

South Dakota State University
**Open PRAIRIE: Open Public Research Access Institutional
Repository and Information Exchange**

Bulletins

South Dakota State University Agricultural
Experiment Station

2-1899

Sugar Beets in South Dakota

J.H. Shepard

South Dakota Agricultural College

W.H. Knox

South Dakota Agricultural College

Follow this and additional works at: http://openprairie.sdstate.edu/agexperimentsta_bulletins

Recommended Citation

Shepard, J.H. and Knox, W.H., "Sugar Beets in South Dakota" (1899). *Bulletins*. Paper 62.
http://openprairie.sdstate.edu/agexperimentsta_bulletins/62

This Bulletin is brought to you for free and open access by the South Dakota State University Agricultural Experiment Station at Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. It has been accepted for inclusion in Bulletins by an authorized administrator of Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. For more information, please contact michael.biondo@sdstate.edu.

(So. DAK. BUL. No. 62.)

February, 1899.

Bulletin 62.

U. S.
EXPERIMENT STATION
SOUTH DAKOTA.



IN CONNECTION WITH THE
SOUTH DAKOTA AGRICULTURAL COLLEGE.

SUGAR BEETS IN SOUTH DAKOTA.

DEPARTMENT OF CHEMISTRY.

BROOKINGS, SOUTH DAKOTA.



SIoux FALLS, S. D.
WILL A. BEACH, PRINTER AND BINDER.
1899.

GOVERNING BOARD.

REGENTS OF EDUCATION.

HON. H. H. BLAIR, Pres.....	Elk Point
HON. M. F. GREELEY.....	Gary
HON. R. W. HAIRE, Sec'y.....	Aberdeen
HON. L. M. HOUGH.....	Sturgis
HON. F. A. SPAFFORD.....	Flandreau

STATION COUNCIL.


DR. F. A. SPAFFORD, Regent Member.
JNO. W. HESTON, President of College.

JAS. H. SHEPARD, Director.....	Chemist
E. C. CHILCOTT, Vice Director.....	Agriculturist
D. A. SAUNDERS.....	Botanist
E. L. MOORE.....	Zoologist
N. E. HANSEN.....	Horticulturist
E. A. BURNETT.....	Animal Husbandry

A. M. ALLEN, Secretary and Accountant.

ASSISTANTS.

A. B. HOLM.....	Soils
W. H. KNOX.....	Chemistry
S. A. COCHRANE.....	Irrigation
F. G. ORR.....	Librarian

 Any farmer of the state can have the Bulletins of this Station free upon application to the Director.

SUGAR BEETS IN SOUTH DAKOTA FOR THE YEAR OF 1898.

DEPARTMENT OF CHEMISTRY.

JAMES H. SHEPARD,
Chemist.

W. H. KNOX,
Assistant.

SEASON OF 1898.

At the close of the work for 1897 it became evident that no further progress could be made in determining the saccharine strength of beets grown in this state. The results were all that could be desired in every way. It was suggested, however, by factory builders and intending investors that the securing of commercial data was necessary. It was suggested that our next need was to ascertain the cost per acre of producing the beets, and also to determine the tonnage from large plats where the beets were all harvested and weighed, in order that commercial conditions might be obtained.

At the same time Dr. H. W. Wiley, Chief Chemist, United States Department of Agriculture, suggested the same line of work for this Station to follow. Also, since the sugar beet investigation for the United States had been placed in his charge he offered to furnish us with the necessary seed and to give any other assistance in his power. Urged by these considerations, this Station again resumed the experiments with sugar beets. It was deemed best to confine the work to a few localities rather than to send the seed promiscuously over the State. Preferably those localities were selected which had been making efforts towards securing sugar factories.

In pursuance of this policy five points were selected, viz., Aberdeen, Huron, Yankton, Sioux Falls, and Brookings. Committees were selected in each locality and advised to organize and to make united efforts to obtain the commercial data required. In each place the committee elected a president and secretary, and entered upon the work with hearty good will. The seed furnished to this Station by the Department of Agriculture, through the kindness of Dr. Wiley, was distributed to these different committees. Instructions for preparing the ground, sowing, cultivating, and thinning were furnished to the committees. It was the intention of the writer to visit these different stations during the season. He was able to inspect the plats grown at three of them. The committees were urged to obtain photographs and to make their data as full and explicit as possible, since it was the expectation to discontinue this work at the close of the present season. Photographs of some of the plats grown have been secured and will appear in their appropriate places in this Bulletin.

The instructions sent out were quite full and complete, varying but little from those issued in previous years. It was urged upon the committee, however, that the seed should be sown thickly; the rows 20 inches wide, and the beets were to be thinned to a distance of from 6 to 8 inches in the row. This would make closer culture than we have heretofore been able to secure. In all probability, this is rather closer than beets should be grown in average seasons in this State. In most instances the instructions were adhered to faithfully, and the result has been that we have secured a fine crop of beets richer in saccharine strength than any heretofore produced, but, as might be expected, the tonnage has been somewhat diminished. In all probabilities it would more nearly meet commercial conditions to have the beets thinned from 8 to 10 inches. This will be especially true provided contracts are let at a flat rate per ton. But, owing to the difficulties previously encountered of having the beets grown too far apart, by way of precaution, it was deemed

best to have the standard for cultivation set rather closer than it should be since there is a natural tendency, on the part of the farmer, to grow the beets too far apart. The beets grown have been of medium size, very finely formed, crisp and brittle. In fact, a majority of them would have been suitable for seed production. The results obtained are gratifying in the extreme, since the size of beet, that may be grown in this State is simply enormous. Specimens have reached this Station, from all parts of the State, at various times, ranging from 5 to 16 pounds each. Also in our own work we have demonstrated that wherever the beets were thinned to greater distances in the row they grow to an enormous size.

Taking all things into consideration, it would seem then that we have reached the limits of useful experimentation. The samples received at the Station this year were more satisfactory than those received in previous years. In fact, in one or two instances only, were parties requested to send a second sample. There is one thing concerning the sampling which should be taken into consideration, and that is, they were not selected by experts, but selected by the farmers themselves who certainly had no means of judging their richness and fitness for sugar making purposes. The following instructions were sent to each grower:

“DIRECTIONS FOR SUGAR BEET CULTURE, 1898.

SELECTION OF THE GROUND.

1. A high, level, well drained, sandy loam will be the best. The land selected should have a clayey subsoil. Sandy or gravelly subsoil is objectionable since if it is high it will dry out, and if low it will furnish too much water to the beets late in the fall. Since most of our plowing must be done this spring, it is advisable to choose land that was kept as clean and free from weeds last year as possible. It is of prime importance that the best land available should be chosen for this year's plats. Use no fertilizers this year.

PLOWING THE LAND.

2. The land must be plowed with an ordinary plow 8 inches deep, which is followed by a subsoil plow 6 inches deeper, making 14 inches in all. In case a "Secretary" plow is used, the plowing and subsoiling can be accomplished in one operation. Nothing short of this deep plowing will answer. Otherwise the sugar beets will be obliged to grow above ground. All that portion growing above ground is useless for sugar making and is cut off and rejected when the beets are topped. If the seed-bed is deep enough, only a small portion of the crown will appear above ground.

FIRMING THE SEED-BED.

3. When sugar beet culture is fairly established in this State, it will be necessary to plow and subsoil the land in the fall in order that the rains and snows may pack the soil back again until it is solid and firmed. If the bed is not thoroughly packed the surface of the soil will lose capillary connection with the ground below, and thus dry out. The seeds will not germinate, or if they do, the beets will make a sickly growth. It will be necessary in this year's trials to plow most of the plats this spring. The seed bed can be properly firmed by much dragging, rolling, planking, etc. The more the team is driven over the plat, the better the bed will be firmed by the tramping of the horses; in fact the tramping it receives from the horses' feet is one of the most efficient ways of packing. The harrow fines and pulverizes the soil, which is absolutely essential. If the roller is used it will be necessary to drag again lightly before sowing the seed. Too much stress cannot be laid upon thoroughly firming the seed-bed. It should be so solid that a man sinks in very little when walking across it.

SOWING THE SEED.

4. In this year's test the seed must be sown thickly with a garden drill at the rate of from 18 to 20 pounds per acre. It is necessary that the beets come up very thickly in the rows in order that a full and perfect stand may be obtained. If this be neglected the beets will grow too large, the sugar content will be low, and the juice will be loaded down with impurities which will unfit the beets for sugar making.

The width of the rows should be as small as possible, while still permitting the use of horse cultivation. Heretofore all of our plats have been sown 22 inches apart, owing to the fact that heavy draft horses required about that much room to walk in. From experiments made at this Station, we have found, however, that a careful Percheron horse can walk in a 20 inch row, consequently, we shall insist that the rows in this year's test shall all be made 20 inches apart. I am satisfied that our State average in the past year was reduced from 2 to 3 per cent. owing to the wide rows used by experimenters. Sow not later than May 7th.

CULTIVATING AND THINNING THE BEETS.

5. As soon as the beets come through the ground, in case weed seeds begin to grow, go over the plat with a wheel hoe, fitted with weed cutters. Cut rather close to each row. When the young beets have each obtained four good leaves, go over each row again in the same way; then use a hoe with a 4-inch blade. With this hoe go over each row and cut most of the extra beets, leaving small blocks of beets two inches square. After the plat has been blocked, go over each row by hand removing all the weeds and beets from each block, excepting the strongest and healthiest plant growing therein. In this way the beets will be thinned to from six to eight inches in the row. This will leave each beet from 120 to 160 square inches of ground for its own use. More room than this for each beet is a positive damage, resulting in low purity co-efficient and low sugar content. This close growing is one of the principal factors of successful sugar beet raising. Too much stress cannot be laid upon it.

CUT WORMS AND INSECT ENEMIES.

6. In case cut worms prove troublesome, it may be difficult to save the plat. There is nothing better to be done than to mix dry bran and Paris green and sow it at a shallow depth between the rows with the same drill used in planting the sugar beet seed. In case the grey beetles begin to eat the leaves, the plants must be sprinkled with a very weak solution of Paris green, not so strong as usually applied to potatoes. One teaspoonful of Paris green to a pail of water will be about right.

CARE OF THE PLAT DURING THE SEASON.

7. The plats must be kept perfectly clean with a wheel hoe or a shallow working horse cultivator. The beets are not to be hilled up but the ground is to be worked somewhat toward the beet, leaving the row slightly hollow in the center. About the middle of July, or soon after, the leaves will cover the ground and the plat will require no further attention until harvesting.

SAMPLING.

8. No samples of beets are to be taken from the plats until further instruction is received from this Station. It may be that several samples will be required from a plat this year in order to ascertain the exact time of ripening. In all cases franks will be sent to the grower, which will allow the beets to be sent free by mail.

HARVESTING.

9. When the grower receives notice to harvest, and the beets must not be harvested until word is received from this Station, a furrow is to be plowed close to a row with an ordinary plow. The beets can then be pulled out by means of the tops. Two weights will be required.—First, the weight of the beets and tops. Second, the weight of the beets after topping. The topping is performed by means of a large, sharp knife, making a single, clean cut through the neck of the beet, cutting off that portion which grew above ground. All the beets harvested from each plat this year must be accurately weighed and the ground must be accurately measured in order to obtain results which are thoroughly reliable."

At harvest time the following circular was sent to each grower:

Special Bulletin, October, 1898.

"DATA ON SUGAR BEET CULTURE, 1898.

"In the Sugar Beet Experiment for 1898 the aim is to collect typical data which shall be valuable and convincing to intending investors in Beet Sugar Factories. This will call for better work than has ever been done before. No guess work of any kind will be acceptable. Exact facts only are to be reported. The data required are as follows:

1. Character of soil—geological and otherwise.
2. Value of soil per acre, at market rates.
3. Cost of plowing and subsoiling.
4. Cost of preparation of soil for planting.
5. Cost of planting.
6. Cost of thinning and cultivating, and number of times cultivated, and how.
7. Cost of harvesting and topping.
8. Estimated cost of delivering beets to a factory at a distant of not more than six miles, or at a railway station at a distance of not more than six miles.
9. Exact area under cultivation, (measured).
10. Exact weight of beets cultivated, tops and all, (weighed).
11. Exact weight of beets after removal of the tops, (weigh).
12. General observations on the weather from week to week.
13. Location of plat.
14. Name of grower.
15. P. O. Address.
16. Date of plowing.
17. Date of planting.
18. Date of harvesting.
19. Width of rows.
20. Distance between beets in row.
21. How was seed bed firmed?

