



Pioneering Discoveries

Real Working Farms ● Real World Solutions

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Spring 2009

● Graduation reports to showcase Discovery Farms research results

By Dennis Frame

Over the past seven years, the UW Discovery Farms program has generated tons of data. One of the more daunting tasks is taking all the data from one farm, printing it, and joining columns together so that you can look over several years of monitoring results to determine the impact of specific storm events or management practices. To make sense of this data, you have to understand how it was collected, the strengths and weaknesses of our monitoring systems, and the farming system/management that occurred during the collection process. With all this data at hand, you can begin turning it into information that can be used by producers and agency personnel.

The process of turning data into useable information and summarizing what we have learned through each of our

projects has been called "graduation reports." A graduation report contains all the information available on each project, as well as information on how to access briefs, factsheets and presentations developed from the data. Each project will be unique in terms of the number of briefs, factsheets and presentations. However, the types of information available should be the same from project to project.

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Flume at a Discovery Farms monitoring station.

● High-volume runoff recorded at Pioneer Farm

By Randy Mentz

Early analysis of this year's winter runoff has produced some surprising numbers. Despite having less snowpack this year than last year's record-breaker, there was a lot more snowmelt runoff – 18 times more. Pioneer Farm's stations recorded 1.8 inches of snowmelt runoff compared with last year's 0.1 inches. The last time we saw this much snowmelt was in 2005 when manure runoff and fish kills generated a lot of media attention and spurred the creation of the Dane County Manure Management Task Force.

While 1.8 inches is a lot of runoff, the early March rains caused even more. The rains that pounded southern

Wisconsin from March 7-10 dropped 2.29 inches of rain at Pioneer Farm, 90 percent of which ran off (2.07 inches).

These numbers highlight the influence that soil conditions have on runoff dynamics. The soil was both saturated and frozen ever since the late-December warm spell that melted snow, which then refroze at the soil surface.

Based on field observations, the melting snow at the top of the snowpack ran off very rapidly when temperatures warmed up in early February. Layers of ice in the snowpack and at the soil surface likely prevented downward movement of the melt water, forcing it to run off by flowing over the snow surface and along the frozen soil.

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ABOUT THIS NEWSLETTER:

WELCOME TO *Pioneering Discoveries*, WITH A UNIFIED FORMAT COMBINING NEWS AND RESEARCH FROM DISCOVERY FARMS AND PIONEER FARM. LOOK FOR THIS DOT – ● – FOR STORIES FROM DISCOVERY FARMS AND THIS DOT – ○ – FOR STORIES FROM PIONEER FARM.

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DIRECTORS' COLUMNS



Refurbished milk house allows for more research opportunities

With the construction of the new dairy facility at Pioneer Farm, the old milking parlor has been put to new tasks. Over the past year, between field work and runoff events, Pioneer Farm staff got to work re-fitting the building. We removed old wallboard, tore out old equipment and installed new sheetrock, cabinets and lighting.

This area now provides Pioneer Farm a clean, heated work area for conducting maintenance on equipment, preparing samples and cleaning equipment. We are also planning to use this area for analysis of manure and compost samples.

While we have conducted compost work in the past, the new work area will provide an ideal place for us to analyze manure and compost samples, and we are now gearing up to take advantage of the new space. Research Technician Nick Addison has been reviewing compost analysis methods, and we have been purchasing needed tools and equipment. We hope to have everything set up and ready by early summer.

The new work area will allow Pioneer Farm to expand research conducted in the new high-rise swine facility. While Alicia Prill-Adams has conducted several research projects in the new facility related to nutrition, we have not yet conducted research related to the operation and management of the beneath-barn manure composting system – a unique manure handling system that needs further study.

Dennis Busch, Research Manager, Pioneer Farm

The new work area will allow Pioneer Farm to expand research conducted in the new high-rise swine facility.



How's it going?

