



ILLINOIS
NREC

Ten Years of Farmer Funded Research

Who is Illinois NREC?

**Created in 2012
through state
statute**

**Funded by \$.75/ton
assessment on
fertilizer sold in
Illinois**

**Collaboration
between ag,
environmental
groups, and state
agencies**

- Pursue nutrient research & educational programs
- Ensure adoption and implementation of practices that
 - Optimize nutrient use efficiency
 - Ensure soil fertility
 - Address Environmental concerns regarding fertilizer

Who is Illinois NREC?

- 13 Member Council (9 voting and 4 advisory)
- Voting Members
 - 3 Farmers (ILFB, ICGA, ISA)
 - 3 Members from Fertilizer Industry
 - CCA
 - Specialty Fertilizer
 - Illinois Department of Ag
- Advisory Members
 - 2 Environmental Organizations (Sierra Club & Environmental Law Policy Center)
 - State/Federal Ag Research Station Representative
 - Illinois EPA

Funding and Progress to Date

- Since 2013
 - Over \$30M invested in research projects
 - Five NREC publications: Turf Guide, Three Cover Crop Guides Guide to MRTN,
 - Annual Reports, Investment Insights, Field Notes, videos, Research Forum
 - 72 peer reviewed papers published in Professional Journals written by NREC-funded researchers
 - Many opportunities for collaboration on research and outreach projects
 - Provided research critical for adding saturated buffers to the strategy
 - Supported dozens of students on their undergrad, Masters, and PhD work

NREC and Illinois' Strategy



Work in

Work in parallel
(but
independently)
with the strategy



Evaluate

Evaluate removal
rates for BMP's
already in
strategy



Provide

Provide peer-
reviewed
research for
BMP's not
already in
strategy



Serve on

Serve on Policy
Working Group,
and Ag Water
Quality
Partnership with
support to
Science Advisory
Team



Fund

Fund bi-annual
USDA-NASS
Survey re: NLRs
awareness and
adoption

2023 Research

- \$3.9 Million in research awards
- 27 total projects
 - 22 ongoing
 - 5 new
- Grants recipients:
 - University of Illinois
 - Southern Illinois University – Carbondale
 - Western Illinois University
 - Illinois State University
 - Purdue University
 - IFCA

Crop Year 2023 NEW Projects

1. Updating Illinois phosphorus and potassium soil test recommendations for the 21st century – *Margenot*
2. A missing piece of the Illinois phosphorus puzzle: quantifying statewide streambank erosion to inform effective nutrient loss reduction strategy - *Margenot*
3. Quantifying the effects of tillage, fertilizer placement, and winter cover crops on nutrient losses via soil macropore flow - *Yu*
4. On-farm and farmer-led: quantifying nutrient use efficiencies and contextualizing nutrient losses in corn-soybean production - *Margenot*
5. Assessing Diverse Cover Crops for N and P Efficiency, C Sequestration, and Economic Impact on Illinois Crop Rotations - *Rhykerd*

4R Nutrient Management

“Nitrogen placement and application timing for best efficiency, growth, and yield of corn across Illinois.” - *Below, Fred and Eric Winas.*

- Banding can increase grain yield and N removal, while limiting N loss to the environment.

“Assessing tile depth and spacing impact on nutrient losses and crop production.” *Bhattarai, Rabin., Richard Cooke, and Jeong Hanseoki.*

- The larger the drainage coefficient, the greater the tile flow and nitrate-N losses
- More tile flow and nitrate-N losses were observed during the non-growing season than during the growing season

“Integrating tillage, soil carbon dynamics, and tile nitrate loss.” - *Gentry, Lowell and Andrew Margenot.*

- Tile nitrate concentrations in 2021 for the four treatments showed a spike in tile nitrate concentration with heavy rains in late June
- tile nitrate in the cover crop plots quickly began to increase following termination

4R Nutrient Management

“Precision nitrogen management for improving farm profitability and water quality in southern Illinois.” - *Sadeghpour, Amir, Joshua McGrath, Karl Williard, and Jon Schoonover.*

- A preliminary evaluation of the data indicates that (a) winter cereal N uptake could accurately be predicted and (b) split N application for southern Illinois and Kentucky are more effective than upfront N management.

Nitrogen Rate Research – MRTN – *Nafziger, Emerson., Dan Schaefer, John Pike, Jason Solberg*

- Uniform distribution of EONR points from 2021 data did not indicate a need for an updated to the bases MRTN value for 2022
- N-Rate trials are moving to a “stamp method” which will compare the field rate to either a rate above OR below that.

