CIRCULAR NO. 1.
UNIVERSITY OF ILLINOIS.
Agricultural Experiment Station.
E. Davenport, Director.

URBANA, ILL., APRIL 1, 1897.

THE SUGAR BEET.

The unusual demand made upon this Station for information relative to the growth of sugar beets has lead to the publication of this circular.

IMPORTANCE OF THE SUGAR BEET INDUSTRY.

Sugar cane, for many years the source of the world’s supply of sugar, is being superseded by the sugar beet.

The sugar belt is thus transferred from the tropics to the temperate regions of the globe.

So rapidly has the sugar beet industry developed in Europe that it has become the basis of agriculture in France, Germany, and other countries. Germany alone produces annually from sugar beets over $160,000,000 worth of sugar, while the United States produces from the same source only $3,000,000 worth. Germany exports 100 million dollars worth while the United States pays to foreign countries as great a sum for the sugar she imports.

The importance of the question to our people is apparent when we realize that one-fifth of the total exports of agricultural products is required to pay for the sugar we import.

We do not export enough dairy products from the United States to buy the sugar for Illinois alone. In fact it will require one-third of Illinois’ great corn crop of 1896, at the commercial price of eighteen cents per bushel to supply her people with sugar for one year.

It is significant that although the United States consumes more sugar than any other civilized country she also produces less than any other except England.
**STATISTICAL.**

Production and consumption of beet sugar in Europe and the United States in 1894.

<table>
<thead>
<tr>
<th>Country</th>
<th>Production in tons.</th>
<th>Consumption.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amount in tons.</td>
<td>Pounds per capita.</td>
</tr>
<tr>
<td>Germany</td>
<td>1,830,500</td>
<td>690,000</td>
</tr>
<tr>
<td>Austria</td>
<td>1,043,000</td>
<td>320,000</td>
</tr>
<tr>
<td>Russia</td>
<td>595,000</td>
<td>554,000</td>
</tr>
<tr>
<td>France</td>
<td>745,000</td>
<td>539,000</td>
</tr>
<tr>
<td>Belgium</td>
<td>250,000</td>
<td>1,650,000</td>
</tr>
<tr>
<td>Holland</td>
<td>85,000</td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>140,000</td>
<td></td>
</tr>
<tr>
<td>England</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>22,595</td>
<td>2,303,400</td>
</tr>
</tbody>
</table>

Table showing the rapid increase in the production of sugar from beets in the United States since 1887.

<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>1887</td>
<td>620,000</td>
</tr>
<tr>
<td>1888</td>
<td>4,000,000</td>
</tr>
<tr>
<td>1889</td>
<td>6,000,000</td>
</tr>
<tr>
<td>1890</td>
<td>8,000,000</td>
</tr>
<tr>
<td>1891</td>
<td>12,000,000</td>
</tr>
<tr>
<td>1892</td>
<td>12,005,000</td>
</tr>
<tr>
<td>1893</td>
<td>27,083,000</td>
</tr>
<tr>
<td>1894</td>
<td>45,111,000</td>
</tr>
<tr>
<td>1895</td>
<td>67,200,000</td>
</tr>
</tbody>
</table>

Production and consumption of sugar in the United States for the year 1894, produced from—

<table>
<thead>
<tr>
<th>Source</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorghum</td>
<td>8,000</td>
</tr>
<tr>
<td>Maple</td>
<td>7,000,000</td>
</tr>
<tr>
<td>Beets</td>
<td>45,000,000</td>
</tr>
<tr>
<td>Sugar cane</td>
<td>600,000,000</td>
</tr>
</tbody>
</table>

Total home production: 653,400,000
Imported: 4,335,143,881
Total home consumption: 4,988,593,881
Value of sugar imported, compared with wheat exported for five years.

<table>
<thead>
<tr>
<th></th>
<th>1891</th>
<th>1892</th>
<th>1893</th>
<th>1894</th>
<th>1895</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imported</td>
<td>$105,790.016</td>
<td>$104,408.813</td>
<td>$116,055.784</td>
<td>$126,971.888</td>
<td>$76,469.836</td>
<td>$560,727.538</td>
</tr>
<tr>
<td>Sugar</td>
<td>2,269,722</td>
<td>2,877,744</td>
<td>1,997,334</td>
<td>1,984,778</td>
<td>1,095,146</td>
<td>10,089,174</td>
</tr>
<tr>
<td>Molasses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$12,540,336.72</td>
</tr>
<tr>
<td>Exported</td>
<td>$31,420.272</td>
<td>$161,300.113</td>
<td>$93,534.970</td>
<td>$50,407.041</td>
<td>$43,808.653</td>
<td>$490,957.078</td>
</tr>
<tr>
<td>Wheat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheat flour</td>
<td>$54,705.616</td>
<td>$75,376.283</td>
<td>$75,494.947</td>
<td>$60,271.770</td>
<td>$51,651.928</td>
<td>$326,485.944</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$876,053,022</td>
</tr>
</tbody>
</table>

