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## DEALING WITH SEASONAL VARIABILITY IN SOIL TEST RESULTS

**Seasonal variation in soil test results is real...and has been recognized by soil scientists for more than four decades.** Sizeable fluctuations in soil test levels can occur seasonally (monthly) and are associated with changes in soil temperature and moisture, soil microbial activity, crop residue decomposition, clay mineralogy, and nutrient cycling. Shallow soil samples (0 to 2, or 0 to 4 in.) may be more susceptible to seasonal fluctuations in test results than samples collected from deeper depths.

### How much variation can be expected across seasons, within a year?

- **Soil pH**—can vary as much as 0.5 to 1 pH units on poorly buffered soils, especially on the coarser textured soils. Soil pH is usually lower in dry periods and higher in wet conditions.
- **Extractable soil phosphorus**—may be more stable than soil pH and extractable potassium in the majority of soils. Under prolonged flooding, phosphorus associated with iron complexes can be released. When soils dry, phosphorus can be bound tightly in iron and aluminum complexes, which lowers availability to plants. Seasonal variation can be as much as 10 to 20 pounds per acre or 5 to 10 parts per million (ppm).
- **Extractable soil potassium**—can be affected by soil freezing and thawing, and wide variations in soil moisture. Under very dry conditions, and upon freezing, certain clay minerals can release potassium from their mineral structure. Upon re-wetting, the potassium may be bound in the clay structure. In some high clay soils, the seasonal variation can be as much as 20 to 50 pounds per acre, or 10 to 25 ppm. Older, more highly weathered soils, most often found in the southern states, may be less likely to show strong seasonal variations in extractable potassium levels. Yet, seasonal variation in extractable potassium in sandy soils can be large.
- **Extractable soil sulfate and nitrate**—are affected by microbial activity. Release of ammonium and nitrate-nitrogen and sulfate-sulfur from organic matter slows in dry soils. Existing nitrate levels can decline when soils are saturated for extended periods, especially during warm weather. Unlike nitrate, sulfate-sulfur is not prone to atmospheric losses during saturated conditions. Soil nitrate and sulfate levels can vary more than two-fold seasonally.

**There is no practical or reliable way to adjust results or recommendations based on the environmental conditions. The adage is “sampler beware.” What should farmers and crop advisers do to obtain consistent and accurate soil test results and recommendations?**

- **Collect samples at the same time, depth, and environmental conditions each year.** Many universities have based their interpretations and recommendations on fall or early winter sampling. Ask your lab for sampling guidance, if you have questions.
- **Sample at least every other year,** to chart values and observe upward and downward trends in fertility. Remember, it takes at least three points to make a line. Sampling every 3 years provides only three points in a 10-year period. If one of the three data points (one year) in 10 years happens to represent environmental abnormality (too dry, too wet...or an abrupt moist period following an extended dry period), then it is nearly impossible to chart trends in soil test levels with confidence.
- **Tracking trends in soil test results over time** is just as important as the soil test value in a given year.

**Determine a representative sampling time and be consistent from year to year,** but be ready to adjust your sampling schedule to avoid aberrations from the “normal” environmental conditions. If you have not used this strategy in the past, start this year. Improve nutrient management decisions and nutrient use efficiency in your fields by starting with a quality soil sampling program...based on knowledge of seasonal variation.

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