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ROTHAMSTED  
RESEARCH

## Report for 1974 - Part 1

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### The Farms

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## THE FARMS

J. R. MOFFATT

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### ROTHAMSTED

The year was very difficult and disappointing for farm work. Spring drilling started later than usual but despite the lack of frosts the ground worked well. A long spring drought enabled all crops to be sown in reasonable time; early growth was retarded but crops, especially beans and potatoes, grew rapidly during the unsettled summer. After a good start the weather for haymaking deteriorated and the quality of much of the hay was lessened. Conditions at cereal harvest deteriorated badly in September and much of the wheat was battered before it was cut about two weeks later than usual. There followed one of the wettest autumns on record and all field work, including the drilling of experiments for 1975, was seriously delayed. During a drier and very mild spell of weather in December potato lifting was completed except for a small area which was too wet. Cereal drilling was also completed but at the end of the year much ploughing remained to be done.

#### The effect of weather on crops

The winter was mild but wet; ploughing finished early in January but very little other land work was possible until the last few days of March. The rainfall for the first three months of the year totalled 236 mm, 75 mm above average. During this period most of the grassland was given its N-rich fertiliser.

The position then altered drastically and there was a six-week spell of dry weather with north-east winds which dried the ground rapidly and made conditions excellent for field work. The drilling of beans and barley started on 26 March, much later than usual, but all were planted by 5 April. Germination and growth was slow and patchy due to the dry soil. Other crops were drilled in satisfactory seedbeds. As the drought continued the soil became very hard and dry; the ground for potatoes had to be cultivated to level it before fertiliser could be applied, and the ground sown to wheat became too hard to roll. The growth of all crops and grass was retarded and they showed signs of suffering from



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drought; the strong winds delayed the spraying of cereals. In April, the 21 mm of rain fell on only eight days, and 30 mm in May on 12 days.

The early part of June was dry and some excellent hay was made but many bales were damaged by heavy rain which fell in the middle of the month. All crops benefited from the rain which fortunately did not cause much lodging but the persistence of unsettled weather delayed the finish of haymaking. The July weather was unsettled with wide fluctuations in temperature, sunshine and rainfall; rainfall was about half the normal but seemed adequate for most crops, all of which grew rapidly.

Harvest started at the end of July with small areas of winter barley and rape, but a wet spell then delayed harvest work until mid-August, by which time much of the winter oat crop was laid. In a fine spell in the latter half of August the winter oats and all the barley were harvested in good condition as lodging was not severe. An excellent start was made with the harvesting of winter wheat but the work was seriously interrupted by a long spell of very unsettled weather; rain fell on 22 days during September and the total of 124 mm was almost twice the average. Strong winds battered most of the unharvested wheat. Work restarted about the middle of the month and was done whenever the straw was dry enough to go through the combine, irrespective of the moisture content of the grain. There were some losses due to badly lodged crops shedding before cutting and sprouting in the ear. Harvest finished about two weeks later than usual.

Spring beans remained green well into September and seemed unaffected by that month's gales. They then ripened quickly and harvest started on 23 September but, because of many interruptions by rain, did not finish until mid-October. This was another wet month, rain falling on 22 days. Potato lifting was delayed but conditions improved towards the end of the month and all yield rows of experiments were lifted by 4 November. The drilling of winter cereals was also delayed and many experiments needing an early drilling treatment had to be revised.

November was extremely wet; rain fell on 26 days and totalled 143 mm, about twice the average. The ground became waterlogged and land work was halted for days on end. The few sugar-beet plots were lifted when the ground was too wet for potato lifting. The weather improved in early December and the ground dried considerably. With a good labour force the rest of the potatoes were lifted before Christmas from ground which would carry the lifting equipment. Many wheat experiments were drilled, the last on 31 December. At the end of the year some straw was still lying and much ploughing remained to be done.

### Field experiments and crops

There were nearly 5000 full-scale plots, and yields were taken from over 4000.

