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Report for 1939-45

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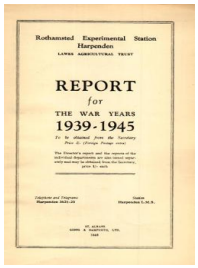

The Farm

J. R. Moffatt

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THE FARM

By J. R. Moffatt

General policy

In 1939 the acreage farmed was 420 acres, of which only 138 acres were under arable crops. Much of the grassland was laid down in the early years of the agricultural depression, 1925-29, though some of it was considerably older. As much of this grassland was not very productive and economic conditions were improving, the system of alternate husbandry or ley farming was introduced early in 1939. The intention was to grow two or three arable crops and cash the residues of the feeding stuffs fed on the land before sowing down to long-term leys. The advent of war greatly stimulated this breaking-up policy, but owing to the urgent need for food production most of the land was retained for arable crops for several years.

In 1943 when the drive for food was at its highest the area farmed was 489 acres, the increase over the 1939 acreage being achieved by renting some extra land and by the reclamation of over 17 acres of derelict woodland. In that year 52 acres of old grassland were broken up and the area under tillage exceeded that of grassland for the first time since 1927. 67 acres of old permanent grassland were retained as these were carrying long-term experiments which had to be continued.

By the end of 1945, 140 acres of old grassland had been ploughed up and 20 acres of derelict woodland had been reclaimed ; a further 18 acres of old grassland were scheduled for breaking up early in 1946. The area farmed in 1945 stood at 495 acres, and as a result of reseeding, the area of grassland again was greater than that under tillage.

The following table shows the most important changes which have taken place in the farming system during the six years of war.

	1938-9	1941-2	1942-3	1943-4	1944-5
Total acreage of farm	420¼	481¾	489¼	494¼	495¼
Tillage acreage	136½	214½	248¾	248½	224
Temp. ley acreage	1	35	45½	58¾	84¼
Arable acreage	137½	249½	294¼	307¼	308¼
Grassland ploughed	10	24	60¼	8	—
Land reclaimed	—	3	17½	1	—
Acreage of : Wheat	45	66	115½	94	74½
Barley	20	39	52¾	57	49
Oats	13	29½	15	16	16½
Beans	2½	16½	6	12½	6½
Potatoes	6¾	15½	22½	24½	26
Sugar beet ..	4½	4	5½	4	3¼
No. of experimental plots ..	1,215	1,619	1,570	1,707	1,722
Man hours worked	22,620	40,902	51,826	45,121	41,140
Wages paid	£1,290	£2,901	£3,798	£3,641	£3,713
Horse hours worked	7,950	9,282	9,595	8,440	7,558
Tractor hours worked	995	3,170	4,520	4,194	4,799
No. of tractors	1	2	3	3	4
Average wheat yield (cwt. per acre)	20.7	20.9	22.6	25.07	25.14
Purchased foods	£473	£187	£39	£73	£110
Nitrogenous fertilisers used (tons)	10	23.25	29.25	44.5	42.75
Value of produce sold	£2,922	£5,303	£5,628	£7,383	£7,401

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The most notable changes which have taken place, and which reflect the trend in farming generally, are the big increases in the area under tillage and under temporary leys, which together give a very big increase in the area of arable land. This in 1944 and 1945 amounted to an increase over the pre-war figure of 124 per cent. with the tillage area, when at its maximum in 1942-44, showing an increase of 82 per cent.

The area under wheat and barley increased rapidly until 1943, when they gave an increase of approximately 160 per cent. The acreage of potatoes has shown a rapid increase throughout the whole period, and in 1945 was almost four times the pre-war figure.

The number of experimental field plots has gradually increased and in each of the last two years numbered over 1,700. This increase in experimental work together with the increased area of crops needing a lot of labour almost doubled the number of man hours worked. The sudden rise in 1943 was due largely to the unskilled and less efficient labour which had to be used to harvest the 184 acres of cereals and the roots crops. The combined effect of the greater number of hours worked and the change in agricultural wages, which rose from 35/- to 70/- in the period under review, is seen in an approximately threefold increase in the total amount of wages paid.

