Collecting Representative Soil Samples

The fact that a soil test is no better than the sample it was taken from cannot be over-emphasized. Soil fertility variation is an inherent soil property present in every farm field.

Table 4-4 is an illustration of variation across a field. Although the data is from North Dakota, the principle is the same for all soils. Note the range of soil test values especially for sites 3 and 4. With grid sampling we see this type of variation in most fields.

Table 59: Range and Average Soil Test Values from Four Sites in a North Dakota Field

	Site 1		Site 2		Site 3		Site 4	
	Range	Avg	Range	Avg	Range	Avg	Range	Avg
NO_3-N	21 – 84	39	31 – 208	90	12 – 46	23	14 – 225	62
P	5 – 20	12	7 – 39	17	2 – 46	14	7 – 110	27
K	240 – 540	423	360 – 540	509	130 – 970	365	405 – 690	521

Data from Kansas State University showed that soil phosphorus varied by as much as 40% within a distance of one foot. Although these may be extreme cases, it shows that variation can be a problem even when the land has been uniformly treated over a number of years.

There are several guidelines to follow when collecting soil samples which reduce the variation problem and create a sample that more accurately reflects the fertility levels of the area from which it was taken.

Proper Sampling Equipment

Soil probes, soil augers, and spades can all be used for sampling. If using a spade, care should be taken that a uniform slice of soil is taken at each site. A clean plastic pail is recommended for use while collecting the soil samples. Never use a galvanized metal pail or any container that may be contaminated with fertilizer, manure, etc. Finally, the soil should be submitted to the lab in a clean cloth or plastic lined paper bag and sent as quickly as possible. If the soil sample cannot be sent immediately, spread out the soil on clean paper to air dry. This reduces the chances of appreciable amounts of organic nitrogen mineralization by microorganisms during the time between sample collection and drying at the lab.

Depth of Sampling

A surface sample of 0-8 inches should be collected for N-P-K and micronutrient analysis. Subsoil samples from 8-36 inches (8-24 inches minimum) should be collected for testing for residual nitrate-nitrogen.

Divide Field into Sampling Units

A single soil sample should represent no more than 40 acres. In fields that have numerous slopes, divide the field by topography. Represent side-slopes with one sample, low areas with another, hilltops with another and so on. Do not mix cores from low areas and side-slopes together; that does not give you much information. Areas of a field that have had different crops, fertilization or liming should also be sampled separately. Changes in soil color, drainage, and texture should also be sampled separately. Avoid dead furrows, old feedlots, old farm sites, terrace channels, alkali spots, or any small area in a field that is drastically different; that only serves to contaminate an otherwise good sample. Sample odd areas separately.

Number of Cores in a Composite Sample

Within a sampling area, take at least 15 cores at random. Be sure to keep top and subsoil cores separated in their respective pails. After collecting the cores, thoroughly mix and put about one pound of soil into a clean bag for each depth.

Labeling of Soil Samples

Clearly label each bag and be sure the sample identification matches that on the soil information submittal sheet that you submit along with the sample or samples. Soil sample submittal sheets can be found at *www.wardlab.com/sample-submittal.php*

Grid Sampling

Grid sampling is important for assessing soil nutrient variability. Each sample for a grid point should be a composite of at least 8 subsamples. It is suggested that two subsamples be taken from the left and right sides and from the front and back of the sampling vehicle. Mix the subsamples before placing in the sample bag.

Soil Test Calibration

Soil tests are used to predict the amount of plant nutrient needed to supply crops with 100% of their nutrient requirements. Some soils are very low in certain plant nutrients and consequently require high rates of fertilizers to supply crop needs. On the other hand, other nutrients are found in very high levels and no additional nutrient is required.

Definition

A soil test is a chemical means of estimating the nutrient supplying power of a soil. The test must be calibrated before it can be properly interpreted. Soil tests are calibrated by establishing fertilizer rate experiments on different soils to determine the best fertilizer rate at a given soil test level. Once a number of fertilizer experiments have been conducted, the data can be summarized, and fertilizer recommendation guides developed for each soil test level. Field research is necessary before soil test values can be used to suggest fertilizer rates. Land Grant University Agricultural Experiment Stations provide this information.

Chemical Analysis

The chemical method used to measure the available soil nutrient level is important to the extent that the method must be accurate. The extraction method must show measured increases in nutrient level as the indicated field crop response decreases.

In designing chemical methods, the question of measuring “fixed” or “reserved” chemical forms is frequently raised. For example, no fieldwork has ever shown that different levels of “fixed” K influence the yield of agronomic crops. In general, fixed forms are not available forms and should not be included in the forms extracted by a soil test method.

Correlation and Interpretation

All soil test values must be correlated with crop growth from fields of known response. The experimental site must have only the fertilizer nutrient as a variable. Variables such as plant population, planting pattern, tillage practices, variety, planting date, soil, and rainfall/irrigation are identical in time and quality. For example, when a P experiment is carried out on a P responding soil, and one plot is fully fertilized while another has everything except P, a difference in rate of growth is established that can be measured as the final yield per acre.