GREENBOOK

2006

SUSTAINABLE AGRICULTURE

The Greenbook is dedicated to
the farming families of Minnesota.
Their innovation, cooperation, and persistence
are creating a more sustainable agriculture.

Greenbook 2006

Program Vision Statement

Agriculture in Minnesota will be based on dynamic, flexible farming systems that are profitable, efficient, productive, and founded on ethics of land stewardship and responsibility for the continuing vitality of local rural communities. Minnesotans will strive to understand and respect the complex interconnectivity of living systems, from soil to people, so as to protect and enhance all natural resources for future generations. Minnesota agriculture will sustain an abundance of food and other products as well as meaningful, self directed employment that supports the quality of life desired by farmers and rural communities. Agriculture will foster diversity in all its forms of production, products, markets, and cultures.

Program Mission Statement

To work toward the goal of sustainability for Minnesota agriculture by designing and implementing programs that meet the identified needs and support the creativity of Minnesota farmers.

MINNESOTA DEPARTMENT OF AGRICULTURE
FROM THE FARM TO YOUR FAMILY

July 2006

Minnesota Department of Agriculture
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Introduction to the Greenbook 2006

I am pleased to introduce the 17th edition of the *Greenbook*, a publication of the Minnesota Department of Agriculture's Agricultural Resources Management and Development Division (ARMD). We highlight the project results of creative and innovative farmers and researchers involved with the Sustainable Agriculture On-farm Demonstration Grant Program.

Sustainable agriculture focuses on farming practices that reduce inputs and protect the environment. It also includes diversification of crops and alternative livestock systems, and it gives farmers increased access to alternative markets.

Greenbook 2006 contains articles highlighting the results of the grantees' projects and provides practical and technical information. Each article includes personal observations and management tips from the participants. Additionally, these grantees are willing to share their knowledge and experiences with you. They are all dedicated to making Minnesota agriculture more profitable and environmentally friendly. Feel free to give them a call about their projects.

This year's *Greenbook* also includes four articles on sustainable agriculture provided by the Minnesota Institute for Sustainable Agriculture (MISA), a unique partnership between the College of Agricultural, Food and Environmental Sciences at the University of Minnesota and the Sustainers' Coalition, a group of individuals and non-profit organizations. MISA received funding from the Sustainable Agriculture Research and Education (SARE), a program of USDA's Cooperative State Research, Education, and Extension Service (CSREES) to help farmers implement sustainable agriculture practices. The articles in the *Greenbook* present the work done on these projects.

Greenbook 2006 also includes updates on other ARMD projects such as organics in Minnesota and the integrated pest management program.

I hope you find *Greenbook 2006* interesting and full of new and useful ideas.

Gene Hugoson, Commissioner
Minnesota Department of Agriculture

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Sustainable Agriculture Grant Program

Program Purpose

The Grant Program provides a unique opportunity for farmers, non-profit groups, agricultural researchers, and educators across the state to work together to explore ways of enhancing the sustainability of a wide range of farming systems.

Program Description

The Department has received over 1,010 grant applications and has approved over $2.5 million in funding for 244 projects since the program began in 1989. Project categories include: Alternative Markets and Specialty Crops, Fruits and Vegetables, Cropping Systems and Soil Fertility, and Livestock. The grant projects, located throughout the state of Minnesota, are described in *Greenbook 2006*.

Grants provide a maximum of $25,000 for on-farm demonstrations that last up to three years. The projects demonstrate farming methods or systems that increase energy efficiency, reduce agricultural chemical usage, and show environmental and economic benefits. A Technical Review Panel evaluates the applications on a competitive basis and makes recommendations to the Commissioner of Agriculture for approval. The Technical Review Panel is made up of farmers, university agricultural researchers, extension agents, and educators and works with assistance from the Sustainable Agriculture and Integrated Pest Management Program staff.

Grant Summaries

The project summaries that follow are descriptions of objectives, methods, and findings of individual grant projects funded in the past two years. To find out more details about these projects, contact the principal investigators directly through the listed telephone numbers, addresses, and email addresses.

Summary of Grant Funding (1989-2006)

Year	# of Grants Funded	Total Funding	Average Grant Size	Ranges
1989	17	$280,000	$16,500	$3,000-25,000
1990	14	189,000	13,500	4,000-25,000
1991	4	46,000	11,500	4,000-23,000
1992	16	177,000	11,000	2,000-25,000
1993	13	85,000	6,000	2,000-11,000
1994	14	60,825	4,000	2,000-10,000
1995	19	205,600	11,000	2,000-25,000
1996	16	205,500	12,900	4,000-25,000
1997	20	221,591	11,700	1,000-25,000
1998	19	210,000	11,100	1,000-24,560
1999	23	234,500	10,200	3,000-21,000
2000	17	150,000	8,800	4,600-15,000
2001	16	190,000	11,875	5,000-25,000
2002	18	200,000	11,000	4,300-20,000
2003*	---	---	---	---
2004*	---	---	---	---
2005	10	70,000	7,000	2,000-11,600
2006	8	70,000	8,750	4,600-12,000
Total Funded	**244**	**$2,595,016**		

**No grants were awarded in 2003 and 2004.*

Sustainable Small Farm Promotion Using a Novel Market Stand

Principal Investigator

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Project Duration

2004 to 2005

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Keywords

community supported agriculture (CSA), direct marketing, economics/marketing, urban agriculture, value added, vegetable crop

This sustainable agriculture demonstration project was a USDA North Central Region Sustainable Agriculture Research and Education Program producer grant.

Project Summary

An Airstream trailer was renovated to include refrigeration and vegetable storage for bringing produce from an organic vegetable farm to market. The novel design proved not only convenient for our farm but eye-catching for our customers as well.

Project Description

Blue Roof Organics is a small vegetable farm located near Stillwater, MN, 30 miles from the Twin Cities. We grow seasonal produce that is marketed through the Stillwater Farmers Market, do limited restaurant sales, and sell direct farm memberships (CSA). Currently we have three acres in organic certified production.

The goal of this project was to use an interesting and eye appealing market stand to attract attention to sustainable local foods and farms. I gutted a single axle 1964 Airstream Tradewinds camper (interior in extremely poor condition) to renovate into a market stand.

The interior construction was designed to haul vegetables, including a refrigeration system. I removed the black water system, plumbing, and gas lines from the trailer frame and patched the flooring. Once I had the interior cleaned out, I built a platform 10" off the floor, creating a pocket to store folding tables and other long items. On top of this platform I constructed a 4' x 8' x 4' cooler with metal, wood, and foam sheeting. The rear wall of the cooler was framed to support a packaged refrigeration unit similar to those found on retail ice chests. The front wall of the cooler was framed with a 3' wide door for easy access and use. The front area of the camper remained cleared out to provide ample space for stacking bins of produce - those not requiring chilling - and transplants early in the season.

For the exterior, I focused on the view from a customer's eyes. The stand was fitted with a 16' blue awning to provide shade. Steel carts were tucked against the exterior with various sized blue bins hanging from them and displaying produce. At market, I generally used larger bins on the bottom to hold potatoes, extra squash, or other bulky crops and tried to put more colorful produce on top in smaller bins. I originally considered affixing metal strips for hanging bins directly on the outside of the camper, but in the end didn't feel the aluminum frame of the Airstream would handle the stress over time. I think the moveable stands provide more flexible marketing and display opportunities.

Farmers Market Stand.

