THE SPROWSTON FARM

A Report for Members of the Norfolk Agricultural Station

December, 1959 **Vol. II, No. 3.**

Note This is a progress report for Station Members and its contents are **Confidential**

PROBLEMS OF SPRAYING VINING PEAS

In 1959 it was disconcerting to find that peas for vining were scorched by dinoseb amine at rates which in previous seasons had been perfectly safe for the same varieties. Differences in temperature or stage of growth did not account for this since the scorch was most severe in peas 6 to 8 in. high—normally quite a safe stage—and the temperature on the day of spraying did not exceed 62°F. On subsequent occasions reducing the dosage from 7 to 6 pints lessened the damage to the peas but resulted in less effective control of weeds while spraying as low as 5 pints ensured the safety of the peas but did little more than check the weeds. As the season went on reverting to the normal dosage rates produced no damage but this was to be expected since the later sown peas were of a type more resistant to scorch than the early variety. All the spraying was done at a volume rate of from 40—60 gallons per acre.

This experience was a salutary reminder that the technique of spraying a tender crop such as peas with a selective herbicide cannot be reduced to a simple formula and much care is needed to kill weeds without damaging the crop.

The effect of variety and temperature on the correct dosage rate is generally referred to in the manufacturers' recommendations, although the list of the more tender varieties is not always complete. The risk of scorch is much less likely with dinoseb amine than with ammonium dinoseb. But undoubtedly there are other factors to be considered. Growing conditions in the spring of 1959 were particularly favourable, the early sown peas grew very rapidly and without check and this undoubtedly made them more susceptible to scorch. When the time came to spray the early peas high winds prevailed and although it may be right to delay spraying because of this there comes a time when postponement is no longer practicable and some risk must be taken. In even a moderate wind, however, the impact of the spray on the foliage is appreciably heightened and the mechanical damage to the foliage accentuates the scorching effect of the chemical. After wet weather the danger of scorch is greater although after the damage has been done wet growing weather helps the peas to recover: in our case a crop of Laxtons

which suffered the most severe scorch would have been a sorry sight had not a timely rain intervened about 24 hours after this spraying.

But it may be asked, if so many factors must be allowed for in calculating a safe dosage rate, is it going to be worth while spraying at all with dinoseb under unfavourable conditions when the safe rate is too low to kill weeds effectively? In other words does the check to the crop, which may have to be accepted in order to ensure a good kill of weeds, necessarily result in reduced yields? This is a difficult question to answer and experimental evidence is limited although at Terrington E.H.F. some yield reduction was recorded when a susceptible variety, Gregory's Surprise, was sprayed at very high rates of application. Arguing from first principles, the reduction in the effective surface area of leaf as a result of scorched foliage would be expected to weaken plant development; but on the other hand when growing conditions are favourable the amount of haulm produced is often excessive and unless the scorch is very severe there may be little ultimate effect on crop yield. The appearance of the scorched peas at Sprowston this season just before harvest certainly did not suggest any lack of growth or vigour and these peas in fact gave the best yield of any (over 35 cwt. per acre) although much of the crop, especially the later sown peas, of course, suffered severely from the drought. Nevertheless the appearance of the crop after it had been sprayed was too disturbing to encourage much optimism about its future! Perhaps as with harvesting malting barley the best course is to avoid going near the field, although unfortunately, one's neighbours cannot always be relied on to do the same.

THE FARMERS' READING

The advances in scientific knowledge relating to agriculture, in farm machinery and in farming techniques have been so diverse and far reaching in the past few years that the only hope of becoming familiar with all the latest developments is to leave the hard work of reading the original contributions in scientific journals such as the " Journal of Agricultural Science " or the " Annals of Applied Biology " to the specialists, whose job is to interpret and summarise for the general reader. For this purpose a review should not merely be a compilation of results but should aim to survey the subject in a critical manner, and distinguish between what is really novel, and what has been tried before and perhaps discarded, or between conclusions with a real weight of evidence to support them and those of a more speculative nature which require further confirmation. Unless the complete picture is presented, isolated results suggesting a new trend may be quite misleading.

