

The First Steps in Creating a Crop Nutrition Plan: *Soil Sampling, Tissue Sampling, Analysis*

Everyone has a budget – where are crop nutrition dollars best spent? The first, most important tool for developing a plant nutrition program is a good soil test. Unless growers know the condition of their soil, any fertilizer program will be based on averages and generalities. It's vital to understand what the soil has, and what it doesn't have, in order to create a well-thought-out fertilizer program.

01 | **SOIL SAMPLING**

02 | **TISSUE SAMPLING**

03 | **ANALYSIS**



**CROP
NUTRITION
WEEK**

PRESENTED BY



01 | SOIL SAMPLING

The first step is collecting a sample. Let's look at some guidelines.

USE CLEAN EQUIPMENT

Make sure you don't have any sources of contamination that could influence the results of a soil test. For instance, use plastic containers dedicated to soil testing and not used for other purposes. The container has been proven to affect test results.

KNOW YOUR FIELDS

Soil sampling may be completed in a grid sampling pattern if nutrients are being applied using precision application and variable rate technology equipment. If variable rate applications are not intended, fields may be separated into similar areas or zones.

Knowledge of the field is critical, so that distinct areas of the field can be sampled separately. A composite soil sample should represent an area no larger than 20 acres, while larger areas can be split into multiple samples.

Sampling should be completed in a zigzag pattern throughout the zone, making sure to avoid the outside boundaries of each area. Make sure the zone is well-represented in the soil sample. Up to 20 acres are to be represented by less than 1 pint of soil in the sample bag, and the laboratory uses just a small portion of that to do their analysis.

ORDER THE PROPER TESTS

It's important that the laboratory conduct tests on cation-exchange capacity (CEC),

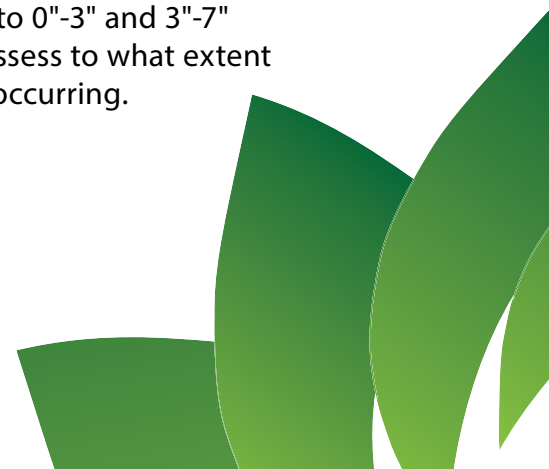
pH, organic matter, base saturations and all nutrient levels, including micronutrients. Most laboratories offer several test packages with various nutrient tests. Individual tests may be requested in addition to those included in a test package.

BE AWARE OF SEASONAL EFFECTS

Consistency is key when comparing multi-year soil tests. There can be considerable seasonal influence on soil test values, especially on potassium and pH. Soil pH values can vary as well, depending on rainfall or irrigation, nitrogen or sulfur inputs and soil buffering capacity. It may be wise to take soil samples during periods when these variations hit average values. These periods are generally in the early fall and again in late March-April. However, the ideal time frame for taking soil samples should be based on ease of field access so that differences in soil type, slope, drainage and cropping pattern can be most easily accounted for.

EFFECTS OF CULTURAL PRACTICES

Reduced tillage, ridge tillage and zero tillage can cause layered, stratification of organic matter, pH and soil nutrients. Split samples into 0"-3" and 3"-7" increments to assess to what extent stratification is occurring.



02 | TISSUE SAMPLING

After soil testing, the nutritional plant analysis is the most important tool to understand the actual nutrient status of a plant.

The best way to take advantage of a tissue analysis is to use it to decide the next steps of a nutritional program. It's also a great tool to help us identify hidden deficiencies in the crop. Sometimes, the plant analysis is also the best way to get an accurate diagnosis of what we are seeing in the plant, since it isn't always easy to identify the real cause of a problem. This is especially true when we need to be sure we are identifying a disease or a nutritional deficiency – or both.

