THE SPROWSTON FARM

A Report for Members of the Norfolk Agricultural Station
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Note This is a progress report for Station Members and its contents are **Confidential**

THE EXPERIMENTAL PROGRAMME

Although the Station has been at Sprowston since 1921, for the past 35 years it has had only one Director—Mr. Rayns. Without doubt, its rapid development, and its place in the Agriculture of this country has been largely due to his leadership and direction and with his retirement at the end of October, 1960, members will be considering what changes if any are likely to follow. Probably the greatest asset of the Station in the past has been the flexibility of the farming programme, which has allowed changes to be made to suit new conditions without altering the basic plan founded on sound arable husbandry. In the early 1920's sugar beet was introduced into the rotation, and more recently the introduction of potatoes and peas for quick freezing has helped to maintain a high level of cash cropping. With each new crop, problems have arisen not only at Sprowston but in the County generally, and these problems have been tackled in an ever-expanding experimental programme. No experimental programme can remain static any more than a fixed farming policy can remain unchanged and still successful, and changes of emphasis must also be made from time to time as the situation demands. Conversely a programme develops as it progresses and any rapid change would be pointless and harmful.

A number of experiments in the programme that have appeared regularly in the past are now nearing completion, and these will be replaced by others based on current problems. The Station's work on sugar beet and cereals will still form the main basis of the programme and in particular the possibility of reducing hand work at singling by mechanical aids and weed control chemicals will be actively pursued. At the same time the increasing importance of potatoes and quick freeze vegetables must be acknowledged, and experimental work on these crops will probably be expanded.

The provision of a good range of calf pens last year on the Oak Lodge Farm improves the Station's facilities for livestock experimentation, and the Committee have in mind an extensive programme of experimentation on calf rearing to be started in the

autumn of 1961. The new bullock yards with individual cattle ties—sited adjacent to the calf-pen unit—will also mean that the animals' performances can now be followed right through from birth to slaughter in addition to providing facilities for additional experimental work on the growing animal.

Fattening Cattle

Details of the performance over the summer period of the home reared stock were given in the last report (Vol. II, No. 5, December, 1960).

Since yarding, satisfactory gains have been maintained and results to date in lbs. are shown below:—

	Liveweights				Mean daily gain
	Oct. 24th	Dec. 19th	Jan. 16th	Feb. 13th	Oct. 24th—Feb. 13th
Friesian Steers ...	617	730	779	810	1.72
Angus x Friesian Steers	586	713	766	809	2.00
Angus x Friesian Heifers	574	682	758	788	1.91

A direct comparison between Friesian and Angus cross Friesian would be unfair as the Friesian cattle are housed at Church Farm and due to the disposition of the yards housing conditions are not strictly comparable. However on a feeding regime based until Christmastime on beet tops and chat potatoes and then on pea haulm silage all cattle have made good weight gains and the ability of the heifers, though they are smaller than the steers, to fatten quickly meant that sales of the best finished animals began in mid-January at about 7½ cwts. liveweight.

A small sample group of Friesian steers and Angus cross Friesian steers and heifers whose progress was followed closely during their first 12 months has been yarded with the other cattle. It was found that with supplementary feeding over the summer period (not given to the bulk of the cattle) and good grazing the sample animals achieved high liveweight gains. Since yarding, their performance has not been appreciably higher than the remainder but the advantage gained during the summer has been maintained and they are in a more forward condition. It is hoped to continue this work on supplementary feeding in the grazing period and relate this to winter feeding at various levels.

POTATO TRIALS 1960

Period of Sprouting Trial: King Edwards

This trial was started at Sprowston in 1960 and followed work done in Essex and more recently at Terrington E.H.F. on the control of sprout numbers. It is known that the number of sprouts produced by a tuber affects the proportion of ware in the subsequent yield. Once mature potatoes have completed an initial dormancy

period early chitting (started in October or November) tends to encourage the development of a single apically dominant sprout which suppresses the growth of other sprouts during the chitting period. The seed tuber so produced has few sprouts at planting time and will give fewer, but larger potatoes than seed which was chitted later and produced many sprouts per tuber. The trial compared seed chitted for various periods with unchitted seed, which was held at 40 degrees Fahr. during the chitting period, and seed which was chitted and then desprouted shortly before planting. In addition some seed was chitted very early and as rapidly as possible and then held at 40 degrees Fahr. until planting time. This pre-sprouting treatment, if successful, might be used to put more seed, or seed of different varieties needing different sprouting conditions through limited chitting facilities.

