THE SPROWSTON FARM

A Report for Members of the Norfolk Agricultural Station

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THE FARMING.

Potato Chitting. We have nearly but not quite completed the mechanisation of the potato crop. There were some teething troubles with both the planter and the harvester, but both machines worked satisfactorily as experience in their manipulation accumulated.

Chitting facilities have been provided for 25 tons—half the seed we need. Sprouted seed has long been recognised as heavier yielding than unsprouted seed and the value of the yield increases even at the most modest measurements between the two methods promises a satisfactory return on the outlay.

We have not put in a glass chitting house but have installed indoor lighting and storing facilities on what is often termed the "Dutch Method". A bay of the barn at Oak Lodge Farm was levelled and re-floored, ventilation and electric heating provided so that by storing in chitting trays up to 12 ft. high, 25 tons of potatoes can be trayed up and lighted. Twelve light units, each consisting of three 4 ft. fluorescent tubes are sited in the aisles between the stacks of trays; each light unit serves a total of some 160 trays. The electric heaters are thermostatically controlled.

The cost per ton of potatoes chitted was £5 for adapting the end of the barn, £12 for the lighting and heating and £18 for the chitting trays.

The principle of this system is to store potatoes in trays at about 40°F. at which temperature sprout growth does not occur, and when sprout growth is required early in the New Year to raise the temperature and give artificial light. By this combination sturdy green shoots can be produced. Ventilation is important, particularly before sprouting is started and when the temperature must be kept around 40°F.

The advantages of sprouting this way are:—

1. The expense of a glass chitting house can be avoided and use made of any building suitable for the purpose on the farm.

2 The rather extreme variations which occur in the day and night temperatures of glass chitting houses can also be avoided. A more constant environment can be maintained in a building than in a glass house and the control of sprouting is easier.

Beef Cattle. The first and best of the calves reared in the autumn of 1956 have just been sold at 16-17 months old weighing

8¾ cwt. live weight. The remainder have done very well and now weigh 7 cwt., the Friesians being slightly heavier than the Angus Friesian Crosses. During January their live weight gain was almost exactly 2 lb. daily, despite some trouble from ringworm. These cattle should be finished and sold before the end of May, when at the present rate of growth they should weigh around 9 cwt. live.

The ration of each per day at present (end of January) is 35 lb. pea haulm silage, 7 lb. beet pulp, 3 lb. oats or barley, 1 lb. fish meal, 5 lb. straw and 2 oz. minerals. No hay is available and the protein lost thereby is made up by including fish meal. The quantity of straw is guesswork, for the animals are of course in an open yard.

The live weight gains have been higher and the cattle more uniform with less under beasts since the yards were modified two years ago. They can now be held separately during feeding, but we do not often use the yokes. Each bullock has to put its head between two uprights of iron tubing to reach the trough and this seems to give greater stability at the trough and less rustling around. Most of the cattle "stay put" during feeding and there is no bullying.

The bullocks are, of course, dehorned which in itself makes them quieter, and enables them to be handled easier in the yokes.

Despite the satisfactory performance of the home-reared stock at Sprowston this year, their records and older ones, now of very long standing, testify to the wide range in individual performance. Much of this is no doubt due to breeding and the increasing use for beef purposes of cattle from milk-producing herds focusses attention on the value of the progeny of the type of bulls used with the primary object of breeding more dairy, and not beef, animals.

We have an interesting project in hand now which will throw some light on the subject for one of the milk-producing breeds—the Friesian.

Steer calves by three Friesian bulls at the Beccles A.I. Centre have been collected from herds in the county, ten from each bull. They have been reared at Sprowston under uniform conditions and their growth and general performance (including carcase examination) as beef animals will be recorded.

This trial is being carried out in conjunction with the Institute of Animal Genetics, Edinburgh, and we hope to find out whether Friesian animals selected primarily for their ability to produce milk differ in their power to transmit useful beef characteristics, and we may discover some variation between males in that capacity.

Farm Crops. Most of the yields of commercial crops were given in the December report. We are not yet able to calculate returns from the potatoes, but it is probably the best crop so far grown at Sprowston. Sixty acres of sugar beet averaged 15¾ tons per acre at 16½% sugar, a yield which has only once (in 1953) been bettered on the Sprowston farm.