NOTE: *Wages of the farmer and his team should be charged at the regular market price.*

"DIRECTIONS FOR TAKING SAMPLES OF SUGAR BEETS FOR ANALYSIS.

"Select two or three average sized beets, wrap each one in a paper and place them in a sack. The beets chosen for analysis must come from a place in the row where the stand was perfect with a perfect stand on each side. Now fill out the blank on this sheet, place it in an envelope and place in the sack with the beets. Tie up the sack, attach the enclosed mailing tag and forward by mail. No postage is required. The package must not weigh over FOUR POUNDS or it will not be received at the postoffice."

In regard to the data obtained, it is but just to say that they have been in most cases satisfactory. There have been a few growers in each locality who failed to complete their reports, consequently, these plats have been omitted. This failure to report was not due to the fact that the crop failed. In fact, some of the plats personally visited by the writer and found to be most excellent in stand and other particulars are the ones from which no reports were obtained. It seems that in the press of work at the very last, when it came time to harvest the beets, the farmers preferably gave their first attention to crops which would give them cash returns. This is not surprising however since all experimenters carrying on co-operative work with farmers have had just such experiences before. As an example, I will state that one farmer did his work most excellently, raised a very fine crop of beets with a high percentage of sugar; harvested them; topped them; and weighed them carefully, and then lost his weights.

All who have sent in reports agree that another year, on a larger scale, they could produce the beets at a less cost per acre. We found this true in many respects on our home plat. For instance, the thinning on the last half acre cost us one half less than on the first half. This was because the boys became more expert in thinning and the blockers more expert with the hoe. The same thing was true with many plats in regard to topping the beets. Three or four blows were used to cut off the tops, where one should suffice; and so examples might be multiplied indefinitely. Two items in the cost of production have been added at this office, viz., the interest on the land and the cost of seed. The interest on the land has been reckoned at 6 per cent. on the acre valuation, while the cost of seed has been assumed arbi-

trarily, viz., 20 pounds per acre at 15 cents per pound, making \$3.00 per acre. The seed sown was of the original Kleinwanzlebener type, grown by Dippe Bros., Quedlinberg. It has proven to be a most excellent variety for this state. One or two plats of Vilmorin seed were also sown. These will be noted in the appropriate places.

The reports from the several sections follow:—

ABERDEEN.

The committee appointed to take charge of the sugar beet work in Aberdeen elected Mr. William R. Tennant, President, and S. W. Narregang, Secretary. Mr. Narregang has been identified for a number of years with sugar beet experiments and has taken a keen interest in all of this work. It is largely due to his efforts that the fine showing of the present and past years have been made in the vicinity of Aberdeen. In this vicinity, as in Sioux Falls, it was impossible to obtain reports from all the experimenters which are complete and satisfactory; but, considering the fact that the farmers were busy with their fall work and that they were unaccustomed to the work, and that help was scarce last fall, the reports obtained may be considered satisfactory and typical.

PLAT NUMBER I.

Plat No. 1 was grown by Thomas E. Williams, Plana. The area was one-fourth acre. While the land is rolling, this Plat was situated on rather low ground. It was plowed May 16th. Seed was planted late, May 23rd, and the beets were harvested October 31. The rows were 20 inches wide with the beets from 5 to 8 inches in the row. Mr. Williams firmed the seed bed by dragging seven or eight times and rolling with a log roller. The cultivation was all done by hand, using a Planet Jr. wheel-hoe. The soil was valued at \$20 per acre.

Mr. Williams gives the cost of growing as follows:—

COST PER ACRE.

Plowing and subsoiling	\$ 1 00
Preparing seed bed	25

Planting.....	50
Thinning and cultivating.....	6 00
Harvesting and topping.....	7 00
Hauling to railroad station.....	7 00
Interest and seed.....	4 20
Total.....	\$25 95

This Plat furnished beets at the rate of 14 tons per acre, analyzing 19.66 per cent sugar in the beet. At a flat rate of \$4 per ton this would make a gross income of \$56 per acre. Deducting the cost of production gives a net profit of \$30.05. On a sliding scale these beets should be worth much more than \$4, possibly from \$5 to \$6 per ton. This would increase the profit to a great extent.

The analysis follows:—

No. Beets analyzed.....	3
Av. Weight.....	377 grams.
Degree Brix.....	21.40
Sugar in juice.....	20.70 per cent
Sugar in beet.....	19.66 per cent.
Purity co-efficient.....	92.05 per cent.
Ash.....	.612 per cent.

PLAT NUMBER 2.

Plat No 2 was grown by Robert Owen. The area was 44 square rods. The soil is a sandy loam with clay subsoil and was valued at \$10 per acre. The ground was plowed May 13th, and the beets were planted May 20th, which was too late. The samples were taken Oct. 30th. The rows were 21 inches wide with the beets about 9 inches in the row. The seed bed was firmed by means of a disk harrow and a common drag. The cultivation, after thinning, was done by a horse cultivator. Mr. Owen failed to give the cost per acre of harvesting, which I have assumed at \$8.

COST PER ACRE.

Plowing and subsoiling.....	\$ 1 00
Preparing seed bed.....	75
Planting.....	75
Thinning and cultivating.....	8 00
Harvesting and topping.....	8 00
Hauling to factory.....	6 20
Interest and seed.....	3 60
Total.....	\$28 30

This plat yielded 12.4 tons per acre, analyzing 18.2 per cent sugar in the beet. At a flat rate of \$4 this would give

a gross income of \$49.60. Deducting the cost of growing would leave a net profit of \$21.30. These beets on a sliding scale ought to be worth \$5 per ton, which would leave a net profit of \$33.70.

The analysis follows:—

No. of beets analyzed.....	4
Av. Weight.....	337 grams.
Tons per acre.....	24.8
Degree Brix.....	20.50
Sugar in juice.....	19.10 per cent.
Sugar in beet.....	18.20 per cent.
Purity co-efficient.....	93.17 per cent.
Ash.....	20 per cent.

PLAT NUMBER 3

Plat No. 3 was grown by Mr. J. E. Hickenbotham on a black loamy soil valued at \$10 per acre. The ground was plowed May 11th. Seeds planted May 17th, and harvested November 3. The width of rows was 22 inches, with beets 6 inches in the row. The seed bed was firmed with a plank leveler and the cultivation was done by hand, being hoed twice. The area was one-fourth acre. Mr. Hickenbotham gives the cost per acre as follows:—

COST PER ACRE.

Plowing and subsoiling.....	\$ 1 50
Preparing seed bed.....	1 00
Planting.....	50
Thinning and cultivating.....	7 00
Harvesting and topping.....	5 00
Hauling to factory.....	22 40
Interest and seed.....	3 30
Total.....	\$40 70

This plat furnished beets at the rate of 22.4 tons per acre giving 15.9 per cent. sugar in the beet. At a flat price of \$4 per ton the gross income would be \$89.60. Deducting cost of production would leave a net profit of \$48.90 per acre. On a sliding scale these beets should be worth at least \$4.25 per ton.

The analysis follows:—

No. Beets analyzed.....	4
Av. Weight.....	337.5 grams.
Degree Brix.....	17.90
Sugar in juice.....	16.70 per cent.
Sugar in beet.....	15.9 per cent.
Purity co-efficient.....	93.3 per cent.
Ash.....	1.193 per cent.

PLAT NUMBER 4

Plat No. 4 was grown by C. N. Harris who fails to complete his report. His reply to a letter of inquiry asking to have the weight of the beets, is appended, since it is typical of replies received from others:

"Replying to your letter of the 5th, asking me to give you the weight of the sugar beets raised by me, I will say, that it will be impossible for me to furnish you with this information. I was short of help on the farm, just at the time it was necessary to harvest this crop and it was impossible to weigh them. I harvested them in small lots, just as I was able to get to them, and fed them to the hogs. After a few feeds the hogs were as fond of the beets as of corn.

Yours truly,

CHAS. N. HARRIS."

The analysis follows:—

No. beets analyzed.....	2
Av. Weight.....	975 grams.
Degree Brix.....	17.90
Sugar in juice.....	14.30 per cent.
Sugar in beet.....	13.30 per cent
Purity co-efficient.....	78.2 per cent
Ash.....	1.834 per cent

PLAT NUMBER 5.

Plat No. 5 was grown on the Irrigated Farm at Mellette under the supervision of Mr. R. S. Roe, assistant Agriculturist at this station. The ground is a black alluvial loam and is valued at \$20 per acre. The exact area was one-fifth acre. The land was plowed May 6th, seeds planted May 7th, and the beets harvested October 24th. The rows were 20 inches wide with beets 6 to 12 inches in the row with a 70 per cent stand. The ground was plowed to a depth of 8 inches and subsoiled 4 inches deeper by means of a secretary plow. This Plat is shown in Plate 1. The seed bed was firmed by a pulverizer, a harrow and a roller. Mr. Roe gives the cost per acre as follows:—

COST PER ACRE.

Plowing and subsoiling.....	\$ 4 50
Preparing seed bed.....	1 20

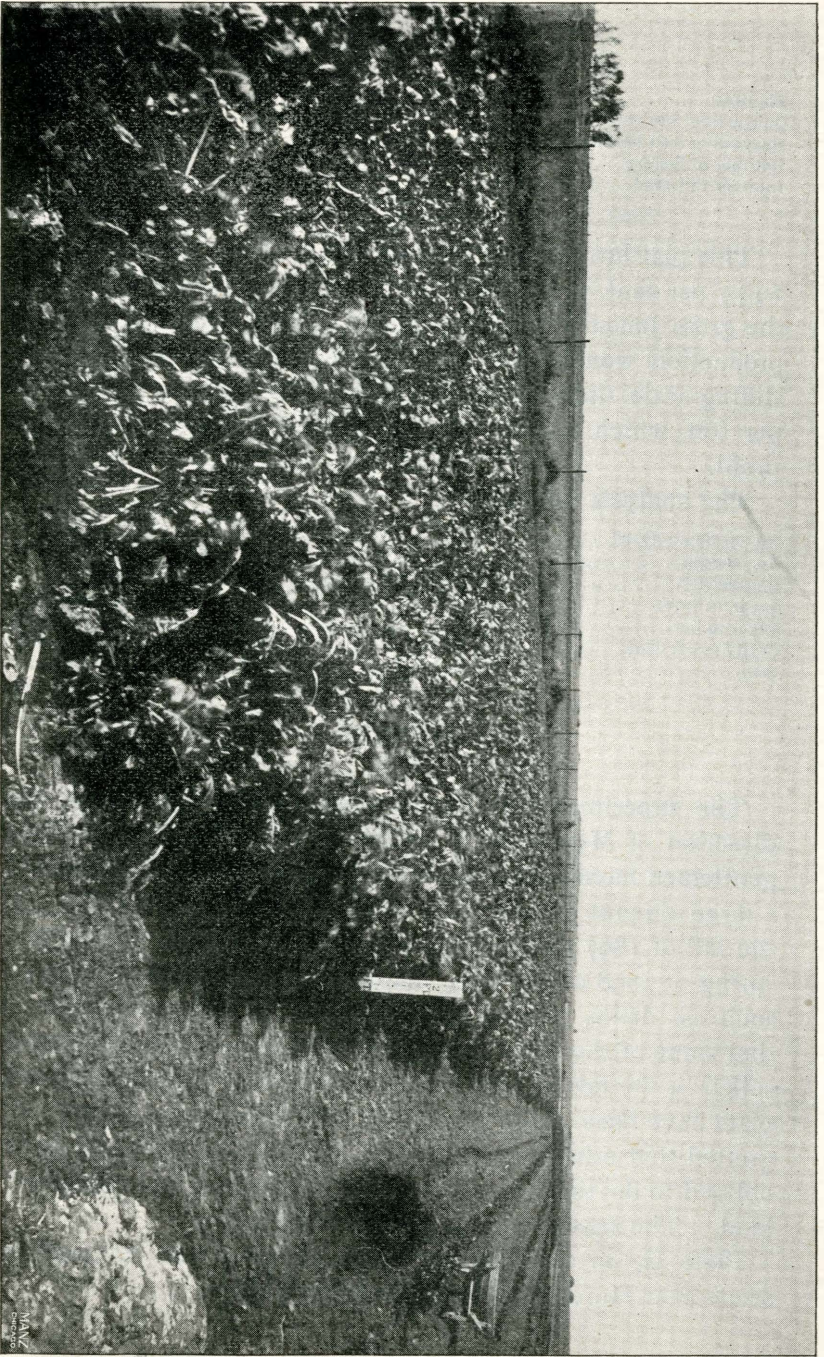


PLATE I.