The results obtained in 1960 are set out below:—

Treatment	Mean Nos. of Sprouts per tuber on 30.3.60	Mean Length of Apical Sprout on 30.3.60. (m.m.)	Total Yield of tubers. (tons per acre)
Chitted from 1st December	2.02	22.9	15.6
Chitted from 1st January	2.92	20.0	14.3
Chitted from 1st February	3.36	13.1	14.1
Chitted from 1st March ...	4.40	4.7	13.5
Unchitted	(5.04)	—	12.2
Pre-sprouted	3.32	14.6	15.4
Chitted, desprouted ...	—	—	14.7

The seed was brought to Sprowston from Terrington, where it was processed, about ten days before the counts were made so that the eyes of the unchitted tubers were just opening. In general a shorter chitting period caused the production of more short sprouts and retarded the rate of emergence of the plants. The slower rate of plant emergence was reflected in the reduced yields obtained except in the case of desprouted seed, which emerged slowly but grew very vigorously so that it had almost caught up with the early sprouted seed at harvest. The pre-sprouted seed did as well as the seed which was sprouted early and spent the whole of the sprouting period in the chitting house.

The yields of ware have not been quoted since in the 1960 season almost all tubers grew to full size so that the yield of seed was small and the same on all plots. In an average season the chitting treatments might be expected to cause differences in the ware-seed ratio.

This trial will be repeated in 1961 using King Edward potatoes and a second trial will be started using Bintje potatoes to find whether they behave in the same way.

Potatoes: The effect of cultivation, wheelings and method of fertiliser application

In the past it has been found that potatoes put in with a three row planter have not grown uniformly. The haulm of the centre rows has not been as green or well developed as that of the outside rows planted over the wheelings of the tractor drawing the planter. Preliminary observations made in 1959 suggested that the centre rows yielded a little better than outside rows in spite of their poorer appearance during the growing season. It was thought that the wheelings caused these differences either because of the physical effect of compaction of the soil under the outside rows or because the fertiliser placed in front of each row as it was planted fell in a more concentrated band in rows with wheelings than in the loose tilth in which the centre row was planted.

A further investigation was started in 1960. This compared two methods of seedbed preparation before planting, using either rotary cultivation or cultivator and harrows, in case this had some effect on the compaction caused by the planter tractor wheels. The fertiliser was placed in the usual way by the three row planter and centre and outside rows were harvested separately. The results were as follows:--

	King Edwards			
	Total Yields of Tubers (tons per acre)			
Field	Garden Pightle			
Fertiliser Application	Placed	Placed	Placed	Placed
Seedbed Preparation	Rotary	Rotary	Cultivator	Cultivator
Row	Middle	Outside	Middle	Outside
Yield	16.0	15.0	16.0	14.1

On another field a trial required that fertiliser be broadcast and worked into the seedbed before planting with the same three row machine with the fertiliser mechanism shut off. Centre and outside rows in this field were also harvested separately. The results of these observations are set out below:—

	King Edwards	
	Total Yields of Tubers (tons per acre)	
Field	14 Acres	
Fertiliser Application	Broadcast	Broadcast
Seedbed Preparation	Rotary	Rotary
Row	Middle	Outside
Yield	11.0	10.9

During the growing season the centre rows in the field where the fertiliser was placed looked worse in both colour and vigour than the outside rows, but in the field where the fertiliser was broadcast no difference between centre and outside rows was observed. The yields recorded from the placed fertiliser plots

confirmed the superiority of the centre rows which was found in 1959. Where the fertiliser had been broadcast there was no difference between centre and outside rows.

These results suggest that the physical effect of tractor wheelings on the soil beneath the rows is relatively unimportant at Sprowston. The wheeling itself does not seem to affect yield although it may cause clods in the bottom of the rows which might give trouble at harvest. The wheeling does appear to have an effect on the distribution of the placed fertiliser in relation to the setts and this produced a variation in yield between wheeled and unwheeled rows. This difficulty could be overcome by modifying the method of placement or by using a two or four row machine, so that no wheelings occur under the rows. It is hoped to try the latter method in 1961.

