



SOIL SAMPLING For Fertilizer Recommendations

NORTH DAKOTA
STATE UNIVERSITY
JUL 09 1990
SERIALS DEPT.
LIBRARY

L.J. Cihacek, L.J. Swenson and W.C. Dahnke

Importance of Soil Sampling

Soil tests measure the relative nutrient status of agricultural fields and serve as a guide to the profitable use of fertilizers. The accuracy of a soil test, however, can be no better than the accuracy of the soil sample. If the soil sample does not accurately represent the field from which it was taken, the fertilizer recommendation based on the sample will be misleading. It is very important to properly collect accurate soil samples.

When to Sample

Soil samples to be analyzed for nitrate-nitrogen can be taken any time after Sept. 1. At this time the soil temperatures are dropping and are generally cool enough to prevent any appreciable increase in nitrate levels from occurring. When fall soil temperatures drop below 50 degrees Fahrenheit the nitrate levels in agricultural fields will remain relatively constant until small grain planting in the spring.

Samples taken before Sept. 1, or in the spring after the soil temperatures have warmed to above 50 degrees, are adjusted for extra available nitrogen when recommendations are made. Soil samples can be taken any time of the year when testing for nutrients other than nitrate-nitrogen.

Sampling Depth

The depth of soil to be sampled depends on the nutrient in question. When a field is sampled for nitrogen, chloride and/or sulfur plus any other nutrients, it is necessary to have a separate sample from the 0- to 6-inch depth and another from the 6- to 24-inch depth or the 0- to 24-inch depth. Use whatever combination is more convenient. Nitrate-nitrogen is soluble in water, so it can move with water movement in the soil profile. After a drought, nitrate-nitrogen may be concentrated near the soil surface. Following rain ($\frac{1}{2}$ inch or more), much of it may be located 6- to 8-inches deep. After a large rain (more than 1 inch), most of the available nitrogen may be 12 to 18 inches deep, and with more precipitation, nitrogen will move below 24 inches. It is recommended that nitrogen samples always be taken to a depth of 24 inches. Soil sampling to a depth of 48 inches may be necessary when growing a crop whose quality is impaired by too much N (sugarbeets, malting barley) or if carryover of N below 24 inches is expected. Sulfate-sulfur and chloride are also soluble nutrients, and soils should be sampled to a depth of 24 inches for them. A 6-inch soil sample is adequate for all other nutrients.

Sampling Materials

Tools commonly used to sample soils for routine analysis include: hand probes, hand augers, shovels or vehicle-mounted hydraulic probes (see



NDSU EXTENSION SERVICE

North Dakota State University, Fargo, ND 58105

MARCH 1990

14 AGR-8

Figure 1). Sampling equipment should be clean, free of rust, and if samples are to be analyzed for micronutrients, chrome plated or made of stainless steel. Soil sampling tools are available from commercial sources. These are designed to either simplify or speed soil sampling. Plans are available for a farm shop hydraulic soil sampling tool assembly (ND Plan 3166-1 and 3166-2, Agricultural Engineering Department, NDSU, Fargo, ND 58105).

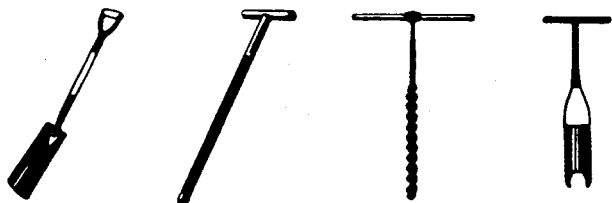


Figure 1. Common soil sampling equipment.

Taking Samples

Figures 2, 3 and 4 show several sampling schemes which can be used to collect a representative soil sample.

With the help of a soil survey map, divide each field into uniform areas. If you don't have a map, look carefully for differences in slope, erosion, crop growth and yield. The soil in each area should have the same color and texture, cropping history, and fertilizer or manure treatments.

Avoid these areas, or sample them separately:

- dead and back furrows
- old fence rows and roads
- old manure or straw pile spots
- fertilizer spill areas
- fertilizer bands in row crops
- animal droppings and urine spots
- eroded knolls or low spots
- saline areas
- wet spots and potholes

As a rule, any area that is different in slope, texture, color, or other features, and is large enough to be fertilized separately should be sampled separately.

Scrape away surface litter. On cropland, take a core of the surface soil to a depth of 6 inches. Sample a row crop field between the rows. Samples for nitrate-nitrogen, sulfate-sulfur or chloride must be taken to a depth of 2 feet (0 to 24 inches).

