Cultural Methods for Sugar Beets

PROGRESS BULLETIN

By W. H. OLIN

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CULTURAL METHODS FOR SUGAR BEETS

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I. Sugar Beet Investigations Already Made at the Colorado Experiment Station.—Investigation work on sugar beets was begun by the Agricultural College before the organization of the Experiment Station. This was done under the direction of President C. L. Ingersoll who had great belief in the possibilities of sugar beets. The first bulletin on sugar beets issued by the Experiment Station was No. 7 in 1888. Since then it has published twelve bulletins on the subject of sugar beets. Most of these bulletins were prepared by the Chemical section of the Station and dealt quite largely with the chemical properties of beets and effect of soil conditions upon the crop.

Prof. W. W. Cooke (Professor of Agriculture) in 1898 began a study of cultural methods, seeking to determine the best time for planting, best distance between rows, proper distance for thinning in the row and how to handle the irrigating water to obtain the best crop. These experiments were reported in bulletin 15 and were strongly in favor of early planting. Definite conclusions were not obtained upon the other problems, which still await solution.

II. Cultural Methods of Our Most Successful Sugar Beet Growers.—To learn the cultural methods practiced by our most successful sugar beet growers, question circulars were sent to 1000 beet growers well distributed in three beet regions of the State; Northern Colorado, Arkansas Valley and the Western Slope region. These growers were selected as representing the growers who were obtaining the best tonnage and therefore getting the most profitable crop returns. The circulars were sent out in June and October of the crop season 1905. They contained the following questions:

1. Number of acres you now have seeded in sugar beets?
2. Number of acres you had in sugar beets last year?
3. Date of seeding beets last year?
4. Date of seeding beets this year?
5. Amount of seed used per acre?
6. Do you tend your own beets?
7. If you employ labor, which have been the most satisfactory—Italian, Mexican or Russian help?
8. Do you fall plow or spring plow for beets?
9. How do you prepare your seed bed for beets? (Please name the operations.)
10. What rotation do you practice for beets—that is, what crops do you grow after beets, before you again plant the same ground to beets?
11. How many times do you cultivate your beets?
12. How many times and when do you irrigate your beets?
13. Do beets require more or less water than other crops?
14. How many loads of manure per acre do you consider best for beets? What kind?
15. How many seasons do you think you can obtain a satisfactory yield of beets without manure?
16. What is your experience with barnyard manure for beets?
17. Do you advise the use of commercial fertilizer for beets? If so, what kind?
18. What is the character of your soil?
19. What do you consider the after feed (tops, etc.) left on the ground worth?
20. What tonnage per acre did you harvest last year?
21. What was your net profit per acre last year?
22. What is the average expense per acre for growing beets on your land?
23. How do beets compare financially with other crops?
24. Would you advise your neighbor to grow sugar beets as a profitable crop?
25. What trouble have you had with insects or plant diseases attacking your plants?
26. To what space between plants do you prefer to thin your beets? Will a greater distance increase or decrease the tonnage and size of beets?
27. Have you grown a satisfactory beet crop on alfalfa sod?
28. Do you think a grain or other crop should be grown on alfalfa sod before planting to beets?
29. What is the effect of early and late seeding upon the yield and quality of beets?
30. Does late summer irrigation tend to ripen the beets earlier or does it seem to prolong the period of ripening?
31. When did you pull your beets this season?
32. What was your 1905 yield?
33. What was your per cent. tare at factory?
34. Was this caused by shape of beet, manner in which the beets were harvested, or dirt on beets?
35. What was the condition of the ground when you pulled your beets?
36. Was the beet crop a satisfactory one in your neighborhood this season? What was the average tonnage per acre?
37. What suggestions in reference to sugar beet culture or problems which you believe essential will you give us?