The steel carts were originally designed as recycling containers that would hold three bins and serve as a convenient dolly to haul recyclables to the curb for collection. The carts are available through Real Goods, and I purchased the bins through Global Equipment and Grainger. The bins are designed to either hang from the wall or stack.

Results

The Airstream worked very well with our farming operation. The chilled cooler box installed inside the camper kept vegetables fresh until sale and also facilitated more efficient harvest and handling. For harvest, the trailer could be pulled near crops if needed, reducing distances lugging heavy bins of vegetables. Preparing for market was easy with the camper; vegetables could be harvested and chilled so, on market mornings, I only needed to hook up the trailer and head off. The vegetables were packed and ready for sale. The extra space provided by the roomy trailer allowed us to bring additional gear for display and educational purposes. Some weeks we would bring different tools and implements to show people equipment used on the farm, and other weeks we would bring extra tables and display items such as soil block starts or minerals used for fertility. Generally, space is pretty tight for market operators, so being able to bring extra items was a bonus that facilitated a greater level of outreach about my farm's practices.

Over the past season people responded favorably to my unique stand and other vendors told me they appreciated its presence at the market. They considered it to be good for the entire market because it could be seen from a long way away, attracting attention to the market as a whole. Several repeat customers mentioned that it was easy to remember to return to the vendor with the Airstream, and it made us identifiable to friends they had referred to us. I think reusing and renovating artifacts of society such as old milk vans, campers, or other unique vehicles can create smart and effective marketing for other direct market farms.

Novel market stands are a good way to attract customers, and refrigeration is essential to quality food production. I feel the cooler is a great idea for small start up CSAs and market growers. In the future I plan to make further improvements to the market stand. I want to add a solar power system for lighting and potentially some high efficiency DC refrigeration. I also plan to add permanent signage to advertise my farm.

The education component of the project came quite naturally by using the converted Airstream at farmers markets and by grabbing attention while on the farm. While at the farmers market I informed people about sustainable farming and how the Airstream fit into my farm. I had signage specifying that I was conducting a demonstration grant, along with other educational material such as pictures of the farm and crops, samples of transplants and soil amendments, and tools that I use to produce my farm's products.

A typical conversation at market would start with someone asking me a simple question about the Airstream. It would either be where I got it, or what year it was. The conversation would generally go from there to talking about USDA's Sustainable Agriculture Research and Education Program (SARE) and how it helped me use the camper as a market stand and what they do to help sustainable farmers. The conversations often turned to talking about my farm directly and what I had to offer local people. Many people were interested in the cooler box and how that played a role in the quality foods my farm produced.

Sean and daughter at the farmers market.

Management Tip

Consider unique vehicles such as old milk vans and campers that will attract customers' attention or strike a chord of nostalgia.

Other Resources

Appropriate Technology Transfer for Rural Areas (ATTRA). PO Box 3657, Fayetteville, AR 72702, 800-346-9140. Wealth of information on vegetable production, direct marketing, organic production, and much more. Available at: www.attra.ncat.org

Developing a Saskatoon Berry Market in the Upper Midwest

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Project Duration

2005 to 2007

Staff Contact

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Keywords

berries, fruit, juneberries, pick-your-own, Saskatoon berries, U-pick

Project Summary

The goals of this project are to: determine whether Saskatoon berries can be profitably grown in Minnesota; identify which varieties are best suited to Minnesota markets and growing conditions; assess the sustainability of Saskatoons, a crop that reportedly requires low fertilizer, chemical, and labor inputs; and develop a Minnesota market for fresh and/or processed Saskatoon berries. The Minnesota Department of Agriculture (MDA) funded portions of the project, which has also received funding from the USDA Sustainable Agriculture Research and Education (SARE) Program.

Project Description

This project is a cooperative effort by sisters Pat Altrichter and Judy Heiling. Pat and her husband Ron own 226 acres in central Minnesota where they raise alfalfa-grass hay and 80 beef brood cows. Pat wanted to start a pick-your-own berry patch to diversify the operation and help increase farm income. Judy, who has been in the nursery business for more than 20 years, identified Saskatoon berries as a likely candidate. Both enjoyed wild berries when they were growing up. "But with the land clearing and ditch spraying, the wild berries are disappearing," Pat says. While doing some research on the Internet, Pat learned about Saskatoon U-pick operations in Canada, where the berries are popular.

Initial research told Pat and Judy that Saskatoon berries (Amelanchier alnifolia) are the most commonly cultivated species of juneberry or serviceberry. The fruits look like blueberries, but are drier and sweeter. Native to the Great Plains and Canada, they are adaptable to many soil types and climates and grow 8' to 10' high and look like lilac bushes when they mature. Established orchards are reportedly productive for 60 or more years and require little maintenance. Pat and Judy hypothesized that since Saskatoons are very hardy, they would be an excellent addition to windbreaks. Since they reportedly have minimal susceptibility to disease and insect problems, an established orchard should only require light trimming, mowing, fertilization, and additional mulch.

Judy and Pat selected a number of varieties to try (Table 1) and began establishing Saskatoons on Pat's farm in the spring of 2004 with funds from a North Central Region Sustainable Agriculture Research and Education Program Farmer/Rancher Grant (see *Greenbook 200*5). They planted 648 2- and 3-year old bushes 4' apart in 18' rows for about 800 plants/A. These did well, despite a dry June and an August frost. There were no apparent insect or disease problems. By fall 2004, Pat and Judy had lost about 10% of that first planting, mostly to deer. In the fall of

This Saskatoon bush was planted in Spring 2004 and flowered in 2006.

Table 1. Saskatoon Berry Varieties Planted

Forestburg
Honeywood
Lee 3
Lee 8
Martin
Northline
Smoky
Thiessen

2004, they began installing 8' woven wire fencing to keep deer out of the berries and they planted another 1,200 trees, this time seedlings, from Canada. They also seeded grass in the rows and mulched around the bushes within the rows with sawdust from a nearby sawmill or wood chips from a tree service, using about one yard of mulch per 10'of row.

In the fall of 2005, they used their MDA Sustainable Agriculture Grant to plant and mulch another 420 3- and 4-year old Saskatoons that had been in Judy's nursery.

Pat says they were encouraged by initial market research on Saskatoons and U-pick operations. "We decided to try a U-pick, as we needed to find an easier way of making a living, as we both want to slow down!" U-pick berry operations are very popular in central Minnesota and many older people in the area have fond memories of collecting wild juneberries. Pat and Judy have talked to several local processors of specialty foods who are interested in buying this unique fruit for jams and jellies. The sisters expect that as others learn about Saskatoons, they'll have a market for started plants as well.

Results

Planting the bushes took about 10 hr/A, with Pat and Judy working together. Mulching took the two of them about 16 hr/A. The domestic bushes cost $3.50-4.00 each, for an investment of $2,800 to $3,200 in plants. The seedlings imported from Canada were more expensive, due to the added costs of shipping and import permits. The cost of mulch was highly variable and depended on the source and the cost of hauling. After establishment and before picking begins, labor is required for mowing the grass planted between the rows. The bushes require occasional light trimming to remove dead or damaged branches.

According to Pat, "the little Saskatoons are tough." All the varieties they planted have done well and all appear to be suckering as they should. Planting in spring and fall worked equally well, although Pat says she observed less deer damage on the fall-planted bushes than on the spring-planted bushes. She thinks perhaps this is because the tender foliage of the spring-planted bushes attracted the deer. "But even if the tops get munched, they still sucker," according to Pat.

