

Nitrogen Management Systems in Tile-Drained Fields: Optimizing Yields while Minimizing Losses

2014 Annual Report for our NREC project

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Synopsis

Although it is well established that there are substantial nitrate losses from corn and soybean production systems, there is not a good understanding of the relationship of current and newly developing nitrogen management systems to nitrate loss from tile lines. Timing, split applications, and cover crop effects on nitrate losses need multi-year measurements to better understand the effects of weather, as well as the resulting crop yields. Because nitrate losses from tile systems are likely to stay at the forefront of state nutrient reduction strategies, we need to be able to tell producers which current and newly developing nitrogen management systems are most likely to reduce nitrate losses without reducing yields. This study will provide the needed data for that, by making multi-year tile nitrate measurements on a field in east-central Illinois where 36 individual tile lines are being monitored with six treatments, each replicated three times. Treatments will range from all N applied in the fall (with inhibitor) to split spring-sidedress with cover crop, the latter representing what we expect to be the “best management practice” for minimizing nitrate loss.

Objectives

The overall goal of this project is to more fully understand current and new nitrogen management systems on corn yields and nitrate losses from tile-drained fields in Illinois.

The objectives are to:

1. To develop on-farm field trials of current and new nitrogen management systems for typical corn/soybean rotations, evaluating both the yield response and the tile losses of nitrate.
2. To determine when and why tile nitrate losses occur in these management systems, during both corn and soybean rotations.
3. Include a final report at the conclusion of this project to address each of the objectives stated above.

Treatments

1. Full rate of NH₃ (160 lb N/acre) applied in the fall after November 1 with nitrapyrin.
2. 80 lb N applied as NH₃ in the fall with nitrapyrin followed by 40 lb N/acre as UAN at planting followed by 40 lb sidedressed as UAN
3. Full rate applied as NH₃ (no nitrapyrin) in early spring (to before planting), with placement between rows by RTK if possible.
4. Reduced rate (120 lb N/acre) applied as NH₃ (no nitrapyrin) in early spring (before planting), with placement between rows by RTK if possible.
5. 80 lb N applied as NH₃ early spring (before planting) followed by 80 lb N as UAN sidedressed.
6. Treatment #5 but with cover crops (oats-radish mixture seeded into standing soybean crop the previous early fall; cereal rye after corn).

Additional supporting measurements of yield, grain protein, soil N contents, and cover crop biomass and N content will be made. Outcomes will be reported during field days, at a wide range of meetings, on web sites, in farmer-oriented magazines, and to other scientists in refereed journals. We are excited that this project is now underway, and feel it will provide needed information on nitrogen management systems and resulting tile nitrate losses while supporting high-yielding row crop agriculture.

Progress in 2014

We have established a tile site in northern Douglas County after review of multiple candidate fields in east-central Illinois. This was a difficult task that took extensive time. The site chosen is the same one as used by Dr. Robert Hoelt in 2002-2004. We have reached agreements with both the landowner (Tom Searls) and the farm operator (Lindy Dambacher) to utilize this field for at least a five-year period. Dan Schaefer from IFCA has been a critical collaborator on the project who will help with getting the practices in place on the field and making sure the right agronomic practices are followed.

Field equipment has been installed, which includes an Agri Drain structure on each of the 36 individual tile lines along with datalogging pressure transducers. Tile flow began in December and we have collected grab samples for the past 8 weeks on all tiles and determined that flow and nitrate are similar across the field. ISCO automatic water samplers have been ordered and will be installed soon. A full weather station has been installed with the data available through the web, including current conditions. We were able to use the previously collected data to help guide our selection of tiles, as the former study utilized 54 tiles. With our 36 tile design, we can have half the field in corn and half in soybean each year, with three replicates for each of the six treatments. Because the agreement and field equipment was installed late in the fall of 2014, we

were not able to begin the fall fertilizer treatments in 2014. For this first spring we plan to implement the fertilizer treatments in a modified manner during this first year. The entire field was in corn in 2014, so the corn treatments will be corn after corn in this first monitoring year. We will therefore modify the N rate to reflect the higher recommendation for corn after corn. Again, our delay in getting this field site going was because it took some time to find a site with suitable tiles, and then many meetings with the landowner and tenant to assure a plan of work, site modifications, cropping systems, treatments, and harvest considerations. We thank Dan Schaefer, Jean Payne, and Bob Hoelt for their collective efforts that led to access to the site selected, as well as facilitating the discussions that led to the agreements we have in place.

Outreach activities to date have included a presentation by Lowell Gentry at the 2015 IFCA Convention in Peoria on January 21, 2015. He described the study that is underway and used previous results to illustrate the importance and context of the work.

Our budget for this one field for next year is greatly reduced from our previous estimate given the time it took to locate and establish the Douglas County field. Much of our 2014 funds will be spent in fully equipping the site in 2015. Therefore, our 2015 request is \$101,152, with revisions in how we plan to spend the funds already committed. A new 2014-2015 budget was included with our renewal proposal. The grants and contracts office of the university has provided an interim financial report that follows showing our expenditures through 2014.

NUTRIENT RESEARCH AND EDUCATION COUNCIL
"Nitrogen Management Systems in Tile-Drained Fields:
Optimizing Yields While Minimizing Losses"
Award Period: January 1, 2014 - December 31, 2014
Current Reporting Period: May 1, 2014 - December 31, 2014
INTERIM FINANCIAL REPORT

INVESTIGATOR: Mark David

EXPENDITURES:	PRIOR PERIOD EXPENSES	CURRENT PERIOD EXPENSES	CUMMULATIVE EXPENSES
Salaries & Wages	\$0.00	\$11,130.25	\$11,130.25
Fringe Benefits	\$0.00	\$3,355.77	\$3,355.77
Material & Supplies	\$0.00	\$23,114.19	\$23,114.19
Travel	\$0.00	\$476.00	\$476.00
Services	\$0.00	\$0.00	\$0.00
 Total Direct	 \$0.00	 \$38,076.21	 \$38,076.21
Indirect	\$0.00	\$4,226.47	\$4,226.47
Total	<u>\$0.00</u>	<u>\$42,302.68</u>	<u>\$42,302.68</u>

AWARD:	
1/1/14-12/31/14	\$430,146.00
Interest Accrued to date	<u>\$27.99</u>
	\$430,173.99
Less Expenditures	<u>\$42,302.68</u>
BALANCE	<u>\$387,871.31</u>

This report was prepared from
 financial records of the
 UNIVERSITY OF ILLINOIS
 GRANTS AND CONTRACTS OFFICE

Sandra Moulton

Sandra Moulton, Senior Director
 Post-Award Administration