Updated: September 2024

Soil Health Benchmark Study

Soil Sampling Protocol

Overview

This Soil Sampling Protocol details how to collect and submit samples to the Cornell Soil Health Laboratory for Pasa's Soil Health Benchmark Study.

This study relies on all Farmer Research Collaborators following the same method for sample collection to ensure we are generating trustworthy insights from high-quality data. **The way you sample will impact your individual soil test results as well as the collective data set.**

Community science projects like the Soil Health Benchmark Study are most successful when individuals are motivated to work towards a collective goal. Thank you for helping to make this one of the largest and most diverse community soil science projects in the nation—let's dig in!

Protocol highlights

- ➔ **Make a sampling plan and gather supplies.** Review guidelines for when to take your soil samples.
- ➔ **Collect the samples.** For each research field, take 10 sub-samples and save 5 cups of soil to submit as your field sample. As you repeat this process for each of your research fields, you will have 1 bag of soil for each field (i.e., if you have 3 research fields, you will have 3 bags of soil).
- ➔ **Pack and ship your soil samples as soon as possible.** Fill out and mail your "Soil Sampling Notes" postcard back to Pasa!

Please review this document carefully, as our soil sampling protocol has been updated for 2024! Pay close attention to how to mix sub-samples, what to do with wet soils, and mailing the "Soil Sampling" postcard back to Pasa.

If you have any questions about the protocol, please get in touch with Pasa or your coordinator.

Watch our soil sampling how-to video!

Scan the code or visit pasafarming.org/SHBS to watch a quick (<5 minutes) video demonstrating the protocol.

STEP 1: Plan when to collect your soil samples.

All of your research fields should be sampled on the same day*, so be sure to give yourself enough time!*

Soil sampling can take anywhere from 1–4 hours *depending on the size of your fields and farm, experience, and soil conditions.*

In any given situation we know there are judgment calls to be made, however please do your very best to follow as many of the guidelines below that you can.

Guidelines for when to collect soil samples:

- **Before the ground freezes!!!** This parameter must be followed above all others mentioned. Not only does freezing affect your sample, it's no fun to dig frozen ground!
- Between **October 1st and December 31st**
- **At least 2 weeks after your last tillage or soil disturbance event**, including after cover crops are planted
- **After most mowing and grazing is done for the year**
- **When soil is neither too dry nor too wet**—the same condition you would look for when planning to cultivate or use tillage equipment
    - Soil is too dry if the surface is crusted or soil is loose and powdery when squeezed in your hand.
    - Soil is too wet if there is pooling on the surface or excess water when soil is squeezed in your hand.
    - Avoid sampling when it is actively raining.
    - If samples have a higher moisture content, drying ahead of shipping is preferred. *See page 7 for instructions on drying your samples.*
    - **Aim to keep your soil sampling date as consistent as possible from year to year.**

STEP 2: Gather and prepare your supplies.

Tip: *Mark a line 6 inches from the bottom of the shovel to guide you in sampling to the correct depth.*

The supplies you will need include:

- A clean shovel. We recommend using a sharp-shooter or drain-spade style to collect a sample with even thickness.

  Note: If you use a pointed-tip shovel, take extra care to collect an even, rectangular slice of soil.

- Ruler or tape measure
- A clean 5-gallon bucket
- Brush/towel for cleaning off your shovel and bucket
- Permanent marker
- Measuring cup (1 cup)

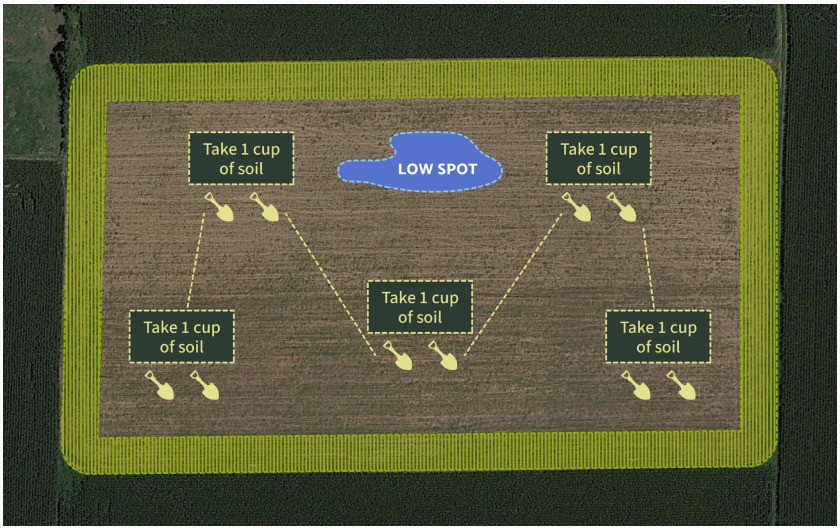
The supplies provided include:

- 1-gallon freezer storage bags, 2 bags for each field being sampled (i.e., 6 bags total for 3 research fields).
- 1 soil sample ID label for each research field. Please affix to the freezer bags prior to going out in the field to collect samples.
- Shipping box and shipping label
- Stamped “Soil Sampling Notes” postcard to fill out and send back to Pasa

STEP 3: Plan where you will collect sub-samples in the research field.

In order to capture a **sample that represents your whole field**, you will collect **10 sub-samples** to create one 5-cup representative sample for your research field.

How to choose sub-sampling locations:



➡ For each research field, walk the length of your field and visualize 5 locations where you will dig holes for soil sampling.