Pat and Judy reported that mulching has done a good job of weed control. They did some spot spraying with Roundup within the rows and plan to apply heavier mulch in problem areas. The grass they established between the rows prevented washouts and yielded two hay crops. When the plants get bigger and bush out, they anticipate they will be unable to hay it but instead will mow it like a lawn.

By July 2006, many of the little bushes planted in spring 2004 flowered, and even a few planted in fall 2004 (as seedlings) flowered. Until the bushes begin producing, Pat and Judy will not be able to measure yields or profitability. Pat and Ron have participated in a farm business management program for eight years and say it has been an excellent tool to evaluate their farming management decisions. So it was natural for her and Judy to consult the farm business management instructor to construct some projections for return on investment. Although they saw that the initial investment to start the Saskatoon operation would be high, it looked as though it would pay off.

Pat and Judy say the main disadvantages to the project have been initial preparation and planting labor and costs of planting stock. They anticipate that the berries will take about five years to mature and produce a return on investment. It's been a great family project – they've had a lot of help from grandchildren pulling weeds, marking rows, and planting small plants. The kids will likely be eager pickers once the bushes begin bearing.

Marketing research has taken the two all over Minnesota and as far away as Canada and Missouri. "We do lots of snooping around," says Pat. She and Judy are very interested in learning about other fruit operations' management methods, weed control, fencing, labor, storage, and strategies for dealing with leftover fruit. They've learned that some operations find high school students are a good labor force. Others get help from residents of retirement communities and nursing homes who are spry and enjoy the work. Still other operations that sell U-pick and already-picked fruit "pick on shares." The customer may pick two pails full, for example, and take home one bucket for free or at a reduced price, while leaving the other bucket behind as "payment" for the operation to package and sell.

Other growers are interested in Pat and Judy's experiment as well. The two gave a presentation about their project at a small farmers' conference in Columbia, MO in November, 2005 and to a standing room only crowd at the Minnesota Fruit and Vegetable Growers Conference in February, 2006. They are on the agenda to present at the National Sustainable Agriculture Research and Education Program conference in August, 2006. "About five years ago if somebody told me I would be up in front of a crowd, I would have told them they were crazy!" says Pat.

Management Tips

1. Planting in fall, rather than spring, may minimize deer damage.

2. Install fences before you plant Saskatoon berries to keep deer away from tender young plants.

3. Pile on mulch – the thicker the better.

4. Establish ground cover between the rows as soon as possible – especially if you have light or sloping soil.

Cooperators

Dave Stish, Farm Business Management Instructor, Staples, MN

Project Location

Go 3 miles west of Randall on Cty. Rd. 14. We are on the north side of the road.

Other Resources

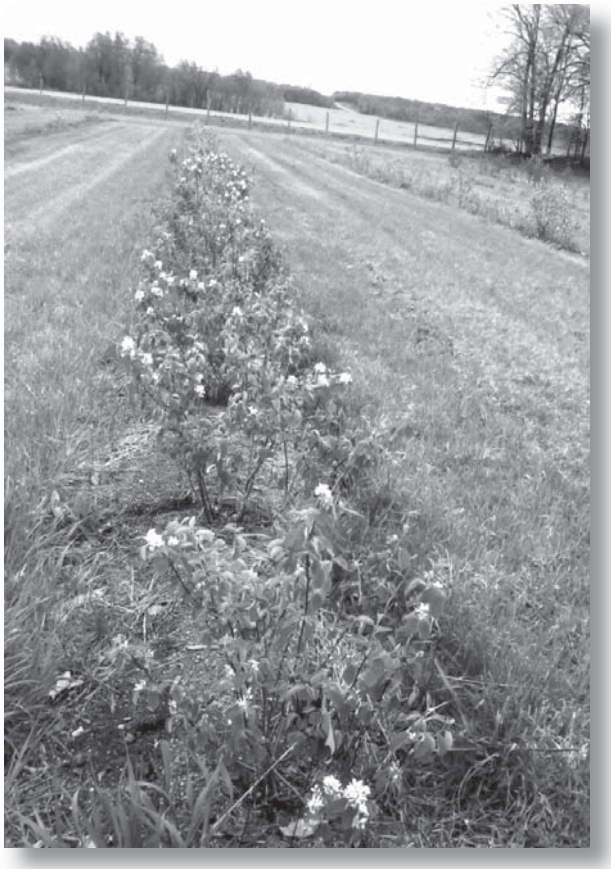
Chaudhary, G. Nabi. N.D. Economics of Saskatoon berry production. Alberta Agriculture, Food and Rural Development. Available at: www.agric.gov.ab.ca (Type "economics of Saskatoon" into the search box.)

Government of Alberta. 2002. Beginning berry production. Available at: www.agric.gov.ab.ca (Type "beginning berry" into the search box.)

Laughlin, Kevin M., Ronald C. Smith, Robert G. Askew. 1996. Juneberry for commercial and home use on the northern great plains. North Dakota Extension Service. Available at: www.ext.nodak.edu/extpubs/plantsci/hortcrop/h938w.htm

Mazza, G. and C.G. Davidson. 1993. Saskatoon berry: a fruit crop for the prairies. In J. Janick and J.E. Simon (eds.), New crops. pp. 516-519. Wiley, NY.

Saskatchewan Agriculture and Food. 2002. Costs and returns for a Saskatoon berry orchard. Available at: www.agr.gov.sk.ca (Click on "Crops," then "Horticulture," then "Production.")



Bushes are planted about 4' apart.

Testing the Potential of Hybrid Willow as a Sustainable Biomass Energy Alternative in Northern Minnesota

Principal Investigator

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Project Duration

2005 to 2007

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Keywords

bioenergy, biomass, energy crop, fossil fuels, hybrid willow, renewable energy

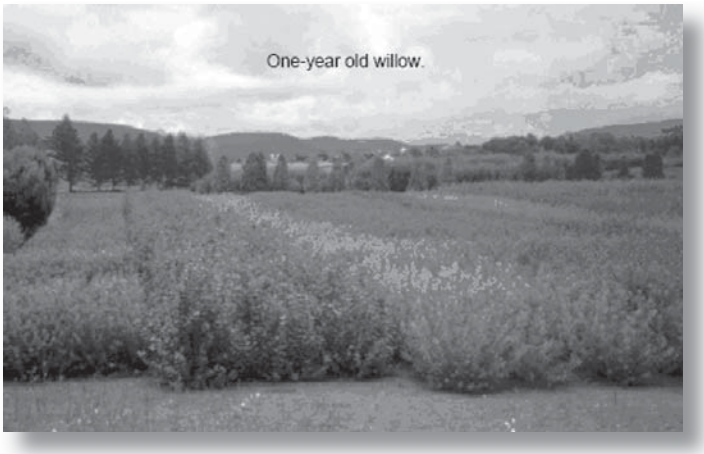
Project Summary

The objective of this project is to test hybrid willow as a potential energy crop for northern Minnesota that presents both potential market and wildlife benefits. We will determine the hardiness of this crop for the meadowlands area; develop a test demonstration planting that can be used to guide future research and development; and provide a northern clonal trial to compare to a similar plot that was planted in Martin County in spring 2004.

Project Description

Renewable sources of energy are becoming more important every day and Minnesota has been a leader in the use of renewables to replace fossil fuels as a source of energy. Woody biomass offers an important option for the production of biomass for energy. In addition to the energy benefits provided by willows, they also have potential for plantings in riparian areas currently in row crop production but which are periodically flooded and have relatively low agricultural productivity. If planted in such sites as a biomass crop, willow can provide a source of income for landowners while protecting soils from erosion and taking up excess nutrients before contributing to the contamination of surface waters. Another possible option or associated benefit of willows used for biomass may be in the management of brushland for upland game birds. Willows used for biomass generally do not reach tree size prior to harvest so may be a viable option in areas where low brush may be desirable for wildlife management.

