ROTHAMSTED RESEARCH

The Culture and Manuring of Sugar-beet

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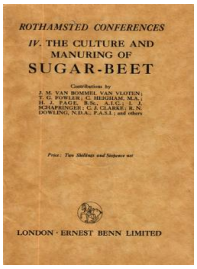

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C. J. Clark (1928) *Practical Experience With Sugar-beet in S. W. England ;* The Culture And Manuring Of Sugar-Beet, pp 37 - 42 **- DOI: https://doi.org/10.23637/ERADOC-1-197**

certain limits favours leaf growth, while high light frequently tends to retard it. As daylight lasts considerably longer in the Northern Hemisphere, this gives the explanation of the high sugar content in Canada and the northern parts of the United States, as well as in this country. It remains for our scientists to discover the reason why daylight is more beneficial than sunshine.

I have now come to the factor of wind in the growth of beet. In certain countries which are cursed with hot winds in the spring, beet suffers through their drying effect. In England the strong winds are only able to affect light, sandy soil, where the seeds may be blown away, or the young plants may be damaged by the winds cutting off their roots the moment they show above ground.

Before closing, I would like to make a few remarks on the storage of beet in this country. This is the last factor with which the farmer has to deal, and it is important when beet has to be stored for any length of time.

The first thing to remember is, that beet should be put in storage when the temperature is just above freezing point. Secondly, that beet should contain its maximum moisture when it is put in storage, and the storage should be made under such conditions that the natural moisture may be conserved.

As the natural weather conditions of this country are very favourable to ideal storage conditions it is likely, if these rules are followed, that the loss of sugar content will be considerably less than in less fortunate countries.

PRACTICAL EXPERIENCE WITH SUGAR-BEET IN S.W. ENGLAND

By C. J. CLARK

Chiselborough

The cultivation of sugar-beet in the West of England was first undertaken on a large scale in 1925, and our experience with the crop is therefore new and brief. The result of the first year's operations was such as to encourage the existing growers to extend their acreage considerably and to attract a number of new growers. With the increased area under the crop a series of new problems presented themselves which can be grouped under separate heads but which in practice are closely related to each other and to the whole balance and economy of the husbandry of the districts concerned.

First of all, there is some uncertainty as to the future of the industry and its position in the world market when it is no longer subsidized

https://doi.org/10.23637/ERADOC-1-197

by the State. There is much good land now under grass which could be broken up to grow excellent crops of sugar-beet, but such breaking up involves the use of some sort of arable rotation on the land, and comparatively few of the crops which are commonly used in the other shifts have much financial attraction at the present time. It follows that the cautious farmer must be very well assured of the lasting benefit he will get from his sugar-beet before he sets about to disturb established grassland.

Secondly, there is the very important matter of an efficient labour supply. The low wages paid to arable workers have discouraged the best of the younger men from following the plough.

Also in rural areas the question of housing for extra hands when they can be brought in from elsewhere is a very difficult one.

Farmers who may wish to increase their acreage of sugar-beet are brought face to face with a real difficulty in getting the extra hands necessary to deal with the crop. In many cases the area of beet grown has to be kept down to the limit of that which can be handled by the regular and existing staffs of the farms.

Men who can be obtained from the labour exchanges are, for the most part, factory workers, and have not the knowledge which would enable them to do the work properly.

Thirdly, there is no local tradition in the handling of the crop, and there is a great lack of practical and local information on such matters as suitable cultivations, width of rows and singling distances, correct manuring, and the economical use of tops and pulp.

The advantages of the crop were ably set forth for the farmers by the representatives of the Yeovil Sugar-Beet Factory Limited, but, despite this, the pressure of the difficulties already mentioned was very real, and a comparatively small acreage was contracted for with the factory.

In the result the interdependence of farm and factory in the production of sugar was clearly seen, and with a poor guarantee of acreage the whole factory building scheme was seriously delayed. This delay led to a further difficulty, for the beets of the 1926 crop had to be delivered to the Ipswich factory far away in Suffolk, causing there a considerable congestion and making it necessary for a number of growers to clamp a portion of their crop for delivery in January and February, after the usual manufacturing season.

