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# Rothamsted Report for 1932

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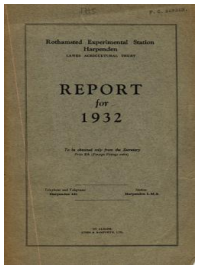


## Sugar Beet

### Rothamsted Research

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Considerable work has been done in tracing relations between crop data and weather conditions. The results are of great scientific interest and of considerable potential value, for they open up the possibility of forecasting yield and quality of crop some long time before the crop is ready for harvesting.

## THE MANURING OF CROPS

The new complex field experiments are more laborious and costly to carry out than the old ones, but they give more precise information about fertilisers. Much of this has been embodied in a volume published by the Ministry of Agriculture, entitled *Artificial Fertilisers*. The demand for information on this subject is so great that the first edition was rapidly exhausted, and a second edition has now been prepared.

There is no doubt that farmers, by more judicious use of fertilisers, could obtain larger yields without incurring appreciably more expenditure than they do at present.

## SUGAR BEET

A serious effort is being made to improve the position in regard to sugar beet. The present average yield of about 8.5 tons per acre is unnecessarily low, and unless it is improved the industry can hardly survive. Hitherto it has been impossible to make adequate investigations into the manuring and cultivation of sugar beet ; the first stages of a scheme have now, however, been worked out jointly with the factory representatives, and it is hoped that this may be put on a permanent basis.

A usual yield of sugar from sugar beet is 1-1½ tons per acre. On the other hand, a usual crop of mangolds (25 tons per acre) contains 2 tons of sugar per acre, and it is quite easy to push up the yield so as to produce 3 tons of sugar per acre. Seeing that the sugar beet is supposed to be a better source of supply than the mangold, it looks as if there is still plenty of scope for improvement.

At present, unfortunately, we have no indication as to which way the improvement is likely to come. Few trustworthy experiments have been made, and the method adopted till recently of bringing foreign experts over to teach our farmers the Continental cultivations has only limited value because of the wide difference between Continental and British conditions. Straightforward manurial experiments do not get us very far ; indeed, in a number of tests last year the standard dressings based on the earlier guidance did not prove very effective. Sugar beet does not respond in the same way as mangolds to manure ; we still have to discover the proper way of treating the crop so as to get the best results. Some points have already emerged. Nitrogenous manures increase the weight of leaves, a valuable consideration for the stockman, but they do not correspondingly increase the weight of the roots, and they decrease the percentage of sugar, but increase the total weight per acre. Phosphates have less effect than one might expect. Potassic fertilisers are less effective than on mangolds. Salt is beneficial. The effect of fertilisers is summarised in Table I, which includes all the experiments made at Rothamsted, Woburn and the outside centres during the seven years 1926-1932.

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TABLE I.—Effect of fertilisers on yield of Sugar Beet : all Centres, 1926-1932.

| Nutrient. | Number of Experiments. | Number of Significant Increases. | Number of Significant Decreases. | Per cent. of Experiments Increases. | Per cent. of Experiments Decreases. |
|---|---|---|---|---|---|
| Nitrogen—Roots | 42 | 26 | 0 | 62 | 0 |
| Tops | 37 | 27 | 0 | 73 | 0 |
| Sugar % | 30 | 1 | 17 | 3 | 57 |
| Potash—Roots .. | 28 | 11 | 1 | 39 | 4 |
| Tops .. | 26 | 5 | 0 | 19 | 0 |
| Sugar % | 24 | 5 | 0 | 21 | 0 |
| Phosphate— | | | | | |
| Roots .. | 19 | 3 | 0 | 16 | 0 |
| Tops .. | 17 | 1 | 0 | 6 | 0 |
| Sugar % .. | 16 | 0 | 0 | 0 | 0 |
| Salt—Roots .. | 9 | 5 | 0 | 55 | 0 |
| Tops .. | 6 | 3 | 0 | 50 | 0 |
| Sugar % .. | 9 | 2 | 0 | 22 | 0 |

Average response to fertilisers

| | Per cwt. N (as S/A) | Per cwt. $P_2O_5$ (as super) | Per cwt. $K_2O$ (as muriate) | Salt (per cwt. Cl ) |
|---|---|---|---|---|
| Roots (washed) tons per acre | +2.31 | +0.46 | +0.51 | +0.59 |
| Sugar percentage .. .. | −0.56 | +0.12 | +0.14 | +0.22 |
| Total Sugar cwt. per acre .. | +6.9 | +1.3 | +2.0 | +2.6 |