**What Has Been Done in the United States.**

That the sugar beet can be grown successfully over large areas in the United States is no longer a matter of experiment. Why then should we not produce our own sugar, thus giving to our farmers the millions of dollars now sent to foreign countries and also furnish-employment to an army of laborers? We have eight or nine successful factories, France has 350, Germany nearly 700.

In 1876 the first sugar-beet factory in the United States was built at Alvarado, California, and this has been enlarged from time to time. The next factory was established at Watsonville, California, in 1889, by Claus Spreckles, and has the largest capacity of any in the country. In 1890 the Oxnard Brothers erected a factory at Grand Island, Nebraska, and the same company has since built factories at Chino, California, and Norfolk, Nebraska. In 1895 two new factories were built, one at Eddy, New Mexico, the other at Menominee Falls, Wisconsin. Three new factories are now in process of construction, one in Utah, and two in California. One of these is building by Claus Spreckles at Salinus, California, and will have a capacity of 3,000 tons of beets a day, or double that of any other factory in the world. West Virginia had a small but successful factory which burned two years ago.

Taking the average output of the existing factories it would require 900 factories to supply the United States and over fifty to supply Illinois with sugar, at the present rate of consumption. And not only will the increase in population increase the amount of sugar used, but the American appetite for sugar is rapidly increasing. The average amount of sugar annually consumed by each person in the United States increased gradually from thirty-four pounds in 1878 to more than sixty-six pounds in 1894.

**Sugar Beet Belt.**

An average temperature of 70° through the months of June, July, and August, is required for the best development of the sugar beet. Through the Eastern part of the United States this would be represented approximately by a line drawn from the northern border of
Nebraska to New York City. The sugar beet region will comprise a belt extending from 70 to 150 miles north and south of this line, varying with local conditions, but it must not be inferred that all farms within this belt are adapted to beet raising.

Large yields of beets may be produced south of this belt, but in the warmer localities it is difficult to secure a per cent. of sugar sufficiently high for profitable manufacture.

The best evidence of success is the fact that the business succeeds. It is apparent that if the farmer could not grow the beets at a price which the factory could afford to pay, both the factory and the farmer would have gone out of the business, and the Oxnard Brothers would not have built a second factory at Norfolk, Nebraska, and a third at Chino, California. Neither would Claus Spreckles at this time be erecting the largest factory in the world. During the eight years from 1888 to 1895 the amount of sugar produced from sugar beets increased from four million pounds to over sixty-seven million. This is encouraging since the growth has been steady and healthy.

Coöperation Among Farmers Necessary to Establish a Factory.

There is no such thing as going into the business in a small way. The plant is enormously expensive. It will not be attempted to make even an inventory of the elements of cost in a factory. Two hundred thousand dollars would build a very modest factory, and some of our factories cost over a million dollars.

In order to establish a factory there must be coöperation among the farmers of the community where the factory is to be established; and this is often hard to secure. However, this is necessary, whether the business is run on the coöperative plan, as is frequently done in Germany, where the grower is a share owner in the factory, or as in this country, where the grower has only an indirect interest in the factory. Whether the one plan or the other is adopted, the farmers must agree to grow at least 3,000 acres of beets annually.

It would certainly be very unwise to establish a factory at an expense of several hundred thousand dollars unless the farmers would contract to supply the beets. To do this does not mean that the farmer must surrender his whole farm to beet growing. For example, there are 50,000 acres of land within a radius of five miles of the factory. It will be seen that to grow the 3,000 acres requires the man who owns 80 acres to grow but about five acres, or less than one-sixteenth of his land would be devoted to sugar beets. The area is not limited to hauling distance. Thousands of tons of beets are shipped by rail.

