University of Wisconsin-Madison
Department of Soil Science
Discovery Farms Office
PO Box 429, 40195 Winsand Drive
Pigeon Falls, WI 54760
715-983-5668 — 715-983-2257 — 715-983-2240
715-983-2138 (fax)

Research and Demonstration Plan for Koepke Farms

Dennis R. Frame
Co-Director
UW – Discovery Farms Program
UW-Extension/UW- College of Agriculture and Life Sciences

September 30, 2004

Introduction:
Koepke Farms Inc. was selected as a Discovery Farm cooperator at the February, 2002 steering committee meeting. Though the farm was selected in 2002, funding was not identified until the summer of 2004. The following proposal is the second draft of the outline of what could be studied on the Koepke Farm and how the Discovery Farms portion of the project is to be implemented.

Koepke Farms is located northeast of Oconomowoc, Wisconsin in both Waukesha and Dodge counties (very close to Washington and Jefferson county lines). The farm owns 557.4 tillable acres, has another 150+ acres of woods and wetland, and rents an additional 225.7 tillable acres. The farm is a confinement dairy operation with approximately 320 cows, 285 dairy heifers and 25 bulls or steers. The cows and heifers are housed in a freestall environment. The bulls and steers are run on a bedded pack system. The farm is managed by four family members (Alan, David, Jim and John) with another eight full-time and 10 part-time employees.

This farm has been very active in the adoption of nutrient management and soil conservation planning. The farm has a current soil conservation plan (1-31-01) and the producers have attended the Farmer Training Course and are qualified to develop their own nutrient management plan. One hundred percent of the owned and rented land has been soil sampled at five acre or less per sample. The operation has solid manure from the bedded pack system. The freestall manure is either applied directly to the field or stored for a short period of time (30 – 40 days maximum). Water from the parlor (both wash water and waste water) is kept separate from the manure. Other practices adopted by this operation include the switch to 100% no-till farming, low rate surface application of all manure, a six-year crop rotation consisting of HHHCSbC.

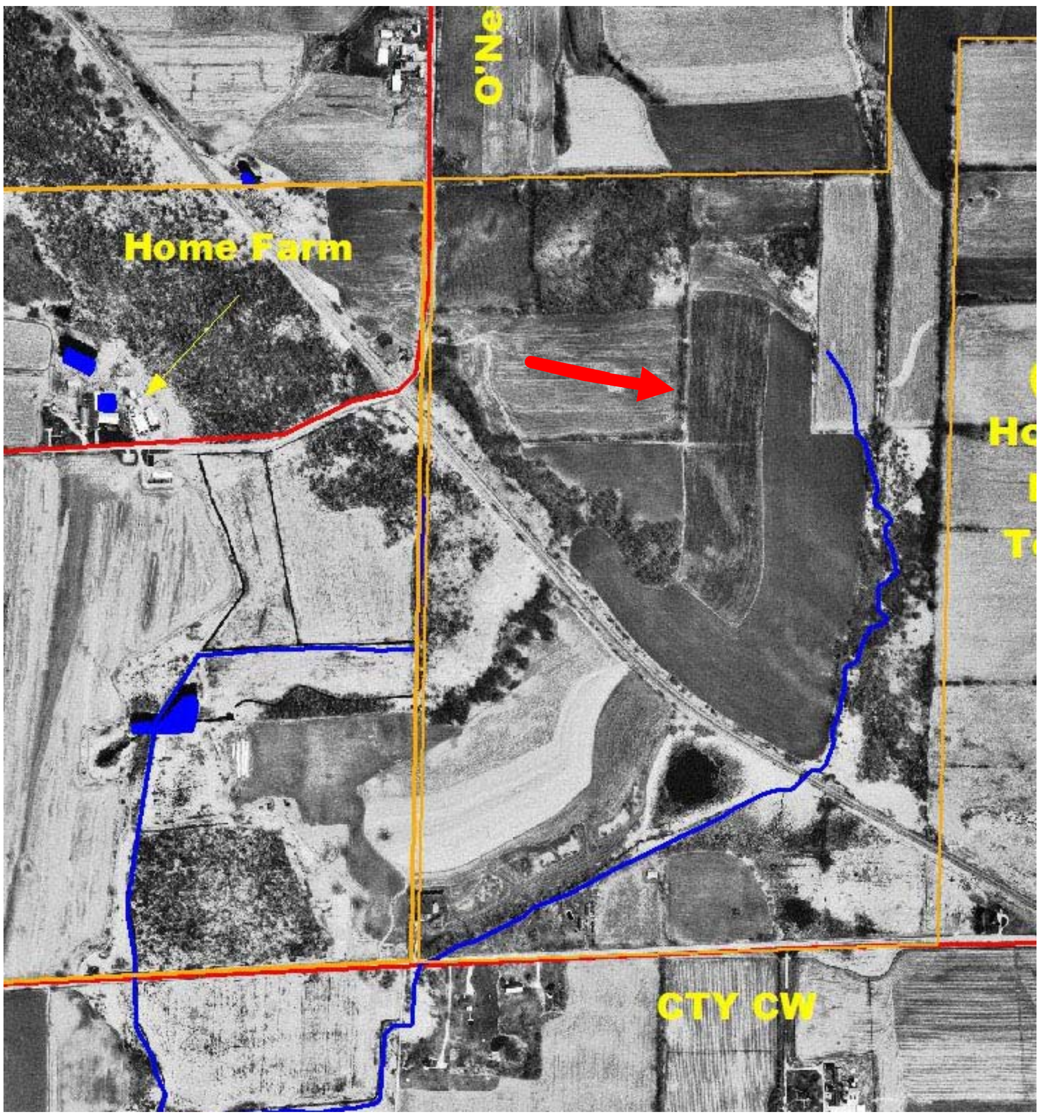
The major challenges identified by this operation include the encroachment of rural residential housing, the application of manure on frozen and snow-covered ground, and the identification of nutrient losses through both surface water and tile lines. These nutrient losses include both nitrogen and phosphorus losses to the stream and tributaries flowing into the Rock River Basin. Appendix A contains additional information on the Koepke cropping system.

