

THE SPROWSTON FARM

A Report for Members of the Norfolk Agricultural Station
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This is a progress report for Station Members, and its contents are **confidential**.

THE FARMING

In order to provide a standard of comparison, all weather records at Sprowston are examined against a 30-year average which shows that our normal annual rainfall is about 25 inches, with 11 inches falling in the first half of the year. Very few years agree closely with the normal and 1964 has been no exception. To the end of November we recorded 18.74 inches against a normal of 22.95, from which one might rightly conclude that 1964 rivalled 1959 for drought conditions. Fortunately, however, from January to the end of June this year nearly 12 inches were recorded; this gave all crops an excellent start, and with few exceptions they showed little sign of drought until they were close to natural maturity. The heavy rains in June provided all the moisture needed by cereals and, with good harvest conditions, samples were of high quality and yields were up to average. Probably because of good growing conditions the yields from spring-sown barley were exceptional and in most cases surpassed those of the winter-sown crop.

This year has amply justified the Station's insistence that, on light soils without irrigation, earliness of planting is second only in importance to adequate manuring. Quick-freeze peas grown on contract and drilled on 2nd March yielded nearly 50 cwt per acre at a tenderometer reading below 100, whereas twenty-five acres of the same variety drilled on 15th May ran out at only 25 cwt and were only saved from complete desiccation by one or two light showers just before they were due for harvesting. Even so, the overall returns from the crop were little less than in the previous year, due almost entirely to the level of yield of the first drilling.

The root crops in 1964 got away to an excellent start, and showed few symptoms of excessive drought until the end of July. By this time the beet on the lighter land were flagging continuously and on the gravel patches this condition persisted until lifting began. It is hardly surprising that the yields of roots per acre are running well below average, but with exceptionally high sugar contents early in the season the crops so far lifted have topped the £100 per acre cash value.

Most of the potatoes for the 1964 crop were grown on the lighter parts of the farm, but they made excellent growth by the end of June and had nearly reached maturity before they were affected by lack of rain. Little blight was seen on the foliage before the beginning of August and the crop was not killed off until the 21st. Lifting commenced in mid-September but, because of warm dry soil conditions, this was limited to immediate sales requirements and no lifting for storage was attempted until mid-October. An excellent crop of Bintje—18 tons of saleable ware per acre—was cleared before the end of November, and to date there has been far less wastage from bruising and wet rots than has been experienced in recent years.

Conditions during the autumn have been ideal for seedbed cultivations, and advantage has been taken of the open spell to push ahead with autumn drilling. The whole of the Cappelle winter wheat shift was sown before mid-November and over a hundred acres of Proctor have been drilled. This is a greater acreage of autumn sown corn than has been attempted before. The Proctor constitutes a calculated risk, which at best can lead to greatly increased yields, and at worst to a small additional expenditure on seed in the spring if conditions during the winter are too severe for this variety.

CEREAL TRIALS 1964

Winter wheat variety and nitrogen manuring trial

The results of last year's trial were discussed in Volume III No. 1 of "The Sprowston Farm."

The varieties grown this year were Cappelle, Viking, Professeur Marchal, Ayr Challenge and Rothwell Perdix. The table below shows the yields obtained in cwt per acre.

Variety	Units of nitrogen per acre			Variety means
	60	80	100	
Cappelle	51.2	50.0	46.5	49.2
Viking	52.4	52.6	51.4	52.1
Professeur Marchal	51.3	49.8	46.8	49.3
Ayr Challenge ...	49.9	40.9	41.6	44.1
Rothwell Perdix ...	47.3	47.2	48.1	47.5
Nitrogen means ...	50.4	48.1	46.9	

It will be seen that Viking gave a substantially higher yield this year than all the other varieties. In two previous trials it was second to Cappelle and Professeur Marchal respectively. Both of these gave similar yields, whereas in the two previous years the differences which were in favour of, in the first Cappelle, and in the second Marchal, were more pronounced. It would appear that seasons have a marked effect, especially on the behaviour of Marchal.

Ayr Challenge again gave poor results and it has been excluded from the 1965 trial. Perdix gave a lower yield than Cappelle and Marchal, but this is thought to have been due in part to spray damage, observed after ear emergence in all varieties. A proprietary mixture of TBA and MCPA was applied exceptionally early and Perdix, probably because it was at that time at an earlier stage of growth than the other varieties, suffered most damage.