As I travel across the state talking with people, one of the first questions they ask is "How's it going" or "How is your budget?" As we all know, these are difficult economic times, and the only thing that is really clear is that the future is going to be different from the past. That said, I want to thank every person and every organization that has worked to maintain the funding and support for Discovery Farms. Your efforts have made a tremendous difference in the level of financial and political support for our program.

We are in a period of uncertainty in regards to budgets, but the mission – "UW Discovery Farms is about identifying and solving on-farm environmental challenges while maintaining and/or enhancing agriculture's economic conditions" – hasn't changed. Over the next 12 months our program will wrap up some of our initial projects and publish this information in a wide variety of settings (peer review papers, newspapers, magazines and our website). We have also begun the task of looking for new farming systems and settings that will help explain what's happening on farms throughout the state. The selection of new projects will be done by our new steering committee. We plan to begin this process this summer.

We are also going to explore the difficult challenge of understanding the relationship between what comes off agricultural fields versus what is often measured in streams and lakes. Some of the questions that have to be answered include:

What is an acceptable level of loss (for sediment, nitrogen and phosphorus, pathogens, etc.)?

How do we accurately assign losses to settings other than agricultural fields (woods, wetlands, in-stream losses, storm water runoff, etc.)?

How are these losses going to be determined (through models, stream monitoring and edge-of-field monitoring) and what are the advantages and disadvantages of each method?

If you think about it, the key question is, how are producers going to prove their farming systems are meeting the acceptable level standard? Can we find a simple method to determine what is acceptable, or are we going to have a system based on large volumes of paperwork?

Dennis Frame, Co-director, Discovery Farms

● Results available from study of headland-stacked poultry manure



Creating a headland stack of poultry manure.

By Paul Kivlin

The UW Discovery Farms program investigated the potential for nutrients to move from headland-stacked poultry manure into waters of the state (surface or groundwater).

Headland stacks are manure piles stored on bare soil at the edge of a crop field prior to application. Stacks are generally applied within three months but may remain in place for up to a year. Stacking – occurring on farms that haul daily or clean livestock lots – is common in the poultry industry because of the manure’s high dry matter content.

This study began with proposals to Wisconsin DNR in the fall of 2002 and was completed with a final report in November 2008. Results indicate that poultry manure (or manure with

similar dry matter content) can absorb and hold large amounts of water, suggesting that headland stacks have limited potential to pollute surface or groundwater if stacked in the proper manner and on proper sites.

Staff from Discovery Farms worked with Paul Kivlin of the UW Nutrient and Pest Management Program on the research as well as development of factsheets, briefs and presentations covering the following topics:

- Discoveries on Headland-Stacked Poultry Manure
- Characterization of Poultry Manure
- Potential Runoff of Stacked Poultry Manure
- Stockpiling Manure and Soluble Salts: Site Remediation for Crop Production
- Effect of Headland Stacking of Poultry Manure on Groundwater

Please find these titles at the Discovery Farms website:

www.uwdiscoveryfarms.org/special/poultry

To get printed copies, or for more information, call 715-983-5668 or send e-mail to jgoplin@wisc.edu, drframe@wisc.edu or paul.t.kivlin@uwrf.edu.

● Pioneer Farm testing alternative surface-water samplers

By Dennis Busch

At UW-Platteville Pioneer Farm, scientists test the adoptability and financial ramifications of farming practices when studied together as a part of a whole-farm applied research system. One area of study at the Platteville sites includes monitoring agricultural runoff.



Monitoring surface water at Pioneer Farm.

In order to estimate the pounds of nutrient or sediment that leave a field or basin, we must have two pieces of information: volume of discharge and concentration. Pioneer Farm uses U.S Geological Survey gauging stations to determine volume. The concentration of nutrients or sediment is determined by collecting a sample at the site and sending it to UW-Stevens Point Water and Environmental Analysis Laboratory. Pounds of nutrients or sediment can then be determined by multiplying the volume by the concentration.