The funding identified for this study comes from a partnership developed with the Sand County Foundation and the NRCS. The goal is to reduce nutrient losses (N & P) from agricultural lands that flow into the Mississippi

River and the Gulf of Mexico. The Nitrogen Reduction Project has identified the Rock River Basin and the Milwaukee River Basin as target areas for this project. This study will provide baseline information on nutrient losses from surface water and tile lines on a no-till dairy operation.

Study Design:
Studies by the Department of Natural Resources (DNR) and the United States Geological Survey (USGS) indicate that steams flowing through the Rock River Basin are high in nutrients (both nitrogen and phosphorus). While these nutrients can come from a variety of point and nonpoint sources, it is safe to assume that agricultural runoff is contributing to the nutrient loading rates. The goal of this study is to determine how much nitrogen and phosphorus are entering the stream system through surface water runoff (waterways) and tile systems. The monitoring equipment will also evaluate the losses of sediment through surface water runoff at one station in the watershed.

Figure 1. Picture of watershed



Two monitoring stations will be installed along the ditch dividing the two fields in the photograph above. Both fields have tile drainage systems installed to drain the wet areas of the field. The tiles empty into the drainage ditch approximately 100 feet north of the end of the field (below the red arrow). In addition to the tile monitoring equipment, a surface water flume (see figure 2 on the following page) will be installed in the waterway of the west field. The reason for placing the surface water station in the west field is that Koepke control the land around this field and the runoff water running through this flume will be largely under their control. The waterway running through the eastern field takes water from a neighboring field and directs it into the drainage ditch. Figure 2 (following page) is a picture of a typical USGS surface water monitoring station located in a waterway on another Discovery Farm.

Figure 2. USGS Surface Water Monitoring Station

The two fields should be planted to similar crops, under go the same management system and have nutrients applied to each field at similar rates and timing during the baseline data collection period. For a period of one or two years, the study will collect baseline information to determine if the two fields represent a good pair of basins (in other words, do the fields have similar flow rates, etc.). The time period for baseline data collection depends upon the number of storms needed to calibrate the basins.

