a&l greatlakes
LABORATORIES

A & L REFERENCE GUIDE

SOIL SAMPLING

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SOIL SAMPLING PROCEDURES

The intention of the following information is to aid you in properly taking soil samples under various conditions and for specific purposes. As it has been said many times, "A soil test is only as accurate as the sample taken."

SAMPLING TOOLS

Tools that may be used to take a soil sample include a spade or shovel, soil sampling tube, or soil auger. Sample tubes or augers should either be stainless steel or chrome plated.

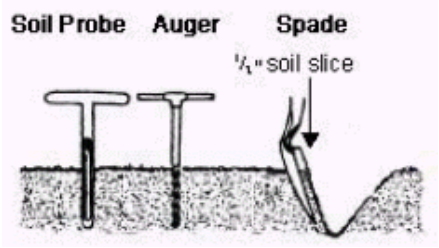
When sampling various soils at different times of the season, it is important to use the proper equipment. A soil probe, either a hand tube or hydraulic probe, can be used under most conditions. A small wooden rod may be helpful in removing the soil core from the tube. The soil auger is especially useful when sampling frozen ground or heavily compacted soil that a soil tube can't penetrate. If a spade is used for sampling, dig a V-shaped hole to sample depth; then cut a thin slice of soil from one side of the hole.

If using a pail to collect the soil, it should be plastic to avoid any contamination from trace metals. For instance, soil will pick up zinc from a galvanized pail.

When sampling wet soils, vegetable oil or mineral oil may be used to lubricate the probe to minimize soil pushing ahead of the probe.

SAMPLE PREPARATION

Mix cores or slices together in a clean plastic container and take enough subsample to fill the special soil sample bag provided by the laboratory. There is no need to process the sample further before shipment. At A&L Great Lakes Laboratories, the sample received is dried, ground, and sieved by experienced technicians. Send a separate bag if the Netamode Test or Residue Test is needed in addition to the Basic Tests.



SAMPLE SIZE

A well-mixed composite from 10 to 20 random locations should be subsampled to give 1 to 1½ cups of soil to be sent to the laboratory for analysis. Greater amounts may be needed when physical properties of the soil (such as textural classification, available moisture, nematodes or pesticide residues) are to be measured.

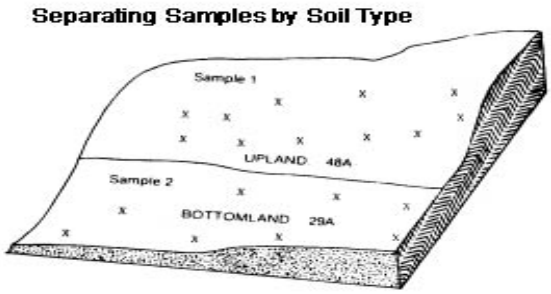
SAMPLE AREA

Area to be included in a sample generally should be no more than forty acres. Small acreages may be sampled when soil is not uniform throughout a field. A soil map or crop response map can be of help in distinguishing areas.

Areas that differ in soil type, appearance, crop growth or in past treatment should be sampled separately, provided this area can be treated separately.

Avoid small areas that are different such as dead furrows, corners of fields, end rows, and poorly drained areas. Stay at least 50-feet from barns, roads, lanes, or fence rows.

The sample should be obtained from 10 to 20 locations within the areas as diagrammed below:



When sampling problem areas, collect separate samples from both the poor area and the good area to use as a comparison. It would be advisable to run a complete test on a surface sample and a sample from a lower depth to provide additional information. Include a description of the problem when samples are submitted so that A&L agronomists may assist you in finding a solution.

If sampling an area with extreme variations, such as where land leveling has occurred or erosion and deposition are severe, the field should be sampled on a grid or incremental unit basis.

SAMPLING DEPTH

When sampling, scrape away plant residue and sample to 6 inches; or if primary tillage is deeper, sample to tillage depth. This is the depth which can be altered with fertilizers or soil amendments. Eighty to ninety percent of the nutrients taken up by the plant come from this tillage depth. Plants also obtain nutrients from a lower depth. Subsoils can provide significant information regarding nitrate-nitrogen and sulfur.