There are several methods of collecting surface-water runoff samples. Each has advantages and disadvantages. Pioneer Farm, the University of Arkansas and the Minnesota Department of Agriculture are working together to evaluate three alternative surface-water sampling techniques:

Real-time monitoring with time-based sample collection. This sample collection method relies on computer connection to the gauging station that allows the operator to collect a water sample based on current conditions at the site. This technique provides good sample collection on small and large events, but it is costly.

Flow-weight composite sample collection. Instead of monitoring events and triggering samples remotely, the flow-weight composite method collects samples based on a pre-programmed volume of flow. For example, before an event the technician will program the sampler to collect one sample for every 1,000 gallons of water that is discharged through the flume. This technique is less costly, but coverage is not as complete.

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● *Discovery Farms staff news: New research tech, intern update*



Aaron Wunderlin joined Discovery Farms as a Research Specialist. He grew up near Potosi on a dairy farm that's been in his family since 1854. Aaron received a BS in biology from UW-Platteville and an MS in environmental science and policy from UW-Green Bay.

Aaron has many years of research and data collecting experience. Besides a thesis looking at streams in Wisconsin's national forest, he has worked on trout streams in southwest Wisconsin, wolves in Yellowstone National Park and black bears in northern Wisconsin.

Aaron likes spending his time outdoors. He enjoys hunting, fishing, camping and hiking. He also likes traveling, usually in

the form of a camping trip. Aaron and his wife have two children and live near Green Bay. He will be working out of the Discovery Farms Manitowoc office.



Hi. My name is Brad Goplin, and I am a senior at Osseo-Fairchild High School. I live on a small dairy farm south of Osseo. During my senior year I have the privilege to do work-study for UW Discovery Farms. Throughout my year here at

Discovery Farms, I gained knowledge on how to prepare a Nutrient Management Plan for my dad and uncle's farm. After high school I plan to attend UW-River Falls, majoring in dairy science, and then return to take over the family farm.

Graduation reports to showcase results

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The first step in summarizing the data is the development of several two- to six-page factsheets that provide much of the information and data gathered through each phase of the study. These factsheets may include the following topics, but will vary based on the study design:

- Farm, site and study design
- Equipment, procedures and sampling
- The water budget: understanding surface water runoff
- Sediment losses
- Nutrient losses
- Changes on the farm over the course of the project

The factsheets provide the information learned through the project. One farm might have three short factsheets on when runoff occurs (how much runs off, runoff on frozen ground and the impact of soil moisture on runoff), while another project may have only one factsheet on runoff.

From each of these factsheets, we develop a one- to two-page brief. The purpose of these briefs is to summarize information published in the factsheets. The goal is to put key points from the factsheet into a brief so people can

quickly read these papers and determine if they want to read the entire factsheet. These papers can be printed by the media to distribute our information to diverse audiences. Each brief contains information on how to access the larger factsheet.



Monitoring station collecting data for Discovery Farms.

The final piece outlining what was learned through a project is the development of presentations and slides. This material provides much of the information contained in the factsheets and is put into a series of presentations. These presentations will be available on the UW Discovery Farms website. The presentations are organized in the same manner as the factsheets.

The first project to have all its information organized and summarized on the website is "Headland-Stacked Poultry Manure." (See page 3.) Over the next several months we will be organizing and writing reports for many of our other projects. As projects are finished and placed on our website, we will be sending out news releases and electronic updates to all of our clients. Please visit the Discovery Farms website to access this information. If you have questions or comments, contact our office anytime.

● **Comprehensive Nutrient Management Plans in Wisconsin**

By Kevan Klingberg

Nutrient management is the main environmental issue facing Wisconsin livestock producers. Improved nutrient management practices will enhance farm profits and improve farm relations with rural neighbors. Good nutrient management practices will also reduce the amount of nutrients and sediment that enter waters of the state.



Livestock producers benefit from manure management plans.

Comprehensive Nutrient Management Plans (CNMP) can be thought of as whole farm livestock environmental plans. Certain USDA programs now define circumstances where producers must develop CNMPs in order to qualify for program participation.

What is a CNMP?