There has been extensive research and testing of willows specifically for bioenergy in the state of New York and also in Europe because of their high productivity as a biomass energy crop. Little testing has been done in Minnesota other than some recent testing at the University research station in Waseca and in Martin Counties. In order for the planting of hybrid willows to become a viable option for landowners in Minnesota, further testing will be required across the state to identify and select the willow species and varieties that will be the most productive. So far, most of the recent testing of willows has been in the southern part of the state. This project will put in a trial in the northeastern part of the state.



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This project combines the efforts of a Minnesota farmer/landowner who is already involved in the planting and production of short rotation woody crops, researchers from the University of Minnesota and the University of Wisconsin-Stevens Point, extension educators from the University of Minnesota, and researchers from the State University of New York who will help select willow species and varieties and provide planting stock. This unique partnership will allow the project team to test the willow varieties under farm conditions and provide opportunities for dissemination of results in both Minnesota and Wisconsin contributing to the further development of biomass energy options in the North Central States while providing viable and sustainable options for Minnesota landowners.

In 2005 and early 2006, the landowner and cooperators planned the trial that will be put in during the spring of 2006. Following planting, the trials will be maintained and monitored for the remainder of the project period. The trial will also be used as a demonstration for landowners and natural resource professionals in the area. With the assistance of the landowner and others, we hope to continue to monitor and expand willow trials in Minnesota.

Results for producing short rotation woody crops in north central Minnesota will be presented in Greenbook 2007.

Cooperators

Larry Abrahamson, State University of New York, Syracuse, New York
Mike Demchik, University of Wisconsin-Stevens Point, Stevens Point, WI
Dennis Gibson, Minnesota Agroforestry Cooperative, Montevideo, MN
Gregg Johnson, University of Minnesota, Southern Research and Outreach Center, Waseca, MN
Tim Volk, State University of New York, Syracuse, NY
Diomy Zamora, University of Minnesota, Brainerd, MN
Gerald Wick, Farmer, Meadowlands, MN

Other Resources

Short Rotation Woody Biomass Program. State University of New York – College of Environmental Science and Forestry. Syracuse, NY. Web site: www.esf.edu/willow

University of Minnesota - Center for Integrated Natural Resources and Agricultural Management (CINRAM) is a partner-based organization that catalyzes the development and adoption of integrated land use systems. Web site: www.cinram.umn.edu

Willow Biomass Project brochure. State University of New York – College of Environmental Science and Forestry. Syracuse, NY. Web site: www.esf.edu/willow/pdf/brochures/willowbrochure.pdf

Volk, T.A. The Potential of Willow Biomass Crops for Bioenergy in central New York. Slide show in pdf. format. State University of New York – College of Environmental Science and Forestry, Syracuse, NY. Web site: www.esf.edu/willow/ed%20modules/pdf%20format/slideshow-rev.pdf

Online Database of Plant Communities Helps Upper Midwest Farmers

Principal Investigator

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Project Duration

2004 to 2006

MN SARE Contact

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Keywords

biodiversity, perennial cropping systems, plant communities

This sustainable agriculture demonstration project was a USDA North Central Region Sustainable Agriculture Research and Education Program producer grant.

Project Summary

Designing diversified, perennial cropping systems is a major challenge. A great deal of information is required to design a cropping system that insures a continuous income stream and meets production and conservation goals.

I have been developing a database of plants for the Upper Midwest that contains information on plant characteristics (height, spread, root type and depth, drought/flood/salt tolerances), ecological functions (nitrogen fixing, water purifying, soil building, wildlife habitat, animal forage, etc.), plant uses (food, medicine, biomass, essential oils, etc.), plant companions, and plant concerns. This data provides the foundation for assembling diverse plant communities based on individual goals.

For the past year I have been working with three other farmers to use the database to design plant communities and develop protocols to evaluate the success of various cropping systems.

Project Description

As an urban sustainable farmer, I have grown certified organic garlic varieties, heirloom vegetables, berries, and other woody perennials. In trying to find plants that would be successful in Zones 3, 4, and 5, I found it very difficult to find information on the ecological properties of plants, their potential uses, plant associations, and production cycles. I decided to build a plant database to be used for designing plant communities for the Upper Midwest. For this project, I expanded the database, implemented some trial plant communities based on database recommendations, and developed protocols to monitor and evaluate the success of those communities.

The three components of the project are:

1. *Collecting Information for the Database.* During the past year I added information to the database, particularly in the areas of biomass and wetland plants. The database now contains information on about 1,400 plants adapted to production in the Upper Midwest. Farmer participants have provided valuable feedback on the factors that are important to them in designing a cropping system.

2. *Designing a Query Tool That Is Easy for Farmers to Use.* A query tool is being developed using PHP with MySQL that will provide user-friendly access for farmers and landowners. This coming year farmer

Apple and cherry fruit guild.

participants will use the query tool to design a second plant community for their farms.

3. *Testing Plant Communities and Developing Evaluation Protocols*. Once the ecological and production goals were defined, we used the plant database to design the plant communities. The next step will be to design evaluation protocols to monitor performance. This is especially challenging for perennial systems where production may not be realized for several years.

Farmer Participants and Site Trials

Mark Shepard, Viola, WI. Over the past ten years, Mark converted New Forest Farms from a typical row crop system to a perennial agricultural system dominated by trees, shrubs, vines, canes, perennial plants, and fungi that produce a variety of food, fuel, and medicine. His objectives for the current site trials are:

- Production of animal feed for pigs
- Production of juice or other market crops
- Ecological benefits to other systems
- Ease of harvest

Mark is currently evaluating the following plant communities:

- Apple, grapes, sunchoke (fodder for pigs)
- Elderberry, grapes, comfrey
- Apple, sea kale, yarrow, New England aster, ox-eye daisy

Renne Soberg, Spring Valley, WI. Renne grows medicinal herbs and garlic varieties on 20 acres. He has the following objectives for his site trials:

- Diverse and productive windbreak with high wildlife value
- Medicinal herbs for horses
- Habitat and food for birds
- Minimal inputs of nutrients and labor (nutrient management, weed suppression, moisture retention)

His design includes a windbreak of trees and shrubs that have high wildlife value and are of different age classes and growth rates. All plants in the windbreak are non-toxic for horses and adapted to clay soil. The medicinal herbs were organized and planted in compatible groupings. The plant communities include:

- Northern red oak, Cornelian cherry dogwood, mullein, tansy*, borage
- Hawthorn, meadowsweet, stinging nettle, lavender
- White Oak, beaked hazelnut, New England aster, chicory, prairie sage
- Hackberry, lilac, Culver's root, wormwood, plantain

*(*Tansy is a noxious weed in some states and also a secondary noxious weed in some counties within states such as MN. Use edging in garden settings to control spread.)*

Paula Westmoreland, Minneapolis, MN. I live in an urban area and was interested in establishing fruit tree guilds and perennial companion gardens for family use. Specifically, I had the following objectives:

- Production of variety of harvestable foods (fruit, vegetables, edible flowers, herbs)
- Production of variety of harvestable cut flowers
- Integrated pest management (attracting beneficial insects and repelling pests)
- Minimal inputs of nutrients and labor (nutrient management, nitrogen fixing, weed suppression, moisture retention)
- Improved soil health

Plant community members were selected for their food value and to meet the needs of the fruit tree for pollination, pest management, beneficial insects, and nitrogen fixation. My plant communities include:

- Pear tree, alpine strawberries, chives, sweet alyssum, borage, wild blue indigo, yarrow, and daffodils
- Gourmet greens, pole beans, peas
- Beets, kale, chives
- Broccoli, zinnia
- Tomatoes, white clover, basil
- Peppers, sweet alyssum, calendula
- Strawberries, bachelor buttons, asparagus, coreopsis

Meagan Keefe, Minneapolis, MN, University of Minnesota Student Organic Farm. Meagan is a graduate student at the University of Minnesota working on designing perennial crops for the organic student farm, Cornercopia. She was looking for plant communities that would have the following characteristics:

- Production of harvestable food and flowers
- Integrated pest management (attracting beneficial insects and repelling pests)
- Minimal inputs of nutrients and labor (nutrient management, weed suppression, moisture retention)
- Improved soil health
- Ease of harvest

Figure 1.

