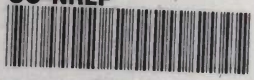


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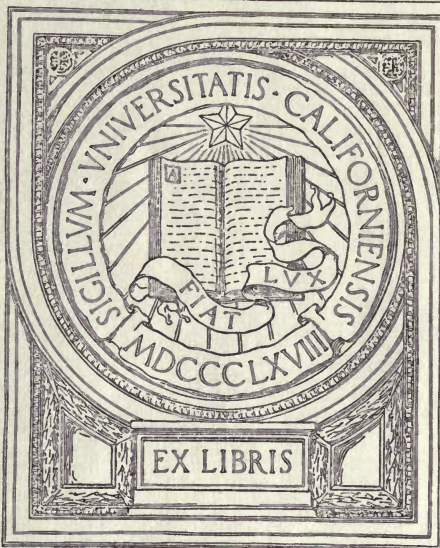
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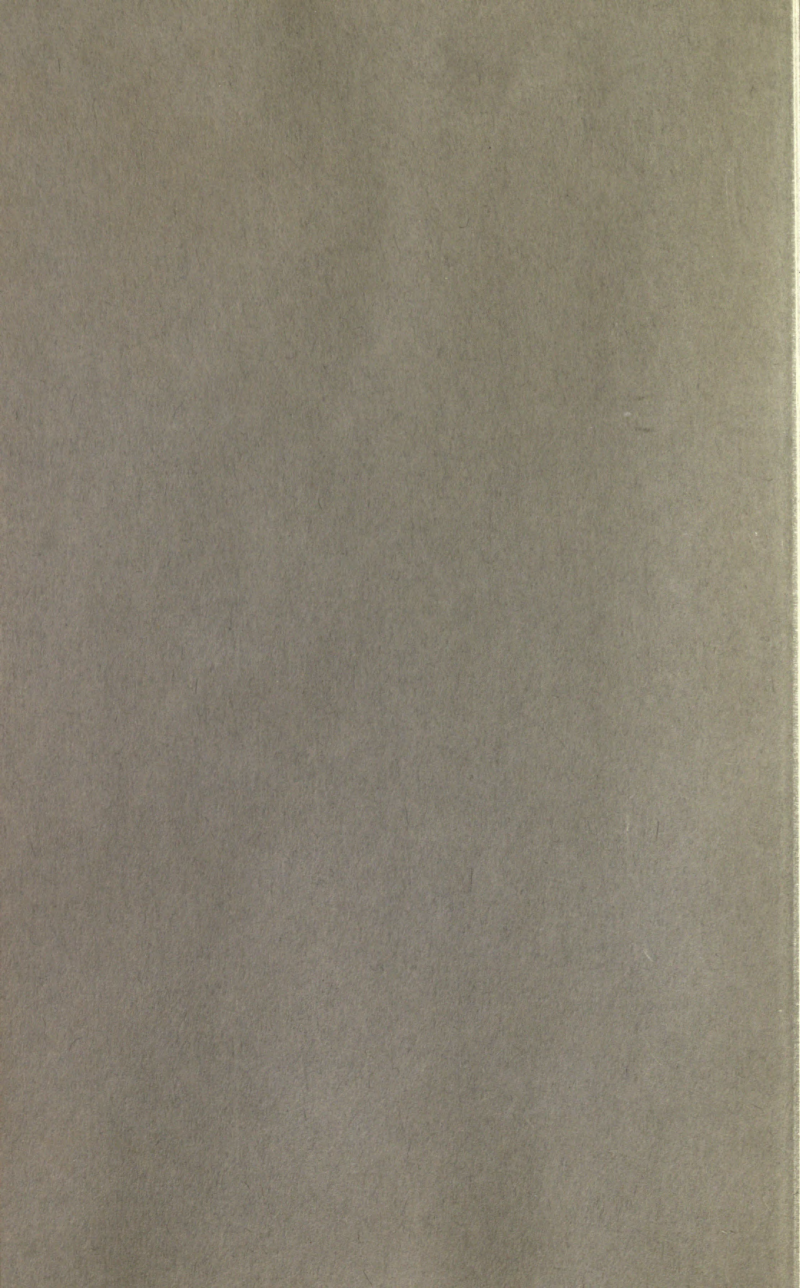
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# SUGAR BEET

Hints  
on Cultivation

**'FROM HOLLAND.'**

COLLECTIVE INDUSTRIAL EXHIBITION  
in the  
NETHERLANDS PAVILION,  
SAN-FRANCISCO,  
- 1915. -

*By*

CARLYN









SUGAR BEET  
HINTS ON CULTIVATION



# SUGAR BEET

## HINTS ON CULTIVATION

By

CARLYN, *pseud.*

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## Preface

THIS booklet is published chiefly for the purpose of giving the farmers a general outline of the question of sugar beet growing.