The number of horse hours worked remained more or less constant, as most of the extra field work was done by tractors, which increased in number from 1 to 4 over the period. With tractors available, some work, such as corn drilling and harrowing, which was previously done entirely by horse teams, was taken over by tractors. The tractor hours worked show big increases up to 1943, when there were three tractors, but the purchase of a fourth tractor in 1945 resulted in only a small increase in the total number of tractor hours worked. The old one which it replaced was still retained as a reserve and is fully employed at busy periods. It is also useful as a standby should one of the other three break down.

Despite the fact that phosphates and potash were only very rarely used on the cereal crops, and as many as four consecutive corn crops were taken on the same field, the mean yield of wheat per acre has shown a steady increase. This can be attributed mainly to the more liberal use of nitrogenous fertilisers on wheat varieties chosen for their ability to stand up to these heavy dressings.

The total value of the produce sold off the farm rose steadily throughout the period. In 1944 and 1945 it was more than 2½ times that of 1939, and averaged approximately £16 per acre over the effective acreage.

Rotation of crops

No fixed rotation was adhered to. The usual policy adopted was to plough up the old grassland during the winter months when no other land work was possible, and to take spring oats or barley as the first crop. Two, three or even four successive corn crops were taken, depending on the condition of the land, and these were followed by a root crop or a long-term ley. In 1943, some 184 acres, over 70 per cent. of the tillage area, were under corn crops. Root crops were generally confined to the old arable ground in order that

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it could be effectively cleaned, and most of the dung went to the potato crop. The bean crop, which had been given up before the war because of the serious losses from bean aphis in bad years, found its way back into the rotation owing to the need for a home-produced, protein-rich food for livestock. The basic rotation on the old arable ground was roots (kale, potatoes or sugar beet), wheat or barley, beans, wheat, oats, but it was not possible to follow it strictly.

Crops and varieties

During the war years the aim was to get the maximum yield combined with reasonable quality, and to this end some modifications were made from pre-war crops and varieties. The most important of these are set out below.

Wheat

Under pre-war conditions the varieties most commonly grown were Squareheads Master and Victor. As neither of these varieties can withstand heavy dressings of nitrogen they were replaced by stiffer-strawed varieties. Desprez 80, Vilmorin 27, Als, Bersée and Jubilégem were all used with success, but Desprez 80, which possesses the stiffest straw, was discarded after two seasons owing to its susceptibility to rust. By the use of these newer varieties yields were considerably increased and average yields of experimental and non-experimental crops in 1944 and 1945 were over 25 cwt. per acre.

Oats

This crop was grown only for feeding to stock on the farm. Spring oats were generally the first crop after newly ploughed grassland, and the variety used was Star, as this proved to be the heaviest yielder on this soil. In order to spread out the harvesting period, winter oats replaced the spring variety in 1944-5. Picton and S147 were grown and both withstood the hard winter of that year. S147 proved the more satisfactory and a further area of this variety was sown for the 1946 harvest.

Potatoes

Before the war most of the small area devoted to this crop was planted with Arran Banner with a small area of Majestic. During the early war years this position was reversed and later Majestic only was grown. The change was made because Majestic yields about as well as Arran Banner and has the big advantage that sprouting does not take place so early in the spring. This makes sorting in the spring very much easier, and this advantage is especially marked when sorting end-of-season reserves in late spring and early summer. Majestic has the further advantage that it is less susceptible to late blight, and the larger tubers are less likely to be hollow in the centre.

Beans

This has always been an unreliable crop because of its susceptibility to damage by bean aphis. With the need for a protein-rich food this crop was grown again, and satisfactory yields were obtained in most years. In 1944 bean aphis considerably reduced

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the yield, but there was some evidence to show that damage by the aphis was not so severe where farmyard manure or potash were given. No new varieties of beans have been introduced, but several different strains are now being tested and grown.