SUGAR BEET TRIALS 1960

Demonstration Plots

In order to demonstrate some of the more important recent developments in the sugar beet spring programme a series of large plots were drilled using a "monogerm" graded seed and rubbed seed of two different grades. A precision drill was used and various seed spacings were combined with different techniques of thinning. For purposes of comparison a cup feed drill, sowing at a low seedrate and followed by complete hand singling was included:—

Plot No.	1	2	3	4	5
Type of Seed	———	8-10/64th "monogerm"			———
Seed Spacing	2¼″	1½″	1½″	1½″	4½″
Seedrate (lbs. per acre)	2.0	2.9	2.9	2.9	1.2
First Braird Counts (Total BCI per 100″)	17.4	20.5	21.0	18.5	9.8
Thinning Technique	Hand Singled	Mechanical 42% reduction Hand Scored	Mechanical 42% reduction only	Hand Singled	Hand Singled
Singling times (man hours per acre)	9.1	9.3	—	9.8	8.6
Final Plant Population (per acre)	29,100	29,600	38,600	28,400	25,000

Plot No.	6	7	8
Type of Seed	8-10/64ths rubbed and graded	7-9/64ths rubbed and graded	8-10/64ths rubbed and graded
Seed Spacing	1½"	2¼"	Cup feed
Seedrate (lbs. per acre)	6.5	3.7	4.6
First Braird Counts (Total BCI per 100")	47.6	36.4	34.2
Thinning technique	Hand Singled	Hand Singled	Hand Singled
Singling times (man hours per acre)	17.0	13.2	14.2
Final Plant Populations (per acre)	32,300	31,000	25,400

The seed used for plots 1-5 was not a true genetic monogerm but a commercial seed containing about 90% of single germs. Its use for the first time in the precision drill resulted in a lower seedrate than was anticipated caused by irregular seed shape and a badly matched belt hole size in the drill. Nevertheless a satisfactory braird was obtained on all plots although the 4½" spacing treatment needed careful and therefore slow handwork consisting solely of removal of weeds and the occasional separation of double plants in order to leave as high a plant population as possible.

Of the various methods of thinning, a mechanical treatment followed by hand scoring (plot 2) showed very little difference in singling time compared with complete hand singling (plot 4) and little time was saved by an even lower seedrate (plot 1). Complete mechanical singling (plot 3) left a less regular braird and, as was intended, a higher final population.

Although the handwork on the braird resulting from the use of the cup feed drill was quicker than that on the precision drilled braird the final plant population was considerably lower. When the singling times were converted to man hours per 1,000 plants left there was little difference between the times taken to single plots 6 and 8. Plot 7, drilled with a smaller grade of seed at a wider spacing, was singled faster than plot 8.

Drill Tests

A progress report on sugar beet drill design was given in the "Sprowston Farm" Volume I, No. 10 for March 1958. Since that time there has been little change in the principals of operation of the main types. The true precision drills fall into two main groups: those which depend on a metal disc containing on its periphery a series of small cells each designed to contain one seed and those which use a punched rubber belt which revolves or reciprocates through the seed hopper and picks up, ideally, one seed in every belt hole.

In 1960 three new machines of the drilled metal disc type and two of the punched rubber belt type were tested. The differences between the brairds produced were so small that no drill could be classed as outstandingly better than the others although there was considerable variation in method of construction, ease of adjustment and purchase price.

Fertiliser Placement Trial

After three years this trial has produced very little conclusive evidence. The treatments were as follows:—

(a) 6 or 10 cwt. per acre of a 9:6:15 compound which was

(b) either broadcast before seedbed preparation or placed by the drill

(c) with or without a top dressing of 2 cwt. per acre of 15.5%N nitro-chalk, applied after chopping out.

In 1958, placed fertiliser gave the same yield as broadcast fertiliser, at both rates of application. It is probable that considerable leaching of seedbed nutrients took place in the wet spring of that year and the subsequent response of the crop to the top dressed nitrogen indicated that available fertiliser was in short supply. Top-dressing increased foliage growth as well as root yield and this was accompanied by a fall in root sugar content.

The 1959 growing season was dry and in common with most of the beet of that year the trial crop showed no benefit from top-dressing. In these very dry conditions the placed fertiliser, although it was put two inches away from the seed, caused some loss of plant from scorch. The low plant population resulted in reduced yields compared with broadcast fertiliser. The scorch was more marked where the higher rate of fertiliser had been used.