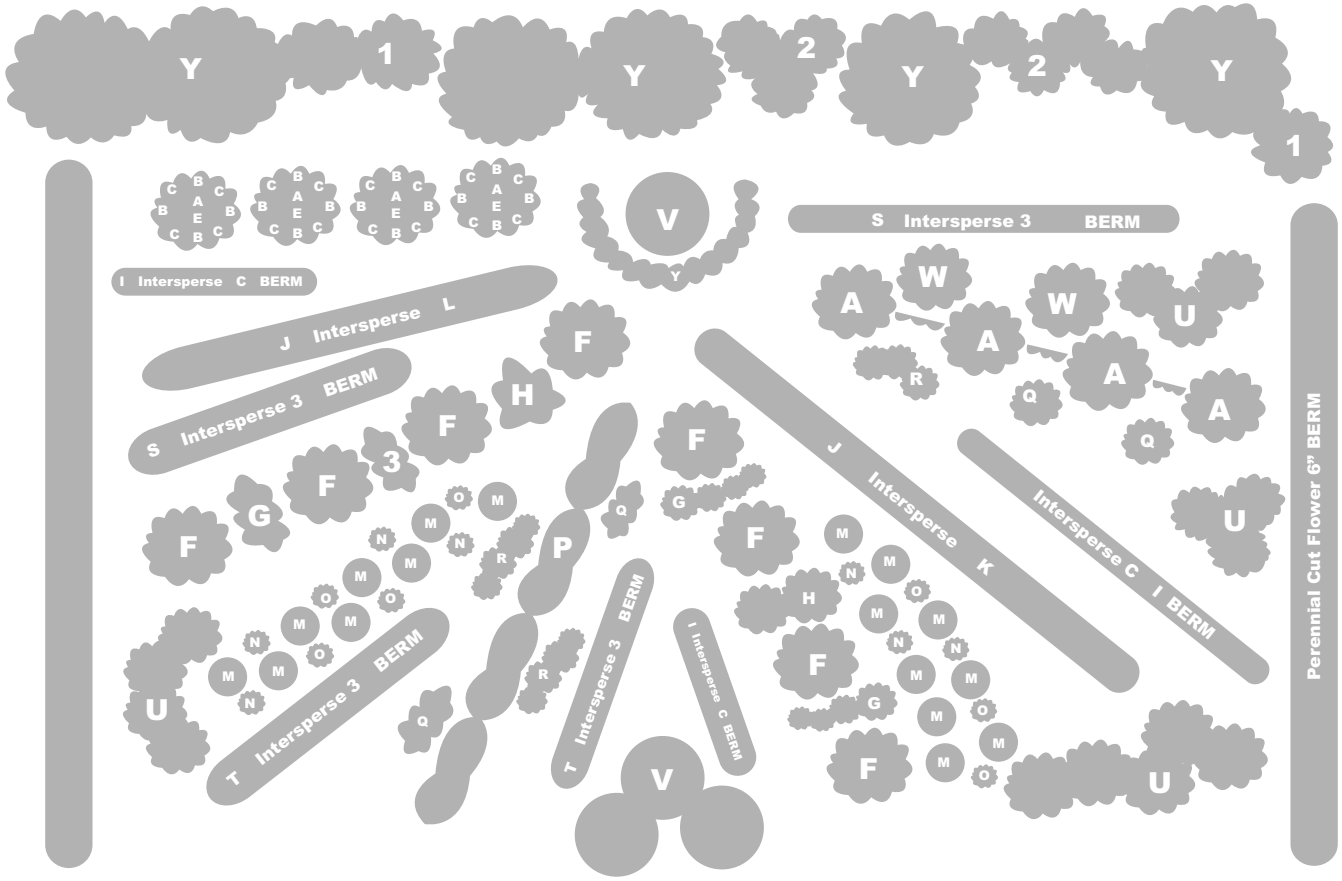

Table 1. Design Key to Student Farm Perennial Guilds

Companion Groups	Borders - Perennial Cut Flower Associates
Apple (A)* – Daffodils (B) – Chives (C) – Pennyroyal Groundcover (D)	Verbena – Love in a Mist – White Upland Aster – Butterfly Flower
Apple (A) – Daffodils (B) – Chives (C) – Creeping Thyme Groundcover (E)	Anise Hyssop – Oregano – Peppermint
Hazelnut (F) – Yarrow (G) – Comfrey (H)	Blazingstar – Scabiosa – Delphinium
Alpine Strawberries (I) – Chives (C)	Columbine – Showy Goldenrod – Tulips
Asparagus (J) – Parsley (annual) (K) – Basil (annual) (L)	Queen of the Prairie – Tall Meadow Rue – Monkshood
Rhubarb (M) – Dill (N) – Hollyhocks (O)	Obedient Plant – Mountain Mint – Gooseneck Loosestrife**
Grapes (P) – Hyssop (Q) – Scented Geranium (R)	Peony – Black Eyed Susan – Alliums – Ox-Eye Daisy
Red Raspberries (S) – Black Raspberries (T) – Tansy (3)**	Daffodil – Yarrow – Veronica – Astilbe
	Fragrant Hyssop – Sky Blue Aster – Lilies – Purple Coneflower
Scattered Companions	**Wildlife Hedge**
Rugosa Roses (U)	Chokecherry (Y)
Sunflowers (V)	High-Bush Cranberry (Z)
Siberian peashrub (W)	Elderberry (1)
	Winterberry (2)

**The letter or number in parentheses corresponds to a letter or number on the schematic in Figure 1.*
***Gooseneck loosestrife is different than purple loosestrife which is a federal and state noxious weed and must be controlled or eradicated. Tansy is a noxious weed in some states and also a secondary noxious weed in some counties within states as is the case in MN. To control the spread of tansy, use edging in garden settings as you would for mint.*

