

How has the Wisconsin Dairy Industry Benefited from the Discovery Farms Program?

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Introduction:

The Discovery Farms Program began in the fall of 2001, with support and assistance from the University of Wisconsin – Extension and College of Agriculture and Life Science, the Department of Ag, Trade and Consumer Protection, the Department of Natural Resources, the Natural Resources Conservation Service, the Wisconsin Pork Producer Association and the Wisconsin Milk Marketing Board.

The mission of the program is to gather water quality information from a variety of farming systems and setting, and to determine the impacts of agriculture on the environment. There are several key differences between this research program and other programs conducted throughout the United States. These differences include:

- ✓ Working on actual farms that must remain profitable and not over burdened by the research projects;
- ✓ Evaluating farming systems and not individual components;
- ✓ Having producers participate in the design and implementation of the project;
- ✓ Having producers lead in the identification and implementation of best management practices to correct any environmental concerns;
- ✓ Gathering data on sediment and nutrient losses from farm fields and watersheds and evaluating this data against field management practices;
- ✓ Gathering actual data from farms versus modeling (estimating) the losses based on small trials done in a controlled setting.

The purpose of this paper is to summarize some of the findings and “discoveries” that have occurred over the past 33 months of the program.

What have we learned?

The Discovery Farms Program has three areas of concentration:

- ✚ Core Discovery Farm Projects,
- ✚ Special Discovery Farm Projects, and
- ✚ Environmental Education and Training.

This paper is divided into each of these areas of concentration and further sub-divided into specific water quality concerns (sediment delivery, nitrogen loss, phosphorus loss, pesticide losses, pathogen movement, etc.) The core projects are on individual farms and are considered to be long term projects (5–7 years in duration). Special projects are one to three years in duration and are designed to target a specific environmental concern. Education and training are designed for a number of different audiences (producers, consumers, agency personnel, etc.), and

occur on a regular basis. This report will begin with the education and training component and conclude with the core farm information.

Environmental Education and Training:

Producer Education

- Over 437 producers with nearly 125,000 acres farmed in 23 Wisconsin counties received on-farm consultation and nutrient management assessments since the project began through December 31, 2003.
- An additional 138 producers with more than 40,800 acres participated in 2003, with crop plans developed for 2004.
- In 2003, 24 workshops were conducted for producers with nearly all of the producers attending at least 2 workshops focusing on nitrogen and phosphorus management.
- 95% of participating producers have completed or received a nutrient management plan or have a plan in development.
- 95% had their soil conservation plans reviewed and updated to assure their plans met accepted specifications.
- 50% of the Nutrient Management Plan writers were the farmers themselves, which indicates a strong motivation to adopt conservation practices and shows the effectiveness of the training programs.
- 82% of local education project providers plan to train additional farmers on nutrient management plans.

Industry/Agency Education

- In 2003, 95 industry and agency personnel attended a two-day training program to learn how to develop a nutrient management plan. This intensive course teaches not only the principles of nutrient management, but also provides a real case study that each participant must use to develop a plan that meets the current state guidelines.
- 55% of the participants were from industry, 40% from agencies and 5% other affiliations. 65% of the participants were certified crop advisors.
- Through this training, 76% indicated that they will be or already are writing nutrient management plans for their customers, 56% will be or already are teaching others how to develop plans and 75% will be evaluating nutrient management plans for their customers.
- Through this training, 77% of the participants indicated they will change the way they write and deliver nutrient management plans and 82% will change the way they review nutrient management plans written by others.

Special Discovery Farms Projects:

- ✓ NRCS 590 Standards Revision.
 - Worked with state agencies on the revision of the nutrient management standard. Insured that the standard would provide a variety of methods for producers to come into compliance with phosphorus-based nutrient management plans (soil test guidelines, P – indexing and/or the establishment of soil threshold levels).
 - Wisconsin will change the state standards in 2004-05 to comply with phosphorus-based planning requirements.

