

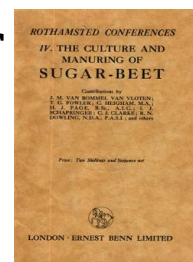
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The Culture and Manuring of Sugar-beet

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I. J. Schapring

I. J. Schapring (1928) *Effects of Climate on the Cultivation of Sugar-beet* ; The Culture And Manuring Of Sugar-Beet, pp 34 - 37 - DOI: <https://doi.org/10.23637/ERADOC-1-197>

EFFECTS OF CLIMATE ON THE CULTIVATION OF SUGAR-BEET

By I. J. SCHAPRINGER

I WILL first of all claim a few minutes of your time to deal with the parentage of that remarkable plant the sugar-beet.

The great-great-grandparent of sugar-beet is supposed to have grown wild somewhere on the Adriatic Coast and in Asia Minor for a considerable time before its sugar value was discovered. It then fell to the provinces of Saxony and Silesia, in Germany, to make use of its value as a sugar producer. The wild plant was not of much value without the help of science, but from the moment its potential value was known its future was assured, and it has grown up to be the sturdy parent of the present breeds of beet which are grown as far north as Sweden, in Europe, and in Japan and Manchuria, in Asia, and in Canada in the New World; while in the Southern Hemisphere, Australia has also produced it in commercial quantities.

In the early years of its infancy scientists were obsessed with the fear that beet could be grown only under certain climatic conditions. Each country that contemplated its cultivation on a commercial scale consulted its scientists as to the suitability of its climate, but in most cases it was left to the company promoter to commence operations without much scientific guidance. Therefore, the expression "beet climate" has to be deleted from the dictionary of the industry. It is even very difficult to define what might be called "the most suitable climate."

The beet tried on small experimental plots, and then on a large commercial scale, accommodated itself to local climatic conditions, whatever they happened to be.

There is no doubt that the cost of growing beet varies under different climatic conditions—for example, in a climate with a very short lifting period, with early and hard winter frosts, the cost of production is higher, owing to the necessity of storing the beet until the factory can use it, and to the consequent loss in sugar content.

A comparison of the conditions governing the delivery of the beet from the farm to the factory in this country with those prevailing in Canada are interesting. In England the lifting period is the same as the manufacturing period—which is about three months—while in Canada the whole operation must be completed within from four to five weeks.

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The deciding factors as far as climate is concerned can be grouped under the following headings :

- (a) Rainfall or humidity ;
- (b) Temperature or heat ;
- (c) Hours of daylight during the growing season ;
- (d) Wind.

The above factors may have different effects in the same vicinity according to the varying qualities of the soil. A light, sandy soil has a different moisture-holding capacity than a heavy clay soil. The heat-conducting capacity of a light soil is different to the same capacity of a heavy soil ; as an example, it is only necessary to plant two rows of beet—one on a light soil and the other on a heavy soil. The beet will germinate much quicker on the light soil than on the heavy soil, because the light soil holds the heat in a way that the heavy soil does not. Even the colour of the soil is of importance in this matter, as the lighter the soil is in colour the less will it store the heat. A light soil of dark colour is the best for this purpose.

Endeavours to work out arithmetical formulæ to determine the relationship of humidity, heat, sunlight and wind, and their combined effect on the growth and sugar content of the beet, have not been successful, and in this respect the scientist has to leave the field to the practical farmer.

In spite of this, the enlightened beet farmer cannot afford to dispense with the meteorologist's advice and assistance, which have become of such great aid in other branches of farming. In the old days our forefathers were dependent on the shepherd for their weather forecasts, but to-day we have outgrown the shepherd and prefer to consult the instrument.

The rainfall in different parts of the globe varies from *nil* to several hundred inches per annum. For agriculture in the temperate zone it is more important that the farmer should know the distribution of the rainfall over the months of the year than the total for the year. About 60 per cent. of the sugar in the beet is composed from elements which the plant absorbs from water. There is a time in the life of all animals when they take to solid foods, but with plants this period is never reached. Every bit of nourishment they take either from the air or the soil must be dissolved in water. It is easier to realize the importance of moisture to the plant when we remember that from 95 to 99 per cent. of all moisture absorbed by plants at the roots is released again into the air in form of vapour.

The British farmer is fortunately placed in comparison with the beet grower on the dry plains of Central Europe. On these plains the sowing has to be done very early in the year so as to make use of the winter moisture which remains in the soil. The following month may be rainless, and it is not until the autumn that heavy rainfalls occur, which not only spoil the quality of the beet but also increase the

difficulties of lifting and hauling. The unexpectedly favourable results which have attended the industry in this country are due mainly to the even distribution of rain all the year round, combined with high humidity and low evaporation.

Every plant needs a certain amount of warmth for germination and growth.

An average temperature of about 59° F. prevails over the best districts of Great Britain from June to August inclusive. The corresponding average temperature for the beet districts of the United States for the same period is about 11° F. higher, yet in spite of the lower temperature prevailing in this country the sugar content of the beet is 1½ to 2 per cent. higher than in the States. Cool nights and moderately warm days in the latter part of summer and in the autumn are most favourable for the storage of the sugar in the roots.

In this country the vagaries of climate are well known. After a few days of warm, early spring weather, a spell of cold weather may set in. This causes bolters, or seed runners, which constitute not only a loss to the farmer but also to the manufacturer, as the bolters harden and resist knives. This is the reason that British farmers are advised not to drill the beet too early, but only after the cold spell is finished.

In this country beet never stops growing—that is, its active productive life is never absolutely checked. This is due to the evenness of the climate, which has really no extremes of temperature.

The beet can stand up to eight degrees of frost when lifted, and even more when underground. If the roots themselves freeze after they are lifted no great amount of harm will result, provided they remain frozen until they are used by the factory. But such low temperatures are the exception here in England. Owing to this fact the lifting period is considerably longer than in any other beet-growing country. This is an advantage which cannot be overestimated, and it is one of the causes of success.

Factories in this country are in a position to work their beet direct from the fields and so avoid the cost and loss of storing. In certain countries 60 days is the average working time of a factory, in countries like Italy, even less, owing to abnormal losses in storage, whereas in Great Britain 80 and even 100 days would be a safe figure. This means that with the same capital one can slice nearly double the quantity of beet that can be sliced in some other countries.

To come to the third of the deciding factors—daylight. Sunshine has always been considered to be the maker of the sugar in the beet, but this is not quite correct. Daylight, as distinct from sunshine, is the real maker of the sugar. Sunshine applied too liberally has, in fact, the opposite effect, and this has been proved in Southern European countries. The question of the exact manner in which light affects the sugar content has not been yet fully explained. Intense light within

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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

Gbiselborough

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