Linseed

This crop was re-introduced in 1944. The La Plata variety formerly grown, gave a poor yield of seed from a bushy plant, difficult to harvest with a binder. This was replaced by the variety Royal which gives a higher yield of seed on a taller and less bushy plant, and the capsules are less susceptible to damage by birds. The crop is either used for stock feed, sold for seed, or for the extraction of oil.

Sunflowers

This rather uncommon crop was grown on small areas in 1943 and 1944, as the high prices offered for the seed made this seem a profitable crop, providing no difficulties were encountered in its cultivation and harvesting. The crop presented no difficulties, if sufficient labour was available at harvest time, and arrangements were made for the proper threshing and immediate drying of the seed. In 1945 nine acres were devoted to the crop, and although the season was unfavourable and resulted in low yields, a satisfactory return was obtained.

Manures and Manuring

No phosphate or potash fertilisers are used on commercial crops, except on fields which are unsuitable for experimentation, to avoid building up reserves of phosphate and potash in the soil that would interfere with subsequent field experiments on the use of fertilisers. Consequently, the rationing of fertilisers had very little effect. The full allocation was taken each year, but by the end of the 1945 harvest sufficient reserves had been built up to serve the 1945-46 crops without drawing any allocation for that year. The potash allocation was reserved exclusively for the potato, sugar-beet and bean crops, while few of the corn crops received phosphates. Large quantities of nitrogenous manures were used, mainly as sulphate of ammonia. This was in plentiful supply most years, and only in 1943 was any difficulty encountered in obtaining supplies. Over 40 tons were used each year since 1943, sufficient for an average dressing of over 1½ cwt. per acre including grassland. Very few crops were grown which did not receive nitrogen. Varieties were chosen mainly for their ability to stand up to and respond to these heavy dressings, and there is no doubt that the policy was well suited to wartime conditions.

Liming and Chalking

The lime status of most of the permanent arable fields and the fields which were laid down to permanent grass about 1928 was fairly satisfactory although rather uneven. This was the result of very heavy dressings of chalk applied in the days of Lawes and Gilbert, when dressings of 50 tons per acre were common. The

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chalk was dug from small pits in fields where it was fairly near the surface. It was only the old permanent grass and the reclaimed woodland which were really acid. To most of this old grassland, small chalk was applied direct from lorries at 10 tons per acre (the minimum dressing which could be spread satisfactorily), while some of the very acid woodland was given over 20 tons per acre. Grass and woodland not sufficiently acid to warrant such heavy dressings were given ground chalk at 10 cwt. to 2 tons per acre according to their requirements. A small amount of ground burnt lime was used to even out irregularities in the arable fields.

Most of the chalking programme was carried out in 1942 when the grant towards the cost of this work was raised to 75 per cent., and in that year 102 acres were treated with 1,021 tons of lime or chalk. During the 6 years 1940-45 a total of 955 tons of small chalk, 157 tons of ground chalk and 32 tons of ground burnt lime were used on 212 acres of land.

Straw disposal

This problem became acute in 1943-44 after the harvest of 1943 when there were 184 acres of corn, with much old straw still in the stack. Supplies of hay were short and the high prices precluded buying-in. So from that time onward all barley straw as well as oat straw was fed to stock, either in yards or in the fields. In order to convert as much wheat straw as possible into farmyard manure, store stock were yarded during the winter months. They were fed almost entirely on oat and barley straw with a small protein-rich supplementary ration of concentrates, and a small allowance of discard potatoes or kale. Much larger quantities of straw than usual were used for litter and its decomposition was accelerated by the addition of sulphate of ammonia to the yards. As the yards were covered there was not sufficient moisture to wet the straw and water was pumped on periodically, but care was exercised to see that no drainage took place from the yard. The resulting dung-compost was used fresh in the spring in the potato bouts, and though in appearance it was longer and more yellow than the ordinary dung it produced very satisfactory results.

