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Testing Your Soil

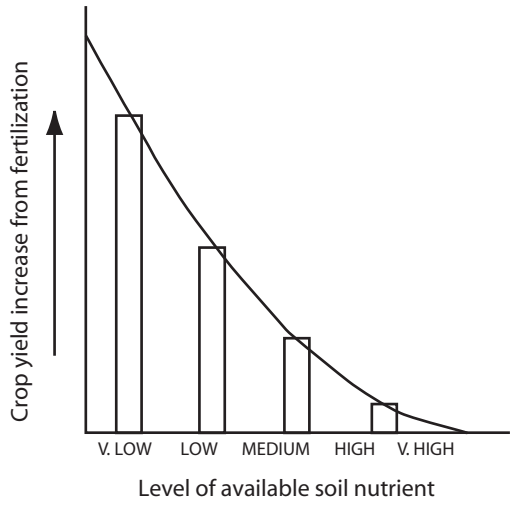
How to Collect and Send Samples

T. L. Provin and J. L. Pitt*

Soil tests can be used to estimate the kinds and amounts of soil nutrients available to plants. They also can be used as aids in determining fertilizer needs. Properly conducted soil sampling and testing can be cost-effective indicators of the types and amounts of fertilizer and lime needed to improve crop yield.

The effects of adding a fertilizer often depend on the level of nutrients already present in the soil (Fig. 1). If a soil is very low in a particular nutrient, yield will probably be increased if that nutrient is added. By comparison, if the soil has high initial nutrient levels, fertilization will result in little, if any, increase in yield.

Figure 1. The probability of a crop yield increase resulting from fertilization depends on the initial amount of available nutrients in the soil.



*Assistant Professor and Soil Chemist/Laboratory Director, Extension Assistant-Laboratory Manager, Soil, Water, and Forage Testing Laboratory; The Texas A&M University System.

There are three steps involved in obtaining a soil test:

1) obtain sample bags and instructions,

2) collect composite samples,

3) select the proper test, and complete the information sheet and mail to the Soil, Water, and Forage Testing Laboratory at 345 Heep Center, College Station, TX 77843-2474. Contact the lab at (409) 845-4816, FAX (409) 845-5958, or at the Web site http://soiltesting.tamu.edu for additional information.

Obtain sample bags and instructions

County Extension offices provide soil sample bags, sampling instructions and information sheets for mailing samples to the Soil, Water, and Forage Testing Laboratory of the Texas Agricultural Extension Service.

Sample bags provided by the Extension service hold a sufficient amount of soil for use in most soil tests. Fill the sample bag or other suitable container with approximately 1 pint of a composite soil sample. Any suitable container can be used for the sample, but it is important to complete the information sheet and follow the instructions for collecting and mailing samples.

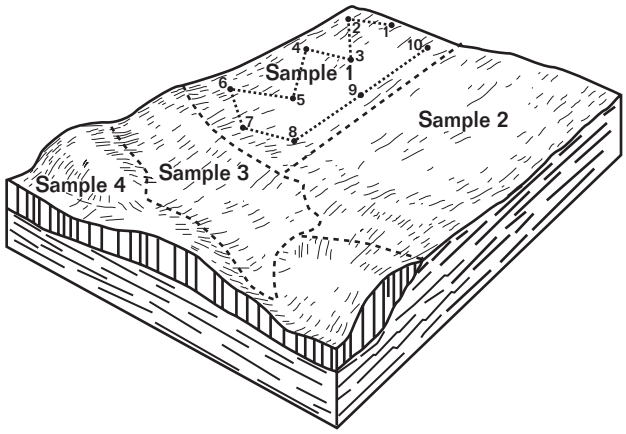
Collect composite samples

The objective in sampling is to obtain small composited samples of soil that represent the entire area to be fertilized or limed. This composited sample is comprised of 10 to 15 cores or slices of soil from the sampling area.

