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## The Sugar Beet

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SOUTH DAKOTA  
*Farman Lloyd Mulford,*

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AGRICULTURAL COLLEGE  
AND  
EXPERIMENT STATION,  
BROOKINGS, SOUTH DAKOTA.

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DEPARTMENTS OF AGRICULTURE AND CHEMISTRY

THE SUGAR BEET.

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OFFICERS OF THE

# Experiment Station.

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Any resident of South Dakota can have the bulletins of the Station mailed to him free by addressing a request to the Director at Brookings, South Dakota. Back numbers cannot generally be supplied.

Correspondence is invited upon any question relating to farm interests. Questions relating to farm crops or stock should be addressed to Professor Foster; questions relating to tree culture or to gardening should be addressed to Professor Keffer; questions relating to insects should be addressed to Professor Orcutt; questions concerning the chemical composition of soils or waters should be addressed to Professor Shepard, and questions about the diseases of animals and their treatment should be addressed to Dr. Cary, all at Brookings, South Dakota

LEWIS McLOUTH, Director

## Departments of Agriculture and Chemistry.

LUTHER FOSTER, AGRICULTURIST.

JAS. H. SHEPARD, CHEMIST.

### THE SUGAR BEET.

The Station has completed its second season's test of the sugar beet, and the result gives us still better evidence of its crop value to South Dakota both for stock feeding and sugar making. While the crop was not as great either in percent of sugar or yield of roots per acre as may reasonably be expected in more favorable seasons, or by following more strictly the French and German methods of fertilizing and cultivating, it was still sufficiently large to insure it a profitable crop even under the opposing influences of the past season.

PREPARATION OF SOIL.—In the whole matter of soil preparation, fertilizing and cultivating, nothing has been attempted that is not within the reach of the ordinary farmer, and our results are no better than he may reasonably expect. In mechanical preparation the soil was almost perfect for such a crop, the ground having been deeply plowed and thoroughly pulverized. The results of long continued experiments in beet growing countries indicate an average depth in plowing of from twelve to fifteen inches to insure the largest and best yield. Deep plowing prevents forking; it also provides a depth of mellow soil sufficient for the growth of the root entirely beneath the surface. Where beets grow partly above the soil the protruding portion becomes tinted, and requires extra work in clarifying the sugar. Fall is the best time for plowing. It leaves a rough uneven surface to weather, catch moisture and settle. The final preparation should be made at planting time, avoiding any plowing or deep stirring that would cause a loss of the accumulated moisture of the winter. Thorough preparation before planting is of prime importance. Any neglect here will be a source of frequent annoyance and delay throughout the season of planting and cultivation. The clod-crusher and roller will greatly assist in this work.



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**FERTILIZING.**—The ground used for the experiment had received a heavy coat of well rotted manure last year and was in excellent condition to nourish this season's crop. It is a fact well established by beet growers that a too abundant supply of stable manure lessens the percent of sugar. This results from a period of growth too rank and too much prolonged. To produce sugar the growth must be arrested in time for complete maturity. The dry, clear weather of this climate is favorable to this result. Stable manure should be applied and plowed under in the fall and not more than fifteen tons per acre used.

**PLANTING.**—Experience has taught that the method of planting is of vastly greater importance than is ordinarily considered. It has been shown that not only the yield per acre but also the percent of sugar depends largely on the manner of planting. Thin planting—rows wide apart and plants well separated from each other in the row, gives beets of the largest size but containing a small percent. of sugar, while the largest yield per acre both in percent of sugar and quantity of beets is obtained from the thickest planting,—rows narrow and beets close together in the row. In Dakota the high price of hand labor and cheapness of land would place the limit of thick planting to that width of row that can be easily cultivated with horse implements. That limit has been placed at twenty inches, but even twenty-four inches seems quite narrow for most of our single cultivators. Our planting in most cases has been made in rows thirty inches apart with the plants thinned to eight inches apart in the row. One-half more plants can be grown with rows only twenty inches apart, and with almost a half greater yield in pounds and a decidedly larger percent of sugar. Our thickest planting was made in rows fourteen inches apart with plants thinned to six inches apart in the row. This planting produced beets smallest in size but uniformly richest in percent of sugar. It is generally admitted that the saccharine richness is inversely proportional to the volume of the beet and that close planting gives beets of richer, better quality, of larger yield in weight and percent of sugar and at the same time exhausts the soil less.

The past season's planting was done the tenth day of May by hand. The furrows were made with an ordinary hand marker to whose runners had been attached small triangular pieces of wood to deepen and widen the marks. The furrows were one and one-half inches deep; in these the seeds were drilled with a garden seeder and covered with the hoe, the covering being well firmed to make it hold the moisture. The porous shell encasing the seed makes an extra amount of moisture necessary to reach the real seed within and cause it to grow. In this dry climate care should be taken to put the seeds down fully an inch and a half in order to secure the moisture needed to start them. Garden seed drills when used for planting should be in the hands of skillful operators to insure satisfactory results. Hand-planting has resulted best in our work.

