information sheets are essential. Often, laboratories have information sheets available and will send them upon request.

When marking the soil sample bag for identification, make sure the label correctly corresponds to the information sheet. Place the information sheet along with the bagged samples in a sturdy cardboard box or similar container for shipment to the laboratory. If shipping frozen samples, seal the information sheet in a plastic bag.

For More Information

For soil sampling information or assistance, contact your local Natural Resources Conservation Service (NRCS), conservation district, or Extension Service office.

USDA - NRCS
10 East Babcock Street
Federal Building Room 443
Bozeman, MT 59715
406-587-6837
http://www.mt.nrcs.usda.gov

Manure as a Resource Series

Three additional brochures are in this series. To receive a copy of any of the following brochures, visit your local NRCS office or http://www.mt.nrcs.usda.gov/.

- Calibrating Manure Spreader Application Rates
- Using Manure Analysis Results
- Sampling Soils for Nutrient Management

 MT 04/07

USDA NRCS

United States Department of Agriculture

Natural Resources Conservation Service

Sampling Soils for Nutrient Management

Manure as a Resource Series

Helping People Help the Land

The Importance of Sampling Soil

A soil test is essential to determine soil fertility levels and make good nutrient management decisions. Appropriate nutrient application can increase yields, reduce production costs, and prevent surface and groundwater pollution.

This publication summarizes:

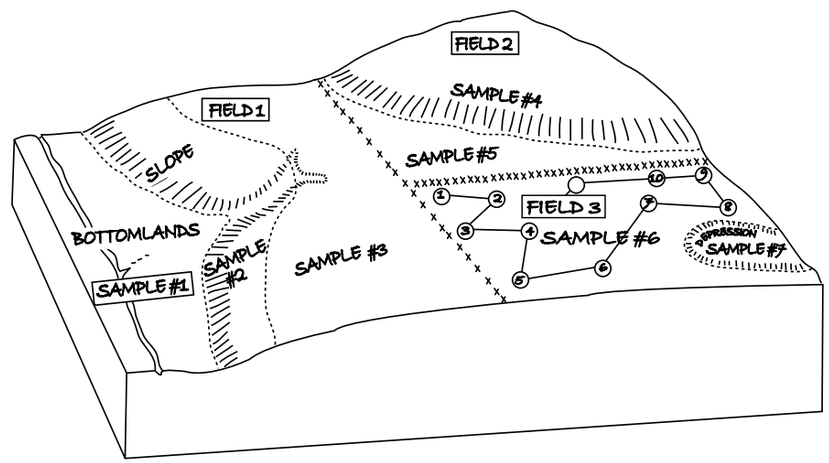
- Field area to sample
- Time of sampling
- Sampling tools
- Sampling depth
- Amount of sample
- Sampling process
- Drying samples
- Sample I.D. and shipping

General Sampling Procedures

A critical step in obtaining accurate soil tests is collecting representative samples in the field. Typically, uniform fields should be sampled in a simple random pattern across the field collecting at least 15-20 equal size soil cores. Avoid, or sample separately, areas like abandoned farmsteads and feedlots, manure piles, fences, roads, eroded knolls, low areas, and salty or wet spots.

Fields with significant landscape or other differences should be divided into separate sample areas. Differences may include soil types, slope, degree of erosion, drainage, crop and/or manure history, or other factors that may influence soil nutrient levels.

More intensive sampling should be used where detailed information about within field nutrient variability is needed (i.e. precision application techniques and zone development).



Soil Sampling Process

Careful soil sampling and sample handling is essential for accurate fertility recommendations. Samples must accurately reflect the fertility of the soil so that analysis, interpretations, and recommendations correctly represent the nutrient status of the entire field. Accurate evaluation can result in more efficient fertilizer use, reduced costs, and reduced environmental degradation.

Field Area

A composite soil sample should represent a uniform field area. Each area should have a similar crop and fertility history. Soil characteristics (color, slope, texture, drainage) should be similar.

Exclude small areas within a field that are obviously different. These can be sampled separately if they are large enough to warrant treatment. The field area represented by a single composite sample should represent no more than 40 irrigated acres or 100 dryland acres. Fewer acres is better.

Time of Sampling

Collect soil samples from fields used for crop production after harvest and before planting the subsequent crop. To obtain the most accurate estimates of nitrogen availability, take samples as close to planting time as possible. Sampling fields near the same time each year is recommended for more consistent results. Nitrate-nitrogen concentrations should be determined annually for non-legume crops. Phosphorus and potassium determinations should be made every three to four years. Sampling and testing for both phosphorus and nitrate-nitrogen is required prior to manure application. Beware of situations that may cause soil values to change between sampling and planting, e.g. heavy rainfall or preirrigation on sandy soils could leach nitrate-nitrogen from the root zone.