There cannot possibly be any hard and fast rules to be complied with on anything pertaining to agriculture, as many things depend on climatic conditions, the constitution of the soil, and other important points for which generations of farmers in every county have had to make allowance.

It has been alleged that sugar beet growing should be conducted on similar lines to that of mangels. To the English farmer this would simply mean the substitution of one root crop for another of a similar nature—with this difference, that sugar beet will secure him a return in money without having to transform

his crop into meat, and thereby depend on the fluctuations of the meat market for his profits.

It must be remembered, however, that sugar beet growing has features of its own and, contrary to mangels, the root grows deep in the ground. Therefore to obtain satisfactory results the soil must be ploughed deeply and whenever possible up to 10 in. or 12 in. This deep ploughing is the secret of sugar-beet cultivation, and when to this is added the right kind of manure for the soil, a very large return for the outlay may reasonably be expected.

We have purposely given no indications in this booklet as to the cost of cultivation and the yield per acre. The chief reason for this is that sugar beet has never been grown in England except on small patches of ground for the purpose of experiment, and therefore no reliable data are available for the time being.

On the Continent those figures can be obtained, as sugar beet cultivation has

been carried on on a large scale for the last twenty or thirty years, the total acreage being at present approximately four million acres—that is, nearly ten times as much as the whole acreage under mangel cultivation in England.

Another important point with regard to sugar beet cultivation is that this root can be grown year in year out in the same ground, and it will be found that after a few years the crop will give a better yield than at first. It stands to reason, of course, that proper manure must be applied so as to give back to the soil what has been taken out of it.

But again the secret of such results is, as we have said before, deep ploughing.

We have, in the course of our experiments carried out in England, met many farmers, and though all were ready and willing to listen, and willing to try the new crop themselves, consideration was given to the large acreage which would be required to feed a sugar factory in a given district—the general impression being that it might displace in time the

cultivation of mangels, and so affect the farmers in many indirect ways which were not apparent at first. Another difficult point to contend with is the belief in many counties that the farmers may expect anything from 35 to 70 tons of mangels per acre. We even once met a farmer who had just grown mangels about the size of a man's fist, and he swore that he got 35 tons per acre. We know that he probably meant 35 small cart loads, transformed into tons in the heat of discussion ; but so long as such fanciful figures are rooted firmly in the minds of those interested in agriculture, it is, of course, hopeless to try to lay the mangel ghost by any manner of means.

But in the same way as the yield of sugar beet on the Continent is taken on an average of four million acres, we think it wise to tackle the mangel ghost on the average yield in England.

From the figures given by the Board of Agriculture it is shown that the average area returned as under mangels in England for the ten years 1900-1909 was



409,230 acres, the average annual yield being 20·04 tons per acre.

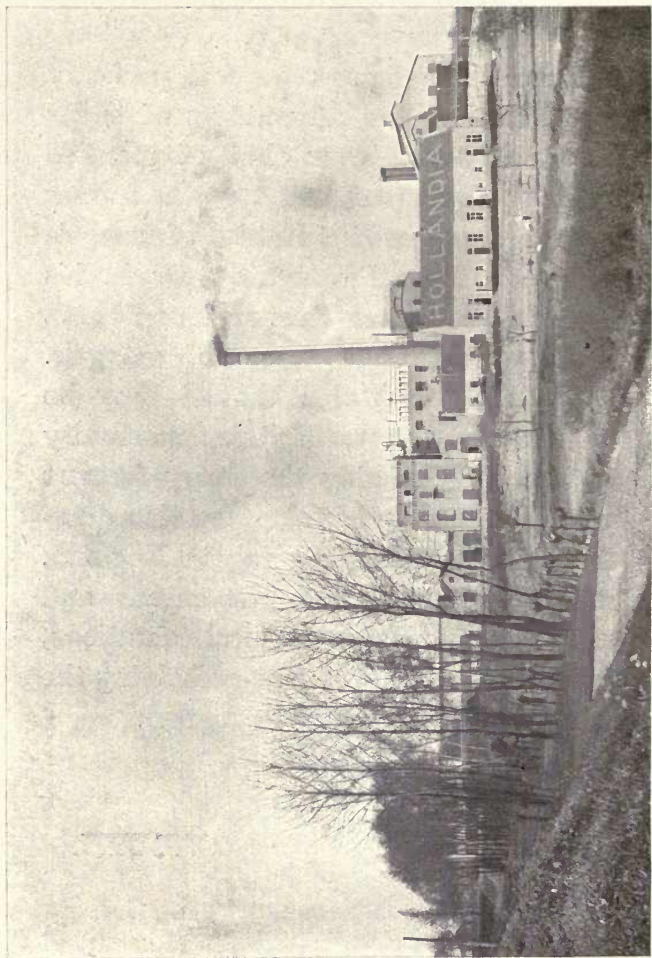
From these figures we feel perfectly satisfied that the advantages of sugar beet cultivation over that of mangels would be apparent, and that the farmer in growing sugar beet instead of mangels will save himself a waste year in his cycle of crops, and thus make an extra profit, which is not the case with mangels.

