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SUGAR BEETS IN MINNESOTA

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INTRODUCTION

In 1923, the consumption of sugar in the United States was 5,668,000 tons, an average of 103.5 pounds per capita. Of this amount 1,348,190 tons, or 23.8 per cent, was produced in the United States and 76.2 per cent of our total consumption was imported. Approximately 85 per cent of the imported sugar has been coming from Cuba under a tariff of $1.41 per hundred pounds; with smaller shipments

Fig. 1. A Sugar Beet Field

from the Philippine Islands, Porto Rico, and Hawaii, tariff free. The tariff regulation now in force has been an important factor in maintaining the price of sugar at a point where sugar beet production has been profitable for Minnesota growers. As beet sugar production in the United States has developed slowly in competition with the island cane sugar production, it will probably be some time before this country ceases to import sugar.

Beets raised independent of the contract basis will not find a market if the contracted acreage is sufficient to operate the available factories to capacity. A copy of the contract for raising sugar beets may be obtained from the Minnesota Sugar Company.

SOIL AND CLIMATIC REQUIREMENTS

Altho sugar beet production has developed slowly in Minnesota, it is doubtful if natural conditions are any more favorable for profitable production in any other region of the United States. Sugar beets thrive well on any of the soils in Minnesota which give good yields of corn, potatoes, or wheat. They are not adapted to light sandy soils, however. Clay loam is the most favorable, but the heavier clay soils to which heavy applications of manure have been made are equally productive, providing proper cultivation is given to keep the soil in good condition. This crop should be located on the best and most fertile land, as the expense of production is too high to start with a soil of low fertility. Sugar beets grown on peat soil are often low in sugar content and for this reason the sugar company operating in Minnesoa is not contracting for beets to be grown on this type of soil. With the right preparation and treatment, however, peat soils yield a high tonnage per acre with a satisfactory sugar content.

Sugar beets, unlike corn, are not sensitive to cool nights and the crop is grown extensively to the northern boundary of the state. It is essential that high sugar content be combined with high yield, as the producer is interested in the total acre yield of sugar. Climatic factors over which the farmer has little control determine largely the sugar content of the beet, and these factors in Minnesota in general are conducive to a high sugar content. The condition of the soil affects somewhat the sugar content of the beet. The producer can spend his efforts best by increasing the tonnage per acre. Greater fertility is necessary for this.

NUMBER OF ACRES TO GROW

One not experienced in growing sugar beets will do well to start with a small acreage. Many farmers have failed in the first attempt because they did not understand the great amount of detail involved. The farmer who has not the time and patience to supervise intensive work should not plant sugar beets. The proper selection and preparation of land, the use of fertilizers, as well as the operations of caring for the crop—blocking, thinning, hoeing, harvesting, and marketing—call for experience that can not be gained from any other crop.

The expansion of the sugar beet industry in Minnesota has been rapid since the close of the war, and has become an important factor in stabilizing agriculture. In 1921 the area devoted to this crop was 11,000 acres. The following year, 17,000 acres were grown; and the area contracted for in 1924 was 27,000 acres. This expansion, resulting from the profitableness of the crop and the recognized value of sugar beets in the establishment of a sound diversified system of agriculture on farms suited to their production, has been made possible largely through a special freight rate for the crop. The only sugar factory in Minnesota at present is located at Chaska, Carver County. The 1924 sugar beet crop will be carried from the most distant points in northwestern Minnesota to Chaska for $1.75 per ton. The rate to Mason City, Iowa, is $2.25 and to Chippewa Falls, Wis., $2.50 per ton. Prior to the establishment of the special rate, $7.50 per ton was the charge. Further development in this state is dependent upon the establishment of more factories to handle the crop. Plans are being perfected for the construction of one or two more factories in the beet-growing sections, but the present facilities can not handle a greater acreage than is now being grown. A factory is in process of construction at East Grand Forks, Minn., which will probably be ready for the northwestern Minnesota crop in 1925. Sugar beets can be included in diversified farming plans on farms where conditions are favorable for production and where the crop is contracted for by sugar companies, with reasonable assurance that this crop will remain a permanent and profitable one.

METHOD OF HANDLING THE SUGAR BEET CROP

The most satisfactory method of handling the sugar beet crop is to produce a definite number of acres under contract with a sugar refining company. The grower is guaranteed a market for his crop and a minimum price. The price which the grower receives may be and usually is considerably more than that which is guaranteed, as it is determined from the net price of sugar on the New York market. The grower is not paid less than the guarantee. The contracting company usually supplies seed and fertilizer at a reasonable cost; and where the acreage is large enough may assist in supplying labor to do the hand work. In Minnesota, Mexicans are employed largely for this work. The sugar company often advances money at a fair rate of interest to finance the producing operations. An inexperienced beet grower, however, should not depend entirely upon the sugar company for labor and funds.

