



Pepin County Discovery Farms Project

A Discovery Farms® Program Update

Project Overview

Eight pan lysimeters were installed in November 2021 in Pepin County. These lysimeters are buried about 4.5 feet below the soil surface and are being used to understand and quantify the potential for nutrients to leach below the crop root zone towards groundwater. The safe drinking water standard is set at 10 mg N/L, which applies to well water. The lysimeters were placed in a field that is irrigated, typically receives manure, and is cropped in a corn-soybean rotation. The field is also managed with minimal tillage, with residue left over the winter to help protect the soil from wind erosion.

The goal of this study is to understand what practices help us to minimize nitrogen leaching to protect our water resources. The field has been set up to allow us to evaluate a control and treatment experiment. Two additional lysimeter studies have recently been added in Rock and Calumet counties. These will also feature a control/treatment study design and look at conservation practices or management strategies to reduce nitrogen leaching. §



Photo of a lysimeter before it's buried.



Next Steps

This is preliminary data, and we will continue to monitor the sites for several years. We will also add a treatment to the sites to assess their impact on reducing nitrogen leaching. Discovery Farms is also monitoring lysimeters in Calumet and Rock Counties, which will help bolster our understanding of the timing and magnitude of these losses as well as practices to reduce leaching. §

Site Management

For our monitoring, we set a "year" of data to cover the time period of April 1 - March 31 to best align with the timing of a cropping system. We have two complete years of monitoring. In the first year of monitoring, the crop was soybeans (following corn), while in the second year it was in corn silage. In year 2, a rye cover crop was planted the day following corn silage harvest (9/9/23). No nitrogen applications occurred in year 1. Year 2 nutrient applications included liquid dairy manure and synthetic nitrogen.



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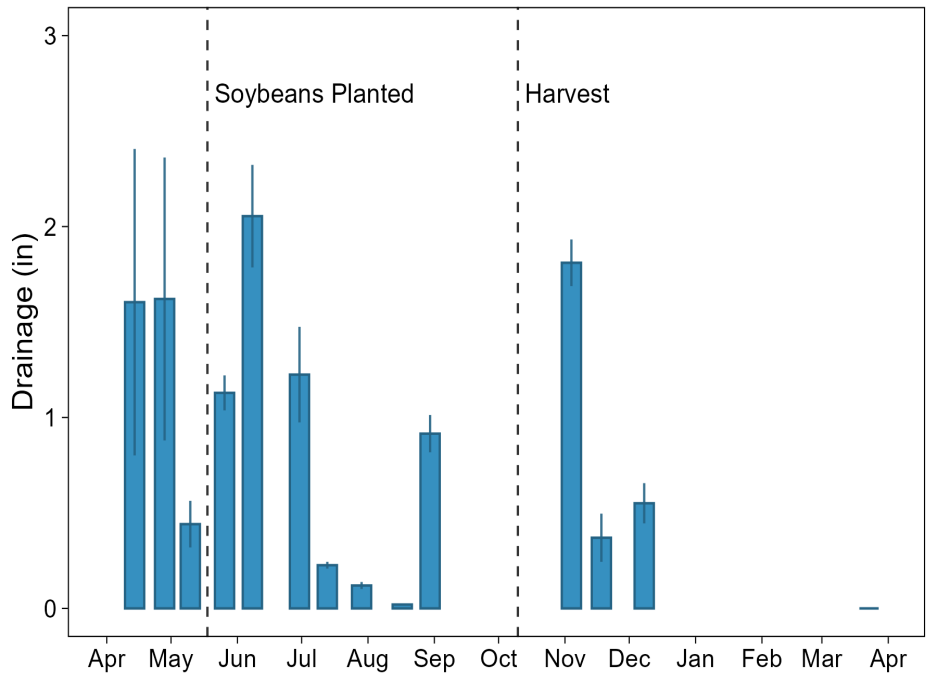
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Drainage

