Dane Demo Farms

The official newsletter of the Dane Demonstration Farm Network

Volume 1, Issue 2

Cover crop with low disturbance manure injection in-furrow

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Fall Research: Plans and Progress

The fall season has been primarily dedicated to conducting extensive soil sampling for Dane Demo Farms' research team. Our program emphasizes farmer-driven research, making data collection a crucial aspect. We have successfully collected over 1,000 sample points across three farms, spanning five distinct studies. It is important to note that the types of samples taken for each study surpass the routine soil tests typically conducted for nutrient management planning. For a detailed overview of each study visit the Research page on our official website: https://demofarms.countyofdane.com/Research.

Curious about the process of taking these samples? Please continue reading.

1) Soil health testing: For this particular sample, we collected multiple sections of soil to create one representative sample. Subsequently, we dried the sample before sending it to the University of Missouri's Soil Health Assessment Center https://soilhealth.missouri.edu/ for analysis. The analysis includes determining factors such as potentially mineralizable nitrogen, active carbon (POXC), wet aggregate stability, respiration, and other indicators of biological activity within the soil. This will allow us to assess the level of biological activity present in each soil sample.

Soil health sub-sample

2) Bulk density sampling was conducted by inserting a ring into the soil and subsequently removing it. The soil within the ring was then

Fall Research: Plans and Progress (continued from page 1)

transferred into a paper bag and dried. Dividing the weight of the dried soil by the volume of the ring yielded the bulk density value. Lower values indicate favorable characteristics, as they signify the presence of adequate pore space and water holding capacity, both of which are beneficial for plants.

3) Nutrient stratification refers to the process of analyzing soil samples collected at depths of 0-2" and 0-6" to determine the extent of stratification in pH, phosphorus (P) or potassium (K) levels within the soil. This allows us to gain insights into the distribution of these essential nutrients in a more accurate and comprehensive manner compared to routine soil sampling methods.

Bulk density ring in the soil

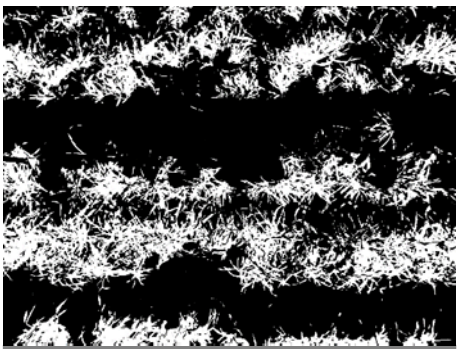
Penetrometer use in-field

4) Soil compaction readings: These measurements are obtained by utilizing a penetrometer. For further information on the utilization of a penetrometer to identify soil compaction, please refer to this instructional video by Francisco Arriaga: 'Using a penetrometer to detect soil compaction' https://youtu.be/Zq_785JqRq8.

5) Nitrate and ammonia: These samples were collected at two depths, 0-12" and 12-24", using a specialized probe that minimizes strain on the operator. Given the unstable nature of nitrogen, it was imperative to transport these samples to the laboratory on the same day for prompt processing, thus ensuring the precision and reliability of the obtained results.

6) Canopy cover measurements at the onset of winter: The aforementioned measurements were obtained utilizing a mobile application called Canopeo. Canopeo is a free application that enables users to assess canopy cover. These measurements hold significance for our research, as they allow us to account for canopy variations across plots.

Cover crop



Cover crop through Canopeo

Are you interested in collecting soil health or other samples from your farm? Please consider reaching out to the local extension staff here in Dane County for state specific guidance. You can find more information at https://dane.extension.wisc.edu/dane-county-agriculture/.

