Soil Sampling and Nutrient Management

WV Co. Agents Spring Meeting
Professional Development Session
April 15 -16, 2008

Tom Basden, Ed Rayburn, Craig Yohn and Roger Nestor
West Virginia University
Extension Service
Proper Soil Sampling Steps

By
Roger L. Nestor
WVU Extension Agent - Barbour County
Good Soil Sampling Steps

1. Why sample?
2. Causes of poor quality samples
3. Where to sample
4. When to sample
5. Soil sampling tools
6. Sampling depths
Why sample soil?

- Increase effectiveness of lime and fertilizers
- To determine what and how much is needed for plant growth
- Increase returns on investments in fertilizer, lime, and time
Causes of Poor Quality Samples

1. Not representative of the area
2. Contaminated from dirty containers
3. Taken at improper depths
4. Wet or frozen samples submitted
5. Dried with oven or hot sun
6. Too small (<1/2 lb.) sample
7. Plant debris in the sample
Where to Sample?

1. Draw a sketch of your fields before sampling
2. Try to sample in 10 acre or smaller areas
3. Collect a minimum of 15 to 20 soil borings
4. If >10 acre area, collect a minimum of 30 borings
5. Sample unique areas separately:
   a. old lime piles
   b. wet areas
   c. flats vs. steep slopes
   d. eroded areas
   e. areas managed differently
   f. texture differences
When to Sample

1. Late summer or early fall

2. Not when soil is wet or frozen

3. Not immediately after applying lime or fertilizer

4. Not immediately after applying organic matter
Soil Sampling Tools

- Soil tube or auger
- Garden spade or trial
- Shovel
## Sampling Depths

<table>
<thead>
<tr>
<th>Category</th>
<th>Depths</th>
</tr>
</thead>
<tbody>
<tr>
<td>New lawns (two samples)</td>
<td>0 – 4 inches</td>
</tr>
<tr>
<td></td>
<td>6 – 8 inches</td>
</tr>
<tr>
<td>Established lawns</td>
<td>0 – 6 inches</td>
</tr>
<tr>
<td>Vegetable gardens</td>
<td>0 – 6 inches</td>
</tr>
<tr>
<td>Permanent grasslands</td>
<td>0 – 2 inches</td>
</tr>
<tr>
<td>Crop rotated hayfields</td>
<td>0 – 6 inches</td>
</tr>
<tr>
<td>Cropland</td>
<td>0 – 6 inches</td>
</tr>
<tr>
<td>No-till crops (two samples)</td>
<td>0 – 2 inches</td>
</tr>
<tr>
<td></td>
<td>2 – 6 inches</td>
</tr>
</tbody>
</table>
Precision Method

- Acreage is determined using GPS
- Points are marked in the field using GPS
- Soil samples are pulled at each point
- Each sample is analyzed separately, representing each point in the field
- Each point is spread to the exact nutrient need
<table>
<thead>
<tr>
<th>0''</th>
<th>vegetable gardens</th>
<th>permanent pastures</th>
<th>meadows</th>
<th>cropland</th>
<th>no-till corn (2 samples)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No. 1</td>
</tr>
<tr>
<td>2''</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No. 2</td>
</tr>
<tr>
<td>4''</td>
<td>top soil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8''</td>
<td>sub soil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No. 1 and No. 2 indicate two samples of no-till corn.
Sample Preparation

- Air dry the soil cores.
- Crush the soil.
- Sift out rocks and course organic matter.
- Place in plastic bag.
- Send to lab soon after sampling.
Correct Info Needed!!!

- Current use of field; hay, pasture, etc.
- Limed in last year?
- Good identification of sample.
- Correct legume percentage.
How often should we sample?

- New lawns - after topsoil has been added and final grading is done.
- Established lawns - every 3 -5 years.
- Gardens - every 2 -3 years.
Sampling frequency (2)

- Permanent grasslands - every 3 – 5 years.
- Continuous row crops and alfalfa - every 1 – 3 years.
- Perennial crops - every 3 years or once each rotation.
This slide intentionally blank
Liming recommendations (Roger Nestor).
Calcium

Ca is calcium, the mineral used in cell wall and leaf and root development.

CaCO$_3$ is the measure of calcium carbonate liming material.

CaCO$_3$ = 2.497 x Ca
Calcium Sources

- burned lime 150 CCE
- hydrated lime 120
- dolomitic limestone 104
- ground limestone 75-95
- marl/oyster shell 95
- calcium sulfate 22% Ca
Things to remember about lime

- Serves as a “control valve” for other plant nutrients
- Different liming materials have different neutralizing values
- Different processing of the limestone determines the fineness of the lime which then determines how fast the lime reacts with the soil
Remembering lime (2)

- WV Agricultural Lime Law defines what agricultural lime is
- Look for high Calcium Carbonate Equivalent (CCE) values
- Particle size is measured by sieve screens; important ones are 100, 60, and 20 mesh
- Effective neutralizing value (ENV) combines Total Neutralizing Value (TNV) and fineness.
Remembering lime (3)

- There is a difference between registered liming material and a certified liming material
- Do not hesitate to ask the lime vendor for the analysis of their liming material.
- Use the worksheet “Comparing the ENV of Ag Lime” or the Excel spreadsheet “Lime Value Worksheet.xls”
Demo of Excel Lime Worksheet

- Always call your lime vendor to get current analysis (you may verify this with WVDA)
- Ask for CCE (Calcium Carbonate Equivalent)
- Ask for % passing 20, 60, and 100 mesh sieve screens
- Insert values into Excel Lime Worksheet
Value of ground agricultural limestone based on total neutralizing value (TNV) as calcium carbonate equivalence (CCE) and effective neutralizing value (EVN) due to fineness of the lime.

Enter name and values associated with lime stone sources in the blue boxes. The spread sheet is protected so changes cannot be made in other cells unless the sheet is unprotected using the Tools menu.

Use equivalent lime costs, either delivered only or delivered and spread.

The TNV or CCE values and the portion of the lime passing specified screen mesh sizes can be found on the shipping label of the lime purchased. This label is required by WVDA.

The lime requirement should be that reported by the WVU soil testing laboratory and is reported as tons of CCE.

<table>
<thead>
<tr>
<th>Lime Stone</th>
<th>High Magnesium Lime</th>
<th>Calcium Lime 1</th>
<th>Calcium Lime 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost/ton lime</td>
<td>$34.00</td>
<td>$34.00</td>
<td>$24.00</td>
</tr>
<tr>
<td>TNV in CCE (from lime label)</td>
<td>1.056</td>
<td>0.98</td>
<td>0.80</td>
</tr>
<tr>
<td>Lime Requirement t/a CCE (from soil test)</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Tons of lime needed based on CCE</td>
<td>1.89</td>
<td>2.04</td>
<td>2.50</td>
</tr>
<tr>
<td>Cost/acre based on CCE</td>
<td>$64.39</td>
<td>$69.39</td>
<td>$60.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Screen mesh</th>
<th>Fraction Passing Screen Mesh (from label)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>0.75</td>
</tr>
<tr>
<td>60</td>
<td>0.85</td>
</tr>
<tr>
<td>20</td>
<td>1.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lime effectiveness based on fineness</th>
<th>Adjustment for sieve size classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;60 100%</td>
<td>0.85 0.60 0.50</td>
</tr>
<tr>
<td>20-60 50%</td>
<td>0.08 0.18 0.19</td>
</tr>
</tbody>
</table>