Table 2. Results of Database Query for Plants Compatible with Black Walnuts

Common Name	Scientific Name	Ecological Function	Human Use
American Elderberry	Sambucus canadensis	Mulch Maker, Nurse, Pest Repellent	Compost, Food, Medicine, Dye
American Grape	Vitis labrusca	Wildlife Habitat	Food, Medicine, Ornamental, Dye, Essential Oil
American Plum	Prunus americana	Insectory, Windbreak, Erosion Control, Wildlife Habitat	Food, Medicine, Ornamental, Dye
Asian Pear	Pyrus pyrifolia	Wildlife Food, Insectory	Food
Common Pear	Pyrus communis	Wildlife Food, Insectory	Food
Crocus	Crocus sativus	Insectory	Food, Medicine, Dye
Daffodil	Narcissus	Pest Repellent, Insectory	Cut Flower, Dye
Daylily	Hemerocallis	Erosion Control, Soil Builder	Food, Medicine
European Wild Ginger	Asarum europaeum	Mulch Maker	Essential Oil, Medicine
Grape Hyacinth	Muscari armeniacum	Insectory	Cut Flower
Jack-In-The-Pulpit	Arisaema triphyllum		Medicine
Red Raspberry	Rubus idaeus	Wildlife Food, Fortress, Insectory, Nurse	Food, Fiber, Medicine
Sour Cherry	Prunus cerasus	Wildlife Food, Insectory	Food, Medicine
Summer Squash	Cucurbita pepo	Pest Repellent	Food, Medicine
Sweet Woodruff	Galium odoratum	Erosion Control	Food, Medicine, Dye
Winter Squash	Cucurbita maxima	Pest Repellent	Food, Medicine

The majority of the plant communities will be planted this spring. A detailed plan for the planting and a key to the plants are shown in Figure 1 and Table 1.

Results

During the past year we used the database as the foundation for designing diverse perennial systems to meet different objectives. We found that the database had all the critical data. With easy access to plant characteristics and ecological functions, the farmers were able to consciously select for specific benefits, such as improved soil health, animal forage, or wildlife habitat. The database quickly produced a list of plants they could investigate further. Most of the plants would not have been considered otherwise. Having plant diversity is essential in perennial systems where farmers need an early, diverse, and stable income source. To be a true knowledge system, farmers need to report back their site trial results. This feature of the database needs further development. An example of the results from a database query is shown in Table 2.

So far, we are seeing increasing economic opportunities as we increase cropping system diversity. The agricultural plant communities were less diverse than other plant communities due to the need for mechanical harvesting.

The evaluation protocols proved to be the most challenging since we are trying to validate complex systems and wanted to minimize the amount of labor required in data collection. We developed a common set of quantitative measurements and added additional ones that suited each farmer's particular goals. In addition, we developed an observation log with detailed instructions. The instructions are particularly important at the student farm where students have different levels of experience and are participating in the trials for short periods of time.

Management Tips

1. Looking at cropping systems functionally is a paradigm shift from what we are used to doing. The database allows us to select ecological benefits that were particular to our sites and interests.

2. Having information at your fingertips makes it a lot easier to expand plant diversity. The database helped narrow plant options and eliminated some of the trial and error that would have occurred otherwise.

3. Markets were an important factor in plant selection. Farmers who had access to markets for herbs and berries had greater opportunities to expand the number of plants in the plant communities.

4. Monitoring the performance of the plant communities is critical to measuring success and sharing information. Evaluation protocols need to be streamlined, yet capture the critical information.

5. Some training is required to help farmers design plant communities and establish site trials.

Cooperators

Mark Shepard, Viola, WI
Renne Soberg, Spring Valley, WI
Meagan Keefe, University of Minnesota Student Farm, St. Paul, MN
Linda Meschke, Rural Advantage and Third Crop Network, Welcome, MN
Jim Kleinschmit, Institute for Agriculture and Trade Policy, Minneapolis, MN

Other Resources

Ecological Gardens LLC. Information available at: www.ecologicalgardens.com

Urban companion garden with perennials and annuals.

Expanding Consumer Interest and Home Gardeners' Use of Heritage Tomato Varieties

Principal Investigator

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Project Duration

2004 to 2005

MN SARE Contact

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Keywords

heirloom varieties, heritage varieties, mulch, tomato

This sustainable agriculture demonstration project was a USDA North Central Region Sustainable Agriculture Research and Education Program producer grant.

Project Summary

To grow my heirloom tomato business, I designed several strategies to increase my farm's growing capacity, encourage other area growers to buy tomato plants for their gardens, and increase the local market for heirloom varieties. After a season of experimentation, I now have an established core of proven taste test winners.

Project Description

As an avid tomato grower, I discovered that my community of gardeners was unaware of the diversity of heirloom varieties and unfamiliar with the importance of diversity in preserving varieties. The joy of discovering the optimum variety for a specific use in the kitchen, and the connection between really good food and heirloom varieties, needed to be made. Besides scientific and ecological reasons for maintaining diversity in what we eat and what we grow, I started growing heirlooms because I like to eat, and I like to eat really good food.

Heritage vegetables come from seeds and plants that have been passed down from generation to generation. The number of varieties of one vegetable can be astounding and provide important genetic diversity to the gardening world. In tomatoes particularly, this diversity means an incredible array of tastes and flavors unmatched by any grocery-store tomato.

For three years I experimented with growing heirloom tomatoes. I grew five to eight test heirloom varieties from seed each year, then distributed sample plants among area gardeners, asking for their opinions, results, and comments. After this three-year test run, I knew I was ready to develop a stronger market for the tomatoes.

There were two components in this project:

- **Growing and selling heritage tomatoes.** I started more seedlings and advertised the products to establish a market. In addition to outreach about heirlooms in general, I made posters to advertise the availability of the heirlooms at the co-op and a local restaurant. I expanded my growing capacity by purchasing additional cage trellises and improving my watering system. I tested soil and experimented with an algae/pond weed mulch harvested from a small pond on my property. I then sold tomatoes through the local food co-op.

Tomatoes on display.

- **Encouraging other farmers and gardeners to use heirloom varieties.** Although several seed catalogs provide heirloom seed, most local home gardeners do not start tomatoes from seed, but buy a few plants from local nurseries. Within my region, no nursery provided heirloom plants. I provided almost 600 plants to 45 individual gardeners and two commercial growers and to a demonstration garden planted by the Land Stewardship Office in Montevideo.

To get the word out, I hosted a series of weekend taste testings at the co-op; provided tomatoes to a local restaurant for a week-long feature; participated in a Slow Food meal attended by community leaders active in organic and sustainable agriculture; provided tomatoes and expertise at a tomato tasting hosted by the Land Stewardship office; provided sun-dried chutney at a regional art crawl; and participated in a gourmet club at the Sapor Cafe in Minneapolis.

Providing samples, recipes, and taste tests are helpful in introducing buyers to the concept of diversity. People can be reluctant to try something unfamiliar, particularly at a higher price. Taste trials accompanied with a salsa, chutney, salad - almost anything - seemed to generate a lot more enthusiasm and understanding: "They really are sweeter," "The colors really do make a more beautiful salad," "These really are the best tomatoes I've ever tasted," and "Wow, what a difference in flavor."

Results

Mulch, Fertilizer, and Soil

I incorporated a heavy dose of manure into the soil in my tomato plot with fabulous results. Few of my other growers had the kind of size and weight that my plot produced. I have sandy soil, which drains well, and I did not use any other fertilizer. Soil tests indicated a great improvement in soil composition.

The tests of pond weed mulch as a fertilizer were inconclusive. However, it clearly proved good mulch for weed control and moisture retention. I was successful in picking the first ripe tomatoes prior to July 4, while most of my growers did not have early crops. The only variable is the early and heavy application mulch with pond weed. The pond weed mulch does keep soil temperature less variable and less subject to the factors (high temperatures) that slowed ripening among other tomato producers. The seaweed mulch provided an unlimited, free supply of mulch that not only suppresses weed growth without leaving behind seed, but also does not carry any upland disease and maintains moisture. It also involved no cleanup; the mulch completely broke up into the soil by the end of the season as it dried out.