Once we have determined that the basins are reacting as a pair and we have identified the nutrient and sediment losses coming from these fields, a plan to reduce nutrient and sediment losses (if necessary) needs to be established. Identification of best management practices and other modifications to the farming system cannot be done until the baseline data collection is complete. The reason for this is because we don't know the level of nutrient losses on this operation under the current farming system. Once the baseline information is collected on this operation, a committee of local and state conservationists, educators, consultants and farmers will review the data and select best management practices which should reduce the losses of these nutrients.

During the first year or two of the study, this operation needs to develop a local advisory committee to identify the issues and concerns facing producers, consultants, agri-business and consumers in this portion of Wisconsin. This committee will serve to ground truth the data as well as the implementation plan for this operation. Data collection will include not only water quality information, but farm management data (crop rotation, planting rates, dates, nutrient application information, etc.). In addition to the field data collection, the Discovery Farms Program will develop a soil conservation plan (RUSLE 2) and a nutrient management plan for the entire operation. We will also work with the local conservation offices to identify sensitive areas and other potential water quality concerns on this operation.

Outreach Objective:
This Discovery Farm should be used as a demonstration site to identify water quality concerns facing producers in southeastern Wisconsin. While this farm is undergoing baseline data collection to determine if we have a good pair of basins, the farm should also be evaluated to determine how it represents other farms in this area. In addition to how this farm represents southeastern Wisconsin, we need to know and understand the current farming system on the Koepke farm. How they handle their crop rotation, nutrients, pesticides and other farming practices all aid in the understanding of this farming system.

The information gathered on this farm will help in the development of best management practices and will provide farmers in this region with local information on how a farming system can affect nutrient and sediment losses (both positively and negatively). Potential questions that this operation could help answer include: nutrient losses through drainage management system, identification of BMPs to reduce nutrient losses from tile lines, the establishment of cover crops to reduce nutrient and sediment losses, the establishment and effectiveness of buffers, nutrient losses from surface applied manure, and the effectiveness and methods of adopting sound nutrient management planning.

The outreach objective is to better quantify the reduction in nutrient losses due to these practices as well as to quantify the benefits/costs to producers. This will help determine the appropriate level of incentive payments, if any, that are needed to implement sound nutrient management practices. Education outreach activities will be aimed at helping producers find ways to improve their bottom line through better use of these practices.

Proposed timeline/practices for the study:

1. Nitrogen and phosphorus losses via tile lines:

Fall 04	Installation of equipment to monitor tile and field runoff in fall of 2004. Monitor for 1-2 seasons to establish baseline data
Fall 06	Once baseline data is established, install either a cover crop study over the tile line study and/or install a water control structure/bioreactor. You might be able to do both at the same time. Water control structure would effect quantity of water, not nutrient concentration. Cover crops would affect concentration of nutrients, but maybe quantity of water also.

2. Cover Crops - measure the ability of different cover crops to scavenge N and P from the soil, reduce soil erosion, and be an effective tool for nutrient management.

Fall 06	Plant cover crop study No.1 over tile line study (assumes baseline data is sufficient at this time)
Fall 05	Plant cover crop study No 2. on another field-no monitoring required.

Some possible cover crop studies:

1. Fall cover (oats, barley, etc.) versus fall/spring cover (winter rye, winter wheat, hairy vetch, clovers, etc) – measure for sediment loss, nitrogen/phosphorus losses in tile lines and in runoff. We could use this to determine incentive payment for cover crops.

2. Fall planting dates of various cover crops and biomass production - this is needed so we know how late into the fall we can plant cover crops and what to expect from them as far as growth

3. Legume cover crops (i.e. hairy vetch, clover) planted after canning crops or winter wheat, burnt down chemically in spring and followed by corn.

4. Other studies going on - we could either replicate or incorporate their findings into our outreach work:
   - weed suppression by various cover crops - Jerry Doll working with winter rye cover followed by no-till roundup ready soybeans.
   - winter rye as a spring forage, cut in early may and followed by soybeans or silage corn - Jim Stute, Kevin Shelley working on this.

