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Report for 1934

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Rothamsted Farm Report - 1934

Rothamsted Research

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Downy Mildew (*Peronospora parasitica* (Pers.) Tul.) was plentiful in October at Woburn. In Butt Furlong field where kale and swedes were mixed the leaves of the latter could be identified by the abundance of the disease on them while the kale was free as late as October, though two months later the kale was also attacked.

Deficiency Disease

Brown Heart. Symptoms resembling "Brown heart" were found occasionally on Lansome field, Woburn.

KALE

Was very healthy in the early part of the season and showed little or no sign of disease until the late autumn.

Downy Mildew (*Peronospora parasitica* (Pers.) Tul.) appeared in the winter at Rothamsted and Woburn in moderate quantity.

Grey Mould (*Botrytis cinerea* Pers.) was moderate at Rothamsted and slight at Woburn in the winter.

White Blister (*Cystopus candidus* (Pers.) de Bary) and *Alternaria Brassicae* (Berk.) Bolle were found occasionally.

BRUSSELS SPROUTS

Very healthy early in the season.

Grey Mould (*Botrytis cinerea* Pers.) was present on the outer leaves and a Soft Rot (bacterial) was occasional, in the autumn, at Rothamsted.

CABBAGE

Ring Spot (*Mycosphaerella brassicicola* (Fr.) Lindau) was moderate and *Alternaria Brassicae* (Berk.) Bolle occasional in the autumn at Rothamsted.

CARROTS were grown only on Lansome field, Woburn.

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

Sclerotinia Rot (*Sclerotinia sclerotiorum* (Lib.) de Bary) appeared in the clamp in moderate quantity.

Soft Rot (*Bacillus caratovorius* L.R. Jones) appeared in the clamp, about 10 per cent. of the roots being affected to some extent.

FARM REPORT, 1934

Weather

The year, October, 1933, to September, 1934, was abnormally dry and hot, rather similar to the previous one. The rainfall totalled 19.16 inches, 3.32 inches below last year's figure and 9.40 inches below the 81-year average. The biggest deficit occurred in the last three months of 1933, when only 3.49 inches were recorded against the 80-year average of 8.38 inches. There was, however, one very wet spell at the end of February and early in March, which stopped all land work for almost three weeks. The four summer months, May to August, were dry, and gave a deficit of almost 4 inches compared with a corresponding deficit last year of almost 5 inches. In nine of the twelve months the rainfall was below the average, and the biggest increase over the average which occurred in March, was only $\frac{1}{2}$ inch. Frequent showers occurred in August, which rather interfered with the harvest.

The total sunshine for the year amounted to just 40 hours above the average of 1,561 hours, but 210 hours less than 1933. The last three months of 1933 gave a deficit of 29 hours. July was hot, and provided 74 hours sunshine above normal.

The mean temperature for the year was about 1°F. above the normal of 48°F. December was very cold and dry, with severe frosts. July gave an average temperature of 3.5°F. above normal.

The weather of 1934, although generally similar to 1933, was drier but less sunny, and the monthly fluctuations of both sunshine and temperature were greater than in 1933.

Weather and Crops

The three dry months, October to December, 1933, enabled root-lifting and carting, and the sowing of winter corn to be carried out under good conditions,

The continued dry weather and frosts made the ground under winter corn very puffy. This encouraged wireworm, but heavy ring-rolling prevented the attack from becoming serious.

The hot and dry summer proved very suitable to the flea-beetle, and one strip of kale in Fosters field failed after three sowings. Other parts of the field became patchy, but the plants grew away with the late rain and further applications of sulphate of ammonia. Where the plant was thin the individual kale plants attained greater size, so that all the ground was covered.

The year was very favourable for charlock, and much of it had to be hand pulled. No infestation was sufficient to warrant the ploughing up of any crop.

In Long Hoos the seeds experiment failed, and a similar experiment was laid down under oats in Pastures field. Here a heavy seeding was given and the plots have taken well.

This year harvest operations began on July 30th, but considerable interruption was caused by the showers. All corn was stooked after cutting, and was carted later in good condition. A little of the wheat was threshed out early and sold for seed.