On Broadbalk, Hoosfield and Barnfield granular fertiliser was used for the first time, and kieserite was used in place of magnesium sulphate. On all these fields the spacing of potatoes in the rows was increased from 15 in. to 19 in.

On Broadbalk aminotriazole was applied in autumn 1973 to control couch grass (*Agropyron repens*) and 'Prebane' (*terbutryne*) was used to control blackgrass (*Alopecurus myosuroides*) except for Section 8. Wild oats were hand pulled twice and there were fewer plants than in 1973. There was little lodging; the wheat was harvested before the break in the weather and the yield was better than in 1973. The growth of potatoes varied greatly between plots and while some were ridged on 24 June other plots were not done until 16 days later. There was a heavy infestation of horsetails (*Equisetum*) on some plots and the worst were hand pulled. Beans appeared to grow better than usual despite the rather numerous weeds but the mean yield was slightly less than in 1973; the effect of the fertiliser treatments was very marked.

On Hoosfield the growth of barley was uneven in the early part of the season. The few



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wild oats were hand pulled and there was little lodging. The mean yield was slightly better than in 1973.

On Barnfield Sections 1 and 2, each strip was divided into four parallel quarters, each running the full length of the two sections to test the effect of fallows of different duration, disease incidence and yield. One quarter-plot was mechanically weeded and one received simazine. After a slow start the beans grew well on most plots; on the strips receiving dung the yield was less than in 1973 but on the other strips the yield was far greater because the harmful effect of simazine in 1973 did not recur in 1974. There were many creeping thistles (*Cirsium arvense*) which were hand pulled. On the remaining sections, Strip 3 was planted with a single row of four varieties of potatoes to test their susceptibility to Pink Rot (*Phytophthora erythroseptica*) which occurred in the 1973 potatoes. Part of Strip 4 was planted with barley as the start of a sequence of continual cereal growing. The rest of the field was fallowed but fertilisers, other than agricultural salt, were applied.

The sugar beet on the Ley-Arable experiment germinated slowly and unevenly. It was sprayed with 'Betanal E' (phenmedipham) to control weeds, and twice with 'Metasystox' to control the vectors of sugar-beet yellows. However, the disease spread rapidly and the heavy infection which persisted until the crop was lifted, lessened the yield.

Small areas of winter and spring rape were sown side by side to determine the number and types of insects which are present in unsprayed crops. Because of uneven ripening the winter crop was sprayed with a desiccant a few days before harvesting. Despite this, harvest losses were big.

### Cropping

Of the 244 ha farmed 188 were under arable crops or fallow, 31 under short-term leys or lucerne and 45 under permanent grass. The main crops were wheat (50.9 ha), barley (64 ha), oats (9.7 ha), beans (23.7 ha), potatoes (13 ha) and fallow (24.5 ha).

Much of the farm is worked on a seven-year rotation so as to give a choice of sites with different probabilities of attack by soil-borne pathogens. Several fields outside the rotation are kept acid or deficient in the major plant nutrients to provide sites for future 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. Stubble cleaning after harvest was prevented by the presence of straw which the weather had prevented us baling, but some areas were sprayed with aminotriazole or paraquat. Some straw was baled and some chopped and ploughed in but little was burnt. All bean straw was chopped but some wheat straw had yet to be cleared at the end of the year.

All fields were rogued for wild oats.

Only one grass field was irrigated during the year as there was ample rain for all crops after mid-June. Three cuts were taken from each of the grass experiments.

**Wheat.** Cappelle-Desprez (21 ha) and Bouquet (21 ha) were the main varieties though some Maris Huntsman (3 ha), Maris Ranger and other varieties were grown (5 ha). It is now routine practice to dress the seed sown on areas after fallow or potatoes with an anti-bulb fly preparation, and in autumn 1973 mercury/dieldrin was used, though tests showed that amount of dust on the seed was far less than optimum and uniformity of treatment was poor. By mid-April the crop was beginning to turn yellow and the spring nitrogen was applied by the end of the month. Mildew (*Erysiphe graminis*) became moderate on susceptible varieties. Conditions favoured take-all which seriously damaged winter wheat where previous cropping and manuring predisposed crops to attack.