It is to be regretted that many to whom this circular was sent neglected to send in reports. Less than 50 per cent. sent in a complete report from which we can quote. From the replies sent in to these question circulars, the following facts were gleaned:

1. Plowing of Beet Ground.—54 per cent. of those reporting, plow their beet ground in the spring; 26 per cent. plow their
beet ground in the fall; 20 per cent. irregular, part of the time spring plowing and occasionally disked potato ground.

TABLE No. 1.

PLOWING BEET GROUND AND RESULTING YIELDS
(IN TONS PER ACRE).

<table>
<thead>
<tr>
<th></th>
<th>Spring</th>
<th>Fall</th>
<th>Indifferent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkansas Valley</td>
<td>18.1</td>
<td>19.2</td>
<td>18.2</td>
</tr>
<tr>
<td>Western Slope</td>
<td>18.0</td>
<td>16.6</td>
<td>16.0</td>
</tr>
<tr>
<td>Northern Colorado</td>
<td>16.7</td>
<td>14.5</td>
<td>17.2</td>
</tr>
</tbody>
</table>

Further data is necessary to show the value of fall plowing recommended for every section of the state growing sugar beets.

2. Date of Seeding.—Between first week in April and first week in June; 61 per cent. seed in the month of May.

TABLE No. 2.

TIME OF SEEDING AND AVERAGE YIELD PER ACRE
(IN TONS PER ACRE).

<table>
<thead>
<tr>
<th>Locality</th>
<th>April</th>
<th>May</th>
<th>June</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkansas Valley</td>
<td>19.3</td>
<td>20.6</td>
<td>18.3</td>
</tr>
<tr>
<td>Western Slope</td>
<td>17.6</td>
<td>17.7</td>
<td></td>
</tr>
<tr>
<td>Northern Colorado</td>
<td>15.7</td>
<td>18.4</td>
<td>*20.0</td>
</tr>
</tbody>
</table>

*Only one reported June planting, therefore it is not comparative.

The study of time of planting shows more clearly than this table reveals that usually early planting is best for yield and quality.

3. Amount of Seed per Acre.—The amount of seed used was from 12 to 25 lbs. per acre. The great majority reported using 15 to 20 lbs. per acre.

TABLE No. 3.

AMOUNT OF SEED PER ACRE AND AVERAGE YIELD
(IN TONS PER ACRE).

<table>
<thead>
<tr>
<th></th>
<th>12 lbs.</th>
<th>13 lbs.</th>
<th>14 lbs.</th>
<th>15 lbs.</th>
<th>16 lbs.</th>
<th>17 lbs.</th>
<th>18 lbs.</th>
<th>19 lbs.</th>
<th>20 lbs.</th>
<th>21 lbs.</th>
<th>22 lbs.</th>
<th>23 lbs.</th>
<th>24 lbs.</th>
<th>25 lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ark. Valley</td>
<td>14</td>
<td>19</td>
<td>19.6</td>
<td>19.8</td>
<td>19.3</td>
<td>18.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Slope</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern Colo.</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Yield</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Only one reported 12 lbs. seed per acre. The majority reported the use of from 15 to 20 lbs. per acre.
4. *Help Preferred.* — 46 per cent. of those reporting preferred Russian labor. No particular class of laborers received a satisfactory vote from the rest.

5. *Space Thinned in Rows.* — This varied from 6 to 16 inches the average being 10.4 inches.

**TABLE No. 4.**

**SPACES THINNED IN ROWS AND AVERAGE YIELDS.**

*(IN TONS PER ACRE)*

<table>
<thead>
<tr>
<th></th>
<th>8 to 10 in</th>
<th>11 to 13 in</th>
<th>14 to 16 in</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Arkansas Valley</strong></td>
<td>18.</td>
<td>20.</td>
<td>23.</td>
</tr>
<tr>
<td><strong>Western Slope</strong></td>
<td>17.7</td>
<td>19.7</td>
<td>20.</td>
</tr>
<tr>
<td><strong>Northern Colorado</strong></td>
<td>15.7</td>
<td>18.4</td>
<td>20.</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>17.1</td>
<td>19.3</td>
<td>21.5</td>
</tr>
</tbody>
</table>

The majority reported from 10 to 12 inches. Further work is necessary on this point. The table clearly shows the advantage in point of yield for the wider spaces in the row.

