Midwest Cover Crops Council
2026 Annual Meeting ~ Dubuque, IA
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Poster Abstracts

Professional - Cover Crop Management

1	Giovani Preza Fontes	What is the ideal cover crop planting window for optimal establishment and cash crop yield?

Cover crops provide numerous agroecosystem benefits, which are closely tied to the amount of biomass they produce. While management is critical for optimizing cover crop biomass and benefits, its effects on subsequent soybean yields remain unknown in Illinois. Field trials were conducted over 3 years (2023-25) to evaluate the effects of planting date, seed rate, and termination timing on cereal rye (Secale cereale) biomass and how these factors interact to affect soybean yield. Overall, our findings suggest that the seeding rate can be reduced to 33 kg/ha when planted between late September and mid-October, and that planting at 67 kg/ha tends to maximize biomass production when planting is delayed into early to mid-November. Soybean plant population decreased with increasing cereal rye biomass in 6 of 8 site-years. Across site-years, cereal rye cover crop significantly lowered soybean yield regardless of management. While high cereal rye biomass may enhance ecosystem benefits, it often results in a yield penalty in soybean under the conditions of our study. Further research is needed to determine the optimal cereal rye biomass level that minimizes potential yield losses for the following crop.

Professional - Cover Crops and Nutrient Management

2	Alan Sundermeier	Tracking Cover Crop Biomass & Soil Nutrients

Determining when to terminate a cover crop is a challenge for regenerative farmers. By tracking cover crop and soil nutrients during spring growth, termination timing decisions can be based on potential nutrients available. In Northwest Ohio, 12 sites had cover crop biomass and soil nutrients sampled every two weeks during spring growth. The sites represent a range of soil types and cover crop species. Data collected consistently showed that early cover crop termination (mid-April) resulted in much lower biomass nutrients. If allowed to grow until mid-May, cover crops accumulated more nutrients resulting in greater economic value. However, soil nitrogen levels in some cases were higher in mid-April compared to mid-May. This may be due to the cover crop absorbing excess nitrogen from the soil and retaining nitrogen in the cover crop biomass. The carbon/nitrogen ratio in biomass varied throughout the spring growth and should be taken into account when determining termination timing.

Professional - Cover Crops and Pest Management

3	Rashelle L. Matthiesen	Optimizing planting methods for cereal rye before corn to mitigate seedling disease and yield decline in Iowa

Cereal rye (CR) is the most widely used cover crop (CC) in Iowa and the upper Midwest; however, in some years, corn yield decline may occur following a CR CC. Corn seedling disease is an important factor in yield reduction as CR acts as a “green bridge” for soil borne pathogens, mainly Pythium spp., that infect corn seedlings in spring. Extending the duration between CR termination and corn planting (> 10 days) can reduce seedling disease and mitigate yield decline. When corn is planted within 3 days of CR termination, i.e., “planting green”, there is a major risk of seedling disease and for reduced yield. Planting corn at different distances from the CR (i.e., precision planting) can also reduce corn seedling disease and yield decline. Moreover, distancing CR from corn reduces the negative effects of planting green. We hypothesize that strip tillage will act similarly to distancing the CR CC apart from the corn crop and consequently mitigate seedling disease and yield decline. We present preliminary data from a 2025 field trial conducted in Ames, Iowa and an overview of the project beginning in 2026. CR biomass, and corn seedlings and yield were collected from six treatments: (i) CR drilled in 7.5 in (19 cm) with a skip row over the future corn row and no tillage; (ii) CR drilled in 7.5 in with a skip row over the future corn row and strip tillage; (iii) CR drilled in 7.5 in without a skip row and no tillage; (iv) CR drilled in 7.5 in without a skip row and strip tillage; (v) no CR control and strip tillage, and (vi) no CR control and no tillage. Strip tillage was done over the future corn row. CR was terminated 0 to 3 days after corn planting. biomass did not differ across treatments ranging from 1401 to 1835 lbs/ac (1570-2057 kg/ha). Root rot severity (%) was greater when corn was planted with no skip row and no tillage compared to all other treatments (P < 0.03). Yield was greatest in the no rye no tillage control (P < 0.06). Evaluating these management scenarios could provide farmers with more flexibility when implementing CR CC as part of their rotations. Furthermore, these data will assist in the development of improved recommendations for planting a CR CC before corn in the upper Midwest.

