FERTILIZER PROBLEMS.

SUGAR BEETS AND STABLE MANURE.
F. H. HALL, W. H. JORDAN AND G. W. CHURCHILL.

HOW MUCH FERTILIZER FOR ONIONS?
F. H. HALL, W. H. JORDAN AND F. A. SIRRINE.

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That stable manure should not be used on sugar beet land has been the general teaching of nearly all writers upon the culture of this crop. This principle has been accepted as authoritative by most experimenters, and the beets in tests have usually been grown with commercial fertilizers, upon land manured in the fall, or where manure has been applied on a previous crop. However, tests made by this Station in 1898 (reported in Bulletin No. 155) showed no disadvantage, but rather a gain, from the use of liberal quantities of stable manure, applied in the spring. Subsequent experiments have confirmed these results.

The first year's tests were made on the farm of F. E. Dawley, Fayetteville, as well as on the Station farm. Manure at the rate of 20 tons per acre was compared with varying quantities of a high-grade commercial fertilizer. A distinct advantage for the manure was noted in yield, in sugar content and in coefficient of purity. Even with a ton of fertilizer to the acre, the yield was less than with the manure; and the percentage of sugar in the beets

*This is a brief review of Bulletin No. 205 of this Station, on Influence of Manure upon Sugar Beets, by W. H. Jordan and G. W. Churchill. Any one specially interested in the detailed account of the investigations will be furnished, on application, with a copy of the complete bulletin. The names of those who so request will be placed on the Station mailing list to receive future bulletins, popular or complete as desired. Bulletins are issued at irregular intervals as investigations are completed, not monthly.
was smaller, though the coefficient of purity was somewhat greater. With no smaller quantity of fertilizer was advantage over the manure shown in a single point. As compared with check plats receiving neither manure nor fertilizer, the manured areas gave a much larger yield and distinctly better sugar content and purity coefficient.

Experiments during the three years following Later tests. were made on the Station farm, on strong land in good condition. Twenty tons of manure per acre was used for two crops, forty tons for the last crop, compared with no manure and with 1,000 lbs. of commercial fertilizer. Drought affected the yields in 1898, the seed on the fertilizer plats failing to germinate well enough to secure a uniform stand.

In 1901, when an excessive quantity of manure was applied, the percentage of sugar in the beets and the coefficient of purity were slightly lowered by the manure; but in each of the other years and in each point, the manured plats gave better beets than the plats without manure or those receiving 1,000 lbs. of commercial fertilizer. Excluding 1898, when drought injured the beets, the average yields were 12 3/8 tons for check plats, 16 1/2 tons for 1000 lbs. fertilizer and 17 3/8 tons for 20 tons manure.

**General Summary of Results Showing the Influence of Manure upon the Quality of Sugar Beets, 1898-1901.**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sugar in beets.</td>
<td>Sugar in juice.</td>
<td>Coefficient of purity</td>
</tr>
<tr>
<td>1899</td>
<td>15.2</td>
<td>15.6</td>
<td>85.2</td>
</tr>
<tr>
<td>1900</td>
<td>14.8</td>
<td>16.2</td>
<td>84.2</td>
</tr>
<tr>
<td>1901</td>
<td>13.1</td>
<td>17.1</td>
<td>82.9</td>
</tr>
<tr>
<td>Averages, excluding 1901</td>
<td>15.2</td>
<td>16.2</td>
<td>83.7</td>
</tr>
</tbody>
</table>

Coefficient of purity.
The use of manure did not promote leaf growth at the expense of the roots, as the following averages will show:

### Influence of Manures on the Relation of Roots and Tops of Sugar Beets.

<table>
<thead>
<tr>
<th>Fertilizer used</th>
<th>Percentage of weight of entire plant found in roots</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1900.</td>
</tr>
<tr>
<td>Commercial fertilizer</td>
<td>Per ct.</td>
</tr>
<tr>
<td>Stable manure</td>
<td>76.5</td>
</tr>
<tr>
<td>None</td>
<td>78.3</td>
</tr>
</tbody>
</table>

If these results are an index to the behavior of Conclusions, sugar beets in general, then there need be no fear of injury to their quality by the use of a moderate, or even liberal, quantity of manure either in fall or spring. Excessive applications may cause slight injury and are not to be recommended, even from the standpoint of yield; as very favorable weather conditions would be necessary to grow a crop repaying the cost of doubling a 20-ton application of manure per acre.

But the beneficial effect of stable manure on the texture and moisture-holding power of the soil, make it advisable to use this fertilizer in preference to chemicals, or at least in addition to them, on most of our soils.

If the use of manure on a field appears to give too vigorous a growth and to produce beets larger than desired at the factories, the distance between the beets in the row may be lessened to advantage. The tests in 1899, with 20 tons of manure per acre, showed increased yields with decreased weights of individual beets as the distances in the row were lessened from 10 inches to 8 inches and from 8 inches to 6 inches.

There is no discernible reason why the plant-food elements in stable manure should exert a more unfavorable influence on sugar beets than the same elements in commercial fertilizers; and since these tests show that they do not do so, the prejudice against the use of manure on beet lands should not influence farmers to discriminate against this valuable product of their stables.
HOW MUCH FERTILIZER FOR ONIONS?

