HOEGEMEYER™

Agronomy Services

Interpreting a Soil Analysis Report

For some people, a soil analysis report can be somewhat confusing. There are all sorts of numbers and parameters on the report that are the numerical results of various tests performed on the soil. Some people find this information to be overwhelming because they don't know why certain parameters are tested. As you read through this publication, keep in mind that soil test results do not measure pounds available to the crop during the growing season, but rather the ability of the soil to supply nutrients to the crop.

The following are explanations of the parameters measured in most soil laboratories of the Great Plains.

pH

pH is an indication of the relative acidity or alkalinity of the soil. It is based on a logarithmic scale from 0 to 14, with 7 being neutral. Being a logarithmic scale each change of 1.0 unit is a 10x unit change. For example a soil pH of 6.0 is 10 times more acid that a pH of 7.0. A soil pH of 5.0 is 100 times (10x10) as acid as a pH of 7.0. Most row crops perform best, and a wider range of nutrients are adequately available, with a soil pH between 6.0 and 7.0. The buffer ph test is conducted to determine the amount of lime to apply in order to reach the desired soil pH. It does not represent the intended or target pH for that crop. This test is required due to the effect of the soil CEC (See below).

Organic Matter (OM)

Soil organic matter performs many beneficial functions in soil. It provides nutrients, holds water and improves soil porosity by preventing clay particles from sticking to each other. "Organic matter" to a soil scientist and as shown in soil-test reports does not actually include all organic material in the soil. It refers only to the stable, highly decomposed, tar-like organic material that gives soils a dark color. (However, soil does not have to be dark to have a significant amount of OM.) Organic Matter is usually given as a percentage of the total sample.

OM

CEC

CEC stands for Cation (pronounced "cat-ion") Exchange Capacity. Cations are elements with a positive charge such as K^{+}, Ca^{++}, Mg^{++}, Cu^{++}, Fe^{++}, Mn^{++}, Zn^{++}, Al^{+++}, Na^{+}, NH_4^{+}, H^{+}, and others. CEC is an indication of the soils ability to attract, hold, and supply cations to plants. Large CEC values indicate that a soil has a greater capacity and strength to hold cations. Therefore, it will be more resistant to a change in the soil test, or pH level. When the soil test level is good, it offers a large nutrient reserve. A high CEC soil also requires a higher soil cation level to provide adequate crop nutrition. Low CEC soils hold fewer nutrients, and will likely be subject to leaching of mobile nutrients such as nitrate nitrogen (NO^3-N), sulfur (S), boron (B) and molybdenum (Mo). These soils may benefit from split applications of several nutrients. The particular CEC of a soil is neither good nor bad, but knowing it is a valuable management tool.

Nitrate-N (NO^3-N)

Row crops show the greatest yield response to additions of Nitrogen sources. It is no surprise that this test is run on nearly all analysis of soils for row crop production. Nitrate-N (NO^3-N) is the predominant form of N

used by most plants. It is an anion that can be lost through normal environmental soil conditions. Many variables can affect plant availability, so use caution if using a recommendation based on the level of nitrate reported.

Phosphorous (P)

Phosphorus is essential to many plant functions and is a component of genetic material. The common P tests were developed to provide an index of P available to plants under a variety of soil conditions. This index is reported in pounds per acre or parts per million (ppm x 2 = lb./A), depending on the report. Due to its strength in soils with calcareous parent material, the Olsen P test is commonly used west of the Missouri River though the Mehlich-3 (colorimetric) P test would do equally as well.

Potassium (K)

Potassium is a cation usually found in adequate amounts in the Great Plains soils. The amount contained in the sample is reported in either pounds per acre or parts per million (ppm), depending on the report format. Additional information may be reported as the percent saturation. Percent saturation is best described as the percent of the CEC that is occupied by the element. The desirability of a particular percent saturation for each of these nutrients is sometimes affected by other soil conditions and the plant species to be grown.

Secondary

Secondary nutrients Calcium Ca, Magnesium Mg, and Sulfur (S), are not often lacking in soils that are formed from loess such as the soils of the Great Plains.

Secondary & Micronutrient Tests

Micronutrients are as important to plant growth as the levels of macronutrients in the soil. However, they are required only in very small quantities and are often supplied adequately by the soil. Of the micronutrient tests available, the results of Zinc, Manganese & Iron are the most valuable to soils of the Plains though instances of deficiency are rare.

Sodium (Na) & Soluble Salts

Because high levels of Sodium (Na) & soluble salts are generally damaging to plant growth, some labs run tests if this is a suspected problem. Sodium is reported both as parts per million (Na ppm) and percent saturation (Na Sat %). Soluble salts are reported as a measurement of electrical conductance of the soil solution called millimhos/centimeter (mmhos/cm). This value increases as the salt content of the soil increases.

Texture

Soil texture refers to the percent sand, silt, and clay contained in the soil. The proportions of these components determine the name assigned to the soil (sandy loam, silty clay, etc.) as shown in the USDA textural triangle. The name of the texture is reported in one column, with the percentages of sand, silt, and clay in the following 3 columns. This information has several applications, but is probably used most frequently to identify drainage characteristics of the soil.

HOEGEMEYER™

Agronomy Services

Recommendations

Laboratories vary on how or if they choose to provide recommendations for amending the soil. Discussions of recommendations are beyond the scope of this document, but remember to be cautious to not interpret the soil test results as absolute figures when they are only an index. As stated before, soil test results do not measure pounds available to the crop during the growing season, but rather the ability of the soil to supply nutrients to the crop.

CREDITS: **Modern Corn and Soybean Production, Hoeft, Nafziger, Johnson, & Aldrich**
A&L Analytical Laboratories, How to Interpret A Soil Test Report
Midwest Laboratories, Midwest Memos