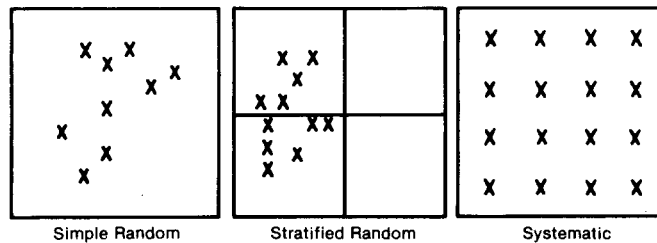


Figure 2. Soil sampling plans (x represents an individual soil sample location).

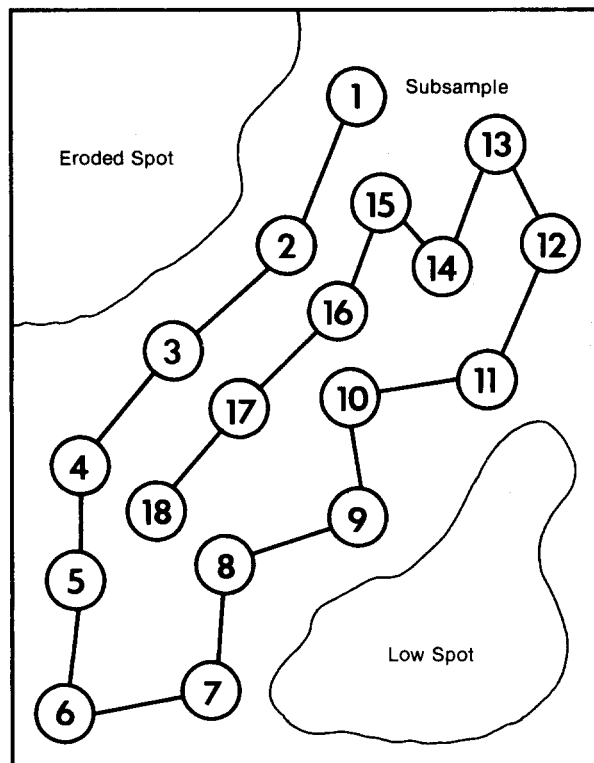


Figure 3. A soil sampling plan for glacial landscapes.

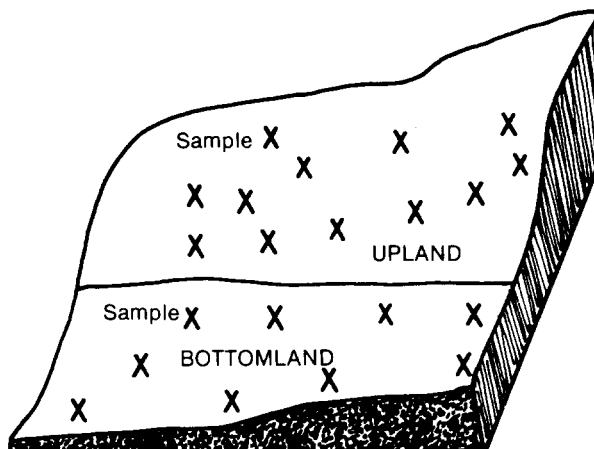


Figure 4. A soil sampling plan for rolling landscapes.

Place the cores in a clean container. Repeat this procedure in a minimum of 20 places.

Break clods and mix the soil cores thoroughly. Fill a soil sample bag with about $\frac{2}{3}$ -pint of this mixture. This is a "composite sample." Label each bag with your name, address and a sample number. It is a good practice to prepare a map or sketch of your farm-field layout, showing areas sampled. This will provide an accurate record of your soil test reports. Soil sample bags can be obtained from the NDSU Soil Testing Laboratory (Soil Testing Laboratory, Waldron Hall, NDSU, Box 5575, Fargo, ND 58105) or county extension agents, or sturdy plastic or paper bags may be used.

Moist samples should be air-dried immediately after collection to prevent alteration of nitrate concentrations by soil microorganisms. Spread samples uniformly on clean paper in a dust free area. An alternative procedure is to transport samples to the testing laboratory immediately in a cold ice chest. Rubber gloves should be used to handle samples to be analyzed for chloride to prevent contamination from the chloride in perspiration on the hands.

