IPNI Plant Nutrition TODAY
Better Crops, Better Environment...through Science

From Scientific Staff of the
International Plant Nutrition Institute (IPNI)
3500 Parkway Lane, Suite 550
Norcross, Georgia 30092-2844 USA
Phone: 770-447-0335 Fax: 770-448-0439
E-mail: info@ipni.net Website: www.ipni.net

Spring 2013, No. 1

DECISION SUPPORT FOR ADAPTING CORN NITROGEN MANAGEMENT TO WEATHER

Nitrogen depends a lot on the weather. Crops demand more of it from the soil when weather favors rapid growth. Soils mineralize more of it from organic matter when they are warm and moist. And more of it gets lost when excess water either leaches it from the soil or denitrifies it in zones depleted of oxygen. So it's no surprise that N can be managed better when weather is accounted for.

Different soils respond differently to weather. A corn production study in Ontario, Canada showed that different parts of the landscape made different amounts of N available over a number of years. Among these years there were varying amounts of rain between planting and the V6 growth stage. Areas with low soil organic matter made only small amounts of N available, and the amounts declined as amounts of rain increased. In areas with high organic matter, however, amounts increased with rain to a point, but then declined sharply in the wettest years—by as much as 180 lb/A—to even less than in the low organic matter areas. Managing for yearly weather differences can require managing soil variability across the field at the same time.

The complexity of managing N for different soils and weather demands a decision support tool. Decision support generally involves a system that gathers information from many sources and quickly interprets it. One example particularly useful for corn in humid growing regions is the Adapt-N decision support tool developed by Cornell University. By accessing near-real-time weather data, it makes incorporating weather into N decisions much easier. AgProfessional magazine chose it as Top Product of the Year for 2012.

Recent research on the Adapt-N tool is indicating promise. It's designed to assess soil N supply at the "right time" – just before corn starts taking it up rapidly. In many cases its use leads to reductions in applied rates, though in some cases it can lead to increases. Users have found it very important to accurately estimate potential yields, since in high-yielding situations the crop more frequently runs short of N. Optimum N rates often don't correlate directly to corn yields, but once a few other factors—including weather and soils—are taken into account, greater corn growth does take up greater amounts of N. The law of conservation of mass does indeed apply!

There is need to innovate when it comes to "right time." The Adapt-N tool is currently configured for use in sidedress systems, in which the bulk of the N is applied around the V6 growth stage, usually in the month of June. Under favorable weather conditions, sidedressing is often the most efficient time to apply N to corn. The opportunity for losses is small, and it often produces the highest yields. Weather extremes, however, can lead to situations in which sidedress is not the optimal timing. For example, the dry conditions of the 2012 season in some fields led to reduced availability of N from sidedressed bands, as compared to preplant incorporated fertilizer. Roots simply couldn't get to the band in the dry soil. And in years with very wet conditions in June, it can be difficult to get on the field with application equipment, and the needs for N can be high owing to the large loss potential.

A real-time decision support system can be useful with different application timings as well. Applying a little more N up front at planting—for example, half or two-thirds of a normal year's optimum rate—can ensure the crop is well nourished in both dry and wet conditions. For the remainder of the crop's requirements, high-clearance equipment capable of variable rates and guided by GPS can ensure more flexible timing to implement the guidance from more sophisticated decision support.

Any decision support tool will have its limits, and needs field-testing. It's important to understand how the tool works to be able to interpret its results properly. Get acquainted with the tools available to help you deal with weather's impact on the N cycle. You can expect improvements in both yields and N use efficiency.

– TWB –

For more information, contact Dr. Tom Bruulsema, IPNI Northeast Director, Phone: (519) 835-2498. E-mail: Tom.Bruulsema@ipni.net.

Abbreviations: N = nitrogen; GPS = Global Positioning System.

Note: ***Plant Nutrition TODAY*** articles are available online at the IPNI website: www.ipni.net/pnt