6. *Number of Cultivations.* — 44 per cent. cultivate 4 to 5 times. 31 per cent. cultivate 6 to 7 times. 25 per cent. stated they cultivated two, three, eight, ten or as many times as the crop seemed to require cultivation.

**TABLE No. 5.**

**NUMBER OF TIMES CULTIVATED AND AVERAGE YIELDS.**

*(IN TONS PER ACRE)*

<table>
<thead>
<tr>
<th></th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th><em>As often as needed</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Arkansas Valley</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22.2</td>
<td>17.</td>
<td>18.5</td>
</tr>
<tr>
<td><strong>Western Slope</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17.</td>
<td>20.0</td>
</tr>
<tr>
<td><strong>Northern Colorado</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17.</td>
<td>17.0</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>19.3</td>
<td>18.3</td>
<td>17.2</td>
<td>18.3</td>
<td>17.8</td>
<td>17.</td>
<td>18.5</td>
</tr>
</tbody>
</table>

* Only one reported

This table does not give us positive data and further work is necessary to draw conclusions.

7. *Times Irrigated.* — 56 per cent. report two to three times. 18 per cent. report four times. 15 per cent. report often as needed.

From answers sent no definite data on yields could be obtained.
PLATE III.—VARYING TYPES OF SUGAR BEETS

8. To the question *Do Beet Crops Require More or Less Water than Other Field Crops.*

- 38 per cent. said more water.
- 30 per cent. said less water.
- 31 per cent. said same as other crops

9. *Value of after Crop, Tops, Etc.*—In answer to this question, 65 per cent. placed the value between $2 and $3 per acre, while the average value assigned was $3 per acre.

10. *Tonnage for 1904.*—The average for those reporting was 17.4 tons per acre. The state average for the same year was less than 12 tons.

11. *Tonnage for 1905.*—The average yield reported was 14½ tons per acre, which is several tons above the estimated average of the State. This would indicate that 1904 was a more favorable year for beet culture than 1905, and that those reporting are among our most successful farmers in this industry.

12. *Expense per Acre.*—The expense differed according to locality from $20 to $50, but the average was $33.05 per acre.

**TABLE No. 6.**

**COST OF PRODUCTION.**

<table>
<thead>
<tr>
<th></th>
<th>Average yield per acre Tons</th>
<th>Average cost growing per acre</th>
<th>Total income per acre</th>
<th>Cost of growing * ton of beets</th>
<th>Total profit per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkansas Valley</td>
<td>19.9</td>
<td>$31.10</td>
<td>$96.60</td>
<td>$1.56</td>
<td>$95.50</td>
</tr>
<tr>
<td>Western Slope</td>
<td>17.7</td>
<td>34.80</td>
<td>85.20</td>
<td>1.96</td>
<td>50.40</td>
</tr>
<tr>
<td>Northern Colorado</td>
<td>17.1</td>
<td>36.43</td>
<td>81.68</td>
<td>2.13</td>
<td>48.25</td>
</tr>
</tbody>
</table>

*Minus the tare.

13. *Net Profit of the Crop.*—The reports varied to a remarkable degree, from nothing to $75.00 per acre. It was almost impossible to strike an average, the greater number reporting between $40.00 and $55.00 per acre.

14. To the question *Number of Years Beets Have Been Grown on the Same Ground Without a Change of Crop?*—The average was two years. However, most of these farmers have been growing beets but two years.

15. To the question *Do You Manure Your Beet Land?*—59 per cent. report they do, 41 per cent. report they do not.
TABLE No. 7.
BEETS GROWN WITH OR WITHOUT MANURE.
YIELD, TONS PER ACRE.