- ✓ Phosphorus Index:
 - Dedicated a scientist to the development of a Wisconsin Phosphorus Index that can be field tested and calibrated.
 - Continue to supply water quality data and field management data to properly calibrate this index.
 - Provide education and training in cooperation with the Department of Soil Science on the P-index.

- ✓ Headland stacking of manure:
 - Developed and received approval on the study design for evaluating the environmental ramifications of stacking manure in fields.
 - Worked with DNR for two years to design a three phase study to identify the potential for both surface and groundwater contamination by nutrient leaching from these stacks.

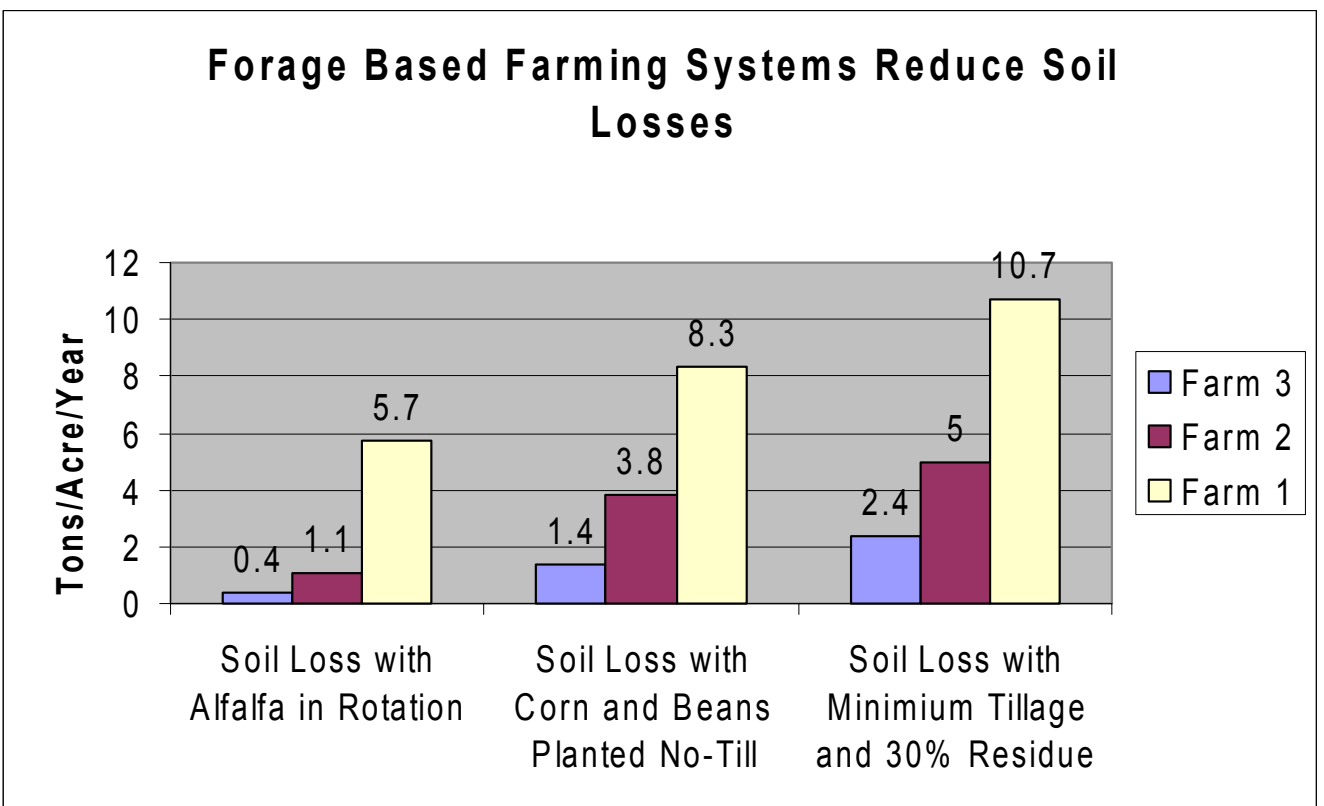
- ✓ Comprehensive Nutrient Management Plans:
 - Working with NRCS and a variety of producers on standardize formats for a CNMP.
 - Determining the economic impacts of having a CNMP plan developed for a dairy operation.

