

Sugar Beet Problems in the Netherlands, As Contrasted With Those In America

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The beet sugar industry in the Netherlands is now about one hundred years old. The sugar beet was introduced into our Dutch agriculture in the first decade of the 19th century without much success, but after the erection of a sugar factory in 1854 in the southwest of our country, this crop found a growing interest and at the moment an acreage of 125,000 to 150,000 acres is normal for us, and our yield per acre is the highest in Europe.

The average yield per acre for the last ten years is 15.2 tons per acre, with a sugar content of 17.0%. In 1949 we had a bumper crop on 167,000 acres with an average yield of 18.2 tons per acre, but a sucrose content of 15.5%. Early in September the sugar content was normal, but then after rainfall new top growth suddenly started and the sugar content dropped considerably. This is probably an experience not unknown to American beet sugar factories.

With the expansion of sugar beet growing there was also an increasing number of sugar factories. Originally these were small factories with a very limited capacity, but gradually there came about a concentration of the industry and the number of factories was reduced. We now have twelve operating factories. The slicing capacity of the respective factories ranges from 2,000 tons to 5,000 tons, with a total for the twelve together of 34,000 tons in 24 hours.

An interesting feature in the development of our beet sugar industry is the fact that 60 percent of the sugar beet crop is processed in factories owned cooperatively by the farmers. As is well known, the cooperative idea is strongly developed among the Dutch farmers for many other purposes also.

As an average all over the country 5.0-6.5 percent of the arable land is planted to sugar beets, but in some districts the amount of land used in beet culture may be as high as 20 percent. Sugar beet growing is therefore not spread evenly all over the country but is mostly to be found in the west and northeast parts, mainly in those districts where the soil is clay or silt; only a limited acreage is found on sandy soils. The area per contract varies from 0.5 acre to an extreme of 1,000 acres, with an average area per contract around 4 acres.

As is probably known, a large part of our country is below sea level and so are most of the beet districts. Therefore, mostly the water level is sufficiently high for successful beet growing; irrigation, as is so common in many parts of the U.S.A., is not necessary.

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The average annual rainfall is about 28 inches, and the average temperature in summer varies from 62° to 65° F. The rainfall is not evenly distributed, as February to June have less than 2 inches per month and July to November 2.5 to 3 inches, August and October being the rainy months of our climate.

In dry summers, however, there is sometimes not sufficient moisture for the beets. This may seem strange for districts below sea level, but for example, most of our islands in the southwest area (where 15-20% of the arable land is planted to beets!), are surrounded by salt or brackish water, and therefore it is impossible to fill the drains with water from outside the banks, even when water is badly needed.

The sugar beet seed used is all grown in Holland. The method used for seed growing is still from stecklings overwintered in clamps or pits because our climatic conditions make it impossible to overwinter the stecklings in the field, as you do in the United States. Therefore our beet seed growing is subject to more risks and the quality of the seed is less stabilized than in the U.S.A.

No breeding work is done by the sugar industry, as it is all left to private firms. There is, however, a very strict control on the varieties, as our Institute takes samples of all the seed delivered to the factories and this seed is planted on many variety trial fields spread all over the country. Only the sale of approved varieties registered on a special list is allowed in our country. This applies not only for sugar beets but for all other crops.

The general advice to the farmer is to plant at least two varieties, one early ripening for the early deliveries, and a late variety for the later part of the harvest. The basic idea is to get the highest economic production of sugar per acre, and as such a large part of the industry is owned by the farmers themselves. The factory results play an important part in the final decision on the varieties. Therefore, the varieties for early harvest have a higher sugar content but a somewhat lower root yield, whereas the later ripening ones are about 1-1.5 numerically less in sugar percentage but about 10-12% more in root yield.

The amount of seed used is about 15 pounds per acre of whole seed. The row width until a few years ago varied from 13-16 inches. More recently, however, there has been a tendency to increase the row width to 20 inches on account of mechanization.

The number of plants aimed at as an ideal stand is 28,000 per acre. Some districts, however, are lower in number of plants per acre and the average over the country as a whole is 25,000 per acre.

What struck me among other things when I paid a visit to this country in 1946 was the wide range of variation in the use of fertilizers for beets, the amount used varying from none to fairly heavy dressings. A normal dressing for sugar beets in our country is 110 pounds of nitrogen per acre, together with 100-120 pounds of K₂O and 50-70 pounds of P₂O₅. In soils rich in potash and phosphate sometimes more nitrogen is given, but there is always the risk that too much top will be grown and a lower sugar content obtained. Also, in some cases the dressing of potash or phosphate is omitted, but mostly all three of these fertilizer elements are given.

Potash is chiefly given as 40% potash salts and phosphate as superphosphate. For nitrogen we prefer calcium nitrate or calcium ammonium nitrate. Ammonium sulphate is not very popular and mostly gives lower yields; Chilean saltpeter has been used to a large extent but its use entails the risk of crusting our clay soils when we have heavy rainstorms in spring.

As many of our beet growers have no cattle at all, manure is applied only to a limited part of our sugar beet soils. This brings the risk of a low percentage of organic matter, which on our clay soils leads easily to a poor soil structure. Our farmers try to overcome this difficulty by growing a green manure crop, (especially red clover and alfalfa) in their rotations, but this seems to be not quite sufficient and the problem of applying sufficient organic matter is worrying many of our farmers and soil specialists. I understand from American publications that this is a problem we have in common.

On the sandy soils, cattle are being raised on all the farms and the farmers in these districts will not grow sugar beets without manure as they know by experience that on this type of soil good yields are only obtained when manure has been applied.

