

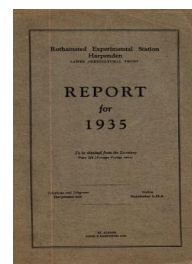
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Report for 1935

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Rothamsted Farm Report, 1935

Rothamsted Research

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CARROT

Violet Root Rot (*Helicobasidium purpureum* (Tul.) Pat.) was found at harvest on a few roots on the experiment on Lansome field.

FARM REPORT, 1935

Weather

The year October, 1934, to September, 1935, was remarkable for the wide variations of rainfall from the monthly averages. Very wet spells alternated with very dry spells throughout the year. October and November were dry; December had an average of more than twice the normal rainfall for the month; January and March were dry, the latter providing 1.5 inches of rainfall below normal; in April the fall was just under 4 inches, twice the normal; late May and early June were very wet, and the early part of August very dry; the September rainfall totalled 4.47 inches, nearly twice the normal for the month. The total rainfall for the year amounted to 30 inches, 1.48 inches above the average.

The winter was abnormally mild, and frosts were almost entirely absent before Christmas. Frosts occurred after Christmas, but were neither severe nor prolonged. The mean temperature for the year was 2°F. above the normal of 48.1°F. In ten of the twelve months the mean temperature was above normal, the outstanding month being December, 1934, with an average of 7°F. above normal. The only two months in which the average was below normal were November, in which month the difference was only 0.1°F., and May, in which month the severe late frost occurred. On the night of May 16th, 1935, an unusually late and severe frost was experienced, 9° of frost being recorded.

In spite of the high average temperature, the total sunshine for the year was 19.4 hours below the 42-year average of 1,562.4 hours. Nine months showed a deficit; the greatest increase was provided by July which, with a total of 280 hours, gave almost 78 hours in excess of the normal.

Weather and Crops

The wet December severely interfered with the sugar beet lifting and prevented any ploughing. The dry January provided the opportunity to get most of the ploughing done, and spring corn-sowing was mainly carried out in March. The heavy rain in May and June made the grass grow ahead of the stock, and several fields, besides those originally shut for hay, were mown. The start of haymaking was delayed until June 21st by rain. Conditions during the making, however, were excellent, and in spite of the lateness in cutting, the hay was of good quality. Usually haymaking and root singling both demand labour at the same time, but this year all singling was finished by the time the cutting commenced.

Harvest commenced on July 31st, 1935, with spring oats. Conditions generally were good, though a wet spell at the end of August delayed the finish of harvest. Stubbles broke up well. The

wet September prevented dung carting and interrupted the ploughing for winter corn.

The severe frost on May 16th, 1935, damaged the first-formed flowers of the winter beans and the final yield was reduced. The plants were rather more forward than usual at that date owing to the warm winter and spring, and the effect of the frost was therefore more severe. No damage was done to other crops. Cold winds persisted throughout May and retarded all growth.

The tilth of the winter corn crops was quite firm in spring, there being not sufficient frosts to make the ground puffy.

It was found difficult to prepare a suitable seed bed for the spring oats after sugar beet. The ground was severely puddled during the lifting and carting of the beet in December, and there was little time for frost action between ploughing and sowing.

The year was a favourable one for weeds; charlock, mayweeds and poppies were especially prevalent.

Classical Experiments

Broadbalk was ploughed twice, once immediately after harvest and again shortly before drilling. The plots were drilled on October 23rd, under good conditions. The section fallowed in 1934 showed up during the year by its more luxuriant growth, and every plot on this section and the 1933 fallow section was laid at harvest. Of the other two sections only the dunged plot and the plot receiving the heaviest dressing of sulphate of ammonia were laid. Black Medick and a species of *Lathyrus* were present in rather larger amounts than usual, especially on certain plots. A few wild oats appeared on the dunged plots but these were hand-pulled before harvest.

The half-acre wheat after fallow was badly attacked for the second successive year by wireworm and wheat bulb fly (*Hylemyia coarctata*). The plant was consequently thin and the yield low.