- ✓ Methane production on farms:
 - Produced and distributed a bulletin titled “Frequently Asked Questions about Methane Generation on the Farm”.
 - Distributed over 1200 copies of this bulletin to dairy producers throughout the state and country.

- ✓ Using citrate as a means of reducing manure phosphorus concentrations:
 - Conducted a thorough literature and economic review of the potential to reduce dietary phosphorus levels by feeding a source of citrate. Though the chemistry may work, the economic returns make this unrealistic at the present time.

- ✓ Whole farm nutrient balance:
 - The data indicates that farms can be managed to minimize nutrient build-up if producers maximize production and carefully evaluate their purchases of off-farm nutrients.

- ✓ Soil Conservation Planning:
 - The Discovery Farms Program has worked closely with NRCS and others on the adoption of RUSLE 2 and has identified a few glitches in the program:
 - The estimated soil loss from hay rotations was extremely high because the model was based on western hay production. The model has been changed and the new estimations seem to be much better.
 - The time to run a soil conservation plan is still high (generally 40 hours per farm or more) and a simplified method must be identified if we hope to get a plan for all Wisconsin farms.
 - Actual yields can dramatically change soil loss estimates.
 - Dairying and ruminant livestock production can dramatically reduce soil losses:



As shown above, using three different farming systems in three portions of Wisconsin, dairying reduces soil losses and protects the environment from sedimentation and phosphorus delivery to streams and lakes.

- ✓ Wisconsin Buffer Initiative:
 - We are working with 4 dairy producers conducting on farm research to understand and quantify storm water runoff and snow melt runoff from unique farming systems operating on diverse landscapes representative to WI.
 - Snowmelt runoff volume was impressive and relatively clean as it comes from an alfalfa field and comparatively more sediment laden as it comes from a corn field.
 - Growing season rainfall runoff has produced less volume, likely due to non-frozen soil and water percolation.

- Volumes do increase when rain events occurred on recently wet/saturated soil.
- Field observations for farms in different locations vary, indicating landscape / location / soil type / previous crop / other interactions.
- Early analysis indicates that buffers must be based on local conditions in order to be effective. Buffers in the driftless region will not greatly reduce sediment and nutrient reaching the stream without changes in the upland management practices.
- Buffers need to be designed with specific constituents in mind in order to achieve the desired results (reduce sediment, phosphorus, etc.).

Core Discovery Farm Information:

The investment in core Discovery Farms must be viewed as a long-term investment. We have had monitoring equipment on one farm for nearly three years and on two others farms for six months. Therefore, the information gained from these operations is just starting to be realized and the benefits will continue for several years.