REPORT CARD

Because plant physiology is dynamic, it is necessary to compare your plant analysis results with what we expect to see on a plant at the same time we sampled. Of course, how dynamic the physiology of the crop is, correlates with the type of crop, so what the plant analysis can tell us differs from one crop to another. A plant analysis is almost like a midyear report card. How does your crop nutrition plan look, graded against the best in the class?

LONG SEASON

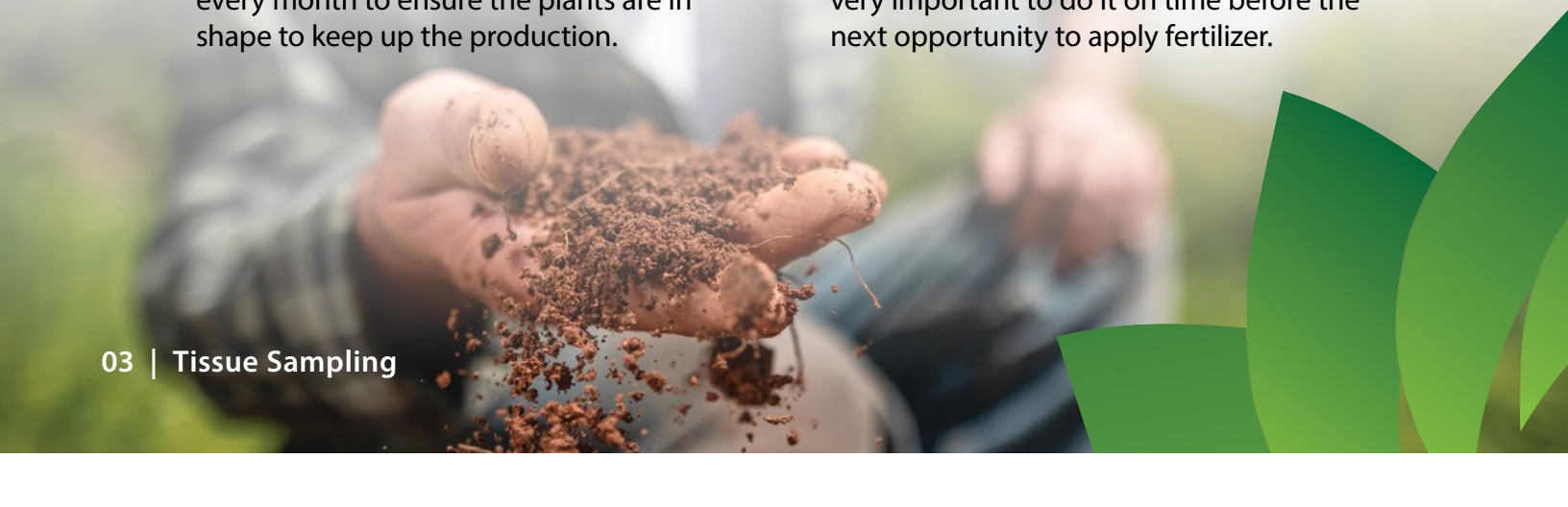
For intensive crops with a long season, such as greenhouse tomatoes or peppers, or open field chilies, eggplants or papayas, some growers prefer to do a plant analysis every month to ensure the plants are in shape to keep up the production.

TREE CROPS

In tree crops, we can take one to three plant analyses per year. A tissue analysis made before starting the season, in conjunction with a soil test, is the best way to determine the fertilizer program for the oncoming season. Sometimes a plant analysis before blossom can help us decide if we should do foliar application to assure the best yield, and a final analysis will tell us how well-prepared the tree is for the dormant period and sprout time.

ROW CROPS

Row crops may only need one tissue analysis before the reproduction stage in order to determine if the fertilizer program is in need of a correction. In this case, it is very important to do it on time before the next opportunity to apply fertilizer.



