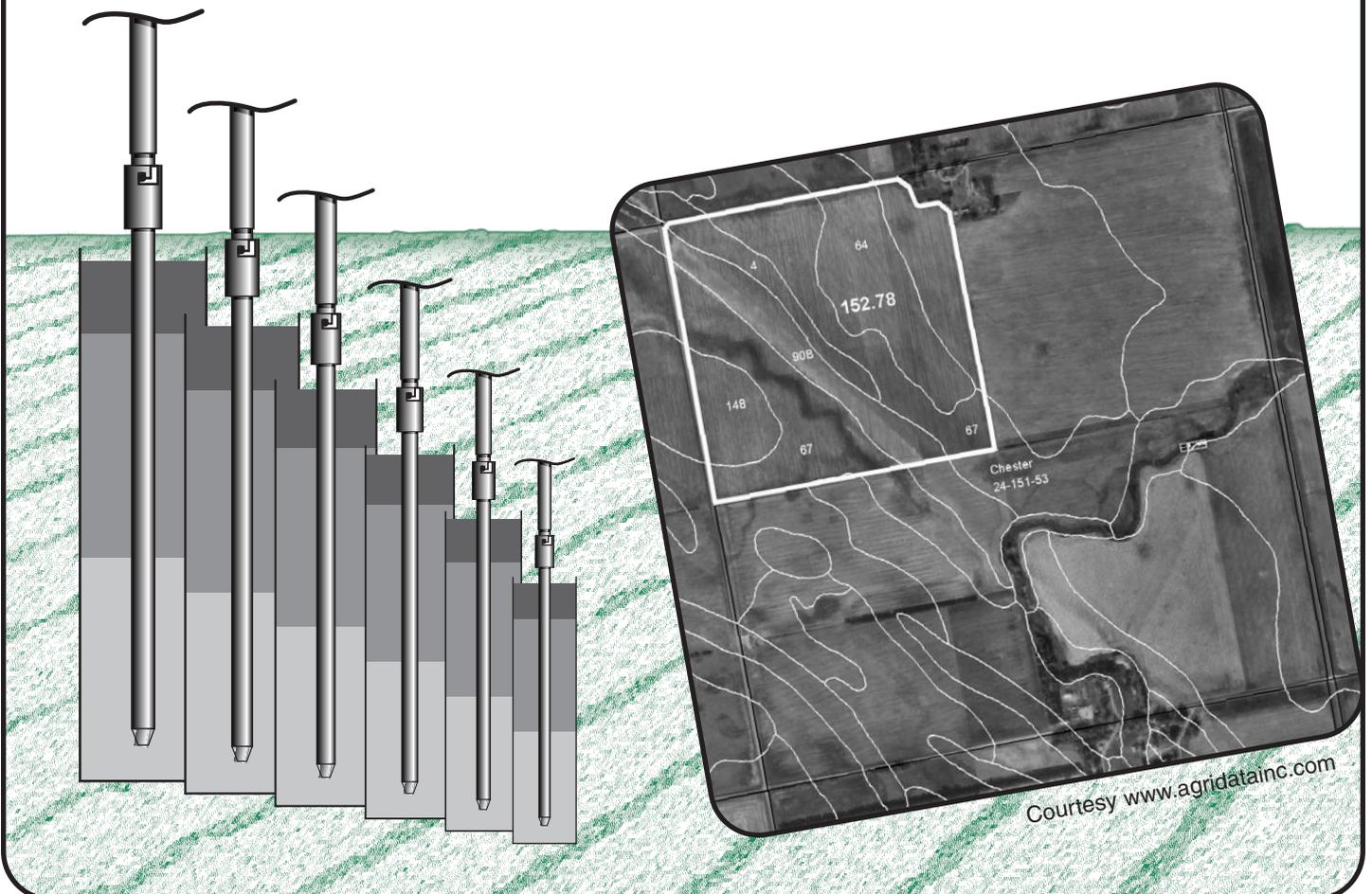


SOIL SAMPLING GUIDE



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 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" 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 12" of frost to extend the sampling season. AGVISE hydraulic and hand sampling equipment can be seen on our web site at www.agvise.com

Soil Sampling 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 the sample. Do not use lubricants made of vegetable oil. If the soil samples are stored at warm temperatures for several days, the vegetable oil will stimulate microbes to use nitrate in the sample, resulting in an incorrect low nitrate level. Be sure to cool or freeze soil samples if any lubricant is used.

