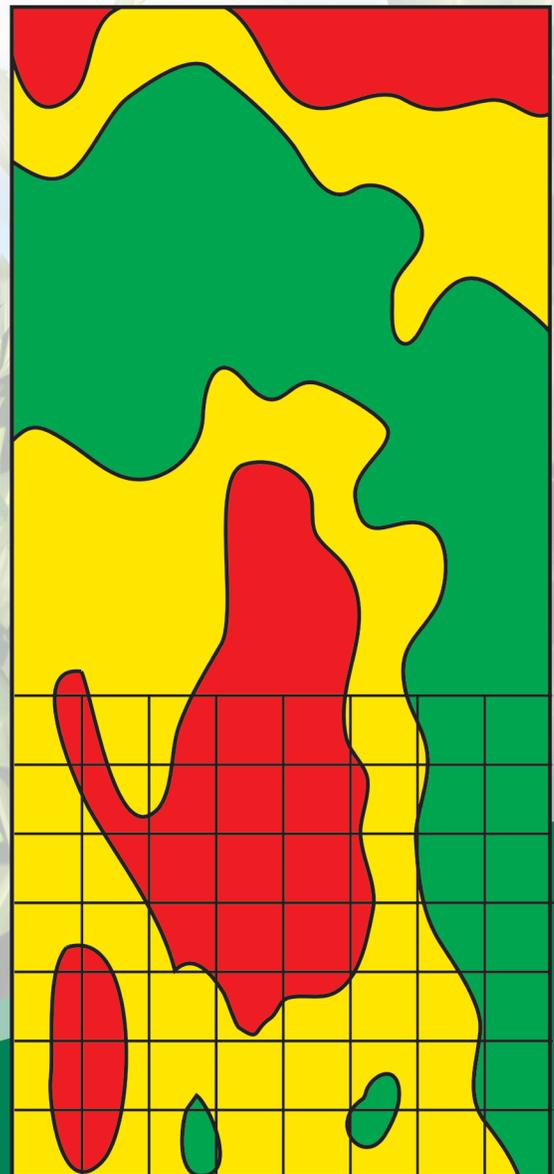


SOIL SAMPLING GUIDE



Introduction

Soil testing is the best tool available to determine the amount of each nutrient needed for the coming crop year. Soil test results have the most value when the area sampled is uniform enough to be represented by one sample. Any area of the field which is non-representative should be avoided or sampled separately. Differences in soil type, salinity, topography, crop history, manure history, or other management differences are all reasons to divide a field into two or more separate soil samples.

Soil Sampling Equipment

Soil samples are usually collected with a soil probe. This equipment allows the collection of a uniform slice of the soil profile to any depth. AGVISE Laboratories manufactures and distributes hydraulic soil sampling equipment. These hydraulic systems can sample to depths of 24 or 48 inches and are designed for mounting inside the truck cab. Mounting the system inside the cab allows you to examine each soil core as it is collected and results in the highest quality soil sample. Mounting the system in the cab also allows sampling through at least 6 inches of frost, thus extending the soil sampling season. AGVISE hydraulic and hand sampling equipment can be seen on our website (www.agvise.com).

Soil Sample Contamination

All sampling equipment should be rust free. Do not use galvanized or brass equipment (zinc contamination). WD-40 is recommended as a lubricant to reduce soil sticking in probe tips. Research has shown that WD-40 does not contaminate soil samples for nutrient analysis. Do not use lubricants containing vegetable oil. If soil samples are stored at warm temperatures for several days, vegetable oil will stimulate microbes to use nitrate-N in the sample, resulting in an incorrect low nitrate-N content. Be sure to cool or freeze soil samples if any lubricant is used and if samples will be stored more than one day.