It is clear that the farmer runs much less risk than the company which erects the factory and therefore a community that is seeking a factory, must expect to bind itself to grow beets for a series of years.
The following gives the approximate cost of the various operations connected with the growing of sugar beets:

<table>
<thead>
<tr>
<th>Operation</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow plowing (fall)</td>
<td>$1.15</td>
</tr>
<tr>
<td>Sub-soil plowing (fall)</td>
<td>$2.00</td>
</tr>
<tr>
<td>Harrowing with spading harrow (spring)</td>
<td>$4.00</td>
</tr>
<tr>
<td>Harrowing, common harrow</td>
<td>$2.25</td>
</tr>
<tr>
<td>Rolling and floating harrow</td>
<td>$2.24</td>
</tr>
<tr>
<td>Seed, twenty pounds at 10 cents</td>
<td>$2.00</td>
</tr>
<tr>
<td>Drilling in seed</td>
<td>$4.45</td>
</tr>
<tr>
<td>One cultivation by horse</td>
<td>$8.00</td>
</tr>
<tr>
<td>Two cultivations with horse</td>
<td>$1.30</td>
</tr>
<tr>
<td>Two hand hoeings</td>
<td>$6.00</td>
</tr>
<tr>
<td>Loosening the beets with plow</td>
<td>$1.00</td>
</tr>
<tr>
<td>Topping, throwing in piles, cleaning and loading</td>
<td>$7.00</td>
</tr>
<tr>
<td>Transporting twelve tons two and one-half miles</td>
<td>$5.00</td>
</tr>
<tr>
<td>Rent of land</td>
<td>$4.50</td>
</tr>
<tr>
<td><strong>Total cost of crop</strong></td>
<td><strong>$39.94</strong></td>
</tr>
</tbody>
</table>

This itemized account is very suggestive to the person unacquainted with sugar beet growing. He will observe that it requires much hand work, and is necessarily expensive. The haphazard methods too often practiced with corn would be disastrous with beets. Under the most favorable treatment by the farmer, if the season is bad, the crop may contain less than the required twelve per cent of sugar and purity co-efficient of 80. If it falls much below this standard, which is required by most factories, the beets are rejected.

Relation of the Factory to the Farmer.

In this country the relations between the beet growers and the factory are governed by a contract. The factory agrees to purchase, at $4.00 per ton, all the beets grown by the farmer that contain not less than 12 per cent of sugar with a purity co-efficient of 80. The beets are to be delivered at the factory in a marketable condition, the tops cut off squarely at the base of the bottom leaf. The factory agrees to furnish the grower with seed at 10 cents per pound. Payment is made every month for beets delivered the month before. While the McKinley law was in force, and a bounty was offered, some, if not all, the factories paid $5.00 per ton. Many of the factories in Germany are coöperative, the growers being share-owners.

As soon as harvested the beets are delivered at the factory, and the farmers run no risk of loss by freezing, while the German grower must deliver the beets when wanted by the factory.
The average American objects to the great amount of handwork required by the beet crop, but if there is money in the business, that objection will quickly vanish. The greatest difficulty has been to secure labor at a price that would leave a margin of profit. It is true that wages are higher here than in Germany, but we grow beets cheaper than they do, owing to their high rent ($10.00 to $16.00 per acre), and the fertilizers that must be used to keep up the yield. The German applies from $12.00 to $25.00 worth per acre each year. In this we have a present advantage. However the Nebraska grower is already finding that even the prairie soil is not inexhaustible.

While the cost of growing beets for sugar will always be higher than for other crops, yet, as the industry increases, greater skill and better machinery will considerably reduce the cost.

The 1,500 acres grown by the Oxnard Brothers, at Norfolk, Nebraska, cost at the rate of between $32.00 and $34.00 per acre in 1894.

**Highly Bred Seed Essential.**

The high per cent of sugar content necessary to success in the sugar beet industry can be maintained only by the most careful methods of plant breeding. The sugar content has been increased from the four to six per cent of the unimproved beet, to twelve and sixteen per cent for the field crop, with individual beets testing twenty and even twenty-two per cent of sugar. It is these last that are selected for seed production. High bred plants, like high bred animals, tend to degenerate or return to their normal condition. Especially is this true if the conditions are unfavorable and the characteristics are newly acquired, and not strongly fixed. Hence it is that the grower gives special attention to the source of his seed. He must have well bred seeds—that is, seeds with a good pedigree.