For example, the results of a single cereal variety trial or even several trials may show that a new introduction is more promising than subsequently proves to be the case. The National Institute

of Agricultural Botany, however, tests varieties over a period of years and at a large number of centres, and their recommendations based on these trials, which are published in leaflets available from the Institute (1), are a reliable indication of the value of a new variety for particular conditions. Similarly, the formidable mass of research work on the control of weeds by spraying is compressed into a handbook, the Weed Control Handbook (2) which has been revised nearly every year and offers the farmer a very useful and impartial guide to correct spraying technique.

The task of the research worker is to acquire new fundamental knowledge in the general field of agricultural science : it is for the experimental farm or the outstanding farmer to demonstrate how this new knowledge can be put to good practical use. The experiences of the outstanding farmer or an advance of real practical significance soon find their way into the farming press—and often the first hint of anything really new is found in the pages of these papers which need no further introduction to the farming world; they include not only the national weeklies " Farmer and Stock-breeder " and " Farmers' Weekly " but a number of papers of special regional significance such as the new " East Anglian Farming World." Articles of a practical outlook on a wide range of subjects also appear in " Agriculture " (3) and more detailed information can be found in the Quarterly Review of the National Agricultural Advisory Service (4), a publication which is noteworthy for its reviews of particular topics, e.g. calf rearing, in which all the latest information is summarised and critically discussed.

The Ministry leaflets (5) cover a vast range of individual matters in some detail, more so in many cases than is possible in the larger Bulletins (6) which are handbooks to particular subjects such as the breeding of livestock or the rotation of crops. All these technical publications of the Ministry are frequently revised and brought up to date, particularly the better known bulletins such as No. 48 " Rations for Livestock " and No. 36 " Manures and Fertilisers." Besides the well known weekly farming papers already mentioned, " Farm Mechanisation " (7) as the title implies, is a very useful source of information relating to the use of machines on the farm—an aspect of farming which of course has expanded prodigiously in the last ten years.

Finally, for long train journeys, the Annual Report of the Agricultural Research Council (8) can be confidently recommended; it contains brief reports of all the work in progress at our agricultural stations and institutes and references to the possible impact on practice of what is being done.

1. Farmers leaflets obtainable free from the Secretary, National Institute of Agricultural Botany, Huntingdon Road, Cambridge (s.a.e.).
2. Weed Control Handbook, 1958, Blackwell Scientific Publications, Oxford. Price, 12/6d. From publishers or any bookseller.
   Formerly revised by the British Weed Control Council annually, now in handbook form which may not be revised for a year or two.

3. Agriculture. The Journal of the Ministry of Agriculture, Fisheries and Food. 9d. monthly. From H.M.S.O., Kingsway, London, W.C.2., or any bookseller.
4. N.A.A.S. Quarterly Review. 2/– per issue. From H.M.S.O. (see above) or any bookseller.
5. Ministry leaflets. 2d. each. From H.M.S.O. (see above) or any bookseller.
6. Ministry Bulletins. Price varies but usually around 4/– to 5/–. From H.M.S.O. (see above) or any bookseller.
7 Farm Mechanisation. Temple Press Limited. 2/6d. monthly. From newsagents.
8. Report of the Agricultural Research Council. The most recent report is for 1957–58. From H.M.S.O. or any bookseller. Price, 8/–.

AGRICULTURAL METEOROLOGY

The weather station at Sprowston, which was established in mid 1924, has provided a daily record of temperature, rainfall, sunshine and humidity for a period of 36 years. These records and those from a chain of several hundreds of similar stations all over the British Isles are sent weekly and monthly to the Climatological Branch of the Meteorological Office. There they are collated and summarised and presented in the form of a monthly weather report which includes amongst other things charts showing the distribution of temperature, sunshine and rainfall.

This great mass of data about our climate provides useful information to workers in many fields of study. For instance the normal range of humidities in a particular district has a great influence on the design of ventilation systems in public swimming baths, prevailing wind direction and rainfall affect the deposition of smoke pollution, rainfall concerns the drainage and water supply engineer and some of the more optimistic weather statistics frequently find their way into advertising for seaside resorts.