NAME

Planting	90
Cultivating and thinning	5 00
Harvesting and topping	14 00
Hauling to factory	9 00
Interest and seed	4 20
Total	\$38 80

This plat furnished at the rate of 18.2 tons of beets, giving 19.57 per cent. sugar in the beet. At a flat rate of \$4 per ton the gross income would be \$72.80. Deducting the cost of production would leave a net profit of \$34 per acre. On a sliding scale these beets should be worth from \$5 to \$5.50 per ton, which would make a material increase in the net profit.

The analysis follows:—

No. Beets analyzed	4
Av. Weight	325 grams.
Degree Brix	21.90
Sugar in juice	20.60 per cent.
Sugar in beet	19.57 per cent.
Purity co-efficient	94.00 per cent.
Ash	1.95 per cent.

HURON.

The experiments at Huron were carried out under the direction of Messrs. N. T. Smith and J. H. Miller. These gentlemen have shown much earnestness and have exhibited a large amount of enterprise in carrying out this work. In the fall of 1897 they purchased a Secretary Plow and in the spring of 1898 other tools adapted especially for this work, such as drills, cultivators, etc., etc. It will be observed that some of the plats under their care were plowed and subsoiled in the fall of 1897. The results from these fall plowed plats have been most gratifying, and it is to be deeply regretted that other experimenters throughout the state were obliged to do their planting on spring plowed and subsoiled land. The season was favorable in the main.

Plate II, on the opposite page, shows a beet harvesting scene near Huron, in the James River Valley.

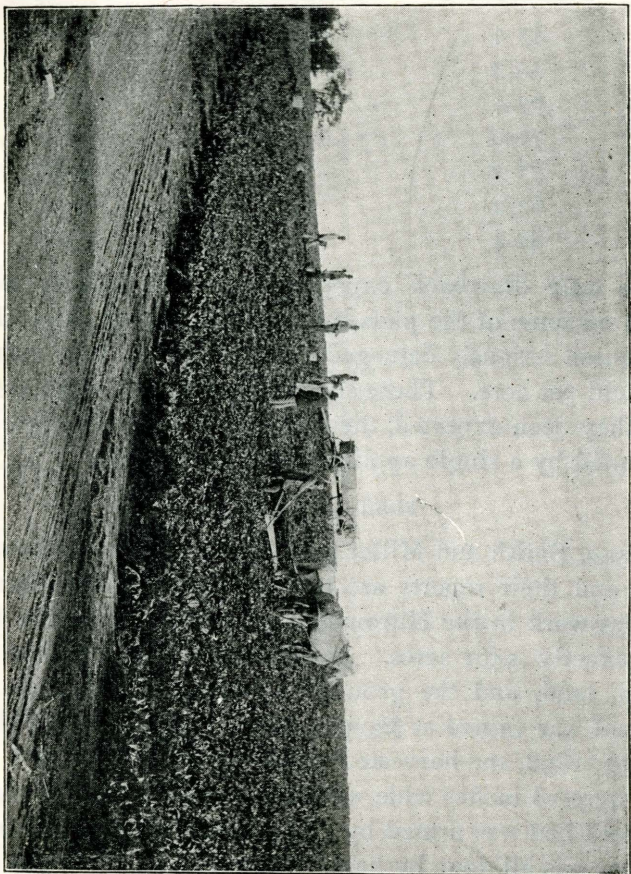


PLATE II.

Mr. Smith gives the following Meteorological conditions during the growing months:

1898.	Mean Temp.	Min. Temp.	Total Precipitation.
April	45.4	15	2.98
May	55.3	34	2.90
June	67.4	44	1.81
July	71.0	45	3.83
Aug.	71.2	46	0.46
Sept.	62.2	27	1.31
Oct.	42.4	17	1.01

The only drawback experienced in this locality was an attack on some of the plats by the small black false chinch bug which seriously damaged some of them, thus reducing the yield per acre. These small pests did their work quickly. Had they been expected, their ravages could easily have been prevented by a single application of Paris green.

PLAT NUMBER I.

Messrs. Smith and Miller grew seven plats at their own expense and their reports are most complete. The details of the plat work in the Huron district follows. Plat No. 1 contains exactly .5461 acres. It was situated on the James river bottom land, and the ground was plowed Nov. 8th, 1897. The soil was valued at \$20 per acre. The beets were planted May 13, 1898, and harvested November 14th and 15th. The rows were 18 inches wide with the beets 6 inches in the row. The seed bed was firmed by a large wooden roller. The cultivation was all done by hand, using a hoe and a Planet Jr. wheel hoe. In this case, as in all others throughout the state, the work was not done as cheaply and as advantageously as it would be were our people more experienced in handling the sugar beet crop. The actual cost per acre for raising this plat was as follows:—

COST PER ACRE.

Plowing and subsoiling.....	\$ 1 75
Preparing seed-bed.....	1 00

Planting	1 00
Thinning and cultivating	10 30
Harvesting and topping	13 70
Hauling to factory	9 87
Interest and seed	4 20
Total	\$41 82

The net results were 32.9 tons of beets per acre, giving 15.3 per cent. sugar in the beet. At a flat rate of \$4 per ton, the gross income would be \$131.60 per acre. Deducting the actual cost of production would leave a net profit of \$89.78 per acre.

The analysis follows:—

No. of beets analyzed	2
Av. weight	600 grams.
Degree brix	20.20
Sugar in beet	15.30
Sugar in juice	16.10 per cent.
Purity co-efficient	79.70 per cent.
Ash	1.026 per cent.

PLAT NUMBER 2.

Plat No. 2 was grown by Smith and Miller on James river bottom land. The soil was valued at \$40 per acre. The exact area under cultivation was .8054 acres. The plowing was done May 17th, the planting May 19th, and the harvesting Nov. 16th. The rows were 18 inches wide with the beets 6 inches in the row. The seed bed was firmed by means of a roller and a drag. The thinning and cultivating was all done by hand as before. Both the plowing and planting were too late.

COST PER ACRE.

Plowing and subsoiling	\$ 1 50
Preparing seed bed	1 75
Planting	1 00
Thinning and cultivating	7 00
Harvesting and topping	6 80
Hauling to factory	3 70
Interest and seed	5 40
Total	\$27 15

The net yield per acre was 14.9 tons of beets, yielding 15.87 per cent. sugar in the beet. At a flat rate of \$4 per ton the gross income would be \$59.60. Deducting the cost of production the net profit would be \$32.45 per acre. These beets should be worth more than \$4 per ton.

The analysis follows:—

No. beets analyzed.....	2
Av. weight.....	560 grams.
Degree Brix.....	20.40
Sugar in the juice.....	16.70 per cent.
Sugar in beet.....	15.87 per cent.
Purity co-efficient.....	81.86 per cent.
Ash.....	1.113 per cent.

PLAT NUMBER 3.

Plat No. 3 was also grown by Messrs Smith and Miller on James River bottom land. The soil was valued at \$15 per acre. It was plowed May 21st and the seeds were planted May 23rd, which was altogether too late a date. The beets were harvested Nov. 8th. The rows were 18 inches wide with beets 6 inches in the row. The seed bed was firmed with a drag only. The exact area under cultivation was one acre, yielding 12.5 tons of beets per acre. The plowing was done with a common plow and the ground was not subsoiled. Taking it all together, the foregoing combination was very unfavorable.

Mr. Smith gives the cost per acre as follows:—

COST PER ACRE.

Plowing.....	\$ 1 25
Preparing seed bed.....	50
Planting.....	1 00
Thinning and cultivating.....	3 00
Harvesting and topping.....	7 50
Hauling to factory.....	3 75
Interest and seed.....	3 90
Total.....	\$20 90

This plat harvested 12.5 tons of beets, giving 16.44 per cent. sugar in the beet. At a flat rate of \$4 per ton the gross income would be \$50 per acre. Deducting the cost of production would leave a net profit of \$29.10. These beets, however, should be worth at least \$4.50 per ton.

The analysis follows:—

No. beets analyzed.....	2
Av. weight.....	575 grams
Degree brix.....	21.10
Sugar in juice.....	17.30 per cent.
Sugar in beet.....	16.44 per cent.
Purity co-efficient.....	82.00 per cent.
Ash.....	.86 per cent.

PLAT NUMBER 4.

This plat was grown by Smith and Miller on the hillside just where the upland prairie descends to the James river bottom. One acre was cultivated, the market value of which is \$15. The ground was plowed May 20th, and the seeds were sown May 22nd. These dates were altogether too late. A common plow was used and the ground was not subsoiled. Taking these things into consideration, the very small yield of 6.5 tons per acre would not be unexpected. The beets were harvested Nov. 3rd. The rows were 18 inches wide and the beets were thinned to 6 inches. A drag only was used in preparing the seed bed. Mr. Smith gives the cost per acre as follows:—

COST PER ACRE.

Plowing.....	\$ 1 25
Preparing seed bed.....	50
Planting.....	1 00
Thinning and cultivating.....	3 00
Harvesting and topping.....	7 50
Hauling beets to factory.....	1 95
Interest and seed.....	3 90
Total.....	\$19 10

This plated yielded 6.5 tons of beets, analyzing 18.72 per cent. sugar in the beet. At the flat price of \$4 per ton it would yield a gross income of \$26 per acre. After deducting the cost of growing it would yield a net profit of \$6.90 per acre. These beets, however, should be worth \$5 per ton. At this rate even the small tonnage obtained would yield a net profit of \$13.40 per acre, which is greatly in excess of any profit to be obtained from grain raised in the state.

The analysis follows:—

No. beets analyzed.....	2
Av. weight.....	425 grams.
Degree Brix.....	22.60 per cent.
Sugar in juice.....	19.60 per cent.
Sugar in beet.....	18.72 per cent.
Purity co-efficient.....	85.83 per cent.
Ash.....	.702 per cent.

PLAT NUMBER 5.

Plat No. 5 was cultivated by Smith and Miller, on sandy, upland prairie soil adjacent to the city of Huron. It was

valued at \$40 per acre. The land was plowed and subsoiled with a Secretary plow, Nov. 9th, 1897. The seed was planted May 19th, and the beets were harvested Nov. 16th. The width of the rows was 18 inches, and the beets were 6 to 12 inches apart in the row. The seed bed was firmed by means of a drag, a plank and a roller. The area of the plat was .3168 acres. This plat was attacked by the false chinch bug and nearly destroyed, which accounts for the small yield of 7.08 tons per acre. Mr. Smith gives the cost per acre as follows:—

COST PER ACRE.

Plowing and subsoiling.....	\$ 2 50
Preparing seed bed.....	2 00
Planting.....	1 00
Thinning and cultivating.....	12 60
Harvesting and topping.....	2 50
Hauling to factory.....	1 70
Interest and seed.....	5 40
Total.....	\$27 70

This Plat gave 7.08 tons per acre of beets, analyzing 15.87 per cent. sugar in the beet. At a flat rate of \$4 the gross income would be \$28.32 per acre. This would leave the small margin of .62 net profit per acre. If these beets were sold on a sliding scale they ought to be worth \$4.25 per ton. This would make a net profit of \$2.37 per acre. It will be noticed that the greatest expense, namely, that of thinning and cultivating had been incurred before the beets were destroyed. Again, it must be remembered that were common care used, such as farmers engaged in sugar beet raising would exercise, the insects which destroyed the beets could easily have been poisoned, when the results would have been far different and the yield in all probability would have been from 20 to 30 tons per acre.

The analysis follows:—

No. beets analyzed.....	2
Av. weight.....	600 grams.
Degree Brix.....	20.50
Sugar in juice.....	16.70 per cent.
Sugar in beet.....	15.87 per cent.
Purity co-efficient.....	81.46 per cent.
Ash.....	1.251 per cent.

PLAT NUMBER 7.

Plat No. 7, area .836 acres, was grown by Mr. C. A. Sauer on upland prairie black loam, ten miles northwest of Huron. The land was worth \$5.00 per acre. The false chinch bug destroyed three-fourths of the beets. The ground was plowed June 10th, and the beets were planted the same day, (altogether too late), in rows 18 inches wide, and the beets were thinned to 6 inches in the row. They were harvested Nov. 8th. The ground was not subsoiled but plowed with a common plow and the seed bed was firmed with a drag. The estimated cost per acre is as follows:—

COST PER ACRE.

