

# Soil Testing for Fertility Management

## *Lessons from a Master Soil Consultant*

by Neal Kinsey

In a survey conducted some years ago, when farmers were asked whether they believed soil testing was something that should be used for raising better crops and improving soil fertility levels, 82 percent answered yes. When these same farmers were asked if they actually used soil tests, only 28 percent said yes.

Anecdotal evidence suggests the percentage has improved in agriculture today. To remain profitable under present conditions, every farmer and grower should realize that fertility levels must be measured. These measurements can then be used to manage soil fertility, allowing growers to more precisely achieve top production and quality, while still keeping costs at the minimum necessary to meet the goal.

The following information is especially meant for those who already believe that using soil tests is important. It is particularly intended for those who count on such tests to guide them in terms of providing better soil and plant nutrition, and is an attempt to provide additional “food for thought” to those who really work at managing fertility, using soil tests to measure what they have from farm to farm, field to field, and perhaps even area to area within a field.

There are hundreds of soil-testing laboratories, and many different methods are used to determine the levels of nutrients in the soil. Which lab or which methods are best will not be debated here. If you have tests that work well for you, use those tests. If you are not sure, then test your soil tester!

For those who use soil analysis to manage soil fertility, there are several questions that ought to be addressed:

- How often should you test to maximize benefits?
- How many samples are needed to properly represent a field or farm?
- How deep should a soil sample be taken?



It is surprising to see how many different answers are given to each of these questions, and not all of those answers are correct. Each question will be discussed below.

### **HOW OFTEN SHOULD YOU SOIL TEST?**

Rather than one general answer to this question, there are really several possibilities, and each will depend on factors that have to do with land use, the crops to be grown, and the needs of the operation.

A soil sample every 3 or 4 years may be sufficient to provide a general indication of fertility (the stated purpose for most soil tests that only check for pH, phosphate and potassium), without providing the very detailed analysis required for specific management decisions.

But what if initial recommendations have not been accomplished sufficiently? If, for example, the test accurately shows a need for lime, and it has not yet been applied, spend the time and money on liming, not on taking more soil samples.

On the other hand, the amount of principal materials required might be more

than has been budgeted for fertilizer, necessitating three or four years to accomplish the most-needed applications before it becomes feasible to proceed. Then, too, some people may not believe it is possible to determine the full effects of lime or other materials without waiting several years after application to be sure it will show up. It does require up to three years to measure the full effects of an agricultural limestone application, but if the calcium and magnesium content and the fineness of grind are both correctly determined, the application can be pro-rated beneficially over all three years, as long as accurate spreading records are kept (recording the source of the lime, the year, the month or season, and the tonnage applied.)

### **WHAT ARE THE ECONOMIC BENEFITS?**

If you are taking soil samples and have the capabilities to follow through with addressing deficiencies, don't just take samples every three or four years. Instead, stop and analyze the situation. How valuable is the crop? Those who are growing seed crops, or crops of higher value, should test before *every* crop. One client who owned a seed farm provides a good

example: He would regularly sample twice within a 12-month period, once before raising a seed-corn crop, and again before a seed-wheat crop. We also have commercial vegetable and berry growers who sample to fertilize for their principal crop, and again prior to whatever will be used in the rotation, even if it will be cover crops.

Some of our largest clients grow tree fruits and nuts, and they correctly take soil samples every year. Even cotton, corn, soybean and wheat producers who are achieving high yields should do the same thing, and many who are clients of ours do just that. One alfalfa grower put it this way, "If I soil test properly, it costs me less than one or two small square bales of hay per acre. But if I don't test, it can cost far more than that — through buying fertilizer I really don't need, or through loss of yield for failing to apply something the soil did need."

Thus, as long as it is possible to purchase and apply what is required for the crops to be grown, soils should be tested before every major crop. And for plants and crops that are grown over a period of years, soil tests should be taken prior to any major fertilization program that involves materials used to build up the soil fertility levels.

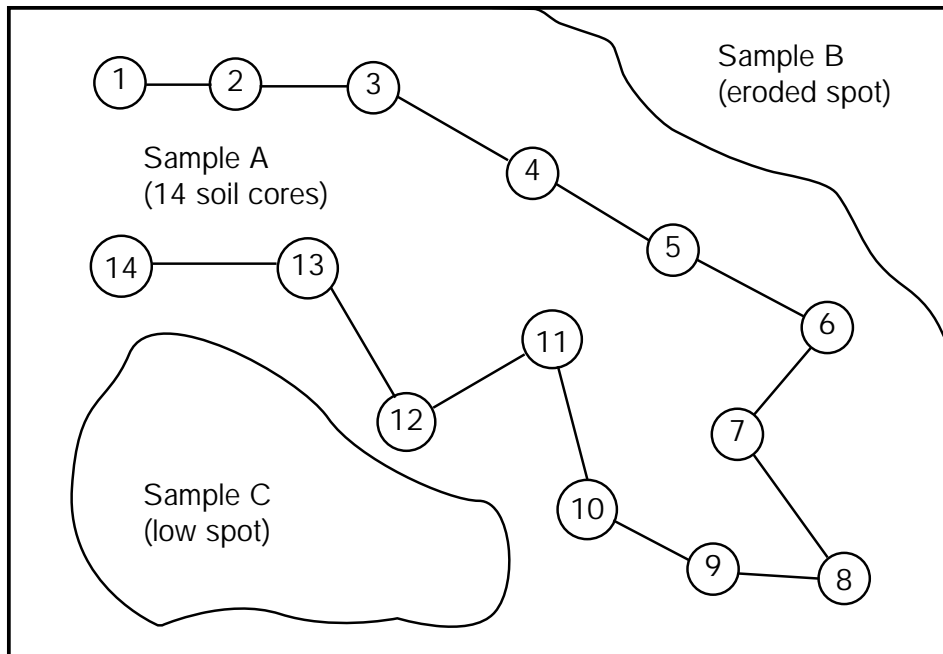
Know the soil fertility of your land. Always manage your soil testing work to correctly measure what you are doing, including progress or regression, in terms of soil fertility. One of the greatest mistakes in agriculture today is failure to sufficiently use soil tests to properly measure and correctly mete out the fertilizers and soil amendments needed for the land.