F. H. HALL.

In the intensive agriculture of Long Island, commercial fertilizers have often been used in excessive and unprofitable amounts. The effort has been to get the largest possible crop from the area cultivated. In securing these maximum crops the planter often forgot that a moderate yield with a small outlay for fertilizers might give greater profits than a larger crop gained by spending twice as much. Probably, also, he had never given careful study to the effect upon his crop of varying amounts of fertilizer; but thought, "If a little is good, more is better.''

Potato growers frequently used a ton of high-grade fertilizer per acre, which would contain an amount of plant food far in excess of the needs of the largest crop it would be possible to grow. Such fertilizing seemed wasteful, and Station tests proved it so.

Tests on onions. Similar conditions exist among the onion growers of Orange County, who often use, year after year, large quantities of commercial fertilizer, without knowing how profit and loss would be affected by smaller applications. Four years' tests, concluded in 1901, prove that 500 lbs. of fertilizer per acre will, ordinarily, give large profits; but that larger applications than this must be accompanied by exceptionally favorable conditions for growth.

*This is a brief review of Bulletin No. 206 of this Station, on Commercial Fertilizers for Onions, by W. H. Jordan and F. A. Sirrine. Anyone specially interested in the details of the investigations will be furnished, on application, with a copy of the complete bulletin.
and high prices in market for the product, to insure proportionate returns.

The test fields were in the heart of the onion section, on the black, peaty, friable soil which the onion loves; and the crops were raised by experienced growers, using approved methods.

The experiments included four years' crops on one farm, one year's crop on another. The fertilizer (4-8-10 formula for three years, 4-8-5 formula the last year) was applied at the rate of 500, 1000, 1500 or 2000 lbs. per acre on each of two plats (about 1/16-acre each). Two plats were left as checks. The application was repeated each year except as noted in the table. The onions suffered as usual from insects, diseases and bad weather, but not to a sufficient extent to make the results unreliable.

On the farm where the test was made for one year, the soil had, in previous years, received liberal manuring, so that it was rich in fertility. In consequence, the fertilizers applied in the test, whether in large or in small amounts, were thrown away. The check plats gave as heavy yields as the fertilized plats. And this is a type of soil which the owners continue to fertilize year after year.

The summary of yields and profits for the four-year series is given below.

**RESULTS FROM USE OF VARYING QUANTITIES OF FERTILIZERS ON ONIONS.**

(AVERAGES PER ACRE FOR FOUR YEARS.)

<table>
<thead>
<tr>
<th>Quantity of fertilizer.</th>
<th>Cost of fertilizer.</th>
<th>Yield.</th>
<th>Profit from fertilizer.</th>
<th>Total increase of yield.</th>
<th>Increase yield for each addition 500 lbs. fertilizer.</th>
<th>Fertilizer cost each bbl. increase, onions.</th>
<th>Fertilizer cost per bbl. of increase from each addition 500 lbs. fertilizer.</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0</td>
<td>85.3</td>
<td></td>
<td></td>
<td>33</td>
<td>33</td>
<td>16.6</td>
</tr>
<tr>
<td>500</td>
<td>$5.47</td>
<td>118.3</td>
<td>$35.84</td>
<td>33</td>
<td>3.3</td>
<td>27.4</td>
<td>16.6</td>
</tr>
<tr>
<td>1000</td>
<td>10.94</td>
<td>125.2</td>
<td>38.87</td>
<td>39.9</td>
<td>6.9</td>
<td>24.7</td>
<td>16.6</td>
</tr>
<tr>
<td>1500</td>
<td>16.41</td>
<td>132.0</td>
<td>42.75</td>
<td>46.7</td>
<td>6.8</td>
<td>35.1</td>
<td>16.6</td>
</tr>
<tr>
<td>2000</td>
<td>21.87</td>
<td>134.4</td>
<td>39.44</td>
<td>49.1</td>
<td>2.4</td>
<td>44.5</td>
<td>16.6</td>
</tr>
</tbody>
</table>

1 During the last year of the test, no fertilizer was applied on five of the ten plats.
2 At $2.5 per ton; footnote 1 explains variation from even figures.
3 Onions $1.25 per barrel.
It appears from this table that there would have been a good profit from the use of 500 lbs. of fertilizer even at very low figures; for the increase cost only 16½ cents a barrel, for fertilizer. The larger amounts of fertilizer gave increase enough to yield profits, at $1.25 a barrel; but none of them would have done so at 75 cents a barrel. In 1900, a good onion year, the 500 lbs. application gave as large an increase as greater amounts; while in 1898, a poor year, the differences in yield were small, but progressive from lowest amount of fertilizer to the highest. This proves that the supply of plant food is only one factor in crop production; that temperature, soil texture and water supply must be favorable if the fertilizers are to give their best results.

"It is evident, then, that considering the varying price of the marketable product, the close margin of profit from heavy manuring with fertilizers even with fairly good prices for the crop product, and the vicissitudes of the crop due to the limitations of season, the onion grower runs great risk of diminished profits when he uses 1,500 and 2,000 lbs. of commercial manure per acre."