Sampling Subsoils

Subsoil fertility affects production of many crops. Better management decisions can be made when subsoil nitrogen, chloride or sulfur levels are known. Soluble salt problems, as an example, can be assessed best by knowing the subsoil characteristics.

For taking subsoil samples, a soil tube with extension rods or the hydraulic soil probe are well-suited.

Specialized Sampling

Row Crop, Reduced Till and No Till

Reduced tillage in row crops has different meanings to various people. As a specialized sampling problem it means tillage that doesn't incorporate crop residues more than 3 inches. Ridge till may or may not be considered reduced tillage under this definition. No-till management leaves all residues on the soil surface.

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- to 6-inch depth. Both samples are important. The 0- to 6-inch depth should be used for general fertilizer recommendations. The 0- to 2-inch sample should be used to adjust the fertilizer program for fertilizer placement and for an organic matter test to provide for more efficient herbicide programs. Generally at the surface you will find higher fertility, higher organic

matter content, and lower pH, all of which affect fertility and herbicide programs.

Usually the basic soil test (pH, P, K) is adequate for the 0- to 2-inch depth. However, other analysis should be run in some situations. In very high water table soils, soluble salts can also accumulate at the soil surface at higher concentrations than indicated by a 0- to 6-inch sample, causing stress to plants, particularly at early stages of growth. Samples for nitrate-nitrogen and chloride should still be taken to a depth of 24 inches. Trace element tests on the 0- to 2-inch sample can be misleading. These nutrients can accumulate with organic enrichment of the soil surface. A 0- to 6-inch sample is recommended in these situations.

Ridge Till

When using ridge till, soils should be sampled half-way down the ridge at a 45 degree angle to the ridge as shown in Figure 5.

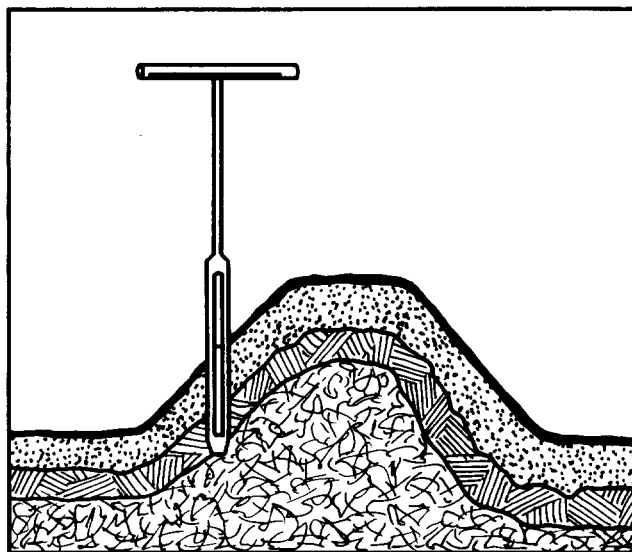


Figure 5. Soil sampling for ridge till.

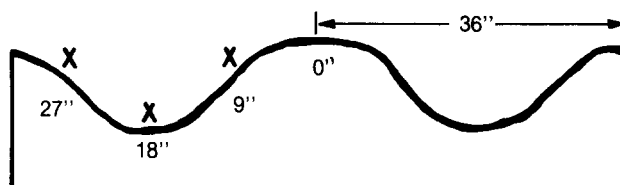


Figure 6. Soil sample locations for irrigated row crops (x represents one individual soil sample location).

Irrigated Fields

If all fertilizer is applied in a band for irrigated crops, sample three to four cores that are spaced equally between the ridge or row. For example, if the row spacing is 36 inches, samples are taken at 9, 18 and 27 inches from one reference row. This evens out chances of sampling directly in a fertilizer band.

Fields irrigated with a center pivot system require special sampling techniques because of the varied terrain and specialized management. Divide

the circle into several units and further subdivide the hills and valleys. Sample each area and either combine the laboratory results if soil test results are similar or treat each area separately.

Pesticide Analysis Sampling

Specific sampling guidelines are required for pesticide or toxicant analysis. Growers should consult with the individual laboratory doing the analysis, pesticide manufacturer or appropriate extension service personnel for more information.

Helping You Put Knowledge To Work

NDSU Extension Service, North Dakota State University of Agriculture and Applied Science, and U.S. Department of Agriculture cooperating. William H. Pietsch, Director, Fargo, North Dakota. Distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. We offer our programs and facilities to all persons regardless of race, color, sex, religion, age, national origin, or handicap; and are an equal opportunity employer. 5M-3-90