CNMPs are conservation plans that are unique to livestock operations, with planning standards and criteria defined and administered by the USDA-NRCS. They document practices and strategies adopted or planned by livestock producers to address natural resource concerns related to soil erosion, livestock manure handling and emergency response actions.

A well-designed CNMP can also be useful when applying for a state or local livestock siting permit, a facility expansion permit, or a manure storage permit. Livestock producers who are interested in specific details about Comprehensive Nutrient Management Planning should talk to their local NRCS staff.

What is the value of a CNMP?

One of the values of a CNMP to agricultural producers comes through the farm-specific process of interacting with a consulting team hired to develop the plan. Another value is the creation of a detailed document that defines current farm conditions and management strategies, lays out future plans and outlines a roadmap towards that change.

How does it fit with State requirements?

Producers who choose to develop a CNMP will meet the State of Wisconsin and local nutrient management requirements. One of the components of a CNMP is the development of a nutrient management plan based on the current NRCS Nutrient Management 590 Standard.

What are the components of a CNMP?

WI-NRCS has a detailed website devoted to CNMP components and expectations for creating a document that meets standards:

www.nrcs.usda.gov/technical/cnmp.html

The website contains downloadable tools, references and templates. All CNMPs must document the natural resource status or impact, as well as management response within the following categories:

1. Introduction, general information and emergency response
2. Maps and site photos
3. Manure and wastewater handling and storage
4. Public health
5. Soil and water conservation
6. Nutrient management
7. Record keeping
8. Feed management
9. Pest management
10. Prescribed grazing
11. Appendix

Each of these chapters, when combined, becomes a Comprehensive Nutrient Management Plan. An assessment of each CNMP component by the agronomic and/or engineering consultant needs to be provided to develop a complete picture of the farm operation. The consulting team helps the producer identify and prioritize farm management response, as needed.

What consultants are qualified to develop CNMPs?

At a minimum, all CNMPs need the expertise of an agronomy consultant and an engineering consultant. The WI-NRCS website lists qualified private sector consultants:

www.wi.nrcs.usda.gov/technical/planners.html

Livestock producers who are interested in specific details about Comprehensive Nutrient Management Planning should talk to their local NRCS staff. An 8-page factsheet about Comprehensive Nutrient Management Plans is available from the UW Discovery Farms office or at our website:

www.uwdiscoveryfarms.org

● *Producers find economic, environmental value in cover crops through Incentive Program*

By Nancy Drummy

Nitrogen lost from agricultural fields reduces yield potential of nitrogen-demanding crops. Nitrogen can leach into groundwater, and is often cited as a contributing factor in the gulf hypoxia issue. This nitrogen loss is commonly associated with excessive applications; however, nitrogen losses can occur even when it is applied at recommended rates.

The majority of nitrogen loss is in the nitrate form and often occurs when crops are not actively growing. Planting a cover crop following harvest of the main crop has proven to be successful in scavenging excess soil nitrates that might otherwise be lost into groundwater. This practice can also hold the nitrogen in the organic form until the following growing season when it can be used by the main crop.

Discovery Farms began partnering with Sand County Foundation in the fall of 2004 to offer cover crop incentive payments to farmers in the Upper Rock River Watershed. Incentive payments are \$10 per acre for non-winter-hardy cover crops and \$18 per acre for winter-hardy cover crops.

One of the goals of this program is to help farmers explore how cover crops can add value to farming systems. From 2004 to 2008, more than 6,000 acres of cover crops were planted in the Upper Rock River Watershed through this incentive program. Each year the number of acres in cover crops has increased. In 2008 alone, more than 2,600 acres of cover crops were established in the area.

Approximately 33 percent of participating farms were grain operations, and 66 percent were livestock operations. Livestock producers planted a cover crop primarily to harvest it as a supplemental feed source in early spring, prior to planting the main crop. They also wanted to capture and retain nutrients from late-summer manure applications.