Cattle were given free access to the wheat-straw stacks in the fields during the autumn and early winter. A large proportion of the straw was consumed and the remainder which was pulled out and trodden under by the cattle, was made into compost where it lay by the addition of sulphate of ammonia and water pumped from nearby water troughs. This again was used to good effect on the potato crop.

The chaff and cavings from threshing, which could not be burnt because of blackout restrictions, were all utilised, the wheat chaff and barley and oat cavings as stock feed, and the remainder was made into compost. Some of the older wheat straw was also made directly into compost either with sulphate of ammonia and water, or with sewage sludge and water.

None of the compost heaps were turned as the labour was not available, but the results of the first two seasons showed that if plenty of water is used the heaps rot down satisfactorily except

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for a little on the outside. The dry material from the outside was not used, but formed the base of the next heap. Normally the temperature rose to over 70° C. within a few days and on one occasion a temperature of 95° C. was recorded.

Feeding stuffs

At the outbreak of war there was a good stock of feeding stuffs in hand and these were carefully husbanded. In 1941 when the allocation of feeding stuffs depended upon the sales of corn, our allocation was so high that we were asked not to take the full amount. Since then only very small allocations have been made and the farm has been almost self-supporting. The sugar-beet pulp allocation from the beet factory was a very welcome addition. When buying feeding stuffs those containing the highest proportion of protein were purchased, and these with the home-grown beans enabled the livestock rations to be correctly balanced.

Implements

Until about 1939 many of the implements on the farm were old and nearly worn out, and many of them were horse machines which had been adapted to tractor haulage. In that year a start was made to replace the older machines by new ones. The outbreak of war greatly accelerated this programme, and now there is an excellent range of modern implements. Field work has not been hindered by lack of implements although on a few occasions implements were hired from the War Agricultural Executive Committee. The number of tractors was steadily increased from one in 1939 to four in 1945 to keep pace with the cropping programme. All tractors are of the four-wheeled type and two of them are row-crop machines to which toolbars can be fitted. Items of new field equipment were a set of heavy disc harrows, a combined seed-and-fertiliser drill, a crop-spraying machine capable of dealing with sulphuric acid, and an elevator-type potato digger.

Labour

As on other farms the biggest difficulty experienced during the war years was the shortage of labour. This was accentuated by the shortage of cottages on the farm, and even had skilled workers been available there was no accommodation for them. In 1941 and 1942 help was given by young local workers and members of the Women's Emergency Land Corps, but after 1942 these sources of labour almost dried up, and in 1942 and 1943 help for root singling and potato picking was given by local youth organisations and by school children. The arrival of Italian prisoners of war in 1943 considerably eased the position and a team of four has been engaged continuously since then. For urgent seasonal work larger gangs of Italians were used, and were subsequently replaced by gangs of German prisoners.

Buildings

In 1939 the farmstead consisted of an assortment of buildings, some quite new while others consisted of army huts and hangars used in the 1914-18 war. The older buildings were ill adapted for

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present-day requirements and were inconvenient besides being worn out. A building programme was inaugurated in 1939, but instead of the gradual replacement of the old buildings which was intended, the programme was pushed ahead with all speed after the outbreak of war. We were fortunate to get all the essential buildings erected and fitted out by the time building restrictions were imposed. They included a range of implement sheds and tractor garages, a service block including cloakrooms and a mess-house for the men, two cedarwood cattle yards, a granary with feeding-stuffs loft over it, and a food-mixing room, and further covered barns and covered threshing gangways to facilitate the storing and threshing of experimental crops. Some of the older buildings were adapted for other purposes, a new surface-water drainage system was laid, and the roads round the buildings were made up.

The main buildings now form a compact block, rectangular in shape and under a continuous roof, so that it is possible to get to almost any part of the buildings dryshod.