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Eyespot was more prevalent than in recent years, but lodging of wheat was caused more by adverse weather than by disease.

Yields were rather lower than in 1973, largely because of the battering the crop received early in September. The mean yield of the variety trial on a healthy site was 6.85 t/ha compared with the 1973 mean of 7.06. Cappelle gave the lowest yield of the eight varieties; the new semi-dwarf variety Maris Fundin yielded well (7.34 t/ha) on the healthy site but poorly (5.36 t) on the diseased site where it was severely affected by eyespot, and the mean yield was 6.50 t/ha. Maris Nimrod gave the best yield on the healthy site (7.35 t/ha). Increasing amounts of nitrogen up to 189 kg/ha increased the yield but the highest rate given in two doses gave less on both sites than the single dose.

Three fields of Cappelle, Bouquet and Maris Huntsman yielded 5.5, 5.8 and 5.9 t/ha respectively.

**Barley.** About 3 ha of winter barley were grown on experiments. Julia (53 ha) was the main spring variety with Zephyr and Mazurka in some experiments. Rothamsted-grown Julia seed, cleaned and dusted against mildew (*Erysiphe graminis*) with ethirimol by a mobile machine, was used on most areas. The disease was prevalent on untreated crops by late May and had become severe by early June. There was some brown rust (*Puccinia hordei*) on susceptible varieties by mid-July. After a rather slow start the crop grew satisfactorily and there was little lodging.

Yields were disappointing. The mean yield in the variety experiment was 4.97 t/ha compared with the 1973 figure of 6.21, and 6.35 in 1972. Our standard variety Julia yielded 4.85 t/ha, and the old variety Proctor, when treated against mildew, gave a surprisingly good yield (4.63 t/ha). The highest yields were given by Lofa Abed (5.70 t/ha) and Maris Mink (5.45 t/ha). Julia and Proctor with mildew control by ethirimol yielded more than with control with tridemorph. Yields increased with increasing amounts of nitrogen up to 113 kg/ha. The yield from non-experimental areas varied between 3.66 and 5.80 t/ha, with an overall mean of 4.56 t.

**Oats.** A larger area than usual was sown to oats which acted as a 'break' crop in the rotation. Peniarth winter oats were grown on 8 ha and the spring variety Manod was grown on nearly 2 ha. The crop grew well and harvest started early in August but a wet spell then delayed the work for ten days, by which time much of the Peniarth was lodged. The best yield was about 5.4 t/ha with an average of 4.2 t/ha.

**Beans.** Minor (17 ha) and Maris Bead (3 ha) were the main varieties and a small area of a new variety Minden was grown for seed; most of the Minor and Maris Bead seed was grown at Rothamsted or Woburn and was free from broad bean stain virus (BBSV), and stem eelworm. Simazine was used as a pre-emergence spray but the dry conditions reduced its normal effectiveness. The crops which grew slowly at first but quickly after the June rain, were given one early spraying with 'Metasystox' to control an infestation of black aphids (*Aphis fabae*) as the ground was too dry for phorate granules to be effective. The crop remained green until well into September and seemed unaffected by that month's gales. They then ripened quickly. Harvest was interrupted and did not finish until mid-October. Yields were good; Minden, free from virus, and grown on eelworm-free soil, yielded 5.72 t/ha of uncleaned grain at 85% dry matter. This is almost twice the average yield over the last few years. In a variety experiment where the mean yield was 3.52 t/ha, Minden yielded 4.6 t. The yield of Minor and Maris Bead was about average but on one experiment where spraying was long delayed, the mean yield was only 1.8 t/ha.