Plowing.....	\$ 1 25
Preparing seed bed.....	50
Planting.....	1 00
Thinning and cultivation.....	13 80
Harvesting and topping.....	5 44
Hauling beets to factory.....	6 00
Interest and seed.....	3 30
Total.....	\$31 29

This Plat yielded 6.8 tons of beets per acre, giving 17.96 per cent. sugar in the beet. At a flat rate of \$4 per ton the gross income would have been \$27.20 per acre, showing under the circumstances a net loss of \$4.09. Some of the expenses allowed are generous indeed, and it is probable that a farmer could have made good wages considering the work done on the Plat. That is to say, that the \$4.09 loss would only be apparent. Again, if these beets were sold on a sliding scale they ought to be worth \$5 per ton, which would make the gross income \$34 per acre. At this rate \$2.71 per acre gain would be shown. Again, it was not necessary to lose the beets through their insect enemies.

The analysis follows:—

No. of beets analyzed.....	2
Av. weight.....	475 grams.
Degree brix.....	22.70
Sugar in beet.....	17.96 per cent.
Sugar in juice.....	18.90 per cent.
Purity co-efficient.....	83.21 per cent.
Ash.....	

PLAT NUMBER 9.

Plat No. 9 was grown by E. C. Lyman, one and one-half miles north-east of Huron. The exact area under cultivation was .1899 acres. The soil was black loam on a side hill with a northwest exposure. The soil was plowed May 28, with a gang plow and was not subsoiled. The seed bed was planked. The rows were 20 inches wide with beets about 6 inches apart. The seed was planted May 30th, and the beets were harvested Oct. 26-28th. The stand was defective. Mr. Lyman kept no account of the expenses incurred. This Plat yielded 14.6 tons per acre. The beets wilted before the analysis was made.

The analysis follows:--

No. beets analyzed.....	2
Av. weight.....	575 grams.
Degree Brix.....	26.70
Sugar in juice.....	23.30 per cent.
Sugar in beet.....	22.14 per cent.
Purity co-efficient.....	87.27 per cent.
Ash.....	.572 per cent.

YANKTON.

The committee at Yankton having charge of the sugar beet experiments this year was selected from the sugar beet company with G. W. Roberts, President, and J. R. Hanson, Secretary. This committee selected Mr. George H. Whiting to have charge of the cultural work. The results obtained from Yankton are very good as might be expected from the good work done in this vicinity during previous years.

PLAT NUMBER 1.

Plat No. 1 was grown by George H. Whiting on a deep, rich, black loam, gently sloping to the south. The exact area under cultivation was one-fourth acre, and he values his land at \$100 per acre, owing to its location in the city limits. Complaint came from Yankton that the early spring rains caused the sowing to be late. This land was plowed May 26th, and the seed was planted May 30th. The beets were harvested October 25th to 30th. The rows were 20 inches

apart and the beets grew about 3 inches in the row. The seed bed was firmed with a harrow and a plank. The cultivation consisted of three hand hoeings and three cultivations with the wheel hoe. Mr. Whiting in his anxiety to have a fine patch for show purposes placed a large amount of work upon it; also the beets were left so close together in the rows that they failed to reach a sufficient size to give as heavy a yield per acre as might be expected. However, under such circumstances the beets gave a phenomenally high percentage of sugar. Mr. Whiting is confident that he could readily double the tonnage by thinning the beets to a greater distance in the row. In this he is undoubtedly correct. This Plat, like the Home Station Plat, is interesting as it serves to emphasize how, by doing excessive work on a Plat and by keeping the beets too close together, sugar beets may be grown at a loss when contracted under a flat rate. This beautiful Plat is shown in Plate III.

Mr. Whiting gives the cost per acre as follows:--

Plowing and subsoiling	\$ 3 00
Preparing seed bed.....	1 25
Planting.....	75
Cultivating and thinning.....	10 00
Harvesting and topping.....	21 00
Hauling to factory.....	3 00
Interest and seed.....	9 00
Total.....	\$48 00

This Plat furnished 9.6 tons of beets, giving 19 per cent. sugar in the beet. At a flat rate of \$4.00 per ton the gross income would be \$38.40, leaving a net loss of \$9.60. On a sliding scale these beets ought to be worth at least \$5 per ton, if not \$5.25. At \$5 per ton the gross income would be \$48, leaving Mr. Whiting very good wages and interest on his land as his sole source of profit. It should be said right here that the cost of harvesting and topping these beets is enormous. This was due to the fact that those doing the work were unskilled and consumed an exorbitant amount of time. Moreover, the small size of the beets naturally increased the cost of topping per ton.

The analysis follows:—

No. beets analyzed.....	3
Av. Weight.....	400 grams.
Degree Brix.....	21.80
Sugar in juice.....	20.00 per cent.
Sugar in beet.....	19.00 per cent.
Purity co-efficient.....	91.74 per cent.
Ash.....	.698 per cent.

PLAT NUMBER 2.

Plat No. 2 was grown by Fred Jacob, three miles east of Yankton, between the James and Missouri rivers. The soil is a sandy loam and is valued at \$25 per acre. The ground was plowed May 17, and the seed sown the same day. The rows were 22 inches wide, with the beets 7 inches in the row. The seed bed was firmed with a plank and the beets were cultivated with a hoe. The area was one fourth acre. This plat is shown in Plate IV. Mr. Jacob gives the cost per acre as follows:—

COST PER ACRE.

Plowing and subsoiling.....	\$ 2 80
Preparing seed bed.....	28
Planting.....	50
Thinning and cultivating.....	12 00
Harvesting and topping.....	20 00
Hauling beets to factory.....	9 00
Interest and seed.....	4 00
Total.....	48 58

This Plat yielded 22.8 tons of beets per acre, analyzing 19.5 per cent. sugar in the beet. At a flat rate of \$4 the gross income would be \$89.20. Deducting the cost of production would leave a net profit of \$40.62 per acre. On a sliding scale these beets ought to be worth between \$5 and \$6 per ton, which would make a corresponding increase in the net profit. In this Plat the cost of harvesting is also excessive.

The analysis follows:

No. of beets analyzed.....	3
Av. weight.....	540 grams
Degree brix.....	22.00
Sugar in juice.....	20.50 per cent.
Sugar in beet.....	19.50 per cent.
Purity co-efficient.....	93.1 per cent.
Ash.....	1.152 per cent.

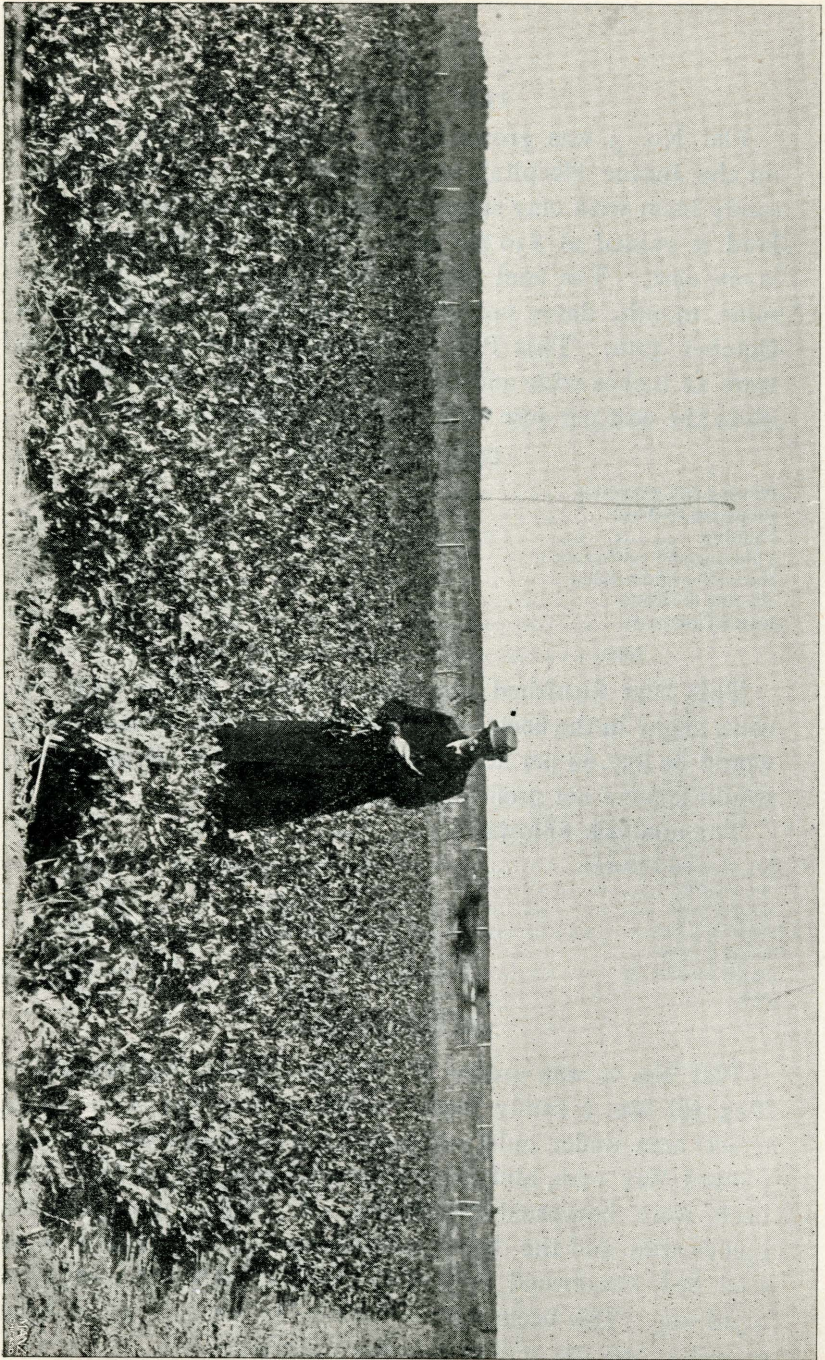


PLATE III.

PLAT NUMBER 3.

Plat No. 3 was grown by E. G. Edgerton, farm foreman for the Insane Hospital, at Yankton. The soil was a black, sandy loam with clay subsoil sloping to the southwest. The land is valued at \$30 per acre. The area under cultivation is one acre. The land was plowed in May and planted the same month, dates not given. The beets were harvested October 30th. This Plat is shown in Plate V. The rows were 22 inches wide and thinned to 8 inches. Mr. Edgerton gives the cost per acre of production as follows:—

COST PER ACRE.

Plowing and subsoiling.....	\$ 3 00
Preparing seed bed.....	2 00
Planting.....	3 00
Thinning and cultivating.....	10 50
Harvesting and topping.....	6 00
Hauling to factory.....	7 00
Interest and seed.....	4 20
Total.....	\$34 70

This Plat furnished 14.2 tons of beets, giving 15.6 per cent. sugar in the beet. At a flat rate of \$4 the gross income would be \$57.60 per acre. Deducting the cost of production would leave a net profit of \$22.90.

The analysis follows:

No. of beets analyzed.....	2
Av. weight.....	745 grams
Degree brix.....	18.30
Sugar in juice.....	16.40 per cent.
Sugar in beet.....	15.6 per cent
Purity co-efficient.....	89.16 per cent.
Ash.....	1.148 per cent.

PLAT NUMBER 4.