If you are interested in making a full review of your crop's nutrient trends throughout the season, you may want to pull a tissue sample weekly. If you intend to establish this type of sampling, pull tissue samples from the same places in the field, at the same time each week. Regardless of crop type or analysis schedule, it is very important to plan out how many tests will be completed during the season – with both plant and soil analysis.

For the results of the tissue analysis to be useful, it is necessary to use a sampling standard methodology.

SAMPLING PROCEDURE

- 1. Selection of the tissue to sample***
- 2. Sampling***
- 3. Preparation of samples for shipment to the laboratory***

An important note: When there is an abnormal area in the field, it is necessary to take plant tissue samples and have an analysis from this area separate from the remainder of the field. It is also highly recommended to do a soil test of the same abnormal spot in order to have as much information as possible. Having analysis of the normal and abnormal areas will help determine the origin of what is happening and help concentrate efforts to solve the problem.

The time and overall investment involved in acquiring this important mid-season snapshot of your crop is small compared to the potential opportunity gained. Tweaking applications, finding unseen deficiencies or pinpointing nutrient uptake trends can help dial-in your crop nutrient management strategy for a better return on your fertilizer dollar.



03 | ANALYSIS

Obtaining a good quality soil sample is the critical first step in building a crop nutrition plan. But then what? The information on that soil test is essential to understanding the condition of the soil and how to determine nutrient recommendations. Step two is the analysis of your information.

SOIL TEST

The first section of the soil test to review is the pH, Cation Exchange Capacity (CEC) and percent base saturation section. We get a general indication of the soil texture by the CEC. For instance, a soil with a CEC below 8 is considered sandy, whereas a soil with a CEC between 8 and 14 is a medium-textured, or loamy, soil. When a soil has a CEC higher than 14, there is a fairly high clay content.

A report will include organic matter, pH, Cation Exchange Capacity, base saturation and nutrient levels, including micronutrients.

Soil pH has a direct effect on nutrient availability. Base saturation is the ratio, or

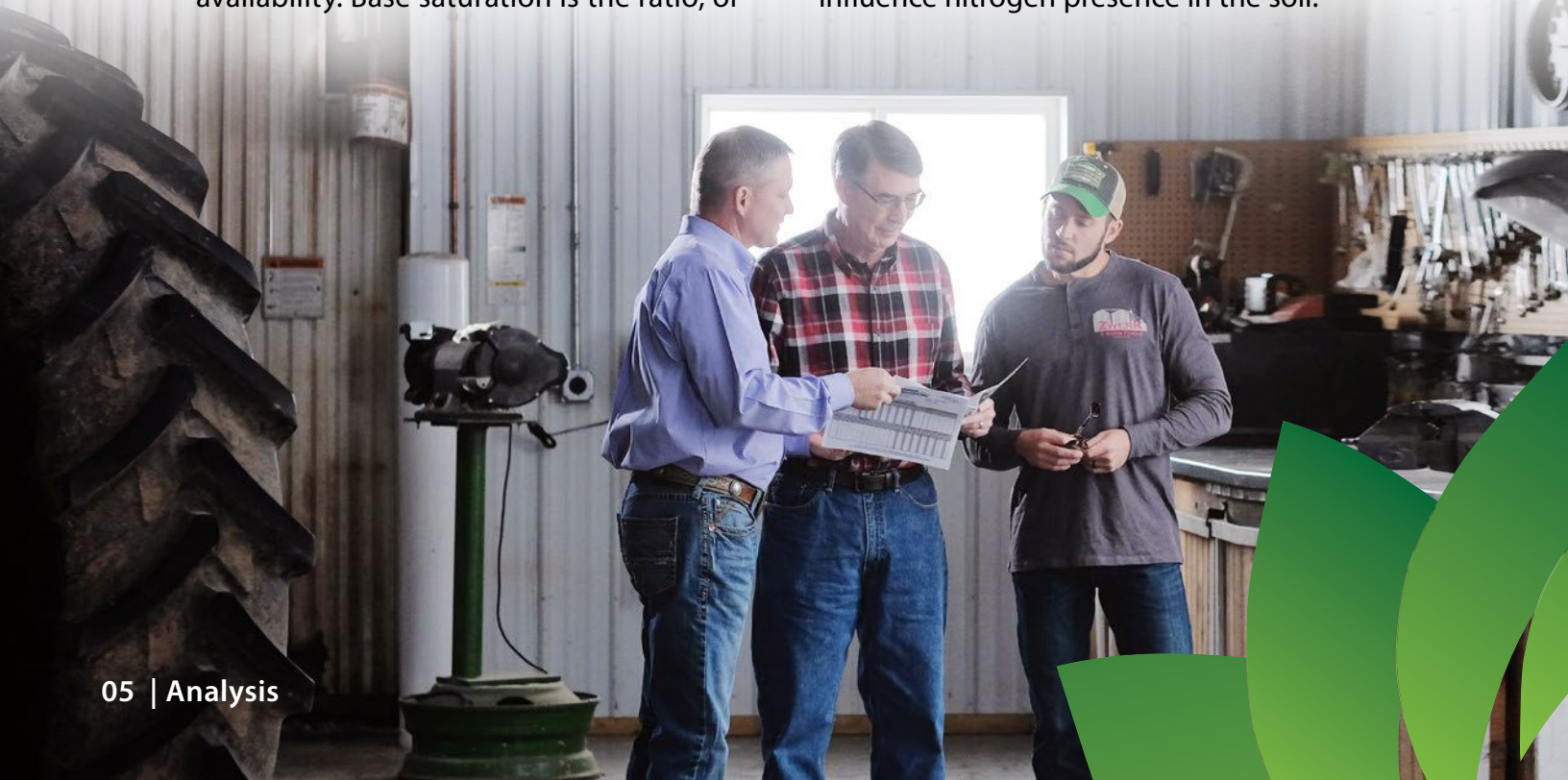
proportion, of the amounts of potassium, magnesium, calcium, hydrogen and sodium in the soil.