Classical Experiments

Broadbalk was sown on October 17th, section IV being fallowed. The section fallowed in 1933 showed up distinctly in spring as a greener and more luxuriant growth. At harvest only a few of the heavier plots were laid, and little damage was done. The stubble was cleaner than it has been for several years. Poppies were almost entirely absent and slender foxtail (*Alopecurus agrestis*) was not nearly so prevalent as usual.

Hoosfield barley plots were sown this year after the fallow in 1933. Sowing took place rather late, as a result of the heavy rainfall early in March. The narrow six-inch spacing was reverted to and only the one variety—Plumage Archer—was sown. The individual plots did not show up so distinctly as in previous years, as the effect of fallowing was to even out the plot differences. The only two strips which were noticeable were those without superphosphate. On these plots the leaf tips turned brown early in the year but the plant recovered later; these plots came into ear about ten days later than the other plots. The stubble quickly became green after harvest, and a surface

ploughing was done to bury these weeds and to encourage others to germinate. The surface was periodically worked until the winter ploughing, when the germinated weeds were buried.

Barnfield was ploughed up by November 17th, and so received the benefit of the December frosts. The wet spell early in March made it impossible to work the land, and the tith at sowing time was rather coarse. Germination was poor except on the dunged plots, and damage was done by the Pigmy Mangold Beetle (*Atomaria linearis*). Growth was slow during the early summer, but the roots grew away well later and the average yield for the whole field was over 20 tons per acre. The field is now badly infested with couch grass (*Agropyrium repens*). The heaviness of the soil and the small period of time available for cultivating the land before sowing in spring, makes it difficult to keep the weed in check.

In Agdell the seeds undersown in the barley failed, and the field was ploughed up and sown with spring beans. The central strip, which receives mineral manures only to the root crop, had the best plant. The middle and lower strips (M and O) were badly infested with coltsfoot.

Park Grass plots were given a more severe harrowing than usual, early in the year, and the plots were rolled after the application of the manures. The hay was made in good condition. Only very few of the plots made sufficient growth for a second cut, but the mower was run over all plots to remove what growth there was, so that the spring growth would not be retarded.

The half-acre wheat after fallow in Hoosfield was attacked by both wireworm and wheat bulb fly (*Hylemia coarctata*). The resulting plant was rather thin, but all the ground was covered.

The exhaustion land in Hoosfield was sown with barley after last year's fallow, and yielded 22 cwt. per acre. The old manurial strips, last manured in 1901, could easily be detected.

Modern Long-Term Experiments

Four-course. The potato series looked very backward throughout the season, although there was no severe attack of any disease. The slight attack of blight, however, was not sufficient to account for the poor appearance of the crop, and the stock of seed was the same as was used in the other experiments. The average yield of $3\frac{3}{4}$ tons per acre was considerably less than in previous years, but all the tubers were perfectly healthy and kept well.

The plot in the seeds break which had the straw applied on the surface, yielded very badly again this year. In future, to avoid this killing of the plant by the straw, all organic manures are to be ploughed in after harvesting the barley and pure rye grass will then be sown.

Six-course. The clover break failed for the third successive year, in spite of the heavy seeding. A fair plant was present during the winter months, but this disappeared in the spring. There was no severe attack of disease. *Sclerotinia trifoliorum* was present in small amount, but not sufficient to cause complete failure of the clover. It is proposed to sow a strip of inoculated seed next year on an adjoining piece of land to see if this improves the "take" of the clover.

The forage mixture contained very few beans or vetches, as they were crowded out by the rapidly growing rye. Since the start of the rotation the mixture has been predominantly rye, and this year it was decided to treat it as a rye crop and harvest the mature grain. In future rye alone will be sown, and harvested as a grain crop.

Three-Course (Straw and Green Manure). The only noteworthy feature was the sugar beet plots following rye ploughed-in. The beet on these plots were much less forward and the leaves were more yellowed than those following either of the other two green manure crops. The mean yield on these plots was also lower.

Three-Course (Cultivation). The wheat stubble became very weedy after harvest, and both the rotary and tine cultivation done for mangolds in spring left the weeds on the surface, and they soon took root again. On these cultivated plots it was difficult to pick out the rows of mangolds, long after those on the ploughed plots were showing well. The predominant weed was Slender Foxtail (*Alopecurus agrestis*), and the whole area had to be carefully hand-hoed as soon as the rows could be picked out. In the wet spring the weeds rapidly covered the ground and smothered the plants before the rows showed sufficiently well to enable hoeing to be done. The mean yield of all the plots this year was almost 36 tons per acre.