Mechanization of the sugar beet crop in the Netherlands is not to be compared to what is taking place in your country. There are a number of reasons for this difference. In a small country like ours with a very dense population it is necessary to get the highest yield from every square yard and very intensive farming is necessary. Our soil in the fall is very wet and sticky and harvesting the beet crop with heavy machinery ruins the soil structure, and thus has an unfavourable influence on the next crop. Also, the labor problem is less pressing than in the U.S.A., and the price of machinery in relation to wages of farm labor is much higher for our farmer than for the American farmer.

However, it must not be thought that there is no mechanization of our agriculture. On the contrary, much is done to mechanize our farming operations, but with machinery adapted to our special circumstances.

For sugar beets the use of segmented seed has been tried, but it proved to be too risky on many of our soils as it needs a very good seedbed or otherwise it gives a poor emergence. Since then we have tried various methods of polishing the seed and various types of precision planters more or less successfully. We have also found that the problem of soil structure is very important both in relation to mechanization of spring work and to mechanical harvest, and this brings us back to the problem of organic matter and bacterial life in the soil as especially important contributors to an effective and desirable soil structure.

The beet tops are very important to many of our farmers for the feeding of their cattle. As most of the tops are fed as silage it is a necessity to develop a harvesting method which enables us not only to save the tops but also to save clean tops. When the tops are soiled with clay, the risk of formation of butyric acid instead of lactic acid is great. Such silage is of poor quality and has a rancid odor. Cattle tend to refuse to eat improperly fermented silage.

Mechanization of harvesting operations is making very rapid progress, the usual system being first to top the beets mechanically and then to lift the topped beets with simple lifters or root harvesters.

Under normal harvest conditions the main problem is the dirt tare, as it is very difficult to clean the beets, especially when the soil structure is bad and the beets have developed many fangs, or, as you would say, forked or sprangled roots.

Soil structure has under our conditions many relations to beet growth and development. We have found that in the Netherlands at the end of June (*i. e.*, eight to ten week after drilling) we are able to judge whether the final root yield will be low, average or high. So the first growth and rapid emergence are very important. This is influenced largely by the quality of the seedbed and therefore by soil structure.

The influence of soil structure on the development of sprangled roots is very striking, and also we found that on soils of poor structure there are often more bolters, due to the fact that emergence in these soils is slower, and therefore the germinating seed is given a longer exposure to cold temperatures which induce bolting. It is therefore easily understood that part of our attention has been turned to the relations between soil structure and beet as an important factor for beet production. As these problems are very complex we work closely with soil specialists and hope that our sugar beet breeders will also pay more attention to these problems.

It may be interesting also to mention our beet transport. In a flat country like ours with many rivers and canals more than 60 percent of the beet transportation is by barges. Road or truck transport, under contract, takes about 15 percent, only 10 percent goes by rail, and the balance is by local deliveries. As a matter of fact, we have some factories having no rail transport at all. One of these has a slicing capacity of 5,000 tons in 24 hours and will probably be enlarged to 6,000 tons, which shows the efficiency of barge transport.

Our climate being fairly cool in autumn, there is not much loss of sugar. Also we do not have the enormous quantities of beets stored at the factories as you have sometimes and the problem of ventilating the piles we do not know.

As in other countries we also have many pests and diseases in our crop. Of these I will only mention two as being of major importance: virus yellows and the beet eelworm or nematode.

The virus yellows disease has spread all over western Europe in the last twenty years and, if infection is early, losses can be as high as 25 percent. Up to the moment no means of combatting this disease have been found, neither do we have resistant or tolerant varieties as you have for the curly top virus.

Beet eelworm is a well known disease in many countries where beets are grown, but I will mention it here because, at the moment, it is one of our main problems. We have quite a few farms where no beets can be grown

at all because of the beet nematode. This very heavy infestation is due to the fact that farmers have grown sugar beets too intensively in their rotations. I was therefore very astonished when in 1946 I found that, in some of your western sugar beet districts, beet crops were grown in a very short rotation on farms where eelworm was present. As soil disinfection, at least under our conditions, is not effective we have developed a field control system. This is based on counting the number of eelworm cysts in soil samples and giving advice to the farmer when he will be allowed to grow beets again on a certain field. If we can find the time and the money we will try to make a complete map of the eelworm infestation all over the country.

In many districts sugar beets are grown not only for the roots but high value is put upon the byproducts. I mentioned earlier the use of beet-top silage. The same is true for pulp which is turned out partly as wet pulp and partly as dry pulp, both for use as feeds. In some districts on sandy soils the farmers more or less grow the beets for the tops and the pulp. They regard the sugar more or less as the byproduct!

Molasses is used partly for alcohol production, but another part is used for making silage. For example, young grass cuttings sprinkled with molasses give excellent silage.

The lime sludge is used for improving the pH of the soil. On some special types of soil it has a very beneficial influence. This is probably due to the fact that the calcium carbonate particles in the lime sludge are extremely fine and also the small amount of organic matter in the lime sludge has a favorable influence on the bacterial life in the soil.

The contribution of the sugar beet to the development of agriculture in many parts of Europe and particularly in the Netherlands has been a considerable one. At present the situation is such that in our country a well developed and well balanced agriculture cannot be thought of without the sugar beet crop, and we have no other plant which could take its place in the rotation.

Not only is the sugarbeet an important source of cash income for the farmer but through the value of the byproducts for cattle feeding his expenses for buying feeds are cut and more net profit is made. In some areas the tops only are estimated to have a cash value varying from \$40 to \$100 per acre. And to this can be added the value of the pulp and lime sludge.

From a general economic point of view the production of the larger part of the sugar consumed in this country by our own farmers is of basic importance. The introduction of the sugar beet in our agriculture has led to better farming practices and therefore has a favorable influence also on the production of other crops. Sugar beets therefore must keep their place in our crop rotation and we hope that research work done for this crop may lead to further improvement in the same way as has been done so successfully in America.