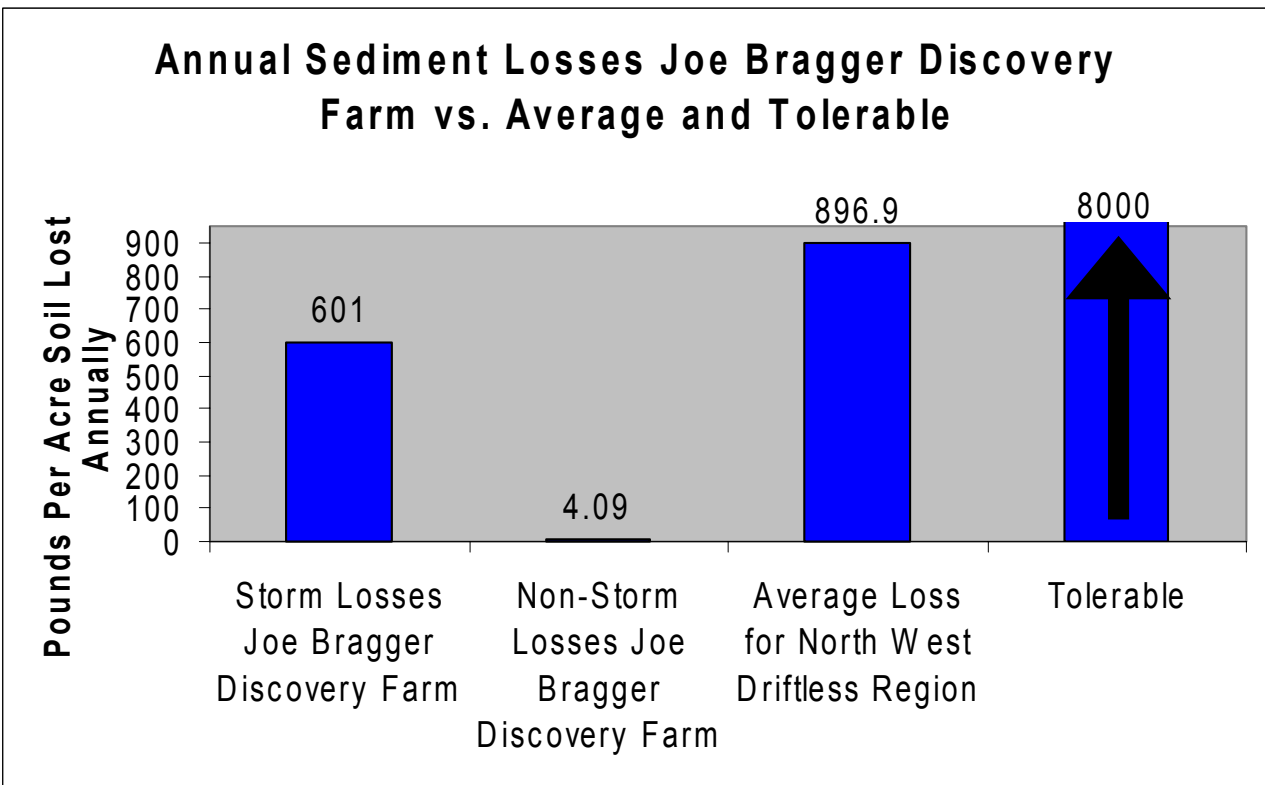
A. Braggers

- We have learned that in periods of baseflow (when it is not raining or during snowmelt) the concentration of nutrients are higher in the non-agriculture watershed than in the ag watershed (see below):

Constituent	North	South	Factor
Total Phosphorus	0.022	0.049	2x (S)
Diss. Phosphorus	0.015	0.032	2x (S)
Nitrate	2.48	1.64	1.5x (N)
Total Nitrogen	2.62	1.87	1.4x (N)