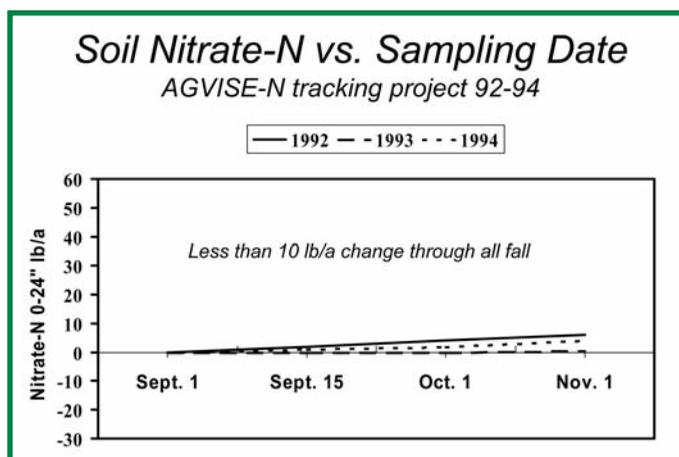
Soil Sample Depth

Separate soil samples from 0-6" and 6-24" depths are required in areas where soil nitrate testing is recommended (0-6" & 0-24" combination is also acceptable). **Be sure to place the 0-6" and 6-24" sample in separate sample bags.** In areas where the soil nitrate test is not yet used, a 0-6" sample or tillage depth sample is recommended. In established legumes or residential lawn or vegetable gardens, a 0-6" soil sample is recommended. Non-mobile nutrients such as phosphorus, potassium and most micronutrients are tested on the 0-6" sample. Nutrients that are mobile in the soil like nitrogen, sulfur and chloride are tested on the both the 0-6" and the 6-24" sample depths. Deep rooted crops like sugarbeets and corn often require nitrogen to be tested down to 48".

When to Soil Test?

Soil testing for P, K, pH, %OM, salts, Ca, Mg, Zn, Fe, Mn, and Cu can be done at any time of the year. Testing these nutrients and soil properties every 2-4 years is sufficient because they do not fluctuate greatly from year to year. Many dealers and consultants test for these nutrients each year, which allows them to develop better long-term trends for each nutrient and soil property.

Soil testing for nitrogen, sulfur and chloride is generally done in the fall following harvest or early spring. Soil nitrate testing is considered a best management practice in many areas of the Midwest. Soil nitrate levels should be tested each year due to large potential changes in residual soil nitrate level. These changes are due to yearly fluctuation in crop yield, nitrogen losses during the season etc. Soil nitrate testing can begin immediately following small grain harvest (late August or early September). Even though soil nitrate levels may increase slightly through the fall due to mineralization, University specialists recommend soil testing before fall tillage on small grain fields.



The best quality samples can be collected before tillage. Soil testing before volunteer grain starts using nitrogen from the soil profile provides a more accurate assessment of the soil nitrate available for next years crop.

Sample Quality is Best on Un-tilled Fields

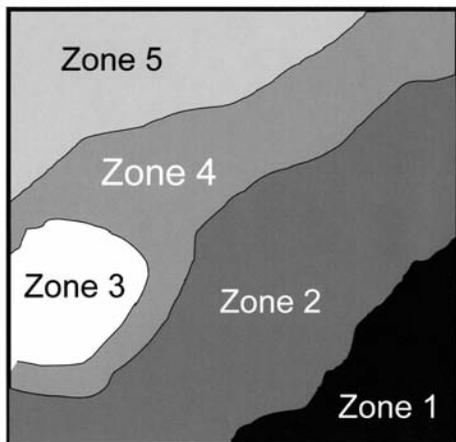
Soil sampling an undisturbed soil profile provides better control of sample depth compared to sampling tilled fields. Sample depth is critical to getting consistent test results for non-mobile nutrients like phosphorus, potassium and zinc. Soil testing untilled fields also allows you to identify unproductive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

Common Soil Sampling Methods

Composite Field Sample Method

A composite field sample is attained 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 testing (see example). Any areas of the field that are not representative should be avoided. Sample cores should not be taken in saline areas, sandy ridges, etc. To get better information, it is best to collect a separate sample from these non-representative areas.

Productivity Zone Sampling Example



10-15 Probe sites per zone area

can be defined using information from satellite canopy images of past crop years, yield maps, salinity maps, soil type maps, topography, etc. Determining zones based on multiple layers of information is recommended. A representative soil sample is collected from each productivity zone by collecting 10-12 cores. Soil nutrient levels in each zone can be quite different. Yield potential in each zone may also be quite different based on differences in soil texture, salinity, drainage, etc. Fertilizer guidelines are based on the nutrient level and the appropriate yield goal in each zone.

Grid Soil Sampling Method

Grid soil sampling involves splitting fields into small equal sized areas for testing (1-5 acres). The soil cores can be collected from the center point of each grid area or randomly within the grid area. A minimum number of 8-10 cores are collected from each grid. Fertilizer guidelines are calculated based on the nutrient level for each grid area and the yield goal for that grid area.

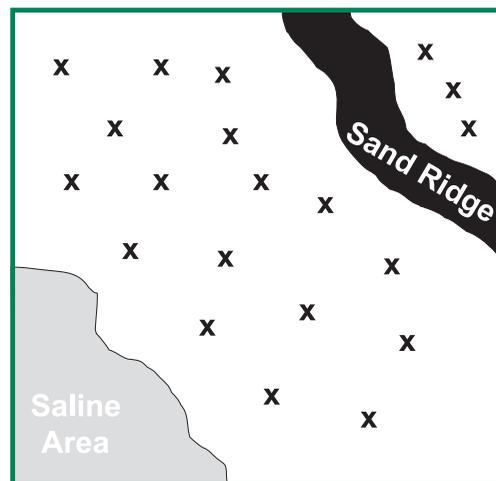
Sample Handling

Proper soil sample 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 samples are stored in a warm area for extended periods of time, the nitrate level in the sample will increase. Warm temperatures during storage increase the activity of

microbes in the soil sample. This microbial activity causes the release of additional nitrate-N in the soil sample bag. If this happens, the laboratory analysis for nitrogen will be incorrectly high, due to improper sample handling.