We hope that this booklet may be found useful, and we take this opportunity of heartily thanking the many farmers who have earnestly taken up this question of sugar beet growing in England, and have afforded us the means and necessary knowledge of local conditions, fully trusting that they were helping the wheel along the path of progress.

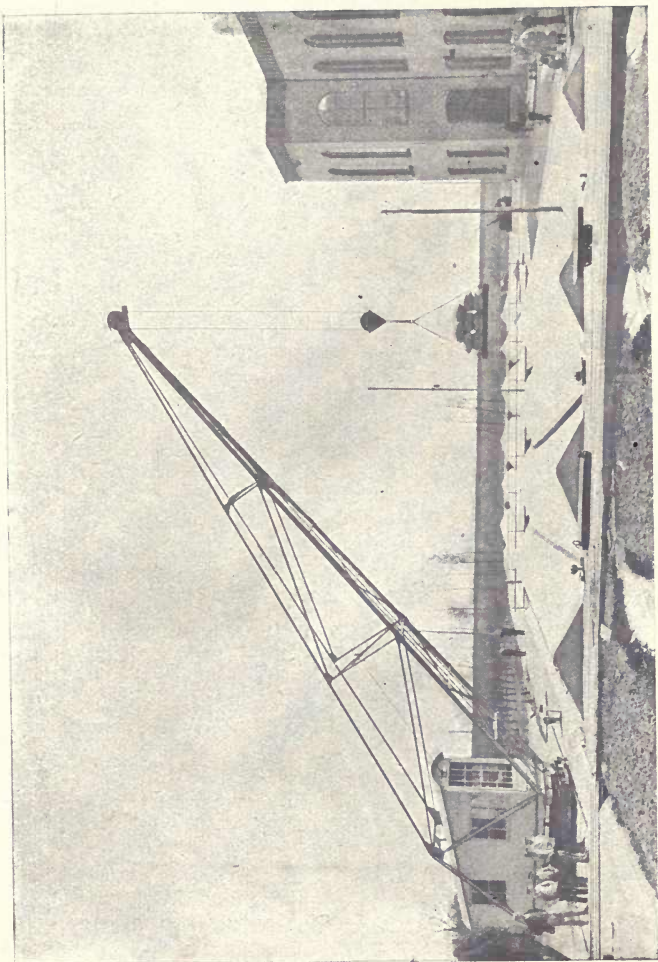
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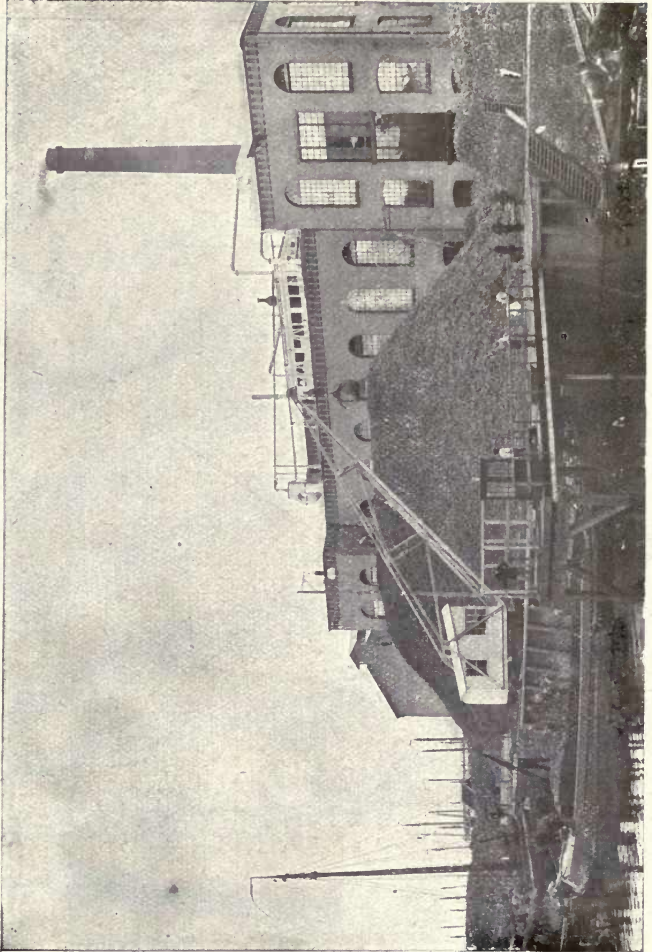
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A Sugar Factory in Holland (General View).