EPA Drinking water standard for Nitrate is 10 mg/L

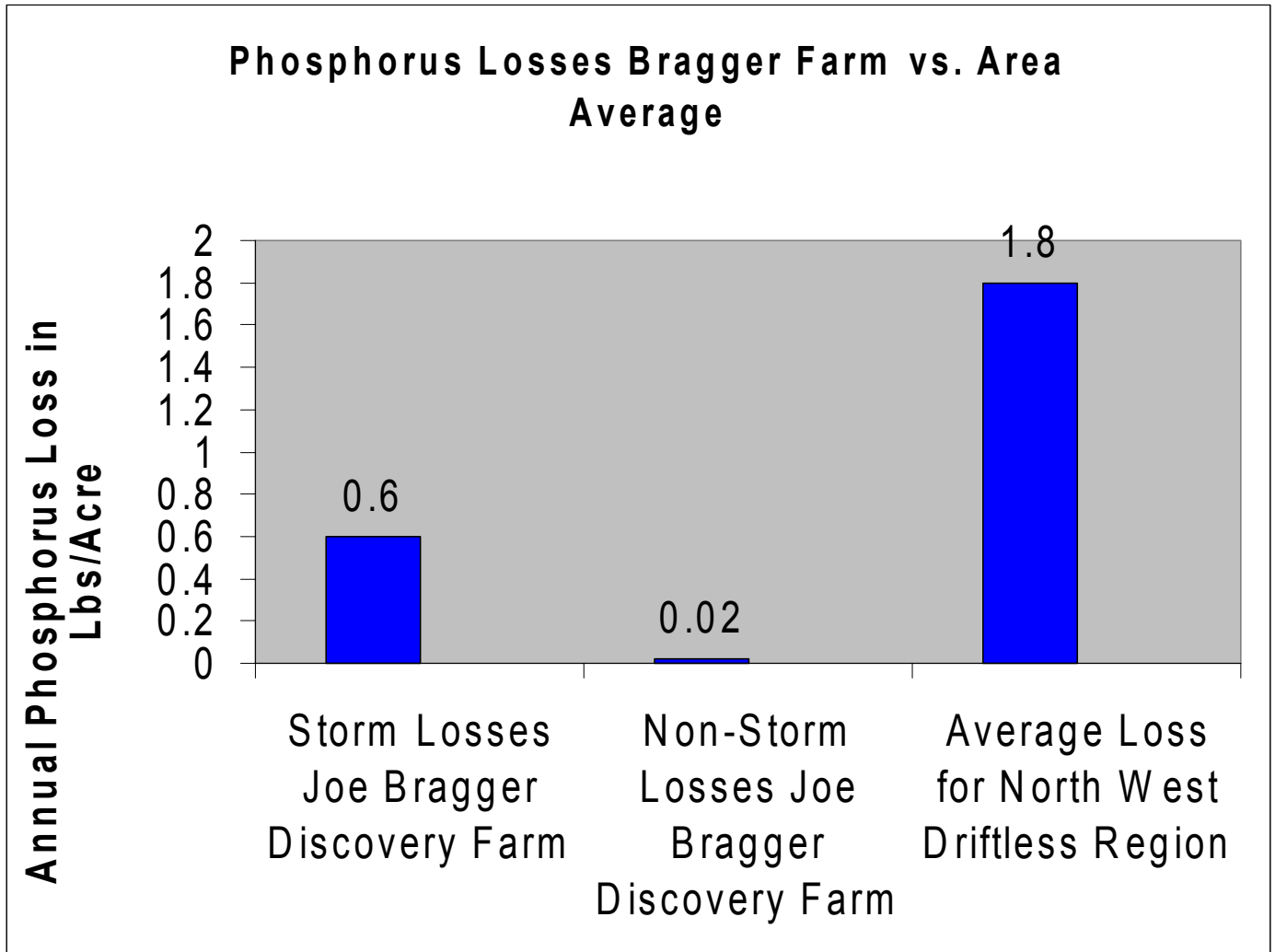
- b. Through this study we know that the water flowing in both the north and south streams are well below the safe drinking water standard of 10 ppm Nitrate Nitrogen.
- c. We know that the water flowing through this farm is cleaner than the Mississippi River where it flows.
- d. We have also learned that conducting a groundwater study on this farm is not possible because water is bypassing the gauging station through some underground passages.
- e. This farm is an excellent surface water site and through this project we know that our paired basins are excellent pairs.
- f. We have learned that this farm has significantly less soil loss than other farms in the west-central driftless region (see below).



