



September 2012

## Crop Nutrition Following the 2012 Drought: Southeast

*The drought during the spring and summer of 2012 was one of the most damaging and widespread that growers across the US had experienced in decades. A drought of this magnitude can definitely affect nutrient uptake, retention, and behavior in soils and the way nutrients may need to be managed for post-drought crops. Unfortunately for farmers in the Southeast US, dealing with a drought is business as usual. When asked about management changes in response to this year's drought, the typical response among southern growers has been along the lines of "nothing different; this happens every year". While "this happens every year" is an obvious exaggeration, an analysis of historical US Drought Monitor data revealed that dealing with at least moderate drought is, in fact, common in the Southeast region.*

### Drought Frequency and Severity in the Southeast

Looking at the past ten years during the period between March and September, only twice did the IPNI Southeast region average below abnormally dry on the Drought Monitor. In three years the region was abnormally dry and five times over the past ten, the data show that the majority of the region was under moderate to severe drought conditions for most of the spring/summer growing season. All states in the region have experienced extreme to exceptional drought conditions at least three out of the past ten years, while AL, FL, GA, and SC endured the worst categorized drought at least five times since 2006. This fact is not surprising as these states make up the Southern Coastal Plain, which is characterized by coarse-textured, low cation exchange capacity (CEC) soils that can get dry in a hurry. Conversely, the states least prone to drought stress are the northern-most states in the region, KY, MO, and TN, where the soils have a much greater water holding capacity.

Another contributor to the frequent drought stress in the Southeast is inconsistent rainfall. In many years, total volume of precipitation will be normal, but the erratic distribution leads to drought conditions. While extreme to exceptional drought happens most often in July and August, severe drought conditions occur just as frequently in the spring as in mid-summer.

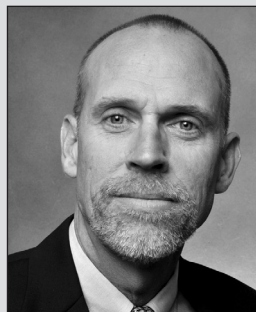
So while living with drought is a reality in most years for growers in the Southeast, 2012 was significant in terms of reduced yields in rain-fed crops, crop failure or abandonment, and harvesting crops for other than the intended purpose (hay rather than grain). These factors result in nutrient management implications that need to be considered going into 2013.

### Nutrient Removal

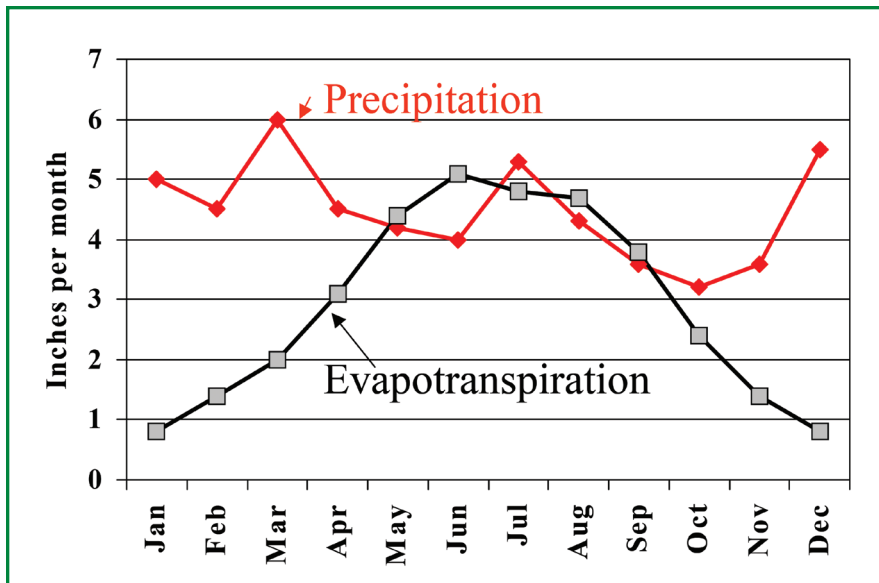
With the exception of some hay and pasture, most crops in the region received nutrient forms application rates appropriate for typical yield levels. The reduced yields, especially in dryland corn, will certainly leave residual nutrients in the field. Excess levels of mobile nutrient forms like nitrate ( $\text{NO}_3^-$ ) and sulfate ( $\text{SO}_4^{2-}$ ) are susceptible to leaching; but even in the sandy Coastal Plain soils,  $\text{NO}_3^-$  will not move through the soil profile without water. Many states in the Great Plains and Midwest will use inorganic soil N tests to measure the residual N contribution for 2013 crops; however, in the Southeast, this practice is of little value. Normal winter precipitation in the region is more than adequate to leach any remaining  $\text{NO}_3^-$  out of the soil profile and no contribution to next year's crops should be counted on, even following the extreme drought conditions of 2012. **Figures 1 and 2** illustrate the average rainfall and  $\text{NO}_3^-$  leaching potential for a Southern Coastal Plain soil. **Figure 2** demonstrates that under normal winter precipitation,  $\text{NO}_3^-$  can migrate two to three feet during the time between fall harvest and spring planting of a cotton crop in Central Alabama.