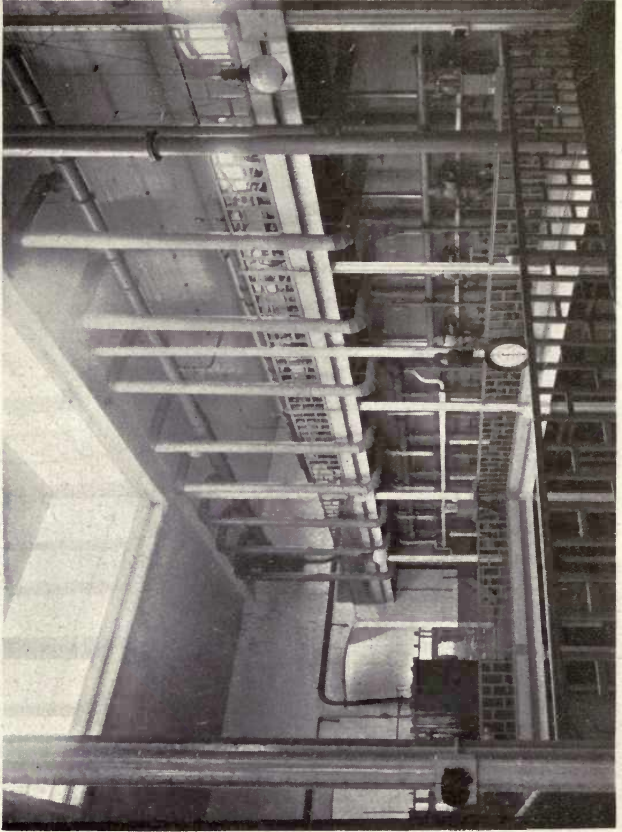
Concrete slopes with gutters on which the Beets are heaped up before being floated down to the Factory.



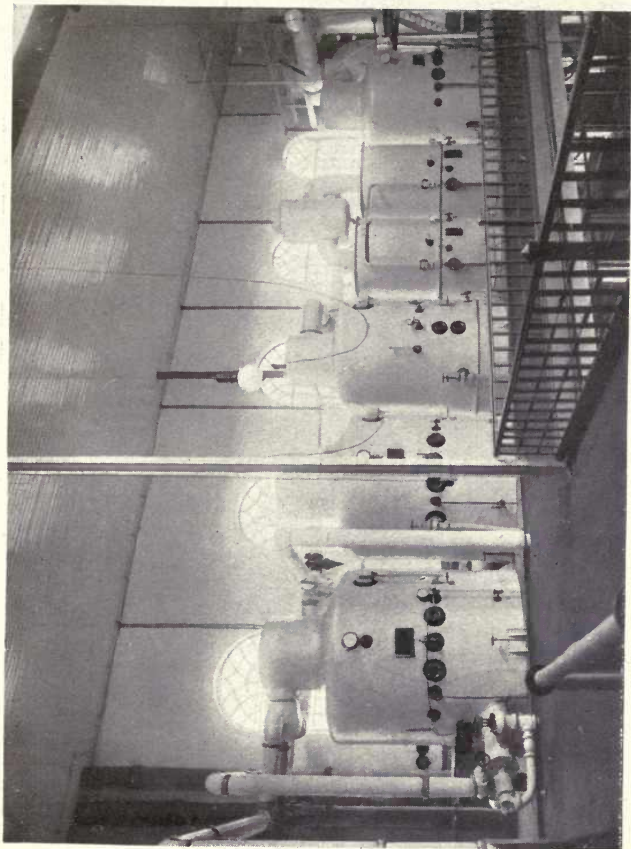
The heap of Beet during the season.