All the responses are small, showing that the factors we at present control do not play the chief part in determining the crop. This was well brought out in the Rothamsted experiments in 1932, one of which was made in Long Hoos and one in Great Knott field ; both yielded almost exactly the same weight of tops, yet the crop in Great Knott gave nearly double the yield of roots obtained in Long Hoos. The averages for all the plots were :

| | *Rothamsted.* Long Hoos. | *Rothamsted.* Gt. Knott. | *Woburn.* Stackyard. | *Woburn.* Butt Close. |
|---|---|---|---|---|
| Tops, tons per acre .. .. | 14.9 | 14.6 | 6.33 | 15.8 |
| Roots, washed, tons per acre | 7.2 | 13.5 | 6.08 | 11.9 |
| Roots, per ton of tops .. | 0.48 | 0.92 | 0.96 | 0.75 |
| Date of sowing .. .. | May 19th | May 19th | May 10th | May 6-12th |
| Response per cwt. Nitrogen | | | | |
| Roots, tons .. | −2.01 | 1.97 | −2.04 | 1.63 |
| Tops, tons .. | 0.22 | 4.84 | −3.01 | 5.58 |

The two fields are not far apart, and Great Knott is not noticeably better than Long Hoos ; indeed, if there is a difference it is rather the other way ; the same seed was used, and it was sown the same day in both fields ; yet the one crop is the average which we recognise as below what is permanently possible for a successful industry, and the other represents a level that would bring a profit both to the farmer and the factory even if the subsidy should disappear. An attack of wireworm in Long Hoos, necessitating late patching, may account for much of the difference.

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At Woburn the results are very similar excepting that the weight of tops on Stackyard is only 6.3 tons per acre ; the two fields are further apart and the soils differ, but we are unable to say what should be done to Stackyard to make it give the same yield of sugar beet as Butt Close.

Where to look for the difference we frankly do not know. Both experiments included a number of variants, but none caused any more than minor differences. In Long Hoos and in Stackyard the manurial dressings per acre are the same ; they varied in the different plots between 0 and 0.6 cwt. nitrogen, 0 and 1.0 cwt. $K_2O$ and 0 and 0.6 cwt. $P_2O_5$ : 13 different combinations were tried, but all without effect. In Great Knott and in Butt Close the treatment is also the same ; the experiment consists in variations in time of applying the nitrogenous and the other manures, and also variations in the intensity of cultivation. The nitrogenous manures were effective in raising yields, but it was immaterial whether the manures were applied at sowing or three weeks beforehand, or whether half the nitrogen was kept back till the time of singling, though in this case the weight of tops suffered. Intensive cultivation —hoeing every 10 days between the rows—so far from benefiting the crop, reduced the weight both of roots and of leaves, the roots being reduced 1.2 tons and the tops 2.5 tons per acre. No more cultivation was needed beyond that required for keeping down the weeds. Clearly some new kind of experiment is needed different from the old fertiliser trial, and new methods are now being tried at Rothamsted, which if we can obtain the funds to continue them, will, we hope, prove more successful.

One cause of low yields stands out clearly : sugar beet will not tolerate soil acidity. On acid soils the yields are low, and they are raised by the use of calcium carbonate. A spectacular increase was obtained at Tunstall, and one that is perhaps more normal at St. Albans.

| | *No Chalk* | *Chalk, per acre.* | | | | |
|---|---|---|---|---|---|---|
| | | 1 ton. | 2 tons. | 3 tons. | 4 tons. | S.E. |
| *Tunstall—* | | | | | | |
| Roots, tons per acre | 1.82 | 12.61 | 14.30 | 14.27 | 14.74 | 0.432 |
| Tops, tons per acre | 1.44 | 11.79 | 12.01 | 13.50 | 13.32 | 0.557 |
| Sugar, per cent. .. | 18.74 | 18.72 | 18.84 | 18.65 | 18.79 | 0.114 |

| | *No Chalk.* | | | *Chalk.* | |
|---|---|---|---|---|---|
| | No Phosphate | Basic Slag | Super-phosphate | Super-phosphate | S.E. |
| *St. Albans—* | | | | | |
| Roots, tons per acre | 5.25 | 6.58 | 6.68 | 8.94 | 0.571 |
| Tops, tons per acre | 6.34 | 7.53 | 7.67 | 10.19 | 0.614 |

In spite of the acidity of the soil, basic slag was no better than superphosphate, and it was much inferior to superphosphate *plus* chalk.

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