In previous trials, 80 units of nitrogen have been shown to be about the optimum for winter wheat grown on the farm after potatoes. This year, as can be seen from the results, except in the case of Perdix there was no increase in yield above an application of 60 units of nitrogen per acre; in fact further applications up to 100 units depressed yields. In 1965 a 40 unit per acre treatment will be added; Professeur Marchal and Ayr Challenge have been excluded and replaced by Maris Widgeon.

Barley variety, time of drilling and nitrogen manuring trial

Last winter, unlike that of 1962/63, was relatively mild and both winter and spring varieties when drilled in the autumn survived and produced full brairds. However the spring sowings were made in mid February, which was rather earlier than in previous years; this and the comparatively wet late spring and early summer favoured the spring sown crops and, on average over all four varieties, they were outyielded by the autumn drillings by only 1 cwt. This is of course a much smaller difference than had been observed in all previous years except following the very severe winter of 1962/63.

The four varieties used were again Proctor, HB.292/91 (now on the N.I.A.B. Recommended List as Maris Otter), HB.292/73, and HB.246/5/5 (newly Recommended as Maris Concord). Proctor and the two 292 hybrids averaged $37\frac{1}{2}$ cwt per acre autumn drilled, and $34\frac{1}{2}$ cwt for spring plantings. Concord, on the other hand, yielded $39\frac{1}{2}$ cwt from autumn drilling and 45 cwt when sown in the spring. At both times of drilling it was the highest yielding variety. Next highest in both cases were Proctor, and HB.292/73 which this year considerably outyielded its sister variety Maris Otter. This was true to the form of other seasons following normal or mild winters. It is known to be less hardy than Otter, but it has been provisionally approved for addition to the Recommended List on the strength of its normally superior yield. Both of these hybrids have shown great potential and are a considerable advance on Pioneer, the only winter hardy malting barley available up to now.

The responses to nitrogenous manuring show an interesting trend this year. Previously it had been generally true that all the varieties when autumn sown responded up to 80 units per acre, while spring drillings showed no response above 60 units. All the trials have followed a cereal crop. This year, however, the spring varieties Proctor and Concord, whether autumn or spring sown, responded to 80 units; of the two new hybrids Otter gave practically no return from more than 40 units when spring sown, whereas HB.292/73 did best at 60 units. Yields of both were depressed at over 40 units from autumn drillings.

This trial has now been discontinued and replaced by another comparing two times of drilling in the autumn, two varieties—Maris Otter and HB.292/73—and three levels of nitrogen applied all in the spring or as 20 units in the autumn with the rest as a top dressing.

Spring barley variety and nitrogen manuring trial

The results of a similar trial carried out in 1963 were discussed in Volume III, No. 1 of "The Sprowston Farm."

In 1964 the barley followed sugar beet and six varieties were compared at three levels of nitrogenous manuring.

The following table shows the yields in cwt per acre:

	Units of nitrogen per acre			Variety means
	40	60	80	
Maris Concord ... (HB.246/5/5)	48.1	48.9	48.1	48.4
Impala	46.6	48.6	49.0	48.1
Vada	47.0	44.4	48.2	46.5
Cambrinus	44.6	44.8	42.1	43.8
Pallas	40.5	41.6	42.0	41.4
Proctor	36.3	40.6	40.2	39.0
Nitrogen means...	43.9	44.8	44.9	

It should be noted that HB.246/5/5 has now been named Maris Concord and included in the N.I.A.B. Recommended List as a feeding barley especially suited to East Anglia. The highest mean yield was from this variety, which also gave the highest yields at 40 and 60 units of nitrogen per acre. Proctor was lowest at all levels of nitrogenous manuring and was significantly out-yielded by all the other varieties except Pallas which, as in 1963, was disappointing. This variety has rarely done well at Sprowston. Impala was second highest yielding at 48.1 cwt per acre, less than $\frac{1}{2}$ cwt lower than Maris Concord. These two varieties were outstanding, yielding 23 and 24% respectively more than Proctor. The grain of both is slow to break dormancy and this is particularly unfortunate in the case of Maris Concord which in other respects has shown promise for malting. Vada again yielded well, but Cambrinus was disappointing and showed the greatest tendency to lodge. On average, increasing the level of nitrogen from 40 to 60 units gave a non-significant increase in yield of about 1 cwt, and there was no response to a further 20 units. Apart from Vada and Cambrinus, all varieties showed a response to 60 units, but only Impala and Pallas showed any sign of response to a further 20 and then by under $\frac{1}{2}$ cwt per acre. At Sprowston, barley following a white straw crop usually gives an economic response up to 80 units of nitrogen but, as in this trial, after a well fertilised beet crop the optimum level probably lies between 40 and 60 units.