Soil Sample Depth

Separate soil samples for 0-6 and 6-24 inch depths are required in areas where soil nitrate testing is recommended (0-6 and 0-24 inch depth combination is also acceptable). Be sure to place the 0-6 and 6-24 inch samples in separate sample bags. In areas where soil nitrate testing is not yet used, a 0-6 inch sample (or tillage depth) is recommended. In established legumes, residential lawn, or vegetable gardens, a 0-6 inch sample is recommended. Non-mobile nutrients such as phosphorus, potassium and most micronutrients are tested on the 0-6 inch sample depth

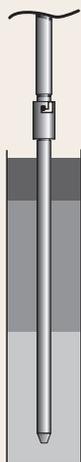
only. Nutrients that are mobile in soil such as nitrogen, sulfur, and chloride are tested on both the 0-6 and the 6-24 inch sample depths. Deep-rooted crops like sugarbeet and corn often require nitrogen to be tested down to 48 inches.

When to Soil Test

Soil testing for P, K, pH, organic matter, salinity, Ca, Mg, Zn, Fe, Mn, and Cu can be done at any time of year. Testing these nutrients and soil properties every two to four years is sufficient because these non-mobile nutrients do not fluctuate greatly from year to year. Many ag retailers and crop consultants test for these nutrients each year to develop better long-term trends for each nutrient and soil property.

Soil testing for nitrogen, sulfur, and chloride is generally done following harvest in fall or early spring. Soil nitrate testing is considered a best management practice in most areas of the Midwest and Great Plains. Soil nitrate should be tested each year because of large potential changes in residual soil nitrate. These changes are caused by yearly fluctuation in crop yield, weather, nitrogen loss during the growing season, etc. Soil nitrate testing can begin immediately following small grain harvest (late August or early September). Even though soil nitrate content may increase slightly through the fall due to mineralization, university specialists recommend soil testing before fall tillage on small grain fields. Residual soil nitrate usually changes less than 10 lb nitrate-N/acre in response to net N mineralization or immobilization during fall.

The best quality soil samples will be collected before any tillage for a more uniform soil sampling depth. Soil testing before volunteer small grains begin to accumulate nitrogen from the soil profile will provide a more accurate assessment of soil nitrate available for next year's crop.



Analysis conducted on topsoil		
Nitrate-nitrogen	Zinc	Carbonate
Ammonium-nitrogen	Iron	Soil pH
Phosphorus	Manganese	Buffer pH
Potassium	Copper	CEC
Sulfate-sulfur	Magnesium	Base saturation
Chloride	Calcium	Soil texture
Boron	Sodium	Water holding capacity
	Organic matter	
	Soluble salts	

Analysis conducted on subsoil	
Nitrate-nitrogen	Soluble salts
Ammonium-nitrogen	Soil pH
Sulfate-sulfur	Soil texture
Chloride	Water holding capacity

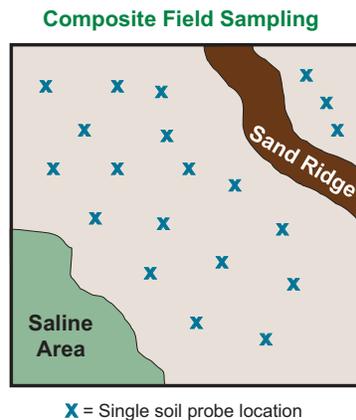
Soil Sample Quality is Best before any Tillage

Collecting soil samples from an undisturbed soil profile provides better control of soil sample depth than in disturbed, tilled fields. Soil sample depth is critical for obtaining consistent soil test results for non-mobile nutrients like phosphorus, potassium, and zinc. Soil testing in untilled fields also allows you to identify unproductive areas of the field while sampling. These unproductive areas should be avoided or sampled separately to determine if soil fertility was part of the problem. When sampling fields after tillage, be sure to take each soil core from a firmed area such as a wheel track for more consistent depth control.

COMMON SOIL SAMPLING METHODS

Whole-field Composite Sampling Method

A whole-field, composite soil sample is obtained by collecting 15-20 soil cores to represent an entire field. The 15-20 cores are then mixed thoroughly, and a portion is sent to the laboratory for analysis (see example). Any areas of the field that are not representative should be avoided. Soil cores should not be taken in saline areas, sandy ridges, etc. For better soil test information, it is best to collect separate soil samples from these non-representative areas. A composite soil sample will provide the average soil nutrient level in each field. Soil sampling large fields as a single composite soil sample can result in many acres being under or overfertilized. Splitting large fields into smaller areas for soil testing will result in more accurate soil test results. Fertilizer guidelines are calculated based on nutrient level and appropriate yield goal for each field.