To sample a field or pasture, make a map that identifies each area in the field where subsamples were taken (Fig. 2). Fields or tracts of land with differences in past crop-

ping, fertilization, liming, soil types or land use will require several composite samples. The field identification map should be used each time samples are collected from that field to compare results over time.

Figure 2. Fields should be subdivided into sampling units as needed and a composite sample should be collected from each unit.

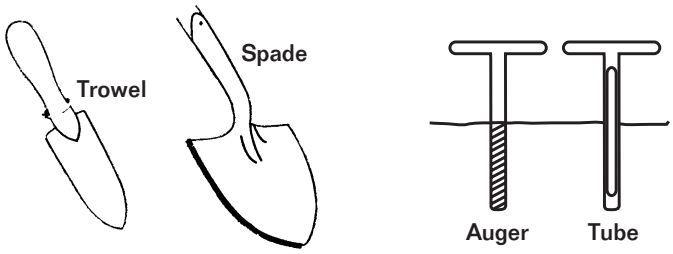


Factors that will affect results include sampling tools, number of subsamples, depth of sampling, and soil compaction and moisture.

Sampling tools

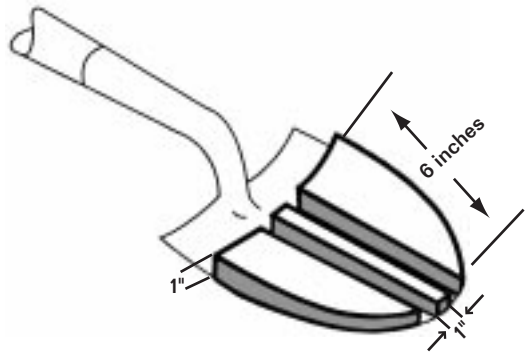
Several tools can be used to collect samples (Fig. 3). The choice depends on soil conditions and sampling depth.

Figure 3. These tools can be used to collect soil samples.



The selected tool must be able to cut a slice or core through the desired layer of soil as illustrated in Figure 4. The objective is to obtain a cross section of the plowlayer or layer being subsampled.

Figure 4. Collect a slice or core of soil to the desired depth.



Number of samples

In fields up to 40 acres, collect at least 10 to 15 cores or slices of soil per composite sample. Composite samples should represent the smallest acreage that can be fertilized or limed independently of the remaining field or acreage. The development of precision agriculture has allowed some producers and fertilizer suppliers to manage soil fertility levels on 1- to 3-acre parcels. In small gardens and lawns, five to six cores may be adequate. Because soils are variable, it is important to obtain enough subsample to ensure a representative composite sample. A greater number of cores makes the sample more representative of the field.

Unusual problem areas should be omitted or sampled separately. To properly diagnose the causes of poor crop production, collect separate composite samples from the good and poor growth areas. Do not include soil from the row where a fertilizer band has been applied.

Depth of sample

Traditionally, soil samples are collected to a depth of 6 inches. This depth is measured from the soil surface after non-decomposed plant materials are pushed aside. This sampling depth can be significantly altered based on tillage or fertilization practices.

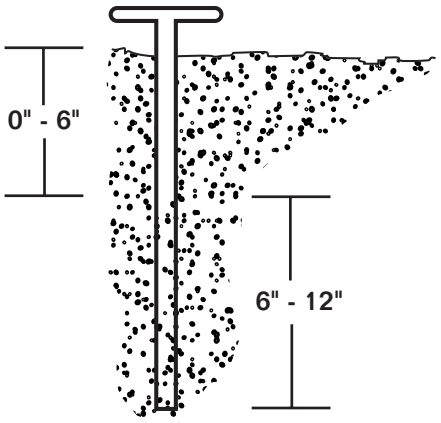
Stratification (accumulation at the surface) of phosphorus and lime from prior surface applications can dramatically alter soil test data. Stratification is of particular concern in reduced tillage and nonirrigated fields that receive limited rainfall. In these instances, subsurface sampling depths may vary from 2 to 8 inches or 3 to 9 inches below the surface. Also, deviations from the traditional 6-inch sampling depth may be required if fertilizer has been placed deeper in the soil.