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**Figure 1.** Average monthly precipitation and evapotranspiration (plant use and evaporation) for Central Alabama. (Ward et al., 1959 as presented in Mitchell, 2001).

Depending on the timing and volume of fall moisture, some growers may consider planting a cover crop to sequester some of the unused N. Most cover crops in the South are used as a moisture and soil conservation practice and little data exist on using them as catch-crops. More details on this practice are covered in other papers in this *INSIGHTS* collection.

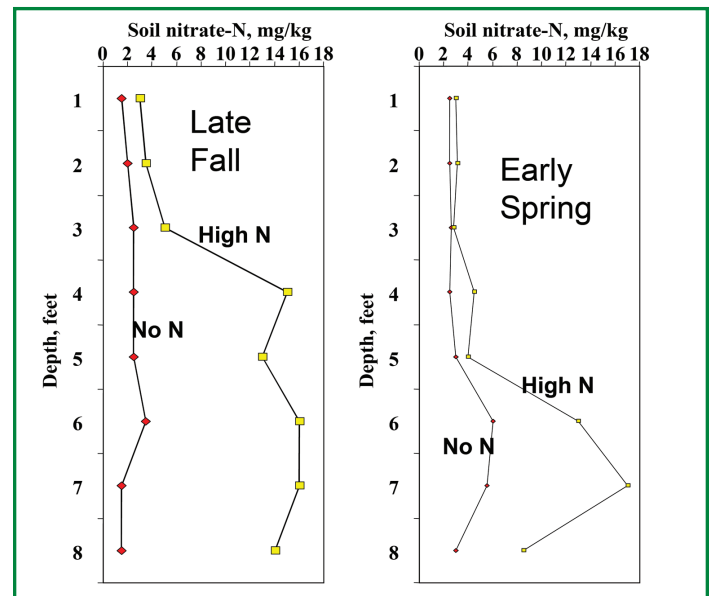
Residual amounts of immobile nutrients like phosphorus (P) and potassium (K) will also be higher following reduced yields or crop failure and should result in lower fertilizer need in the following year. In the sandier soils in the region found throughout south GA and FL, excess K can leach with winter rains and become unavailable to the next spring's crop. The best way to determine the nutrient levels available for the crop following a drought is a soil test.

Another situation that can affect nutrient removal in a drought year is when the crop is harvested for hay rather than grain. Baling drought-stressed corn is a common practice in the more severely affected areas of the region. This practice salvages some value from the drought-stricken crop, but results in a higher nutrient removal than if the crop were only harvested for grain and the stover remained in the field. The quantity of nutrient removed in the hay is difficult to estimate because the crop is usually harvested at a different stage than if it were initially intended to be a forage crop. Also, the nutrient content of the plants will vary according to how badly the crop was stressed. In addition to baling the failed crops, many growers in the region are planning on baling the straw from irrigated rice, corn, soybean, and peanut crops to offset the hay shortages. This practice will also result in greater nutrient removal that will need to be accounted for. Just like in the failed crop situation, the number one tool to ensure the nutrient needs for the following crop will be met under these circumstances is a soil test.