Tomato Varieties

After this project (my fifth year of testing varieties), I've established the core varieties I will grow in the future (and will add only one or two experimental varieties each year). I intend to advertise plants and tomatoes next year as the "best of taste tests" and maintain reasonable diversity for my kitchen and market. My observations on each of the varieties tested are listed in Table 1.

Management Tips

1. My recommendation to other producers would be to offer diversity, provide samples and recipes, and be patient. It takes time to build customers for any new product. Be creative in establishing relationships with new markets.

2. Rotate your crop to help insure against soil borne disease; use manure; and, in my region, do not transplant to the garden before June 1. The risk of cold weather is too great and early planting into the garden is not going to guarantee an early harvest.

Other Resources

Ibsen, Gary, with Joan Nielsen. 1999. The Great Tomato Book. Ten Speed Press, Berkeley, CA. Excellent reference.

Livingston, A.W. 1998. Livingston and the Tomato with forward by Andrew F. Smith. Ohio State University Press, Columbus, OH. Great historical reference and a good read.

Smith, Andrew F. 1994. The Tomato in America: Early History, Culture, and Cookery. University of South Carolina Press, Columbia, SC. Great historical reference and a fun read.

Topp, Ellie, and Margaret Howard. 2001. The Complete Book of Year-Round Small-Batch Preserving. Firefly Books Ltd., Ontario, Canada. Excellent preservation recipes.

Ardie with small sample of tomato varieties.

Table 1. Observations on Heirloom Tomato Varieties

Variety	Notes and Observations
Amish Paste	Grown in 2002 with excellent results. Larger than stated and good for sauce. Good, dependable harvest. Recommended.
Aunt Ruby's German Green	Juiciest tomato in the garden. Large tomatoes, positive feedback from other growers, great in mixed color salads. Best of the greens.
Azoychka	Very bright yellow. Good flavor. Did show signs of disease early on.
Beams Yellow Pear	Plentiful, only so much I can do with yellow pear. Favorite among some so commercial growers should be aware of small but loyal market. Excellent as tomato figs or in gift baskets.
Brandywine (Sudduth's Strain)	Grown in 2003 and 2004, excellent results in 2004. Late tomato, large and sweet. For the patient grower, but worth the wait. Susceptible to disease. Prefer the Giant Syrian.
Druzba	Good canning tomato; recommend for commercial growers because it's dependable. Nothing special to distinguish it above other main-crop choices.
German Pink	Good tomato in class of Brandywine and Giant Syrian. Big, showy, excellent flavor.
Giant Syrian	No doubt, best tomato both for production and flavor. Unable to find any reference to this tomato in publications except the Seed Savers catalog and can't imagine why. Growers always ask for it, and I think it has the best flavor of the tomatoes I grow.
Gold Medal	A large yellow that I would use every year to represent the yellow spectrum. Holds color well for roasting. Watch for peak flavor as ripens on vine.
Green Zebra	Zebras from my experience are overrated. Would not grow either red or green zebra again. Buyers find them interesting and attractive, but the flavor just isn't there.
Hillbilly Potato Leaf	Another great yellow, beautiful and sweet. Difficult to choose between this and Gold Medal - either provides a good contrast, but Gold Medal is slightly less fragile.
Hungarian Heart	Bigger and meatier than Amish Paste. Perfect tomato for roasting. First choice for paste tomato.
Isis Candy	Consistently rated most flavorful among taste testers. Big yield and makes very good juice. Best flavor of the small, reddish tomatoes. Big plant, takes garden space.
Juane Flamme	One of my favorites for color contrast in canning, frozen, salads, roasting, and drying. Holds color. Early, dependable, prolific.
Kellogg's Breakfast	More yellow than orange and held color better than the Gold Medal yellow for canning and roasting. I'd definitely put this on the list to grow for flavor and color contrast for both fresh eating and processing.
Nyagous	My favorite of the black tomatoes tested. Attractive egg shaped fruits and best for dependable show of diversity. Best use in the kitchen of the blacks and least fragile.
Paul Robison	Nice for slicing if the black color is desired. Preferred Nyagous because it was smaller, wonderful shape, fewer seeds, and equally good flavor.
Opalka	I didn't care for the texture, though the flavor was good. Fruits were zebra-like. Red and yellow stripes not matching catalog description. Had blossom end rot on these tomatoes, which I've never had in western MN before, as did other growers.
Red Zebra	Did not like this tomato. Interesting, but lacked flavor. Subject to blossom end rot.
Riesentraube	Cheerful little tomato, slightly larger than I expected. More round than pear shaped. Good color for juice, good cherry tomato for baskets and salad, but nothing distinctive.
Sioux	Standard, red tomato in the class of Wisconsin 55 and Druzba. Seemed slightly hardier this summer than the other two. Excellent for canning and processing. True red.
Stupice	Remains my favorite as early dependable tomato. At 55 days, Stupice harvested last week of June. Nice, fresh flavor, not great but a good early salad tomato. Good for the small garden.
Sun Gold Hybrid	Only hybrid tomato grown for testing; rated very high at every taste test. Early and continued bearing fruit late. Fill a basket and serve as candy. A very popular tomato; alas, a hybrid.
Tiny Tim	My aunt likes these little very red tomatoes. Very good 'pot' tomato. I grew these among herbs in my flower/herb garden and in pots at the entry to my house. Pretty plants and fruit clusters, but the flavor is tame compared to the Isis Candy or Sun Gold.
Wisconsin 55	All-purpose tomato for processing. Good size, attractive, old fashioned taste. Good, standard market tomato for all sorts of processing. Growers who can picked this as favorite all purpose.

Raspberries Grown in High Tunnels for Northern Climates

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Project Duration

2004 to 2005

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Keywords

extended season, high tunnels, raspberries

This sustainable agriculture demonstration project was a USDA North Central Region Sustainable Agriculture Research and Education Program producer grant.

Project Summary

Growing crops in the northern region of Minnesota is a real challenge for market gardeners. We have been using season extending devices for some crops, but recently began exploring using season extension for raspberries. For this demonstration project, we built a greenhouse-like high tunnel and planted several varieties of everbearing (fall producing) raspberries. We tested the ability of fall bearing raspberries to survive (and overwinter) in a greenhouse environment and whether we would be able to extend our raspberry production season using high tunnels. The raspberries planted in the high tunnels in the spring of 2005 produced raspberries from mid-August through the beginning of October, and enabled us to be the sole fresh raspberry vendor in the fall at the farmers' market.

Project Description

Our farm consists of 12 acres of sustainably grown vegetables and fruits, free range chickens, and 20 acres of Christmas trees. One of our crops is raspberries, a high-value product in Duluth, where the short growing season makes our customers hungry for every bit of summer sweetness they can find. We learned years ago that, living this close to Lake Superior, we had to 'cheat' the weather any way that we could.

We decided to try growing fall-bearing raspberries, in addition to our summer-bearing raspberries, to extend the season. Because the fall-bearing raspberries are Zone 4 plants and our farm is in Zone 3, we experimented with using a greenhouse-like high tunnel to shelter the plants. While tunnels like these have been used for annual crops (we have had tomatoes under high tunnel production for over 15 years), this is the first time they have been used for a perennial plant in Minnesota.

We had to be flexible during the process; some unexpected twists led us to change our plans along the way. The new 96' by 30' high tunnel (15' maximum height) was supposed to be installed in fall 2004, but was delayed due to a wet fall and was not constructed until spring 2005. Then, further research on high tunnel production made us decide that instead of mulching the rows of plants, we would till the mulch into the topsoil and use landscape fabric around the plants.