Statistics about the weather can be of direct use to the agricultural industry in a number of ways, for example in the prediction of crop yields or the siting of orchards in places likely to be free from late frosts, but two of the more important applications are in disease warning and spacing of successional drillings. The fungus which causes potato blight requires a period of warm moist weather to form spores which can spread the disease rapidly to other potato crops. The relationship between the prevailing weather and the development of the fungus was studied by Beaumont and he found that the conditions required were a period of not less than 48 hours during which the temperature in the standard weather station screen does not fall below 50° F nor is the relative humidity less than 75%. Detection of these " Beaumont periods " is one of the functions of weather stations during the summer months and this information, together with observations on the stage of growth of the crop and the amount of the disease already present can be plotted on a chart

which provides the basis of the potato blight warning system. At Sprowston we do not have the equipment for continuously recording relative humidity which is necessary to decide with certainty whether a "Beaumont period" has or has not occurred, but evidence from the rain gauge, the daily wet and dry bulb thermometer readings and other weather observations can give a very useful guide.

In planning a succession of sowings for a crop such as peas, the assumption is made that plant growth is virtually at a standstill when the mean air temperature falls below 42° F. Using the daily maximum and minimum temperatures and tables it is possible to work out the daily amount of effective growing times (that is, above 42° F) available. The measurement is made in accumulated day-degrees or "heat units." The number of heat units required by different crop varieties to reach maturity is known so that the times of successional drilling can be spaced out by the appropriate number of heat units in order to give a planned harvest succession. This method is used with vining and canning peas and can also be used in horticulture.

The Sprowston weather records are invaluable in the interpretation of field trial results both for a series lasting several years and in the individual year when the timing of rainfall, for instance, may have a profound effect on the availability and use by the crop of a nitrogenous top dressing.

CEREAL TRIALS, 1958

Winter Wheat: Time of drilling, seedrate and top dressing trial

In 1959 wheat drilled at the end of September again yielded 1½—2 sacks per acre better than the crop drilled a month later, confirming the results of the previous two years. In all three years a seeding of 1½ bushels per acre gave as good results as 2½ bushels and in earlier trials the same conclusion was drawn. It seems that the higher seedrate does not benefit crop yield but is worthwhile as an insurance against a really hard winter when there may be a severe loss of plant.

As might be expected in such a dry growing season the later applications of nitrogen were probably not fully utilised, and the effect of seedbed nitrogen was much more pronounced than in the previous two years. Thus in the presence of a March top dressing equivalent to 1½ cwt. per acre of sulphate of ammonia, the same quantity of nitrogen on the seedbed produced 2 sacks of grain in 1959 as compared with 1 in 1958. The April top dressing, however, was much less effective, only giving an extra 1 sack in 1959 as compared with 3 sacks in the previous two seasons. Evidently in 1959 responses to the April top dressing were limited by the lack of water and the relative effectiveness of seedbed fertiliser was therefore greater.

Barley : Rates of nitrogen and time of application trial

The outstanding characteristic of Proctor barley is that it can produce high yields of grain in response to generous fertilising and at the same time is potentially an excellent malting variety if the season allows it and the manuring policy, particularly the use of nitrogen, does not ignore the previous cropping and state of fertility of the field. Previous experience with Proctor at Sprowston showed that where the barley followed a cereal nitrogen equivalent to as much as 3 cwt. sulphate of ammonia could greatly enhance yield without adverse effect on grain quality. More recently an investigation has been in progress at a number of centres throughout the country, including Sprowston, concerned with the effect on grain yield and quality of varying levels of nitrogen applied at different stages in the growth of the crop.

This experiment has now completed three trial years. The results of the first two years were reported in previous issues of the " Sprowston Farm " (Vol. 1 No. 9, Vol. II No. 1). In both these years the barley was taken after wheat and with adequate phosphate and potash but no nitrogen, yields were only around 8—9 sacks per acre. A dressing equivalent to 1½ cwt. sulphate of ammonia nearly doubled the yield without appreciably affecting quality—in fact, in 1958, the best of a bad lot of samples were found at this level of nitrogen. A further 1½ cwt. sulphate of ammonia equivalent added 2—3 sacks to the yield with some reduction in quality, although probably just remaining within the malting range. At the highest rate of nitrogen equivalent to 4½ cwt. sulphate of ammonia, only feeding barley was produced and although in 1957 the extra dose of nitrogen improved yield by another 3 cwt. the reverse was true in 1958 when yield was reduced by about the same quantity of grain.

