Meta-analysis of Enhanced Efficiency Fertilizers (EEFs) in Corn Systems in the Midwest

A systematic approach to compiling the results of a wide variety of studies investigating the agronomic and environmental effects of enhanced efficiency fertilizers

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4 Research Fund

PROJECT GOALS

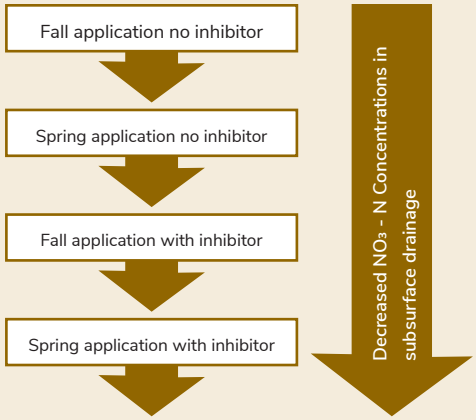
SOURCE	N fertilizers versus N EEFs
RATE	Rate of application of N versus N EEFs
TIME	How does timing of the N application as EEFs influence yield?
PLACE	Does the placement of N EEFs influence corn yield?
4R	Do EEFs produce significantly greater corn yield when other factors, such as placement, application time, and N rate are considered?

PROJECT RESULTS

Enhanced efficiency fertilizers had variable and usually small benefits to corn yield in the Midwest. Application timing had a much greater impact on yield than enhanced efficiency fertilizers in studies with timing treatments.

SOURCE	For all N sources, timing had the greater effect on yield than the use of EEF. Nitrous oxide (N_2O) Emissions – anhydrous ammonia had the greatest fertilizer-induced emissions. The addition of EEFs to all sources reduced N_2O emissions.
RATE	N rate has a greater effect on yield than use of an EEF.
TIME	N timing has a greater effect on yield than the use of an EEF. Anhydrous ammonia increased yield when applied at planting vs. pre-plant or fall application.
PLACE	Banding fertilizer and split applications found to increase N_2O emissions, but not enough information to comparable across studies.

MORE PROJECT RESULTS ▼



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MEET RACHEL

"I became interested in 4R research, and particularly with systematic reviews and meta-analysis, to be able to ask more pertinent and worthwhile questions. As a relative new researcher in the field, I found it to be a good framework to decide what questions would be worth pursuing."

Rachel grew up on a small cattle farm in southern Illinois and went on to get a BS in biology at Saint Louis University, and a Masters and PhD at North Carolina State University. Her interests have been better management of soils in production systems. When she started teaching and researching soil fertility in production agriculture at Southern Illinois University, she found the 4R framework useful for thinking about nutrient management. "I have always tried to optimize the balance of protecting natural resources while still producing the things we need." As the new silviculture professor and Co-director of the Forest Productivity Cooperative at NCSU, she is bridging the gap between agriculture and forest plantations.

WHAT DO WE DO NEXT?

- Meta-analysis of the effect of N timing on yield and N losses
- Nitrate leaching has the greatest lack of published literature
- Standard deviations or standard errors should be estimated and reported so that results of a study can be used in a meta-analysis
- Increased collection of weather data points in N research