The buildings were designed to allow as much productive work as possible under cover during the winter months, to provide the best facilities for this work, and to make working conditions as good as possible. They were wired for electric light and power, and many labour-saving devices were incorporated.

Use of electricity

Electric light and power was supplied to the farm in 1932, and in that year many operations previously performed by internal-combustion engines were adapted for electrical drive. However, the full advantage of electrification is only secured if each machine to be driven is fitted with its own motor of the correct type, and the self-contained unit is placed in the most convenient position for the operation. The proper placement of farmstead machinery is vitally important and can seldom be achieved if the machines are driven from a countershaft, with its attendant transmission losses. The placing of the farmstead machinery in the new buildings was planned before the buildings were erected so that a very convenient layout was assured. The unit-drive principle was adopted wherever possible, and although this was more costly in the first place there is no doubt that it will soon repay the extra cost. The electrical equipment has been increased during the past six years, and now consists of twelve motors ranging from a 20 h.p. motor used for driving the large threshing machine down to a ½ h.p. portable motor which is used for work previously carried out by hand, e.g., potato sorting, winnowing, seed dressing, and tool sharpening. The absence of noise and fumes, the ease of starting, the small amount of attention required by the motors, and the reduction of the risk of fire make electricity the ideal form of power in the farmstead.

The most important new items of electrically-driven farmstead machinery that have been installed are the Essex automatic hammer mill for grain grinding, the food-mixing machine, the hoist with swinging jib for loading and unloading vehicles, and the air compressor used for controlling pests of stored products and for inflating pneumatic tyres. A pneumatic grain conveyor will, it is hoped, be installed shortly.

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Farm Investigations

Storage of potatoes under cover

There are many advantages to be gained by storing potatoes under cover instead of in outside clamps: earthing-up is avoided, profitable inside winter work is provided irrespective of weather conditions, the sorting operation is made more congenial, and with the aid of electric light the work can be carried on throughout the whole day in winter, and the unpacking and packing up at the start and end of the day is eliminated. The main drawback to this method of storing is that if the potatoes can only be stored to a depth of about 4 feet, a large area of roof space is needed though much of the covered space is not utilised.

In 1943 a trial was carried out to test the effect of storing potatoes in a much larger heap than is usually recommended. The heap, measuring 40 feet by 11 feet wide by 6 feet deep, was made under a Dutch barn with the retaining wall on the open side made of straw bales, while on the closed side bundles of straw were placed against the corrugated iron. Majestic tubers, which were blight free, were carted straight from the field in late September and after a few days were covered with straw. The bulb of a recording thermograph was placed in the middle of the heap a few days later to record temperatures. Although a considerable amount of sweating took place no rise in temperature was recorded. The heap was opened at the end of January, 1944, and the potatoes came out in perfect condition.

In 1944 the trial was repeated on the same site but with the heap 7 feet deep. The thermograph was installed immediately the heap was completed and on this occasion an initial rise in temperature of 2·6° C. was recorded. During the very cold spell in December, 1944 and January, 1945 the temperature in the heap remained below freezing point for four weeks, but when the heap was opened at the end of January, 1945 the potatoes showed no evidence of injury.

In 1945 a further trial was carried out on a heap measuring 21 feet by 24 feet with a height of 9 feet against the straw-bale walls sloping up rapidly to 12 feet, and containing approximately 100 tons of potatoes on a floor space of 56 square yards. Again there was an initial rise in temperature of 4·7° C. followed by a steady fall, and the potatoes were in perfect condition when sorted in March and April, 1946.

These trials have shown quite conclusively that Majestic tubers which are free from blight and reasonably dry when lifted can be safely stored under cover in very large heaps without any deterioration taking place.