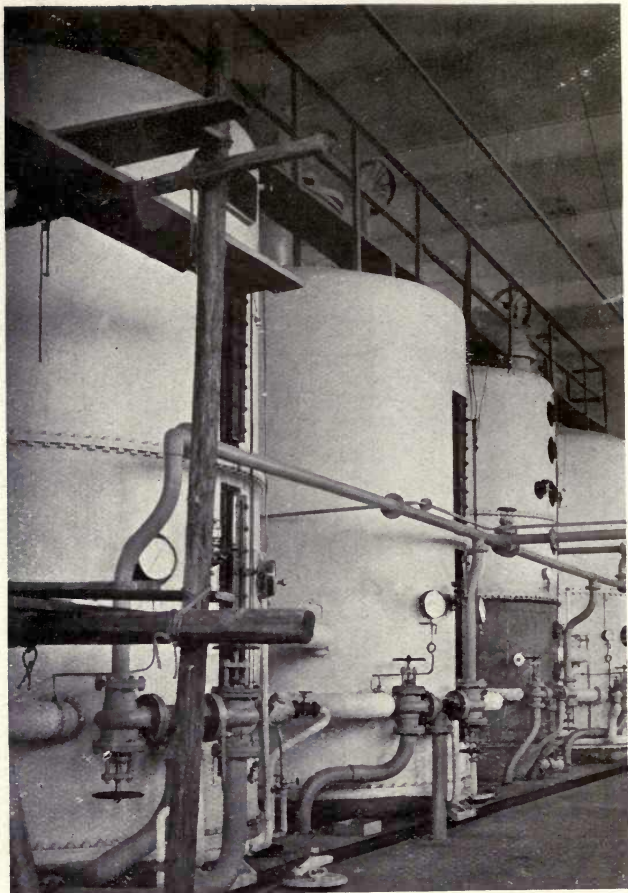
The floor above the Diffusers, in which the juice is extracted from the Beet slices.



A Row of Tanks in which the Beet juice is purified.

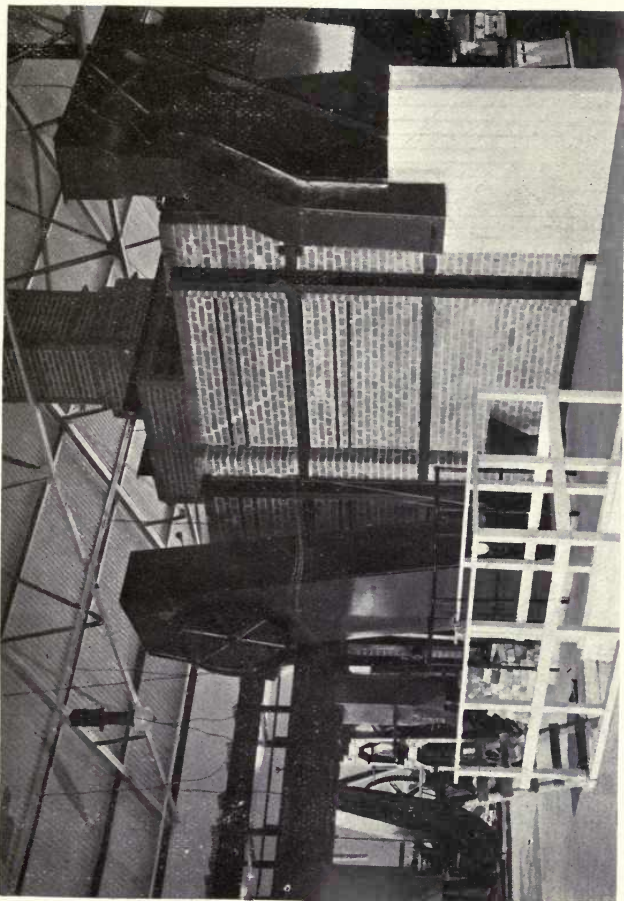


Vacuum Pan, in which the Beet juice is evaporated to a thick sugar syrup.



