

Soil Testing: BMP For The New Millennium

Soil testing is one of the most important management practices for crop production in the new millennium. It is certain to be listed among the best management practices (BMPs) recommended by industry and university agronomists, consultants, and farm managers for the benefit of their farmer clients. Dealers also continue to use soil testing as a planning and marketing tool and as a management support service for their customers. Likewise, the environment benefits from improved management of soil resources and fertilizer materials.

Periodic soil testing, combined with a good record-keeping system for each field (including information on prior soil tests, fertilizer and manure applications, and crop yields) serves as a gauge to indicate whether soil fertility is increasing, decreasing, or remaining constant. Fertilizer use and crop yield statistics indicate that soil fertility on many farms may be declining due to deficient nutrient management.

The consequences of “mining” soil nutrients may not become apparent for several years. If no nutrients are applied in a corn-soybean rotation with high or very high soil tests, the P1-phosphorous (P) soil test will typically drop 5 to 6 lb/A/yr, and the potassium (K) soil test will decline approximately 10 to 15 lb/A/yr. If this trend continues, substantial loss in crop yield potential will result, and it may take several years of higher fertilizer rates to restore optimum productivity. Allowing soil test levels to decline is destructive to future productivity and profitability.

Farmer Benefits

Farmers should use soil testing as a management tool for making scientifically sound management decisions about their soil fertility program. A fertility management program based on soil testing benefits the farmer in many ways:

- Improved yields and profitability from providing needed nutrients for the crop.

- Increased the uniformity of nutrient availability across a field, so that optimum response to other management inputs can be achieved.
- More uniform crop growth which makes the individual plants more competitive with weeds and simplified other management practices such as cultivation, spraying, etc.
- More uniform plant maturity within a field, simplifying crop harvesting and drying and improving market quality.
- Allocation of fertilizer dollars to the nutrients that will give the greatest increase in profit. Intensive sampling and variable-rate fertilizer application allow fine-tuning of fertilizer applications within a field.

Environmental Benefits

The environment benefits from increased use of soil testing because fertilizer applications based on soil tests and realistic crop yield goals help ensure proper rates are recommended and applied. More efficient use of plant nutrients by growing crops means less potential losses from leaching or surface runoff. Site-specific fertility management assures nutrient needs are properly identified and proper corrective fertilizer applications are made. Withholding needed fertilizer may be more damaging than applying the proper amount of fertilizer to produce a high-yielding, profitable crop. Poorly nourished crops leave less residue to hold soil in place. Providing optimum levels of all nutrients helps increase yields and may help to reduce the need for intensively farming some marginal land.

What Is Soil Testing?

Soil testing is a management practice that uses chemical analysis of representative samples of soil from a given field along with calibration data derived from research on similar soils to provide an estimate of the expected yield responses to applications of fertilizer materials.

The greatest potential for error in the process is in the collection of samples in the field. Since a one-pound sample of soil submitted to the laboratory for analysis will represent the soil from 1 to 40 acres (up to 80 million pounds of soil in the top 6 inches), collection of truly representative samples is a critical step. The laboratory will actually use less than a teaspoon full of soil from the sample. If a good sample is collected, the results of the test should provide a reliable estimate of the nutrient status of the soil. Increasing the number of samples from a field can help improve the reliability of the recommendations.

The soil test level indicated for a nutrient is an index of the relative amount of that nutrient in the soil and available for plants to utilize. The soil test number itself is meaningless without the appropriate set of calibration data with which to compare it. The result of the correlation and calibration data is reflected in the soil test ratings — low, medium, high, etc.

Soil Testing Is . . . Agronomically Sound

Soil testing is based upon years of scientific study of sampling procedures, crop yield responses to fertilizer application, and interactions of plant nutrients with other production factors. Scientists have proven that soil tests provide the information necessary to make intelligent decisions on the amounts and composition needed to achieve a selected yield goal for a specific soil-climate-management system. Soil testing helps identify the variability of nutrient content within a field and among different fields on a farm.

Soil Testing Is . . . Economically Efficient

To maximize return on every dollar spent on fertilizer, it is important that the right combination and rates of fertilizer materials be used for the crop to be grown. Soil test information along with a realistic yield goal are essential to making the decisions on fertilizer needs. Without soil tests it is impossible to determine which nutrients are in short supply and which ones are adequate for the crop. Total fertilizer costs are sometimes reduced through use of soil tests, but even more important, the dollars spent on fertilizer are invested in the nutrients most needed by the crop.

Soil Testing Is . . . Environmentally Responsible

The potential for environmental problems can be greatly reduced through a fertilizer management program based on soil testing. Fertilizer application according to soil test results assures the proper combination of nutrients for most efficient utilization by the crop. Potassium fertilizer, for example, can increase the efficiency of nitrogen (N) utilization. As K application is increased, the most profitable level of N application is also increased. Without knowing the K soil test level, it is impossible to determine the most efficient rate of N.

Balancing N, P, K, sulfur (S), and magnesium (Mg) is essential to efficient use of each of these nutrients, essential to attaining most profitable yields, and essential to protecting the environment. In an Illinois research project, the most profitable combination came when N, P, and K were balanced according to soil test information. This was also the combination that produced the highest yields and left the least N in the soil for potential loss to groundwater and surface water. Leaving out P or K caused reduced yields, reduced efficiency, and left a portion of the N fertilizer unused by the crop.

Frequent soil testing will help determine if current management is robbing future productivity and profits. Combined with local calibration data from university research, soil testing serves as the best guide available for determining nutrient needs for growing crops. Soil testing to provide a balanced fertility program is a vital component of sustainable farming programs that are profitable, efficient, and environmentally responsible.