Spring barley row width, variety and nitrogen manuring trial

This trial series has now completed three years; last year's results were discussed in Volume III, No. 1 of "The Sprowston Farm".

In 1964 the trial followed sugar beet. A summary of the results is given below in cwt per acre:

	Units of nitrogen per acre			Means
	40	60	80	
Proctor	41.7	44.0	42.7	42.8
Maris Concord (HB.246/5/5)	49.2	51.1	51.7	50.7
Narrow (4 inch) rows	46.9	49.9	48.0	48.3
Wide (8 inch) rows	44.0	45.1	46.4	45.2
Means	45.4	47.5	47.2	

Maris Concord outyielded Proctor by 8 cwt or 18%. This is in line with results from other trials at Sprowston in 1964. The heavy rains in August delayed the harvest and caused some lodging, especially at the higher levels of nitrogen. Proctor did not stand as well as Concord and this may have had an effect on the results, but in each year of this trial the latter has clearly demonstrated its superiority over Proctor. In both varieties there was a significant increase in yield from drilling on the narrower rows. Under the conditions prevailing at Sprowston it seems reasonable to look for a 5% increase—this may not seem much, but on a two ton crop it represents an extra 2 cwt of grain per acre. Increasing the level of nitrogen for Proctor from 40 to 60 units gave a worthwhile increase in yield, but a further 20 units led to a depression. Concord also did not respond to more than 60 units. The interaction between row width and nitrogen is of interest. At all levels of nitrogen yields were higher from drillings on 4 inch rows. There was, however, a decrease in yield when more than 60 units were applied, whereas on 8 inch rows there was a response up to 80 units. Even so, the yield at this level of nitrogen was slightly lower than that obtained from barley on the narrower rows which had received only 40 units. This year's results have confirmed the advantage to be gained from drilling barley on a 4 inch as compared with an 8 inch row width.

WEED CONTROL IN SUGAR BEET

The choice of herbicides

This subject was reviewed extensively in "The Sprowston Farm" Vol. II, No. 8, and the latest developments were discussed in Vol. III, No. 2 last year. Progress is continually being made, however, and further comments may be useful.

The greatest interest among the farming community has been in those herbicides applied to the soil by means of a band sprayer immediately after drilling the crop. In this category there are a number of products which can be used, but the principal choice lies between a mixture of endothal and propham (*Murbetex*), a mixture of diuron and propham (*Dipro*), and pyrazon (or PCA) which will be commercially available in this country for the first time in 1965 as *Pyramin*. The activity of all three is affected by the nature of the soil, so that doses must be varied, the lowest levels being used on light soils very low in clay and organic matter. None of these herbicides is suitable for use on highly organic soils.

The endothal/propham mixture has a number of limitations, an important one being its cost. Recommendations are made, on the basis of a soil test, from a range of four doses to suit soils from very sandy to medium heavy loams. No recommendation is made for most clay soils. The cost ranges from about 25/- to £5 per acre when sprayed in bands of seven inches on beet drilled at a 20 inch row width. During the past four years widespread and largely successful use has been made of this mixture, and this must be considered a point in its favour. Considerable use of this herbicide may be expected to continue on the lighter lands. Growers on heavy land, and on land where resistant weeds such as fat hen and charlock present a serious problem, have not been satisfied with this mixture or have regarded it as, at best, a stop gap measure.

These deficiencies encouraged the development of the mixture of diuron and propham, which may be used economically even on heavy soils and which should normally be more effective against fat hen and wild mustards, possibly at the expense of poorer control of knot grass and black bindweed. It seems, however, that diuron may be more critically affected by variations in soil moisture relationships than endothal and this could be reflected, at worst, in crop damage under very wet conditions and inadequate weed control under dry ones. The risk of serious crop damage should be reduced or eliminated by the fact that all recommendations are made on the basis of a soil test, and that the company concerned can draw on its experience of the wet spring of 1964 to modify recommendations where necessary. There is a choice

from nine doses in all, costing from about 19/- to 95/- per acre, band sprayed at 20 inch drill width.

The latest introduction to this field, pyrazon, seems from experiments to be by far the most selective of the three herbicides, with good control of a wide range of weeds although wild oats and the field pansy are resistant. In the case of pyrazon neither of the companies concerned are providing a soil testing service so that the user must decide which dose is suitable for his own conditions. This could effectively reduce the safety margin of the compound on some borderline soils, although very few problems have been encountered with its widespread commercial use on the continent. Two doses are being recommended—one for sands and one for sandy loams, loams and silts. No recommendation is being made for clay soils. The cost per acre is likely to be around 50/- and 58/- for band spraying at the two recommended dose rates.