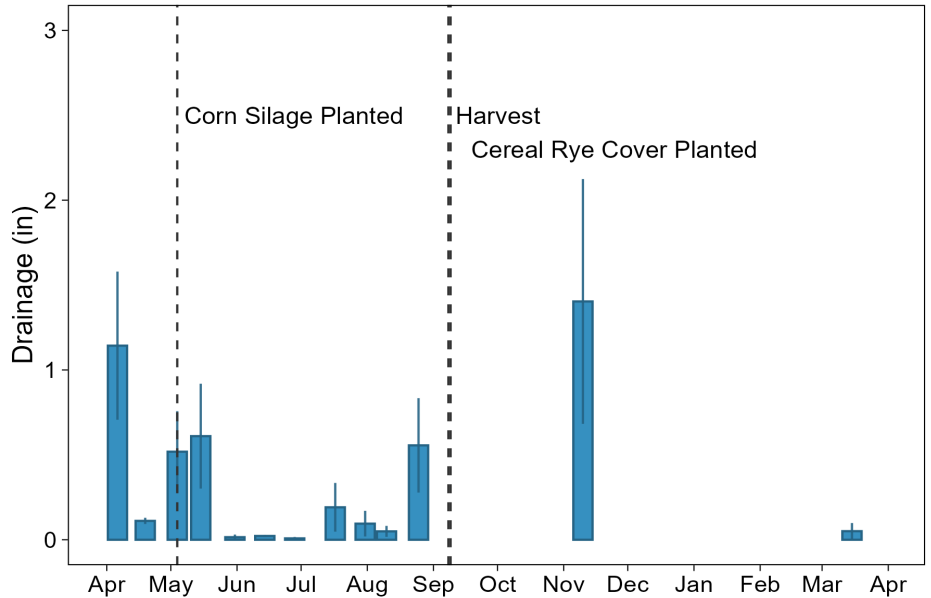
Drainage and water quality samples are collected approximately biweekly. During the first year of monitoring, one pair of lysimeters had consistent performance and were used for the analysis shown to the right. During the second year, six lysimeters (three per side of the field) had consistent performance and were included in the data analysis. There were 13 sampling events from the two lysimeters in Field Year (FY) 2022. In FY2023, the lysimeters on the east portion of the field had 13 sampling events again while those on the west side of the field had 9 events. Due to the differences between year one and two of data, just the data from the east portion of the field is shown here.

The graphs to the right show the drainage from the east lysimeters in both years of monitoring. In FY2022, just over 12 inches of total drainage were collected from the lysimeters. In FY2023, the lysimeters had 4.8 inches of total drainage. This information provides context and understanding to the timing and magnitude of potential leaching events. §

Pepin East, Field Year 2022



Pepin East, Field Year 2023



Nitrogen Leaching

The timing and amount of nitrogen leached can be seen below for both FY2022 and FY2023. Nitrogen leached is calculated by multiplying drainage by nitrate concentration. During the first year of monitoring, there were a couple large leaching events prior to soybeans being planted and established. While we expect there to have been leaching during this vulnerable period of the year without an established crop, the magnitude of leached nitrogen may have been enhanced due to the high level of soil disturbance from the installation of the lysimeters the previous fall. This data does provide important information on the timing of losses though. For the remainder of the first year, the leaching events were lower and more consistent in magnitude. The total nitrogen leached was 99.5 lbs/ac in FY2022.

In our second year of monitoring, the largest leaching events were seen at the time of crop maturity being reached and after harvest. Green dashed lines indicate nutrient applications. Overall, FY2023 was a drier than normal year, although this site did receive irrigation. In October, there was above average precipitation, and a large leaching event was observed following this. The lysimeters on the east side of the field leached a total of approximately 52 lbs/ac in FY2023. §