If the hand work——thinning, hoeing, and topping—is to be done by children during vacation, not more than ten acres should be planted, so that they will not be forced to hurry through this work. For efficient work, this class of labor must be supervised. If the hand work is to be done by contract labor, a larger acreage is necessary to make it profitable for the grower and the workers. From 20 to 30 acres should be planted in order to employ a fair-sized colony of experienced Mexican beet workers. The acreage should not be more than the grower can keep thoroly cultivated, free from weeds, and which he can harvest and deliver at the proper time.

PREPARATION OF THE LAND

Every operation from plowing the land to delivering the beets calls for painstaking care. The slighting of any operation will be reflected in the returns. Poorly plowed land causes low yields and may result in a serious loss to the grower. In Minnesota the sugar beet crop, like corn, potatoes, and other cultivated crops, follows the hay and pasture crops in the rotation plan. Any land for sugar beets should be plowed deep in the fall, as it holds the snow and accumulates moisture. Freezing and thawing weather leaves the land in the most desirable physical condition. Insects are killed through exposure and weed seeds are turned under to germinate, after which they also are killed. Deep plowing is necessary to produce a loose soil for root development and expansion, as well as to cover the manure thoroly, when a rapid and complete decay is assured without loss from leaching. Plowing should be 8 inches deep, if possible, and not less than 6 inches. Land that is badly infested with weeds should be planted to a cleaning crop such as corn, or summer fallowed one year before the growing of sugar beets is undertaken.

Spring Preparation

The spring preparation of fall-plowed land for seeding, if properly done, eliminates work later in the year which careless preparation would entail. As early in the spring as possible the land should be thoroly disked and harrowed. If allowed to lie for a time after this operation a great many of the weed seeds will germinate. Just before planting the land should again be thoroly disked and harrowed. This will destroy the weed growth and make a fine, well packed seedbed. If the soil is heavy or cloddy, a harrow of the Meeker type or a planker will put the surface soil in fine condition. A smooth, level surface will facilitate seeding and is necessary for efficient cultivation.

FERTILIZERS AND MANURE

Most productive lands in Minnesota will produce sugar beets with a satisfactory sugar content. A large tonnage per acre makes the crop more profitable to the grower. This can be secured by increasing the soil fertility. The cost of producing 8 tons per acre is almost as great as that of producing 12 tons or more. Probably the most important single factor for increasing soil fertility is a very liberal application of barnyard manure. At least 10 tons per acre should be applied.

Applying commercial fertilizers is a common practice with sugar beet growers and it is usually a profitable one. Before applying a commercial fertilizer, it is advisable to consult the county agent or the state experiment station and ascertain the proper fertilizer to use. Fertilizers are most conveniently applied at the time of seeding. Drills are equipped to distribute the fertilizer in the row with the seed at planting time.

SOURCE OF SEED

The most reliable source of seed which yields a satisfactory tonnage of a high sugar content is the sugar company which contracts for the crop. Beet seed varies greatly and for this reason the companies grow their own seed. The grower should take advantage of this and not trust to unknown seed. Approximately 15 pounds of seed per acre is required and this can be had for about 15 cents per pound at the present time.

PLANTING

Planting should be done just as soon as the soil is warm and dry enough to insure quick germination. The young beet plant is sensitve to frost. Seeding in low places should be delayed until all danger of late spring frosts is past. If a large acreage is contracted, it is necessary to plant at different times so that the entire field will not require hand work for thinning and hoeing at the same time. The regulation 4-row beet drill, spacing the rows from 22 to 24 inches apart, is the most satisfactory planter. Great care is necessary in order not to plant the seed too deep. From an inch to an inch and a half, or just deep enough to get the seed into moist soil is the right depth. If too deep the plants will have difficulty in pushing their way up through the soil. For all types of soil the disk drill is more satisfactory than the shoe drill.

CULTIVATION

Just as soon as the plants appear above the surface and the rows can be distinguished, they should be cultivated. If the land is properly prepared, blind cultivation is usually not necessary; but if adverse

conditions arise, or for any reason weeds grow faster than the beets, blind cultivation should be given to check them. At least two cultivations should be given before blocking and thinning. Immediately following the thinning operation another cultivation is necessary. The cultivator should be set to throw a little loose soil which has been removed from the row in the blocking process, back to and around the plants. Subsequent cultivations must be given to control weed growth and conserve the moisture. Just before the leaves cover the ground the final cultivation should be given. It should be thoro but not deep.