When sampling for nitrate-nitrogen, the most appropriate time for sampling is in the spring or during the growing season. Since nitrate-nitrogen will move with the water front, it can be leached deeper with winter and spring precipitation, especially in sandy soils. Generally, when sampling for nitrate-nitrogen, A&L recommends sampling at 1 foot increments down to 3 feet. It is suggested that the depths be kept separate so that a more accurate assessment can be made regarding soil fertility and soil physical conditions.

TIME TO SAMPLE?

Soil samples may be taken at any time during the year. However, it is generally recommended to be consistent from year to year. If a particular field is sampled in the spring, it should be sampled in the spring the following years. If this cannot be done, seasonal variations should be expected and taken into account.

In addition, pH can vary during the growing season due to presence of soluble salts, CO_2, organic matter decomposition, nutrition uptake and exchange, and fertilizer applications.

Nitrate-nitrogen and sulfate-sulfur are leachable. Therefore seasonal variation may occur in levels of these nutrients, depending on soil types, weather patterns, and moisture levels.

Consistency in the time of year samples are taken can eliminate much of the question of whether a variation does occur in a particular soil. A field history should be established to help distinguish seasonal and sampling variation from real fertility changes.

The best time to take soil samples is probably whenever it best fits into your time schedule. However, there are several items to consider before sampling:

1. Allow ample time to receive results from the laboratory.
2. Sample when you will not be hurried - allow time for taking a representative sample.
3. Sampling should be done in accordance with the grower's field observations.
4. Taking both a soil sample and a plant sample during the growing season may help distinguish nutrient uptake patterns from chemical, physical, or disease factors.

It is recommended that you sample fields every other year or every third year. In the case of intensive cropping, manure or sludge applications, or sandy soils, annual sampling is recommended to monitor the available nutrients or potentially damaging salt accumulations.

SPECIALIZED SAMPLING

SAMPLING REDUCED TILLAGE AND NO-TILL

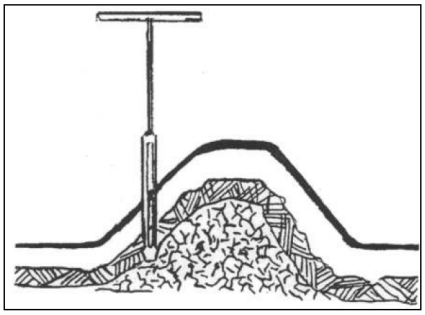
No-till and reduced tillage have different meanings to various people. When referred to here, we mean any tillage that doesn't incorporate soil much more than 3 inches. Remember, most disks and chisel plows, if run 6 inches deep, are only incorporating to one-half that depth.

To get a representative soil sample under these conditions, it is best that soil samples be taken from two depths. Take one from the surface 2 inches, and one from the 0-6 inch depth. The 0-6 inch depth should be used for general fertilizer recommendations. The 0-2 inch sample should be used to adjust the fertilizer program placement and to provide for accurate herbicide programs. Generally at the surface you will find higher fertility, higher organic matter content, and lower pH, all of which affect the fertility and herbicide programs.

Usually a basic test is adequate for the 0-2 inch depth. However, a more complete test should be run in some situations. Zinc deficiencies have been seen under reduced tillage, even though the 0-6 inch sample showed adequate levels. Shallow sampling revealed most zinc concentrated at the surface, positionally unavailable to plant roots under dry conditions. Soluble salts could also accumulate at the soil surface at higher concentrations than indicated by a 0-6 inch sample, causing stress to plants, particularly at early stages of growth.

SAMPLING RIDGE-TILL

When using ridge-till or ridging-up for floor irrigation, it is recommended that you sample half-way down the ridge at a 45° angle to the ridge as shown below.



SAMPLING CENTER-PIVOT GROUND

Many who sample center-pivot ground include too large an area in their sample, creating an excessive variation in results from year to year. Here are several suggestions for best results:

1. Split the circle into thirds. This would limit the sample to about 45 acres. Take about 15-20 cores from each of these thirds.
2. If time or expense is a limitation, take one sample from the hillsides and another sample from the valleys.
3. If the circle is on flat land, sample two areas containing no more than 40 acres each. These two areas could be selected from extreme variations in the field. (For instance, sandy versus clay loams or one area that you know hasn't yielded as well as another area). Then either average the lab results from the two areas or else treat these areas of the field separately.