Annual Experiments

Sugar beet. Kleinwanzleben E seed was used for the annual experiments this year. The variety Kühn previously used was retained in the rotations to maintain continuity. Although Kühn was sown and singled before Kleinwanzleben E, the latter made much more vigorous growth and gave better yields. All roots grew well after a rather late and slow start, and the mean yield of the two experiments was 14 and 15 tons of washed beet per acre with sugar percentages of 17 and 18.

Potatoes. The variety Ally was again sown this year. The crop grew well throughout the year and was almost entirely free from disease. Several of the plot yields reached 13 tons per acre, with a very low proportion of seed and chaff.

Brussel sprouts. The plants were not set out until June 8th, as we had to wait for rain. Hand watering had to be resorted to, to give them a start, but they grew away well and yielded three pickings, the first on October 24th. The quality of the sprouts was excellent, and the yield of 90 cwt. per acre was much above last year's figure.

Wheat. The experiment to determine the effect of top dressings of sulphate of ammonia applied at different times throughout the growing period, gave no significant result. The mean yield of all plots receiving nitrogen was 37 cwt. per acre, those unmanured yielding 35 cwt. per acre.

Beans. This year, for the first time, a manurial experiment on beans was included in the experimental programme. The autumn sowing was destroyed by birds and the plots were resown early in February. The only significant responses were to the two levels of dung. The mean yield of the higher dung level (15 tons per acre) was just over 20 cwt. per acre.

Cropping, 1933-34

It was the turn of Fosters field to be dunged for kale this year. Half the field was dressed in autumn, 1933, and the rest in the following spring. The field was drilled in strips from the north. The first sown strip was destroyed by the flea-beetle three times. Before the second and third sowings the seeds were soaked in turpentine and paraffin rags were dragged across the crop. This strip was eventually sown broadcast with rape and winter green turnips and a fair yield of green food was provided.

In previous years part of the field to be cropped with kale was sown in the autumn with rye, to provide keep for the ewes and lambs in April. This was folded off and the kale sown. In 1932 the kale following the rye was much poorer than the rest of the field, and in 1933 the corresponding area was more severely attacked by the flea-beetle. The probable explanation of this is that the tilth for kale after folded rye is much coarser than on the uncropped area; hence the plants took longer to germinate and subsequent growth was slower. The same difficulty in providing a suitable tilth after folding is experienced for barley after folded kale.

Pastures field was sown with our own seed of Marvellous spring oats in mid-February. Drilling took place in both directions. The crop made good progress at the start but later became badly infected with oat eelworm (*Heterodera schachtii*). The plant became thin, and certain areas were almost completely destroyed. The sparsity of the plant enabled knot grass (*Polygonum aviculare*) to gain a firm hold, and this smothered out most of the undersown seeds on the north side. The oats were thicker on the south side of the field, and the experimental strips of seeds mixtures made good growth. Carting of the oats had to be delayed until the weeds in the sheaf butts were withered. After the field was cleared the stubble was broken up, the weeds harrowed and horse-raked together and burnt. The north side of the field was dunged in the autumn ready for kale in 1935.

No satisfactory control measure against the eelworm is yet known, and at present the only way to prevent a recurrence of the attack is to give the field a long rotation to ensure that oats are not sown again for at least eight years. A small experimental area of oats will be sown next year to test the effect of various soil fumigants on the eelworms.

Harpenden field was sown with winter beans, but rooks, game, and frost did considerable damage to the crop. Most of the field was redrilled in spring, but again severe damage was done by birds and the plant became thin. Much hand and horse-hoeing had to be done to keep the field reasonably clean and about two acres of headland were ploughed up. Spring beans were also drilled on the site of the 1933 brussel sprouts crop, so that the whole field was under the same crop. The final yield was 13 cwt. per acre. Ewes were run over the stubble after harvest, and the field was then thoroughly cultivated and ploughed up for wheat. The tractor thistlebar was used on the field before sowing wheat to kill any self-sown beans.