The use of herbicides

Weed control became a serious problem owing to the shortage of labour and as a result of taking several successive corn crops. Sulphuric acid and copper sulphate had been used in past years on the non-experimental fields with some success, but the former can only be used on cereal crops and the latter is efficacious only against certain weeds. In 1944, in conjunction with the Botany Department, preliminary tests were made with dinitro-ortho-cresol

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(D.N.O.C.) and some of its salts. Large-scale tests were made to compare them with sulphuric acid and copper sulphate plus salt against weeds, particularly charlock in barley. Small-scale tests were made to ascertain what crops could withstand spraying with these materials.

The large-scale tests showed that the D.N.C.O. and its compounds gave a very good kill of charlock at all stages of growth, and had very little effect on the barley, even if the spraying was delayed until the end of May when the charlock was in full flower. Sulphuric acid used when the plants were young, gave a much quicker and equally good kill of charlock, but the barley was severely damaged, although it grew away well and at harvest time the sprayed area was indistinguishable from the rest of the field.

In the small-scale tests sugar beet seedlings were killed by the sprays, while beans and kale suffered very severely and did not recover. Flax was killed off by all materials except copper sulphate plus salt and the sodium salt of D.N.O.C., and even these two materials caused such a severe setback that plant and yield were greatly reduced.

In 1945 large-scale tests were carried out using an increased range of materials on a wheat crop containing a greater variety of weeds. Very satisfactory weed kills were obtained with "Denoc," D.N.O.C., and the sodium salt of D.N.O.C. plus an activator (sulphate of ammonia), and the only effect on the wheat crops was a slight discolouration of the tips of the leaves. Other materials gave less satisfactory results, but the tests will be repeated.

By the use of these materials a very good control of weeds in cereals was secured. Even perennial weeds such as thistles and docks were so damaged and weakened that they could not cause much damage to the crop by competition and did not recover in time to set seed.

Segmented sugar-beet seed

In 1944 observation plots were laid out to compare segmented sugar-beet seed drilled at 10 lb. per acre with normal seed at 20 lb. per acre. The plants from the normal seed were much thicker in the row before thinning and averaged 58 plants per 100-inch length, compared with 31 plants from the segmented seed. Using normal seed, out of 100 separate inch lengths 32 contained plants, of which 50 per cent. were single plants, while from segmented seed only 22 of the 100 separate inch lengths contained plants, but of these 73 per cent. were single plants. Singling of the plants from segmented seed was noticeably more easy and rapid, and the plant was less damaged, but the final count per acre showed a difference of 4,000 plants per acre in favour of the normal seed.

In 1945 normal seed sown at 16 lb. per acre was compared with segmented seed sown at 4, 7 and 10 lb. per acre. Seed-bed conditions were not particularly good and a spell of very unfavourable weather immediately followed the drilling. The segmented seed germinated much more slowly and unevenly than the normal seed, and when the plots of normal seed were ready for the first horse hoeing those of the segmented seed had to be missed as the rows were not showing sufficiently clearly. These plots remained backward throughout

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the season, and the plant number and yield was increased with the rate of drilling. Normal seed gave 5,000 plants per acre more than segmented seed sown at the heaviest rate. This result confirms experience gained elsewhere that segmented seed is not likely to be successful where conditions at sowing time are unfavourable. It also appears that for the lower seed rates to be successful the seed must be placed for more accurately in the row.

Reclamation of derelict woodland

When the estate was purchased in 1934 the growing timber in the woodland was not bought. The vendors felled it in 1938 and left an area of approximately 74 acres of derelict land full of tree stumps, smashed coppice and the rotting trunks of trees which had blown down over the previous ten years. For a year or two nothing was done, but the herbaceous vegetation began to spread with alarming rapidity; it consisted mainly of St. John's wort, willow-herb, burdock, ground ivy, brambles, and some bracken.