Fig. 2. Thinning Sugar Beets

Blocking and Thinning

This work is usually done by contract labor supplied by the sugar company contracting for the beets, or by school children, or both. Before thinning, the beet rows are blocked by cutting out all the plants in the row with a sharp hoe, except bunches that are left 10 or 12 inches apart. From these bunches all plants but one are removed. No operation in the entire process of beet raising is more important than thinning, and the acreage of beets should not be so large that the grower can not supervise the work. This kind of work is slow and tedious and with the class of labor employed, there is a tendency to hurry through it.

The beets should be thinned about the time they have four leaves. Before this it is impossible to tell which will be the strong plants, and only the most vigorous plants should be left.

Hoeing

The cultivator does not clear the weeds close to the row, so hand hoeing is necessary. Two hoeings and sometimes three are needed. About twice as much time is required to hoe an acre of sugar beets as to cultivate it.

Harvesting

Sugar beets should be harvested when they are mature. This point is not absolutely definite, but the general condition of maturity can be told rather easily. As the lower leaves become brown and all the foliage has a drooping, yellow appearance, maturity is indicated. In most sections of Minnesota beets are ready to harvest before the 20th of October. Sugar beets dug too early are low in sugar content and carry a high percentage of impurities. The sugar company reserves the right to designate the time of harvesting. This is done to insure a high quality of beets and to accommodate the capacity of the factory by regulating the time of delivery. Harvesting can not be delayed until the time of freezing weather or the crop will be frozen in the ground.

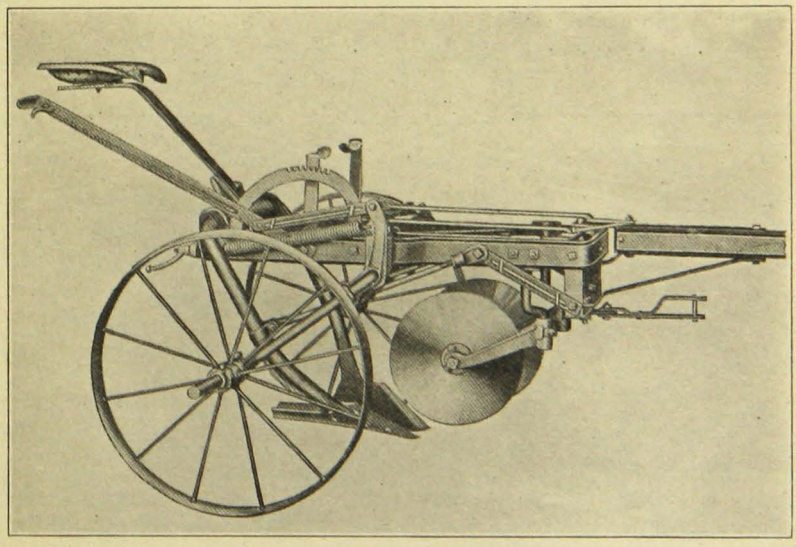

Fig. 3. Two-Blade Riding Beet Lifter

Digging involves two processes, lifting and pulling. Lifting is done by the grower most economically with the two-blade riding beet lifter. The beets are lifted slightly and left standing in the loose soil. After the beets are lifted in this way, they are pulled by hand and thrown into piles for convenience in topping. The piles are about a rod apart

and contain the beets from twelve rows. As the beets are pulled the loose dirt is removed by knocking two together. If the beets are thrown into the pile with the tops in one direction they are more easily topped.

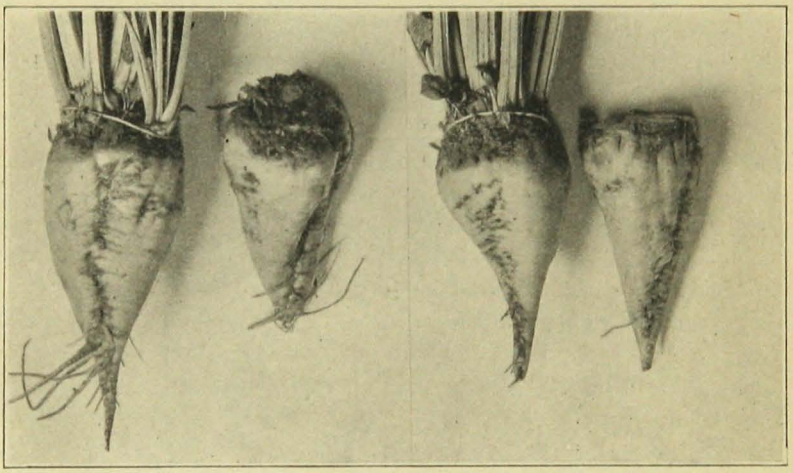

Fig. 4. Topped Beets
At left, topping poorly done. At right, cut made at proper place.