THE RELATIVE PERFORMANCE OF SPRING AND AUTUMN WHEAT.

The terms spring and autumn as applied to wheat varieties require some definition. A spring wheat requires a relatively short growing season and will yield satisfactorily if sown in March or even April, as is the case with the quickest maturing varieties. Some spring wheats can also be sown in the autumn as they are sufficiently frost-hardy to withstand the winter: these can be termed alternative varieties. A true "winter" wheat on the other hand, such as Holdfast or a typical Scandinavian variety, will only come into ear if there is a period of relatively low temperature during its growing season. Consequently it is not advisable to sow such a variety after mid-February because in the absence of the necessary cold weather period the wheat may completely fail to ear.

For three years a trial at Sprowston compared two alternative varieties, Atle and Bersee, sown in the autumn and the spring. In 1951, Atle yielded 1½ sacks more when autumn sown rather than spring sown, whereas Bersee gave the same yield at both times of drilling. In 1952, drilling Atle in the autumn gave an advantage of 2 sacks in yield, while autumn-drilling Bersee increased yield by 1 sack. In 1953, however, autumn sowing depressed yield of both varieties, but in this year there was a bad attack of Eyespot over the trial area and as might be expected the autumn-sown wheat suffered more severely from the infection. The results therefore suggest than an alternative variety yields better when sown in the autumn except where attacks of soil-borne cereal diseases are encountered.

There have been no trials at Sprowston comparing spring-sown wheats with the more recent high-yielding autumn varieties, but some idea of their relative performance may be gained from the yield results of separate trials conducted in the same year. In 1953, for example, autumn-sown Hybrid 46 yielded 19½ sacks on one trial and 20½ on another, while spring-sown Atle averaged 15¼ sacks in experimental plots. In the following very wet year the yield of Hybrid 46 was 20 sacks in each of two trials and Atle gave 17½ and 16½ sacks in two other trials. Last year both Cappelle and Hybrid 46 gave about 19 sacks per acre, whereas Atle gave 11¼ and 10. So in three years, modern short-strawed winter wheats in our trials have outyielded Atle drilled in the spring by between 3 and 8 sacks an acre. It should be made clear that these comparisons were not made on the same field in each year, nor was the previous cropping the same, since the spring wheat followed beet or another cereal whereas the winter corn was taken after a legume in all cases. Having made this reservation, it can be said that in general this experience has been borne out by the farm crops: Cappelle and Hybrid 46 together outyielded Atson by 11 sacks in 1954 and 8½ in 1955. However, the margin in favour of autumn-sown wheat may be reduced in the future owing to the improved performance of the newer spring wheat varieties, such as Koga II, Svenno and Peko, which have outyielded Atle in trial by 10 to 20%.

These results indicate that wheat sown in the autumn is likely to be more profitable than spring sowing on the lighter soils where a long growing season is needed for optimum yields. After potatoes or peas a winter-sown variety must be the first choice and spring wheat should only be regarded as an alternative to barley following a late-harvested crop like sugar beet. However, in special circumstances the sacrifice in yield entailed by sowing spring wheat may be justified. When combine strength is low in proportion to the acreage of cereals to be harvested, the later ripening of spring wheat may help to spread the harvest. Also if wheat has to be grown on land known to be infected with Eyespot, leaving the land fallow over winter helps to starve out the fungus and in these circumstances drilling spring wheat may reduce the disease incidence in the crop.

CONTROL OF VIRUS SPREAD IN POTATOES BY SPRAYING.

