A Guide to Collecting Soil Samples for Farms and Gardens

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Without a soil analysis, it's nearly impossible to determine what a soil needs in order to be productive. Laboratory soil analyses (soil tests) provide information on your soil's available nutrient-supplying capacity. This information helps you select the correct kind and amount of fertilizer and liming material, which helps you develop and maintain more productive soil and increased crop production.

Recommendations in this publication are based on the results of fertilizer experiments, soil surveys, and results obtained by farmers.

Why should I collect a soil sample?

Reasons for soil sampling include the following:

- Establish baseline soil nutrient status for new landowners
- Measure change in soil nutrient status over time
- Document soil nutrient management for certification requirements
- Determine nutrient application recommendations prior to planting
- Assess pH and the need for liming
- Avoid excessive nutrient applications or soluble salt accumulation
- Develop a plan for possible variable-rate fertilizing within a field

When should I collect my soil sample?

For perennial crops such as orchards, tree plantations, alfalfa, grass seed, and permanent pasture, the most important time to have the soil analyzed is before planting, so that necessary nutrients can be mixed into the soil. This analysis is especially important in acidic soils, which are likely to need liming. Apply lime and mix it with the soil several months before planting (for example, in the fall for spring planting), since it reacts slowly with the soil. Following establishment, then:

- For pastures and legumes, test soils every 3 years after planting.
- For Christmas trees, established fruit and nut trees, berries, and grapes, use annual foliar tissue analysis instead of soil

This publication is not intended to be a guide for obtaining soil samples for environmental testing.

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testing. Soil samples are recommended every 3 to 5 years or when the tissue analyses indicate a need.

Do periodic soil tests also for annual crops, particularly when you first cultivate a field or change crops or rotations. For annual crops, especially vegetables, test soil in the fall or winter or just before planting. If you plant successive crops in a single season, you don't need to test before each planting. Soil samples are recommended every 2 to 3 years.

More information on soil laboratory analysis, soil test interpretation, and crop nutrient recommendations is available in other OSU Extension publications (see "Resources," page 5).

Where should I collect a soil sample?

The area in which to collect a soil sample may depend on the soil type, crops grown, management history, or all of these. The farm in Figure 1 has three separate sampling areas: A (orchard), B (pasture), and C (vegetable row crops). In this example, a separate soil sample should be collected from each of the three areas.

Figure 1. Collect a separate soil sample from each of the three areas (A, B, and C).

How do I collect my soil sample?

Sample where the crop will be planted

If you are using raised beds, such as for vegetable crops, take your samples in the beds, not in the areas between them.

Avoid unusual areas

Avoid sampling in small areas where you know that conditions are different from the rest of the field (for example, former manure piles, fertilizer bands, or fence lines). You often can spot these places by looking for plants growing especially well or very poorly.

Take 15 to 20 subsamples

Each sample should consist of subsamples taken from 15 to 20 locations within the sampling area (marked with x in Figure 2).

Figure 2. Take 15 to 20 subsamples within one sampling area.

Avoid contaminating the sample

- Use clean sampling tools (Figure 3), and avoid contaminating the sample during mixing or packaging. A small amount of fertilizer residue on tools or hands, for instance, can cause serious contamination of the soil sample.
- Do not include mulch or vegetation in the sample.
- Do not use galvanized metal, brass, or bronze tools to collect samples that will be tested for micronutrients (such as zinc).

Take the soil sample to the correct depth

Sample the part of the soil where the plant roots will grow. For most annual and perennial crops, sample from the surface down to about 6 to 8 inches (Figure 4) or to the depth of tillage. For pastures or soils that have limited or no tillage, refer to *Evaluating Soil Nutrients and pH by Depth* (EM 9014) for more information about collecting your soil sample.

Collect samples at the same depth. For example, if you take initial samples at a 6-inch depth, keep that same depth for all future samples, to get a more accurate comparison.

Carefully mix the soil sample

Place all of the soil subsamples from a single sampling area in a clean container and mix thoroughly (Figure 5, page 4). Do not worry about breaking the sample up into tiny particles. Labs have soil grinders to further mix the sample.