Sampling Tools

A stainless steel soil sampling probe is the most commonly used tool for collecting soil samples under normal conditions. The soil probe provides a continuous soil core with minimal disturbance to the soil that can be readily divided into various sampling depths. Vehicle-mounted hydraulic probes are available and are a better choice under adverse soil sampling conditions. Other tools include one or two plastic sample buckets, shovel or spade, sample bags, and markers for identifying samples on sample bags. Tools should be clean, free of rust, and stored away from fertilizer materials. DO NOT USE galvanized or brass equipment of any kind as it will contaminate the samples with micronutrients.

Sampling Depth

Laboratory tests are calibrated to specific depths. It is vital to collect samples from appropriate depths because a core taken deeper or shallower will generate erroneous results. Sampling depth for most soils is typically the tillage depth in six-inch intervals. The top six inches of soil has the most root activity and fertilizer applications are generally restricted to this depth. These surface soil samples (zero to six inches) are typically used for conventional tests of organic matter, phosphorus, potassium, pH, and salt levels. Deep-rooted crops such as wheat and barley need deeper samples if nitrogen fertilizer recommendations are desired. Be sure to separate and discard surface litter.

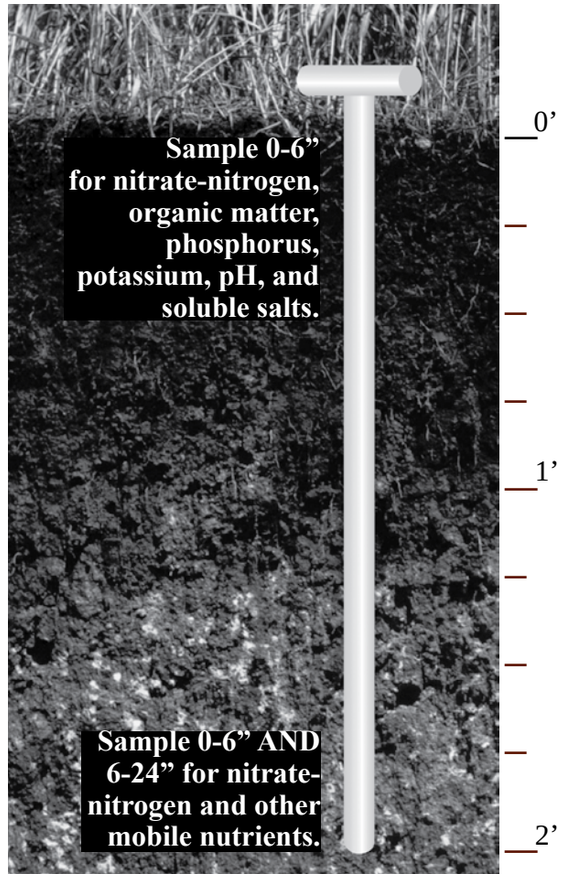
Subsoil samples from the six- to 24-inch depth are needed to estimate available nitrogen and in some cases sulfur. Nitrate-nitrogen and sulfate-sulfur are mobile in the soil and will move below the six-inch tillage layer. If leaching has not moved these nutrients below the rooting depth, they will be available for plant uptake.

Both surface and subsurface soil samples are needed to test for available nutrients in the root zone.

Amount of Sample

Soil cores collected for each sampling depth must be thoroughly mixed. Individual soil cores from a minimum of 20 locations should be mixed thoroughly in a clean plastic container. Approximately a pint (two cups) of the soil mixture (called the composite sample) is then placed in a soil sample bag which is often lined with plastic.

Soil Profile



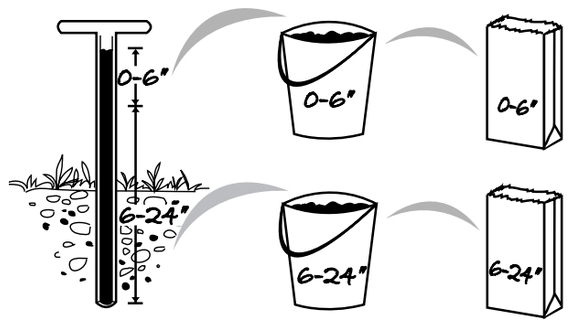
Obtain an Accurate Sample

Take at least 15-20 representative soil cores to a minimum depth of 24 inches.

Separate each of the cores into two portions (0-6 and 6-24 inches) and place each into a separate pail. Separate plastic pails should be used to mix the surface and subsurface samples.

Mix, dry, and bag each portion separately.

Montana State University fertilizer guidelines for nitrate-nitrogen are based on soil analysis to two feet. In cases where a field is higher variable or vulnerable to leaching, collecting additional samples to a depth of 24 to 48 inches is recommended.



Take a full 24-inch soil core sample in many field locations.

Place the two portions of the core in separate plastic buckets.

Bag the dry surface and subsurface samples.

Drying samples

Moist soil samples must be air dried as soon as possible before being bagged and sent to a soil testing lab. Drying is best accomplished by spreading each sample on paper to air dry at room temperature. Do not oven dry the samples. Samples may also be bagged and frozen for shipping.

Sample Identification

Along with each soil sample, sampling information sheets should be filled out that describe the location, past cropping and management history, and proposed crops along with a list of tests requested. Complete