Pasa SUSTAINABLE AGRICULTURE | Research

Soil Health Benchmark Study:

How to take soil samples

Our soil sampling protocol is specifically designed for taking soil samples to submit to the Cornell Soil Health Laboratory. We ask each research collaborator to follow the same soil sampling protocol each year they participate in the study so we can accurately compare data.

During the first year a farm participates in this study, a staff member will visit to help select research fields and to conduct the soil sampling alongside the farmer research collaborator. During the following years, research collaborators follow the instructions below to conduct the sampling themselves.

Please review this document carefully, as our soil sampling protocols have been updated for 2023! Pay close attention to how to mix sub-samples, what to do with wet soils, and mailing the new "Soil Sampling & Field Operations Notes" postcard back to Pasa.

Protocol highlights:

Step 1: Plan when to take your soil samples. For most farms, this will be mid-October to mid-December.

Step 2: Collect the samples. For each research field, you will 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 end up with 1 bag of soil for each field. If you have 3 research fields, you will end up with 3 bags of soil.

Step 3: Pack and ship your soil samples as soon as possible. Additionally, fill out and mail your "Soil Sampling & Field Operations Notes" postcard back to Pasa!

Remember, how you sample will directly impact your soil test results!

STEP ONE: Plan when to take your soil samples - Important Key Points

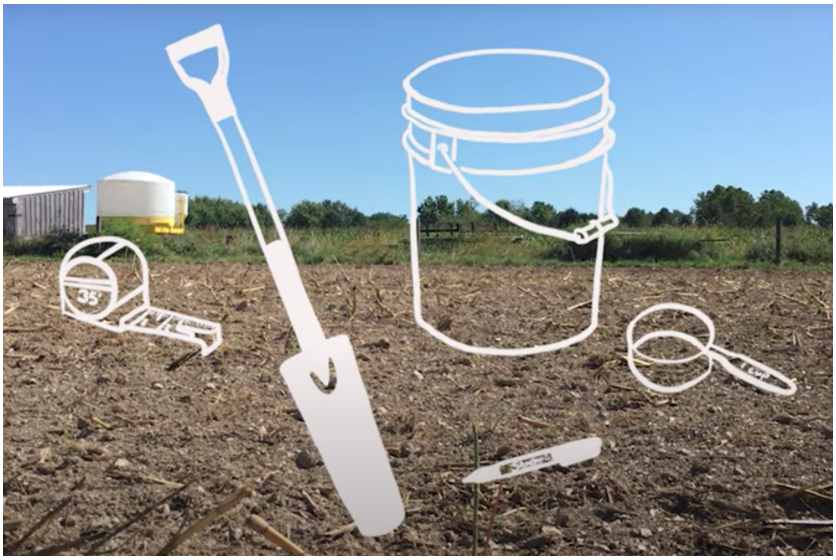
- Take soil samples after all equipment activity and all soil disturbance is done for the year, but no earlier than September 31st. Take soil samples before ground freezes.
    - For many farms (but not all), the sampling window will be from mid-October to mid-December. The last date to take soil samples is December 31st, *however please do not wait until this time if your fields are ready to be sampled!*
    - Examples:
        - **Vegetables:** If a cover crop will be planted, take the soil sample *after* cover crop planting and after any field prep operations.
        - **Grains, row crops, and forages:** Take the soil sample after crop harvest or after the last cutting of hay. If a cover crop or forage crop will be planted, take the sample *after* cover crop planting and after any field prep operations.
        - **Permanent pastures**: You can sample at any time starting in October, but before the ground freezes.
- Collect samples from all of your research fields on the same day. See the enclosed map of your soil health research fields. It's important that field names and locations are accurate, so please be in touch if there is a discrepancy.
- Sample and ship in the beginning of the week, so there is less delay in shipping to the lab due to weekends. Please ship your samples as soon as possible, ideally within one day if conditions allow.
- Avoid taking samples at times when the soil is too dry (and difficult to get a shovel into), or saturated and muddy. A good rule of thumb is if the soil is workable and able to be tilled, it's a good time for soil sampling.
    - If your soil is wet when sampling, drying ahead of shipping is preferable. More on this on page 7.
- Take soil samples before ground freezes. **This rule must be followed above all other rules mentioned above.**

If you are unsure that you'll be able to pull your samples following the parameters above, or if you have any question about these guidelines, please get in touch with your coordinator!

STEP TWO: Collect the samples.