Soil samples that will be analyzed for all other nutrients are not affected by temperature and do not need special handling.

Composite Field Sampling



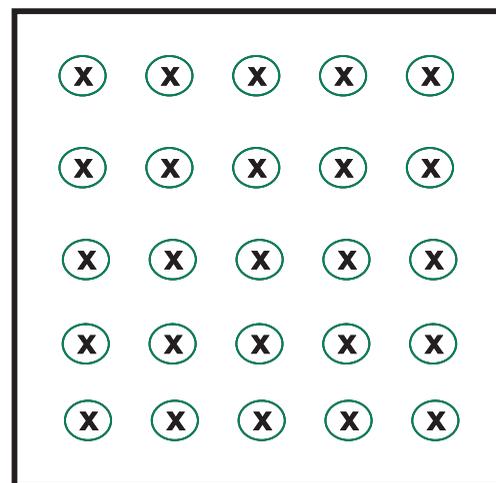
X = Single soil probe location

A composite soil sample will provide the average soil nutrient level in each field. Sampling very large fields as a single composite 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. The nutrient levels in the soil, along with the yield goal of the crop to be grown are used to calculate the fertilizer guidelines.

Productivity Zone Sampling Method

Fields can be split into productivity zones for soil testing. These productivity zones

Grid Sampling Example



X = 8-10 Probe Sites per grid point

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 & Forms

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

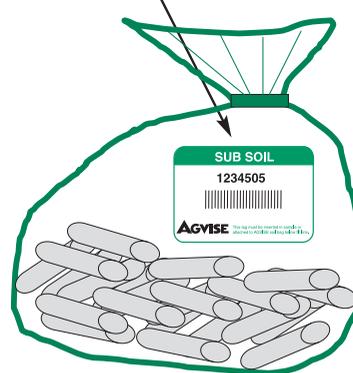
- Firm Submitting sample:** Information on the firm submitting this sample appears in this area. AGVISE will provide preprinted customer ID stickers for your convenience or this information can be written in.
- Grower Name:** The grower name may be provided by the submitter of the sample. Grower name is not required.
- Sampler:** This space is provided for the identification of the person who did the sampling.
- Sample Date:** The sample date may be important for recording field history.
- Field ID:** Each sample should have a specific field and sample ID for future reference.
- Sample Location:** The county, township, section and acres are provided for future reference.
- Sample Depth:** Providing the correct sample depth is critical. Incorrect sample depths will result in reporting errors in levels of nitrogen, sulfur and chloride.
- Crop Choice:** This information is optional. If crop choices, yield goals and guidelines are completed, fertilizer guidelines will be provided at no charge.

- Soil Test Option:** This information must be completed for testing to be completed. If this information is not provided, testing will be delayed until customer can be contacted.
- Other Analysis:** This space is provided for any additional analysis customers request.

Reference Number Stickers: The reference number stickers must be placed on each sample bag according to sample depth. This reference number is critical for tracking samples in the laboratory. Any samples received without reference numbers may be delayed in processing through the laboratory. Please see the example of how reference number stickers are placed "ON" small paper sample bags, and "INSIDE" of large plastic sample bags.

PLASTIC SOIL SAMPLE BAG

Place reference number sticker inside plastic bag. Do not remove back of sticker.



PAPER SOIL SAMPLE BAG



Peel reference number sticker from form, and place on bag as shown.

AGVISE LABORATORIES Highway 15, P.O. Box 510 Northwood, ND 58267 701-587-8010 FAX 701-587-6013

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

Mr. Farmer ACCOUNT NO. LA 21714
Green City NAME **1** ADDRESS **1**
D. Cooper SAMPLE DATE **11/13/96** CITY STATE ZIP
1234505 LAB USE ONLY

Frank's 80 SEC. **23**
Polk QTR. **SE**
Farley ACRES **80**

1234506

24-48" **7** **9**
0-6" **0-6", 6-24"** **OTHER**
0-24" **0-6", 0-24"**

Corn **160 bu** **8**
Wheat **60**
Soybeans **50**

Chloride **10**

FIELD ID: Frank's 80 SEC: 23
 CO. Polk QTR. SE
 TWP. Farley ACRES 80

PREVIOUS CROP: RICE SUGAR BEET POTATO SUGAR BEET ALFALFA A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

SMALL GRAIN C2
 ROW CROP C1
 POTATO C3
 SUGAR BEET C5
 ALFALFA E
 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

OTHER Chloride **10**

SMALL GRAIN C2
 ROW CROP C1
 POTATO C3