**How the Seed is Produced.**

The process is something as follows: The field of beets grown for this purpose is harvested with more than ordinary care to prevent any possible injury to the beets. From these the grower selects roots of good shape weighing from sixteen to twenty-five ounces, and these are stored in the silo until spring, when they are again sorted, and what are known as the “mother beets” are selected for planting. The selection is made by cutting off the tips of the roots and throwing them into a solution of common salt having a definite specific gravity, or the whole beets may be thrown in. Those which float are thrown out. Only those which sink are subjected to the final test. A hole is bored obliquely through the center of the upper portion of the beet and the juice from the pulp thus removed is tested with a polariscope, and only those containing the highest per cent of sugar are saved for planting. They are then set out in rows about thirty inches apart each way.
The earth is firmly packed around the roots, and an inch of loose soil covers the crown.

In the fall the seed is harvested, cleaned, and stored in a dry place. This seed is not placed on the market, but is planted in the spring, and from this crop "mother beets" are again carefully selected and placed in the silo. In the spring following, the beets are planted as before, but the mothers are not generally subjected to the same rigid test of the polariscope.

The seed from this crop is then placed on the market. It will thus be seen that four years of work is required to produce a crop of seed for the market. The breeding of sugar beet seed is carried on extensively in Europe, but only to a limited extent in this country.

After several years of careful experimenting in Nebraska it was found that light seeds—that is, those with a low specific gravity—and also small seeds, gave a smaller yield, a lower per cent of sugar and coefficient of purity than heavy and large seeds.

The following from the "Norfolk Sugar Beet Co.," of Norfolk, Nebraska, is quoted entire as being a brief and most complete statement of the essentials of the sugar beet culture. This is especially valuable as it emanates from a commercial source and treats of conditions very similar to our own.

GENERAL INSTRUCTIONS FOR SUGAR BEET CULTURE.

SOIL.

Never select poor land. Use the best piece available on your farm, for the richer the soil the better the crop. The best soil is so called bottom land. New land should not be selected, as it never produces a high tonnage—it should be at least two years under cultivation. If possible spread the ground before plowing with well rotted manure, but manuring the previous year is much more beneficial and preferable. Should there not be sufficient manure at hand, we would advise the use of a fertilizer consisting of lime-cake, ammonia, and phosphates. This may perhaps appear to be expensive, but experience has shown that greatly increased tonnage results therefrom. Under no circumstances should seed be planted where land is sandy enough to blow.

PLOWING.

Immediately after taking off the grain, plow shallow (2 or 3 inches) in order to prevent the weeds from going to seed. When this is done spread your field with manure and in the fall plow deep (10 to 12 inches). This is very important, because the beet is thereby enabled to penetrate into the subsoil without much obstruction, thus preventing it from growing out of the ground and allowing it to extract considerable nourishment from the lower soil. The deep plowing will also give you clean ground and will make it ready for the early planting and thus insure large tonnage.

In case the plowing has not been done in the fall, plow as early in the spring as the ground will do to handle without sticking, for three reasons: 1st, because the sooner the weeds are encouraged to grow the more of them can be killed before planting the beets; 2nd, because land plowed while the weather is cool will retain
the moisture much longer than it will if plowed during warm weather; 3rd, because it is much better to allow the ground to settle as much as possible after plowing and before preparation of seed bed so that it will become thoroughly packed, thus insuring better and quicker germination. In the spring never throw up more than two inches of soil that has not been stirred before; if your soil has never been plowed over 6 inches it is better to use a subsoil plow to loosen the ground to the proper depth. These instructions refer only to spring plowing; when good land with deep soil is plowed in the fall, it makes no difference how much new soil is turned up as it would decay in winter through the action of the frost. After spring plowing harrow or better float, once immediately, and then leave the ground as it is until the time to prepare the seed bed, thus allowing the weeds to sprout. If the previous crop was corn, it is absolutely necessary to take the stalks and roots off the ground in the right manner in order to permit of easy and proper horse-cultivation; it will not do to plow the stalks under, however, as it cannot be done effectually, the cultivator-knives bringing them back to the surface once more, and at the same time dragging along with them, more or less of the small beet plants. The best way is to remove the mold-board from the plow, which will enable you to loosen the roots without turning the corn stalks under. Then gather them up with a hay rake into piles and after burning as much as possible haul off the remainder.

Preparation of Seed Bed.