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**Potatoes.** King Edward and Pentland Crown were the main varieties. Rothamsted-grown seed from Scottish VTSC seed was grown on most experiments and this will be the routine practice in future. The 1974 seed crop was planted with phorate granules and in isolation but, as aphids appeared early and in large number, the stocks were at some risk because of the increased amount of virus infection this year. However, tests made in the autumn showed that the little virus disease did not preclude their use for seed. Because of the mild winter and late start to potato planting no heat was needed to chit the seed. A linuron/paraquat spray was used to control weeds. The crop grew rapidly during July and August, and two sprayings were done against blight, the first incorporating 'Metasystox' to kill aphids. The haulm of those grown for seed was destroyed in August; the wet weather caused the tubers of the ware crops to grow very rapidly and so the haulm, though quite green, was destroyed early in September to prevent the tubers becoming oversize. Lifting was extremely tedious and drawn out because of the heavy rainfall and shortage of pickers, but volunteers from the laboratory staff gave considerable help. The tubers were quite large but of good shape with very little disease or scab, except from waterlogged areas where many tubers rotted in the ground; they carried in quite a lot of soil. Yields were generally good; in an experiment comparing varieties, Pentland Crown gave a mean yield of 58.7 t/ha (51.6 t in 1973), Majestic 56.4 t (49.6 t), King Edward 54.5 t (48.6 t) and Record 43.9 t (35.9 t). In an experiment including some newer varieties, one of these, Stormont Enterprise, gave the best yield (58.4 t/ha), closely followed by Maris Piper (58.0 t).

**Grass.** Most grass fields were given either a high-nitrogen compound fertiliser or 'Nitro-Chalk 25' in early March. The grass grew slowly in the cold spring and yields for silage were small; hay yields were also smaller than usual and the quality was very variable. An NK-rich fertiliser was applied after silage and hay, and was washed in by irrigation on one field and by rain on other fields. The grazed fields were given a mid-season application of 'Nitro-Chalk 25' and were topped. One field was sprayed with mecoprop to control chickweed (*Stellaria media*). The ample rain provided more than sufficient grass for the cattle throughout the summer and autumn, and some fields from which it was hoped to take a late hay crop were eventually grazed.

### Cattle

The usual policy was continued of buying in young Hereford-cross cattle in autumn for fattening on the grass the following summer. They are outwintered cheaply on silage which is the produce of the experimental grass plots and outsides of hay fields, hay and brock potatoes. Those not fattened from the grass are finished in the covered yards with the addition of home-grown concentrates. In 1974, 189 cattle were sold fat from the Rothamsted and Woburn farms. In autumn 1974, 141 young cattle were bought for Rothamsted. There are ample feeding stuffs to last the cattle through the winter.

### Equipment

New equipment consisted of a straw chopper for use on stubbles, and a haulm pulveriser which arrived too late to be used this year. This replaces the horizontal chain flail machine which has been used in the past.

### Staff

Of the Recorder Staff, J. R. Hayles left.



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### WOBURN

The year started well following the fine, dry autumn of 1973. After a mild winter, spring cultivations led to moisture loss and the growth of all crops was retarded but most of them recovered with the rain from mid-June onwards. Hay crops were light and of variable quality. Wheat yields were affected by bad weather early in September but beans and potatoes gave excellent crops. The autumn was very wet and unfavourable to farm work.

#### The effect of weather on crops

January and February were mild but damp and no field work was done. Spring work started in early March with bean drilling but was interrupted by a wet spell, during which work was done on grassland. A dry spell started at the end of March and in a four-week period when only 3 mm of rain fell, field work progressed rapidly. All sowings and potato planting finished by the end of April, wheat was given its nitrogenous top-dressing and the spraying of spring barley was completed by the end of May. In April and May there was less than half the normal amount of rain, and all field work kept up to schedule. However, temperatures were low and all crops and grass grew slowly.

Haymaking started in fine weather in June but heavy rain after the middle of the month spoilt some of it. The latter half of the month remained wet with 47 mm of rain falling in two weeks, and in July the weather was dull and damp; arable crops benefited greatly from the rain which did no serious damage to the cereal crops.