Little Hoos was sown with Victor wheat following beans, and yielded an excellent crop of 32 cwt. per acre. The only manure given was a top dressing of 1 cwt. of sulphate of ammonia per acre, and in spite of the heavy crop no lodging took place.

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The $1\frac{1}{2}$ acres of Victor wheat in Pennell's piece was very badly laid and damaged by sparrows. Most of the crop had to be cut with the mower and carted loose.

Great Knott was sown with barley following kale. The west side of the field was folded and the rest cut and carted. Ewes were run over the cut stalks to clean up the stems and fallen leaves. The field was ploughed in March, but considerable difficulty was experienced in getting a suitable tilth. No manure was applied, and the crop yielded 25 cwt. per acre.

Long Hoos was set aside for the annual experiments which are described elsewhere. The site of the seeds experiment which failed was sown with linseed in mid-May. The dry weather made germination very slow and three distinct germinations took place, each after a slight shower of rain. The crop consequently ripened unevenly, and when it was cut many of the bolls were quite green. The yield was $9\frac{1}{2}$ cwt. per acre.

In May, 1934, a further seven acres of arable land, now called Harwood's piece was taken over. The field had not been under cultivation for over two years and was covered with couch grass and docks. Cleaning operations were done throughout the summer, but it will be some time before the field is really clean. It will be cropped with kale next year, so that horse-hoeing can be done throughout the summer.

Grassland

The grass made fair progress in the spring, and although the pastures became very bare later in the summer they did not appear so scorched as in the previous year. A further 59 acres of old grassland were taken over in the early summer, and although the quality was poor and growth was slow, the field provided very valuable keep at a time when other pastures were nearly bare. Next year manurial trial strips will be laid down to determine the best way to improve the field. Store cattle will be outwintered there during the coming winter.

The fields which carried sheep through the winter were shut for hay early in the year. In spite of the drought the hay made fair growth and final yields were satisfactory. The failure of last year's hay crop resulted in our stock of hay being almost spent after the winter feeding, and it became necessary to buy in two stacks of cheap hay for the outwintering cattle.

The grassland has been overstocked for the last few years, and during the grazing season the fields quickly became bare and stale as they were rarely rested. Hay crops were also poor, as the fields were grazed quite late in the spring before being shut. At present the grass is carrying about one ewe per acre, and this figure we shall be able to maintain.

No real cultivation other than topping in summer has been given to the grassland for several years. This year the fields were harrowed in spring and topped in summer. Moss has made an appearance in many of the fields, and a severe annual harrowing will be done in future to keep this in check.

Livestock

Horses. Two four-year-old Suffolk geldings were purchased privately in summer, and one old horse has been sold. The increase in the number of horses to six is necessary to keep pace with the expansion of the experimental programme.

Pigs. The satisfactory results of the first pig experiment, the account of which appeared in the last Report, led us to conduct a further experiment this year. The experiment was designed to obtain information on the effects of different levels of nutrition. The highest level was *ad lib.* feeding, which was compared with three lower levels. The lowest level proved to be too low, but a comparison of the other three levels showed no significant economy in food consumption of any one level over any other, although *ad lib.* feeding tended to be more wasteful of food during the latter stages. So with equal food utilisation, *ad lib.* feeding would give the best results, as pigs on this level would reach selling weight earlier, thus giving more rapid capital turnover.

During the first contract period (November-March, 1934), 123 bacon pigs were delivered to the bacon factory from the two farms, and 340 pigs during the second contract period (April-December, 1934). The following table gives the percentage grading returns for the two farms separately.

GRADING RETURNS (1st Contract)							
	Total pigs de- livered.	Grade A.	Grade B.	Grade C.	Grade D.	Grade E.	Un- graded.
Rothamsted	50	14	56	24	6	—	—
Woburn ..	73	25	48	20	7	—	—
2nd Contract							
Rothamsted	168	24	42	17	15	1	1
Woburn ..	172	17	32	17	21	—	13 *

* Due to pigs being delivered slightly under weight.

The Rothamsted figures include the pigs from the two experiments, a large proportion of which graded C and D.