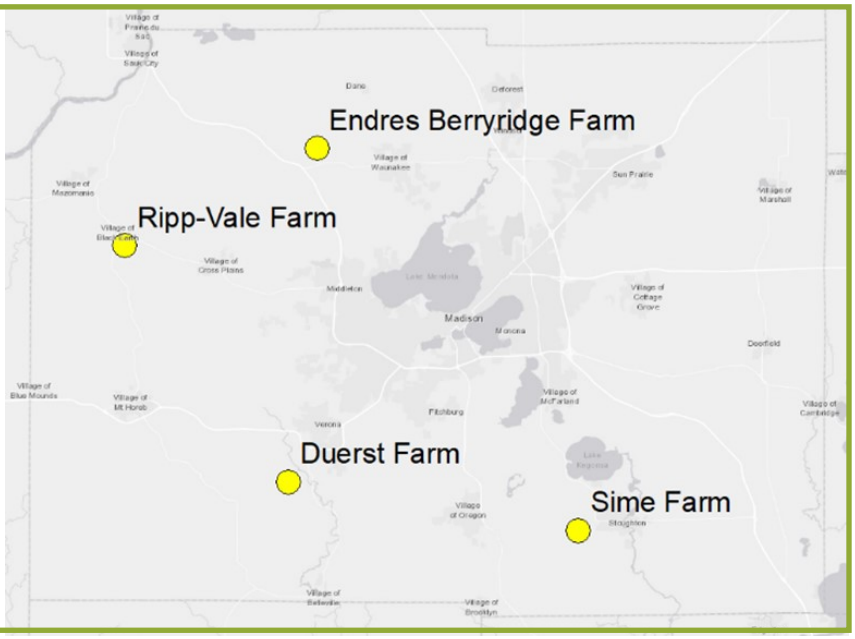
New Farm Joins the Dane Demo Farm Network

Tyler Duerst, Verona

Tyler Duerst operates cropland within the Sugar River watershed. In addition to this, he works for his in-laws in Darlington WI on their medium-sized dairy farm. Within his grain operation, Tyler grows corn, soybeans, and wheat. He practices no-till and plants cover crops after harvesting wheat. Some of the acres Tyler currently manages were part of his family's original home farm. To preserve the land and facilitate its use for agriculture, his family opted to sell a portion of the property to Dane County, responding to overtures from developers. Consequently, the land will remain as open space, which includes areas designated for farming. The County's ownership of a portion of the acres Tyler farms affords unique research opportunities, including the exploration of practices that might be perceived as having increased risk from a farmer's perspective, such as prairie strips. Due to the property's topography, it is also conducive to the establishment of distinctive edge-of-field monitoring sites. With the County's ownership, monitoring can be sustained for an extended period, without the complications of negotiating multiple land access agreements.

Dane Demo Farms Across the County

The Dane Demo Farm network consists of farms located throughout the county and encompasses a diverse range of farm types, sizes, soil types, and weather. The primary objective is to provide a wide array of farmer-driven research opportunities that are relevant to the various farming systems within the county.



Planter Clinic Planned for February 8th

Dane Demo Farms, in partnership with three farmer-led watershed groups, Biological Farmer Friends, Farmers for the Upper Sugar River, and Yahara Pride Farms, will be hosting a planter clinic at the UW-Arlington Research Station on Thursday, February 8th. The main focus of the event will revolve around planter setups for high residue systems. The agenda for the day includes a panel discussion featuring six experienced farmers who will share their insights on planting techniques involving cover crops, manure, and/or previous crop residues. UW experts will provide recommendations on optimal planter setups, and the event will conclude with the opportunity to engage with representatives from after-market manufacturers.

Registration is online at the Dane Demo Farms website: https://demofarms.countyofdane.com/
The program schedule is on page 4.

Planter Clinic Planned for February 8th (continued from page 3)

Event Agenda:

10:30 to 10:45 Registration and Refreshments

10:45 to 11:00 Welcome and Introductions

11:00 to 12:00 **Farmer Panel**: Six farmers from across Dane County will share information on their planter set-ups along with their planting situation; how much residue they are dealing with; how they apply nitrogen during planting; and challenges and successes in planting in high residue systems

12:00 to 12:35 Hot Lunch

12:35 to 1:15 **Planter Setup Review**: John Gaska, Research Support for the Conley program at UW and Brian Luck, Associate Professor and Extension Specialist with UW Biological Systems Engineering will review optimum planter setup for no-till and cover crops

1:15 to 1:45 Q & A with presenters, including the farmer panel

1:45 to 2:00 **Representatives** from Copperhead Ag, Martin-Till, Precision Plant, and Yetter will share introductory information on the products they provide

2:00 **Ask an Expert**: Attendees are free to visit with after-market representatives and visit the "Ask an Expert" table to seek answers to their planter setup questions and check out a collection of closing wheels

Dane Demo Farms in the News

The press event organized at the Sime farm in September was a success, attracting the participation of three local news stations. The County Executive, Joe Parisi, together with Josh Odekirk from the USDA-NRCS and Dr. Francisco Arriaga from the UW, addressed the audience on behalf of the project.