Professional - Cover Crops and Soil Health

4 Ashley Waggoner Cover crops research at the US Dairy Forage Research Center

The US Dairy Forage Research Center (DFRC) utilizes a multidisciplinary and integrated approach in dairy systems research. There are many avenues for the use of cover crops within dairy systems, and as they have been integrated into dairy systems, they have become staples of research at the DFRC. Research at DFRC including cover crops spans the whole system, with focuses on plant breeding for forage usage, cover crop feeding trials, and agronomic studies. The DFRC has also partnered with the University of Wisconsin-Madison and the Michael Fields Agricultural Institute in the Soil Health Alliance for Research and Engagement, where research and outreach regarding soil health often includes the use of cover crops.

Student - Cover Crop Management

5 Somdatta Achar Evaluating Yield Outcomes with Perennial Ground Cover Systems in Corn-Soybean Rotation

Perennial Ground Cover systems (PGCs) are novel crop cultivation approaches utilizing perennial cover crops compared to annual cover crops. This approach is intended to address sustainability challenges in conventional corn-soybean systems, particularly natural resource degradation such as soil erosion, depleted soil carbon, and greenhouse gas emissions. Prior research on PGCs highlights several difficulties in managing perennial covers alongside cash crops. One of the primary concerns is the inconsistency in crop yield, largely driven by competition between the perennial covers and cash crops for essential resources such as light, water, and nutrients. As part of a Department of Energy funded project, perennial ground cover field trials have been conducted at several locations across the U.S. Corn Belt including at the University of Nebraska-Lincoln (ENREEC), Corteva Agriscience (Johnston, Iowa) and The Land Institute (Salina, Kansas). Project goals include identifying the best agronomic management practices for PGCs into corn-soybean rotations by ensuring that corn and soybean yields are not negatively impacted by the presence of perennial cover crops. This project will determine a combination of crop rotation and perennial grass species which will lead to optimum yield. The experiments measure crop performance parameters including plant height, population stand count, above-ground biomass, growth stages, grain and stover yield. Simultaneously, cover crop metrics such as crop-to-PGC separation distance, PGC height, PGC above-ground biomass, and weed above-ground biomass are recorded to assess their influence on cash crop yield. Results will provide insights into how PGC spatial configuration and biomass accumulation interact with crop development and yield outcomes. Findings from this research project will contribute to refining PGC management strategies and inform broader adoption of regenerative practices that improve the sustainability of U.S. Midwestern agriculture.