All three herbicides depend for their action upon soil moisture and rainfall after spraying and, on the evidence so far available, it is not possible to compare pyrazon with the other two in this respect. Experiments are continuing on methods of soil incorporation which might reduce dependence upon rainfall, but in the meantime it is advisable to use these materials during the early part of the season when suitable conditions are more likely to be encountered.

Considerable care is required in the use of these herbicides and all three require efficient agitation in the spray tank, this being especially important in the case of *Dipro*. In the past great stress has properly been laid on careful operation in the field, maintenance of correct tractor speed and band width and so on. It is not generally realised that the abrasive powers of wettable powder herbicides, slight though they are, can lead to considerable wear particularly of the pump and the nozzle tips. This can gradually lead to difficulty in maintaining pressure and therefore an adequate degree of agitation, and to poor distribution from worn nozzles. As a band sprayer ages it therefore becomes increasingly important to check its performance before the beginning of each season.

Figures on cost were believed to be accurate at the time of going to press but these should be regarded as a guide only. Much has had to be omitted for lack of space, so that these remarks should be regarded only as a guide to the best use of the literature produced by the chemical manufacturing companies.

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

Winter wheat preliminary trial

Of the large number of varieties tested for the first time in 1964, only two outyielded the control (Hybrid 46) at Sprowston but three—Cebeco 72, Jubilar and Stauderers 12/51—were selected to go forward into main trials on the strength of results from other centres.

The performances from the newer varieties were disappointing and this was particularly so in the case of several which were affected by herbicide applied in the early spring. Yields in these cases were more than 15% below the control. Although traces of herbicide abnormalities could be detected in almost every other variety, the extent of the damage was usually small and yields were not appreciably depressed. The best performance came from a late maturing German wheat, Heines 3411, and this was followed closely by Jubilar, Cappelle-Desprez, Maris Widgeor and Floress. The three varieties which were in their final year of trial, namely Ayr Challenge, Rallye and Vilmorin 5905, were all intermediate in yield between Cappelle-Desprez and Hybrid 46. A decision not to Recommend these varieties has since been taken.

Mildew infection was quite heavy on several of the more susceptible varieties and in two cases mildew resistance broke down during the course of the season.

Winter oat preliminary trial

Two varieties from the Welsh Plant Breeding Station, in trial under the numbers 5370/19/9/45 and 5687/3/7/31, were both outstanding at Sprowston and outyielded Powys by 8.6 and 7.4 cwt per acre respectively. Although tall, and rather weak in the straw as a result, they were both early maturing and showed a high level of mildew resistance. In this trial they were much better than Peniarth and results from other centres both in this and in previous years show their yield potential. However, unlike Peniarth they do not have resistance to oat stem eelworm.

Two new short and stiff strawed varieties in their second year of testing appeared very similar to, but were lower yielding than, S.172.

Winter barley preliminary trial

With the growing importance of winter sown barley there has come a need to find varieties of high yield, good quality and more particularly with good winter hardiness.

For this reason a large number of true winter six-row barleys from Continental sources were tested last season against the only really winter hardy variety of British origin, Pioneer. Dina, Senta and Eckendorf 5657 were the most promising of the new material both at Sprowston and at other centres. Proctor, however, was the highest yielding variety in the trial with a yield of 40.6 cwt per acre compared with Pioneer at only 31.8 cwt.

Both Maris Otter and the provisionally Recommended sister variety, HB.292/73/2/2, outyielded Pioneer by more than 9%. Winter hardiness, following the mild winter of 1964, was quite satisfactory in the case of HB.292/73/2/2 and, while it is firmly established that it has a lower level of frost hardiness than Pioneer or Maris Otter, it is considerably better in this respect than autumn sown Proctor. Results from national trials over a period of four years have shown it to have a 4% yield advantage over Pioneer, and therefore to be similar to Maris Otter. However, following a mild winter the yield from HB.292/73/2/2 could normally be expected to be higher.

Mildew was again quite severe on some varieties and only Eckendorf 5657, a German six-row barley, showed any resistance. In recent years winter barley varieties have been attacked not only by mildew but also to a lesser extent by leaf blotch, caused by a fungus (*Rhynchosporium secalis*). Winter sown crops have been infected at Sprowston but so far spring crops have remained virtually free. This disease has been much more serious in the south-western counties where it has attacked both winter and spring barleys. Evidence suggests that varieties differ in their relative susceptibility. Dea and Jumbo show good resistance, while Pioneer, although not free, has more resistance than most of the other available winter varieties. The fungus, which is encouraged by warm and moist weather, develops readily on mildew-free leaves and under favourable conditions they eventually turn completely brown and wither.