Plat No. 4 was grown by Torger Nelsen, Mission Hill. The soil was a sandy loam, valued at \$25 per acre. The exact area under cultivation was one-fourth acre. It was plowed May 14th, and the seed was planted May 16th. The beets were harvested November 1st. The rows were 22 inches wide and the beets were thinned to 7 inches. The seed bed was firmed by a drag several times, followed by planking. The beets were cultivated by hand. Mr. Nelsen gives the cost per acre of growing as follows:—

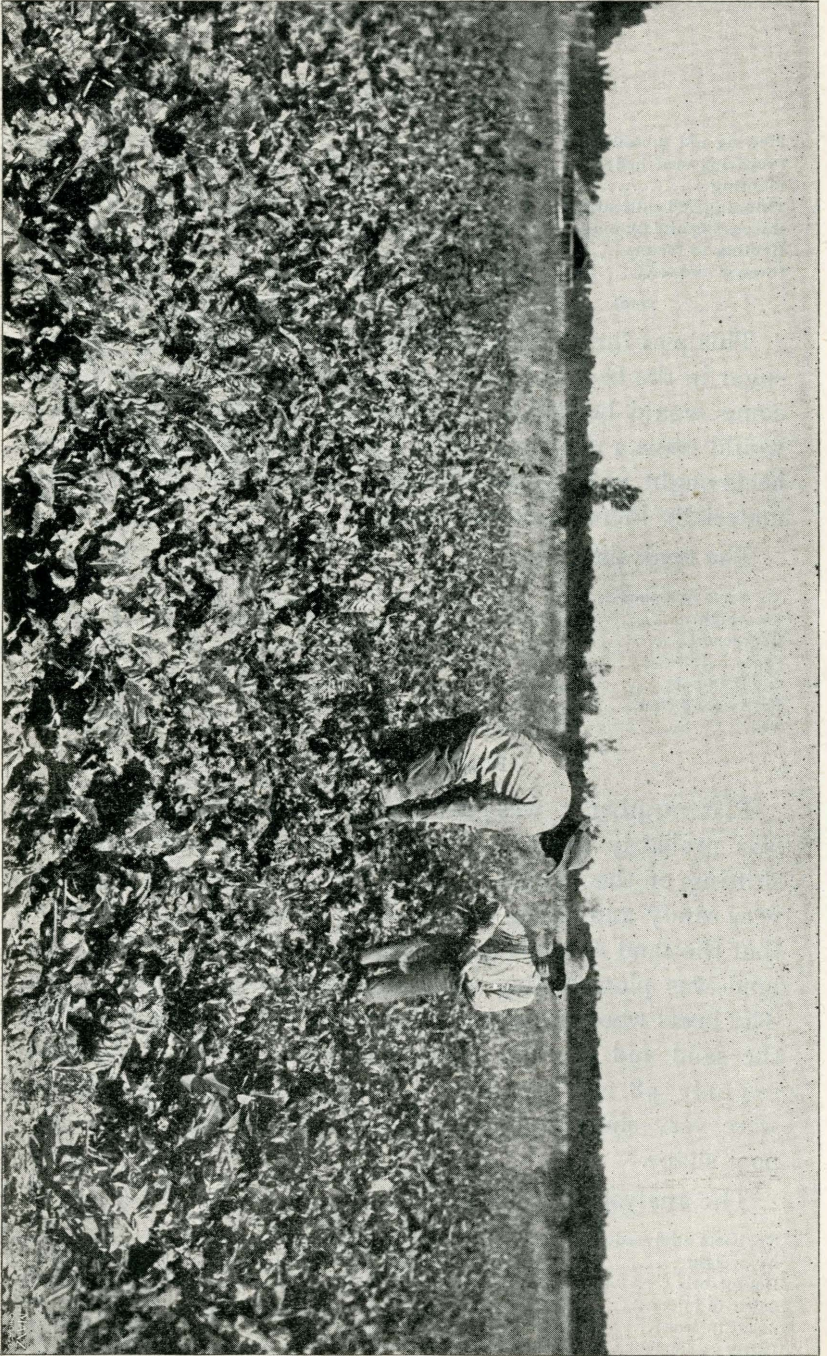


PLATE IV.

COST PER ACRE.

Plowing and subsoiling.....	\$ 4 00
Preparing seed bed.....	1 00
Planting.....	2 00
Thinning and cultivating.....	10 00
Harvesting and topping.....	8 00
Hauling to factory.....	4 80
Interest and seed.....	4 80
Total.....	\$34 60

This plat furnished 11.8 tons of beets, giving 18.5 per cent. sugar in the beet. At a flat rate of \$4 per ton the gross income would be \$47.20. Deducting the cost of production would leave a net profit of \$12.60. On a sliding scale these beets ought to be worth upwards of \$5 per ton, which would materially increase the net profit.

The analysis follows:—

No. beets analyzed.....	4
Av. weight.....	340 grams.
Degree Brix.....	21.50
Sugar in juice.....	19.50 per cent.
Sugar in beet.....	18.5 per cent.
Purity co-efficient.....	90.7 per cent.
Ash.....	.675 per cent.

PLAT NUMBER 5.

Plat number 5 was grown by F. M. Coates & Son. This was probably the first Plat planted on the soil formed by shifting of the Missouri river. Mr. Coates describes it as very sandy and being mixed with some gumbo, and states that the sand extends to a depth of more than 100 feet. The land was plowed May 28th, and the seed planted May 31st. The beets were harvested November 8th. Altogether with the sand and the late planting the crop was a failure, yielding only 3.8 tons per acre. The beets sent in for analysis were very short and showed a stunted growth and a very poor shape.

The analysis follows:—

No. beets analyzed.....	4
Av. weight.....	412 grams
Degree brix.....	19.00 per cent.
Sugar in juice.....	17.60 per cent.
Sugar in beet.....	16.7 per cent.
Purity co-efficient.....	92.57 per cent.
Ash.....	1.242 per cent.

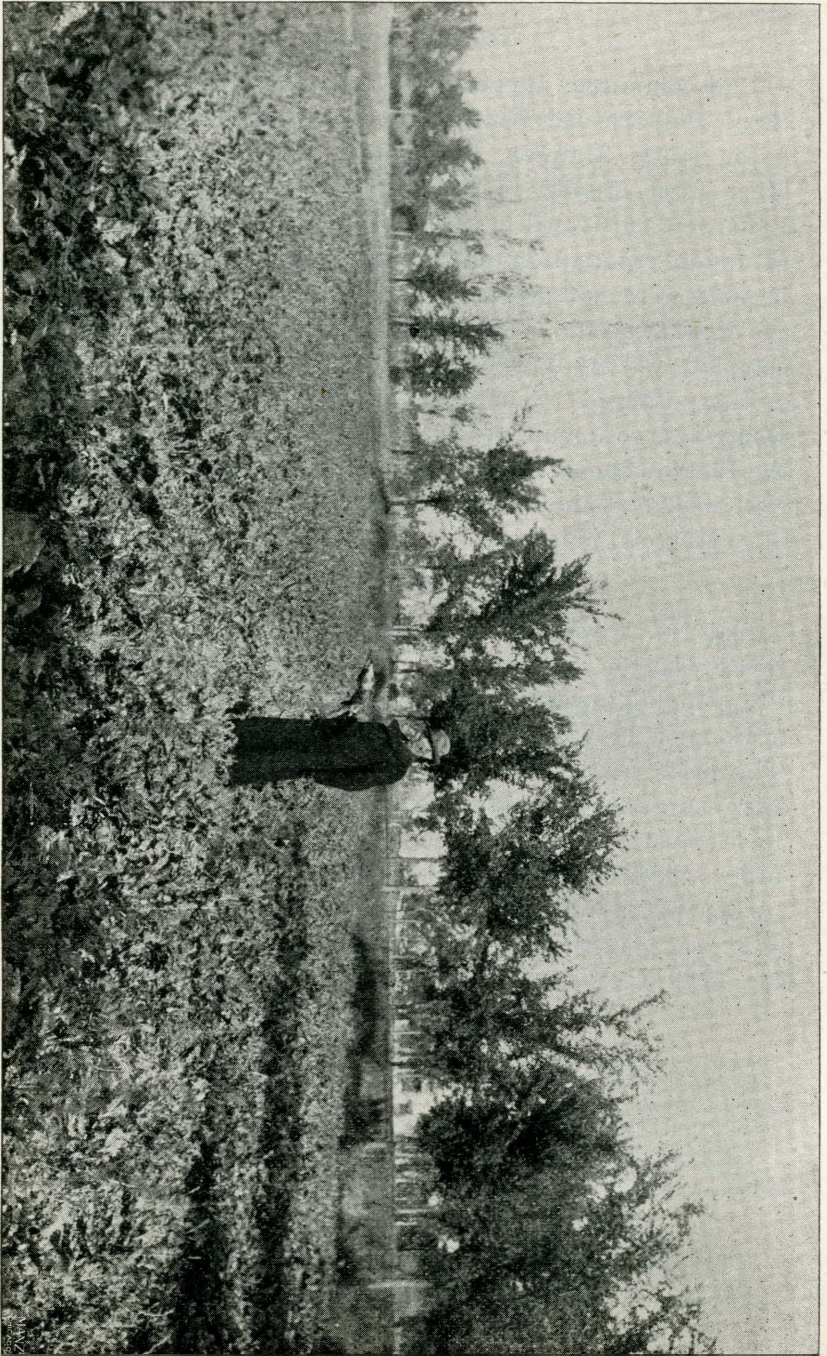


PLATE V.

SIOUX FALLS.

The committee appointed to take charge of the work in Sioux Falls elected Thomas H. Brown, Secretary, and Professor James Simpson, President. These gentlemen exhibited great interest in the work. Although a number of Plats were cultivated in this vicinity it was found impossible to obtain reports from but two experimenters. It seems the farmers were not prepared to weigh the beets and collect the data necessary. The results given, however, are full and complete and are typical of what would be obtained by the ordinary grower. Coming as they do from State Institutions where a large amount of work was necessary in order to keep the Plats in show form it would seem the cost of production was, as here at the Home Station, higher than would obtain in commercial practice.

PLAT NUMBER I.

Plat No. 1 was grown by N. E. Phillips, Warden of the South Dakota Penitentiary. The land selected was a sandy loam sloping towards the northwest. Mr. Phillips purchased a Secretary Plow with which the land was plowed April 15th. The beets were planted on April 29th, and May 1st. They were harvested October 24th. The rows were 16 and 18 inches apart with the beets 6 inches in the row. The seed bed was firmed by driving a herd of cattle over it. The cultivation was all done by hand, a wheel hoe being used. One acre was planted and the land was valued at \$40 per acre. Mr. Phillips gives the cost of cultivation as follows:—

COST PER ACRE.

Plowing and subsoiling.....	\$ 5 00
Preparing seed bed.....	1 50
Cost of planting.....	1 50
Thinning and cultivating.....	6 30
Harvesting and topping.....	12 00
Hauling to factory.....	4 25
Interest and seed.....	5 40
Total.....	\$35 65

This Plat furnished 17 tons of beets, giving 17.29 per cent. sugar in the beet. The seed planted was of the Vilmorin

variety. At a flat rate of \$4 the gross income would be \$68 per acre. Deducting the cost of growing we have a net profit of \$32.35. On a sliding scale these beets ought to be worth \$4.75 which would increase the foregoing net profit to \$40.10.

The analysis follows:—

No. beets analyzed.....	3
Av. weight.....	363 grams.
Degree Brix.....	20.50
Sugar in juice.....	18.20 per cent.
Sugar in beet.....	17.29 per cent.
Purity co-efficient.....	88.78 per cent.
Ash.....	1.08 per cent.

PLAT NUMBER 2

Plat No. 2 was grown on black loam at the South Dakota school for Deaf Mutes. Professor Simpson gave this work over to the superintendent of the farm, Mr. John Griffiths, who did the work and furnished the data. The location of the Plat was high, on a bluff above the Sioux river. It is divided into city lots. The area cultivated is one acre. This



PLATE VI.

Plat is shown in Plate VI. Mr. Griffiths gives the cost per acre as follows:—

COST PER ACRE.

Plowing and subsoiling.....	\$ 4 00
Preparing seed bed.....	1 00
Planting.....	80
Thinning and cultivating.....	17 93
Harvesting and topping.....	16 00
Hauling beets to factory.....	5 80
Interest and seed.....	5 40
Total.....	\$50 93

This Plat furnished 23.5 tons of beets, giving 16.6 per cent. sugar in the beet. At a flat rate of \$4 per ton the gross income would be \$94. Deducting the cost of growing would leave a net profit of \$43.07

Both Mr. Phillips and Mr. Griffiths have the cost of plowing and subsoiling double what it should be, at the least calculation. Also the cost of thinning and cultivating is excessive, especially in Plat 2.

The analysis follows:—

No. beets analyzed.....	3
Av. weight.....	413 grams
Degree Brix.....	20.30
Sugar in juice.....	17.50 per cent.
Sugar in beet.....	16.63 per cent.
Purity co-efficient.....	86.21 per cent.
Ash.....	.998 per cent.

BROOKINGS.

The committee appointed to take charge of the sugar beet work in Brookings elected J. O. Andrews, President, and Dr. G. J. Coller, Secretary. The work at the Station where one acre was grown was under the direction of Professor E. C. Chilcott. Owing to various causes I have been unable to obtain complete results from some of the Plats grown. None of these Plats, however, were failures. The reason for no reports is that the grower failed in some respect. He either did not weigh his beets or failed to gather the required data.

PLAT NUMBER I.