6 Marcos Menghini Optimizing Cover Crop Integration in Wheat-Based Cropping Systems

The short growing season in North Dakota makes it challenging to intensify crop production. However, small grains such as hard red spring wheat (HRSW) create a valuable window of opportunity to establish cover crops, which help protect the soil, improve soil health, and build a more resilient production system. The objective of this study was to evaluate the influence of different cover crop seeding timings and methods on cover crop biomass production, weed suppression, and soil coverage. Research trials were conducted at the NDSU North Central and Carrington Research Extension Centers in 2025. The experimental design consisted of a randomized complete block design with six treatments and six replications. Treatments included a control - no cover (T1), volunteer HRSW only (T2), volunteer HRSW with turnip and hairy vetch broadcast (T3), volunteer HRSW with turnip and hairy vetch drilled (T4), volunteer HRSW with winter rye broadcast (T5), volunteer HRSW with winter rye drilled (T6). Cover crops were broadcast at HRSW flowering (Feekes 10.5) and drilled immediately after HRSW harvest. Aboveground biomass of cover crops (including volunteer HRSW) and weeds was collected using a 0.25 m^2 quadrat. Plot images were captured with a professional digital camera and analyzed using Stover software to quantify soil surface cover. Across both sites, treatment T3 demonstrated superior performance, exhibiting the highest soil cover and cover crop biomass, coupled with the lowest weed biomass. Turnip and hairy vetch (T3) established and developed more effectively when broadcast at HRSW flowering, indicating strong adaptability to this timing. In contrast, winter rye showed poor establishment when broadcast, likely due to poor seed-to-soil contact. Drilled treatments (T4 and T6) consistently performed well across sites, likely due to improved seed–soil contact and uniform seeding depth. These factors reduced establishment risk and resulted in good soil cover and cover crop biomass, while maintaining low weed pressure. Grain yield remained stable across all treatments at both sites, suggesting that integrating cover crops could be a viable strategy for intensifying and diversifying wheat-based production systems.

7 Luís F. B Pires Cover crop options for prevented planting areas in North Dakota

Excessive rainfall, flooding, and other extreme weather events can delay planting or devastate planted acres, forcing producers to declare prevented planting. While prevented planting is often perceived as a setback, it also presents an underutilized opportunity to establish cover crops and improve soil health. When left unplanted, these fields are highly susceptible to erosion and biological degradation. The objective of this study was to evaluate the performance of ten cover crop species in terms of aboveground biomass production and soil surface coverage when seeded during a simulated June prevented planting window. The trial was conducted at the NDSU North Central Research Extension Center in Minot, North Dakota. The experimental design was a randomized complete block with three replications. Treatments included hairy vetch, common vetch, red clover, radish, sorghum-sudangrass, piper sudangrass, pearl millet, Japanese millet, forage barley, and cereal rye. All cover crops were drilled on June 5, 2025. Aboveground biomass was quantified using a 1 m^2 quadrat, and soil surface cover (%) was assessed through digital image analysis using the Stover software. Sorghum-sudangrass demonstrated exceptional vigor, producing the greatest biomass (7,536 kg ha^{-1}), followed by piper sudangrass and pearl millet, with average biomass yields of 5,123 and 4,533 kg ha^{-1}, respectively. In contrast, cool-season species exhibited limited biomass production. Cereal rye produced 698 kg ha^{-1}, while red clover had the lowest biomass at 463 kg ha^{-1}. Despite these differences, most treatments achieved greater than 90% soil surface coverage. The results highlight a clear phenological mismatch for cool-season species planted in June, as they struggled under elevated temperatures and thermal stress. Conversely, warm-season C_4 grasses, particularly sorghum-sudangrass, were well adapted to the prevented planting window, maximizing biomass production while providing rapid soil protection. Among the species evaluated, warm-season grasses represent the most effective option for combining erosion control and biomass accumulation in prevented planting scenarios in North Dakota.

Student - Cover Crops and Nutrient Management

8 Ava Antic Closing the Yield Gap of Soybeans after Cereal Rye through Sulfur Application

Cereal rye is a common cover crop in the Midwest due to its overwintering biomass and soil fertility properties. Despite common adoption, research is still needed to improve soybean yield after cereal rye. Fertility management practices are needed to mitigate cereal rye immobilization of sulfur and are integral for further cereal rye adoption at the farmgate. This study examines which combination of urea and/or gypsum is needed to enhance soybean yield in both cereal rye and no cover systems. Preliminary conclusions are that sulfur application (in pelletized gypsum form) can improve soybean nodulation and fixation throughout the growing season to in return increase yield. The addition of sulfur had the same yield implications in cereal rye and no cover systems. The sulfur application yielded more than a nitrogen (urea) application. However, the combination of applying sulfur and nitrogen marginally increased yield in 2023 and 2025 compared to a singular nitrogen or sulfur application in West Lafayette, Indiana. Harvest data from 2023 through 2025 are analyzed in this study to dive deeper into the sulfur nitrogen yield interaction.