It was realised that the area presented problems which would arise in many instances after the war, namely, what to do with small areas of derelict woodland from which all the saleable timber had been removed. Clearing and replanting is costly, and natural regeneration uncertain, and not worth the risk. Furthermore, as small areas of woodland would not warrant the employment of a forester, the plantations would receive little attention and the value of the timber would thereby be reduced. In past years many of these small areas of woodland were planted because the soil was poor and the art of pasture-making was not properly understood. With modern knowledge of soil improvement and pasture-making, and with modern equipment, much of this type of land could be made successfully into pasture or arable land.

The problem of reclamation of this land was tackled in five different ways;

1. *Clearing the surface and direct seeding.* An area of 3½ acres was cleared of surface weeds and rubbish in 1939, everything, including the coppice, being cleared down to ground level. Basic slag was then applied by hand at 10 cwt. per acre, and a mixture of grass and clover seed was hand-broadcast in the spring of 1940. No implements at all could be used because of the tree stumps, and the seeds were not harrowed in. The summer of 1940 was very dry and germination of the seeds was slow, but by the autumn quite a good cover of grass was obtained. No clover germinated that year, but in the spring of 1941 a considerable number of wild white clover plants were found, and since then a good plant of wild white clover has established itself. Some elders, brambles, and thistles continued to grow. The elders were kept in check by cattle eating the young shoots, but thistles and brambles had to be cut by hand in 1940 and 1941. Since then the weeds have caused very little trouble and the area is now carrying a very productive sward of grass.

The ease with which this land was reclaimed, and our subsequent experience with other areas showed that clearing and reseeding should be done as soon as possible after felling, before elders and herbaceous weeds can get established.

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2. *Clearing and ploughing before direct reseeding.* The area tackled by this method was 10 acres in size, and had carried a fine larch and spruce plantation. On old maps it was called Claycroft, probably because of the nature of the soil, and this was probably the reason it was planted to trees some 40-50 years ago. The clearing was not begun until the late winter of 1942, by which time the area was a mass of thistles, burdocks, nettles and willowherb, and direct seeding was impossible. The old wood and the dead tops of the weeds were collected and burnt, although we found out later that these dead weed tops need not have been touched. The ground was then ploughed with a Shearer stump-jump disc plough. The independently mounted discs rode over the top of the stumps, compressing large springs which immediately forced back the discs once the obstacle was surmounted. The plough did very good work and the land was ploughed in both directions. Throughout the summer this area was fallowed and worked with a heavy set of Shearer stump-jump disc harrows. These also did fine work, and enabled the land to be cleared of weeds, besides producing a fine tilth from the heavy soil. The area was slagged and limed during the summer, and a grass and clover seeds mixture was sown in the spring of 1943. These seeds were roughly harrowed in with a set of chain-link harrows. They germinated and grew well, and the field was stocked in July of the same year. It is now carrying a fine sward of productive grass. The larch and spruce stumps, of which there are several thousand, have rotted considerably, and will probably be turned out by a gyrotiller in a year or two when the grass is due to be broken up.

3. *The use of pigs for removing the herbaceous vegetation.* Tamworth pigs were chosen for this work as they are very hardy, and are best able to fend for themselves, while their long snouts are evidence of their ability to root well. The area allotted to them was enclosed by an electric fence, which was very satisfactory once the pigs had learnt to respect it. Our experience showed that pigs can play a very useful part in woodland reclamation, and that for about 7 months of the year they can live on what they find without any supplementary feeding. It is important that they should be given only a small area at a time and should be moved to another areas as soon as the first has been cleared of vegetation and well rooted up. If they are left too long on any one area they will tend to poach the ground badly in wet weather. The pigs are also assured of a more regular supply of food by this system. Bad patches of brambles, which they are not keen to eat except the fruit, should be cut out by hand. The area should be levelled, manured if necessary, and sown with grass seed as soon as possible after the pigs have been removed. This gives the grass and clover seeds time to establish themselves before there is much competition from weeds, for weed seeds establish themselves very quickly in the fine soil turned up by the pigs. The ideal arrangement would be to have sufficient pigs to clear the surface vegetation and root up whatever area can be cleared of coppice, levelled, and manured by the following spring, ready for the seeds mixture to be sown early.