Livestock producers planted cover crops following corn silage (mid-September through mid-October), small grains and short-season vegetable crops. Winter rye was their cover crop of choice. Seeding costs for winter rye ranged from an average of \$15 per acre in 2004 to \$35 per acre in 2008. Although the \$18-per-acre incentive payment no longer covers seeding costs, livestock producers continue to increase planting acres of winter rye.

Grain farmers planted cover crops following short-season vegetable crops or small grains, primarily for erosion and weed control. Oats were the cover crop used on most grain operations due to inexpensive seeding and easy establishment. Also, because oats winterkill, no spring management or herbicide is required. Seeding costs for oats ranged from \$3 per acre in 2004 to \$7 per acre in 2008. The incentive payment for an oat cover crop is \$10 per acre.

In 2008, with the rising cost of commercial fertilizer, grain farmers started using legumes as a cover crop to provide nitrogen. In the fall of 2008, 18 percent of the cover crop incentive acreage planted by grain farmers was in legumes. Interest continues to grow in using legumes after winter wheat or short-season vegetable crops in order to provide nitrogen for the following crop. More work is needed to provide producers with better estimates of nitrogen contributions from legume crops.

Sand County Foundation and Discovery Farms will continue to offer the cover crop incentive program in 2009. The program endeavors to help farmers realize both the

conservation value as well as the economic value of cover crops. For more information, contact Nancy Drummy at 920-382-4286.



Inset: Field planted in a cover crop mixture of clovers, vetch and tillage radish, seeded in August after wheat harvest. Above: Same field seven weeks later in September.

● Soaring Eagle Dairy: A family affair

By Lisa Bauer

In 1980, after farming for 24 years with his father and brother, Jim Fitzgerald built a 60-cow tie-stall barn to farm on his own. Almost 30 years later, Soaring Eagle Dairy has about 950 more cows, several more barns and three additional owners. Along with Jim's wife Sandie, farm partners include their three daughters: Kelly, Julie and Stacy.

Julie Maurer said they also have a "kid brother" and another sister who work off the farm, but "There's opportunity for them here if they want to come back. Mom and Dad have always told us, 'If you ever want to come back to the farm, you're always welcome.'"

Unlike her sisters, who started at SED after high school, Julie's path to the farm was a bit longer.

"We did chores all of our lives, so I felt like I had to leave the farm for awhile," she added. With an associate's degree in accounting, she worked at Kohler for 11 years in hospitality and accounting as well as a manager of several departments. But in 2005, Julie was ready to return to the farm, bringing her wealth of business knowledge and experience.

Julie has her hands full managing SED's parlor, including equipment, supplies and labor, as well as human resources on the farm. She also works on milk marketing and public relations. Sandie does most of the farm's book work. Jim and Stacy's husband Jeremy do crop work and maintenance, and Stacy and Kelly manage the dairy herd.

"For Kelly and Stacy, it was more of a natural decision for them to come back to the farm. They were always more involved in FFA and ag in school. As Dad did, they both went through the UW short course after high school and have always farmed," Julie said. "They are animal people and enjoy working with the cows. They can spot a cow that's just a little bit off a mile away. That's just their gift."

As evident from her easy-going manner, Julie's gift is working with people. She adds that the farm is lucky to have employees with good tenure, including a feeder that has been with them for 8 years and one of the milkers on the farm for 22 years.

Employing more than 20 people at any given time, SED has come a long way since 1980.

In 1994, Jim started using a custom heifer grower and milked about 90 cows. In 1997, he built a 400-cow free-stall barn and



Soaring Eagle Dairy owners and families.

double-12 parallel parlor. A transition barn was added in 1999, allowing the herd to grow to 640 cows. An expansion of that barn in 2004 provided an additional 100 free stalls as well as a dedicated maternity area. And in 2005 a second free-stall barn and expansion of the parlor brought cow numbers to about 1,000.

SED milks three times a day, using the latest technology throughout the farm. Cow comfort is important and led them to add a mist cooling system, rubber flooring and long-day lighting, along with sand-bedded free-stalls. Heifer calves are raised on-farm until 5 months of age then sent to Colorado – they return to the herd 2 months prior to calving. Cows are fed a total mixed ration of corn silage, haylage, corn, cottonseed and corn gluten. Jim grows more than 1,400 acres of crops to provide the herd's forage needs.