Pictured: Bruce and Karl Sime (back center and back right), with Karl's wife Courtney and their three boys

Featured Research Project: Cover Crop Termination

One project that is conducted at all participating farms is the cover crop termination study. This study aims to determine the optimal time to end a cover crop while still achieving improved soil health, weed control, and increased soil organic matter, without impacting subsequent crop yields.

Each farm has allocated between 2 to 3 acres of land for this project, which will be carried out for four consecutive years. The study includes various crop rotations, such as continuous corn silage, corn and soybean rotation, and continuous corn.

All farmers are implementing the following cover crop treatments:

1) No cover crop
2) Early termination of cover crop in spring
3) Termination of cover crop 2 weeks to 10 days before planting
4) Termination of cover crop at planting

A few farmers have chosen to add additional treatments, which include:

1) Termination of cover crop 10 days after planting
2) Crimping the cover crop at planting
3) Harvesting rye for forage

As part of the soil sampling process, we have collected all the samples mentioned in the article 'Fall Research: Plans and Progress' on pages 1-2. We will continue to monitor these plots for the next four years and share any new findings as they emerge.

Sign Up for the Dane Demo Farm Newsletter

Sign up and stay informed!

As part of our newsletter subscription, you have the **option to receive text alerts about upcoming field days and tours**. To subscribe, visit our website at demofarms.countyofdane.com, select 'learn more', and choose 'newsletters'. There you will find a 'sign up' button that will open a form where you can enter your information and select your preferred method of staying connected.

Dane Demo Farms

A Word from Extension

Surface Soil Test Phosphorus Values: A Water Quality Risk Assessment

Chelsea Zegler, Ag & Water Quality Educator

Chelsea Zegler

Soil nutrients are often distributed unevenly throughout soils. This occurrence, called nutrient stratification, is common in agricultural and natural settings. For instance, due to the concentration of plant roots, residue (unharvested crop "litter" or biomass left at the surface) and weathering, soils tend to have more organic matter close to the soil surface. The concentrated organic matter appears as a dark layer in soil profiles (Figure 1). Phosphorus is often highly concentrated at the soil surface in crop fields because the amount of fertility applied exceeds the amount removed in crop harvest. Although the stratification of phosphorus (P) also occurs in nature, in agricultural settings there is an increased risk to surface water quality because the occurrence is amplified. The risk of nutrients entering surface water resources is elevated when: 1) the soil surface has higher levels of P, 2) there is a lack of growing plants in the fallow season and 3) runoff is likely due to snowmelt and heavy precipitation events.

Precipitation that is unable to filter into the ground, known as 'surface runoff ', travels into our streams, rivers, and lakes. Surface runoff mostly interacts with the top inch of soil along with what is on top of it. Consider when the ground is frozen, or snow covered: water is constantly interacting with the soil and other fertility sources (fall applied synthetic fertility, manure, plant residue, etc) during freeze-thaw events. Scientists have started to refer to this area as the "zone of interaction" (Figure 2). Fertility sources can release P when they interact with this water, creating dissolved P. Dissolved P, the portion of P in solution with water, does not need soil movement to move off the field with surface runoff . Fallen leaves contribute phosphorus pollution in a similar mechanism in forested areas.