Germination may be hastened by soaking the seeds in hot water for twenty-four hours just before planting. They can easily be made

dry enough to plant with a machine by rolling them in plaster or dry soil.

**VARIETIES PLANTED.**—The following is a list of the varieties planted with the names of the firms from which the seeds were purchased and the price paid for them per pound. When planted with a drill from six to ten pounds per acre will be required, the amount depending upon the distance the rows are placed apart. Imperial, Silisian and red-top were furnished by D. Landreth & Sons, Philadelphia, at 40 cts. per pound. Vilmorins imperial, Lane's improved and white sugar came from J. C. Vaughan, Chicago, the first at 60 cts. and the others at 40 cts. per pound. Salzer's imperial and sweet white, John A. Salzer, of La Crosse, supplied at 20 cts. per pound.

In some instances the varieties are the same, no doubt, with different names.

**CULTIVATION.**—Early cultivation will kill the weeds at starting and form a layer of mellow earth which constitutes an obstacle to dryness.

The loosened layer acts as a mulch and tends to keep the soil below cooler while it prevents the water from reaching the surface to be evaporated.

The crop of the past season was twice hoed and four times cultivated. The implement used for the latter was an adjustable spring-tooth cultivator. This work began soon after the plants were up and continued until the middle of July.

**THINNING.**—This work can best be done just after a rain. The plants should be thinned to the proper distance in the row before the roots begin to develop. Where the planting is done with a drill, a sharp hoe may be used for thinning. The cutting must be deep enough to prevent any after growth of the roots cut off. In case the extra plants are pulled out, care should be taken not to loosen those that remain standing and thus check their growth. If the weather is favorable at the time of thinning the blank places may be filled in by transplanting, but the roots of the latter are usually found in several divisions instead of a single tap root.

**HARVESTING.**—The crop should be pulled and stored in the root cellar or put in piles convenient for covering in the field before there is any danger of injury from freezing. In this respect they require more attention than other root crops. A temperature low enough to freeze the surface of the ground will destroy their keeping qualities. Beets injured in this manner should be fed out at once that they may not be an entire loss. Though the injury may seem at first very slight experience has shown us that they soon become spongy, then turn black and finally rot. The usual plan of twisting off the tops as the beets are pulled has proven in our experience the safest and most economic method. While turnips, rutabagas and carrots are not materially injured for keeping by having the root cut or broken, a beet so injured is apt to decay when stored.

**STORING.**—Sugar beets and mangels require the same treatment in storage.



They should be placed in cool, moist cellars, making the piles not to exceed four feet in depth. In our dry Dakota cellars it is best to cover with damp earth to keep them from wilting. This will also help to protect from freezing. The dirt must be put directly on the beets, no straw or litter of any kind intervening. In this way we have kept them in the best condition into May.

### VALUE FOR STOCK-FEEDING.

For feeding, the sugar beet and mangle are the most reliable of all the root crops. Taken as a whole they have fewer enemies and are less liable to failure than almost any other crop grown in the state.

They are less liable to disease than either rutabagas or turnips, and less easily affected by drouth. They also surpass them for feed-in percent of digestible nutrients. When the feeding value of one hundred pounds of sugar beets is nineteen cents, that of one hundred pounds of rutabagas is fifteen and of turnips only eleven cents.

When properly stored they keep in good condition for feeding longer than any other root crop, under favorable circumstances keeping clear through the feeding season until the grass is ready to pasture in the spring. Both the feeding and keeping qualities depend upon complete maturity. Bulk of crop is not the only thing to be sought, neither are roots of unusually large size desirable. For the most satisfactory results in feeding, seek rather the weight in many roots of medium size perfectly ripened. Roots can not be relied on to supersede either hay or grain, but by being fed with them they greatly increase the value of both. Their succulence makes them an excellent stomach regulator, preventing the constipation that frequently comes from the continued use of dry foods. It is this quality, too, that makes them of special value to the dairyman for keeping up the flow of milk. They replace to a large degree the green succulent food of summer. All the stock on the farm relish sugar beets in winter. Sheep do excellently on them, and the greater part of their winter's supply of food may come from this source. A quantity should always be kept for ewes that vean their lambs before the grass starts. It should be noted, however, that for some time before the lambs come the ewe's ration of roots should be small since it is generally conceded that a full supply at this time has a tendency to produce abortion.

Hogs kept through the winter for breeding purposes should have a daily allowance of cut or pulped beets in connection with their dry food. They can thus be more economically kept, and they come through the winter healthier and in every way better prepared to farrow and raise their pigs. In all cases the roots fed should be cut into pieces small enough to prevent choking. A spade may be used for this purpose, but a root cutter is more convenient and does the work better and much more rapidly.