Early August was wet which spoilt some late hay and delayed the start of harvest until 19 August. All barley was cut by 27 August and a start was made with winter wheat, but a long wet spell in early September delayed the finish of harvest until 12 September. Beans ripened late, and though cutting started on 17 September it did not finish until 14 October. In September rain fell on 23 days and was more than twice the average. The bad weather continued throughout October and November when rain fell on 19 and 22 days respectively. The ground became very wet and there was quite a lot of soil erosion in Stackyard field. Potato and sugar-beet lifting and ploughing were seriously delayed; however, during a spell of better weather in December potato picking was finished just before Christmas and sugar-beet lifting by the end of the year. Much ploughing was done but a lot remained to be done at the end of the year and some wheat had still to be drilled.

#### Field experiments and crops

There were over 2000 field plots taken to harvest, a further 250 from which no yields were taken, and nearly 500 microplots. In the dry autumn of 1973 all autumn-sown crops were drilled in good time and in good conditions, but spring sowings were rather late. Potato experiments were lifted late but were finished by the end of October.

#### Cropping

Of the 75.4 ha farmed 46 were under arable crops or fallow, 15.2 under temporary grass and 14.2 under permanent grass. The main crops were barley 14.6 ha, wheat 9.9 ha, potatoes 8.5 ha and beans 5.1 ha. Bare fallow occupied 6.6 ha.

The light land is worked on a six-course rotation and the heavy land on a four-course to provide different intensities of soil-borne cereal pathogens, and to prevent those of potato and sugar beet reaching dangerous populations. 'Break' crops for cereals are potatoes, beans, ley or fallow. During the autumn magnesian limestone was applied to light land and ground carbonate to the heavy land. Several areas were sprayed with aminotriazole to control couch grass, and on some areas paraquat was used to control weeds and volunteer corn. One field was tile drained and many areas were sub-soiled.



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All cereals were rogued for wild oats but they were few.

There was a big increase in the number of rabbits but the clearing of a focal breeding spot on a neighbour's land eased the problem. Despite shooting and gassing of hedge-rows many experiments had to be netted and others suffered some damage. There was less damage than usual by pheasants or other birds.

**Wheat.** Cappelle was the standard variety, and that sown after potatoes was dusted with mercury/dieldrin. The crop grew well in the mild winter but looked yellow towards the end of March. In one field analyses showed the amount of nitrogen in the lower stems to be as low as 0.2 ppm so some 'Nitro-Chalk' was applied immediately and some a few weeks later. Despite some heavy storms there was little lodging except on the high-N plots of the variety experiment which gave a mean yield of 6.63 t/ha. Increasing rates of nitrogen lessened the yield of most varieties, presumably due to the effect of lodging. Chlormequat chloride (CCC) was effective in lessening the length of straw and increased the yield of all varieties except Maris Fundin; Cappelle yielded least (5.76 t) and Maris Templar most (7.55 t) with Maris Fundin a close second (7.41 t). Other yields averaged about 5.0 t/ha but less than 2.5 t from the sandy hill where the crop had been grazed by rabbits before it was netted.

**Barley.** Julia, treated with ethirimol was the only variety grown except in the variety trial. Sown under ideal conditions initial growth was slow, but accelerated with the rain in June. There was little lodging but because of green grains all the crop had to be dried. The average yield in the variety trial was 5.09 t/ha (5.11 t in 1973). Maris Mink gave the best yield (6.37 t/ha) but a surprising feature of the experiment was the good yield (5.32 t) given by Proctor when sprayed with tridemorph; Julia yielded 5.28 t/ha. Yields in other experiments ranged between 4.4 and 6.0 t/ha. Mildew (*Erysiphe graminis*) was damaging where not controlled, but brown rust (*Puccinia hordei*) was less severe than at Rothamsted.

