

## ENVIRONMENT

**Title:** Drainage Water Quality Impacts of Agricultural Management Practices: Timing of Manure Application and Use of a Winter Cereal Rye Cover Crop - #18-134 IPPA

**Investigator:** Dr. Matt Helmers

**Institution:** Iowa State University

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### Abstract

Agricultural nutrient management practices are an important component of the effort to improve water quality in the Mississippi River Basin. Optimizing the use of fertilizers and animal manures in combination with other management practices has the potential to minimize negative impacts on water quality. The objectives of this study are to evaluate the effects of liquid swine manure application timing, cereal rye (*Secale cereale*) cover crops, a nitrification inhibitor, and gypsum soil amendment on grain yields and on nitrate-N and Total Reactive Phosphorus (TRP) losses via subsurface drainage. The study was evaluated from 2016 through 2019 using thirty-six 0.4 ha (1 ac) plots outfitted with a subsurface drainage water quality monitoring system.

Results show that early fall applied swine manure (EFM) with a rye cover crop resulted in significantly lower 4-yr average nitrate-N concentrations in drainage water compared to EFM without a cover crop in a corn (*Zea mays* L.) - soybean (*Glycine max* (L.) Merr.) rotation. Four-yr average N uptake in aboveground cereal rye biomass averaged 98 kg N ha<sup>-1</sup> (88 lb N ac<sup>-1</sup>) prior to corn and 68 kg N ha<sup>-1</sup> (61 lb N ac<sup>-1</sup>) prior to soybeans, suggesting that significant recycling of both residual soil nitrate-N and manure N occurred. There were no significant differences in 4-yr average nitrate-N concentrations or losses in continuous corn treatments receiving either LFM or spring manure (SM). Average TRP concentrations were low (7 to 40 µg P L<sup>-1</sup>) and there were no significant differences between treatments. The Instinct® nitrification inhibitor showed promise for improving yields when applied with fall manure but it had no detectable effect on water quality. Biennial fall applications of 2.24 Mg ha<sup>-1</sup> (1 ton ac<sup>-1</sup>) of gypsum had no observable effects on water quality or yields. Delaying manure applications from both early fall to late fall and from late fall to spring resulted in significant increases in corn yield.

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For more information contact:

National Pork Board • PO Box 9114 • Des Moines, IA 50306 USA • 800-456-7675 • Fax: 515-223-2646 • [pork.org](http://pork.org)

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