During an early hot spell in May we had an attack of swine erysipelas and several deaths occurred among the fattening pigs. All the pigs on the farm were inoculated and no further trouble was experienced.

Several weakly litters of pigs were produced during the year, and as this was thought to be due to the ageing of the boar used, a new young Large White boar was bought. The new boar is giving good and large litters.

All seed, chat and rejected potatoes were fed raw to the sows outside during the winter and they appeared to relish them. The general condition of the sows on being brought in to farrow was improved as a result of this extra feeding and no harmful results were apparent.

All fattening pigs are now given dry meal at the commencement of each feed and water is added after about ten minutes. This method of feeding has improved the belly measurements of bacon pigs, and it prevents the pigs overloading their stomachs with cold water.

Cattle

The policy during the year has been to reduce the numbers of cattle. The cows, which were used to rear calves intensively, were

sold during the year as they calved. Six Shorthorn heifers from a well-known herd were bulled to calve in the early Spring of 1935. With their calves they will be kept outside during the summer without supplementary feeding, and the calves will be weaned into covered yards in the autumn.

The fattening cattle were not hurried on during the summer as we wanted them to qualify for the payment from the Cattle Fund. The price of beef, however, has fallen so low that it more than counter-balances the payment from the fund.

Sheep. The work started in 1931 has continued along previous lines. The best of our Half-bred ewes were again mated with a Scotch Half-bred tup this year to produce ewe lambs for breeding. We now have 42 of these lambs born in 1932, 30 born in 1933 and 18 born in 1934. Up to the present it has been impossible to make any direct comparison with Scotch Half-bred ewes as both farms were stocked to capacity. This year, however, with the culling of several old ewes it has been possible to buy in 50 Scotch gimmers. Of these 35 are at Woburn together with 15 Rothamsted bred gimmers, while 15 of each breeding are at Rothamsted. Two direct comparisons will now be made under slightly differing conditions of management.

The 4 teated ewes were again put to a tup possessing 4 teats. Although most of the ewes milk in all four teats after lambing we have, as yet, found no indication that their lambs make use of the extra teats as no superiority in weight is shown at 6 or 18 weeks, over those lambs from normal 2-teated ewes. Unfortunately this year owing to scarcity of triplets it was not possible to get any of these ewes to rear three lambs.

The attempt to breed from ewe lambs was continued. 49 were put to the tup in 1932, 60 in 1933, and 38 in 1934. Of these only 13, 29 and 25 lambed. It remains to be seen whether the ewes which lamb as hoggs will make better mothers than the others.

Experiments to determine the best methods of flushing ewes are being continued. The results of the first two years have shown no significant increase in the number of lambs from the flushing treatments. A further experiment was started in 1934 with more intensive treatments than previously, and a shorter time elapsed before turning in the tups.

Twenty-eight of the Rothamsted flock were mated for lambing in January this year, to cater for the early market; 41 lambs were born and reared. The main lambing commenced early in March and the final figures give a lambing percentage of just under 150. There was a marked scarcity of triplets, only two being born throughout the lambing. This occurred on other farms and was attributed by the shepherds to the bare and scorched condition of the pastures at tugging time. About 50 old ewes were culled from the flock during the summer, the best of which were sold in lamb.

Electrical Investigations. An account of this work is given separately on p. 69.

Estate Work

Since the purchase of the Estate the farm has undertaken most of the extra work entailed. The new boundary fence in High Field

has been creosoted, Barnfield pond has been cleaned and fenced in, and many of the gates and fences have been repaired.

Buildings

There have been no structural alterations during the year other than new windows to the experimental pig pens. A scheme for a new piggery in place of the converted army huts at present in use, is under consideration.

Successes at Shows

A detailed list of awards secured at national and local shows in 1933 and 1934 is given on p. 71.

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.
R. A. Lister & Co., Ltd.	Oil engine, Sheep shearing machine
Miller Wheels, Ltd.	Tractor wheels.
G. Monro, Ltd.	Simar rototiller and motor hoe.
Parmiter & Sons, Ltd.	Rake & harrows.
Ransomes, Sims & Jefferies, Ltd.	Ploughs, cultivators, drills, grass rejuvenator.
Ruston, Hornsby, Ltd.	Grain drill, binder.
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.