## Soil Testing

When collecting soil samples following an extreme drought, it is advisable to wait until a few weeks after a rain. If this is not possible and the ground is not too hard to sample, there are some issues that growers and advisers need to be aware of. First, the seasonal variability in soil test K is well known and substantial and can be even more pronounced under drought conditions. The amount of variation depends on the amount and type of clay present, the severity of the drought when the sample is collected, and the available K levels under normal soil moisture conditions. All of this potential variation in measuring soil test K makes collecting the samples from a consistent depth even more important. In a drought year, K and other nutrients will be concentrated near the surface. When sampling in a field with hard, dry soil, it is easy to pull the sample from too shallow of a depth. A soil sample collected from the wrong depth can result in an incorrect fertilizer recommendation.

Soil pH can also be misleading under drought conditions. The lack of water movement and restricted nutrient uptake results in a concentration of soluble salts in the soil surface that lowers soil water pH. This is a temporary decrease and pH will come up 0.2 to 0.6 units once soil moisture returns to normal. This is why it is good to wait until after it rains to begin collecting soil samples for the next crop. Some soil test laboratories measure soil pH in a salt solution (called salt pH rather than water pH), which minimizes or eliminates the soluble salt effect. Therefore, it is important to check soil test reports or with the laboratory to determine which method was used to measure pH. In most public and private soil testing laboratories in the South, a buffer pH (BpH) is measured and used to estimate liming requirement. The buffer is a salt solution and is not affected by the increased soluble salts



**Figure 2.** Soil nitrate movement in a Benndale sandy loam in Central Alabama. (Jackson, 1998 as presented in Mitchell, 2001).

in the sample, so even though a water-pH will provide an erroneous low reading, unnecessary lime will not be recommended. Another consideration regarding pH and liming is that during extended drought periods like happened in 2012, lime applied in the spring may not have had sufficient moisture to react with the soil. In these cases, recommended lime may not be necessary.

Since drought conditions can lead to somewhat unpredictable changes in soil test results, growers should compare their soil test results (from this coming fall) against the results from previous years. That said, growers should be aware that rapid changes in soil nutrient availability indices may occur on low CEC soils subjected to greater than normal amounts of nutrient removal (e.g., grain and stubble removal), but on soils with moderate to high CEC, soil test nutrient values may not change appreciably from one year to the next, especially when annual fluctuations from temporal and spatial variability are considered. Knowledge of each field's history of nutrient deficiency problems (if any), applied fertilizer sources and rates, and soil test history are all important considerations in making nutrient management decisions for 2013.

## Summary

4R Nutrient Stewardship is applying the right nutrient source at the right rate, at the right time, and in the right place. Considering the economic toll taken this year, all of the uncertainty surrounding nutrient removal in drought-stricken crops, and the variability in soil test results collected under drought conditions, determining what is "right" in 2013 will be more challenging than ever. Even in the Southeast where "this happens every year". ■

## References

- Jackson, S.E. 1998. Nitrogen movement under long-term fertilization and cropping in two Alabama soils. M.S. Thesis. 84 pp. Auburn University, AL.
- Mitchell, C. 2001. Late fall and winter application of nutrients to cool-season forages in Alabama. Ala. Coop. Ext. Serv. No. S-01-01. Auburn, AL.
- Ward, H.S., C.H.M. van Bavel, J.T. Cope, Jr., L.M. Ware, and H. Bouwer. 1959. Agricultural drought in Alabama. Ala. Agric. Exp. Stn. Bul. 316. Auburn, AL.

## Nutrient Deficiency Photo Application for iPhone/iPad Released

**I**PNI has released a new Crop Nutrient Deficiency Photo Library app for your iPhone or iPad (see <http://info.ipni.net/ndapp>). The app contains key photos of classic nutrient deficiency documented from research plots and farm fields for 14 common crops. It also provides supporting text

and illustrations of nutrient deficiencies. This mobile app will be a great tool for crop advisers, consultants, farmers, and anyone wanting help in identifying nutrient deficiency symptoms in common crops. **DC**