The plant of wheat on Agdell was rather thin throughout the year and the ground became rather weedy. Coltsfoot (*Tussilago Farfara*) was especially troublesome on the half which grew beans in 1934. The wheat ears were severely damaged by house sparrows during July, and the crop had to be cut and carted before it was fully ripe.

Hoosfield barley plots were drilled with Plumage Archer barley in six-inch rows early in March. Good growth was made throughout the year, and all plots stood well at harvest. Plot differences showed up well this year. The crop was cut and carted under ideal conditions. Threshing took place in January, 1936, and the grain from all plots was bulked and sold for malting. The nitrogen content expressed as the percentage of the dry matter was 1.57 and the calculated extract obtainable from the resulting dry malt was 99.8 per cent. After harvest the stubble was surface ploughed and was worked by harrows at intervals until the winter ploughing.

Ploughing of Barnfield commenced on December 1st, 1934, but was not finished until January 18th, 1935. The field was cultivated and ridged in spring and then worked down for the seed bed. Drilling was done at the end of April but germination was slow and the rows appeared gappy. A survey of the field showed that almost

every plant was badly attacked by the Pigmy Mangold Beetle (*Atomaria linearis*). A similar attack was recorded in 1934, but did not destroy the plant. The field was worked as soon as weather conditions allowed and was resown with a mixture of swedes and mustard. A dry spell followed the sowing and only a few isolated plants appeared, even the mustard failing to germinate. The field remained uncropped for the rest of the season but sufficient cultivations were given to keep down weeds. Thistles soon appeared, but there was a remarkable absence of annual weeds. The rain later in August enabled the annual weeds to germinate, the dunged plots being most thickly populated.

The Park Grass plots were severely harrowed in spring and were rolled after the application of manures. The hay was made and carted under good conditions but the yield appeared rather smaller than usual. The second cut was made late in September, the grass being cut and carted in the green state.

The exhaustion land on Great Hoosfield was sown with Victor wheat after barley. Initial growth was quite good, but this was not maintained, the plants later becoming small and stunted with red leaf tips. The old manurial strips which last received manure in 1901 were again noticeable, and the area was harvested according to the old plots. The yield from the two plots which had received dung was very much greater than any other plot.

Modern Long-Term Experiments

Four-Course Rotation. A slight change in the cropping was introduced this year. The seeds mixture, which in past years was undersown in the barley, was replaced by ryegrass sown after the harvesting of the barley and ploughing in of the organic manures. The ryegrass came and grew well during the year, and the yield was good. Some trouble was experienced in ploughing the hard-baked ground after harvest ready for the seeds.

Liming was also introduced, 10 cwt. per acre of ground agricultural lime being applied after potatoes for the barley crop. The potato crop was generally poor, and the yields low, although they were better than in the past two years.

The wheat was the most backward of any on the farm, and appeared quite green on August 1st. It ripened quickly, however, but yields were rather low.

Six-course Rotation. The clover break failed for the fourth successive year, in spite of a very heavy seeding. A good plant was established by autumn, but this disappeared in the spring. The fungus *Sclerotinia trifoliorum* was present but the attack did not seem severe enough to account for the almost total failure of the crop. When the seeding of the barley for the 1936 clover crop was made, the adjacent area was sown with seed inoculated with two different bacterial strains to see if any improvement could be secured by this means.

The break which has in the past been sown with a forage crop was sown this year with rye alone. In 1934 the forage crop was

harvested as a mature rye crop, owing to the scarcity of tares and beans in this and past years.

Ground agricultural lime is now applied at 10 cwt. per acre to each plot twice in the rotation, before barley and after potatoes. It is hoped this will increase the length of life of the clover plant.

Three-course Rotation (Straw and Green Manure). A noticeable feature this year was that the barley plots which were manured in 1934 and had rye ploughed in before the barley were lighter in colour and the plant was smaller. The mean yield of these plots, although good (33 cwt. per acre) was well below that of the other treatments. The depression observed last year from rye ploughed in for beet was not apparent this year. In fact, the beet plots which had rye ploughed in gave the highest yield in 1935.

