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ROTHAMSTED RESEARCH

Rothamsted Report for 1932

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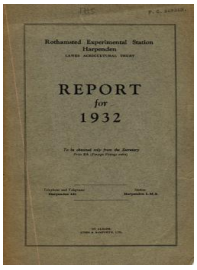

Rothamsted Farm Report

Rothamsted Research

Rothamsted Research (1933) *Rothamsted Farm Report ;* Rothamsted Report For 1932, pp 55 - 64 **- DOI: https://doi.org/10.23637/ERADOC-1-64**

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Hoos and Great Harpenden and moderate in Great Knott. It was not found on Stackyard field, Woburn.

Blight (*Phytophthora infestans* (Mont.) de Bary) appeared in late July, mostly on Great Knott where it was moderate in quantity.

Stem Canker (*Corticium Solani* Bourd. and Galz.) was slight at Rothamsted and moderate on Stackyard field, Woburn.

TURNIPS

Finger and Toe (*Plasmodiophora Brassicae* Woron.). There was a very bad attack in Agdell field on the variety Bruce (regarded as resistant).

FARM DIRECTOR'S REPORT, 1932.

Weather

Like the previous season, the year October, 1931, to September, 1932, was distinctly favourable for farm crops and grass. The rainfall was well distributed, while the summer was marked by hot sunny spells. Severe frost during the winter was practically absent, although there were several periods with light frost. The only appreciable amount of snow fell in the last week of December, but quickly disappeared.

October with only 0.66 inches of rain was 2.43 inches below the 79 year average ; mangold carting from Barn Field was completed under unusually favourable conditions ; there was no mud and thus the field escaped the usual cutting up with ruts. Despite this dry spell, it was more difficult to obtain good autumn seed-beds on account of the previous moist summer and wet harvest.

Root-lifting was finished before the weather broke in November. The rainfall of the next three months was all below the 79-year average, February being practically dry, with only 0.21 inches. This facilitated spring work after which numerous showers encouraged a good germination. May was unusually wet with 4.27 inches, compared with the average of 2.15 inches, which encouraged the grass, but also led to the leaching of some of our nitrogenous top-dressings. June had only 0.85 inches and there was a heat-wave at the end of the month and early in July, but well distributed showers kept the grass from becoming burnt up. For both hay-making and harvest the weather was highly favourable and conditions remained reasonably dry up to the end of the farm year. The rainfall for the 12 months was only 23.55 inches, 5.22 inches below the 79 years' average, yet there was never any fear of drought.

The sunshine for the year, 1,406 hours, was 173 hours below the average. This deficit occurred chiefly in April, May, July and September. The only month with an excess of over 12 hours was March with 144 hours (an excess of 28).

The mean temperature for the season practically coincided with the 54 years' average of 48°F. The winter months and August were warmer than usual, while all months from February to May were consistently below their averages. March was cold, with easterly winds, and this withered up the pastures and everything at all green.

For other weather features, see the graph of deviations from average values (p. 66).

Cropping, 1931-32 (For dates, yields and other information, see pp. 108-114).

This year it was the turn of Great Harpenden to receive dung

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and grow a crop of kale. Since Black Bent is now less conspicuous on this field, part of it was undersown with seeds in the spring of 1931 (under winter and spring oats), to save sowing rye over the whole field in the autumn. After harvest 4 acres were dunged and sown with rye. The seeds adjoining provided excellent material for flushing * the ewes and later for wintering them, after which the area received a good dressing of dung, while the rye was a useful bite for the ewes and lambs in April. Some of this rye, grazed and then left to harvest yielded about 78 per cent. grain, and less than 50 per cent. straw, as compared with the ungrazed area. After grazing and ploughing, the whole field was sown with kale. This year we escaped any trouble with the turnip flea-beetle and had an excellent yield. On the four acres after the rye, however, the kale was much poorer, as has been noticed in previous years. The explanation, now the subject of experiment, is not yet clear but may be only a time-of-sowing effect.

The experiments on kale are described on p. 160-162.