Figure 1

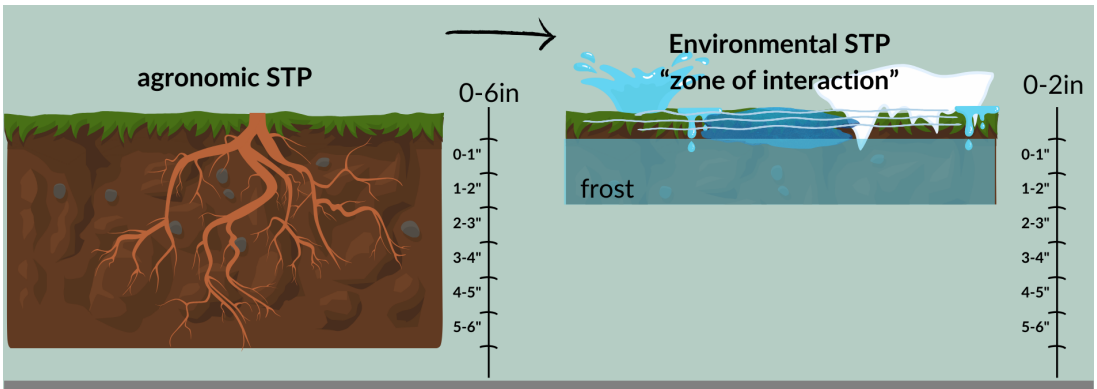


Figure 2

Typically, soil samples are taken to a 6-inch depth for agronomic nutrient management decisions. The composite samples provide an average nutrient level across the depth and can mask how nutrients differ within each inch of the profile. Figure 3 demonstrates how soil samples can have the same average soil test phosphorus (STP) value, but the distribution can vary greatly. Research is not conclusive on whether nutrient stratification in the top 6 inches impacts crop yield, as most crop roots are within this depth. However, there is growing evidence that high STP levels in the top two inches of soil (greater than 75 parts per million (ppm)) leads to increased dissolved P in surface runoff from fields . The loss of dissolved P from fields (and into surface water) occurs especially while the soil is frozen, as we struggle to control water and P movement during

this period. Dissolved P is the portion of P in solution with water and does not need soil movement to move off the field with surface runoff.

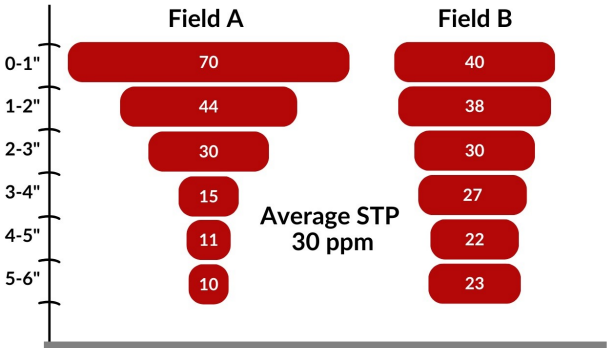


Figure 3

Data from Wisconsin and Ohio show that STP levels in the top inch of the soil are 69% and 55% higher respectively than the average composite STP values in the corresponding 6-inch sample, irregardless of tillage (Zopp et al., 2019, Baker et al., 2017). When it comes to reduced tillage systems, the Discovery Farms database shows the average tilled field STP in the top inch was 59 ppm, compared to 85 ppm in no-tilled fields. However, more data is needed to understand if this stratification is temporary while soils adjust or are alleviated by additional soil health practices.

One recent study highlights the potential for certain cover crop species to reduce this risk, while others can worsen the issue. Researchers at Purdue looked at the impact of long-term cover crop adoption on surface soil test phosphorus levels. Fields were in a corn-soybean rotation with identical fertility management, with either no cover crops, annual ryegrass, cereal rye, or an oats and radish mixture seeded annually after crop harvest for 9 years. Long term use of annual ryegrass decreased STP in the first two centimeters, while oats and radishes increased STP compared to the no cover crop control, a similar trend was seen for phosphorus released when the soils were mixed with water. The researchers hypothesize the overwintering grass cover crops were more effective in managing surface soil phosphorus loss due to their higher root biomass at the soil surface and less decomposition time before crop growth. Annual ryegrass and cereal rye extensive shallow roots utilize vulnerable phosphorus at the soil surface and their ability to overwinter means a majority of that phosphorus is not released until termination (Figure 4) . The oats and radish mixture have significantly less root biomass at the surface and the phosphorus in the aboveground biomass starts to decompose at the first frost, leaving 4 months of phosphorus release when the ground is frozen and no plants are available to utilize the released phosphorus.