“Sources and cycling of nitrate in tile-drained corn-soybean rotation systems: A stable isotope approach.” - *Yu, Zhongje and Lowell Gentry.*

- Fertilizer N is the direct source of tile nitrate during flow events following fertilizer N application
- Nitrate produced from soybean residue decomposition is an under-appreciated source of tile nitrate loss during the non-growing season following soybean harvest.

Cover Crops

“A long-term evaluation of nitrogen application timing and cover crops impacts on the fate and availability of nitrogen fertilizer and crop production on tile-drained fields.” *Armstrong, Shalamar, Michael Ruffatti, Dan Schaefer, Philip Brown, Mike Kelly, and Robert Fish.*

- cover crops reduced the flow weighted nitrate-N concentration by 37.5%
- cover crops reduced the mass of nitrate-N loss by 43% and 46% relative to the control and zero control treatments.
- The rate of loss from the legacy N pool begins to decline after approximately three years following tile drainage installation in high organic matter soil
- cover crops maintained a 47% lower rate of nitrate loss consistent across the 6-year period relative to the N fertilized treatment without cover.

“The effect of cover crops on surface water quality: A paired watershed experiment in the Lake Bloomington watershed.” - *Armstrong, Shalamar, Michael Ruffatti, Dan Schaefer, Philip Brown, Mike Kelly, and Robert Fish*

- Cover crops' impact on nitrate loss via tile-drainage is scalable to the watershed level.
- a reduction in tile-drainage water NO₃-N concentration was observed for the cover crop watershed relative to the reference (control) watershed. (33% reduction)

Cover Crops

“Evaluating nutrient loss reduction strategies: Longer rotation with cover crops and bioreactor.” - *Gentry, Lowell., Dan Schaefer, and Eric Miller.*

- This project demonstrated proof of concept that a more diverse rotation (Corn-Soy-Wheat with double-crop soybean after wheat and cereal rye after corn) can compete financially with conventional C-S production while reducing tile nitrate by more than 30%.

“Insect management in cover crop systems.” - *Seiter, Nicholas and Brodie Dunn*

- The relatively low risk of insect damage should not be a deterrent to adopting a winter rye cover crop ahead of soybean.

Edge of Field

“Drainage water management (DWM) and saturated buffers for achieving NLRs goals.” - *Christianson, Laura., Paul Davidson, and Richard Cooke.*

- A new saturated buffer model showed Nitrate loss reduction of 48% (+/- 19%) for combined ten site-years with removals of 3.5-29.3 kg nitrate-N/ha annually

“Modelling and designing saturated buffers for nitrogen and phosphorus mitigation in Illinois.” - *Schoonover, Jon., Karl Williard, Gubir Singh, and Christopher Blattel.*

- In 2021 the pitchfork buffer outperformed the standard by reducing discharge and nutrient loading by 17%.

“Water and sediment control basins (WASCoBs) influence on crop yields and water quality near Atterberry, Illinois.” - *Schoonover, Jon., Karl Willard, Gurbir Singh, and Kevin Turnbow.*

- WASCoBs trapped/attenuated ~98.5-99.8% of total suspended solids, ~83.8-97.4% of total phosphorus, ~32.0-59.6% of Nitrate-N, and ~42.3-82.9% of Ammonium-N.

Phosphorus

“Capitalizing on 150 years of soil samples to determine legacy P and improve water quality in Illinois.” - *Margenot, Andrew., Reid Christianson, and Amir Sadeghpour.*

- Legacy P can accumulate rapidly over a short period of time: the majority of 150% increase over 145 years occurred in ~10% of that time.
- using the Morrow Plot example, it would take 150+ years of crop drawdown to restore to 1876 levels.

“Evaluating slow release P fertilizers to increase crop production and environmental quality.” - *Margenot, Andrew., Roland Cusick, Allan Hertzberger, and Neha Chatterjee.*

- In soils with deficient soil test phosphorus or STP (<18 mg/kg Mehlich III colorimetric), 50-50% struvite-MAP blends appear optimum for maximizing vegetative corn and soybean growth while minimizing residual STP by up to -18%.

Where can I get more info?

- **Website:** illinoisnrec.org
- **Twitter:** @IllinoisNREC
- **Facebook:** @IllinoisNREC
- **Email:** Julie@illinoisnrec.org or sgolovay@illinoisnrec.org



Make plans to join
us in Champaign on
February 9, 2023