Land that has been fall-plowed must be harrowed as soon as the frost is out of the ground and the soil is dry enough to prevent sticking. This work will level the ground, thereby holding the moisture in the soil and increase the germination of the weeds, etc. To secure a good crop, it is absolutely necessary to kill all the weeds in the ground before seeding. Here is where most failures occur, and if weeds are allowed to get a start the cultivation of the crop will involve much unnecessary and expensive hand work. Therefore, to prepare a good seed bed, we advise working the soil four to five inches deep with a pulverizer, or better yet with a corn cultivator, once lengthwise and once crosswise. Making sure not to miss any spot in the field as it is necessary to loosen any weeds that may have already sprouted. Then harrow lengthwise and crosswise to level the soil perfectly and finish killing the weeds. After this pack the top soil (2 or 3 inches) well, with a heavy roller, never use a plank float, as floated ground is never well packed and will besides increase blowing and washing. The better the soil is packed after the weeds are killed the better the beet seed will sprout. All the above work must be performed at a time when the ground is in good working condition, (that is, not too damp, as the working of wet soil must be strictly avoided.) As beet seed requires considerable moisture to germinate, it would also be a great loss to the beet grower to allow the soil during the preparation of the seed bed to dry out; therefore in dry weather or in an average season the field must be prepared and seeded the same day, this being the only way in which the moisture can be kept in the ground—a great feature in crop raising and especially so in beet culture.

To prevent the blowing, which is very disastrous to the small beet plants, (our experience has shown us, that even the best black bottom land will blow, if level, and fine, which it must be to secure a good crop) we advise running a light harrow over the field, after rolling but before seeding. This harrow must be very light and can be easily constructed and without much expense by using 2x2 pine pieces for the beams and large nails for the teeth, only letting them project below the beams 1½ to 2 inches. This harrow must simply scratch the soil (not over ½ inch deep), thus giving a rough surface, which will surely prevent blow-
ing, except on dry sandy soil on which, for this reason and some others, sugar beets should never be planted. The soil must not be loosened again by a deep harrowing, as this would injure the germination.

**Seeding.**

*To secure a full yield it is absolutely necessary to have a good stand.* The time of planting depends largely upon the season, it being generally from about April 25th to May 25th, or about the season of corn planting. Not less than 20 pounds of seed per acre should be used to secure a good stand under all conditions; because, should the weather be dry the best seed will come up first and there will be enough for a good stand; on the other hand should a crust be formed on the field after a heavy rain one plant will help the other to break through the ground. Therefore sow at least 20 pounds to the acre.

Seeders made especially for this purpose, seeding four rows at a time and dropping the seed continuously in rows (14 to 18 inches apart according to the fertility of the soil) will plant 10 to 12 acres per day. Never plant over three-fourths of an inch deep, but see that the earth is well packed around the seed by the press wheels, attached to the back of the drill, because by pressing the surface the necessary moisture for germinating in a dry season is drawn by capillary attraction out of the deeper soil. The heavier the soil and the earlier the planting, the shallower must the sowing be in order to prevent the seed from rotting in the ground. The deeper the seed is planted, especially in heavy soil, the weaker the plants will be if they come up at all. Therefore avoid deep planting.

Parties growing a large acreage and not having very much help, will do well to plant the crop in sections, at intervals of one week apart, in order to gain more time for thinning; however, do not plant too late, for in that case the beets will not be strong enough when the dry season sets in, about the middle of July, and will therefore suffer from the drought, while the earlier and consequently stronger plants will thrive well and a heavier and better crop be insured. You had much better hire help during the thinning time than to plant too late.

**Cultivating.**

This work is performed with one-horse cultivators, which work two or four rows at a time. If, after sowing, a heavy rain should cause a crust to form on the field, the light harrow is recommended; but this only in case the seed has not germinated, as otherwise it would be better to run the cultivator over the field, following the rows, which can be done easily before the seed is up as the marks of the press-wheels can be plainly distinguished. *This work, however, can be better done by hand hoes (11 inches wide; see hoeing). As soon as the beets break through the ground and the rows can be followed the cultivation must begin, the earlier the better, not only to destroy the weeds but to loosen the soil, which permits the air to penetrate, thus forcing the growth of the beet and improving its quality. It is very important to kill the weeds before they get above the ground, or at least before they become well rooted. This can be easily accomplished by cultivating the field with the flat shovels every 8 to 10 days, care being taken to set the knives as close as possible to the rows, and never over two inches from the rows as long as the beets are small. As the beets grow older, however, the shovels should be run gradually farther away from the beets, and also deeper until the leaves meet in the center of the rows by which time the cultivation should have reached a depth of 6 inches and should then cease as the beets are ready to lay by. Besides destroying the weeds this repeated cultivation prevents evaporation from the deeper soil and secures a good and healthy growth. Never kill your beets, as level land keeps the moisture best.
THINNING OUT.