Three-course Rotation (Cultivation). The difficulty found in preparing a suitably clean seed bed for the mangold break after the rotary and tine cultivation mentioned in the 1934 Report appeared again this year. The 1934 wheat stubble quickly became weedy after harvest, and after the spring cultivation these weeds took root again. It was impossible to see the rows until the whole area had been hand-hoed. The two worst weeds were Slender Foxtail (*Alopecurus agrestis*) and Bladder Campion (*Silene inflata*). An autumn cultivation will in future be done on the wheat stubble to prevent this trouble. The mangold seed was treated with magnesium sulphate and phenol as a preventative against Pigmy Mangold Beetle attack. The average yield of approximately 20 tons per acre was lower than the 1934 average but was due to the smothering action of the weeds in the early stages.

The wheat plant was rather thin and the average yield of approximately 21 cwt. per acre was about 2 cwt. per acre lower than in 1934. The barley yields, however, showed a great improvement over last year's figures, this year's average of approximately 34 cwt. per acre being about 8 cwt. higher than in 1934.

Annual Experiments

The number and area of plots under annual and long-term experiments was increased again this year. The number of plots was 875, occupying 18.44 acres. The usual trouble was experienced in obtaining casual labour for singling roots, and when this was obtained the quality of the work was very poor.

Sugar beet. All beet plots were drilled and singled earlier this year. All sowing was done before the end of April and singling by the middle of June. Kleinwanzleben E. seed was used on all annual experiments though Kühn was retained for the rotations. Slight attacks of the Pigmy Mangold Beetle and Flea Beetle were recorded. The beet in the narrow spaced rows looked small and yellow late in summer, and the individual plants were very small. The first sown beet (mid-March) showed a large number of bolters, the actual percentage being as high as 18. This early sowing also provided the highest tonnage of roots per acre, and the greatest weight of sugar per acre. The sugar content of all beet was lower than in 1934.

Potatoes. The potato crop looked poor and backward throughout the year, and on no plot did the haulms meet in the rows. Plot differences, however, were well marked. Lifting of the crop was delayed by weather, but all tubers came up in a clean and sound condition. The produce of each plot was stored separately in the clamp so that the effect of the manures on keeping quality could be determined. Blight was present in small quantities at lifting time.

Brussels sprouts. The setting of the plants was delayed for many days by the high winds which prevented the application of manures. The plants were set on June 5th and 6th, but were immediately attacked by pigeons. Many plants were pulled right out of the ground and others were stripped of foliage. The area was patched in July and the plants watered in. Further damage was done and replacements were needed up to August. Growth was slow throughout the season and several further gaps appeared. The tops were completely stripped by pigeons in December and the sprouts themselves were next attacked, most of them being made unfit for sale. Only two small pickings were made. The germination of weed seedlings was noticeably smaller on these plots which received soot.

Wheat. The experiment on the time of application of nitrogen to wheat again yielded no significant result. The average yield of all plots not receiving nitrogen was 30.7 cwt. per acre, and the average of those receiving nitrogen was 30.6 cwt. per acre. Early in summer those plots which had received nitrogen could be detected by their darker foliage and more forward growth, but this difference disappeared before harvest.

Beans. Certain plots furthest from the farm buildings were somewhat damaged by birds, but on the rest of the area the plants grew well. Damage was done to the early flowers by the late frost, and this may have affected some plots more than others. The plots not receiving potash either in dung or in mineral form made less rapid growth and formed fewer pods. *Botrytis* disease, though present generally, was more severe on the potash-deficient plots.

Temporary Ley in preparation for Wheat. The seeds on the Pastures field plots looked well during the spring and yielded a good first cut. The vetches and mustard sown after the first cut germinated badly and the only plots on which the rows became visible were those which had received the full year's fallow. Even on these plots the germination of mustard was worse than the tares. The green crops were resown after rain late in August, and fair germination resulted. Once again the germination was best on the plots which had received the full year's fallow.