Pans in which the sugar is crystallized.





Oven for desiccating the Beet pulp.



Corner of the Sugar Warehouse.

## HISTORY OF SUGAR BEET

ABOUT 160 years ago, in 1747, sugar was first discovered in fodder beets by the chemist Marggraf, and the question of extracting it was seriously taken up by a few of the leading scientists on the Continent. At the end of the eighteenth century, Achard, one of Marggraf's pupils, laid a proposal for the erection of a factory before King Frederic William III of Prussia.

This proposal was not effectively taken up until several years later and after infinite difficulties, and though Germany was the cradle of the beet-sugar industry, it did not succeed there at first, the experiments being quickly superseded by those made in France under the auspices of the Government.

Up to that time all the sugar consumed in the world was made from cane, cul-

tivated mostly in British Colonies, and was brought to Europe chiefly by the British mercantile sailing fleet. Therefore the prices increased enormously when Napoleon issued the decree known as the Continental Closure, with a view to shutting the Continental markets to all English goods. Prices of from £15 to £50 per cwt. were paid, and this was naturally a great stimulus to the energy of sugar manufacturers on the Continent. This was the chief reason for the erection of the first beet-sugar factory in France, where Napoleon I took a keen personal interest in the new industry.

When, however, the Continental Closure came to an end, these exorbitant prices decreased, the immediate result being that the young beet-sugar industry died, with the exception of a few struggling factories.

These difficulties, however, ultimately turned to the benefit of the industry, which became self-supporting as it was conducted on more scientific lines, and the few surviving up-to-date factories

gave the lead to others. It was not, however, until well into the forties that they succeeded in bringing the beet-sugar manufacture to the front as a practical industry.

Since that time the cultivation of sugar beet has increased by leaps and bounds in most of the European countries, chiefly Austria, Belgium, Denmark, France, Germany, Holland, Russia, Spain and Sweden, where the total acreage under beet cultivation is approximately four million acres.

In the U.S.A. the beet-sugar manufacture was taken up much later, and not until 1901 was any special encouragement given to this manufacture. There were then sixty-three factories in that country, producing over 400,000 tons of refined sugar, but since that time the increase in beet cultivation has been so great that by 1910 forty new factories were erected to cope with it.

It will be seen from the foregoing that a very wide knowledge of sugar beet

growing has been acquired by most of the European countries, and from experiments made it has been found that, given the proper cultivation, sugar beet can grow almost anywhere.

The important points of cultivation are, first : deep ploughing, rolling and manuring.

The drilling is done between April 15 and May 15, according to the season, and after that the fields must be kept in proper condition by careful hoeing. The roots begin to ripen towards the middle or end of September, though the raising of the crops may last till the end of October.

#### HINTS ON SUGAR BEET CULTIVATION.

The fields set aside for sugar beet growing are ploughed at least 8 in. deep in October or November, though this first ploughing may be delayed till the beginning of January. When the furrows have remained exposed to the air

as much as possible, and before getting ready for drilling, the fields must be levelled, and then, when the land is dry, rolled with a stone or wooden roller.

N.B.—Though 12 in. ploughing has been found most desirable to obtain a good crop of sugar beet, it is not expedient to plough more than 8 in. deep when the fields are prepared for the first time. The depth of ploughing can be increased year by year until a depth of 12 in. has been reached.

Should the subsoil be of a different nature from the surface soil, it is not desirable to disturb the former, and too deep ploughing should in that case be avoided. One of the great advantages of sugar beet cultivation is that the crop may be raised from the same field year after year.

#### SOWING.

The seed is sown between April 15 and May 15, according to the weather, which must be dry for this work, and after the drilling the fields are rolled again. Should