Plat No. 1 was grown by Professor E. C. Chilcott. The land was high black loam with a clay subsoil, sloping gently

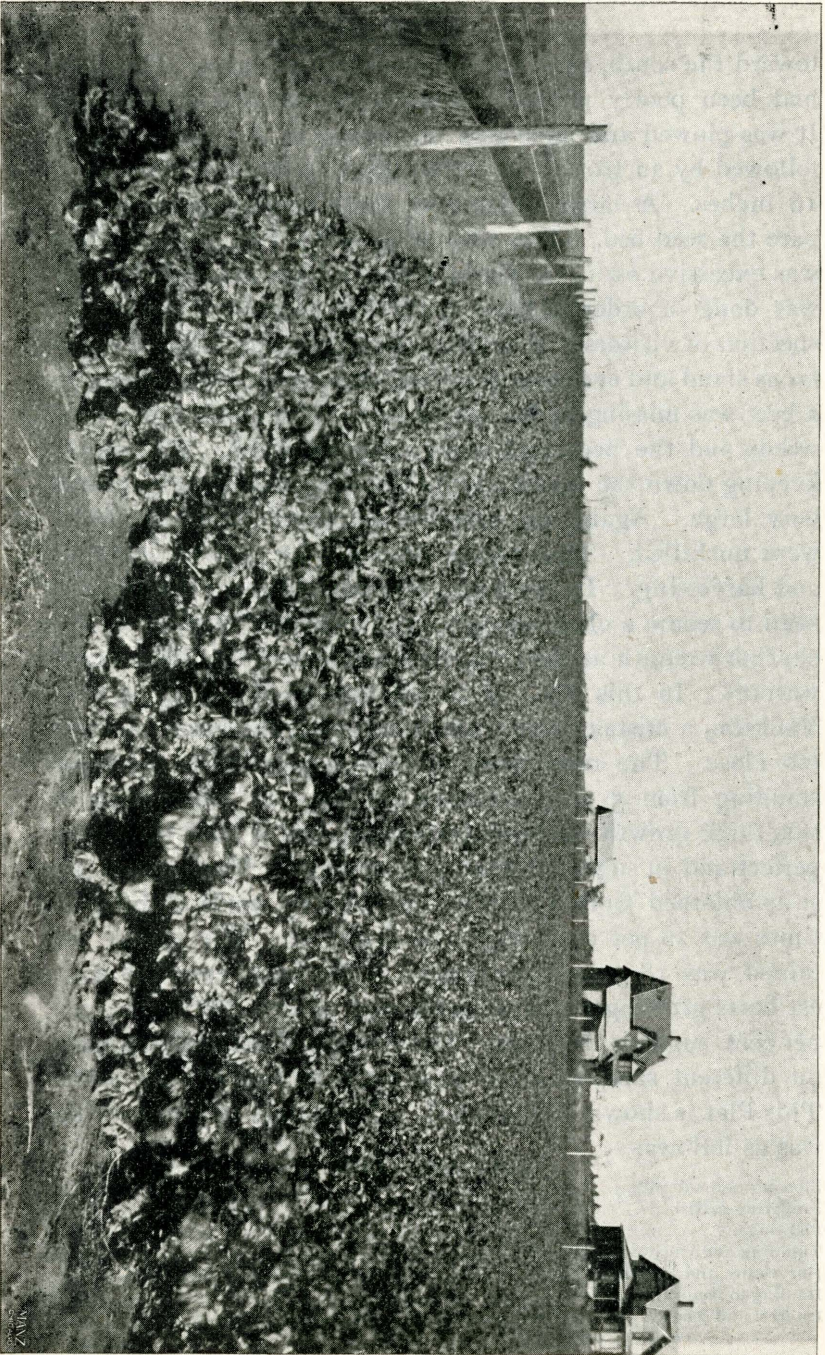


PLATE VII.

toward the south, and was valued at \$40 per acre. This land had been poorly plowed the previous year and sown to flax. It was plowed and subsoiled by means of a common plow, followed by an Iron King Subsoiler, to a depth of from 14 to 16 inches. A large amount of work was necessary to prepare the seed bed. The cost of growing this Plat of beets was excessive owing to the fact that a large amount of work was done in order to keep the Plat in show form for the inspection of visitors. It was in all respects an ideal Plat, so far as stand and evenness of growth were concerned. Scarcely a beet was missing in the whole Plat. The ground was very weedy and the beet seed sown all germinated. The cost of keeping down the weeds and for thinning was in consequence very large. Again, the laborers employed to do the work were unskilled. This nearly doubled the cost of thinning and harvesting. In previous years our greatest difficulty has been to secure a close enough stand to insure as high a saccharine strength as the climatic conditions of the State would warrant. In this Plat, as in the case of Mr. Whiting's, at Yankton, a mistake was made in allowing the beets to grow too close. The rows were 20 inches apart with the beets standing from 5 to 7 inches in the row. In consequence of this thick growth the beets were small, but in form they were perfect and in sugar content phenomenal. The highest results obtained from a number of analyses made at different times was 26 per cent. sugar in the juice. The lowest obtained was 18.5 per cent. sugar in the juice; even the largest beets growing at the extreme end of the Plat gave 15.2 per cent. sugar in the juice. The average of six analyses made on different samples gives 22.6 per cent. sugar in the juice. This Plat is shown in Plate VII. The actual cost of growing was as follows:—

COST PER ACRE	
Plowing and subsoiling.....	\$ 3 00
Preparing seed bed.....	1 85
Planting.....	75
Thinning and cultivating.....	23 22
Harvesting and topping.....	16 55
Hauling to factory.....	3 00
Interest and seed.....	5 40
Total.....	\$53 77

This Plat yielded 11.4 tons of beets, averaging 21.3 per cent. sugar in the beet. At a flat rate of \$4 per ton this Plat would give a gross income of \$45.60 per acre, affording a loss of \$8.17. On a sliding scale it is difficult to say just what these beets would be worth since in all probability beets of their extraordinary richness in sugar are seldom offered. At \$5.80 per ton they would yield a gross income of \$66.12, affording a net profit of \$12.35 per acre. An average analysis made from a fine sample of beets before they had reached their greatest perfection gives the following results:—

No. of beets analyzed.....	4
Av. weight.....	315 grams
Degree Brix.....	22.60
Sugar in juice.....	21.20 per cent.
Sugar in beet.....	20.14 per cent.
Purity co-efficient.....	93.00 per cent.
Ash.....	.96 per cent.

PLAT NUMBER 2.

Plat No. 2 was grown by G. W. Roe in the city limits of Brookings. The ground is an upland prairie soil. The land close by is worth \$25 per acre. The area cultivated was one-fourth acre. The land was plowed and subsoiled and the seed planted the first week in May, and the beets were harvested the last week in October. This Plat was plowed with a common plow, followed by a John Deere Iron King subsoiler to a depth of from 14 to 16 inches. The rows were 20 inches wide with beets 6 inches in the row. The seed bed was firmed with a Campbell packer. The cost of production was as follows:—

COST PER ACRE.

Plowing and subsoiling.....	\$ 4 00
Preparing seed bed.....	1 00
Planting.....	1 00
Thinning and cultivating.....	5 75
Harvesting and topping.....	15 00
Hauling to factory.....	9 00
Interest and seed.....	4 50
Total.....	\$40 25

Mr. Roe had a fine stand of beets yielding 22.5 tons per acre, analyzing 17.1 per cent. sugar in the beet. At a flat rate of \$4 per ton, the gross income would be \$90 per acre.

Deducting the cost of growing would leave a net profit of \$49.75 per acre. On a sliding scale it is likely that these beets would be worth about \$4.75 per ton, which would make a corresponding increase in the net profit.

The analysis follows:—

No. beets analyzed.....	3
Av. weight.....	338 grams
Degree Brix.....	20.17
Sugar in juice.....	17.90 per cent.
Sugar in beet.....	17.1 per cent.
Purity co-efficient.....	88.74 per cent.
Ash.....	.675 per cent.

PLAT NUMBER 3

Plat No. 3 was grown by Hogan Anderson, three miles south of Brookings. The soil was a black sandy loam. The area grown was three-fourths acre. The land was plowed April 27th, and planted the next day. The beets were harvested October 26th. The rows were 20 inches wide with the beets 6 to 7 inches in the row. The seed bed was firmed by a roller. The land was valued at \$20 per acre. Mr. Anderson gives the cost of growing as follows:—

COST PER ACRE.

Plowing and subsoiling.....	\$ 1 25
Preparing seed bed.....	50
Planting.....	75
Thinning and cultivating.....	5 00
Harvesting and topping.....	5 00
Hauling to factory.....	20 40
Interest and seed.....	4 25
Total.....	\$37 10

This Plat yielded 20.4 tons per acre of beets, analyzing 15.77 per cent. sugar in the beet. At a flat rate of \$4 per ton the gross income would be \$81.60. Deducting the cost of production would leave a net profit of \$44.50 per acre. On a sliding scale these beets ought to be worth about \$4.25 per ton.

The analysis follows:—

No. beets analyzed.....	3
Av. weight.....	526 grams
Degree Brix.....	18.70
Sugar in juice.....	16.60 per cent.
Sugar in beet.....	15.77 per cent.
Purity co-efficient.....	88.70 per cent.
Ash.....	.823 per cent.

PLAT NUMBER 4.

Plat No. 4 was grown by R. M. Crawford, seven miles southeast of Brookings. The soil was an alluvial creek bottom, valued at \$25 per acre. Mr. Crawford says the beets were not properly thinned. Owing to the manner in which the harvesting was done he was unable to give the cost. In order, however, to make this report as complete as possible I have assumed the cost for cultivation and thinning and for harvesting and topping at \$10 each. These figures are certainly high enough and will greatly exceed the actual outlay put upon the work. The area under cultivation was three-fourths of an acre, and of this one-fourth acre was sown to Vilmorin seed and one-half acre to the Kleinwanzlebner variety. The land was plowed on April 25th and 26th, with a common plow, followed by a subsoiler. The seed was sown May 3rd. The rows were 20 inches with the beets from 4 to 7 inches in the row. The seed bed was firmed by means of a harrow and a plank. The cultivation was done by means of a horse cultivator.

COST PER ACRE.

Plowing and subsoiling.....	\$ 3 00
Preparing seed bed.....	1 25
Planting.....	1 25
Thinning and cultivating.....	10 00
Harvesting and topping.....	10 00
Hauling beets to factory.....	7 00
Interest and seed.....	4 50
Total.....	\$37 00

This Plat yielded as follows:—Of the Vilmorin 14.1 tons, giving 15.39 per cent. sugar in the beet; of the Kleinwanzlebner 12.2 tons, giving 16.06 per cent. sugar in the beet. At a flat rate of \$4 the first would give a gross income of \$56.40 per acre; the second \$48.80. Deducting the cost of production the Vilmorin would give a net profit of \$19.40 and the Kleinwanzlebner \$11.80. On a sliding scale the Vilmorin ought to be worth \$4.25 per ton and the Kleinwanzlebner \$4.50 per ton. Mr. Crawford states that with better cultivation and proper thinning the tonnage could be doubled.

The analysis follows:—

	VILMORIN.	KLEINWANZLEBNER.
No. beets analyzed.....	4	4
Av. weight.....	418 grams	287 grams
Degree Brix.....	18.50	19.10
Sugar in juice.....	16.20 per cent.	16.90 per cent.
Sugar in beet.....	15.39 per cent.	16.05 per cent.
Purity co-efficient.....	87.50 per cent.	88.40 per cent.
Ash.....	.36 per cent.	.608 per cent.

HARDING COUNTY.

Since this county furnished the richest sugar beets grown in South Dakota last year, an exception was made in the case of Mr. David Willett. A small quantity of seed was sent to him in order to see whether the results obtained last year would be continuous. So far as known, at this station, there is no move on foot toward the erection of a sugar beet factory in that region. Mr. Willett raised beets yielding 6 tons per acre and giving the following analysis:—

No. beets analyzed.....	4
Av. weight.....	293 grams
Degree Brix.....	26.30
Sugar in juice.....	24.00 per cent.
Sugar in beet.....	22.80 per cent.
Purity co-efficient.....	91.2 per cent.
Ash.....	.720 per cent.

CULTIVATION OF THE SUGAR BEET IN SOUTH DAKOTA.

The work of this Station could scarcely be deemed complete should we fail to lay before the farmers of the state some facts concerning sugar beet culture, gained by the experiments of the past ten years during which time this work has been in progress. It would seem that so far as this subject is concerned the work of this Station is completed. There is little hopes of obtaining more accurate and more exhaustive results by any method of procedure which comes within the scope of station work.