The use of Scotch or Irish seed by ware potato growers in the Eastern Counties and elsewhere in England is dictated by the need to prevent virus degeneration of the crop. Viruses are carried and spread by the peach-potato aphid in its movements within crops and from crop to crop. Over most lowland areas in England aphid activity starts early in the season before the plants grown from infected tubers have developed recognizable symptoms enabling them to be rogued out: in this way the viruses spread in the crop. In Scotland and other seed-producing areas, the cooler, wetter conditions delay aphid movement until after the infected plants can be identified and destroyed and in these areas seed stocks can be kept free from disease. Unfortunately, the cost of transporting the seed from Scotland to the ware-producing areas of England contributes to the high price of seed, which has been estimated as one-third of the cost of growing the ware crop. If a way could be found of keeping seed free from virus disease for periods of up to four or five years it would enable English ware growers to reduce their expenditure on imported Scotch or Irish seed by renewing their stocks only every two or three years instead of every season as is now common practice. With this object in view the possibility of insecticidal spraying against aphids to restrict the spread of virus in ware crops is being investigated by Dr. Broadbent and others at Rothamsted. Their earlier work showed that fortnightly spraying at high volume with overhead nozzles and underleaf lances would prevent the spread within the crop of the more serious Leaf Roll virus and reduce that of the less harmful Rugose Mosaic virus. More recent trials have suggested that 6 or even 4 sprays at high or low volume may be equally effective. In view of these findings, experiments are now in progress at a number of centres throughout the country to establish the cheapest and most effective method of spraying under practical farming conditions. In co-operation with Rothamsted, one of these trials was started at Sprowston in 1955 to test whether the number

of sprays could be reduced from the six successfully used at Rothamsted to one or two only. In 1955 a uniform stock of Stock Seed potatoes was planted over an area divided up into ¼ acre plots with the following spraying treatments using DDT emulsion at low volume:—(1) sprayed six times at fortnightly intervals during June, July and August, (2) sprayed once only in June, (3) sprayed once only in July, (4) sprayed once in June and once in July, (5) no spray.

At harvest the potatoes from each plot were clamped separately and the following season used as seed to plant up plots which received the same treatment in 1956 as in the previous year. The intention is to repeat this for up to five years, records being taken each year of aphids present in the air and on the crop and of virus disease in the crop. These records should provide information on which to base a spraying technique which maintains the stock reasonably healthy for the longest time at the least expense. So far, it seems that aphid numbers on the crop may be kept down effectively during late June and July by two sprayings only. As the incidence of virus disease was low in 1955, an assessment in 1956 revealed that there were few diseased plants either on the sprayed or the unsprayed plots, so no treatment comparison can be made as yet.

It must be emphasised that spraying can only restrict the spread of infection within the treated area and it will not prevent the introduction of virus from an adjacent infected crop. If spraying proves to be effective in delaying the breakdown of potato stocks by viruses, it would seem to provide a means whereby the farmer can grow on in isolation enough once-grown seed of a satisfactory standard to plant up his ware acreage for a third year.

SUGAR BEET.

Low Seedrates. In "The Sprowston Farm" of March, 1955, a description was given of the first attempts to produce a thin, regular and easily hand-singled braird of sugar beet by using precision drill units modified to sow at very low seedrates. In 1954 two machines were tried out: the seeding mechanism of the most promising of these units consisted of a moving rubber belt punched with holes in which single seeds were carried to the coulter. The spacing between seeds sown, and consequently the seedrate, could be altered by using belts perforated at different intervals.

In the following two years this machine was used in order to test lower seedrates than are normally recommended. In 1955 sowing belts were modified to place rubbed and graded seeds at 1¼ in., 2¼ in. and 4½ in. intervals, giving seedrates of 5½, 3¼ and 1¾ lbs. per acre. Two additional belts placed seeds at alternate 2 in. and 7 in. spacing, and 2 in. and 3½ in. spacing, equivalent to seedrates of 1¾ and 3 lb. per acre. Unfortunately the cold dry spring resulted in low field germination (40-45%) and the stands of beet were rather thinner on all treatments than they should have been,

with the result that the final plant after singling ranged from 25,000 plants per acre at the 5½ lb. seedrate down to 19,500 at the 1¾ lb. rate. Differences in singling time were recorded, the saving in labour at the low rate being 14%. This saving must, however, be regarded as due to the lower final plant left rather than any improved proportion of single plants. Nevertheless, it was very interesting that under the extremely dry conditions these differences in plant population affected yield very little. At Sprowston we do not expect yield to fall appreciably until the plant population falls below about 26,000 plants per acre, but at 19,000 plants some considerable loss would be forecast. In a drought season, however, the plants are competing for water and widely-spaced individual plants are better able to compensate for any reduction in numbers.