An attempt to attack some of the outstanding problems of manuring and field treatment was made in a series of experiments centred on Bristol University and carried out in part under the auspices of the Somerset County Agricultural Advisory Committee. Two of these experiments—one concerned with the use of potash, nitrogen and phosphate, and the other with the width of drill rows—were carried out on our farm at Chiselborough, and I can quote the results for what they are worth.

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It must be remembered that these figures are the result of single experiments, and they may differ both in sense and value from the results of the whole series when these have been collated by the central authority.

The manurial trial consisted of 8 plots each twelve rows wide and 135 yds. long. The rows were 18 in. apart and the beets were sown on the flat. The plot treatments were as follows :

Plot 1. Complete Manure, less 1½ cwt. muriate of potash per acre.

Plot 2 ,, ,, { 1 cwt. sulphate of ammonia per acre. 4 cwt. 30 per cent. superphosphate per acre. 1½ cwt. muriate of potash per acre.

Plot 3. ,, ,, less 2 cwt. superphosphate per acre.

Plot 4. Control, No Manure.

Plot 5. Complete Manure, plus an extra 1½ cwt. muriate of potash per acre.

Plot 6. ,, ,,

Plot 7. ,, ,, with 6 cwt. kainit in place of 1½ cwt. muriate of potash.

Plot 8. ,, ,, with 1½ cwt. of sulphate of potash in place of 1½ cwt. muriate of potash.

Each of the plots was divided into three areas, called A, B and C, which received different amounts of nitrogen as top dressings.

Section A had 2 cwt. nitrate of soda per acre.
Section B had 1 cwt. nitrate of soda per acre.
Section C had no top dressing.

The results in yield per acre of washed beets and the percentage sugar contents are shown in the following Table :

Plot No.	*Yield*						*Sugar Content*		
	A		B		C		A	B	C
	tons	cwt.	tons	cwt.	tons	cwt.	per cent.	per cent.	per cent.
1	19	5	19	16	15	6	14·10	18·00	17·04
2	20	12	20	8	16	6	16·68	18·24	20·64
3	21	16	20	0	15	4	15·48	18·54	20·46
4	21	16	19	16	16	2	20·82	17·52	18·42
5	19	5	21	0	18	9	18·06	19·02	22·50
6	20	12	19	16	19	1	17·04	20·58	21·06
7	19	10	18	6	17	18	22·56	18·72	21·72
8	20	17	20	8	19	13	21·06	19·26	17·28

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It will be observed that the level of yield was high throughout, even Section C of Plot 4 which received no manure at all producing as much as 16 tons 2 cwt. of washed beets per acre. With such a high level of yield the differences due to manuring are likely to be relatively small, and it is interesting to observe that the first top dressing of nitrogen produced a commercial increase in every case. The limits of experimental error in any set of single plots in a single season must necessarily be very wide, and small differences as between one plot and another cannot be regarded too seriously, but a definite trend over a large number of plots, and covering several different treatments, deserves more careful consideration.

If all the A sections are taken together as representing a plot receiving 2 cwt. nitrate of soda as top dressing, and a similar calculation and average is taken for the other two sections, the following result emerges :

Section	*Yield per Acre*		*Sugar Percentage*
	tons	cwt.	
A (2 cwt. N) . .	20	9	18·22
B (1 cwt. N) . .	19	19	18·73
C (no top dressing) .	17	6	19·89

It appears that the first cwt. of nitrate of soda has increased the gross yield by 2 tons 13 cwt., and that the second dose has caused a further increase of 10 cwt. This rise in yield has been accompanied by a definite fall of sugar percentage, and in order to correlate the two things, and to find out how far the gain in gross weight has been neutralized by loss of sugar content, it becomes necessary to reduce the calculation to terms of sugar per acre.