➡ Locations should be spaced out through the field in a zig-zag pattern.

➡ At each location, a pair of subsamples will be taken 5–10 feet apart from each other (indicated with shovels).

➡ You will end up collecting a cup of soil from each location.

Tip: Do your best to capture all of the activity in the field as you take soil samples. This may mean taking samples within different crops, or sampling in a combination of crops and bare ground.

Areas to avoid:

- Field edges, where there is a chance for greater compaction
- "Trouble spots," like a low, wet spot
- Irregular areas compared to the rest of the field, like a rock outcropping, an isolated, extreme change in topography, or an isolated clump of vegetation that is not found in other parts of the field

Special scenarios

- **If your system involves permanent beds** (i.e. the entire field is not tilled, only the beds): collect all sub-samples within the permanent beds and avoid sampling the pathways/aisleways.
- **For vegetable beds still in production at the time of sampling:** 3 to 4 of the 10 subsamples should be taken in an aisle/pathway.
- **For row crops still in production at the time of sampling:** At each of the 5 locations, plan to dig one hole as close to in-row as possible and one hole in between rows.

STEP 4: Collect and mix your sub-samples.

A. At your first sub-sampling location, **remove loose surface debris around the sampling area**, like dead leaves or mulch. Do not pull out anything that is rooted in the ground, and do not remove the top surface of the soil.

B. **Dig a hole about 8 inches deep and 8–10 inches wide**. (This is not the sample!)

Tip: *Be mindful of where you are piling the soil when digging so that soil from this pile does not accidentally get included in your sample. We suggest making one pile of soil close enough so it can be used to fill in the hole after the sample has been taken.*

C. From the side of the hole, position your shovel head at a 90 degree angle to the ground and **take a vertical, rectangular slice of soil 6 inches deep and about 2 inches thick.**

   It is important to collect a slice of soil with uniform thickness from top to bottom.

   If you are using a **pointed-tip shovel**, take extra care to collect an even, rectangular slice of soil. This may mean digging a hole slightly deeper so you can remove the uneven end of the sample due to the pointed-tip.

D. **Remove extra soil hanging past the sides of the shovel.** Remove extra soil so that your sub-sample is the same thickness throughout. Do not remove any rooted plants from your slice of soil yet—it is better to do this when your sample is in the bucket.

Tip: *Use one hand to hold the soil slice in place as you remove it from the hole.*

E. **Slide the slice of soil into your bucket.** If you have rooted plants in your slice of soil, shake off as much dirt as you can (there will be lots of microbes and carbon in that root-soil!), then remove the plant and root debris from your bucket.

F. **Repeat steps A through E to take the second sub-sample at your first location.** *Reminder: This second hole should be 5–10 feet away from your first hole.*

G. **Mix these two sub-samples together, breaking up soil clods larger than an acorn with your hands.** Take care to remove large and medium sized rocks and other large pieces of vegetation or roots. You likely will not be able to remove everything, but do your best.

H. **Transfer one cup of soil into the <u>correctly labeled</u> 1-gallon freezer bag.** We recommend using a measuring cup so you are not sending more soil than what is needed, but a large handful is also about a cup.

I. **Return any excess soil to the field.** Fill in the holes and clean the bucket out with your hands or a brush before moving on to the next paired sampling location.

J. **Repeat steps A through I at each paired sampling location, a total of 4 more times.**

When you've finished sampling your field, **you should have about 5 cups of soil** in your freezer bag. Mix the soil thoroughly again in the freezer bag.

K. **Double check that the field you just sampled matches the label on the bag!** Use a permanent marker to clearly write the **Sampling Date** on the label. Double bag the sample (make sure the label is on the inside bag!). Place your bagged sample out of direct sunlight while sampling your other research fields.

L. Repeat sampling steps for your remaining research fields. **Do not mix samples from different research fields!**

M. Fill out the **questions** on the stamped and addressed "Soil Sampling Notes" postcard.

➡ **Important! Here's what to do if your soil samples are very wet:**

- Drying wet samples before shipping is preferred. Shipping very wet soil may have an impact on your soil test results. You can use your best judgment to determine what "very wet" is. Soil with some moisture is ok to be shipped right away. If you are unsure whether to dry soil samples, it may be best to dry them.

- After the samples are brought in from the field, they can be spread on newspaper in a dry, protected, not hot area, out of direct sunlight. Be sure to separate and label each sample so they do not get mixed up. After a day, stir the sample material. After a second day, this material can be put back into the freezer bag and then shipped.

STEP 5: Pack and ship your soil samples.

A. Ship your samples <u>as soon as possible, ideally within one day.</u>

B. Keep the soil samples away from direct sunlight. While you don't need to refrigerate them, please keep them near room temperature.

C. Double check to make sure each bag containing your soil samples is clearly labeled with **Pasa's name, Farm Name, Field Name, Soil Sampling ID#, and Sampling Date** (you add the sampling date).

D. Make sure each sample is double bagged with a non-labeled freezer bag on the outside.

E. Place the bagged and labeled samples in the shipping box and affix the prepaid shipping label. *Do not send any field management records or the postcard to the soil lab.*

If needed, the Cornell Soil Health Lab's address is

Cornell Soil Health Lab
804 Bradfield Hall
306 Tower Rd.
Ithaca, NY 14853

F. Take the box to your nearest post office and put it in the mail!

G. Drop your completed "Soil Sampling Notes" postcard in the mail at the same time - this will also let us know that you've sent in your soil sample!