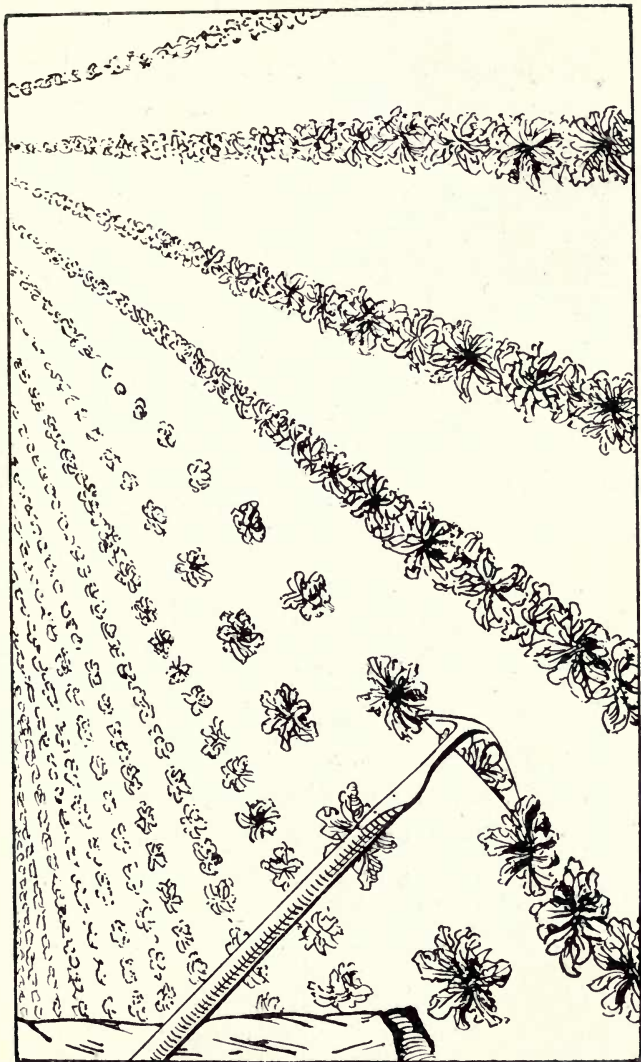
the weather be wet, the last rolling may be dispensed with. The seeds are drilled in rows from 15–21 in. apart, which should allow for horse hoeing when the beet is cultivated on a large area. The seed must not be planted more than  $\frac{1}{2}$  in. deep.

About three weeks after the drilling is done the plants come out of the ground, and as soon as the rows are well visible the fields must be hoed.

About six weeks after the drilling the plants will be about from 1 in. to 2 in. high. The growth has then proceeded far enough to show that the plant will live. Then by means of a hoe the rows are chopped out. In this way the rows are divided into clumps of from three to six plants, each clump being about 10 in. apart.

This chopping out proceeds very quickly as nothing else is done at the same time, and the little chopped-out plants are simply left lying on the field. Singling should take place as soon as it is possible to detect the strongest plant in each clump.





Rows being chopped out.

This plant must be pressed down gently between two fingers so as not to disturb the root, while with the other hand the weak ones are pulled out. Singling requires great care and takes a long time.

A fortnight after the singling the fields are hoed again, and after that more or less regularly hoed according to the condition of the fields.

### MANURE.

After the autumn ploughing apply 6 to 8 cwt. Superphosphate, ordinary quality at 14 per cent.; and also 6 to 8 cwt. Kainite per acre. When the drilling is being done  $\frac{3}{4}$  cwt. per acre of Nitrate of Soda are put on the land, and  $\frac{3}{4}$  cwt. more Nitrate of Soda when the plants are chopped out and are about 1 in. high.

About a fortnight later a third application of Nitrate of Soda should be made; this time  $1\frac{1}{2}$  cwt. should be used.

It should be noticed that Nitrate of



Singling. One hand pressing gently on the ground, with the strongest plant between two fingers, the smaller plants being pulled out with the other hand.

Soda may be strewn over the land in a dry state, or diluted with water before application is made.

For light sandy or peaty soil the quantity of manure per acre should be slightly increased ; the proportion should be roughly as follows—

Superphosphate	. . . . .	10 cwt.
Kainite	. . . . .	10 "
Nitrate of Soda, First Application	. . . . .	1 "
" " Second	" " . . . . .	1 "
" " Third	" " . . . . .	2 "

N.B.—Basic Slag may be used instead of Superphosphate.

### RAISING THE CROP.

The crop is raised between September 15 and October 15, according to the season and time when the fields are drilled. Under ordinary conditions the beets are ripe when the leaves begin to turn yellow, but it sometimes happens that in very dry weather the leaves will turn yellow earlier. If after such a dry period wet weather sets in, the aspect of



Healthy well-shaped Sugar Beet.

the fields will again change to green, because new leaves are forming. This unfortunately affects the quantity of the sugar being formed in the beet. It must be noticed that under ordinary conditions, the change from green to yellow in the beets means that the beet has stopped growing but continues to make sugar, and the crop must be raised shortly after the change in the colour.