9 Susanna Berg How does Cereal Rye Cover Crop and Reduced Nitrogen Management Affect Soil Microbial Structure and Corn Root Architecture?

The implementation of cover crops is known to holistically benefit soil health through the retention of soil and additional organic matter. However, the impact of cover crops in combination with nitrogen (N) input levels lacks ample research. The effect of long-term cereal rye and variable N fertilizer levels on microbial community structure and microbial carbon use efficiency was evaluated at the Southeastern Purdue Agricultural Center (SEPAC) in a corn and soybean rotation system. SEPAC is host to silty, poorly drained soils, typical of the Eastern Corn Belt. The low organic matter area would benefit from the increase in microbial biomass and nutrient cycling efficiency from the cover crop treatment. Treatments are a two-factor split plot design with cover crop versus no cover crop, and normal (190 lbs/ac) or low (140 lbs/ac) nitrogen. Microbial structure was assessed using total phospholipid fatty acid (PLFA) abundance, fungi and bacteria populations, carbon respiration, and 18-Oxygen water tracing carbon use efficiency. Changes in plant carbon allocation analyzed against multi-depth root architecture, including root length, biomass, surface area, and average root diameter will help to better understand system resilience and root growth decisions for nutrient acquisition across variable microbial environments. The results of this study will contribute to the potential interactions between cereal rye cover crop and nitrogen management and their effect on carbon dynamics and root growth, with implications for crop productivity.

10 Robert Fowler Environmental Effects of Cover Crop Biomass in Southern Minnesota Farm Systems

Cover crops (CC) are an integral practice in conservation agriculture. However, there exists some uncertainty at which planting rates and subsequent biomass levels CCs deliver measurable ecosystem services. Controlling soil erosion and subsurface inorganic nitrogen losses are of particular interest when including CCs in rotation planning. The costs of planting at various rates can be compared to effective biomass thresholds in order to make more informed management decisions. To assess the ecosystem services of increasing CC biomass attainment, we planted cover crops at multiple seeding rates in plots established in Saint Paul, Waseca and Lamberton, MN in fall 2024. Cereal rye treatments of 10, 20, 40, and 80 lbs/ac and oat/radish treatments of 10+1, 20+2, 40+4 and 60+6 lbs/ac were compared to a fallow control in a randomized complete block design with four replicates. We used mesh erosion mats to compare water-borne sediment movement in all treatments. Ceramic cup lysimeters have been installed in St. Paul and Waseca to determine subsurface NO_3^- losses under select treatments and the control. Soil N balance has been investigated using fall and spring 3-depth soil cores. CC aboveground biomass has been harvested and tested for N content to establish uptake. Another portion of this study involves measuring arbuscular mycorrhizal fungi (AMF) legacy following select CC treatments in a subsequent soybean cash crop. We will measure concomitant soil health parameters such as aggregate stability, organic nitrogen (ACE), potentially mineralizable carbon (PMC) and soil phosphate. For this poster, we will focus on the relationship between CC biomass, sediment losses, NO_3^- leaching and soil N economy. Data from the completed 2024-25 season will be presented. This study is ongoing and data from the 2025-26 season is being processed. Preliminary results from 2025-26 may also be presented.