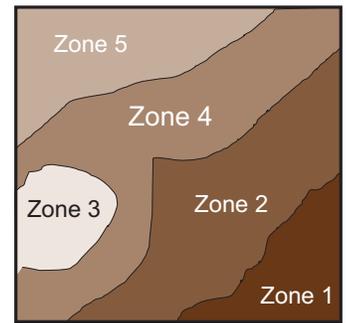


Productivity Zone Sampling Method

Fields can be split into productivity zones for soil testing. Productivity zones can be defined using information from satellite imagery of previous crop years, yield maps, salinity (EC) maps, soil survey, topography, etc. Determining zones based on multiple data layers is recommended. A representative soil sample is collected from each productivity zone by collecting 10-15 soil cores for each zone soil sample. Soil nutrient levels in each zone

can be vastly different. Yield potential in each zone may also be different based on soil texture, landscape position, salinity, drainage, etc. Fertilizer guidelines are calculated based on nutrient level and appropriate yield goal for each productivity zone.

Productivity Zone Sampling Example

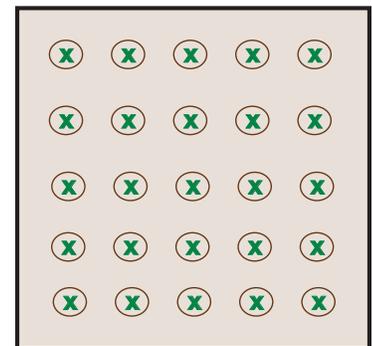


10-15 Probe Sites per zone area

Grid Soil Sampling Method

Grid soil sampling involves splitting fields into small, equal-sized areas for soil sampling (usually 1- to 5-acre grid areas). Soil cores are collected from the center point of each grid area or randomly within the grid area. A minimum of 8-10 soil cores are collected from each grid area. Fertilizer guidelines are calculated based on nutrient level and appropriate yield goal for each grid area.

Grid Sampling Example



⊗ = 8-10 Probe Sites per grid point

Proper Soil Sample Handling Procedures

Proper soil sampling handling procedures depend on which nutrient analysis is requested. Soil samples that will be analyzed for nitrate-N should be kept cool, frozen, or shipped to the laboratory immediately. If soil samples are stored in a warm area for an extended period of time, the nitrate-N concentration in the soil sample will increase. Warm temperatures stimulate soil microbial activity, causing release of additional nitrate-N during storage. If this occurs, the laboratory analysis for nitrogen will be incorrectly high, due to improper soil sample handling. Soil samples that will be analyzed for all other nutrients are not significantly affected by storage temperature and do not require special handling.

Herbicide Residue Analysis

Soil samples that are collected for herbicide residue analysis may require special sample containers and shipping. Please call the laboratory before sampling for instructions on sample handling and shipping requirements. AGVISE Laboratories provides foil-lined bags for herbicide residue samples.

Sample Information and Forms

Filling out the soil sample information forms completely and placing the reference sticker on the sample bags properly is important for soil test reporting accuracy. Please review the example below. The highlighted (green) items are required for samples to be processed quickly through the laboratory.

1. Firm Submitting Sample: Information on the firm submitting the soil sample appears. AGVISE provides pre-printed customer ID stickers for your convenience or this information can be written in.
2. Grower Name: The grower name and address may be provided. Grower name is not required.
3. Sampler: This space is provided for the identification of the person who performed the soil sampling.
4. Sample Date: The date of soil sampling may be important for field history records.
5. Field ID: Each soil sample should have a specific field and sample ID for future reference.
6. Sample Location: The county, township, section, and acres are provided for additional information and future reference.
7. Sample Depth: Correct soil sample depth is critical for proper data reporting. Incorrect soil sample depth will result in reporting errors for nitrogen, sulfur, and chloride.
8. Crop Choice: This information is optional. If crop choice, yield goal, and P & K application method are completed, fertilizer guidelines will be provided at no charge.
9. Soil Test Option: This must be provided for analysis to be completed. If this not provided, analysis will be delayed until customer can be contacted.
10. Other Analysis: This space is provided for any additional analyses requested.

