**Beginning Farmer & Rancher Development Program**

**FARMING 101 Newsletter**  
Fall 2011 Issue

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**Step 1: Soil Testing**

One of the first steps to beginning farming is to obtain a soil test. A Soil test is used to assess the amount of nutrients available to plants from your soil. This is important in determining what fertilizer and how much to apply to your fields before planting.

To do a soil test you will need to first pickup a soil sample box and information sheet from your county extension office, see figure 1. Request several boxes, you may need more than one. You will also need a soil probe, auger, or a simple trowel will suffice, a bucket, and knife or tool for scraping if you are working with clay soil.

After you have selected the areas you will be planting and decided on what you will be planting you are ready to start collecting your soil sample(s). Samples should be taken from each field or unique area to be planted. Each sample should be a composite or compound sample. A composite sample is a collection of several subsamples from one field, mixed together to obtain one sample for the entire field.

You should start collecting your subsamples at one end of the field and move zigzag across your field, randomly collecting the samples as shown in figure 2. Before collecting your subsamples scrape away the grass and debris from the top layer of soil where you plan to dig. Dig down 6-8 inches and collect your first subsample making sure you collect a representative subsample of all layers of soil as shown in figure 3. Repeat 15 to 20 times depending on the size of your field (a single sample should not represent more than 10 acres). Deposit each subsample into your bucket. Once you have collected all the subsamples for that field, mix them together. You have just completed making your first composite or compound sample. You will now need to fill-in the requested information, name, address, field ID, what you intend to grow, on the sample collection box. Fold your box out according to the diagram and deposit a sample.
Sand has the largest particles and the largest pores between particles. A soil with 50% sand tends to drain well, dry out and warm up quickly. It also tends to be less fertile and does not hold moisture well throughout the season.

Clay has the smallest soil particles and the least amount of water and air spaces between particles. Consequently, a soil with 50% clay will have all the opposite characteristics of sand, drains, dries out and warms up slowly, but is fertile and once wet holds water well.

What type of Soil do you have?

Have you thought about what type of soil you are farming? I am speaking less about the actual type of soil and more about the texture of soil you are farming. It is important to know what texture of soil you are farming because it will influence what you will plant, how often you will fertilize, and even the productivity of your crop. There are four general textures of soil. They are sandy, loam, silt, and clay. Sandy soil is considered coarse, very aerated and well drained. On the opposite side of the spectrum is clay soil. Clay soil is considered fine, not well aerated and does not drain well. As with most things anything considered an extreme is not the best. This is true with soil as well. Sandy soil has a tendency to be too well drain and clay soil has a tendency to erode. In between sand and clay you have silt and loam, see figure 1. Silt soil is moderate in size, has a smooth or floury texture. According to Auburn University Extension publication on Water Quality a loamy soil contains roughly even amounts of sand clay and silt. Loamy soil allows the water and nutrients to move more freely.

Remember your soil texture should not stop you from farming but influence what and how you will be farming. Grow products that grow well in the soil that you have.
Appendix 1: Soil Sampling For The Home Gardener

Determining soil texture by feel

Start

Place approximately 1 ounce of soil into your palm. Add water drop-by-drop and knead soil to break down all aggregates. Soil is at the proper consistency when plastic and moldable like moist putty.

Add dry soil to soak up water.

Does soil remain in a ball when squeezed?

Yes

Is soil too dry?

Yes

Is soil too wet?

Yes

No

No

Sand

No

Place ball of soil between thumb and forefinger, gently pushing the soil with the thumb, squeezing it upward into a ribbon. Form a ribbon of uniform thickness and width. Allow the ribbon to emerge and extend over the forefinger, breaking from its own weight. Does soil form ribbon?

Yes

Does soil make a ribbon up to 2 inches long?

Yes

Loam

Longer than 2 inches?

Clay

Source: Virginia Cooperative Extension
Soil Sampling for the Home Gardener
http://pubs.ext.vt.edu/452/452-129/452-129.html
Soil pH

Soil pH is a measure of how acidic or alkaline your soil is. Soil pH is important to know because it affects the availability of nutrients, the number of microorganisms, and the effectiveness of your pesticides. Soil pH ranges from 3.5 to 9.0 with 3.5 to 6.5 are considered acidic and 7.4 to 9.0 are considered alkaline, 6.6 to 7.3 are considered neutral, see figure 1.

