Bluestem Breezes
Karaline Mayer
February 11, 2013

Soil Test Cool-Season Pastures This Spring

What a beautiful weekend we just experienced! I am so thankful for the moderate temperatures allowing many producers to prepare for the incoming winter weather.

As we make plans for upcoming events, let's look out in to the future a few more weeks and consider the advantages to soil testing cool-season pastures and hay fields. KSU Soil Fertility Specialist Dave Mengel recently wrote an article I believe you'll find helpful as you prepare for this spring:

For most producers, fertilizing cool-season grasses such as smooth bromegrass means applying nitrogen in the spring. But there can be more to it than that.

There is a large body of research in Kansas to suggest that phosphorus (P), potassium (K), and sulfur (S) may also give responses at low soil test levels. The key to determining if these nutrients may be needed is a good soil test. Unfortunately, in sampling cool-season pastures and hayfields, the sampling process has gotten a little more complicated in recent years.

Sampling soils of cool-season pastures

Where we used to think of using a single soil sample from the surface 6 inches to make all our fertilizer and lime decisions, we now may need as many as three samples.

First sample. For P and K, a good soil test will still be a 0-6 inch sample, consisting of 10-15 individual cores collected across the field. If soils vary widely, sampling by soil type will improve the quality of the soil testing. Spring is a good time to take those samples, before the grass really takes off and begins to grow.

Second sample. While P and K recommendations are based on a 6-inch sample, a second sample taken from the surface 0-3 inches for pH only will give the best information for making lime recommendations. Brome is relatively tolerant of acid soils, and can make good yields at pH as low as 5.5.

The reason soils become acid is primarily the result of N fertilizer application. Ammonium nitrate or urea will both require about 360 pounds of ECC, or roughly 700 pounds of agricultural lime, to neutralize the acidity produced from every 100 pounds of N applied. Since both of these products are normally broadcast on the soil surface, the acidity will be produced in the surface 2-3 inches of soil, lowering the pH of that surface soil.

We then add lime, which is relatively insoluble in water, to the soil surface to neutralize the acidity. We end up needing to lime more frequently, but at lower rates, just as with no-till fields. By focusing on that surface 3 inches of soil, we can do a better job of determining the pH in the region of the soil where many of roots are and where we add fertilizer and lime. This results in a more accurate lime recommendation.

Third sample. The third sample we may need is a deeper profile sample for S. Research over the past 30 years has shown that bromegrass has responded to S fertilizer more than any other crops we grow. That situation is changing, as the Clean Air Act has reduced the amount of S deposited on soils dramatically. Today we are also likely to see responses to S on many soils with no-till wheat and corn, too.

We need to consider deeper soil samples for S because it is a mobile nutrient. It is not retained tightly in soils like P or K, but rather tends to move into the subsoil and accumulates on the high-clay subsoil found in many Kansas soils. So just testing the surface soil will many times indicate S is deficient, when actually there may be plenty of S in the subsoil to meet crop needs.

P, K, and S application timing

Ideally, late summer or fall is the preferred time to apply P, K and S. Fall applications of P and K are important to stimulate root growth and the production of new buds for next year's shoots. Fall applications of P when soil test levels are low have consistently shown better responses than spring applications.

Adding S in the fall may also be beneficial. The reason is that most of the S fertilizer available is in elemental S form. Plants can only take up and utilize S in the form of sulfate. Elemental S must be oxidized to sulfate by bacteria in the soil, and that may take several months. By applying the S in late summer or fall, the bacteria will have time to "do their thing" before the plant needs large quantities of S the following spring.

Cool-season grass response to P, K, and S fertilization

Research conducted in eastern Kansas has shown that at low P and S soil test levels, hay yields can be increased 400 to 700 pounds per acre with modest applications. Generally, the most efficient P fertilization will be obtained from the first 30 pounds applied. Only at very low soil test levels do we see responses to higher rates. Sulfur applications are also generally made at modest application rates.

Can you build P and K levels in soils in a bromegrass field? Yes, but it will be very expensive and not very efficient. P and K are both taken up in large quantities in the vegetation of bromegrass. They can be taken up in amounts which exceed the amounts required for optimum growth. This isn't very significant in grain crops, where the vegetation is returned to the soil and those nutrients are "recycled." However in forage crops, we harvest the vegetation and remove those excess quantities of nutrients. Thus, trying to build soil test or maintain high soil test levels in forage crops is difficult and not economical.

Summary

Think about soil testing your cool-season grasses this spring for pH, P, K, and S in preparation for fall fertilization. It's a little more difficult than it used to be, but it could pay some big benefits.

For further information, visit the Extension Office (215 Kansas, Courthouse, Alma; kamayer@ksu.edu; 765-3821). For Bluestem Breezes archives, check out wabaunsee.ksu.edu.