Section A yielded 75 cwt. of sugar per acre.
Section B ,, 75 ,, ,,
Section C ,, 69 ,, ,,

Taking the same figures and treating them from the point of view of gross cash return to the farm we get the following results :

Section A—Beet at £3, 0s. 9d. per ton = £62, 2s. per acre.
Section B ,, £3, 2s. 3d. ,, = £61, 18s. ,,
Section C ,, £3, 4s. 9d. ,, = £56, 10s. ,,

From these figures it would appear that in this experiment the first cwt. of nitrate of soda was a very profitable investment, but that the second one did not pay for itself.

The figures serve also to stress another point which is sometimes rather neglected. The heaviest yield brought the best return both of

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sugar and cash, and the higher sugar percentage of the lighter crop was not sufficient to make up for the serious loss in gross weight.

The other experiment included five plots with the rows from 14 in. to 24 in. apart. Again all the yields were high, but there was a decided difference in favour of the narrow rows. The yields and cash values per acre were as follows :

Distance between Rows	*Yield per Acre*		*Cash Value at 60s. per ton*	
in.	tons	cwt.	£	s.
14	24	0	72	0
16	22	0	66	0
20	20	18	62	15
22	18	13	56	0
24	19	18	59	10

The results of this one season's experiments are interesting, and although they may not be wholly convincing in all the differences of manuring and treatment which they cover, they serve to form part of a far greater mass of evidence which is being collected in the West. Further, they serve to give some indication of the very satisfactory level of yield obtainable in the West Country under our normal farm conditions. As yet sugar-beet has no definite place in the rotations, and it has been taken generally either in place of mangolds or cereals.

The great advantage which it enjoys in that it is grown on contract for a price per ton, which is known in advance, coupled with the undoubted success of so many of this year's crops, lends very great support to the growing opinion that it should be used on a far larger scale in the West in the future. It seems that the crop might do much to preserve and to extend the arable area. Such an extension, bringing with it the greatly increased cash returns associated with heavy crops of beet, should benefit both the farmers and their workers to a considerable degree.

Beet, with the long harvesting period of three months, is very little damaged by wet conditions in autumn, and thus has another very great advantage over cereals, especially in the Western Counties, where the rainfall is high.

The success of the 1926 crop, and the eagerness with which the growers are seeking to extend their acreage, supports the conclusion that, given suitable land, the crop should present no insuperable difficulties to anyone who is used to growing root crops. The supply of labour for singling remains a critical point, and there is need for a great deal more information about the kinds and quantities of artificial manure to use.

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If full advantage could be taken of the crop, and the area under it extended over suitable land, it should do more to put the farming industry on a sound basis than any other crop we have to select from.

EXPERIENCE WITH SUGAR-BEET IN THE MIDLAND COUNTIES

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In 1924, when the Notts. Education Committee decided to draw up and carry out a scheme of manurial experiments on the sugar-beet crop along certain definite lines, it was understood that numerous experiments and field trials had been carried out in various parts of the country, which had, in a general way, demonstrated the value of manurial dressings. It was felt, however, that more evidence was required as to the economic returns obtained under varying classes of soil, bearing in mind its natural or acquired fertility, previous cropping and manurial treatment, and climatic conditions prevailing over a series of years. I should like to mention the fact that Mr N. Howard assisted in carrying out the whole of the work.

It was decided to arrange the experiments so that each series would aim to answer one definite question, such being in each case—

Series 1. The effect of nitrogenous top dressings.
Series 2. The effect of potash.
Series 3. The maximum profitable manuring.

The first two series have been running for three years, and Series 3 for two years, each being tried on two or three farms each year.

Although, as with all experiments on the manuring of sugar-beet, the results over the whole period would appear at first glance to be somewhat contradictory, as a matter of fact definite information has been obtained which will be of practical value. All the plots were duplicated to ensure reliability and to prevent errors due to any abnormal conditions.

Climatic Conditions.—Knowing the enormous influence of varying climatic conditions it was considered advisable to keep careful records of rainfall and temperature from seed-time to harvest.

Series 1—Nitrogenous:

Objects: To test the effect of a complete dressing of artificials (*a*) without a top dressing of nitrogen; (*b*) with one top dressing of nitrogen; (*c*) with two top dressings of nitrogen.

https://doi.org/10.23637/ERADOC-1-197