11 Hannah Francis Rye cover crop N-uptake, decomposition, and partitioning in SOM pools in Upper Midwest cropping systems

Context: Rye (Secale cereale) is a useful nitrogen (N) scavenger when used as a cover crop in Upper Midwest dairy systems, where excess nitrogen is often present post-silage harvest because of fall manure applications. While growing rye decreases pre-plant soil nitrate levels, after the cover crop is terminated, farmers commonly ask about the fate of the accumulated cover crop nitrogen. The mineral associated fraction (MAOM) of soil organic matter (SOM) is an important mediator of soil N cycling, so tracing the fate of cover crop N into SOM pools will help us understand how the N from a cover crop cycles through, or builds, soil organic nitrogen pools.
Objective: We seek to determine the partitioning of above-ground cereal rye cover crop N in soil N fractions (POM, particulate organic matter, and MAOM) as influenced by cover cropping, manure, and their interaction throughout the growing season in a corn silage system.
Methods: A randomized complete block (silage grown with or without a rye cover crop and with or without fall-applied manure) design field study was conducted in Arlington, WI. Microplots of 15N enriched cereal rye were established within whole plot treatments. Soil samples within the microplots and whole plots were collected throughout the silage growing season.
Results to come: While we are still processing data from this past growing season, other work has demonstrated that most of the N from a cover crop does remain in the soil. Additionally, most bioavailable N comes from the MAOM-N pool in agricultural soils. Thus, while nitrogen from a rye cover crop may not be plant-available during the growing season, it may provide a valuable contribution to soil organic N pools. This positions rye as a critical control for excess N in the system with potential to build longer term N stores.

12 Kristina Harms — Comparing Two Years of Organic Sweet Corn Production within Clover Living Mulch Systems

Sweet corn (Zea mays) is a popular warm season specialty crop that occurs across many locations in the United States but can pose a challenge, through water and nitrogen resources. Research conducted in 2024 and 2025 at the SDSU Southeast Research Farm, in Beresford, South Dakota, investigated the impact of established clover living mulch on organic sugary enhanced sweet corn variety Who Gets Kissed© sweet corn (High Mowing Seeds). Two years prior to sweet corn planting, three clover cultivars were established: 'Domino' white clover (Trifolium repens), 'Aberlasting' white x kura clover (T. repens x ambiguum), and 'Dynamite' red clover (Trifolium pratense) with a bare-ground control. Acorn squash (cucurbita pepo) and cabbage (Brassica oleraceae) were grown during the first two years of clover establishment with four different soil management combinations (till, till + fabric, no-till, no-till + fabric) over all whole block treatments. A John Deere tractor pulled a strip till attachment to create 12-inch-wide strips through all clover whole plot and soil management sub-plot combinations for sweet corn to be direct seeded. Weed biomass was highest in the red clover treatment with annual weeds such as 'palmer amaranth' (Amaranthus palmeri) and 'lamb's quarters' (Chenopodium album). Weed biomass typically decreased as the season progressed; however mid-season differences in climate between 2024 and 2025 distinguished differences of late season clover and weed pressure. Sweet corn yield, graded in accordance with USDA standards for husk off marketability, decreased in no-till treatments of all clover cultivars. Historic usage of fabric did not impact sweet corn yield. As demonstrated by this work, clover living mulch competition impacts vary based on seasonal weather. Overall, clover living mulch systems have benefits for field pathways, but continue to interfere with sweet corn growth and yield.

Student - Cover Crops and Pest Management

13 Luis Esteban Gonzalez — Effect of Winter Cereal Rye Variety on Allelochemicals, Seedling Disease, and Yield of Corn

Reduced corn yield following a winter cereal rye (CR) cover crop (CC) has been attributed to various factors, including CR biomass production, allelopathy, and seedling disease. Biomass, production of benzoxazinoids (BX) allelochemicals, and corn seedling disease vary among CR varieties. Consequently, we hypothesized reductions in corn yield may vary among CR varieties and be associated with greater biomass production, increased BX production and more severe seedling disease. A field trial was established in which corn was planted following four cultivars of CR (Serafino, Elbon, Aroostook, and Rymin) and a control without CR. Data collected included CR biomass, BX concentration in soil, root rot severity, and yield of corn. Wet spring conditions delayed field activities, and all CR varieties were heading at termination. Elbon produced the most biomass (9 Mg/ha) of all CR varieties (P<0.001). No differences in biomass occurred among the other varieties. No differences in BX concentration in soil among CR varieties were detected (P=0.2773). Corn seedlings in CR plots had more severe root rot than the control, and among varieties, the most severe root rot occurred following Serafino (P<0.05). Yield of corn was greatest in the control plots (P=0.0027) and no differences in yield were observed among the CR plots. These data do not support our hypothesis. This field trial is being repeated this growing season. Data from these studies will inform the best management strategies and the choice of CR variety to mitigate yield loss.