Care should be exercised in doing this part of the work as it is the most important of all the cultivation and care of the crop. It is very necessary that this should be done just at the right time, and the sooner it is done the better for the growth and yield of the crop. As soon as the beets have four leaves they should be thinned and must not remain longer than one week without thinning, as the roots will entwine around each other, if left longer, and make the thinning detrimental to the plant that is left. To perform this work, the beets should be bunched (directly after a horse cultivation) with an ordinary 6 inch hoe, cutting 6 inches of beets out and leaving a two inch bunch containing from 3 to 6 beets. After the beets are bunched the healthiest plant in each bunch is selected by the thinner to be left standing, the others being pulled out by hand, together with all the weeds near by. This operation will leave one plant every nine or ten inches and the ground should be pushed up well around each (but not packed.)

HOEING.

The first hoeing, which is very important for the growth of the small plants, must be given with an ordinary 1½ inch hoe between the rows of 1½ to 2 inches deep and as soon as the beets break through the ground, or if crust is formed, as soon as this occurs, following the press-wheel marks.

As the ground will have become packed during the bunching and thinning, thus preventing proper circulation of air, and the young plants moreover, will have become weakened by their disturbance; and for the further reason that it is cheaper to do it then, the second hoeing should be given with a 7 inch hoe the day after the beets are thinned, and never later than a few days after, care being taken to kill the weeds out close to the plant but in such a manner as not to loosen or injure the beets. As the cultivator only loosens and clears the ground between the rows, the hoe must perform this work between the different plants. The hoeing should be 3 inches deep. A similar hoeing may be necessary twice after this, the last depending upon the freedom from weeds, also upon whether the ground is loose enough to enable the roots to grow. Both of the last hoeings should be as deep as it is possible to make them without injuring or loosening the plant. Under ordinary circumstances no work should be necessary in the field after eighty days from the time of planting except the final and deepest horse cultivation.

HARVESTING.

By the first part of October the beets are ready to harvest; the first planting generally a few weeks earlier. As the beets increase in tonnage mostly in September and the first part of October the harvesting with full force should not be started before the middle of October. The harvesting is done with a two-horse puller which loosens the beets but leaves them in the ground. After this the beets have to be pulled by hand and topped with a corn-knife at the base of the bottom leaf and can then be shipped to the factory, or siloed at the field and shipped later, after the beet growers have finished their other farm work.

SILOING.

As to the best method of doing this, from our six years' experience in siloing in this state, we would recommend the following plan:

In the first place do not harvest your beets until they are ripe, as green beets do not keep as well in silos as ripe ones, and besides should you harvest when too green they might not contain the necessary 12 per cent of sugar with purity of 80 per cent.

In an average season no beets should be siloed before October 15, and if the weather is warm it would be better to wait until the 20th, but in no case should
the beets be allowed to remain unharvested—and not siloed—until the ground freezes. Frost bitten beets will not keep; therefore all beets that you silo must be free from frost and be covered up the same day that they are harvested.

We would advise making five to seven silos to the acre, placing not less than two tons in each silo. When ready to silo lift the beets from forty to forty-five rows with a horse harvester. These loosened beets must then be pulled out of the ground by hand and thrown in piles. It is advisable, in case the strip you have lifted contains forty-five rows, to make a pile (silo) every six rods the length of the strip, and as this section of the forty-five rows is about four rods wide and six rods long, each silo would thus contain the beets from twenty-four square rods (about one-seventh of an acre). To prevent unnecessary handling it is advisable to first pull out the beets from the middle of the marked twenty-four square rods, placing them in such shape as to make a vacant place in the center, of about one rod wide and two rods long, then to pull the balance of the beets throwing them into a window close to and surrounding this vacant spot. When this is finished, top the beets (at the base of the bottom leaves) with one stroke of the knife and throw them in the vacant place, making a pile four feet wide and not over three feet high, the length of the pile depending entirely upon the yield. After all the beets are topped and piled up in proper shape cover the pile with six inches of dirt, being careful not to have any leaves or straw on the beets or mixed with them, and also to leave wide open a hole one foot in diameter, every five feet on top of the pile (at least two in each pile) for ventilation, as beets will sweat some after siloing.