In Pastures field, beans, sown 14th October after potatoes and spring corn, suffered badly round the headlands from pheasants, so that two acres of the field had eventually to be fallowed. The rest of the field yielded well, thereby strengthening the place of beans in our commercial cropping. Immediately after harvest pigs are turned on to our bean stubbles so that we have no trouble with beans coming up in the following crop.

Spring oats were sown in Little Hoos on 26th February, drilling them in two directions. Frost shortly before sowing brought the land into a fine tilth for sowing and the crop looked thick and even. At the foot of Broadbalk another acre of Marvellous oats, self-sown from the previous year, also did well, but suffered badly in the stook from sparrows.

Fosters was this year devoted to experiments, the one year's ley being left untouched round about them and so filling up the odd ground profitably and neatly. The experiments were barley (varietal response to manures and time of sowing), wheat (top-dressing), temporary leys as a preparation for wheat, and forage mixtures (out-of-season sowing).

Great Knott also contained several experiments—potatoes (manurial), forage (time of cutting), forage mixtures, and sugar beet (manuring and cultivation). Wheat occupied the rest of the area. Victor wheat is preferred whenever possible. Although results have shown Wilhelmina and Swedish Iron III to be about equally productive, the strong straw of Victor is an advantage where there is a plentiful supply of nitrogen. The Victor wheat in the wheat experiment in Long Hoos V yielded so heavily that parts of it were laid and serious lodging occurred with one acre of winter oats in Long Hoos VI.

In our experience, spring oats are more successful than winter. The former yield better, and although their straw may be of rather less value, they stand up much better. Provided they are sown early we have had no trouble with frit-fly although occasionally wireworm proves troublesome.

* By "flushing" is meant the better feeding of the ewes two or three weeks prior to tupping in order to bring them into a thriving condition for breeding.

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The kale in Long Hoos I was folded off by sheep during the winter and the last of it was ploughed on 22nd February. Sections II and III after linseed were ploughed earlier and a few nights' frost on narrow furrows, well set up, enabled the whole field to be broken down to a good seed bed for barley. The crop after the linseed received 1 cwt. sulphate of ammonia, and gave a heavy yield, but, despite the folding of the kale, Section I could have stood a similar dressing. All three sections were undersown with a cheap seeds mixture for the sheep during autumn and winter.

The rape kale in Long Hoos VII looked well up to the end of December, 1931, but, after that, suffered badly from pigeons. It recovered later and provided green food at a time when grass was abundant. Even had it been unpalatable to pigeons its yielding capacity would have been low. From our experience, it does not seem worth growing. After the rape kale had been eaten off, mustard was sown and eaten off by our lambs, in preparation for beans.

Classical and Other Experiments

Broadbalk was sown on 13th October, it being the turn of Section II for fallow. In the spring the effect of the previous year's fallow on Section I stood out very clearly, particularly on plots 3 and 5. At harvest most of the plots on this section were very badly laid, with consequent loss of yield. Squareheads Master is a poor variety for measuring the effects of fallow.

One of the most striking results of the fallowing on weed control has been the ease with which Black Bent (*Alopecurus agrestis*) has been suppressed and the extraordinary rapidity with which it has increased after the fallow. Perennial weeds and poppies and most other weeds have now ceased to be troublesome on Broadbalk but Black Bent becomes a very serious weed by the time the next fallow in any particular section is due. Hand-hoeing, even if practicable, would harm the wheat since the Black Bent is so often closely mixed up with the rows of wheat. More intensive harrowing of the wheat, however, is being tried, whenever the ground is sufficiently dry during the winter, and a final harrowing is deferred as long as possible up to the end of April.

In view of the striking results of fallowing on Broadbalk, it was decided to split up each of the two alternate wheat and fallow strips in Great Hoos, into 4 sections, giving each one in turn an extra two years' fallow. This will supplement the information obtained on this question in Broadbalk by giving results on different soil and in different seasons for 3-year as well as 1-year fallows and their residual effects.

