Fertilize The Oat Crop!

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Recommended Citation  
Nelson, L. B.; Meldrum, H. R.; and Lawton, Kirk (1946) "Fertilize The Oat Crop!," *Farm Science Reporter:* Vol. 7 : No. 1 , Article 2.  
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Fertilize The Oat Crop!

Fertilizer May Boost Oat Yield 20 Bushels An Acre, Tests Show

WE CAN PROFITABLY use commercial fertilizer for oats on many Iowa farms.

That is the conclusion we have reached from tests made by the Iowa Agricultural Experiment Station in the past 2 years. In 1944 and 1945 we had over 30 field experiments with about 1,500 small plots. These were scattered over most of Iowa's major soil areas.

In noting the good results one should remember that in both 1944 and 1945 the early part of the growing season for oats was cool and moist. Under these conditions nitrogen fertilizer does its best job. We must keep that in mind when we start laying down our dollars to buy commercial fertilizer for Iowa's second most important crop—oats. In a dry, warm spring, the results might not be so satisfactory.

The results of the last 2 years' tests show that:

1. Many Iowa soils do not have enough available nitrogen in them to produce the best crop. Under these conditions nitrogen fertilizer does its best job. We must keep that in mind when we start laying down our dollars to buy commercial fertilizer for Iowa's second most important crop—oats. In a dry, warm spring, the results might not be so satisfactory.

The results of these tests are shown in the accompanying table.

The yields of Nitrogen for oats are averages of 7 experiments, and those for Nitrogen-potash for oats are averages of 22. We used the various fertilizers at these rates: Nitrogen 20 pounds to the acre in 1944 and 40 pounds in 1945; phosphate 40 pounds to the acre and potash 20. It takes 100 pounds of ammonium sulfate or 20-0-0 fertilizer to put on 20 pounds of nitrogen; 200 pounds to put on 40 pounds of nitrogen. For the phosphate and potash, it would take 200 pounds of 0-20-10.

All fertilizer was applied broadcast and disked into the soil before sowing the oats.

The average yields in the test show that in these two years nitrogen increased yields most, phosphate next and potash least. In 1944, 20 pounds of nitrogen to the acre (100 pounds of amm-

Set-up and Results

In these fertilizer tests, we used nitrogen, phosphate and potash alone on some plots. This gave us a chance to learn which of the fertilizer materials the different soils needed for oats. Then on some plots we used various combinations of nitrogen, phosphorus and potash. This gave a check on the combination that worked best.

The results of these tests are shown in the accompanying table.

The yields for 1944 are averages of 7 experiments, and those for 1945 are averages of 22. We used the various fertilizers at these rates: Nitrogen 20 pounds to the acre in 1944 and 40 pounds in 1945; phosphate 40 pounds to the acre and potash 20. It takes 100 pounds of ammonium sulfate or 20-0-0 fertilizer to put on 20 pounds of nitrogen; 200 pounds to put on 40 pounds of nitrogen. For the phosphate and potash, it would take 200 pounds of 0-20-10.

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<table>
<thead>
<tr>
<th>Fertilizer*</th>
<th>1944 Bushels increase (7 experiments)</th>
<th>1945 Bushels increase (22 experiments)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>7.9</td>
<td>15.7</td>
</tr>
<tr>
<td>Phosphate</td>
<td>3.4</td>
<td>3.0</td>
</tr>
<tr>
<td>Potash</td>
<td>2.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Phosphate-potash</td>
<td>3.9</td>
<td>3.2</td>
</tr>
<tr>
<td>Nitrogen-phosphate</td>
<td>10.6</td>
<td>24.4</td>
</tr>
<tr>
<td>Nitrogen-potash</td>
<td>8.0</td>
<td>18.6</td>
</tr>
<tr>
<td>Nitrogen-phosphate-potash</td>
<td>11.2</td>
<td>25.4</td>
</tr>
</tbody>
</table>

*20 lbs. nitrogen were used in 1944 and 40 lbs. in 1945.
same as on land which received no fertilizer; but when fertilizer containing both nitrogen and phosphorus was applied, the yield jumped from about 13 bushels on the untreated soil to 54 bushels on the fertilized.

Effect of Previous Crops

How much the soil needs nitrogen depends on how many crops of corn it has grown since a legume sod was plowed under or since it was manured. When we grouped the 1945 experiments according to the previous crops grown we found:

1. In fields following clover the most available nitrogen was found where only one year of corn had been grown following the legume. Here an increase of 8 bushels of oats was obtained from 40 pounds of nitrogen.

2. The soils following 3 years of alfalfa still had considerable available nitrogen in them even after producing two crops of corn. On these soils the increase from 40 pounds of nitrogen was nearly 12 bushels of oats.

3. On fields where two or more years of corn followed clover, very little available nitrogen was left in the soil. When we applied 40 pounds of nitrogen to these fields, the yield of oats increased 28 bushels to the acre.

Why Oats Need Nitrogen

Oats must have 1 pound of nitrogen for each bushel. So a 65-bushel oat crop takes 65 pounds of nitrogen from the soil. Some of this nitrogen can come from plant material that is plowed under. Nitrogen also can come from legumes grown, from manure or from nitrogen fertilizer.

Corn is our chief crop in Iowa. It, too, needs a lot of nitrogen, so we usually apply the manure just before the corn crop, and corn is the first crop we grow on land after clover or alfalfa is plowed under. Corn is grown on many farms for 2 years or longer after the land has been in legumes or manured. Thus most of the easily available nitrogen is used up by the corn before the oats get a chance to use it.
Oats must obtain the nitrogen they use in about 3½ months when the weather is often wet and cold. In this weather the microorganisms in the soil are slowed down and produce less available nitrogen from the organic matter in the soil.

