AN AGRONOMIST'S VIEW OF FUTURE NITROGEN MANAGEMENT

Steve Hoffman [1/]

We currently have more tools available to help with corn nitrogen management than we have ever had. Each of these tools has the potential to help us make better decisions, but none of these tools on their own should be viewed as a complete solution.

A pre-plant or pre-sidedress nitrate soil test is an excellent way to measure the amount of nitrogen available in the soil. The problem with a nitrate soil test is that it is simply a snapshot in time of the soil nitrate level. In areas that receive excessive rainfall, we know that nitrate can be lost from the root zone through leaching or denitrification. Agronomists would love to know the current nitrate status of the soil throughout the growing season, but weather conditions do not always allow for soil sampling. I have not found it possible to sample mud. Whole field sampling of corn that is taller than 20 inches is also problematic. One approach that should be further investigated is to sample soil water at various depths for a direct in-field measurement of soil nitrate. This approach was investigated by a team at the University of Minnesota. (1)

In-season sensors that measure the greenness of crop leaves can be used to help determine the need for sidedress nitrogen. One of the problems with this technology is the need to wait for the crop canopy to become full enough so that the sensors are detecting reflection from vegetation and not from the soil surface. Greenness of the crop should also be thought of as a snapshot in time. It is not a direct measurement of soil nitrogen levels.

Some have proposed the use of plant tissue testing to determine the need for supplemental nitrogen. I believe that this could be a useful tool, but once again sampling a whole field taller than 20 inches in height is a problem. We also know that the calibration of critical tissue test nitrogen levels for different stages of growth is not currently adequate to be able to deliver a sidedress recommendation for most stages of corn development.

Several predictive models have been developed to help with nitrogen management. I am thankful to have nitrogen models available, but have come to believe that it is not realistic to expect that the current models can possibly handle all of the variables that occur across the landscape. Corn on the same soil type could have different tillage systems between farms. One farm might use cover crops while another farm does

---

[1/] Managing Agronomist, InDepth Agronomy, 8426 Borgwardt Ln., Manitowoc, WI 54220.

not. Dairy manure characteristics can vary widely from one farm to the next depending on the bedding source and design of the manure system. Does the manure system consist of a single storage pit, or are there multiple pits used for flushing barns? Does the farm have a methane digester? These are just a few of the countless variables that occur *BETWEEN* farms that make it unrealistic to expect our current models to adequately predict soil nitrogen status. A model is much more likely to be able to account for the variables found within a *SINGLE* farm if the model is custom fit to the conditions on that farm.

In my opinion, we need an adaptive nitrogen prediction model that becomes customized to the unique scenarios of an individual farm over time. We also need to be able to plug in any of the nitrogen management measurements at different growth stages of corn so that the model can be self-adjusted over time with the goal of becoming customized for the set of variables that exist on that farm. There are occasions where agronomists will want to use a soil nitrate test and other times when a different measurement tool is more practical.

Nitrogen predictive models should be "plug and play" ready so that all of the available nitrogen status tools can be used to adjust the model itself. I believe that this approach will bring us much closer to attaining precision nitrogen management.

When it comes to the multiple choices of nitrogen management tools, "all of the above" is the correct answer.

References

1) Field Sampling and Electrochemical Detection of Nitrate in Agricultural Soils -A paper from the Proceedings of the13th International Conference on Precision Agriculture, July 31–August 4, 2016
John Brockgreitens, Dr. MinhPhuong Bui, and Dr. Abdennour Abbas
Department of Bioproducts and Biosystems Engineering, University of Minnesota, St. Paul, MN.