The highest yield and best quality resulted when the nitrogen was given on the seedbed and both yield and quality tended to decline the later the nitrogen was put on, the worst case being when all the nitrogen was applied as a top dressing in late May. In 1959, however, owing to the dry weather, only nitrogen applied early was utilised by the crop and this may account for the remarkable fact that where all the nitrogen was applied on the seedbed the grain nitrogen percentage was higher than where half was given on the seedbed and half as a top dressing—the reverse of what normally happens. On the assumption that the part of the dressing applied later was largely ineffective, the comparison becomes one of level rather than of time of application and the full dressing on the seedbed would naturally be expected to produce grain of higher nitrogen content than the half quantity given at the same time. Where the whole 3 cwt. sulphate of ammonia dressing went on the seedbed, the grain nitrogen reached the extraordinary figure of 2.7% : most of the treatment samples were over 1.9% and it is not surprising that the expert who judged the samples felt constrained to classify them as feeding quality only !

Barley: Rate and method of application of fertiliser trial

Although there is evidence that nitrogen is best given for barley on the seedbed, those who combine drill barley have been reluctant to sow the optimum rate of nitrogen for the crop with the seed owing to the risk of impaired emergence. However, in recent experiments reported from Rothamsted, there has been no damage to germination even at rates equivalent to 3 cwt. sulphate of ammonia which is as much as can be justified in almost any circumstances. These results were obtained on a limited range of sites and in 1959 it was therefore decided to carry out a large number of experiments throughout the country in order to confirm the Rothamsted work on different soil types and also find out whether there was any advantage in combine drilling high rates of nitrogen as compared with broadcasting. One experiment in this series was undertaken at Sprowston and since at most of the other sites barley followed a cereal we agreed to take the experimental crop after beet tops ploughed in.

Special fertilisers were prepared which enabled the various experimental fertiliser combinations to be sown at a constant drill setting. However, in practice, the compounds were not quite uniform in their physical properties and this led to small discrepancies between the actual and theoretical quantities of fertiliser delivered on the different treatments.

The whole trial area received a standard rate of 1½ cwt. per acre superphosphate and the treatments comprised three levels of nitrogen equivalent to 0, 1½ or 3 cwt. sulphate of ammonia, either broadcast or combine drilled, each nitrogen treatment being tested at three rates of potash, 0, ½ and ¾ cwt. per acre muriate of potash equivalent. At the highest rate of nitrogen there was an additional treatment in which half the nitrogen was combine drilled and half broadcast on the seedbed.

The preceding beet crop received generous potash fertilising and it is not surprising that there was no response to potash at either rate. In fact the land was evidently in a good state of fertility and even in the absence of nitrogen the barley yielded a fair crop of 13 sacks per acre. The first 1½ cwt of sulphate of ammonia whether drilled or broadcast produced 2½ sacks of grain per acre but the response to the double dressing varied according to the method of application : where broadcast the gain over the low rate was 1¼ sacks per acre and if combine drilled only ¼ sack. Where the high rate was half drilled and half broadcast there was an intermediate response of 1 sack per acre.

Germination counts showed that the high rate of combine drilled nitrogen significantly reduced the plant compared with the same amount of fertiliser broadcast and drought conditions prevented the barley from tillering enough to compensate for this.

Evidently there was some impairment of germination in this season which affected yield to the extent of about ¾ sack of grain.

Assessments of malting quality were carried out and the barleys which had received no nitrogen or nitrogen at the low rate were classed as Pale Ale quality while those which had received the high rate of 3 cwt. per acre of sulphate of ammonia were judged to be of good average malting quality.

Early drilling (mid February) and a useful fall of rain just before harvesting to mellow the grain may have accounted for the relatively high standard of samples obtained.

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

Preliminary trials assessing yielding ability and field characters of newly-introduced varieties comprised the major part of the N.I.A.B. cereal work at Sprowston this year. Crop yields were affected by the drought but grain quality in all three cereals was the best for several years. Mildew was again prevalent and the value of resistance to this common disease was very evident in the winter oats and spring barley trials.