Hoos barley was sown this year for the fourth time with two different varieties of barley, in widely spaced rows. It has now been decided to fallow it until it is clean so that we can revert to the old method of narrow spacing, without further break in continuity. The total yields of grain (in lb.) were as follows :

1914-28	(narrow spacing) (average)	33,007
1929	(wide spacing)	18,672
1930		34,794
1931		32,323
1932		38,360

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It is still doubtful whether the field, once clean, can be kept clean, even with modern implements. But we have had fair success with Little Hoos which is as clean to-day as it was five years ago, although the intervening crops have been clover hay, wheat, forage and corn, spring oats, and beans. In a small test on commercial barley it was found that the crop from 18 inch rows amounted to 66 per cent. of that from the closely spaced crop.

All crops in Agdell now show signs of suffering from acidity. The swedes are generally badly affected with finger-and-toe disease. This year we tried to overcome this difficulty by using the Bruce turnip, well known for its resistance to the disease, and much used for that purpose in the North of Scotland. A reliable strain of the variety was used but the attempt was a failure. Over 50 per cent. of the roots were diseased, many very badly.

Barnfield produced the best yield of mangolds for many years. The total crop over the whole field averaged over 20 tons per acre. As the production of a good spring tilth is difficult on those plots deficient in organic matter, in recent years we have ploughed the whole field in the early winter. Subsequent frost and weathering have then been effective in producing a fine seed-bed. In many places the top soil is very shallow, sometimes only 4 inches, but we are gradually increasing our ploughing depth. Germination of the mangolds is frequently slow, despite a good tilth, on those plots receiving no dung.

The experimental programme now contains three new rotation experiments, 3-course, 4-course and 6-course. These are worked on sites by themselves, for with their varying length of rotation and the numerous different crops, it is impossible to provide large non-experimental areas of these crops. This difficulty does not arise with the one-year experiments, which could be laid out in the appropriate commercial crops but, for convenience in working, supervision and demonstration have been concentrated within a few fields.

The general method of fitting in the experimental and the non-experimental cropping can be summarised as follows :

Dung is applied to each field once in five years.

Potash and phosphate are no longer applied to non-experimental crops, to minimise the risk of hiding responses to these fertilisers in subsequent experiments.

A period of not less than two years must elapse before a new experiment is laid down on an old experimental site.

About 12 acres of root crops are grown on the non-classical fields annually, chiefly in the form of kale.

About 12 acres of beans are grown on the non-classical fields annually.

Two sites for new long-period experiments are to be constantly held in reserve. At present they are Long Hoos V and VII.

In addition to the results of the kale experiments already mentioned, the forage experiments on Great Knott were particularly noteworthy from a husbandry point of view. In the one case the effect of time of cutting a mixture of oats, vetches and beans, was studied, in the other the effect of different proportions of oats and

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vetches on total green yield, yield of dry matter, and yield of nitrogen. For further particulars see pp. 148-149 ; 152.

The potato experiment in Great Knott failed to give information on the effect of a winter cover of rye, and on the comparison between autumn and spring dunging. The former question is now being studied in Rotation III and for the second an experiment of improved design is now under consideration.

Grassland

This was another highly favourable season for pastures. As usual there was a tendency towards a shortage early in July but it did not materialise. Wild white clover was again abundant in August. There has been little change recently in the composition of the grassland that has been sown down since 1927, but Great Field is still altering, the amount of clover and of good grasses continuing to increase. No cultivation treatments were found necessary, the animals spreading the droppings on their hooves. In view of the feeding of out-wintered stock it has so far been considered unnecessary to supplement this with nitrogenous top-dressings.

This year we tried the effect of topping the pastures earlier, starting on 14th June. But we found that this was less effective than later. The topped plants at once threw up new flowering stems ; thistles also quickly recovered.

In the autumn we took over two portions of Rothamsted Park each of about 20 acres.

Livestock

Sheep : The work begun last year with sheep has continued. By the end of the year we had over 40 home-bred Half-breds (Border Leicester-Cheviot, F_2) ready for putting to the ram.

The Dorset Horn-Cheviot gimmers obtained from the Earl of Elgin proved earlier than the *average* of our flock in taking the ram, but a number of our ordinary Half-breds were as early. Since gimmers are generally somewhat later in coming in season than ewes, this result appears reasonably satisfactory, although we had hoped to see a more striking difference. A Dorset-Horn ram ran with these gimmers all summer. Now we also have a number of Dorset-Horn x Half-bred lambs and will follow up their time of breeding in the same way.