The mission of this family farm includes running an efficient, profitable business resulting in high quality dairy products, but it also mentions creating a positive image for the dairy industry, promoting personal growth for all employees and considering Christian values when dealing with one another, the livestock and the environment.

In today's economy, most businesses are struggling, and SED is busy making plans to weather the economic storms.

Julie said the family regularly meets with the farm team: their nutritionist, crop consultant, veterinarian, Extension agent, technicians, dealers and others. The latest conversations in these meetings revolve around keeping costs in line without sacrificing production or animal care.

"It's tough, because we already run a pretty tight ship," Julie adds. "There's no doubt we're operating in the red, but our saving grace is that we have all of our feed bought and paid for in storage. We can handle a few months of bad prices."

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Soaring Eagle Dairy

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SED handles everything as a team. In addition to those meetings, the family also convenes a partners' meeting every other week to talk about financials, employees, the herd or any other issues.

"These are important get-togethers, but it's true that a lot also gets discussed and done under a cow or behind a bunker since we see each other all day," Julie added. "For the most part, we get along well, and it's pretty laid back around here. We're a pretty tight family. We're all from the same mold so we know what makes each other tick and what ticks each other off."

And the advantage to having so many partners includes having time off. Julie said they all work long and hard hours, but when someone needs to get away, they cover for each other.

We were happy to participate in Discovery Farms," Julie said. "We're committed to helping the industry find environmentally sound solutions."

She added that the farm has always had environmental goals, and the family is mindful about their impact on the land.

"We've learned a lot as has the industry in going through the Discovery Farms process," Julie said. "We've always tried to do things before they were mandated, such as installing buffer strips along creeks. What's really been shocking is how complex the picture is."

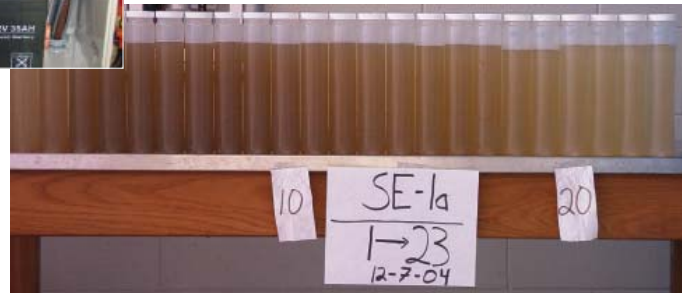


She explained that the farm's nutrient management plan is important in protecting natural resources. All manure on the farm is scraped from barns into a collection pit that flows via a flume to an earthen lagoon behind the barns. Manure is hauled in the fall to 1,400 acres owned or leased by SED. Closer fields have manure injected into the ground by a tractor and drag hose while fields farther away rely on tankers to haul the manure. They incorporate manure into the soil within a few hours and have established voluntary buffer strips to protect waterways.

Discovery Farms research at SED found, among other things, that when monitoring surface water in tile-drained landscapes, it's crucial to identify the extent of the tile drainage area because water from outside the defined surface watershed can cross boundaries via tile.

For Julie, the Discovery Farms work is another part of her job that she's enjoyed.

"Farming is such a refreshing career compared to corporate life. That decision to come back and farm was a good one," Julie said. "I wouldn't change it for anything."



Inset: Datalogger used to monitor water quality at Soaring Eagle Dairy. Above: Collection bottles of sampled water at SED.

Alternative surface-water sampling at Pioneer Farm

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Single-stage passive sample collection. Passive systems do not rely on automation for sample collection. This system collects a sample by siphoning water from the flume when the water reaches a specific depth. This technique is very inexpensive but provides limited sampling.

The final comparison for the alternative systems will be based on how accurately we can predict nutrient and sediment loss and their relative costs, including purchase, installation and maintenance.

The project is funded, in part, by a grant from the Minnesota Department of Agriculture.

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