Common Classes of Soil pH. A pH range of 6 to 7 are generally considered favorable for crop production (figure 2. Target pH for Different Crops), while many floriculture plants require a much more acidic soil. A soil whose pH is 5.5 or below will have low calcium, magnesium and phosphorus availability. A soil whose pH is 7.8 and above usually have low availability of iron, manganese, copper, zinc, and especially phosphorus and boron.

Microorganisms are important to the soil. Microorganism activity is responsible for breaking down organic matter and most chemical transformation in the soil. Organic matter would be soil composed of anything that once lived. It includes plant and animal remains in various stages of decomposition, cells and tissues of soil organisms, and substances from plant roots and soil microbes. A pH of 6.6 to 7.3 is favored for microbial activity.

Soil pH is critical when using pesticide as well. Your soil pH can have a negative effect on your pesticide. Most pesticides are labeled for specific soil conditions. If you use these pesticides outside of those soil pH range it may prove your pesticide ineffective, change it to an undesirable form, or may not degrade as expected posing a threat to future crops.

Soil pH is affected by several factors both natural and artificial. Location, weather, climate, are examples of natural affects. Artificial affects would be adding lime or soil leaching. You may not be able to change natural factors affecting soil pH. Soil pH can be modified using lime or calcium. In situations where your soil pH is low you will need to add lime to raise the pH level. In situations where your soil pH is high you will need to add calcium. Soil testing will tell you what your soils pH is and make recommendations as to how much lime/calcium you will need spread.

A simple pH test can be done using a meter similar to the one in figure 3. You may purchase one at your local gardening center. These meters are great for testing throughout the season but are not intended to replace your yearly soil test. These meters will give you a pH level but make no recommendation toward soil nutrient levels or comments toward the crops you intend to produce.
**Understanding Your Soil Sample Report**

Approximately three to seven days after you submit a soil sample for testing you will receive your soil test report. Your soil test results report should look something like diagram A. Diagram A is a soil test report for samples taken for demonstration purposes. The diagram is marked with numbers 1-13 and labeled. Below is an explanation of each label.

*Diagram A. Sample Soil Test Report*

<table>
<thead>
<tr>
<th>LAB No</th>
<th>Sample Designation</th>
<th>Crop</th>
<th>Soil Group</th>
<th>Soil pH</th>
<th>Phosphorus</th>
<th>Potassium</th>
<th>Magnesium</th>
<th>Calcium</th>
<th>Lime-Stone</th>
<th>P2O5</th>
<th>B2O3</th>
</tr>
</thead>
<tbody>
<tr>
<td>21006</td>
<td>1 not planted</td>
<td>Cool-Season</td>
<td>1</td>
<td>5.6</td>
<td>P&lt;0.01</td>
<td>H 117</td>
<td>H 71</td>
<td>H 370</td>
<td>1.0</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>See Comment 1</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>See Comment 2</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21007</td>
<td>1 not planted</td>
<td>Legumes</td>
<td>1</td>
<td>5.6</td>
<td>L 19</td>
<td>M 117</td>
<td>H 94</td>
<td>H 370</td>
<td>1.0</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>See Comment 1</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>See Comment 3</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 plantedfld</td>
<td>Cool-Season</td>
<td>2</td>
<td>5.5</td>
<td>M 42</td>
<td>H 160</td>
<td>H 94</td>
<td>H 569</td>
<td>1.5</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>See Comment 1</td>
<td></td>
<td></td>
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<td></td>
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<td>See Comment 2</td>
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</tr>
<tr>
<td></td>
<td>2 plantedfld</td>
<td>Legumes</td>
<td>2</td>
<td>5.5</td>
<td>M 42</td>
<td>M 160</td>
<td>H 94</td>
<td>H 569</td>
<td>1.5</td>
<td>60</td>
<td>40</td>
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<tr>
<td></td>
<td>See Comment 1</td>
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<td></td>
<td>See Comment 3</td>
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</tr>
</tbody>
</table>

**Comment No.1:** Soil acidity (low pH) can be corrected with either dolomitic or calcitic lime.

**Comment No.2:** For the best results, cool-season annual grasses and legumes (clover, vetch, small grains, ryegrass) should be planted, established and fertilized in September. Apply recommended ground limestone and incorporate into soil before planting. Fertilizer may be applied at planting or after a stand is established. If additional spring growth is desired, apply 60 pounds of N per acre in late winter or spring unless the legume occupies one-half or more of the ground cover.