3. Buffer Strips

This study would be coordinated with another study being conducted on the Koepke farm. The other study is part of the Wisconsin Buffer Initiative and is under the direction of Dr. John Norman. Potential projects include:

Fall 05 — Surface apply liquid manure up hill of buffer study. Measure runoff into buffer. Can we physically split this study site and measure runoff into the buffer with manure and without manure in the same year?

Appendix A

Koepke Dairy Farm Cropping System
June 2004
Prepared by: Jim Leverich, On-Farm Research Coordinator

Alfalfa New Seeding Spring -1 year – 70 Acres

- Follows corn silage
- 6000 gallons per acre of manure is fall applied after corn silage harvest
- Spring seeded with JD 750 No-till drill @ 15 lb of alfalfa/acre
- 3 cuttings are taken
- Sprayed ½ to ¾ pt Dimethoate after 1st cutting to control insect pests

Alfalfa New Seeding Fall After Winter Wheat – 1 year – 30 Acres

- Follows corn silage
- 6000 gallons/acre of manure is fall applied
- Seed winter wheat in fall with JD 750 No-till drill @ 2 bu/acre
- Harvest winter wheat for grain and straw
- Fall seed alfalfa with JD 750 No-till drill @ 15 lb of alfalfa/acre

Alfalfa Hay Ground – 2 years – 200 Acres

- Harvested at bud stage, 4 cuttings are taken
- Cut with JD 1600 sickle windrower/conditioner
- Windrow merger is used
- Chopped for haylage with Gehl 1285
- K2O is applied to hay ground based on soil test requirements
- Spray ½ to ¾ pt Dimethoate after 2nd and 3rd cuttings to control insects

Corn Grain - 1 year – 100 Acres

- 3rd year hay has 2900 gallons of solid manure in a slurry form applied after each crop for a total of 11600 gallons of manure applied before corn production.
- No-tilled with JD 7200 planter into alfalfa stubble.
- 10-10-39 dry starter is applied at 100 lb/acre

Soybeans – 1 year – 135 Acres

- No-tilled with JD 750 No-till drill at 225,000 ppa into corn stalks
- Grain is harvested with combine and used for cow feed and residue is chopped for bedding.
- Dry manure bedding is applied at 10 tons/acre to replace residue.
- Solid manure in a slurry form is applied at 11600 gallons per acre.

Corn Silage – 1 year – 135 Acres

- No-tilled with JD 7200 planter into soybean stubble.
- P34M95 110 day and 34G82 106 day on irrigated land
- 10-10-39 dry starter is applied at 100 lb/acre
- Chopped for corn silage with Gehl 1285 with kernel processor.

Pre-Plant Residue and Field Checks 04/07/04

Location	2004 Crop	Residue % and/or Stand Count	
Norman Alfalfa Site	Alfalfa	18 to 20 plants/ft2	
Old Alfalfa Around Farm	Alfalfa	16 to 18 plants/ft2	
New Seeding Around Farm	Alfalfa	18 to 20 plants/ft2	
Corn Stubble	Soybeans	80 to 85%	
Old Alfalfa	Corn	75 to 80%	

Post Plant Residue and Field Checks 06/14/04

Location	2004 Crop	Residue % and/or Stand Count	
Norman Alfalfa Site	Alfalfa	18 to 20 plants/ft2	
Old Alfalfa Around Farm	Alfalfa	16 to 18 plants/ft2	
New Seeding Around Farm	Alfalfa	18 to 20 plants/ft2	
Corn Stubble	Soybeans	80 to 85%	160000 PPA
Old Alfalfa	Corn	75 to 80%	34000 PPA

Mid Summer Residue and Field Checks 07/06/04

Location	2004 Crop	Residue % and/or Stand Count	
Norman Alfalfa Site	Alfalfa	18 to 20 plants/ft2	
Old Alfalfa Around Farm	Alfalfa	16 to 18 plants/ft2	
New Seeding Around Farm	Alfalfa	18 to 20 plants/ft2	
Corn Stubble	Soybeans	80 to 85%	145000 PPA
Old Alfalfa	Corn	65 to 80%	34000 PPA