TOPPING

Topping sugar beets is an important operation and it is of mutual benefit to the company and to the grower that it be properly done. The cut should be made at the base of the lower leaves. The crown is low in sugar content and high in salts which makes sugar purification

Fig. 5. Topping and Piling Beets

difficult. If the cut is made below this point there is considerable waste. The topped beets when thrown into piles should be covered with tops until time for hauling in order to prevent evaporation in daytime and freezing at night.

Fig. 6. A Pile of Beets with Tops Removed

ACCOMMODATIONS FOR CONTRACT LABOR

The grower must furnish a suitable dwelling place for the beet workers and it must be ready to occupy by April 15. An agreement for the hand workers usually specifies that the workers and their household goods shall be transported to and from the railroad station by the grower. All implements and tools necessary for the hand work are furnished by the grower. Contracted labor is paid a minimum wage per acre for hand work. The contracts specify $25 per acre as a minimum for 1924

Hand workers are paid $9 per acre when the beets are blocked and thinned. A second payment of $7 per acre is made when the beets have been kept clean by hand hoeing until August 15. When harvesting is completed the third payment of $9 per acre is paid, making a total of $25. In addition to this minimum the hand workers are paid 75 cents for each ton over an average yield of 9.1 tons per acre. This bonus is paid for more efficient service, contributing toward the higher yields per acre.

HAULING

Sugar beets may be hauled to the station in a regular wagon box, but to eliminate the labor of unloading by hand a rack should be arranged which turns on an axis to dump out the beets. Where elevated dumps are provided, the load, which has been weighed, is dumped directly into the car or into a hopper for recovering the loose dirt. From the hopper the beets pass through a revolving screen to remove the dirt, which is collected and weighed. This tare is deducted from the original weight of the load. In many sections of Minnesota loading conveniences are not yet established. This entails different methods of computing the dirt dockage. The most common method is to remove the dirt from a small representative sample and determine the percentage of the load which is tare. This work is usually done by experienced tare men.

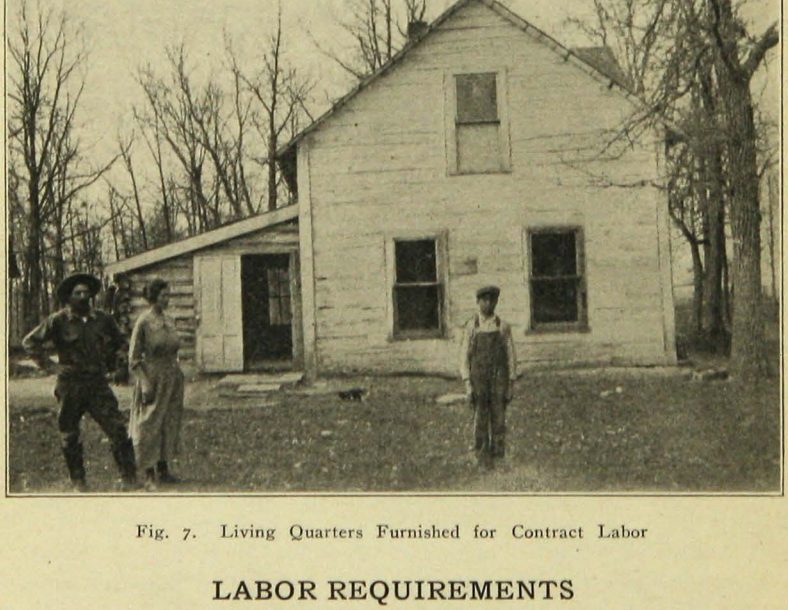

Fig. 7. Living Quarters Furnished for Contract Labor

LABOR REQUIREMENTS

Labor is by far the greatest single item in the cost of producing sugar beets. One acre requires approximately ten times as much man labor as wheat, five times that for corn, and two and one-half times that for potatoes. The horse labor needed is about six times the amount necessary for one acre of wheat and more than twice as much as for corn. For this reason, man and horse labor are presented in hours per acre, to make clear that which is necessary on the average

for each single operation as well as the total amount for the crop. To ascertain the cost of labor, the hours (being comparatively constant each year) are multiplied by the prevalent wage rate per hour for any single year.