Whichever of these methods you use, keep the sample areas the same each year. With these methods, inconsistencies in results from year to year will be minimized and you will have a better field history file.

SAMPLING FIELDS WITH VARYING TERRAIN

If bottomland and hills both represent significant amounts of a field, take a sample from each type of terrain. If either bottomland or hills represent just a small area of the field, do not include these areas in your sample.

POSITIVE PLACEMENT OF FERTILIZER

Starters: When row-placed bands are used, sample between the rows. An exception may be where the total fertilizer program is in a row-placed band. Here you should probe about one-sixth of your total number of probes in or near the row.

Strip/Deep Placement: Increase the number of cores per sample. Take two cores near each other at a distance equal to one-half the band widths. Sample in this manner at 12-15 locations to accumulate soil for a sample.

SAMPLING FOR HERBICIDE RESIDUE

Normal sampling procedures should be used with certain exceptions. The depth of the soil sample depends on the herbicide in question and the soil. Most herbicides do not move much in a fine textured (loam and clay) soil. Some exceptions are Ambien, Banvel, 2,4-D and Tordon. On coarse textured (sandy) soils, all herbicides have more movement. Manufacturers are able to supply this information for their own products.

Correct sampling depth is incorporation depth (i.e., 3") unless the herbicide is quite leachable due to its chemical nature or the soil texture. If this is the case, a 6-7 inch depth is required. If moldboard plowing was performed prior to sampling for residue, sample to plowing depth and inform the laboratory of sample depth so that correct interpretation of residue effects may be made.

Each herbicide decomposes in the soil at its individual rate, but decomposition slows when the soil cools, and stops when soil temperature drops below 62°F. This should be considered when planning sampling for herbicide residues.

SAMPLING VARIOUS CROPPING PRACTICES

PASTURE / TURFGRASS

In sampling pastures, follow normal sampling procedures. However, sample depth should be 3-4 inches. Clean off the soil surface before probing and avoid sampling near manure piles. Also avoid areas where livestock congregate or heavily travel.

ALFALFA / CLOVER

Sample soil prior to planting so that both pH and fertility corrections may be made. A 0-8 inch sample is recommended unless problems exist. If alfalfa is no-till planted, a 0-3 inch sample and a 3-8 inch sample are recommended.

ORCHARD / TREE FARMS

It is suggested that samples be taken from within the drip line of the tree at a 0-18 inch depth.

MICROIRRIGATION

Be consistent by sampling at half the radius of the wetting zone of emitters. Depth will depend on root zone.

SOIL AND PLANT ANALYSIS FOR PROBLEMS

Soil and plant analysis during the growing season can be used to help diagnose growth problems. Many plant abnormalities have causes that are more complex than simple mineral deficiencies in the soil. These causes can often be determined by an experienced agronomist using data from soil and plant analyses together.

When sampling problem areas, make as many observations as possible of conditions which might contribute to the problem – soil compaction, drainage, insects, disease, nematodes, chemical residue and other factors may contribute in varying degrees to problems observed.

SAMPLING FOR NEMATODES

The best time to sample for most nematodes is while the crop is still growing so that spots stunted by nematodes can be easily identified. In early spring, significant populations have not yet developed except in warm climates where preplant sampling can be very useful.

Ideally, one soil sample for nematodes should be taken for each five acres. If sampling a problem area, sample toward the outside edge of the area for greatest numbers. The largest populations of nematodes aren't likely to be found where the severest crop symptoms are seen because these plants are no longer able to support large nematode populations. It is advisable to take a comparison sample from an unaffected area.

Take the samples from a depth of 3-18 inches in the root zone from 20-25 locations using a soil probe or spade. Mix the samples in a bucket and immediately place one to two pints of soil in a bag. Be sure to mark the bag "For Nematode Analysis." Do not let the soil dry out or get hot. Keep samples in shade or in an insulated cooler until the samples can be sent. Samples should be taken when the soil is moist, not when dry.

The best method of collecting "root" samples is to spade up the plants and collect the tips of the roots and feeder roots; areas where greatest populations are found.

In most cases, during the growing season, root samples are more useful than soil samples. However, testing both soil and root samples will give you the most useful information.

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Scientists who don't mind getting dirty.™

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