Damage to the young plants caused by fertiliser scorch was experienced to some extent in 1960 although the final results were very variable. Where the plants had escaped damage, fertiliser placed, even at the high rate, produced results equal to the same quantity of fertiliser broadcast. The effects of top-dressing were also inconsistent and it is hoped that further work may reveal a clearer relationship between method of application and rate of fertiliser.

Method of Application of Fertiliser

In order to find out whether a complete dressing of fertiliser could be applied for beet at a time other than just before or during seedbed preparation a new trial was begun in 1960.

If fertiliser distributor wheelings in the seedbed could be avoided there would be obvious advantages, and treatments were included where the fertiliser was broadcast on the plough in

autumn and in spring. These were compared with the normal application at drilling time, when the fertiliser was either broadcast in the normal manner, broadcast but with the seedrow protected or placed by the drill. The broadcast and broadcast-protected treatments were also applied at the time of the first hoeing instead of at drilling time. These were all compared with a control treatment which received no fertiliser.

The rate of fertiliser application tested was 6 cwts. per acre of a 16:9:9 compound and this level gave a response of about 4½ tons of clean beet from all of the broadcast treatments, when compared with the nil plots. Where the fertiliser was placed by the drill some reduction in final plant population occurred and the yield was midway between that on the nil plots and that of the plots receiving broadcast fertiliser. This confirms the finding in another trial using the placement drill in a dry spring and described elsewhere that damage caused to the braird by fertiliser contact can cause a real loss of potential yield.

Until July all beet on post-drilling fertiliser treatments suffered from nitrogen shortage but when rain came to carry nutrients into the ground these plots made a rapid recovery and yielded as well as the earlier broadcast treatments. The trial will be repeated in 1961.

Weather and Herbicide Performance in 1960

Following the success of mixtures of Endothal and Propham in 1959 an extensive series of trials was laid down in 1960 with the aim of investigating the performance of a mixture of Endothal with Propham (in the ratio 4:3) on a wide range of soils.

The evidence available in 1959 pointed to the fact that the activity of these, and many other soil-action herbicides, is reduced by increasing amounts of clay and organic matter in the soil.

In the case of Endothal and Propham, however, there was no evidence at that time that conditions of rainfall, temperature and humidity had any effect on the mixture's herbicidal activity.

The spring of 1960 was predominantly a dry one and there was only one week wet enough to bring drilling and spraying to a complete standstill.

This wet spell tended to divide the season sharply into two and the sites sprayed between the 21st and 28th March received an average of 1.30″ of rain in the following 3 weeks, whilst those sprayed between the 4th and 20th April received an average of 0.35″.

The 30 year averages for these two periods would be about 1.25″ and 1.75″ respectively, at Sprowston.

In addition temperatures, which were very low in March, rose considerably during April.

The effect of this "climatic grouping" of the trials was remarkable and was sufficient to overshadow differences in herbicidal activity caused by differences in soil type from site to site.

This was also accentuated by the fact that the lighter soils tended to fall in the earlier group of trials and vice-versa so that the effects of soil type and rainfall were, to some extent, confounded.

What in fact happened was that the March applications had the effects which one would have predicted from previous work, whilst the April applications were all either complete failures or showed very low activity.

Endothal is a very soluble chemical and might be expected to respond to rainfall but the solubility of Propham is very low so that the 1960 results came as rather a surprise.

It would appear, however, that the rainfall serves two purposes; firstly, that of transporting the chemical down into the zone from which the weeds are germinating i.e. just beneath the surface, and secondly, by removing the chemical from the surface loss of chemical by evaporation is reduced.

Although the volatility of Propham is rather low under British conditions there is growing evidence to suggest that it is very significant and that in some cases it penetrates plant tissues in the vapour phase.

Further research will be carried out to determine whether this dependance on rainfall can be reduced by shallow incorporation techniques.

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

Virus Free King Edward Trial

A new trial introduced to Sprowston in 1960 compared a stock of King Edward potatoes freed from paracrinkle virus, with seven other King Edward stocks from a range of commercial sources. By culturing the apical growing points of potato plants on agar, a virus free stock was obtained from otherwise infected material. The technique was developed at Rothamsted where work in this field has progressed steadily for several years. All the stocks in the trial were grown and multiplied in Northern Ireland and all appeared virus free and very similar in type when observed during the growing season. When harvested and riddled, large differences in total yield ranging from 11.4 tons to 14.25 tons per acre were obtained depending on the stock, thus revealing the large variations which can occur within a single variety.