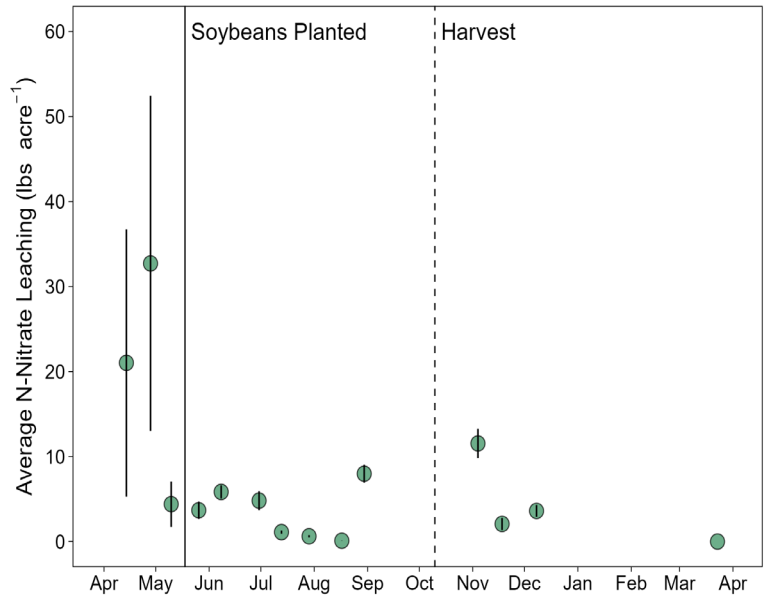
Year 3 of Monitoring

We are currently in our third year of monitoring, which will include data from April 1, 2024 to March 31, 2025. So far this year, 85 samples have been collected by our project partners, the Pepin County Land Conservation & Planning Department. There have been 17 site visits so far as well. The total drainage up to now is 8.1", which is about double the amount of total drainage from the previous year (FY23). Most of the drainage occurred in June and July, which was driven by an unusually wet early summer. The month of June had 8.76" of rain in Durand compared to the 30-yr average of 5.11" of rain in June. During this monitoring year, the crop was soybeans planted green into a cereal rye cover crop. This year of data is on-going. Results will be shared once all the data is collected and analyzed for this third year of data (FY24). After the next year of data is collected (FY25), a treatment will likely be added to the field. The goal is to evaluate the effectiveness of a treatment to reduce nitrogen leaching. Potential treatments include manure management (timing and/or placement) and cover crops.

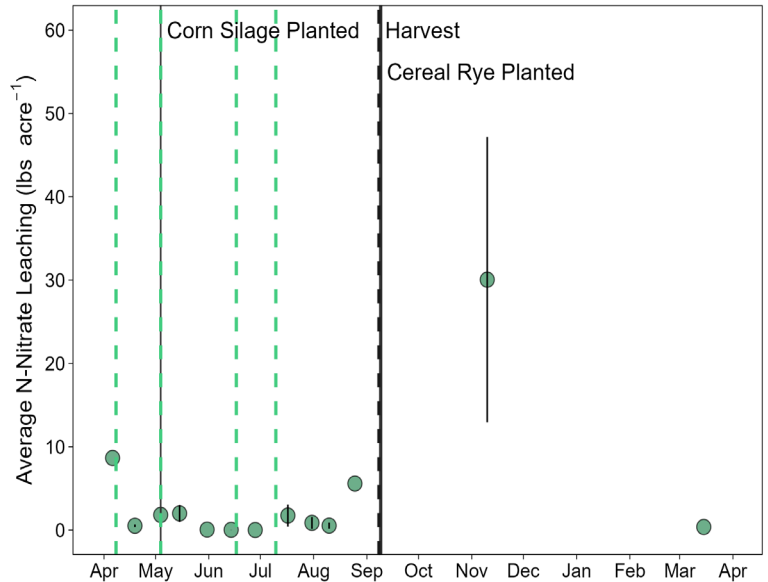
Thank you!

We would like to thank all the individuals who have helped make this monitoring possible: Pepin County Land Conservation & Planning Department, WI DATCP, WI Groundwater Coordinating Council, Farmers4Health, and our participating farmer. Without you, this work would not be possible!

Pepin East, Field Year 2022



Pepin East, Field Year 2023



Meet the Discovery Farms Staff!



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The Discovery Farms® Program, part of UW-Madison Division of Extension, is a farmer-led research and outreach program that conducts research on working farms located throughout Wisconsin, seeking to identify agriculture's impact on water quality.