[MN-CCA column for The Farmer, Oct 2017]

KNOW YOUR NITROGEN BASICS

TEST YOUR KNOWLEDGE WITH REAL-LIFE FALL SCENARIOS

BY Kate Stenzel

Which crop nutrient has the greatest potential to make money — or lose money?

Nitrogen, of course.

It's usually your most expensive nutrient, and it has the greatest effect on corn yield. Nitrogen management mistakes harm not only your bottom line, but water quality, too.

Probably the most common question I get on this topic is, "What's the best nitrogen source and placement method?" Unfortunately, there's no single answer to this question, just as there is no single set of nitrogen best management practices that apply everywhere.

That's because nitrogen interacts in complex ways with many environmental factors: weather, soil type, soil organic matter, tillage and drainage, crop rotation, application timing, and more. So it's essential for farmers to have a solid grasp of nitrogen basics, including:

•the nitrogen cycle;
•nitrogen transformations;
•ways that nitrogen is lost from the soil;
•how nitrogen best management practices change with soils, regions, and rotations;
•best practices to increase nitrogen use efficiency.

University of Minnesota Extension is offering "Nitrogen Smart" classes to refresh you knowledge of nitrogen fundamentals. Watch for upcoming classes, which begin in early 2018. The new training program for farmers aims to maximize economic returns on nitrogen investments and minimize nitrogen losses to the environment. It's funded by your corn check-off dollars, and is a partnership between the U of M, the Minnesota Corn Growers, and the Minnesota Agricultural Water Resource Center.

Meanwhile, test your knowledge of nitrogen principles with some real-life N decision scenarios. Below are some actual questions from Minnesota farmers, collected by myself, and Brad Carlson, a University of Minnesota Extension Educator who oversees the Nitrogen Smart program.

Q: I'd prefer to apply all my nitrogen in the spring, but I can't reasonably accomplish that. How do I decide which fields get a fall application?

A: A great place to start is the U of M Nitrogen Best Management Practices, which summarize recommended practices for all regions of Minnesota. The Nitrogen Fertilizer Rule being developed by the Minnesota Department of Agriculture is based on the practices outlined in these publications.

The most significant pathways for nitrogen loss are by denitrification in saturated soils and through leaching into drain tile or shallow groundwater. Make spring application a priority on fields most vulnerable to these losses. In particular, avoid fall

application on undrained soils that stay wet for a long time and lighter-textured soils that allow fast water movement through the soil.

Q: According to the U of M's Best Management Practices, fall anhydrous ammonia (AA) application with a nitrification inhibitor is an acceptable practice in Rice County but not in adjacent Goodhue County. Yet the soils on my Goodhue County farm are about the same as those in eastern Rice County. How should I apply the BMPs?

A: Best Management Practices are intended to be broad guidelines. Growers must understand their soils and manage each field accordingly. Your certified crop adviser can help you understand which practices are acceptable in each field, and what the risks are.

Another resource for making nitrogen application timing decisions is the Minnesota Department of Agriculture's Vulnerable Groundwater Areas Map, which shows areas at high risk for N leaching.

Q: I farm in west central Minnesota, where fall urea application is considered an acceptable practice. But it's been a very wet fall. Is it still okay to apply urea?

A: This is not recommended. Urea converts quickly to nitrate-N, the form of nitrogen that is susceptible to leaching or denitrification in wet soil. In addition, the urea molecule has a neutral charge, so it can move in wet soil even before conversion to ammonium and nitrate.

Carlson notes that recent University of Minnesota research is showing that in southwestern Minnesota — where fall urea application has been considered an acceptable practice with risk — yields suffer when urea is applied in the fall, compared to spring. So, "We are not recommending fall urea application all the way across Minnesota, from the Iowa border up to Morris," Carlson says.

Q: I applied all my nitrogen as anhydrous ammonia in the fall, after the soil temperature at 6 inches fell below 50 degrees F. But then it got very wet, and the soil didn't freeze. Is my N gone?

A: Conversion of AA to nitrate-N slows considerably — but does not completely stop — when soil temperatures are below 50 degrees. That's why you should always wait to apply fall AA until soil temperatures are consistently below 50 degrees. Remember that ammonia does not leach or denitrify, so as long as the ammonia has not converted to nitrate, it is not subject to loss. I also recommend the use of a nitrification inhibitor to protect your fall AA investment.

Stenzel is a certified crop consultant for Central Farm Service in Owatonna, where she leads the NitrateNow program. She also has 4R Nutrient Specialist and Sustainability Specialist CCA certifications, and serves on the board of directors of the Minnesota Certified Crop Advisers. Find information and links to Minnesota CCAs at http://www.mcpr-cca.org

Key points

•Nitrogen management mistakes harm profits and the environment.

•Nitrogen BMPs vary by region, soil type, and other variables.

•Nitrogen Smart, a new educational program, trains farmers in nitrogen fundamentals.

How long until fertilizer N converts to nitrate-N?*	
Fertilizer material	**Approx. time until nitrate***
Ammonium sulfate, 10-34-0, MAP, DAP	1 - 2 weeks
Anhydrous ammonia	3 - 8 weeks
Urea	1.5 - 3 weeks
Ammonium nitrate	50% is nitrate: 0 weeks 50% is ammonium: 1 - 2 weeks
UAN	50% is urea: 1.5 - 3 weeks 25% is ammonium: 1 - 2 weeks 25% is nitrate: 0 weeks

***Conversion rates vary with soil temperature**

Source: Carrie Laboski, University of Wisconsin

Nitrogen sources vary in the amount of time they take to transform to nitrate-N in the soil, the form that is susceptible to loss by leaching or denitrification.