Student - Cover Crops and Soil Health

14 Yang Chen — Soil C functional dynamics response to various conservation practices in a 33-year-old field trial

Microbial carbon use efficiency (CUE) has been well documented due to its key function in coupling soil carbon (C) sequestration and greenhouse gas emissions. For agroecosystems, higher microbial CUE might represent higher soil organic matter (SOM), food production, and less CO2 production. At the same time, long-term traditional agricultural practices may lead to soil C loss and soil acidification, thus affecting soil health and sustainability. Some studies have shown that conservation practices (such as no-till) may improve soil health by regulating microbial CUE and soil C functional dynamics. However, the response of soil microbial CUE and C functional dynamics to long-term rotation and cover cropping is still unclear. Thus, we collected soil samples in the Purdue University Water Quality Field Station (WQFS) located at the Agronomy Center for Research and Education (ACRE) with the treatments of Prairie (Pr), Continuous Corn (CC), Corn / Soybean Rotation (CS), Continuous Corn + Rye (CC-R), Corn / Soybean Rotation + Rye (CS-R), Continuous Corn + Kura Clover (CC-K) in 2025 summer. We used 18O-water labelled approach to measure microbial CUE. Meanwhile, various soil C pools, and related biological indicators have also been measured. In this poster, we presented the results of soil total carbon (TC) content, the ratio of soil total carbon to total nitrogen (C/N), microbial biomass carbon (MBC) content, and extracellular enzyme activities (BG, NAG, ACP). The results of 18O-water labeled CUE, POC & MAOC, soil microbial community, PLFAs are still under analysis. In addition, we also plan to test soil microbial necromass & lignin phenols. In the follow-up analysis, we plan to explore the response pattern of microbial CUE and various C pools to conservation practices (cover cropping and rotation) combined with linear regression analysis, mixed-effects model, random forest modelling, and structural equation models. Through above efforts, we aim to get more evidence of how microbial CUE and various C pools response to cover cropping and rotation, which is important for agricultural systems in responding to climate change and safeguarding food security.

15 Tyler Meyer — Combined Effect of Irrigation, Cover Crop, and Tillage Practices on Crop Yield, Crop Water Use, Nitrate Leaching and Soil Health in Sandy Soils of Central Minnesota

Sandy soils make up a significant portion of Minnesota's crop land and are the largest users of irrigation. Sandy soils drain much faster, which can increase nitrate leaching by reducing the soil water residence time for denitrification to occur. Cover crops and tillage practices, like no till, can potentially help alleviate excess nitrate leaching while also improving soil health, but these practices have not been fully studied in sandy conditions. The objective of this study is to determine crop yields, nitrate leaching, crop water uptake, and soil health metrics under combinations of cover crop usage and tillage practice under different moisture regimes simulated by irrigation at two locations in Minnesota’s central sandy region. It is important to understand cover crop and tillage effects on the sandy soils of this region due to faster drainage, leading to potentially increased nitrate leaching and a decrease in crop water availability. Preliminary results show minor differences in yield and average soil volumetric water content between treatments.