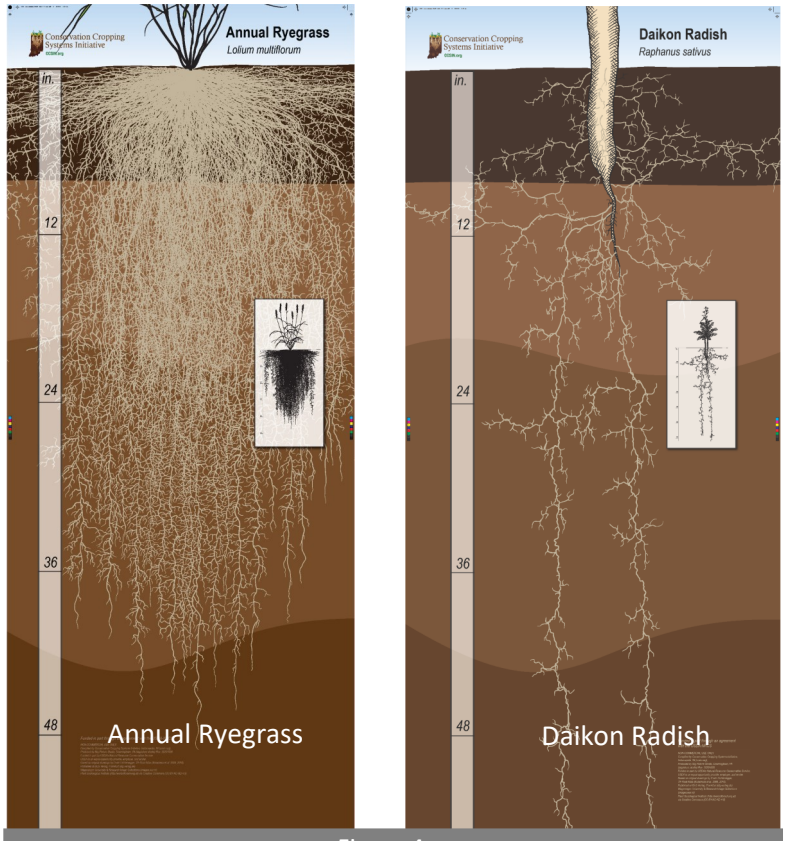


Figure 4

Extension's Agriculture Water Quality Program seeks to explore the relationship between soil erosion best management practices and surface levels of phosphorus. It has long been thought that soil health practices improve bioturbation; that cover crop roots and earthworm activity create channels for water infiltration and movement of fertility from the soil surface. Yet little information exists on the interaction of P between different soil types and cover crop species, and other management decisions on soil nutrient stratification in Wisconsin. The goal is to add insight on the role of long-term no till and cover crop usage compared to sites with more recent conservation adoption regarding surface P levels.

We are looking for high-quality on-farm data to help improve our understanding of (cont. pg. 8)

A Word from Extension (continued from page 7)

the relationship between soil health practices and P concentration at the soil surface. Participating farmers or farmer groups can work with regional outreach specialists to sample field soil at different depths to gain awareness on their nutrient stratification, contribute to the scientific understanding of P stratification, and learn how to minimize nutrient losses. The project kicked off in fall of 2023 and has 50 farmer participants across 24 counties in Wisconsin. The group plans to continue the sampling effort in 2024. If you are interested in participating or learning more, please contact Chelsea Zegler (zegler@wisc.edu).

Events:

Check out the events page on our website to stay up to date on relevant events happening in and around Dane County, https://demofarms.countyofdane.com/Events

Planter Clinic

February 8, 2024 at 10:30 am to 3:00 pm at the UW Arlington Ag Research Station Public Event Bld N633 Hopkins Rd, Arlington, WI, register on the Demo Farms Events webpage or by contacting Kim Meyer, 608-445-1474

NEW Podcast!

The upcoming *Dane Demo Farms podcast* is currently under development and scheduled for release on your preferred streaming platform in February. This podcast aims to provide insightful discussions surrounding various aspects of Dane Demo Farms, including the farmers themselves, their projects, cropping systems, and other related topics within the network. To stay updated regarding the release of our first podcast, please visit our website or follow us on Facebook.

Check out our website at: **demofarms.countyofdane.com**

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