Insect Pest Control. Two investigations on the control and eradication of insect pests were commenced during the year. The piece of Pastures field where the oat crops failed in 1934 owing to attack by the oat eelworm (*Heterodera schachtii*) was treated with fumigants, and oats were again sown. Drilling was late, owing to delay in obtaining the fumigants. The other pest under investigation was wireworm. The piece of grassland between Pastures field and Knott wood was ploughed in late spring, treated with fumigants and sown with sugar beet. In both experiments the fumigants were applied in the plough furrows during the ploughing.

Both crops grew well at the start, but certain plots (Cymag-treated) became very stunted later. The stunted oat plots became thick with may-weed and gave a negligible yield. The beet on the Cymag-treated plots were small and fanged, the roots spreading almost horizontally a few inches below ground-level. The beet on the other plots were normal and the roots of good shape. When both the oat and beet plots were ploughed up after the removal of the crop there was a distinct smell of the fumigants.

Adco. A new method of preparing the straw for Adco was used this year. The barley straw used was soaked for a day in a water tank. After the surplus water had drained off the straw was heaped in layers, and the Adco powder was sprinkled on each layer. The heap was turned only once during the summer. The quality of the resulting product was much better than that produced by the old method of sprinkling the straw with water.

Cropping, 1934-35

Pastures field was dunged for kale this year. Most of the field was dressed in autumn, 1934 and the rest in spring, 1935. The field was drilled with marrow-stemmed kale early in May. The plants came fairly well and little trouble was experienced from the flea-beetle. The field became rather weedy, especially on the site of the 1934 cultivation experiment. The worst weeds were may-weed and iron grass (*Polygonum aviculare*). The plant, although patchy, was fairly thick and grew ahead of the weeds.

Harwood's Piece, the field taken over in 1934 after the purchase of the estate, bore its first crop for several years. It was fallowed in 1934 but drilled with Thousand Head Kale early in May, 1935. Growth was slow throughout the year and charlock and docks were plentiful. Much hand and horse labour had to be expended to keep the field reasonably clean. A small area was dusted with copper sulphate at 20 lb. per acre with quite good results. Most of the kale was folded by sheep during the winter, though about $1\frac{1}{4}$ acres of it were sold for human consumption.

In 1934 the winter beans drilled in Great Harpenden Field were severely damaged by birds, and a very thin and uneven plant resulted. To minimise this damage the beans in Great Knott in 1935 were ploughed in, the beans being placed in the bottom of every second furrow by an attachment fitted to the plough. A rather heavier seeding than normal was given to allow for possible damage. No damage occurred and the crop came up thick and clean. Two harrowings were the only cultivations given and these were sufficient to keep down weeds until the plants met across the rows. The resulting crop gave a large bulk of straw which was poorly podded, partly due to frost killing the flowers and partly to the thickness of plant in the rows. While in the shooks the beans were worried by pigeons. The stubble, which was the cleanest that had been obtained for several years, was grazed by pigs until ploughing.

Fosters was drilled with Plumage Archer barley on two dates, after folded and cut kale. The plant grew well, but the dung applied for the kale, and the folding of sheep, caused much of the crop to be lodged. The yield was good but much grain was lost during harvesting.

Great Harpenden field was drilled with Victor wheat after beans. A top dressing of 1 cwt. of sulphate of ammonia was given in March and a small part of the crop was laid by a thunderstorm shortly before harvest. The crop yielded approximately 28 cwt. per acre. The wheat precision plots and the experiment on the time of application of nitrogen were also situated here. The area immediately surrounding these plots was drilled with Little Joss spring sown wheat. This was badly disturbed by birds and only a thin plant resulted. Linseed was then drilled among the wheat but the mixed crop was again badly damaged by birds just before harvest.

The spring sown Marvellous oats in Long Hoos came well despite the rather rough tilth. A top dressing of sulphate of ammonia was given in March and a good thick plant resulted which stood and yielded well. The crop was harvested under ideal conditions.