**Comment No.3:** For reseeding clover, or clover seed harvest, apply 1 to 1.5 pounds B (Boron) per acre.

The number of samples processed in this report is 2

For further information call your county agent: (334) 727-0340

* 1. Sandy soil (CEC < 4.0 mmolc/g)
* 2. Loams and Light clay (CEC = 4.0 - 6.0 mmolc/g)
* 3. Clay and soils high in organic matter (CEC > 9.0 mmolc/g)
* 4. Clayes of the Black hills (CEC > 9.0 mmolc/g)

** 7 or higher - Alkaline
** 6.5 - Neutral
** 6.3 - Acid
** 5.5 or lower - Strong Acid

*** Extractable nutrients in pounds per acre

If soil group = 1, 2, or 3, Method of Analysis = Mehlich-1. If soil group = 4, Method of Analysis = Misc/Lexiaceae.

Approved by:  
Print Date: April 18, 2011  
Page 1 of 1
1. Farm Name – this is the name and address written on your soil sample collection box (which should have been the farm address).

2. Farm Location – gives the county for the address submitted, its district, and the date the test was done.

3. Lab Number – this is the number the lab uses to keep up with each sample.

4. Field ID – This is the field ID you gave your sample during collection. The comment numbers here correspond to the comment numbers listed under label 12. Comments. In our diagram sample 1 is listed as not planted and sample 2 is listed as planted field. This is taken from information you provided on your sample collection box. A soil test can be taken for a planted field as in the case of sample 2. However, it is always recommended that soil tests are performed prior to planting.

5. Crop – these are the crops you indicated you plan to plant on soil collection box.

6. Soil Group – this is your soil texture. The numbers listed here correspond to the numbers listed under label 13. Starred Info.

7. Soil pH – this is the level of acidity or alkalinity of your soil sample. The soil pH can be further investigated using the starred info (label 13).

   - VL = very low; fertilization needed. Crop yields could be less than 50 percent of potential without this nutrient.
   - L = low; fertilization needed. Crops yields could be 50 to 75 percent of potential without this nutrient.
   - M = Medium; some fertilization recommended. Crop yields could be 75 to 100 percent of potential without this nutrient.
   - H = high; nutrient adequate for crop, although some fertilizer may be applied to high-value crops. Yield potential is 100 percent.
   - VH = very high; no nutrient needed.
   - EH = extremely high; excessive nutrient level could be damaging to the crop or the environment.

8. Results – these are amount of nutrients available to the plant from your soil expressed as pounds per acre.

9. Nutrient Rating – identifies the level of the nutrient available to the plant from your soil. The rating list is as follows:

   - VL = very low; fertilization needed. Crop yields could be less than 50 percent of potential without this nutrient.
   - L = low; fertilization needed. Crops yields could be 50 to 75 percent of potential without this nutrient.
   - M = Medium; some fertilization recommended. Crop yields could be 75 to 100 percent of potential without this nutrient.
   - H = high; nutrient adequate for crop, although some fertilizer may be applied to high-value crops. Yield potential is 100 percent.
   - VH = very high; no nutrient needed.
   - EH = extremely high; excessive nutrient level could be damaging to the crop or the environment.

10. Lime Recommendations - this is the recommended amount of lime needed to produce the crops you indicated. The recommendations are given in tons per acre of agriculture limestone. To convert the recommendation for your field a calculator can be found online at http://www.aces.edu/anr/soillab/limecalculator.php.

11. Fertilizer Recommendations – this is the recommended amount of fertilizer nutrients needed to produce the crops you indicated. The recommendations are given in pounds per acre per season. To convert the recommendation for your field a calculator can be found online at http://www.aces.edu/anr/soillab/chemfertilizercalc.php; or http://www.aces.edu/anr/soillab/orgfertilizercalc.php for an organic fertilizer calculator.

12. Comments – corresponds to notations labeled 4. Field ID.

**Reading Fertilizer Labels**

13-13-13, do you really need it and why? Contrary to popular belief 13-13-13 fertilizer is not a brand name. The numbers 13-13-13 represent the percentage of available macronutrients, nitrogen (N), phosphorus (P), and potassium (K), in the fertilizer mixture. All commercial fertilizers will have three hyphenated numbers called ‘N-P-K’ indicators. For example a bag of fertilizer labeled 12-5-5 has twelve percent available nitrogen, five percent available phosphorus and five percent available potassium. Likewise a bag of fertilizer labeled 0-0-10 has no nitrogen, no phosphorus, and ten percent available potassium. Fertilizers that have all three macronutrients are considered complete, those with two are incomplete and those with only one are simple fertilizers.