Winter Wheat Preliminary Trial

All varieties stood well to harvest giving good grain at very low moisture content. Of the better known varieties, Minister with 14.3 sacks per acre outyielded both Cappelle at 12.8 and Hybrid 46 at 12.3 sacks. A new early short strawed French selection 13179 gave the highest yield followed by the Dutch Minister hybrid C.I.V. 237 and TB 31/23 from Cambridge. Several new stiff strawed French varieties narrowly exceeded Cappelle in yield. One of them, however, showed susceptibility to loose smut and this variety with one other also suffered badly from black mould of the ear. Three other French varieties, and the Belgian Fleuron and Dippes Triumph from Germany yielded between Cappelle and Hybrid 46.

Yellow rust was negligible although the dry weather was favourable to the disease; mildew was slight and loose smut was confined to the variety mentioned above.

Winter Oats Preliminary Trial

In spite of the great contrast in season yields in 1959 of the control varieties, S. 147 with 19.3 sacks and S. 172 with 18 sacks were similar to those in 1958 but Powys yielded relatively better producing 1½ sacks more than S.147.

The outstanding winter oat was again the mildew resistant hybrid 5370/2/2/41 from the Welsh P.B.S. which outyielded S. 147 by 4.2 sacks. A little taller strawed than Powys, it is appreciably

earlier and the freedom of its foliage from mildew and leafstripe was particularly striking.

Spring Wheat Preliminary Trial

As in 1958 the improved yielding capacity of the most recent spring wheats was clearly demonstrated. All but two of the 12 varieties in trial exceeded Atle in yield.

Jufy II, a white chaffed relative of Jufy I recently added to the Recommended List gave the highest yield at 12.6 sacks, closely followed by the German variety Probat and Strubes 6339/48, both short strawed and early and slightly better than Koga II and the other principal German newcomer Carpo.

New Swedish varieties from Weibulls and Svalof yielded slightly less than Koga II and the very early German E.L.S. which did well in 1958 appeared poorly adapted to the dry season and gave a lower yield than Atle, the latter producing about 2 sacks less than the top yielding variety.

Spring Oats Preliminary Trial

In comparison with some 18 new varieties Sun II maintained its good record, being exceeded only by the Irish Stormont Sceptre, the German early short strawed Petkus 558/50 and Addi and Marino from Holland. C.I.V. 697/6 and Condor, also from Holland, Vigor and Gartons' Angus yielded within half a sack of Sun II.

These varieties were generally shorter and earlier than Sun II and similar in straw strength and susceptibility to mildew which was severe despite the drought. The remaining varieties yielded within 1½ sacks of Sun II.

Spring Barley Preliminary Trial

Growth of the crop was restricted by the drought but in contrast with recent years all varieties stood well to harvest and grain was of good quality.

Mildew was severe in 1959 and in general the highest yields were again given by those varieties possessing true mildew resistance, a number of which outyielded Proctor, which suffered exceptional loss of leaf. Thus Union and Elsa from Germany, Vada and Delta from Holland, the Danish Mentor and HB 279/5/1/3 from Cambridge all gave 1—1½ sacks more than Proctor, which yielded nearly 12 sacks. Further trials will be needed to assess the quality of these new introductions but from results in 1959, it seems likely that HB 279 will be satisfactory in this respect derived as it is on both sides from Proctor. However, a number of varieties equally, if not more susceptible than Proctor to mildew, yielded

from ¼—1 sack better, including Maythorpe, Rika and a new Spratt Archer—Freja hybrid from Cambridge, HB 196.

Loose smut was prevalent in all foreign varieties except Delta and Pallas.

Vining Pea Variety Trial

Three American quick-freezing vining pea varieties, Early Freezer, Freezer 37 and Fraser were compared with Kelvedon Wonder and Thomas Laxton at three harvest dates in a small trial handled as in 1958.

Freezer 37 gave the highest yield of graded peas at each stage of maturity. Yields of Early Freezer (long strawed) and Kelvedon Wonder (short strawed) were very similar. At a lower level of yield the weight of peas from Fraser with short haulm and small double set pods was comparable with that from Thomas Laxton characterised by longer haulm bearing large single pods.