From a study of 164 farms it was found that this crop required 155.4 man hours per acre. Of this amount 103 hours were given to thinning, hoeing, pulling, and topping, which was usually done by contract labor. The man labor performed by the grower required 52.4 hours, amounting to $11 per acre at 21 cents per hour. The horse labor, which was 110.7 hours per acre at 11 cents per hour, amounted to $12.17 per acre. This is a total labor cost to the grower of $23.17 per acre, except the cash payment for hand labor. Contract labor is being paid a minimum of $25 per acre with the bonus of 75 cents for each ton above an average yield of 9.1 tons per acre. This brings the total minimum labor cost to $48.17 per acre. At $25 per acre, experienced hand laborers realize more than 21 cents per hour.

Table 1. Labor Requirements for Producing Sugar Beets*

Operation	When performed	Hours per acre		Labor cost per acre		Total cost per acre
		Man	Horse	Man	Horse	
Manuring	Summer and fall	9.9	21.7	$2.08	$2.39	$4.47
Plowing	Fall	4.4	13.1	0.92	1.44	2.36
Disking	April and May	2.3	8.2	0.48	0.90	1.38
Harrowing	April and May	1.1	2.9	0.23	0.32	0.55
Planking	April and May	0.9	2.1	0.19	0.23	0.42
Seeding	April 25-May 30	1.3	2.6	0.27	0.29	0.56
Cultivating	May 25-August 10	11.1	17.2	2.33	1.89	4.22
Blocking and thinning	June	44.2	....	9.28	....	9.28
Hoeing	June and July	21.0	....	4.41	....	4.41
Pulling and topping	October	37.8	....	7.94	....	7.94
Lifting	October	3.5	6.7	0.73	0.74	1.47
Hauling	October and November	17.9	36.2	3.76	3.98	7.74
Total		155.4	110.7	32.63	12.18	44.80
Cost of hand work done by contract		103.0	....	21.63	....	21.63
Net cost of labor performed by grower		52.4	110.7	$11.00	$12.18	$23.17

* Man hours, 21 cents per hour. Horse hours, 11 cents per hour. Minn. Agr. Exp. Sta. Bul. No. 154, p. 21.

COST OF PRODUCTION

Eighty per cent of the total cost of producing sugar beets is the labor cost. It is apparent that the profit from this crop is largely dependent upon the supply of cheap labor.

Table 2. Estimated Cost of Producing Sugar Beets

	Cost per acre	Per cent of total cost
Grower's man labor	$10.99	18.26
Grower's horse labor	12.18	20.24
Contract labor (1924 minimum)	25.00	41.54
Seed, 15 pounds at 15 cents	2.25	3.74
Fertilizer	2.25	3.74
Land rental charge	7.50	12.48
Total acre cost	$60.17	100.00

The labor cost of $48.17 per acre, with $7.50 paid for the use of land (which is thought to be a fair charge), $2.25 for seed, and $2.25 for fertilizer, makes the total cost of production $60.17 per acre.

Table 3. Estimated Returns for Sugar Beets

Value of crop per acre and to grower with an average yield of 10 tons				
Yield	Price	Acre value	Cost of production	Returns per acre*
10	$5	$50	$60.17	−$10.17
10	6	60	60.17	− 0.17
10	7	70	60.17	+ 9.83
10	8	80	60.17	+ 19.83
10	9	90	60.17	+ 29.83
10	10	100	60.17	+ 39.83

* A minus sign indicates loss, a plus sign, profit.

An average yield of 10 tons per acre at $6 per ton is necessary to pay the cost of production. The producer will lose $10.17 per acre, with a 10-ton yield, if paid only the guaranteed price of $5 per ton. In 1923 the price of sugar was such that the companies were able to pay the growers approximately $10 per ton. This resulted in a profit of $30 to $40 per acre with an average yield of 10 tons per acre.

BY-PRODUCTS

Sugar beet tops may be used to advantage as a stock food and should not be allowed to go to waste. Beet tops should be fed green from the field or put into a silo. Dried tops are not palatable. About two tons of dry matter per acre of tops is secured from a good yield of sugar beets.

Beet pulp, the residue after the sugar has been extracted, is also a valuable stock food. It is advisable to take into account the cost of securing beet pulp to determine if the value in comparison with hay, silage, or the root crops justifies its use.