1. **Collect the following supplies:**

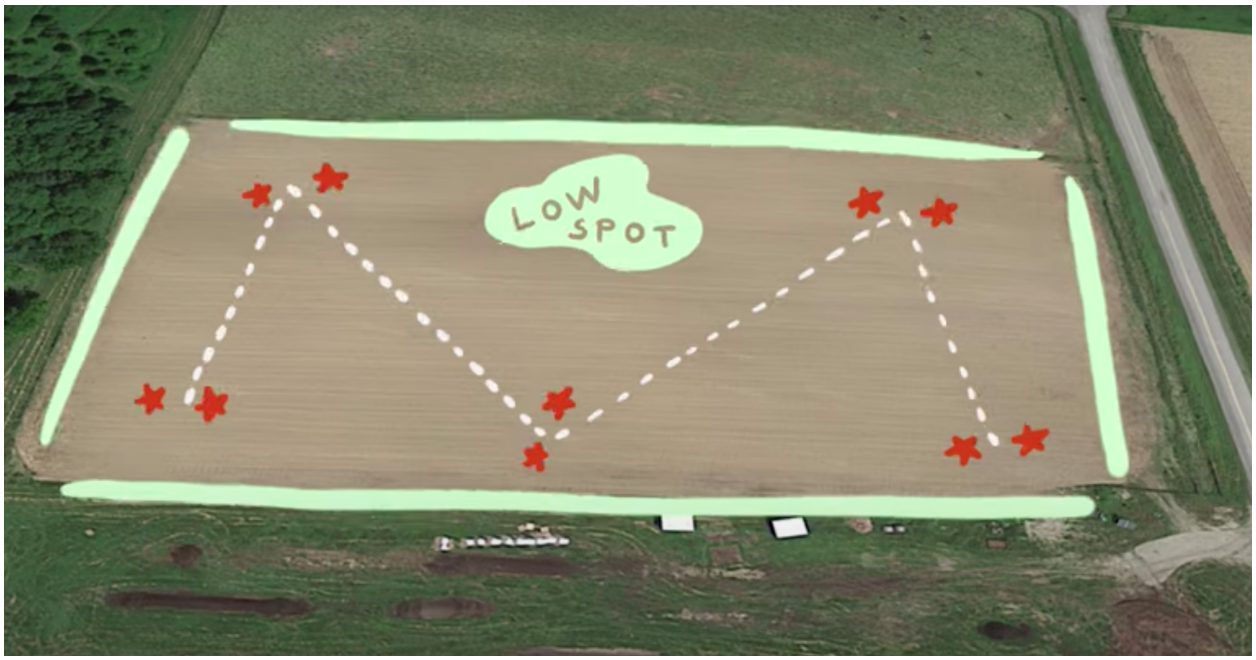
- Straight shovel (see image to right), such as a sharp-shooter or drain-spade style. *Note: A straight shovel helps to ensure you collect an even amount of soil along the 6 inch profile of the sample. If you must use a pointed-tip shovel, take extra care to follow step 3-C and 3-D below to take an even profile of soil.*
- Ruler or tape measure
- One 5-gallon bucket
- Brush for cleaning out your sampling bucket
- Permanent marker
- Measuring cup (1 cup)
- *Provided by Pasa or organizational partners:* Two 1-gallon freezer storage bags for each field being sampled (6 bags in total for most farms). *For returning research collaborators, bags will be prelabeled with your farm and field names for you to put your soil samples directly into.*
- *Provided by Pasa or organizational partners:* Prepaid shipping box
- *Provided by Pasa or organizational partners:* Stamped "Soil Sampling & Field Operations Notes" postcard to fill out and send back to Pasa



2. **Choose 10 locations to collect sub-samples within each of your research fields:**

    A. For each research field, walk the length of your field and visualize 10 locations where you will dig a hole for soil sampling **(see image below)**. Choose 5 pairs of locations, with each location in a pair 5-10 feet apart. Locations should fall along an M-shaped path across the field. Avoid field borders and any irregular areas or "trouble spots," such as a low spot or rock outcropping.

    B. **For fields in vegetable production *at the time of sampling:*** At each of the 5 pairs of locations, plan to dig one hole for soil collection in a production bed/crop row, and dig one hole in a pathway/aisleway. However, if your system involves permanent beds (i.e. the field is not tilled or rotated as a whole unit), dig both holes within the permanent bed.



The dotted line indicates an M-shaped walking path for determining sampling locations. The stars indicate the 10 holes that will be used for soil collection. Avoid irregular areas, like low spots, and field edges.

3. **Collect the soil.**

   A. At your first location, remove surface debris around the sampling location. Including surface debris in your sample will impact your soil health score.