4. *Conversion to arable land.* This method necessitated the

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removal of tree stumps and roots from the ground. At first, blasting was tried alone, using polar ammonium gelignite. This was quite satisfactory when dealing with old stumps, which were often lifted out bodily, but was much less satisfactory with the stumps of recently felled trees. The operation usually shattered the stump, but it was then frequently a long and tedious job to remove the sections, which were often firmly held by the roots. However, several acres were cleared in this way. Later, a bulldozer was tried, but although the stumps were removed satisfactorily, this took too long. The most successful method was a combination of blasting and bulldozing. The latter cleared the soil from around the stump to a depth of 1 to 2 feet, the stump was then shattered by blasting, and the bulldozer completed the work by removing the shattered stump and levelling off the ground. About 6 acres were cleared in this way, and although it was expensive, once the operation was completed the ground could be worked by any implement and prepared for any crop.

5. *Re-afforestation.* It was decided to replant 14 acres of the old woodland and to leave 2 acres for natural regeneration, although it was doubtful whether this latter would be successful. A firm of forestry contractors was engaged in 1940-41 to execute the work of clearing and preparing the ground, fencing against rabbits, and planting with ash, oak, and beech according to the nature of the soil. The total cost per acre was approximately £27, and towards this the government grant of £3 10s. 0d. per acre was secured.

Owing to the difficult labour position it has not been possible to keep down the weeds or cut off the shoots from the old rootstocks as often as was required. A four years' growth of weeds and shoots has now been removed, and fortunately the mortality of the young trees is very low, and rapid growth should now take place.

Livestock

Cattle. The cattle policy was governed by the necessity of producing an even bunch of young stock of known history for grazing experiments. Owing to the difficulty of obtaining suitable calves to rear intensively on a few cows, a herd of Blue-grey (white Shorthorn by Galloway) cows and Kerry cows was run with an Aberdeen-Angus bull. They calved outside and reared their own calves, which were weaned into covered yards in the early winter. In the first few years the cows remained outside all the year, but when the problem of straw disposal became acute they were brought into covered yards in winter to tread wheat straw into dung, and to consume the barley straw. The oat straw was mainly reserved for younger stock. A small ration of protein-rich concentrated foods, together with a small allowance of kale or potatoes was also fed. These cows were bulled in 1945 for the last time, as they are now 9-10 years old, and will be sold fat as opportunity occurs.

Sheep. The grass flock of Half-bred (Border Leicester × Cheviot) ewes was retained, although reduced in size, for the production of fat lambs. In order to get lambs as big as possible, Oxford rams were used after 1942, and to economise in feeding stuffs the lambing date was made about three weeks later, so that young

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grass would be available for the ewes and lambs soon after lambing. The use of purchased feeding stuffs was almost eliminated.

Pigs. The pig herd was dispersed in 1939 owing to unsatisfactory housing conditions, and because they were no longer required to dispose of the products of the farm. It is unlikely that the herd will be restarted unless pigs prove to be necessary for the general economy of the farm, or are required for comparing the feeding values of produce from experimental plots.

Future policy

The farming system outlined was developed to meet the requirements of wartime conditions, and proved suitable for those conditions. Now that the war is over the system will be modified gradually to meet changing circumstances. Certain modifications have already been introduced, and others will follow ; the acreage of cereal crops has been reduced, and varieties of crops are again being chosen with equal emphasis on yield and quality : the number of cereal crops grown in succession will be reduced and some of the special crops will not be grown again : the disposal of straw will not be such an acute problem and the amount of compost made will gradually be reduced : the same emphasis will be laid on making the farm as self-supporting as possible in feeding stuffs : the livestock population will be increased to make full use of the increased area of temporary grass : the farm buildings and implements will be kept up to date, and farm cottages will be provided so that all the workers needed on the farm can be comfortably housed.

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