**Beans.** The variety Minor was grown from eelworm-free seed. It was sown during March and though initial growth was slow the crop grew rapidly after mid-June and all areas carried excellent crops. Simazine was used to control weeds; this was ineffective in one field and the crop was tractor-hoed on two occasions. In another field the simazine was effective but the ground became lashed and set hard, so it was tractor-hoed to break the surface. Aphids were controlled by 'Metasystox' sprayed on 20 June, as the ground was too dry for phorate granules. The crop remained green well into September and did not suffer from the heavy rain or strong winds. Yields were good, one field averaging about 5.0 t/ha after drying.

**Potatoes.** Pentland Crown, resistant to common scab (*Streptomyces scabies*) and Maris Piper, resistant to potato cyst nematode (*Heterodera rostochiensis*) were the main varieties. The spacing between tubers was increased this year from 16 to 19 in.; all the seed was chitted. Weeds were controlled by a linuron/paraquat spray. The crop grew well during the season and was sprayed twice against blight, with an aphicide in the first spray. Except on experiments where potato cyst nematodes were present the haulm remained green late in the season, and to prevent too much splitting or oversized tubers the haulm was destroyed mechanically in early September, followed on most areas by a BOV spray. Despite this the Pentland Crown are badly cracked; the Maris Piper are of nice size, have few growth cracks, and less common scab than usual. In one area where the ground had become waterlogged the tubers had rotted but there was no tuber blight. Yields were large; in an experiment which included several varieties, Majestic yielded 57.7 t/ha



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(32.1 t in 1973), Pentland Crown 56.1 t (33.5 t), Maris Piper 58.1 t (33.6 t) and Record 39.6 t (31.9 t). In another experiment Stormont Enterprise, one of the newer varieties, gave the best yield with 63.2 t/ha, followed by Pentland Crown with 59.9 t/ha.

**Sugar beet.** Variety Klein E was grown on the few experiments. Weather conditions were very unsuitable for this crop: sown early in April in dry soil it germinated very slowly and unevenly, and it was several weeks before it could be decided whether there were sufficient plants for a 'stand'. Only one experiment on dry, sandy soil had to be abandoned. The plants grew slowly and were very uneven when singled. The crop was sprayed with 'Solubor' (66.2% diboron trioxide) and twice with 'Metasystox'. *Myzus persicae* were more numerous than usual, and despite the two sprayings the crop became severely infected with sugar-beet yellows, and the infection persisted until the end of the growing season. Harvest conditions were bad, the yield rows were lifted in November but the discards were not cleared until the end of December.

**Grassland.** A high-nitrogen compound fertiliser was applied to all grassland in March but growth was retarded by the dry weather. Four paddocks were sprayed with DNOC against chickweed (*Stellaria media*), and patches of nettles were sprayed with 2,4,5-T herbicide. Hay yields were light; some made early was carted in excellent condition but later cuts were partially spoilt by bad weather. The second cut of a young ley in early August was of excellent quality, and a third cut was taken in mid-September but the quality was affected by weather. Summer nitrogen was given to most grazed fields and an NK mixture to hay aftermaths. There was ample grass throughout the season for the fattening bullocks.

**Cattle.** The policy with cattle is similar to that at Rothamsted except that no silage is made. Young beasts are purchased each autumn, are treated against liver fluke and warbles, and overwintered in yards on hay and brock potatoes. They are fattened on the grass the following summer. Thirty-nine young cattle were bought during the year.

**Buildings.** There was a serious fire early in November. The main wooden-structured barn containing all the straw and several implements was destroyed and serious damage was done to the adjoining grain cleaning and storage plant.

The old bullock shed, built in 1876, was demolished and a new wooden-framed shed with load-bearing walls and an insulated roof was erected. This will be used primarily as a potato store and provide room for storing and weighing the produce of cereal plots, and the storing and sorting of potatoes from experiments. A central air duct with a fan has been installed to enable the potatoes to be ventilated during storage.