

Soil Sampling Protocol

Planning field sampling design

Prior to sampling a field, it is important to determine:

- The goals of sampling, such as assessing current status for a management unit, identifying constraints in a particular problem area, or comparing between different areas on a farm.
- Whether one sample will adequately represent an entire field or management unit, or whether a unit should be divided up for gathering multiple samples.

Materials needed for one sample

- 2 Five-gallon buckets or similar containers (one for soil, one for supplies)
- 1 sturdy, re-closable plastic freezer storage bag (large 1-gallon) for each sample
- Clipboard and Submission Form (soilhealth.cals.cornell.edu, example page 34)
- Permanent marker for labeling sample bags
- Pen for data entry in submission form
- Straight shovel (sharpshooter or trenching spade style)
- Penetrometer (if available)
- Cooler for sample storage

Steps for soil sampling

Sampling should be done when soils are at field capacity. This ensures appropriate interpretation of field penetration resistance measurements, facilitates proper mixing of subsamples, and prevents soils from smearing during sampling and transport. In general, identify 10 locations within the area you would like to test that are representative of the field or plot (Figure 2.10).

The following recommended guidelines are similar to sampling for nutrient analysis. Irregular areas in a field, such as the low spot in Example 2 to the right, should be avoided, unless a sample is specifically being collected from a problem area to identify constraints.

Whenever possible, fields should be divided into sampling units when there are differences in key characteristics such as:

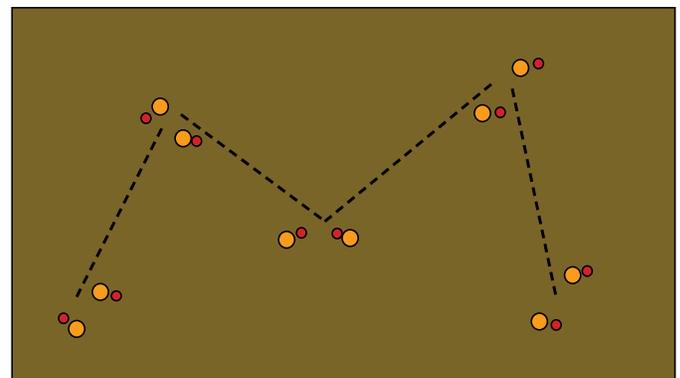
- soil type or slope
- management practices
- observed crop growth and yield.

At each of at least five stops, collect two bulk soil samples at least 15 feet apart. Also take a penetrometer reading for each of two depth ranges (0 to 6 inches, 6 to 18 inches), at each bulk sample location (see field diagrams below).

Sample portions :

- Bulk soil sample (placed in bucket)
- Penetrometer readings (at 2 depths)

Example 1: Uniform field (1 sample)



Example 2: Uneven field - 2 soil types (2 samples)

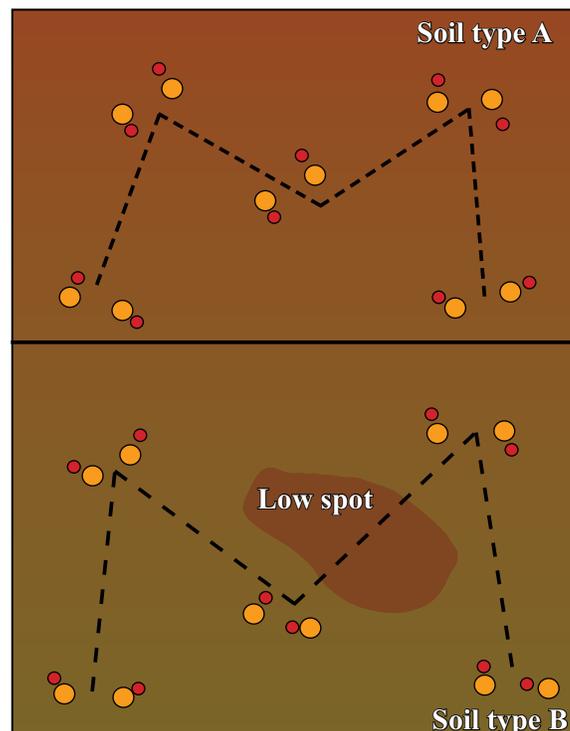


FIGURE 2.10. Examples of different field characteristics and how they may affect sampling.

Part II - Soil Health Assessment

NOTE: We do not recommend using a standard soil probe as more cores will need to be collected than a spade to obtain the necessary amount of soil for analysis, and more physical smearing will result, impairing physical indicator measurements.