### HOW MANY SAMPLES ARE ENOUGH?

The next thing to consider is the question of just how many soil samples should be taken from an area, field or farm. Above all, do not let the number of different fields you have determine the number of samples you will take. That is, do not assume you are doing the job correctly if you take one composite sample per field. Sometimes that may be the case, but too often, it is not.

### WHERE TO PULL SAMPLES

To begin with, consider pulling a few samples from good, productive land, some from average land, and some from



poor-production areas. After you see what is involved, depending on the fertilizer budget and timing, additional samples could be taken where the need is evident.

At the beginning, decide what should be the smallest area worth taking the time to fertilize separately. Then pull samples on fields selected for testing, taking samples from any areas of the same size or larger where visible differences are detectable.

When farmers or growers are only willing to treat whole fields, yet there are observable differences in that field (e.g., in soil types, yield differences, weed populations, large problem areas, etc.), that operation is losing top potential for the field in question. This is another big mistake continuously made by farmers, growers and fertilizer-dealer field men. Be sure to pull sufficient soil samples for optimizing soil improvement and yield.

### YIELD MONITORING

One of the most revealing new developments in high-tech agriculture for some growers has been computerized yield monitoring on harvesting equipment.

Suddenly, producers can see the vast differences between the best and the worst soils in the same field. Using a detailed soil analysis, this method can then show why differences are so great — with fertility as the key. Whether in good- or poor-yielding areas, fertility is almost

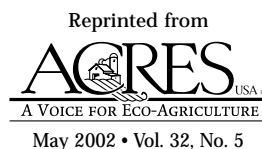
always a major key, even when other factors are also involved.

Use of the information provided by yield monitors has helped farmers and growers see the importance of doing a more complete job when it comes to taking soil tests and supplying the fertilizer needed for each area.

The longer each person works with the Albrecht Model of soil testing, the more they will realize the cost of losses to those who skimp on properly testing the land. This means those producers are also skimping to some degree in evaluating actual fertilizer needs, and yields will suffer as a result. Again, proper measurement is required to adequately manage for top yields and top quality.

### HOW DEEP TO SAMPLE?

The proper depth needed for an accurate soil sample will depend on several factors. If the soil will not be worked more than 2 inches deep, sample only the top 4 inches. This would be true for pastures, hay meadows, no-till crops, orchards, vineyards, lawns, golf courses, etc. Of course, many will disagree when it comes to hay meadows, even more so for orchards or vineyards. But the determining factor here should be the depth that materials can be expected to saturate between soil samplings. This is one big reason why we advocate sampling every year. Four inches is best in all these cases, even if sampling is not done every year.



This depth avoids the chance of applying excessive amounts of materials in any given area where the plant will be taking up nutrients, thus ensuring that exceeding the “law of the maximum” (which means robbing plants of certain nutrients due to the inhibiting effect of excessive levels of others), will not happen.

For soils that will be worked or tilled, the proper sampling depth is around 6½ to 7 inches. We use 6¾ inches as an average, since an acre of soil to that depth weighs approximately 2 million pounds.

Soil will usually tend to drop in terms of fertility the deeper you go. So, samples taken too deep make it appear you need more fertilization than is truly the case. In cases that matter, however, consider taking subsoil samples in at least some of the most important areas, to accurately measure the general levels of nutrients deeper down in the soil.

#### WHEN TO SAMPLE DEEPER

There are times when samples need to reflect what is below a 4 or 6½ inch depth. For example, iron may be deficient in the top few inches, but present in sufficient amounts below that level. In such cases, take the top 4 inches as one sample and then a subsoil sample to the depth desired below that level. For example, some areas that will be planted to trees or wine grapes will be sampled as the top 6¾ inches, then 6¾ to 12 inches, 12 to 18 inches, 18 to 24 inches, 24 to 30 inches, and 30 to 36 inches.

This is especially important when soils will be worked unusually deep, or roots

are expected to draw nutrients from depths below the topsoil layer. In addition, be sure to sample down to the depth of complete nutrient incorporation capabilities. This should be figured at half the depth to which the soil will be worked. For example, if an offset disk will be going 36 inches deep, figure the top 18 inches will need to be sampled and properly corrected for an adequate “balance” to the depth to be maintained, and for maximization of biological activity.

Again, keep in mind that soils tend to be lower in overall fertility the deeper you go. But there are also soils that have higher nutrient levels below the portion normally tested. The only way to be certain is to take subsoil samples, at least in key areas, to determine the actual levels.

#### CONCLUSION

It is recommended that under normal circumstances farmers and growers sample their soils every year. Pull a separate sample from each area of a farm or field that shows differences of any type, so long as the area is large enough to fertilize separately. Sample to a proper depth, depending on whether the soil will be worked, and if so, to what depth. ♦



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