PLANT NUTRITION TODAY

2017 ISSUE 1, NO. 1

IMPROVING FERTILIZER NITROGEN PERFORMANCE –

Recent Global Nitrogen Conference and North America Science Examples

Fertilizer industry leaders, professional crop advisers, and their farmer customers are working more intentionally to improve fertilizer nitrogen (N) use efficiency and effectiveness. Their goal is to use site-specific 4R *(right source, rate, time, and place*) N management practices, in concert with proven soil and water conservation practices, to get as much of the applied N into the crop as economically possible. Such complementary management actions increase the opportunities to raise crop yields and decrease crop yield gaps; while also helping to reduce the risks of residual nitrate-N buildup in the soil profile and helping to minimize losses of N to the environment via other major N loss pathways.

Many different factors affect fertilizer (and manure) N performance in various cropping systems, but as the Table below illustrates, it is quite important to recognize that many are under farmer management control; while many are not.

Below, we call attention to a dozen (12) examples of relatively recent (late 2016 to early 2017) science reports that are identifying and validating more of the options available to professional practitioners and farmers to improve fertilizer N performance; for increased crop yields while also protecting soil, water, and air resources.

Papers presented at 7th International N Initiative Conference (INI 2016) on *Solutions to Improve Nitrogen Use Efficiency for the World*.

Papers by International Plant Nutrition Institute (IPNI) scientists:

- Evaluation of a new fertilizer recommendation approach to improve nitrogen use efficiency across small-holder farms in China, by Dr. He Ping (IPNI China)
- Addressing heterogeneity of maize yield and nitrogen use efficiency in India: Farm-specific fertilizer recommendation from the Nutrient Expert® Tool, by Dr. Kaushik Majumdar (IPNI Asia-Africa)
- Nitrogen performance indicators on southern Australian grain farms, by Dr. Rob Norton (IPNI Australia-New Zealand)
- Enhanced nitrogen fertilizer technologies support the '4R'concept to optimize crop production and

Dr. Cliff Snyder
Director, Nitrogen Program
csnyder@ipni.net

MANAGEMENT FACTORS	ENVIRONMENTAL FACTORS
Fertilizer type (SOURCE)	Temperature
Application rate (RATE)	Precipitation
Application technique (PLACE)	Soil moisture content
Timing of application (TIME)	Organic carbon content
Tillage practices	Oxygen availability
Use of other chemicals	Porosity
Crop type	pH
Irrigation	Freeze and thaw cycle
Residual N and carbon from crops and fertilizer	Microorganisms

PLANT NUTRITION TODAY is a quarterly publication of compiled scientific information developed by the International Plant Nutrition Institute (IPNI). Website: http://www.ipni.net/pnt

> *"These newer scientific reports are illustrating that sizable (> 20 to 50%) reductions in the loss of N from farm fields may be achieved with improved 4R N management practice implementation."*

minimize environmental losses, Dr. Cliff Snyder (IPNI Nitrogen)

- Influence of soil fertility variability and nutrient source on maize productivity and nitrogen use efficiency on smallholder farms in Zimbabwe, by Dr. Shamie Zingore (IPNI Sub-Saharan Africa)
- Full INI 2016 Conference program and other papers on improved N use efficiency

Recently published soil and agronomic science articles from North America:

- Nitrogen Extenders and Additives for Field Crops, by Dr. Dave Franzen (North Dakota State University, USA)
- Effect of enhanced efficiency fertilizers on nitrous oxide emissions and crop yields: a meta-analysis by Mr. Resham Thapa and Dr. Amitiva Chaterjee and others (North Dakota State University, USA)
- Ten Ways to Reduce Nitrogen Loads from Drained Cropland in the Midwest by Dr. Laura Christianson and others (University of Illinois, USA)
- Improving fertilizer management in the U.S. and Canada for N_2O mitigation: understanding potential positive and negative side-effects on corn yields by Dr. Diego Abalos, Dr. Claudia Wagner-Riddle, and others (University of Guelph, Canada)
- Lower nitrous oxide emissions from anhydrous ammonia application prior to soil freezing in late fall than spring pre-plant application by Dr. Mario Tenuta and others (University of Manitoba, Canada)
- Assessment of drainage nitrogen losses on a yield-scaled basis, by Mr. Xu Zhao, Dr. Laura Christianson, and others (University of Illinois, USA)
- Corn nitrogen management influences nitrous oxide emissions in drained and undrained soils by Dr. Fabian Fernandez and others (University of Minnesota, USA)

These newer scientific reports, along with other published research results, are illustrating that sizeable (often > 20 to 50%) reductions in the loss of N from farm fields (via drainage of nitrate-N and/or emissions of ammonia or nitrous oxide) may be achieved with improved 4R N management practice implementation. We are also learning that although the reductions in N losses from farm fields may be proportionately large with some of the improved N technologies, tools, and practices—depending on the soil, cropping system, and climatic conditions—some of the crop yield benefits may be relatively modest to small. That makes it difficult for farmers to economically implement some environmentally important N management and conservation practices, without some incentives or supporting policy.

As you consider the many options available to improve the performance of applied N in your cropping system, try to base your management decisions primarily on sound regional or local science. Where such science is not available for your area, consult your crop adviser or trusted agronomic professional for assistance in choosing economically rewarding and environmentally protective nutrient management practices. Make sure that the right soil and water conservation practices are also in place to protect soil health, water quality, and sustainable production.

IPNI International Plant Nutrition Institute

3500 Parkway Lane, Suite 550, Peachtree Corners, GA 30092-2844 U.S.
Phone: 770-447-0335 | Fax: 770-448-0439 | www.ipni.net