The plots of the spring oat variety trial yielded well, the only plot yielding much below the others was the non-Ceresan treated "Marvellous" plot. On this plot the plant appeared later and remained thinner and more weedy throughout the Summer. The following table gives the yields of the different varieties :

Variety.	Yield, cwt. per acre.	
	Grain.	Straw.
Star	33.3	38.8
Marvellous	31.5	39.0
Progress	30.4	39.6
Marvellous (own seed) ..	30.0	36.0
Eagle	29.0	40.6
Golden Rain	27.7	40.3
Marvellous (untreated) ..	23.2	31.3

The northernmost six acres were undersown with seeds but these failed, and after harvest three acres were cultivated up and drilled with rye for spring sheep feed.

Little Hoos was devoted to the annual experiments described elsewhere.

Pennell's Piece was sown with Danish Steel Monarch wheat. The crop was considerably damaged by sparrows just before harvest, and the yield was low.

Grassland

The grass was rather late in commencing growth, but was very productive during the summer. Haymaking, although late, was done under good conditions and yields were good. Those fields not cut for hay were topped during the summer. By mid-August the fields were bare but the grass grew again rapidly in September.

A cultivation and manurial experiment on the improvement of the poor grassland in High Field was laid down during spring. The plots which received the severe harrowing produced far less flowering shoots than did the other plots. The remainder of High Field was severely harrowed in April and sows were out-wintered there.

All other grassland was harrowed and rolled in spring.

Livestock

Pigs. During the third contract period (Jan. 1st-Dec. 31st, 1935), 385 Class I bacon pigs were contracted to be delivered to the factory, and 401 pigs were actually delivered from the two farms. The following table gives the percentage grading returns for the two farms separately :

GRADING RETURNS

(3rd Contract)

	Total delivered	Grade A.	Grade B.	Grade C.	Grade D.	Grade E.	Under weight.	Over weight.
Rothamsted *	245	18	25	33	22	less than 1	less than 1	less than 1
Woburn ..	156	24	24	26	22	less than 1	3	less than 1

A third pig experiment in the individual feeding pens was started during the summer. The main comparison was between coarsely and finely ground barley meal ; the effect of exercise on the grading of the bacon was also investigated, full measurements of the carcasses being taken at the factory. The pigs appeared much more healthy than in either of the two previous experiments.

Cattle

Six Shorthorn heifers calved down outside in the spring and remained outside with the calves throughout the summer. Other black polled calves were bought in so that each heifer reared two calves for the first period after calving. After weaning in summer a further calf was fostered on and when this was weaned in autumn the cows were dried off and out-wintered cheaply. The cows were bulled to calve in spring, 1936.

Beef prices remained low throughout the year and even with the subsidy the cattle were not making any more than last year.

Sheep. The 1935 lamb crop averaged about 170 per cent., sixteen sets of triplets being born. The lambs were small at the commencement of lambing but those born later were stronger. Ewe losses were rather heavier than usual.

Prices during the year were rather lower than in the previous year. Those lambs not sold fat off the grass were folded on kale during the winter and sold as they became ready.

Electrical Investigations

A brief account of this work is given on page 69.

Buildings

No major alterations or additions have been made to the buildings, but plans for a new pair of cottages and a new Danish type piggery have been prepared and these buildings will be erected during the coming year.

*The Rothamsted figures include many pigs from the third pig experiment.

Following upon the success of the new method of preparing straw for Adco, plans have been drawn up for a new set of buildings for the making and storing of Adco. The plans also incorporate two cattle feeding boxes so that farmyard manure of known quality can be prepared for experimental purposes.

Show Successes

At the Smithfield Club's Fat Stock Show in 1935, we secured the 6th prize for a bacon pig carcass (160-220 lb. live weight), and were commended for three crossbred fat lambs.

At the Redbourne District Annual Ploughing Match the following awards were gained :

- 1st Prize. Best turnout (F. Stokes).
- 1st „ Corn drilling (F. Stokes).
- 2nd „ Best turnout (C. Mephram).
- 3rd „ Horse ploughing (F. Stokes and H. Currant).

The Certificate of the National Horse Breeders' Association and the R.S.P.C.A. Merit Badge were also awarded to F. Stokes.