<table>
<thead>
<tr>
<th></th>
<th>With Manure</th>
<th>Without Manure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkansas Valley</td>
<td>19.5</td>
<td>14.2</td>
</tr>
<tr>
<td>Western Slope</td>
<td>17.5</td>
<td>13.4</td>
</tr>
<tr>
<td>Northern Colorado</td>
<td>16.8</td>
<td>15.3</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>17.9</strong></td>
<td><strong>14.3</strong></td>
</tr>
</tbody>
</table>

This table shows the value of manure for the beet grower. More farmers in the Arkansas Valley are using stable manure or fertilizers than either of the other sections of the state.

16. Time of Pulling Beets. — Time of pulling beets was reported from September to November, the great majority harvesting in October.

17. The per cent. of Tara. — This was reported from 1 per cent. to 23 per cent. The majority, however, was less than 5 per cent.

18. Cause of Tara—75 per cent. of the farmers reporting believed it was due to the dirt clinging to the beets when harvested. The rest attributed it to defective methods of harvesting and character of crown growth.

19. Condition of Ground at Harvest Time. — The great majority report the ground very dry and cloddy at pulling time. This is largely governed by climatic conditions beyond the beet farmer’s control.

20. Is the Crop a Satisfactory One? — 80 per cent. of the reporting farmers declare it to be the most profitable crop which they can grow. The following statements are given by farmers having at least four years of successful experience in sugar beet culture:

1. The sugar beet crop is an expensive one to grow and should be grown on the very best land on the farm.

2. One should not bring to the surface more than two inches of new soil in plowing. Ground which has not been worked holds its plant food in a form not easily available to the plant. The young beet plant does not obtain proper nourishment from such soil and is checked in the beginning of its growth. When proper conditions prevail, beet ground should be plowed at least 10 to 12 inches deep. When beet land is plowed in the fall, the soil is weathered, rendering plant food at surface easily available to young plants.
3. Beet ground should be as uniformly level as the lay of the land will permit.

4. Early planted beets have generally given the best yields. The seed bed should be warm, Moist, but not wet, for the best germination.

5. A uniform stand is seldom obtained when seed is covered more than two inches deep. The vitality of the beet seed does not seem to be sufficient to send the sprout out of the ground from greater depths. Moisture conditions must indicate the depth to plant, as a shallow covered seed makes a rapid growth with proper soil and moisture conditions.

6. Early thinning of beets has given the best results, since young plants recover from the effects of the thinning process without too serious a delay in plant growth. The beet farmer aids in the thinning process by seeding not more than 5 to 10 acres at one time. His help can get over his entire field before the beets are too large for successful thinning.

7. Cultivation is for the purpose of keeping down weeds, prevent baking of the surface and give encouragement to continuous development of the beets.

8. The judicious use of water tends to produce well shaped beets, increases the tonnage and gives a good sugar content, when proper sun and soil conditions prevail.

9. Each factory furnishes field superintendents who are assisting farmers to learn the efficient use of water in sugar beet culture.

10. Beet farmers should plan for at least four weeks of the growing season after the last irrigation to mature the crop.

11. The Colorado climate, sun and soils are well adapted to sugar beet culture. This industry seems destined to grow with the development of irrigation in the state.

12. The growing of beets requires a crop rotation which shall maintain the humus and plant food elements in the soil. In Northern Colorado where sheep feeding is carried on quite extensively, the manure is carefully saved, composted for a year, and then hauled to the beet lands.

13. A practical rotation of alfalfa, potatoes or other cultivated crops, beets and grain is being gradually adopted.

14. The culture of sugar beets is improving farm methods in all crop production.

The Station has planned some cultural experiments with sugar beets and other root crops for the seasons of 1906, 1907 and 1908 for the purpose of determining the best methods for improving the quality and increasing the tonnage of these most profitable crops. Results will be given in other progress bulletins.