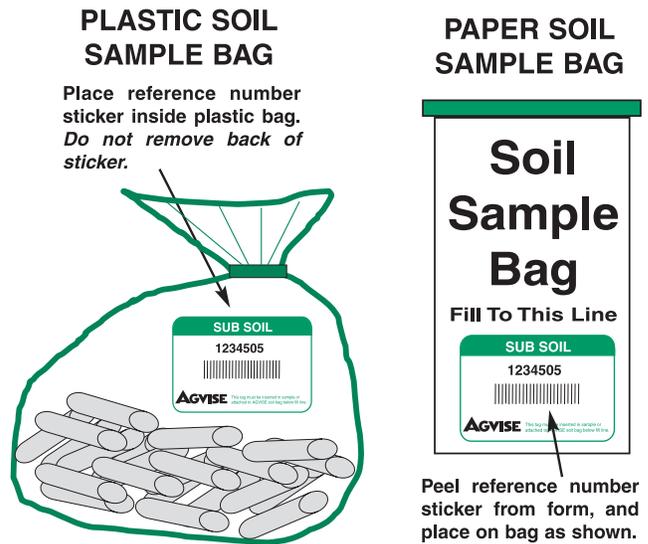
Reference Number Sticker: A reference number sticker must be placed on each soil sample bag according to its respective soil sample depth. This reference number is



needed for tracking soil samples in the laboratory. Any soil samples received without reference numbers may be delayed in processing. Please see example of how reference number stickers are placed ON small paper sample bags and placed INSIDE large plastic sample bags (sticker is placed on pre-cut paper bag first).

Submitting Multiple-depth Soil Samples

Two-depth and three-depth soil samples must be paired and placed together in one plastic bag before submission, so that the same reference number series (i.e., topsoil, subsoil, deep subsoil) are located in one plastic bag. This ensures that soil samples are received and processed together. Failure to pair soil depths before submission may delay processing through the laboratory. AGVISE provides plastic bags for pairing soil depths at no charge.



AGVISE LABORATORIES Highway 15, P.O. Box 510 Northwood, ND 58267 701-587-6010 FAX 701-587-6013

902 13th Street North Box 187 Benson, MN 56215 320-843-4109 FAX 320-843-2074

Soil Sample Bag PLACE REFERENCE TAG HERE

GROWER NAME: **Mr. Farmer** ACCOUNT NO: **LA 21714**

ADDRESS: **Green City** NAME: **Mid Town Ag Service**

SAMPLER: **D. Cooper** SAMPLE DATE: **11/13/96** CITY: _____ STATE: _____ ZIP: _____

IMPORTANT: Make sure the soil for each field below is sent into AGVISE with this form. If not, boldly cross out the field not sent

FIELD ID: **1234505** SAMPLE DEPTH: 0-6" 0-6", 6-24" 24-48" OTHER P & K APPLICATION

LAB USE ONLY: 0-24" 0-6", 0-24" 0-6" 0-6", 0-24" 24-48" OTHER P & K APPLICATION

CROP CHOICE: **1. Corn** YIELD GOAL: **160 bu**

CROP CHOICE: **2. Wheat** YIELD GOAL: **60**

CROP CHOICE: **3. Soybeans** YIELD GOAL: **50**

PREVIOUS CROP: _____

FIELD ID: **Frank's 80** SEC: **23**

CO.: **Polk** QTR: **SE**

TWP: **Farley** ACRES: **80**

CHECK ONE BOX ONLY

SMALL GRAIN C2

POTATO C1

SUGAR BEET C5

ALFALFA E

A FZ

B E

C G

OTHER Chloride 10

CHECK ONE BOX ONLY

SMALL GRAIN C2

ROW CROP C1

POTATO C5