At each location:

- A. See previous page for sampling design. Remove surface debris (Figure 2.11 A)
- B. Use a spade to dig a small hole about 8” deep (B). From the side of the hole take a vertical, rectangular slice of soil 6” deep and about 2” thick. Ensure that the sample is the same width at the top and bottom of the slice. It is important to collect the same amount of soil from all soil depths so the sample is not biased with more soil from the top compared to the bottom, especially since soil biological properties vary with depth.
- C. Manually remove any extra soil to ensure an even, rectangular 6” deep x 2” thick slice of soil, the width of the shovel (C1). Place into clean pail (C2).
- D. At each sub-sample location collect soil hardness information with a penetrometer (D). Record maximum hardness (in psi) from the 0-6” and the 6-18” depth ranges in the sample Submission Form. For additional information on measuring penetration resistance see page 37.
- E. Repeat steps A – C to collect the remainder of the subsamples from at least 10 representative locations in the sampling area. Mix thoroughly and place at least 4 full cups of soil (more if root pathogen pressure assay is desired) into a clearly labeled one-gallon re-closable freezer bag (Figure 2.12).



FIGURE 2.11. The steps of taking a soil health sample. The microorganisms in the soil are sensitive to heat. Keep samples out of the direct sunlight and keep as cool as possible during the sampling. Store samples in a refrigerator or cold room after returning from the field and ship to Cornell as soon as possible. Photo credit: Kirsten Kurtz

Soil sample storage requirements:

- Always keep samples out of direct sunlight, and if possible, in a cooler in the field. High temperatures in a bag of soil sitting in the sun will have a detrimental impact on biological indicator measurements.
- Upon returning from the field, store samples in refrigerator or cold room as soon as possible, cool overnight, and ship for analysis as soon as possible (see further details below).
- Do not freeze the samples.
- Do not dry the samples.
- **IMPORTANT:** If you are planning on submitting a batch of numerous samples, and have particular sampling considerations to discuss regarding storage or pre-processing, such as for a larger research project, please contact Soil Health Lab personnel prior to sampling using the contact information on the soil health lab website.

A complete sample will consist of:

- a clearly labeled bag containing at least 4 full cups of composited soil
- a completed submission form with penetrometer readings clearly recorded

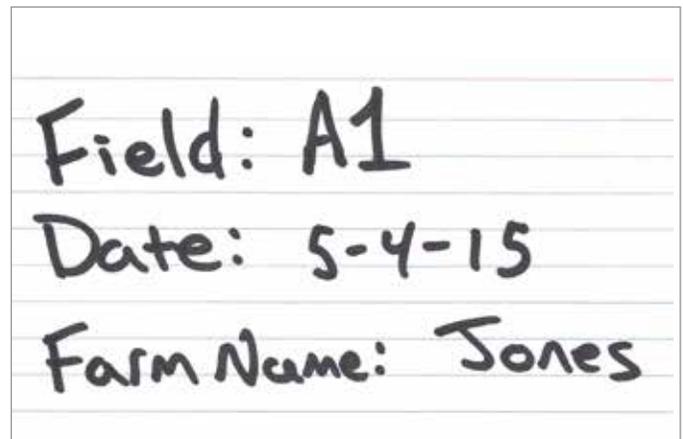


FIGURE 2.12. Sample label for individual field samples. Label should include field name or ID, date sampled and farm name. Correct labeling is critical to ensure that you receive the correct information for your field.

Soil sample shipping to the lab

- Recommended shipping guidelines:
- Visit our website and download the submission form: soilhealth.cals.cornell.edu. Download and save the file (Figure 2.13). Open and fill in the necessary information.
- Save the submission form file for your records and email it as an attachment to: soilhealth@cornell.edu
- **Use a rapid shipping method**
- Print one copy of the submission form and insert into the shipping box with soil samples. There is a PDF version of the form on the website if you don't have Excel
- Make sure to include your penetrometer measurements for each correctly labeled sample
- Use a small USPS Flat Rate Box (\$5.95 in 2016) or send up to six 4-cup samples, using USPS Priority Mail Medium Flat Rate box (\$12.65)



Send samples and completed submission forms to:

Cornell Nutrient Analysis Lab

c/o Soil Health Lab
G01 Bradfield Hall
306 Tower Rd.
Ithaca, NY 14853

soilhealth@cornell.edu
607-227-6055