   B. Use a spade or shovel to dig a small hole about **8 in. deep** and **8-10 in. wide**.

   C. From the side of the hole, position the spade or shovel at a 90 degree angle to the ground and take a vertical, rectangular slice of soil 6 in. deep and about 2 in. thick. *To make the sampling process easier, mark a 6 in. line on the shovel before sampling.*

   D. **For accurate test results, it is important to collect the same amount of soil through the profile.** You want to end up with a rectangular, 6 in. deep x 2 in. thick slice of soil that is the same width at the top and bottom of the slice and has an even thickness from the top to bottom.

      Remove any extra soil hanging past the sides of the spade or shovel to ensure that the sample is the same width at the top and bottom of the slice. And, remove any extra soil so that your sample is the same thickness and does not have more soil from the subsurface compared to the surface.

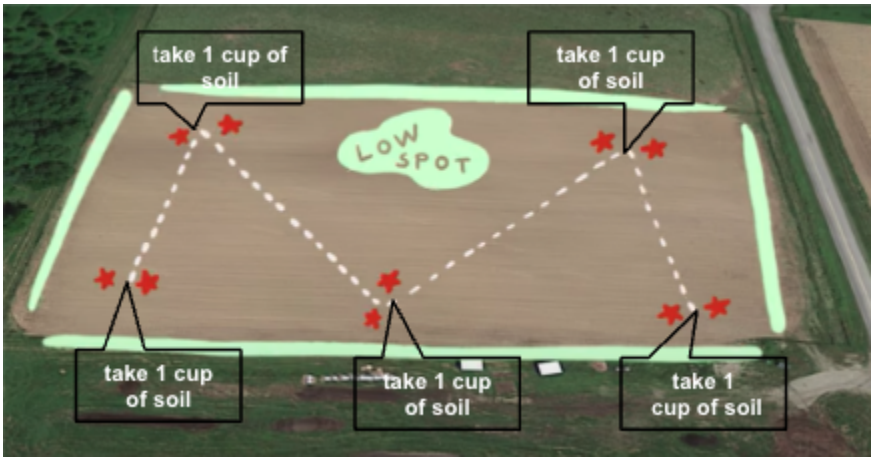
If you need to use a pointed-tip shovel, take extra care to collect an even, rectangular slice of soil.

E. Slide the slice of soil into your bucket.

F. Repeat steps A through E for the paired sample at your first location. Add this slice of soil into your bucket. **Mix these two samples from the first paired location together, breaking up soil clods larger than an acorn with your hands.**

G. Transfer **one cup full of soil** into the correct prelabeled 1-gallon ziplock bag. **Make sure the field you are sampling from matches the label on the ziplock bag!** We recommend using a measuring cup so you are not sending more soil than what is needed. Or, a large handful is also about a cup full. Return any excess soil to the field, fill in the holes that were dug, and clean the bucket out with your hands or a brush before moving on to the next paired sampling location.

H. Repeat steps A through G at each paired sampling location, for a total of four more times. When you've finished sampling your field, you should have about 5 cups of soil in your ziploc bag. Mix it thoroughly one more time in the ziploc bag. Use a permanent marker to clearly label the **Sampling Date** on the ziplock bag and double check the **Field Name** and **Farm Name** for accuracy.



This graphic visualizes collecting one cup of soil at each paired sampling location. *Soil are combined in a bucket from each set of paired holes (red stars), then 1 cup of well-mixed soil is collected into the sampling bag. The remaining soil can be used to refill the holes. A complete soil sample from 1 field should be about 5 cups of soil in a ziplock bag.*

I. **Repeat all of the steps above for the two remaining research fields! Do not mix samples from different research fields!**

J. Fill out the **questions** on the stamped and addressed "Soil Sampling & Field Operations Notes" postcard.

K. IF your soil samples are wet:

Drying wet samples before shipping is preferred. Shipping overly wet soil may have an impact on your soil health test results. You can use your best judgment to determine what "wet" is. Soil with some moisture is ok to be shipped right away.

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 ziploc bag and then shipped.

STEP THREE: Pack and ship your three samples.

1. Keep the soil samples away from direct sunlight. While you don't need to refrigerate them, please keep them near room temperature. They should be shipped <u>as soon as possible, ideally within one day if conditions allow.</u>

2. 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). Use an additional non labeled ziplock bag to double bag each soil sample. Place the labeled samples in the shipping box. *Do not send field management records or the postcard to the soil lab.*

3. Take the box to the nearest shipping facility and mail it to the Cornell Soil Health Lab:

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

4. Drop your completed "Soil Sampling & Field Operations Notes" Postcard in the mailbox. This will also let us know that you've sent in your soil sample!