In 1956 the trial was repeated using gravity-separated seed. The combination of conditions favourable to germination and the use of this improved seed resulted in regular brairds with satisfactory initial populations: the 1½ in. spacing (5½ lb. per acre) produced a braird having 37 beet-containing inches per 100 in. and the 4½ in. spacing (2 lb.), 15 beet inches. The time taken to single at the seedrate of 2 lb. was 8% less than at the 3¼ lb. rate (2¼ in. spacing) which in turn was singled 8% more quickly than at the 5½ lb. rate. Plant population ranged from 28,000 on the 5½ lb. rate down to 25,000 on the 2 lb. rate and at this level of plant no differences in yield between treatments were recorded.

Further work is to be carried out on the use of low seedrates and it would be unwise to draw any final conclusions at this stage. However, the work of two years does show that it is mechanically possible to sow seed evenly at these rates, provided three conditions are satisfied. Firstly, speed of drilling must be kept low in order to give the seeder mechanism time to function efficiently. Secondly, the seed used must have a high field germination capacity and be more stringently graded in size and quality: gravity separation, whereby the lighter and less viable clusters can be dressed out, may help to solve this problem. Thirdly, full plants at these low seedings are only possible where the seedbed is even and uniformly well supplied with moisture.

Processed Seed. Rubbed and graded seed has proved itself to be a useful aid to quicker singling and its popularity has been increasing since it was first made available to farmers several years ago. Nevertheless at Sprowston we are continuing to test different grades of rubbed seed in the hope that it will be possible to produce seed of improved "singleness" without sacrificing field germination. In the course of the work a grade of rubbed seed consisting wholly of clusters between 7 and 9/64ths in. in size was under trial and in 1952 when germination conditions were good this grade did remarkably well. But in the difficult spring of the following year its performance was not so satisfactory, and although a high proportion of singles was obtained germination was reduced and the final plant was below the optimum. Since

the standard rubbed seed is graded between 7 and 11/64ths in. an intermediate grade 8-10/64ths in. was prepared for test in 1954 and, as with the 7-9 grade, this was done by re-rubbing the standard grade and dressing between the appropriate sieves. As compared with 7-11/64ths. seed the 8-10/64ths grade produced 30% less doubles in the field, but was associated with a reduction in germination of 16% which brought about a drop in plant population of 5,000 plants per acre and a loss of 1¾ tons in yield. The investigation was extended in 1955 to compare 8-10/64ths seed derived from twice-processed natural seed not only with the standard 7-11/64ths, but with 8-10/64ths derived from 7-11/64ths by grading only, without re-rubbing. As in 1954, the twice-rubbed 8-10/64ths showed an increased proportion of singles, but this was accompanied by a 26% lowering of germination and a final loss of 5,000 plants per acre. In spite of this, however, and probably owing to the dryness of the season, there was no loss in yield. Once-rubbed 8-10/64ths seed, on the other hand, resembled 7-11/64ths in its properties, there being little difference between them as regards proportion of singles, germination, saving in singling time, plant population or yield. These findings were confirmed in 1956 when again the braird produced from single-rubbed 8-10/64ths was similar in character to that from 7-11/64ths seed.

The results demonstrated how greatly the severity of rubbing affects the field performance of sugar beet seed: if any improvement is to be gained from closer grading of rubbed seed, it is clear that this must be based on sieving the treated seed to provide the required size grades of cluster without any additional processing. This may mean some wastage of usable seed: on the other hand there is limited evidence to suggest that after sieving out the smaller grades from which the majority of the single seedlings are derived, the residue of larger clusters can be processed again and regraded to give an additional recovery of small-grade seed which is little if at all inferior to that obtained from riddling the standard once-rubbed seed.

In this connection there has been widespread interest in gravity separation of the seed which is simply a means of improving cluster quality in any particular size grade by rejecting the less dense, and therefore presumably less viable, clusters. It is possible that, whatever method is used to obtain seed of high germination, but nevertheless capable of producing single seedlings, some wastage of usable seed may have to be accepted. But although this would inevitably mean some increase in the cost of the seed, it would be a small item in relation to the other costs of growing a crop, having regard to the great need for exploiting to the full any possible means of saving labour in thinning.