16 Liting Mai — Assess the Impact of Cover Crop on Agroecosystem Production and Soil Health through Knowledge-Guided Machine Learning

Cover crops have been recognized as one of the effective agriculture practices to increase soil organic carbon (SOC), enhance soil health, and promote agricultural sustainability. At the same time, it may reduce cash crop yields depending on soil properties, weather conditions, and management practices. This trade-off has been studied locally, but still unclear over large spatial content. Effective and efficient approaches are required to assess the impact of cover crops on crop production and soil health. Conventional process-based models require high computational cost and more efficient ways to include observational constraints; while existing data-driven models remain highly uncertain due to limited training data and the nature that "black box" models cannot capture the complex biogeochemical processes. Therefore, knowledge-guided machine learning (KGML) was proposed to address the above challenges by integrating knowledge embedded in a process-based model and machine learning techniques. This study leverages KGML to quantify the impact of cover crops on SOC and yield across the Midwest U.S. This study aims at addressing three key scientific questions at a regional scale: (1) What is the trade-off between cash crop yield and SOC when using cover crops? (2) How does the harvest date of cover crops impact cash crop yield and SOC? (3) How can remote sensing biomass data improve above-ground cover crop biomass simulation and quantify net SOC benefits? Specifically, we first generated synthetic data using a process-based model, Ecosys, for ~11,000 fields from 2008 to 2020. This data was used to train a GRU-based model, with inputs including daily weather forcing, soil properties, and crop management practices. Except for yearly SOC and yield, the model also predicts yearly soil residue, surface residue, cover crop's biomass because they are the intermediate variables of the carbon cycle. For validation, we found that the KGML simulated results were consistent with the Ecosys simulated results through comparison across seven scenarios, including no cover crop as the baseline, and various harvest dates and fertilizer applications for non-legume cover crops as the treatment scenarios. Furthermore, we are verifying the KGML data directly at the observation site after confirming the comparability of Ecosys and observational data. The model will then be applied to regional-scale analysis. This research will contribute to the understanding of sustainable agricultural practices and the optimization of cover crop management for enhanced soil health and productivity by leveraging the state-of-the-art KGML techniques.

17 Mehmet Ozturk — Evaluating Fall and Spring Cover Crop Strategies for Soil Health and Sugar Beet Performance in the Red River Valley

Integrating cover crops into sugar beet systems in the Red River Valley remains challenging due to short fall establishment windows, yet comparing fall and spring planted covers is essential for identifying reliable pathways to maintain soil protection and early season living roots. To evaluate these strategies, we measured soil physical, chemical, and biological indicators from spring soil samples collected two to three weeks after sugar beet planting, and later quantified sugar beet yield and quality at harvest in September or October. The study spans both on farm and research station experiments, enabling assessment of treatment effects across diverse soils, weather patterns, and management contexts. Yield will be modeled as a function of cover crop treatment using mixed effects approaches with site and year as random effects, and complemented by random forest analyses to determine the relative influence of soil health metrics and weather variables. Final results will be presented following completion of the ongoing data analysis.

18 Charlee Williams — The effects of cover crops and two different nitrogen rates on soil biological properties

Nitrogen leaching losses from corn–soybean systems continue to challenge the Corn-Belt region. Cereal rye (Secale cereale L.) cover crops offer a potential solution by scavenging residual nitrogen and improving soil biological activity and soil health. The objectives of this study were to evaluate the effect of a cereal rye cover crop on soil health metrics, as affected by two different fertilizer N rates for the corn crop. This study was conducted at the Southeast Purdue Agricultural Center (SEPAC) in Butlerville, IN, evaluating four types of treatments: No cover/normal nitrogen; No cover/low nitrogen; Cover/normal nitrogen; and Cover/low nitrogen. We hypothesized that cereal rye cover crops would increase soil biological activity and labile carbon and nitrogen pools compared to no cover crop, and these effects would be maintained even under reduced nitrogen fertilizer rates. The soil biological properties assessed included enzyme activity, permanganate oxidizable carbon (POXC), Autoclave Citrate-Extractable (ACE) protein, and potentially mineralizable carbon (PMC), all of which are sensitive indicators of short-term changes in soil conditions. Overall, this study will lead to a greater understanding of the combined effects of cover crops and nitrogen fertility on soil biological systems.