All plants require most, the three primary elements, nitrogen, phosphorus, and potassium, for good growth and health. Nitrogen is required for healthy rapid plant growth and is essential component of chlorophyll, playing a vital role in photosynthesis. When applying nitrogen it is important to know the amount needed. Excessive nitrogen can cause plant “burn” and leaf damage, discourage flowering and increase leaf growth, and it is also known to be a common pollutant. Nitrogen comes in many forms. The table below took from an Oregon State University publication gives some common forms.

Table 1.—Common forms of nitrogen for garden management.

<table>
<thead>
<tr>
<th>Form of nitrogen (Proteins, amino acids)</th>
<th>Source</th>
<th>Availability to plants</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic nitrogen</td>
<td>Animal manure</td>
<td>Not available until broken down—weeks to years.</td>
<td>Immobile in soil. Slowly converted to NH₃⁺ in soil.</td>
</tr>
<tr>
<td></td>
<td>Compost</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plant residues</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blood meal</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Many others</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Commercial fertilizer</td>
<td>Available fairly quickly as ammonium.*</td>
<td>Rapidly converted to NH₃⁺ in soil.</td>
</tr>
<tr>
<td></td>
<td>Fresh manure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urea</td>
<td>Chemical fertilizers such as ammonium nitrate &amp; ammonium sulfate</td>
<td>Used directly by some plants; more so under acidic conditions.*</td>
<td>Can adsorb to clay or organic matter, reducing leaching. Converted to NO₃⁻ by soil organisms.</td>
</tr>
<tr>
<td></td>
<td>Fresh manure</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Breakdown of organic matter in soil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ammonium (NH₄⁺)</td>
<td>Chemical fertilizers such as ammonium nitrate &amp; potassium nitrate</td>
<td>Used directly by most plants.*</td>
<td>Highly mobile in water. Easily leached to groundwater.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO₃⁻)</td>
<td>About 80% of air within soil spaces</td>
<td>Only available to plants with nitrogen-fixing bacteria, such as legumes.</td>
<td>Organic nitrogen and NH₃⁺ are added to soil from legumes.</td>
</tr>
</tbody>
</table>

*Slow-release formulations are available that prolong availability to plants.

Phosphorus, the second number on the label, is an important part of photosynthesis. It is involved in the formation of all oils, sugars, and starches necessary to plant development. It also helps with the transformation of solar energy into chemical energy, proper plant maturation, withstanding stress, effect rapid growth, and encourages blooming and root growth (Source: http://www.ncagr.gov/cyber/kidswrld/plant/nutrient.htm).

Potassium, the last number on your label is a key nutrient in the plants tolerance to stresses such as cold/hot temperatures, drought, and wear and pest problems, according to James McAfee is his article titled “Potassium, a key nutrient for plant growth.” He also says, potassium acts as catalysts for many of the enzymatic processes in the plant that are necessary for plant growth to take place. And that another key role of potassium is the regulation of water use in the plant.

Commercial fertilizers are label for Nitrogen (N), Phosphorus (P) and Potassium (K) whether it is in there or not. To get the best value for your fertilizer dollars, consider the recommendations provided by on your soil test report. The recommendations are given in foot lbs per acre. I suggest you contact your county extension agent to get the best fertilizer recommendation for your field. Your soil test report may show that you are low in one element and medium in another, this would require some specific fertilization calculations.

Why, When, and How to Lime

Having the right amount of lime on your fields is just as important as having the right amount of fertilizer. Your soil test will make recommendations as to how much you will need in tons per acre. The lime you put on your field is used to reduce the acidity of your soil or increase your soil pH levels. Lime assist in making other soil nutrients available to plants.

Liming as it is called on the farm, can take place any time during the year, however, it is not recommended when plants are actively growing.

Lime can be coarse or finely grounded. The coarser the lime the slower it will react with the soil. Finely ground lime mixed thoroughly into the soil can change the soil pH within a few months. He recommends that lime should be with the top six to eight inches of soil.

By: Decetti Taylor, Project Manager, BFRDP, and Leonard Githinji, Horticulture Specialist.