It will make much difference just how this work of cultivation is carried on. It has been demonstrated repeatedly that bad cultivation and the neglect of fundamental princi-

ples involved in successful sugar beet culture, will bring nothing but failure. On the other hand, the careful observance of the proper methods is sure to bring good results. Just how the plowing is done, and just how the seed bed is prepared, and in fact just how the work is done from beginning to end will largely influence the results obtained.

PLOWING.

It is now a well established practice that the plowing should be done at a certain time, and in a certain way in order to leave the ground in the best condition, and in order to have as clean a seed bed as possible. To accomplish these purposes suppose we start with an ordinary grain field. This should be plowed as soon as possible after harvest, and to the depth of not more than two or three inches in order to give a chance for weed seeds to germinate. Then again late in the fall, the ground should be plowed and subsoiled. As a rule the soil should not be turned over to a greater depth than 6 or 8 inches, while the subsoiling should go from 6 to 8 inches deeper. In this way the ground will be stirred to a depth of from 12 to 16 inches. By plowing in the fall not only will the weeds be destroyed, but the ground will have an opportunity to settle before planting time in the following spring. It is necessary that the ground should settle back to as firm a condition as possible before the seed is sown, otherwise there is danger of its drying out. Moreover if the ground is not packed by freezing and thawing, or by spring rains, and by its own weight during this period, the farmer will be obliged to place a large amount of labor upon the seed bed in order to firm it properly. He will be obliged to use a roller and a drag and to drive his teams over it repeatedly until the desired firmness is obtained. Even then it is doubtful if the seed bed can be brought to the same degree of compactness.

For first plowing after harvest a gang or stubble plow may be used, but for the deep fall plowing and subsoiling different tools must be employed. Here the farmer may have the

choice between two methods. First, he may plow the ground with a common single furrow plow to a depth of from 6 to 8 inches. This is to be followed in the same furrow by a subsoil plow to a depth of from 6 to 8 inches deeper. In order to save correspondence we have obtained cuts of various tools made in this country. One of the most efficient of the ordinary subsoil plows is shown in Fig. 1. This is manufactured by the John Deere Company, Moline, Illinois, and is known as the "Iron King" subsoil plow. The second, and perhaps a more preferable method for the fall plowing and subsoiling, would be to employ what is known as the "Secretary Plow," shown in Fig. 2. This is also manufactured by the John Deere Company, of Moline, Illinois. This plow is so arranged that the ground may be turned to any required depth and subsoiled to an additional depth of 6 or 8 inches at the same operation. By means of this plow, properly adjusted, one man and four good horses can plow and subsoil two acres and over per day. The farmer would also find great use for this plow in preparing potato ground, summer fallow, etc.

It is probable that in this State where it is necessary to deepen the soil somewhat, that better results may be obtained by gradually subsoiling an inch or two at a time. This may be accomplished by means of this plow. We have found it impossible with an ordinary subsoil plow to subsoil less than 6 inches and do good work. This is a large body of soil to disturb at once and it is not always easy to get it properly firmed before the crop is put in. This gradual deepening of the soil therefore recommends itself to us as a better method.

PREPARING SEED BED.

If the ground be plowed and subsoiled in the fall the natural freezing and thawing taken together with the spring rains will go largely towards firming and fining the seed bed properly. In this case the thorough use of the harrow and perhaps of a smoothing plank or roller will be all that will be required. In case, however, the ground is plowed in the

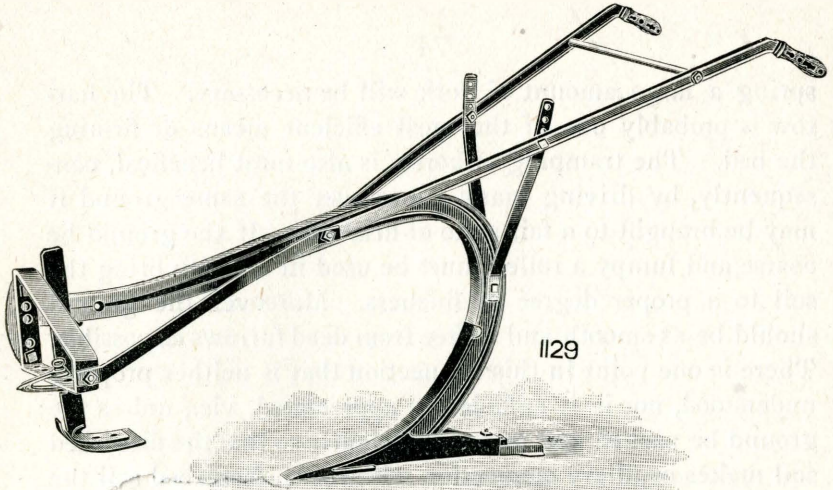


FIG. 1.

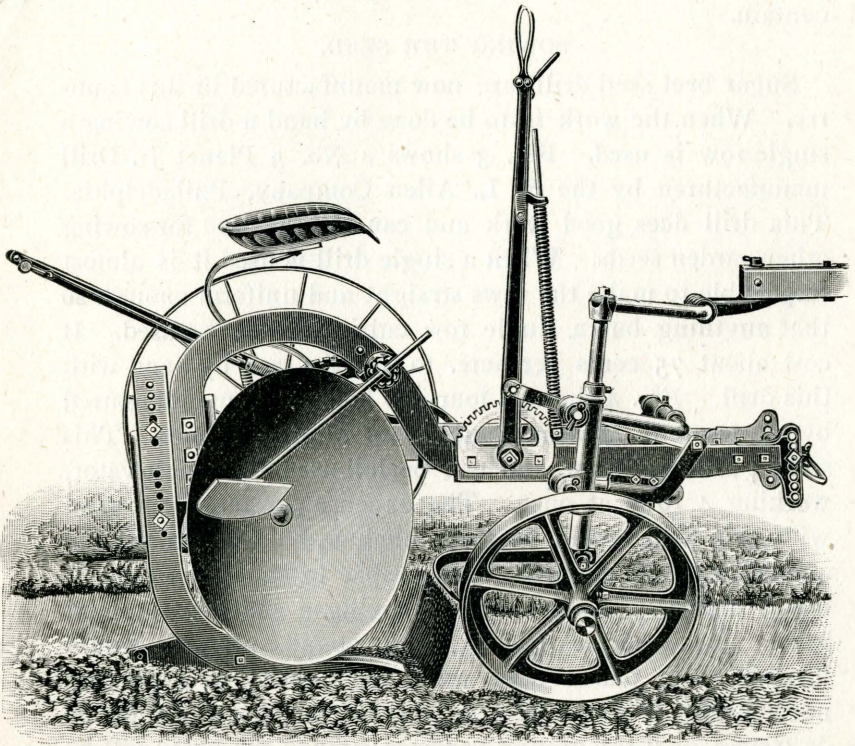


FIG. 2.

spring a large amount of work will be necessary. The harrow is probably one of the most efficient means of firming the bed. The tramping of horses is also most beneficial, consequently, by driving many times over the same ground it may be brought to a fair state of firmness. If the ground be coarse and lumpy a roller must be used in order to bring the soil to a proper degree of fineness. Moreover the ground should be as smooth and as free from dead furrows as possible. There is one point in this connection that is neither properly understood, nor is it sufficiently appreciated, viz., unless the ground be packed and firmed sufficiently so that the disturbed soil makes capillary connection with the undisturbed soil the ground is sure to dry out. The result will be the crop is sure to suffer for water no matter how much the subsoil may contain.

SOWING THE SEED.

Sugar beet seed drills are now manufactured in this country. When the work is to be done by hand a drill sowing a single row is used. Fig. 3 shows a No. 5 Planet Jr. Drill manufactured by the S. L. Allen Company, Philadelphia. This drill does good work and can also be used for sowing other garden seeds. When a single drill is used it is almost impossible to make the rows straight and uniform enough so that anything but a single row cultivator can be used. It cost about 75 cents per acre. to sow the seed by hand with this drill. Fig. 4 shows a four-row horse drill, manufactured by the Deere & Mansur Company of Moline, Illinois. This sows 4 rows at a time and can be followed by a cultivator, working 4 rows at once. The expense per acre for sowing with this drill would be very much less. Concerning the amount of seed required, it is proper to state that there is much difficulty experienced in having a sufficient amount sown. It is true that from 5 to 10 pounds per acre would furnish more plants than could be allowed to grow, but nevertheless, it is equally true that in case a part of them be destroyed, or if the ground becomes packed the beets will be so thin that the crop will prove a failure for sugar purposes.

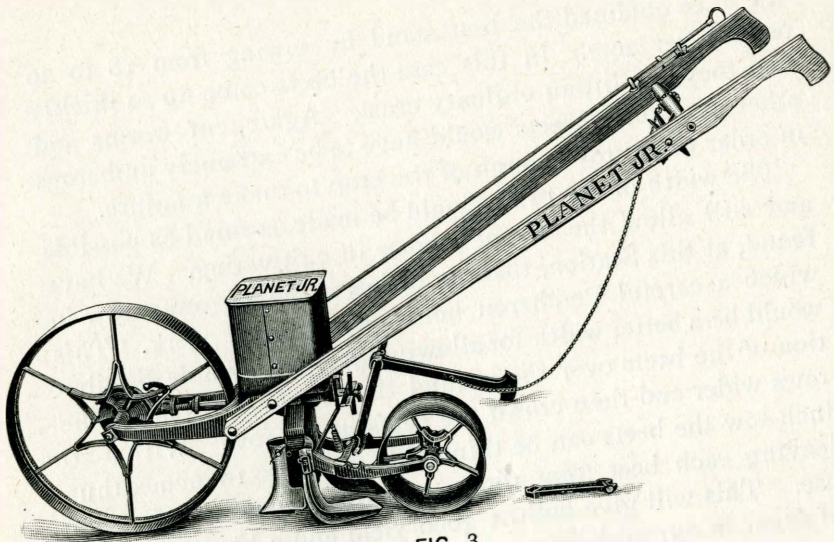


FIG. 3.

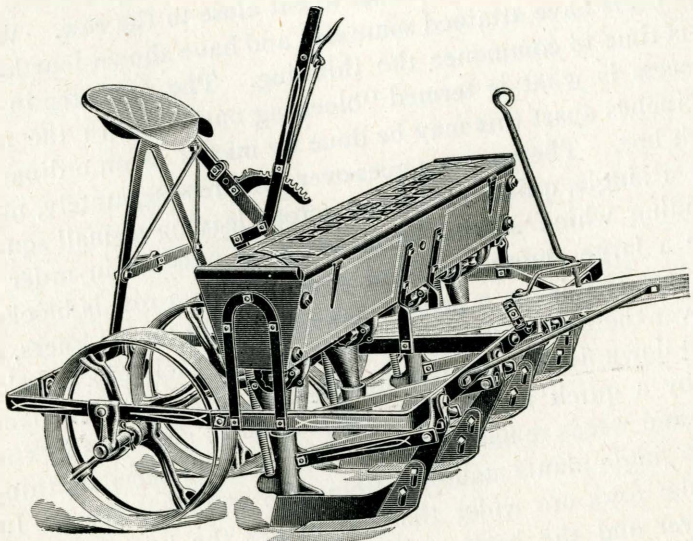


FIG. 4.

We have obtained the best stand by sowing from 18 to 20 pounds per acre. In this case the beets come up so thickly that they can lift an ordinary crust. Again, cut worms and other predatory insects would have to be extremely numerous in order to destroy enough of the crop to make a failure.

The width of the rows should be made as small as possible and still allow the use of a horse in cultivating. We have found, at this Station, that 20 inches is the narrowest row in which a careful Percheron horse can do good work. This would be a better width for allowing the best possible distribution of the beets over the ground than it would to make the rows wider and then crowd the beets in the row. With a 20 inch row the beets can be thinned to from 8 to 10 inches, thus leaving each beet from 160 to 200 square inches for its own use. This will give both a good yield and a big percentage of sugar in our average seasons.

THINNING AND CULTIVATING.