Pre-emergence Weed Control in Sugar Beet. With the exception of nitrate of soda, "post-emergence" herbicides have tended to be found rather harmful to sugar beet and much attention has therefore been paid to the development of "pre-emergence"

techniques. Two methods may be distinguished: "contact pre-emergence", where the chemical is applied just before crop emergence in order to kill any weeds already showing, and "residual pre-emergence", where the chemical is applied to the soil at any time before emergence, even at or before drilling, and then persists in the soil. This last method requires chemicals which are selective in their action, killing weed seedlings but not beet; contact pre-emergence weedkillers are themselves harmful to the crop and selectivity is achieved by careful timing of the application.

In the last two years, use of the contact weedkiller PCP in oil has been widely tested and many growers have been well satisfied with the results. It is most useful where rapidly germinating weeds, such as charlock and wild radish are present; others such at fat hen, chickweed and spurrey can be successfully controlled but timing is more critical. Weeds that are slow to germinate, e.g. knotgrass, are difficult to control by this method. PCP has a slight residual effect and it is therefore desirable to spray if possible about 3 days before the beet are expected to emerge in order to avoid crop damage. There is considerable risk in spraying after any beet are up and this was usually the cause of the few cases of crop damage reported in 1956. The rate of application should be 3 to 4 lb. PCP per acre, using the higher rate if conditions are cold or dry. Under warm, wet conditions some penetration of the chemical into the soil may occur and cause damage to the germinating crop, so here the lower rate is advisable. This technique appears to be more useful in the wetter areas of Central and Western England than in East Anglia, possibly because weeds emerge more quickly there.

Many chemicals have been tested for use as residual pre-emergence treatments but soil type, moisture and rainfall have such marked effects on the results that few have given any consistent success and none can be recommended at present for general weed control. Propham or IPC (isopropylphenyl carbamate) is less dependent on rainfall than many chemicals and is able to control chickweed, knotgrass and some other weeds without harming beet but the range of weeds controlled is not sufficiently wide to make it really valuable.

Propham has also shown promise in the control of wild oats, a serious problem in many sugar beet fields. Wild oat seeds may germinate from a depth of several inches and it is therefore necessary to mix the chemical into the soil; consequently spraying is carried out before drilling and the seedbed is then given its final cultivations. 3 lb. per acre is a suitable rate and the best results have been obtained when spraying was followed by disc-harrowing but this is not always convenient and in the interests of husbandry less thorough cultivations must often be used. Another characteristic of Propham is that it is volatile, and too long an interval between spraying and incorporation causes considerable loss of effect. These are minor disadvantages in the use

of Propham for wild oat control; a more serious one is that on a few soils there has been some degree of crop damage and this makes it difficult to issue recommendations for its use.

Better results and fewer difficulties were found in 1956 with TCA (sodium trichloracetate) and reports received from growers have been very encouraging. Used at 7 to 8 lb. per acre there is very little risk of crop damage and about 80% control of wild oats. It has the advantage that a long interval between spraying and incorporation does not lead to loss of effect as with Propham: as against this, however, TCA does not control any broadleaved weeds. In 1957 it will be compared with IPC on a wider scale that in previous years.

N.I.A.B. CROP VARIETY TESTING SCHEME.

Sugar Beet Strain Trials, 1956. Owing to difficulties of seed supply, last season's main sugar beet trial retained only Battles N and Battles N_2 from the new strains tested in 1955. In 1956 the yields of washed roots from both these strains were slightly below that of Sharpes Klein E at 17 tons per acre but higher sugar contents resulted in yields of sugar per acre equal to Klein E. Yields of tops were high in all strains, Battles N giving a ton less and Battles N_2 a ton more than Klein E at 13½ tons to the acre.

Of the three new strains in the trial Bush No. 1 gave a slightly greater tonnage of beet than Klein E and since the sugar content was also higher the sugar yield came out at some 2 cwt. per acre higher than Klein E. A strain of Klein E from the East Zone of Germany yielded more tops than Sharpes' but less roots with lower sugar. Earlier in the season the tops of the East Zone Klein were noticeably more vigorous but this difference was not evident at harvest. No difference between the strains in ease of topping was recorded.

Bolting was negligible throughout and populations of roots were very similar in all strains.

In a small-scale trial Sharpes Klein E was equalled in yield of sugar per acre by Belge XE and Belge XE polyploid. Two further strains, Rimpau E and Schreibers E, although higher in sugar content gave low root yields and were below Klein E in sugar yield. Bolting was again negligible in these four new strains.