In August we obtained seven Cheviot ewes, and three half-bred lambs from them, from Carlisle, which all had four very well developed teats. We have also collected a number of half-bred ewes with the same characteristic ; and two rams from America. One is a pure descendant from the flock, now dispersed, of the late Dr. Graham Bell ; the other is a first cross between the Bell stock and the commercial stock of the University of New Hampshire, Durham. Prof. Ritzman of that University kindly presented these animals to us. The point of importance is of course to discover whether ewes with this characteristic are any better mothers than those with two teats.

Those ewes not required for other experimental purposes were divided into two flocks. One was flushed in the ordinary way with good grass, the other received concentrates in addition. There was no significant difference in the number of lambs produced under the two treatments ; the recorded difference at Woburn for the old

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ewes, though large, is not significant. The following table summarises the results, and the body of the table gives the average number of lambs produced per ewe in each of the different classes of ewes. The figure in brackets gives the number of ewes in each class. The young ewes at Woburn were really gimmers, but some lambed the previous year.

	Old Ewes.			
	Total number of lambs produced per ewe in previous two years.			
	1 or 2	3	4 or 5	Mean.
Rothamsted—				
Grass only	1.62 (8)	2.00 (23)	1.80 (10)	1.81
Grass+Concentrated food	1.54 (13)	1.73 (22)	1.78 (9)	1.68
Woburn—				
Grass only	1.60 (5)	1.71 (14)	1.70 (10)	1.67
Grass+Concentrated food	1.80 (5)	2.00 (7)	2.20 (10)	2.00

	Young Ewes.			
	Total number of lambs produced per ewe in previous year.			
	0	1	2 or 3	Mean.
Rothamsted				
Grass only	1.43(7)		1.80 (15)	1.61
Grass+Concentrated food	1.42(12)		1.87 (8)	1.65
Woburn				
Grass only	1.80 (5)	2.00 (9)	2.00 (2)	1.93
Grass+Concentrated food	1.60 (10)	2.00 (8)	1.50 (4)	1.70

Standard errors of differences between means :

	Old.	*Young.*
Rothamsted	0.137	0.165
Woburn	0.183	0.191

In the autumn of 1931, 228 ewes (51 being gimmers) were put to the ram. The 215 that lambed during February and March, had 322 live lambs at the end of April, among which were 1 quadruplet, and 14 triplets.

An experiment is now under way on the improvement of the technique of grazing experiments. In this 60 tethered sheep are being used in an attempt to discover the difference in feeding value of a five-year-old pasture in Sawyers I, all under the same seeds mixtures, but parts made up of indigenous strains of grasses and other parts of commercial strains.

Cattle. In October, 1931, the stock consisted of 6 cows and 58 cross-bred Angus stores and calves. During the year the policy was continued of buying black polled calves. But unfortunately it has not yet proved possible to start any experimental work on this section. Six recorded pedigree Dairy Shorthorn heifer calves were purchased from the Anderson herd, to replace eventually our present cows. When it is impossible to obtain good quality black calves,

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at a reasonable price, for they are much sought after, specially in the spring, we are finding it preferable to go in for good quality Shorthorns.

Pigs. The chief development with pigs has been the commencement of an experiment on the technique of animal experiments. The aim is to discover means of increasing the efficiency and accuracy of these experiments. Seventy-two pigs are in the experiment and each is fed individually. Comparisons are also being made between wet and dry feeding, green food and no green food, and different degrees of crowding. For this purpose a number of new pens have been constructed, which can be divided into different sizes at random. Several reserve pigs are kept under similar conditions, to replace any casualties.

Animal Diseases

During the four years in which livestock have been a feature of the farm a wide variety of ailments has been noted. Even for small animals, whenever an unknown or unusual case has occurred, Mr. George Elmes, our veterinary surgeon, has been called in and shown keen interest in investigating the trouble. Some report of the various instances is now due. The list is probably no more varied than on an ordinary farm, but there a farmer generally avoids incurring expense on a dead or small animal and many interesting cases thus never come to light.