In case the weeds start about the same time the beet seed germinates it is best to go over the ground with a wheel hoe, having the weed cutters set to cut close to the row. When the beets have attained some size and have shown four leaves it is time to commence the thinning. The first step in this process is what is termed "blocking out". With the rows 20 inches apart this may be done by means of an ordinary 6 inch hoe. The operator goes over each row separately, making a single, quick, clean cut across, leaving a small square standing which should be as small as possible in order to save a large amount of hand work. After a row is blocked the next step is for a person, usually resting on his knees, to go over the row selecting the best beet in each block, holding it down firmly with the thumb and finger of the left hand and by a quick move of the right hand to pull up all extra beets and weeds remaining. In this way the beets are thinned to single plants standing from 7 to 10 inches apart. In case the rows are wider than 20 inches the hoe should be narrower and the beets should stand somewhat closer to-

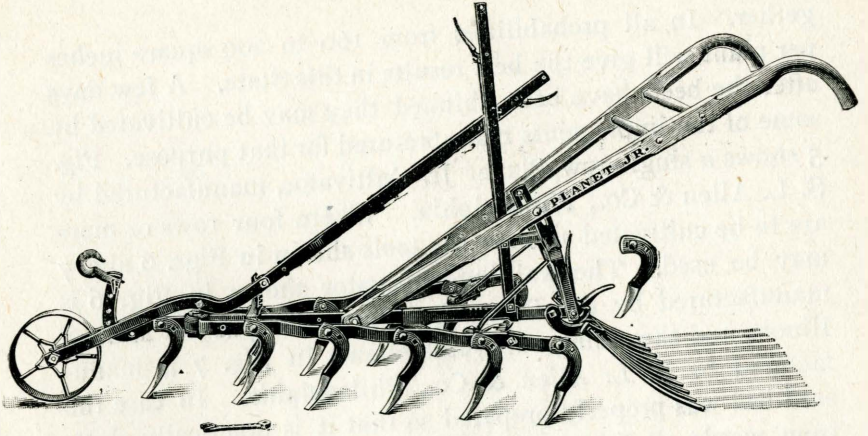


FIG. 5.

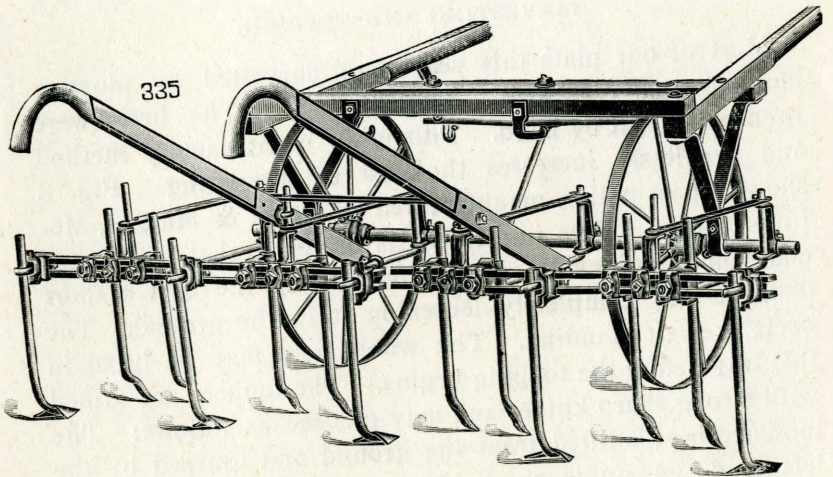


FIG. 6.

gether. In all probabilities from 160 to 200 square inches per plant will give the best results in this State. A few days after the beets have been thinned they may be cultivated by some of the implements manufactured for that purpose. Fig. 5 shows a single row Planet Jr. Cultivator, manufactured by S. L. Allen & Co., Philadelphia. Where four rows or more are to be cultivated at once the tools shown in Figs. 6 and 7 may be used. The walking cultivator shown in Fig. 6 is manufactured by the Deere & Mansur Company of Moline, Illinois, and the riding cultivator shown in Fig. 7 is manufactured by S. L. Allen & Co., Philadelphia. In case the seed bed was properly prepared so that it is practically clean from weeds all future cultivations can be done with the instruments shown. There will probably be no need of further hand hoeing. The ground must not be allowed to become hard or to bake and crack, but must be kept mellow on the surface. Deep cultivation is not required. By the middle of July the leaves will cover the ground and the Plat will need no further attention until harvest time.

HARVESTING AND TOPPING.

Most of our plats this year were harvested by plowing close to each row with a common plow. The beets were then pulled out by hand. This is an unsatisfactory method and needlessly increases the cost of harvesting. Fig. 8 shows a beet puller, manufactured by Deere & Mansur, Moline, Illinois. This implement is driven so that the prongs come on opposite sides of the row, lifting the beet a short distance and completely loosening it in the ground. The beets are left standing. The whole field may be lifted in this way before the topping begins. The toppers are armed with strong sharp knives and may proceed as follows: The loosened beet is lifted from the ground and grasped by the left hand. A single quick blow severs the neck from the beet, removing all the leaves at one cut. The beets are thrown into piles as fast as topped. From these piles they must be pitched into wagons by means of special forks hav-

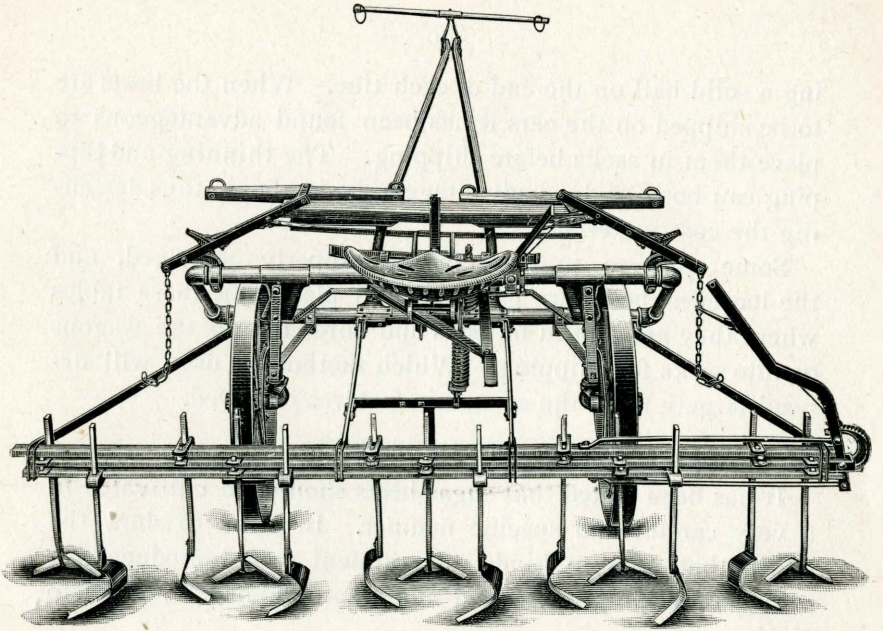


FIG. 7.

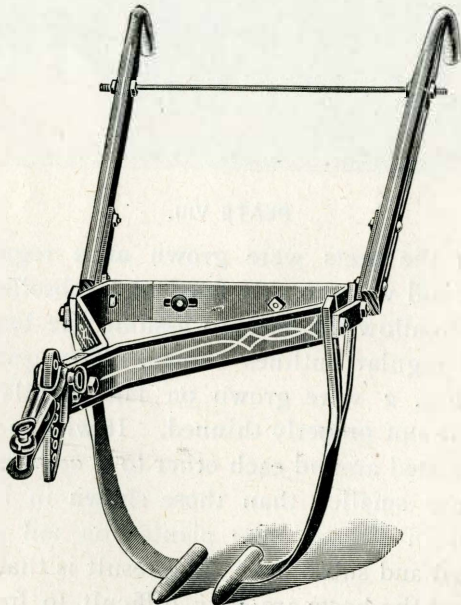


FIG. 8.

ing a solid ball on the end of each tine. When the beets are to be shipped on the cars it has been found advantageous to place them in sacks before shipping. The thinning and topping can both be done advantageously by boys, thus lessening the cost materially.

Some growers provide tables properly arranged, and the loosened beets are gathered and placed on these tables where they are topped by boys and thrown into the wagons or into sacks for shipping. Which method is used will depend largely upon the economic features involved.

CULTURAL EFFECTS.

It has been stated that sugar beets should be cultivated in a very careful and specific manner. In order to show the effects that different kinds of treatment would produce, five groups of beets were selected and photographed. See Plate VIII.

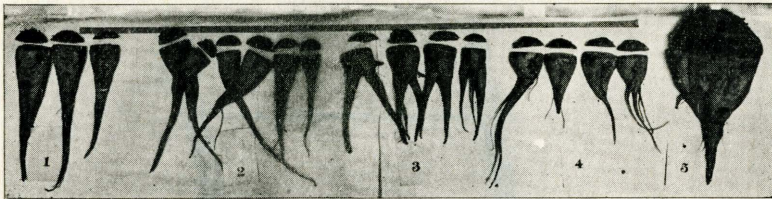


PLATE VIII.

In Fig. 1 the beets were grown at a regular distance apart. The soil was properly fined and subsoiled to a sufficient depth to allow the beets to assume the long, tapering, smooth and regular outlines shown. The group of beets shown in Fig. 2 were grown on land similarly prepared but they were not properly thinned. It will be noticed that they have twisted around each other to a certain extent, and that they are smaller than those shown in Fig. 1. The beets shown in Fig. 3 were planted on soil that was not properly fined and subsoiled. The result is that the tap root is divided and the beets are very difficult to free from dirt, and are not desired by the manufacturer. Those shown in

group 4 were grown on soil which had not been plowed to a sufficient depth. It will be noticed that they are short and that there is insufficient development in the lower part of the tap root, which always contains the greatest amount of sugar. Moreover these beets are small and their yield would be necessarily light. Fig. 5 shows a beet which was grown at the end of a row. This beet weighed between 5 and 6 pounds and it will be noticed that a large amount of it would necessarily be cut off when it is properly topped. In case the rows are too far apart and the beets thinned to too great a distance they are liable to grow this large all through the field. Such beets are coarse, low in sugar and purity, and are not sought after by the manufacturer. It will be noticed that the necks of these beets have been removed and the cuts will give a fair idea of the amount of loss sustained by the different methods of treatment. The perfect beets shown in Fig. 1 gave 26 per cent. sugar in the juice. Those in Fig. 2 gave 21.2 per cent.; in Fig. 3, 24.6 per cent.; in Fig. 4, 25 per cent., while those in Fig. 5 gave but 16.2 per cent.

The ash in No. 1 was .315 per cent., while in No. 5 it rose to 1.14 per cent. The purity co-efficient of No. 1 was 93.2 per cent., while in No. 5 it was 88 per cent. In No. 1 the neck or waste portion amounted to 7.6 per cent., while in No. 5 it reached 26 per cent.

CONCLUSION.

The work of the present year must be considered satisfactory. The results obtained are reliable and definite. On a commercial scale the tonnage could be readily increased, and the cost of production decreased. A complete review of the principal factors involved may be obtained by an inspection of the following summary.

SUMMARY.

ABERDEEN.

GROWER	SUGAR	PURITY	TONS PER ACRE	COST PER ACRE
Thos. E. Williams.....	20.70	92.05	14.00	\$25 95
Robert Owen.....	19.10	93.17	12.40	28 30
J. E. Hickenbotham.....	16.70	93.30	22.40	40 70
R. S. Roe.....	20.60	94 00	18.20	38 80
Averages	19.27	93.13	16.75	\$33 43

HURON.

Smith & Miller.....	16.10	79.70	32.90	\$41 82
Smith & Miller.....	16.70	81.86	14.90	27 15
Smith & Miller.....	17.30	82.00	12.50	20 90
Smith & Miller.....	19.60	85.83	6.50	19 10
Smith & Miller.....	18.40	85.98	7.08	27 70
C. A. Sauer.....	18.90	83.21	6.80	31 29
Averages.....	17.83	83.09	13.44	\$27 99

YANKTON.

Geo. E. Whiting.....	20.00	91.74	9.60	\$48 00
Fred Jacob.....	20.50	93.10	22.30	48 58
E. G. Edgerton.....	16.40	89.16	14.20	34 70
Torger Nelsen.....	19.50	90.70	11.80	34 60
Averages	19.10	91.17	14.47	\$41 47

SIOUX FALLS.

N. E. Phillips.....	18.20	88.78	17.00	\$35 65
John Griffiths.....	17.50	86.21	23 50	50 93
Averages	17.85	87.49	20.25	\$43.25

BROOKINGS.

E. C. Chilcott.....	21.20	93.00	11.40	\$53 77
G. W. Roe.....	17.90	88.74	22.50	40 25
Hogan Anderson.....	16.60	88.70	20.40	37 10
R. N. Crawford.....	16.90	88.40	12.20	37 00
Averages	18.15	89.71	16.62	\$42 03
Average for State.....	18.44	88.91	16.30	\$37 64