At Sprowston the virus free stock was placed third in the trial with a yield of 13.08 tons per acre, a little more than a ton less than the best commercial stock.

Second Early Rate of Bulking Trial

Another innovation in 1960 was a rate of bulking trial comparing Arran Pilot with three second early varieties, Craigs Royal, Red Craigs Royal and Pentland Beauty. Four liftings at fortnightly intervals were taken between July and mid-August. Craigs Royal and the fully coloured Red Craigs Royal behaved similarly in rate of bulking and total yield. The increase in yield for Craigs Royal over the six week period was from 7.2 tons to 14.7 tons per acre, compared with the slower rate of increase and lower total yield for the first early control variety Arran Pilot, the initial and final yields for the latter being 7.6 tons and 12.2 tons per acre respectively. A relatively new variety Pentland Beauty displayed a marked resistance to blight throughout the season. Although possibly slightly later than the other varieties at the first lifting, this variety had a greater rate of bulking and more than doubled its yield of 6.7 tons between the first and final lifting.

Maincrop Trial

The current trials series, started in 1957, continued to test new "Ulster" varieties introduced from Northern Ireland. Ulster Torch, the most outstanding of the group, has consistently yielded better than Majestic over this period. In the first years of testing at Sprowston and elsewhere, this variety showed almost complete resistance to blight in the foliage but this resistance broke down after two seasons. The tubers of this variety, however, are extremely susceptible to blight. Similarly, two recent varieties Ulster Glen and Ulster Ranger are both foliage resistant to blight at the present time, but like Ulster Torch the tubers appear very prone to blight attack.

During the last two seasons Ulster Glen has performed as well as Ulster Torch and has outyielded Majestic. It is interesting to note that the ratio of ware to seed tubers is higher with Ulster Glen, Ulster Torch tending to produce large numbers of rather small tubers.

Of the remaining varieties in trial only the newly recommended variety Ulster Beacon appears to be in the same class as Majestic. Over two seasons the varieties Ulster Tarn and Ulster Ranger were no better than Majestic in total yield of tubers and have consequently been dropped from the forthcoming trials.

Sugar Beet Variety Trials

New sugar beet varieties of both Continental and British origin have continued to appear in the N.I.A.B. variety trials

over the past four seasons. A number have been triploid or polyploid varieties which have often been credited with high yields of roots and tops in their countries of origin. Sharpe's Klein E the control variety has consistently given good performances in both N.I.A.B. and national trials of " commercial " varieties, being among the best for both yield of sugar and bolting resistance. The standard set by Sharpe's Klein E is very high and new varieties will have to surpass this excellence before they are recommended for growing in this country.

Many foreign varieties of particular importance in their own environment have often failed to attain this high level set by Sharpe's Klein E. Two French varieties, Desprez ER and Desprez GO, between them accounting for the majority of the sugar beet acreage in France, were included in the 1960 trials. Both varieties, however, displayed a poor resistance to bolting and gave a lower sugar yield than Sharpe's Klein E.

A further example of poor adaptability to the British environment as a result of material being selected under very dissimilar conditions was shown in Goldsmith's Dobrovice A. This variety from Czechoslovakia—although re-selected—continues to be extremely susceptible to bolting under our climatic conditions and produces a sugar yield below that of the control. These results indicate the value of breeding sugar beet within the environment in which it is to be grown.

Zwaanesse III, which has been in variety trials since 1956, has done consistently well throughout the trial series. This is the first time for many years that a foreign variety has had both reasonable bolting resistance and the ability to produce high sugar yields under British conditions. The variety has recently been recommended by the N.I.A.B.

Several varieties of promise have been tested during the last two seasons. The Dutch polyploids, in particular, Polyrave, Zwaanpoly and Polykuhn, have yielded especially well with yields of sugar comparable to Sharpe's Klein E.

Maribo N and Maribo Poly from Denmark both did well under British conditions and responded favourably with sugar yields and bolting resistance similar to Sharpe's Klein E.

Logie Polycross, a polyploid variety bred in Scotland, had excellent resistance to bolting in the 1960 season but yields of washed roots and sugar were low. A second variety produced in Britain under the name Bush Triplex Monogerm is now also under trial.

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, 6/3d. each, post free.*

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Notes