Spring wheat preliminary trial

The yields in 1964 from the spring wheats were the highest for some years and were very probably due to advantages obtained by drilling in early March and from the warm and wet growing conditions in the late spring and early summer. It would appear from experience of previous seasons that a drought in the early growing stages, especially following a late drilling, has particularly serious effects on the final yields. Spring oats and spring barleys appear slightly less affected by these factors.

The highest yielding varieties in the trial were Aga and the mildew resistant Kloka which outyielded Opal by slightly more than 4 cwt per acre. Several other varieties which were in an earlier stage of testing also outyielded the control but by a small margin. These included W.9537, Heines 267 and TB.122/60/3.

Jufy I was extremely disappointing in yield and finished at only 88% of Opal; so also was the performance of spring sown Prestige which, despite an early sowing, failed to reach a yield anywhere near that of Opal.

The outstanding variety of the trial was Kloka, bred in Germany by von Rümker, which has now been added to the Recommended List. It is similar in both yield and maturity to Opal but is shorter and stiffer in the straw. With good mildew resistance, this hard milling wheat of moderate bread-making quality would appear to be a useful alternative variety to Opal.

Spring oat preliminary trial

All the varieties in this trial were heavily infected with mildew and the majority displayed serious straw weaknesses by the time of harvesting. Those varieties which were stiffer than the average included Milford, Astor, MGH.60852 and 6290/16/2/22. Although somewhat tall and rather weak in the straw, Petkus 656 and Tarpan, both in their final year of trial, outyielded Condor by more than 6%. Cebeco 759 and Rigal were also higher yielding in the Sprowston trial but these performances were not repeated at other centres and none of the four varieties referred to has been Recommended.

Spring barley preliminary trial

Although the trial was not drilled until the 8th April the yields obtained from the better varieties were extremely high. The best eight were all mildew resistant and most of the other high yielders had only slight to moderate mildew infection. The benefits derived from mildew resistance were well demonstrated in a season when infection was particularly heavy on all susceptible varieties. Proctor, susceptible to mildew, yielded only 36 cwt per acre, compared with the outstanding performances of the early stiff-strawed varieties Heine-Peragis 5448 and Heine-Peragis 5466 at 49.0 and 47.7 cwt respectively. These two new German varieties outyielded Proctor by more than 33%. Other mildew resistant varieties which outyielded the control by more than 22% (8 cwt per acre) included Heines 1203, Ackermanns 1223, Heines 1153, Maris Concord (HB.246/5/5), HB.433 and Impala. All these were very resistant to lodging despite a fair length of straw in some cases. The results from the Sprowston trial agreed well with those from other centres and a number of these varieties have since been forwarded for further testing in main trials.

The performance of Cambrinus, by comparison with many of the other varieties, was rather disappointing. Nevertheless its yield of 38.6 cwt. per acre, some 7% above the control, was in line with national trials results. Despite the fact that it is now susceptible to mildew it is currently the highest yielding malting barley freely available.

Europa, now on the N.I.A.B. Recommended List, although formerly free from mildew is now susceptible. It is earlier, stiffer strawed and higher yielding than Proctor, with reputedly equal malting quality.

A number of barley trials conducted at Sprowston independently of the N.I.A.B. have for several years included Maris Concord. It has averaged 117% of Proctor in these trials over a three year period. This figure is considerably higher than the national average of 104% taken over five years, but nevertheless this variety, which is unsuitable for malting in some seasons due to its tendency to dormancy, appears regionally suited to East Anglia as a feeding barley and has been Recommended.

A second barley to be Recommended recently is Impala, which yielded particularly well at Sprowston in 1964 but in trials elsewhere over several seasons finished at 106% of Proctor. It is slightly shorter and earlier than Rika but markedly stiffer strawed. Like Maris Concord this variety is mildew resistant and because of its tendency to dormancy must be considered only as a feeding barley.

Deba Abed, formerly in trials as Abed 3407, is the last of this year's new Recommendations. Although late in maturity this feeding barley is considerably shorter and stiffer strawed and more resistant to mildew than either Proctor or Rika. It is very slightly below Impala in yield but the main advantage is its straw stiffness which cannot be equalled by any variety currently on the Recommended List.

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.