In most instances individual animals only have been affected, but in a few cases several have been involved.

Sheep Diseases.—Our most serious trouble has been Lockjaw (tetanus), affecting the lambs a few days after cutting. In our first experience of it in 1929 we lost half a dozen lambs in rapid succession. In subsequent years we seared the tails of the lambs and inoculated all male lambs with anti-tetanic serum. In both 1931 and 1932 we lost only one lamb, in each case a ewe. Instead of inoculation we have also tried, with success, bloodless castration.

In 1930 we lost a good ewe quite suddenly with volvulus of the bowel.

We have had the usual troubles with bad udders, but up to the end of 1932 had lost very few ewes from this trouble, although some lost either one or both quarters.

A curious trouble has been that occasional ewes, with splendid udders, which have reared lambs in previous years, have completely failed to milk. No treatment has been successful in obtaining milk from these udders; they have just swollen, grown hard and then gradually diminished in size.

We had kept remarkably free from joint-ill in lambs up to the end of 1932 but we regularly dress the navel with iodine. Lamb dysentery is fortunately still unknown. Several lambs have died from wool-ball and also that curious complaint of "doing too well."

At least two ewes have been affected with gid, one only with scrapie, and one with encephalitis.

As a precaution we periodically dose our lambs for stomach worms with copper sulphate or other vermifuge.

Cattle Diseases.—Our most serious trouble in this case occurred in autumn, 1932. A number of young cattle in Sawyers II, wintered inside previously, suddenly began to scour and lose condition rapidly.

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Although brought inside at once they did not improve. One had to be post-mortemed and then the trouble was tracked down to verminous gastritis, a severe infestation in the intestine of *Strongylus axii*. Some responded to treatment, although they received a severe check, but four did not.

In the autumn of 1928, we threw out some sliced sugar beets, left over after sampling for chemical analysis, and two cattle were affected with sugar beet poisoning, one fatally. They appeared to have gorged themselves on the slices. The slices were uncontaminated with chemicals.

Our only other trouble among store or fattening cattle was the loss of one of our best young beasts in 1931 through haemorrhagic gastro-enteritis. It had the appearance of haemorrhagic septicaemia, the occurrence of which in this country is disputed.

In our calf rearing we have been fortunate in escaping any infectious troubles, particularly white scour. We have, however, had cases of pneumonia, particularly in calves which have undergone a long journey, and have had some trouble from scour in putting fresh calves on to cows well on in their lactation.

Horse Diseases. Our horses have kept remarkably healthy and on only one occasion have they required the attention of the veterinary surgeon. In this case one horse was affected with facial paralysis. It gradually yielded to treatment with embrocation externally and strychnine internally.

Pig Diseases. In 1929 we had a slight outbreak of swine fever, brought in by a large white boar from a well-known herd. Luckily no sows or fattening pigs succumbed—as a precaution they were all inoculated—but we lost a number of young pigs.

In 1930 we lost a sow with lock-jaw, the result of putting a numbered disc in her ear.

Apart from the loss of 2 sows with milk fever, one from internal haemorrhage (from the omentum) and one or two deaths (chiefly sudden) from no clear cause, our troubles have been confined to small pigs. The most serious was an outbreak of contagious pneumonia in spring, 1931, which was overcome by turning sows with their litters into outside huts. On several occasions we have sent small pigs to the Cambridge Institute of Animal Pathology. At one time several of the best pigs in several litters were dying suddenly. The cause of death was reported to be septicaemia produced by an organism belonging to the *Salmonella* group of bacteria, infection having occurred through the navel. The Cambridge Institute has also isolated other bacteria from young pigs we have sent. The origin of these troubles was obscure and there have been no further cases for over a year.

On one occasion a sow, which had reared good litters, produced a litter of blind pigs. Although apart from that they appeared healthy, they all died more or less suddenly between four weeks and weaning.

We have been fortunately free from the trouble of scour in young pigs. If it develops it only lasts for a day or two. We attribute this to the attention of our pig man, rather than to any special treatment.