**How Legume Seedings Fare**

Our experiments with alfalfa and clover during the past 5 years have shown that about 70 fields out of 100 were helped by phosphate fertilizer and 15 out of 100 were helped by potash. It would be poor planning not to consider the new legume seeding in fertilizing the oats. When fertilizing the legume hay crop, it is best to apply all of the fertilizer needed for top hay yield at the time of sowing the oats. We think that 200 pounds of 0-20-0 or 0-20-10 for clovers and 300 pounds for alfalfa are enough. So the phosphate and potash needs of the oats will usually be taken care of in applying fertilizer for the legume crop.

If one adds nitrogen fertilizer for the oat crop, what will it do to the legume seeding? In some trials where oat varieties were being tested, 40 and 80 pounds of nitrogen lowered the stands of the seedings. In our 1945 fertilizer trials where the soil had little available nitrogen in it, applying 40 pounds of nitrogen fertilizer seemed to do no harm to the seeding. The legume hay yields from these fields in 1946 should tell whether hay yields were lowered by the use of nitrogen fertilizer.

It is common knowledge that a too heavy growth of oats may hurt the stand of the legume seeding, especially in dry years.

Oats often lodge when grown near farm buildings on fields which have been heavily manured. It would obviously be a mistake to apply nitrogen to such a field, for that would cause still more lodging. The danger of oats lodging from a heavy nitrogen supply in the land will be much less likely with the new stiff-strawed Clinton oats.

To lessen the danger of injuring the legume seeding and at the same time obtain the best oat yield, hold back the nitrogen fertilizer for 2 or 3 weeks after sowing. If the oats appear stunted and light green, with dark green heavy growth occurring over animal droppings, then top-dress the field with nitrogen. If you follow this plan, you would apply the phosphate or phosphate-potash fertilizer at sowing time, then if the oats need nitrogen top-dress later with ammonium sulfate or ammonium nitrate.

In some of our western Iowa tests, where the soils were low in both nitrogen and phosphate, applying only phosphate would cause the sweetclover seeding to grow taller than the oats by harvest time. It was only by applying nitrogen fertilizer to make the oats grow taller that the oat heads could be kept above the clover. Our experience was similar to that of several farmers who used phosphate fertilizer alone on fields where the soil also needed nitrogen—they had trouble with the sweetclover growing taller than the oats.

**Recommendations**

Just what oat-fertilizer program should one follow? We believe that in average seasons efficient use of nitrogen fertilizer can be made on oats whenever they fol-
low 2 or more years of a crop that isn’t a legume. Also nitrogen fertilizer is likely to give good results on land where the management has included few legume crops and has had little manure. The greatest step-up in yield can be expected on eroded soils and sandy soils. In wet, cold years nitrogen probably will profitably increase the oat yield on land which has not been in legumes for at least a year. No detrimental effects should normally occur from nitrogen applications up to 40 pounds an acre under the above conditions.

Consider Oat Prices

The past 2 years’ tests indicate that about 2 pounds of nitrogen will produce 1 bushel of oats. The nitrogen costs approximately 12 cents per pound. One can then decide on the basis of the current oat prices whether it will pay to use it.

Enough phosphate and potash fertilizer should be applied to take care of both the oat crop and the following legume hay crop. The needs of the legume hay crop will determine the kind and amount of these materials. If these needs have not been determined by previous experience with fertilizers, then soil tests may offer a good guide.

Soils samples if properly taken can be used to show whether or not phosphate and potash are needed and the amounts of each that are likely to give good increases in yield. Soil samples may be submitted to the Soil Testing Laboratory at Iowa State College.

On fields where nitrogen and phosphate or potash are needed, 20 or 30 pounds per acre of nitrogen should be used. The nitrogen may be supplied by using 100 to 150 pounds per acre of ammonium sulfate, 75 to 100 pounds of ammonium nitrate, or 100 to 150 pounds of cyanamid. Phosphate and potash may be supplied by applying 200 pounds per acre of 0-20-0, 0-20-10 or 0-20-20 on oats seeded with clover.

For oats and alfalfa seedings, 300 pounds of the phosphate or phosphate-potash fertilizers should be applied. Fertilizer mixtures, such as 10-20-0, 6-12-6 or 6-12-12 (when available), can be used to advantage. These should be applied in amounts to equal the nitrogen, phosphate and potash recommended above.

Fields Well Managed

On fields where better management has been practiced, less than 20 pounds of nitrogen fertilizer with phosphate or phosphate and potash may be used. If preferred, the nitrogen fertilizer may be withheld and applied later as a top-dressing if the oats show nitrogen deficiency symptoms.

On fields which are known to be high in nitrogen, only phosphate and potash should be applied.

On fields where past experience or soil tests indicate that sufficient phosphate and potash are present but where the nitrogen is low, most economical returns will probably be obtained from applying straight nitrogen fertilizer.

**OAT YIELD INCREASES OBTAINED**

<table>
<thead>
<tr>
<th>ACRE YIELD IN BUSHELs</th>
<th>CARRINGTON</th>
<th>GRUNDY</th>
<th>KNOX (IDA)</th>
<th>MARSHALL</th>
<th>CLARION</th>
<th>WEBSTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTROL</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
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<tr>
<td>NITROGEN</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>PHOSPHATE</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>NITROGEN-PHOSPHATE</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
</tbody>
</table>

**NEED OF BALANCED FERTILIZER**

as shown by nitrogen and phosphate responses, singly and in combination, on calcareous Knox (Ida) soil......

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