Deep rooted perennial crops can require deeper subsurface sampling. The slow movement of most plant nutrients prevents any dramatic manipulation of subsurface nutrient levels, however sampling data can be useful to assess pH or salinity problems. Subsurface sampling is illustrated in Figure 5.

When sampling perennial sod crops, sample to a depth of 4 inches. Discard the surface 1/2 inch of soil before mixing the subsamples. Use this sampling method in all established lawns, golf greens and similar turf applications.

The Texas Natural Resource Conservation Commission (TNRCC) requires extensive soil sampling for some land uses. Individuals sampling soil for TNRCC compliance should follow TNRCC protocols and directions.

Figure 5. A sampling tube or auger is needed to collect subsurface samples.



Select the proper test

Several different soil tests are available at the Extension Soil, Water, and Forage Testing Laboratory. These include tests for routine nutrients, micronutrients, boron, detailed salinity, lime requirement, texture and organic matter. After taking the soil sample, select the appropriate test to obtain the desired information.

The **routine** test determines the soil pH, salinity, nitrates (NO_3-N), and levels of the primary nutrients (P - phosphorus, K - potassium, Ca - calcium, Mg - magnesium, Na - sodium, and S - sulfur) available to plants. The routine test will provide the basic N-P-K fertilizer recommendation for selected crops. This test meets most application needs.

The **micronutrient** test estimates the levels of zinc (Zn), iron (Fe), manganese (Mn) and copper (Cu) in the soil that are available to plants. Conduct this test for specialty crops, in soils with high pH on which corn or sorghum is being grown, or to provide general guidelines for troubleshooting deficiencies.

The **boron** test determines the level of water extractable boron (B) in the soil. Conduct the test where clover, alfalfa or other legumes are grown on sandy soils or when soils are being irrigated and water quality is of concern.

The **detailed salinity** test uses a saturated paste extract to measure the pH, electrical conductivity and water soluble levels of the major cations in the soil. From these levels, the Sodium Adsorption Ratio (SAR) is calculated. Conduct this test when water quality is of concern; in soils in the western part of the state where the rate of evaporation or transpiration exceeds the rainfall; when previous soil tests have shown an increase in sodium or salinity; or in areas where brine and salt water spills have occurred. Some TNRCC permits also may require a detailed salinity test.

The **lime** requirement determines the amount of lime needed to raise the soil pH to a desired level. This determination is needed on very acidic (pH <5.2) or acidic soils (pH <6) where alfalfa or other legumes are grown.

Texture and **organic matter** are specialty tests for specific applications. The texture determines the amount of sand, silt and clay in the soil. This test may be requested when installing a septic system. The organic matter may be requested for general information. Both tests often are requested for environmental or research purposes.

The information form, obtained from the county Extension office, requests information about soil conditions, acreage sampled, past cropping, fertilization and an estimate of the expected yield. All information is important in relating soil test results to suggested fertilization and liming. The expected yield is an indication of intended management, past production levels and local environmental factors that control yields. Uncontrolled production factors such as nematodes and disease should be considered in estimating a yield goal or expected yield. In areas where samples are collected from problem fields, the condition of plants should be described along with observations that would aid in relating soil test results to the problem.

Soil samples should not be stored for long periods of time prior to shipping to the laboratory. The levels of nitrate-nitrogen in the soil may change if the samples are stored wet. In addition, the nitrate-nitrogen data from properly dried samples may be of little value if environmental conditions and plant growth have altered levels in the soil. Air drying samples in the shade on clean brown paper is strongly recommended. Do not oven dry the samples because high drying temperatures can alter test results.

Instructions for mailing are provided with the sampling instructions. The fee for each sample should be noted and payment should accompany the samples. The information sheet and payment should be attached to the sample package. Between 5 and 7 days are required to obtain results for routine analyses from the laboratory. In-depth analyses of samples require additional testing and processing time. Therefore, it is important to conduct sampling early in the season. This will ensure that test results are available in time to make necessary fertilizer and lime applications.

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