In 1931 we had one isolated case of swine erysipelas.

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A.I.V. Silage

This autumn we tested this new process, in co-operation with Dr. S. J. Watson, of I.C.I., Ltd., using three crops—green maize, sugar beet tops and kale. Small wooden silos were used for the first two.

Both the maize and beet tops gave well-made silage, but the maize unfortunately was unpalatable. This seemed to be due to the use of too much acid in making it, 14 gallons per ton of diluted A.I.V. stock solution (chiefly commercial hydrochloric acid diluted with four times its bulk of water). The silage had a markedly bitter taste.

With the beet tops only 8 gallons of dilute acid were used for each ton of fresh material, and the product was very palatable, being eaten readily by young cattle.

The kale silage was a total failure, except for a layer of small kale near the top of the stack. Twenty-three tons of marrow stem kale were built into a stack, using the hay elevator, but it was a heavy crop with thick stems and did not settle into a sufficiently compact heap. As a result the bulk of the material continued to ferment and resulted in a rotten evil-smelling heap. The small kale on top, however, had settled down compactly so that fermentation was prevented and this product proved palatable. Its analysis was 20 per cent. dry matter and 1.45 per cent N.

The following table gives the results of ensiling the maize and the beet tops:

	Maize.		*Beet Tops.*	
	Fresh material	Silage	Fresh material	Silage
Total weight, tons	9.19	4.39	10.16	5.90
Dry matter content, % ..	10.28	—	14.45	—
Nitrogen (% in dry matter)	2.02	1.80	2.13	2.18
Fibre (% in dry matter)	29.92	40.16	9.77	11.90
Total Ash (% in dry matter)	12.39	11.67	20.70	32.91

On the assumption that no loss of fibre occurred in the process, there was a loss of dry matter of 25 per cent. of the maize and of 18 per cent. of the beet tops, and in nitrogen of 30 per cent. for maize and 16 per cent. for beet tops. These losses are of the same order of magnitude as have been obtained for silage prepared in silos in the ordinary way.

A preliminary observational test was carried out on the value of the beet silage to young cattle, being outwintered in store condition. Fourteen cattle, receiving 40 lb. silage and 4 lb. concentrates put on 0.92 lb. per day live weight increase while 13, receiving 10 lb. hay and 3 lb. of the same concentrates put on 0.96 lb.

The electrical developments and the possible use of rubber on the farm are described on pp. 19-20.

Buildings

There have been no further developments since the opening of the new buildings by Sir John Gilmour. The equipment and facilities for experimental work are now better than they have hitherto

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been. A scheme is under consideration for providing facilities for weighing cattle and giving accommodation for the making of dung and Adco under uniform conditions.

Staff, etc.

Mr. J. R. Moffatt has now joined the staff as a paid assistant. Mr. E. V. Knight was here for a short time in the autumn as voluntary assistant to help with the livestock experimental work and left to take up a post in connection with pig farming.

At the local annual ploughing match our men had their usual success. Both F. Stokes and A. Lewis appeared among the prize-winners, the former winning the Championship Cup for the second time in four years.

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 observations taken under this scheme include:

Observations taken once daily: 9 a.m. G.M.T.

Temperatures—maximum and minimum (screen), solar maximum, grass minimum.

Rain (inches) and *Sunshine* (hours and minutes by Campbell-Stokes recorder) during the previous 24 hours.

Observations taken thrice daily: 9 a.m., 3 p.m., and 9 p.m. G.M.T.

Temperatures—wet and dry bulb (screen), 4 inches and 8 inches under bare soil.

Wind—direction and force (continuously recording anemobiagraph).

Weather—(Beaufort letters).

Visibility.

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.

Additional data are collected under the following heads:

Radiation.—A Callendar Radiation Recorder (on loan from the Imperial College of Science) gives a continuous record of the radiant energy falling on a receiver situated on the roof of the laboratory. The records are compared with those for South Kensington, and are also used in plant physiological studies in the Station.

Rainfall and Drainage.—The rain falling on one thousandth of an acre is collected in the big gauge erected by Lawes in 1871. Samples of the water are analysed in order to ascertain its nutrient value.

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