It is generally advisable not to put much more than six inches of dirt over the beets in October, but to keep them free from frost you should cover the silo before the weather gets cold, say about ten days or two weeks after harvesting, in any case, before hard frost sets in—evenly, with five to six inches of loose straw, leaving the ventilation holes uncovered, and place about two inches of dirt on top of the straw to prevent it from blowing away and for the purpose of packing it, as when well packed it will best keep the cold air out of the silo.

Thus the covering in the end will be composed of six inches of dirt, two inches of packed straw and then two inches more dirt.

In an ordinary season such covering should keep your beets from freezing, but should there be exceptionally cold weather you might find it necessary (in case we have not ordered all your beets delivered to the factory by that time) to cover the remaining piles with some long manure.

As soon as the covering of silo freezes two inches, shut the ventilation holes with dirt and then keep them shut.

**General.**

When beets arrive at the factory an average fifty pounds is taken from each load. They are then thoroughly washed and examined to see if properly topped, then weighed again, the loss determining the tare.

Beets can be delivered on cars at any station along the line of railroads running into Norfolk, said cars to be loaded to their visible capacity. The factory will make a deduction for freight as follows: Thirty cents per ton for distances of twenty-five miles from Norfolk or under; fifty cents per ton for distances exceeding twenty-five miles and under forty-five; and for distances exceeding forty-five miles and under one hundred, eighty cents per ton. When beets are shipped from a greater distances rates will be named on applying to the factory. For beets delivered on C. St. P. M. & O. R. R. the deduction for freight is as follows: Fifty cents per ton for distances of thirty miles from Norfolk or under; sixty cents per ton for distances exceeding thirty miles but not exceeding forty
miles, and for distances exceeding forty miles but not over fifty miles, eighty
cents per ton, to which rates a further deduction of two dollars per car will be
made for switching charges.

Avoid placing leaves, straw or dirt in the cars, as these are deducted from
the weight of load at factory, besides which freight must be paid upon them also.
It is to the farmers' interest to fill and forward the cars as rapidly as possible.
Shipping tags (which will be furnished by the factory in the fall) should be tacked
securely on the side of every car. When a car is sent to the factory the number
and initials of the same must be mailed us immediately, on a postal card.

From the foregoing any farmer can obtain a general idea of the manner in
which the beet crop must be handled. In raising sugar beets it is absolutely
necessary to get rid of the idea of trying to save necessary labor. Sugar beets
need much work but they pay double or treble as much as any other crop in this
state, if worked well. Our six years experience has shown us that seven tons of
beets per acre pay for all the team work (30 cents per hour) all the hand labor
(7½ to 15 cents per hour) performed on the field, also for seed, rent of land and
machinery and freight; all of the yield above this tonnage being clear profit. Ten
tons may be regarded as an average crop per acre, although much higher yields
are made. A good farmer who takes the right care of the crop and selects proper
land should, in an average season, raise not less than twelve tons per acre. Our
old beet growers even claim to be able to raise, in a good season, by using richly
manured bottom land, 25 to 30 tons per acre, which yield has already been
obtained by several parties.

The seed which is purchased by us from the most reliable growers in Europe
and is of the best varieties will be furnished to our contractors at a nominal price.

MACHINERY.

It is always preferable that farmers growing beets should own their
machinery (for they do better work as they are then entirely independent of the
others). The best seeders in the market can be bought from Jewell Bros., Platte
Center, Neb., the Moline Plow Company, Moline, Ill., and from the Superior Drill
Company, Springfield, Ohio. The best cultivators are sold by the Fremont
Foundry and Machine Company, Fremont, Nebraska, and F. M. Wallace, Fre­
mont, Nebraska. For further information regarding this machinery please
apply to them.

Norfolk, Nebraska.

Realizing the need of more definite knowledge concerning the
adaptability of the various soils of Illinois to the sugar beet culture, the
Agricultural Experiment Station of the University of Illinois has
arranged with a large number of farmers in different sections of the
state to grow small areas of beets under the most favorable conditions
possible on their respective soils, and send samples to the Station for
analysis. It is expected that the results of these experiments together
with the results of those conducted at the Experiment Station, will be
published in a bulletin at the close of the season. If this investigation
shall aid the people in establishing a new and paying industry in our
state on the one hand, or save them from misdirected investment of
capital on the other, the results in either case will more than pay for
the cost and trouble.

P. G. HOLDEN,
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