As soon as the beets are taken out of the ground the tops should be cut off with a knife, applied at the place where the first leaves have grown.

The beets are piled up in small heaps on the fields, covered with the tops to keep them as dry as possible and protect them in case of an early frost.

When the fields are ready the beets are carted to the factory, the tops remaining on the fields. These tops may be used by the farmer as fodder for the cattle.

When pulling out the beets to cart them away they should not be damaged or bruised in any way, and care



How to use the fork for loosening the Beet before pulling out. In light soil the fork is not needed.



Method of cutting the tops off with a knife.



should be taken not to break the thin end.

### BYE-PRODUCTS FROM THE FACTORY.

To obtain the sugar in them the beets are passed through a slicing machine and reduced to a pulp, from which the sugar is extracted. This done, the pulp is dried and then forms an important cattle food, which is invaluable to dairy farmers, as shown by the following analysis—

#### DESICCATED BEET PULP.

	Per cent.
Digestible-farinaceous matter . . . . .	58
Indigestible fibre matter . . . . .	17
Albumen . . . . .	7
Sugar . . . . .	4
Fatty matter . . . . .	1
Ashes . . . . .	3
Water . . . . .	10
	—
	100

To use this dried pulp as fodder it should be soaked in warm water or other

liquid, of which it will absorb five times its own weight; having absorbed this liquid, the pulp will then swell out to about three times its original volume.

#### QUANTITIES TO BE GIVEN TO CATTLE.

Cows	.	7 to 10 lb.	per day and per animal.
Oxen	.	9 to 14 lb.	„ „ „
Calves	.	1 to 5 lb.	„ according to age.
Pigs	.	2 to 4 lb.	„ „ „

A great advantage of this desiccated pulp is that the addition of inferior foods to it is immediately noticeable, and thus an impossibility. A further advantage is that the pulp retains its good qualities for any length of time if kept in a dry place.

#### MOLASSES.

Molasses are the bye-product of the sugar syrup from which all the crystallizable sugar has been extracted. There remains, however, a certain quantity of sugar which cannot be crystallized, and to this sugar the molasses owe their nutritious value. The following analysis

shows that in this respect they are a rich food—

	Per cent.
Sugar . . . . .	49
Water . . . . .	20
Ash . . . . .	12
Organic matters (non-sugar)	19
	—
	100

For use as cattle food these molasses should be dissolved in such a quantity of water as to enable them to be easily mixed with other articles of dry food.

QUANTITIES TO BE GIVEN.

	lb.
To Horses per day and per ton live-weight	7
Milch Cows                    "            "            "	6
Oxen                            "            "            "	7-9
Fattened Cattle               "            "            "	9
Pigs                            "            "            "	12

When the animals are not used to molasses food they should not be given the above-mentioned quantities all at once, but should be gradually accustomed to it.

Molasses food prevents colics, and has a splendid influence on the quality of milk, butter and meat.

## SATURATED LIME.

The raw juice extracted from the beet pulp contains organic impurities which have to be removed. To do this both lime and carbonic acid are used, and after the operation they form a precipitate containing about 33 per cent. of carbonate of lime in a most active state. This carbonate, called *saturated lime*, is in itself a very valuable manure, its effect being to increase the assimilative power of the soil. It has, moreover, a chemical as well as a mechanical action, the presence of the lime quickening the decomposition of the organic and inorganic elements of the soil.

The saturated lime contains, besides carbonate of lime, a large proportion of the organic matters originally absorbed by the sugar beet, chiefly potassium and phosphoric acid, and on that account its use as a manure is strongly advocated.

Saturated lime is of course mostly recommended for use on heavy land, its effect, entirely mechanical then, being to render the soil more friable and therefore lighter to work.

FARMERS' CALENDAR.

OCTOBER—NOVEMBER.

Deep ploughing.

Manuring.

APRIL.

Harrowing.

Rolling.

APRIL—MAY.

Drilling.

First application of Nitrate of Soda.

Rolling (if weather dry).

MAY.

(about three weeks after drilling)

First hoeing.

JUNE.

(two weeks later) Chopping out,

Second application of Nitrate of Soda.

Singling.

(Two weeks later) Third application of  
Nitrate of Soda.

JUNE—JULY.

Keep the fields in good condition.

SEPTEMBER—OCTOBER.

Raising the crop.













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