The beets were analyzed the last week in October. All the samples were in good condition. Samples 10, 11 and 12 were of the same variety, and were planted in different widths of rows and at different

# AND U. S. EXPERIMENT STATION.

distances apart in the row. No. 11 was planted in rows 30 inches apart and thinned to eight inches. No. 11 was thinly planted and No. 12 was planted very thickly. From an inspection of the table which follows it will be seen that the sugar yield depends largely on the manner of planting, other things being equal. It will also be interesting to compare the yield of sugar with the size of the beets:

## SAMPLE 8.—FOUR BEETS TAKEN.

Weights—

No. 1, 0 lbs 12oz. No. 2, 1 lb  $\frac{3}{4}$ oz. No. 3, 1 lb 10 $\frac{3}{4}$ oz. No. 4, 2 lbs 2 $\frac{1}{2}$ oz.

## SAMPLE 9.—FOUR BEETS TAKEN.

Weights—

No. 1, 0 lbs 10 $\frac{3}{4}$ oz. No. 2, 2 lbs 4 $\frac{1}{4}$ oz. No. 3, 2 lbs 10 $\frac{1}{2}$ oz. No. 4, 2 lbs 14 $\frac{3}{4}$ oz.

## SAMPLE 10.—FOUR BEETS TAKEN.

Weights—

No. 1, 0 lbs 11 $\frac{1}{2}$ oz. No. 2, 1 lb 5 $\frac{1}{2}$ oz. No. 3, 2 lbs 12oz. No. 4, 3 lbs 13 $\frac{3}{4}$ oz.

## SAMPLE 11.—FOUR BEETS TAKEN.

Weights—

No. 1, 2 lbs 13oz. No. 2, 4 lbs 13oz. No. 3, 7 lbs 15 $\frac{3}{4}$ oz. No. 4, 15 lbs 8 $\frac{1}{2}$ oz.

## SAMPLE 12.—FOUR BEETS TAKEN.

Weights—

No. 1, 1 lb 1 $\frac{3}{4}$ oz. No. 2, 1 lb 8 $\frac{1}{4}$ oz. No. 3, 1 lb 14 $\frac{3}{4}$ oz. No. 4, 2 lbs 7 $\frac{3}{4}$ oz.

## SAMPLE 13.—FOUR BEETS TAKEN.

Weights—

No. 1, 1 lb  $\frac{3}{4}$ oz. No. 2, 1 lb 15 $\frac{1}{2}$ oz. No. 3, 3 lbs 4 $\frac{1}{4}$ oz. No. 4, 5 lbs 4 $\frac{1}{2}$ oz.

## SAMPLE 14.—FOUR BEETS TAKEN.

Weights—

No. 1, 0 lbs 9 $\frac{1}{2}$ oz. No. 2, 1 lb 6oz. No. 3, 2 lbs 2oz. No. 4, 3 lbs 14 $\frac{1}{2}$ oz.

## SAMPLE 15.—FOUR BEETS TAKEN.

Weights—

No. 1, 1 lb 2 $\frac{1}{2}$ oz. No. 2, 1 lb 13oz. No. 3, 2 lbs 7oz. No. 4, 4 lbs 7 $\frac{3}{4}$ oz.

## SAMPLE 16.—FOUR BEETS TAKEN.

Weights—

No. 1, 0 lbs 15 $\frac{1}{4}$ oz. No. 2, 2 lbs 3 $\frac{1}{4}$ oz. No. 3, 2 lbs 9 $\frac{3}{4}$ oz. No. 4, 5 lbs 12 $\frac{1}{4}$ oz.

## SAMPLE 17.—FOUR BEETS TAKEN.

Weights—

No. 1, 0 lbs 13 $\frac{3}{4}$ oz. No. 2, 0 lbs 15oz. No. 3, 1 lb 13 $\frac{3}{4}$ oz. No. 4, 2 lbs 14oz.

In selecting samples for analysis, twelve beets of each variety were sent to the laboratory. These ranged from the smallest to the largest average beet which the variety afforded. At the laboratory four piles were made and from each pile an average beet was taken, thus securing a fair representation for each sample.

In obtaining the degree Brix, the pulp was placed in a canvas bag and the juice was forced out by hand. No press was available.



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Station No. of Sample.	Name.	Per cent. of stand.	Yield per acre. (lbs.)	Per cent sucrose	Density of juice (Brix).	Per cent marc.	Condition of pulp.
8	Silesian.....	75	23600	10.0	14.2	3.76	Dry.
9	White.....	94	27900	8.2	12.4	3.00	Somewhat dry.
10	Lane's Improved (ordinary planting)...	88	31200	10.2	15.3	3.56	Somewhat dry.
11	Lane's Improved (thinly planted)....	50	14840	5.4	10.4	3.12	Moderately dry.
12	Lane's Improved (thickly planted)....	50	16680	9.9	15.2	3.63	Dry.
13	Red Top.....	75	23850	10.2	15.1	3.85	Dry.
14	Imperial.....	67	15320	9.9	14.0	3.94	Dry.
15	Vilmorins Imperial.....	75	25400	12.3	17.4	4.10	Dry.
16	Salzer's Imperial.....	88	29070	11.0	14.6	3.27	Moderately dry.
17	Sweet White.....	63	32500	11.2	15.6	3.91	Dry.

Again hope is expressed that farmers will raise small quantities of the sugar beet. All samples delivered at the Station laboratory will be analyzed free of charge.