Figure 3. Soil sampling tools.

Analyzing my soil sample

- Find laboratories that perform soil analysis. To search for labs certified by the North American Proficiency Testing (NAPT) program, go to www.naptprogram.org
- Look for a lab that offers a soil test report that you understand.
- Call one or more labs to find out the cost of the soil analysis you need.
- After choosing a lab, request any necessary paperwork (such as an information sheet), find out how you should prepare and submit the sample, and get the address where you should send the sample.
- Prepare and submit the sample according to the lab's instructions. Plastic zipper bags work best; do not use a paper bag unless the lab provides one lined with plastic. Most laboratories ask you to label the sample bag with identifying information and to fill out and include an information sheet with the sample. Don't forget to include payment in a separate, sealed plastic bag.

Figure 4. Measuring sampling depth.

- If you are requesting a nitrate nitrogen (NO_3-N) test, keep the sample cool and send it immediately to the lab. Otherwise, you may choose to dry the sample or send it at your convenience.
- Request that the lab provide both a printed report and an electronic spreadsheet format for more flexible recordkeeping.
- Number each sample, record sample depth, and keep a record of the fields and areas you sampled. Take a photo of the labeled sample bags before mailing them, for future reference (Figure 6).

Figure 5. Use a clean hand tool to mix the subsamples.

What analysis should I request?

- The standard soil analysis from most laboratories measures organic matter, phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), sodium (Na), and soil pH (acidity).
- For acidic soils, the SMP buffer test is the best way to determine how much lime is needed.
- Certain crops might have higher requirements for specific nutrients. Consult OSU Extension publications (see "Resources," page 5) to determine whether you should test for nutrients such as sulfur (S), boron (B), or zinc (Zn).
- Nitrate nitrogen (NO_3-N) is also commonly reported in standard soil tests. Nitrate nitrogen is not useful to determine soil fertilizer applications in western Oregon, as nitrate is readily leached from the soil profile. To determine a nitrogen application rate for your crop, consult the specific fertilizer guide (see "Interpreting your soil analysis," page 5). Post-harvest testing for soil nitrate is used in some cropping systems to determine if excessive nitrogen was applied. In arid regions, such as eastern Oregon, soil nitrate nitrogen tests are used in conjunction with nutrient management guides to determine nitrogen applications.

Figure 6. Take a photo of your sample bags before you mail them, for future reference. Do not use a paper bag unless the lab provides one lined with plastic.

Sampling over time

Once you have researched and selected a laboratory, plan to use the same lab for future tests to keep sample analysis consistent and detect changes in soil nutrients. Also, plan to take your soil sample at the same time of year, same depth, and same approximate field location.

Interpreting your soil analysis

Once you have received the analysis results for your soil, use the following tools to make decisions:

- *Soil Test Interpretation Guide* (EC 1478), 2011 version
- OSU Extension Fertilizer and/or Nutrient Management guides. To search for your crop-specific guide, go to the OSU Extension Catalog at http://extension.oregonstate.edu/catalog/ and search by keywords (nutrient management guide, fertilizer guide, and crop).

You can also consult your local OSU Extension Service agent.

Resources

OSU Extension Catalog publications

Visit the OSU Extension Catalog at http://extension.oregonstate.edu/catalog/ to find these publications.

Applying Lime to Raise Soil pH for Crop Production (Western Oregon) (EM 9057)

Christmas Tree Nutrient Management Guide (EM 8856)

Eastern Oregon Liming Guide (EM 9060)

Evaluating Soil Nutrients and pH by Depth (EM 9014)

Fertilizing with Manure (PNW 533).

Fertilizing Your Garden: Vegetables, Fruits, and Ornamentals (EC 1503)

Monitoring Soil Nutrients Using a Management Unit Approach (PNW 570)

Pastures: Western Oregon and Western Washington Fertilizer Guide (FG 63)

Soil Fertility in Organic Systems: A Guide for Gardeners and Small Acreage Farmers (PNW 646).

Soil Test Interpretation Guide (EC 1478), 2011 version

WSU Extension publication

Soil Management for Small Farms (EB 1895). Washington State University Extension.

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