Brassica Trials. Further strains have been included in the trial of Brussels Sprouts intended for the freezing trade. Picking is still in progress but on such characters as stem height and strength and formation of sprouts the two new Irish strains in trial appear markedly superior to the commercial strains.

A series of observation plots of sixteen varieties of Red Cabbage from Northern Europe was grown during 1956 to provide information on yielding ability and other characters for a study

by the National Vegetable Research Station. Marked differences in adaptation were observed, yields (from 60 plants) ranging from 113 lbs. = 5.9 tons per acre to 296 lbs. = 15.3 tons per acre.

A further series of observation plots of 51 commercial strains of Late Hardy Broccoli are at present being grown. Frost has caused some varietal effects and Cauliflower Mosaic Virus is fairly widespread but all plots established readily and have made above-average growth.

TURKEY EXPERIMENTAL CENTRE.

The Turkey Demonstration Centre at Sprowston was set up three years ago in order to demonstrate how careful selection and recording of breeding stock could raise flock performance and profitability. The three year period originally envisaged for the demonstration has now been completed and the Ministry of Agriculture have transferred responsibility for the operation of the Centre to the Norfolk Agricultural Station as outlined in the Station Annual Report for 1955-56. The same breeding policy will be continued with the object of building up uniform flocks of birds suitable for carrying out experimental work on various aspects of turkey management and feeding. The programme of work will be based on recommendations made by the Poultry Sub-Committee of the Agricultural Improvement Council.

It is therefore appropriate to consider what improvement in the general standard of the birds at Sprowston has been shown during the three years of the demonstration. In the first year (1954) eggs derived from a number of breeders of White turkeys were hatched and the next year's breeding stock were selected from this mixed flock. The performance of these breeding birds during the 1955 rearing season provided the basis for selection of future breeding stock in respect of characters such as level of egg production, hatchability, and day-old poult quality which are not inherited simply and where performance must be judged on family or breeding pen rather than on the individual. From the pens which were above average in these characters the best birds judged on growth rate and body conformation were selected for breeding. Unfortunately the progress of improvement received a severe set-back when in the autumn of 1955 fowl pest was diagnosed, and the entire flock had to be destroyed. Consequently in 1956 it was necessary to choose the breeding stock from a limited number of birds which had been sent away to co-operating farmers as a precaution against an outbreak of disease.

In spite of this set-back and bearing in mind that, if the initial season is omitted, only two years' results are available, some improvement in performance has been achieved. The comparisons are in all cases based on the records of birds hatched at the same time of year and as far as possible managed in a standardised way. In the first place fertility has increased from 81% in 1954 to 87% in 1955 and 93% in 1956.

There has also been an improvement in the hatchability of all eggs set from 65% in 1954, to 70% in 1955 and 73% in 1956 but little change has occurred in the hatchability of fertile eggs or in day-old poult quality.

Live weight gain and efficiency of food utilisation has also improved. In 1955 the average weight of 240 recorded birds of both sexes at 16 weeks was 154 oz. and the cumulative food conversion ratio was 3.3 : the corresponding figures in 1956 were 164 oz. and 3.1 respectively. In both these characteristics a comparable improvement was also shown at the 24 week stage. After only two seasons no appreciable change in conformation has been recorded. The results also suggest that the birds are now more uniform in type and do not show such a wide range of variation but the data requires statistical examination before this belief can be substantiated.

In planning future experiments there is a very wide field of turkey farming problems which require investigation. One urgent need is to find a means of finishing stags of the larger breeds at the lower weights which the domestic market requires.

The practice of feeding lard or tallow to poultry in the last stages of fattening is an old-established one and more recent experimental evidence in the U.S. has shown that fat is laid down more readily on high energy rations containing a proportion of fat not exceeding about 5 per cent. From other work there is reason to believe that implantation of oestrogen either in pellet form or as a cream may improve live weight gain and fat deposition although the value of caponising treatments of this nature for male turkeys has not been tested so thoroughly as it has for cockerels.

A small experiment is being conducted at the Turkey Centre this winter to find out whether these treatments do, in fact, enable stag British White turkeys to be marketed at an earlier age.

The Sprowston Farm is a progress report and its contents are confidential. The report is punched for filing, and files can be obtained from the Office, price 5/9 each, post free.

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