Implements

We now have at our two farms a large collection of modern farm implements which have either been presented or loaned to us by many of the leading implement manufacturers. They form a source of great interest to the many parties of practical farmers who visit us, and detailed information concerning the quality of their work and their suitability to our land is given when required. The firms who have helped us to make this collection and to whom we are indebted are as follows :

Allen & Simmonds, Ltd.	Motor hoe.
J. Allen & Sons.	Motor scythe.
Bamfords, Ltd.	Hay machinery.
E. H. Bentall & Co., Ltd.	Cake breaker.
Blackstone & Co., Ltd.	Swathe turner.
Cooch & Sons.	Potato sorter.
Cooper, McDougall & Robertson, Ltd.	Sheep dipper.
Cooper, Pegler & Co., Ltd.	Spraying machinery.
The Cooper-Stewart Engineering Co., Ltd.	Sheep shearing machine.
The Dawewave Wheel Co.	Tractor wheels.
Dunlop Rubber Co., Ltd.	Rubber wheels, paving bricks.
Ford Motor Co., Ltd.	Tractor.
R. G. Garvie & Sons.	Grass seed broadcaster.
General Electric Co.	Electric motors.
Harrison, McGregor & Co., Ltd.	Root pulper, manure distributor.
J. & F. Howard, Ltd.	Ploughs, potato digger.
International Harvester Co., Ltd.	Tractor, drill, manure distributor.
A. Jack & Sons, Ltd.	Root drill and hoe.
L. R. Knapp & Co., Ltd.	Manure and root drill.
R. A. Lister & Co., Ltd.	Oil engine, sheep shearing machine.

Miller Wheels, Ltd.	Tractor wheels.
G. Monro, Ltd.	Motor hoe.
Parmiter & Sons, Ltd.	Rake and harrows.
Ransomes, Sims & Jefferies, Ltd.	Ploughs, cultivators, drills, grass rejuvenator.
Ruston, Hornsby, Ltd.	Grain drill, binder.
Tarpen Syndicate Co., Ltd.	Portable petrol generating equipment.
Transplanters, Ltd.	Robot planter.
J. Wallace & Sons, Ltd.	Manure sower, potato planter.
J. Wilder.	Pitch-pole harrows.
W. A. Wood & Co., Ltd.	Mower, spring tine harrows.

Staff

H. M. Edginton spent about six months here as a voluntary worker to help with the livestock experimental work and field observations. F. R. Russell also spent a short time during the winter helping with general recording and field observations.

METEOROLOGICAL OBSERVATIONS

Meteorological observations have been systematically made at Rothamsted for many years; these records are being used in the Statistical Department in interpreting crop records. The Station has co-operated in the Agricultural Meteorological Scheme since its inauguration by the Ministry of Agriculture in 1926, and possesses all the equipment required of a Crop-Weather Station.

The following observations under this scheme are taken daily, at 9 a.m. G.M.T.:

Temperatures—maximum and minimum in screen, minimum on grass, 4 inches and 8 inches under bare soil, dry and wet bulb in screen; *Rainfall*—8-inch gauge; *Sunshine*—duration by Campbell-Stokes recorder; *Weather*—Beaufort letters; *Wind*—direction and force; *Visibility*; *State of Ground*.

These, together with notes and observations of crop growth, are used in drawing up the weekly statement for the purpose of the Crop Weather Report of the Ministry of Agriculture.

The above observations are supplemented by the following records, for the use of the Meteorological Office:

Barometer and attached Thermometer; *Solar maximum*; *Temperature*—1 foot under bare soil; *Cloud*—amount, form and direction; *Sunshine*—hourly values of duration. With the exception of the last, all these observations are also taken at 9 a.m. G.M.T.

The following additional observations are also made, to maintain the continuity of the Rothamsted meteorological records:

Temperature under grass at 4 inches, 8 inches, and 1 foot, taken at 9 a.m. G.M.T.; *Wind*—direction and force at 3 p.m. and 9 p.m., G.M.T., taken from chart of recording anemobiograph; *Rainfall*—5-inch gauge taken at 9 a.m. G.M.T.