Simple calculations to help determine the amount of calcium, magnesium or dry potash amendments needed to make base saturation adjustments are available.

Let's explore the nutrition crops need during the growing season:

NITROGEN

Although the recommendation equations are a very good starting point, environmental factors such as rainfall, temperatures and water saturation will influence nitrogen presence in the soil.



PHOSPHORUS

Phosphorous plays a major role in crop production – from the earliest stages of growth through fruit production and maturity. Phosphorus recommendations depend on yield goal and the readily available phosphorus in the soil.

The actual amount of P_2O_5 needed to grow the crop will vary by crop and yield goal, but if the phosphate level is less than 30 ppm, most crops will respond to supplemental P_2O_5 application. Crops that are often planted in cool, moist soils, such as corn, will benefit from a small amount of P_2O_5 applied at planting, even in high phosphorus soils.

POTASSIUM

Row crops may only need one tissue analysis before the reproduction stage in order to determine if the fertilizer program is in need of a correction. In this case, it is very important to do it on time before the next opportunity to apply fertilizer.

SULFUR

Sulfur recommendations are based on several factors, including CEC, organic matter and pH. A rule of thumb to use for determining sulfur need is that most

crops require 1 lb of sulfur for every 10 lbs of nitrogen the plant needs. Most crops will respond to sulfur applications when soil sulfur level is below 25 ppm.

MICRONUTRIENTS

Micronutrients are needed in much smaller amounts than other nutrients, but again, they are every bit as important as the other nutrients for proper crop growth and production. Crops such as corn, soybeans, apples, cotton and tomatoes respond very well to additions of zinc, boron and manganese when the soil test calls for it. Crops such as wheat respond most to iron and manganese. Small amounts in the soil are extremely important; however, excessive amounts can be phytotoxic.

THE BEST PLAN

Soil sampling, tissue sampling and analyzing the results are the key to developing a solid, data-based crop nutrition plan. The more information you have about what's happening with your crops, the better you can give them what they need. If you ever need assistance sampling or analyzing, please contact your AgroLiquid retail partner or AgroLiquid representative.

For more information on building a crop nutrition program to elevate every acre, visit

CropNutritionWeek.com