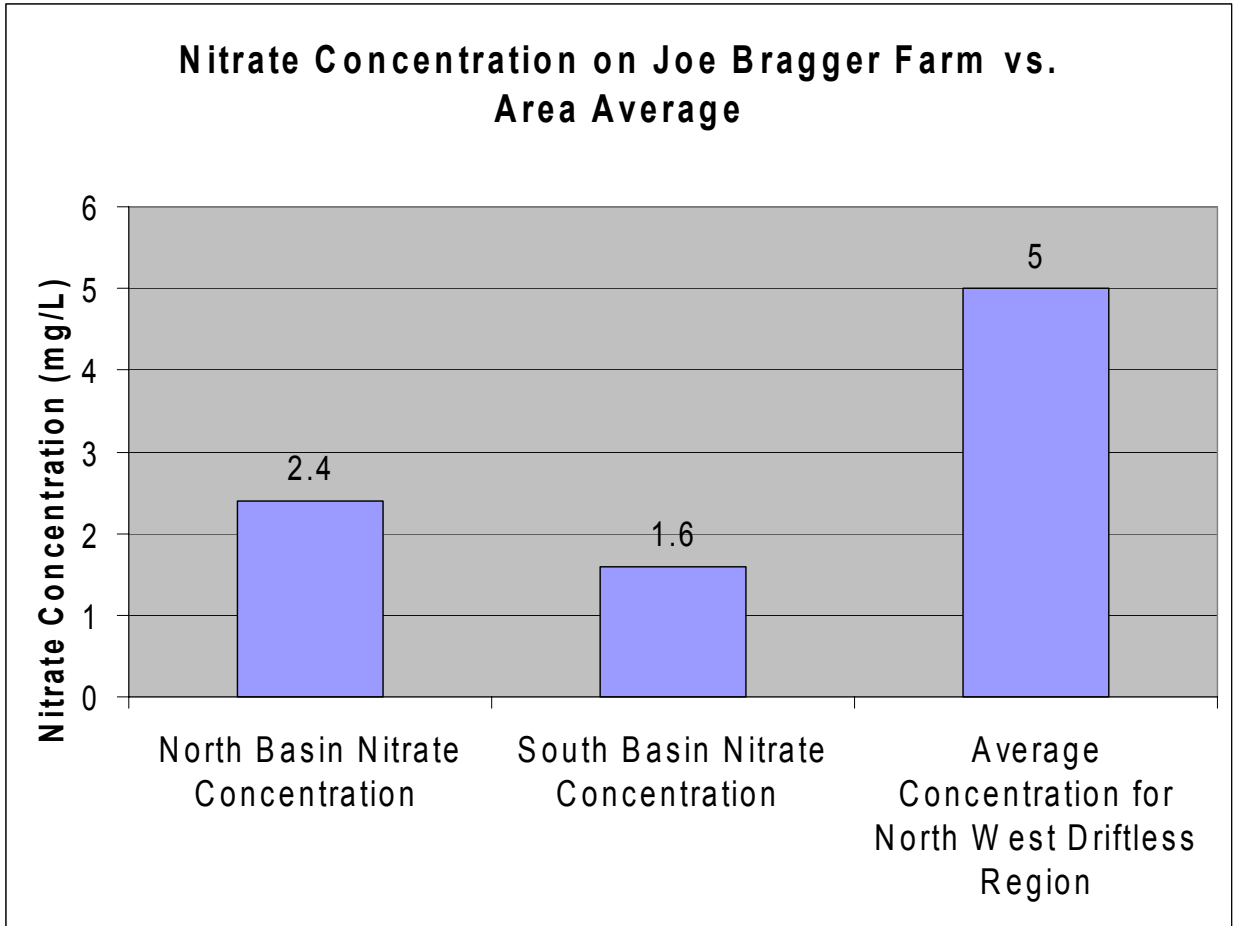
As indicated in this table, the Bragger farm has an annual soil loss of 601 lbs/acre compared to the 10 year average taken from 4 sites in the area. Braggers have 33% less soil loss than other farms in the area. This is incredible considering that this has some of the most extreme slopes in the area.

- g. **We have learned that farming these highly sensitive areas can be done with minimal negative environmental impact if producers adopt good management practices.**
- h. As indicated in the tables below the Braggers are also below the average loss levels for both nitrogen and phosphorus.

- i. Phosphorus losses are about one third the average for farms in this region of Wisconsin.
- ii. Phosphorus is delivered to streams during rain events and is mostly bound to soil particles (87% of P is in the particulate form).



- iii. The concentration of nitrate is higher in the agricultural basin than the non-agricultural basin.
- iv. The concentration of nitrate is about one half of the average for this region of the state.



For the first time in history, producers are involved in collecting and working with water quality data from their operations.

Producers will have the science necessary to fight the opinions and concerns of others.