We purchased several varieties of plants from Ag Resources in Detroit Lakes, MN: Polona, Fall Gold, Autumn Britton, Josephine, Autumn Bliss, and Summit. In the high tunnel we had room to plant five 95' long rows.

High tunnel with raspberries.

Results

Fall-bearing raspberries produce fruit the first year, so we were able to harvest and sell berries in fall 2005. Under normal conditions in Duluth, it's a rare season when fall-bearing raspberries produce at all. They normally begin producing mid-September about the time of our first frost. Our high tunnel raspberries produced from mid-August to early October. Our summer-bearing berries produced from mid-July to mid-August, so this allowed us to have a continuous supply of raspberries for our farmers' market customers. By mid-August the plants were 6' tall, their full height. While not yet very bushy, we expect them to grow more in their second year. The canes were mowed to the ground in the fall because fruit on fall-bearing raspberry plants are produced on the first year canes the following summer, unlike summer bearing berries which bear on the two-year-old canes.

In general, the fall-bearing raspberries in the high tunnels produced less per foot per row than field grown summer berries, but this was also the establishment year for the fall-bearing raspberries. Next summer's production will give us a better comparison.

By far, the best-producing berry for us was Summit. A summary of our results for each variety includes:

- Autumn Britton and Autumn Bliss – Both varieties produced really big berries. They were sweeter than our summer-bearing berries with nice flavor.
- Polona – This variety is more of a jam berry, a bit on the tart side.
- Fall Gold – These berries were delicious! Unfortunately, they just weren't high producers for us and we had only a few berries.
- Summit – Our biggest producer with taste similar to summer raspberries.
- Josephine – This didn't produce the sweet berries we expected. We were told there was a problem with the plants and they are being replaced.

Our berries commanded a premium price at the farmers' market; people were excited about having raspberries in the fall and we were the only ones selling them.

We did identify some problem areas and things to fix:

- The plants did well in the greenhouse over the summer. However, on cooler, foggy mornings when we left the tunnel sides down to protect the plants, we found that later in the day the sun would drastically raise the temperatures in the greenhouse. We are working on a solution for this that would involve a temperature-controlled device that will automatically lift the sides of the tunnel.
- We discovered that an animal, probably a rabbit, spent the winter in the tunnel and did some damage. We will need to seal the greenhouse better.
- The landscape fabric seemed to raise temperatures around the plants and in a storm some of it blew up and pulled some of the plants out. We're not convinced that landscape fabric is the way to go. This year we may experiment further and use landscape fabric on half of the plants with mulch on the other half.
- Although we installed irrigation tape under the landscape fabric, we had no way to measure how much water each plant was getting. This year we are installing a water check valve and, with it, a method to inject fertilizer under the landscape fabric.

This year we have more opportunities for experimentation and growth. Over the winter, a large storm tore plastic off half the tunnel. It will be a learning experience to find out what happens with the plants on each half. So far, it looks like the plants on the exposed part of the tunnel may take off sooner because they have large amounts of moisture while the plants on the other half have very dry soil.

I'm also looking at meeting the demands of a local jam maker and wine maker. This will provide another way to market our products.

We feel like this whole project has put us on the map and are very pleased with the results of the high tunnels and fall-bearing raspberries.

Management Tips

1. Be flexible; this project took more time and was more expensive than we expected.

2. Plan for a way to measure water and a method to fertilize if using landscape fabric.

3. Construction should be completed in the fall and ready to go for the spring planting.

Cooperators

Bob Olen, University of Minnesota Extension, Duluth, MN

Other Resources

Ag Resource Inc., 35268 State Hwy., Detroit Lakes, MN 56501, 218-847-9351, dgbari@tekstar.com

Farm Tek. Information on high tunnels and greenhouses available at: www.farmtek.com

Apple Scab Control Project

Principal Investigator

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Project Duration

2005 to 2007

Staff Contact

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Keywords

apple scab, ascospores, data logger, leaf wetness, sulfur sprays

Project Summary

Our farm consists of 120 certified organic apple trees on 2.5 acres just west of Taylors Falls, MN and the St. Croix River Valley. One of the challenges of growing certified organic apples is controlling fungal diseases on the trees and fruit using only inputs approved for certified organic apple production. We've applied sulfur to our orchard in the past and have not noticed any improvement in disease control when compared to trees that received no sulfur protectant sprays. Our assumption has been that the timing of our sulfur applications has not been correct and that we needed a better method of timing our sulfur sprays. We propose studying the effectiveness of applications of a sulfur protectant based on degree days, leaf wetness, and temperature.

Project Description

All of the trees were planted in 1997 and are just now producing fruit. The trees were planted in an old livestock feedlot which has provided nitrogen rich soil for starting the young apple trees. We've been challenged with maintaining good drainage in our apple orchard since water from the field slopes to the center and through a culvert to an adjacent pond. Our main challenge is managing diseases on the apple trees and fruit using only those inputs approved for organic apple production by the federal National Organic Program and through the Organic Materials Review Institute (OMRI).

As our trees have grown, we've noticed ongoing mottling of the apple tree leaves caused by apple scab. This disease has reduced the quality and quantity of our apple production. We've also noticed the Honeycrisp tree variety appears to be impacted the greatest from this mottling. Since the majority of our orchard is the Honeycrisp variety, solving this mottling issue would improve the success of our orchard operation the most.

Our goal is to determine if improving the timing of protectant sulfur sprays will have any impact on reducing apple scab infections in our apple tree. There have been many studies done on the life cycle of scab infections and the percentage of ascospores which will be discharged under various environmental conditions. Dr. W.D. Mills at Cornell University charted scab infection periods in the 1920s through the 1940s to show the relationship between average temperature and length of wetting period for primary infection to occur. If the leaf surface dries soon enough, a scab infection can be prevented naturally. If, however, the optimum temperature and leaf wetness occur during the accelerated phase of ascospore maturation, a protectant needs to be applied. Sulfur has been advertised as a protectant for apple scab and is approved for use in organic apple production.

Wild Fruit Farms Orchard.

We've been using sulfur as a protectant spray for the last five years and have questioned whether the benefits outweigh the costs. We've compared the difference in scab infection between a few apple trees that were not sprayed and the rest of the orchard that received sulfur sprays. We have not noticed any appreciable difference between the sprayed trees and those trees not sprayed. In the past, our assumption has been there must have been some environmental reason for the differences. However, given the close proximity between the sprayed and un-sprayed trees, that assumption does not seem logical. Our only other conclusion is that our timing of the sulfur sprays was missing the period when the leaf needed the most protection. We believe we can improve the effectiveness of our sprays by deciding when to make those sprays based on tracking the primary scab season which was between 300 and 700 degree days (where degree days are calculated by subtracting a 32 degree base temperature from the mean daily temperature, that is the high and low divided by two) and the leaf wetting period.

In addition, Dr. William MacHardy at the University of New Hampshire discovered long-wavelength red light (daytime) plus wetness are necessary to trigger spore release. Therefore, leaf wetness would only need to be tracked from sunrise to sunset. If the leaf remains wet for more than six hours and the temperature is between 60-75° during the 300 to 700 degree day primary scab season, a sulfur spray would be applied within the six hour leaf wetness time frame.

We are testing our theory that timing is everything with sulfur sprays by setting up a weather station to track degree days and leaf wetness. Our measure of success will ultimately be the percentage of apple scab damage to the leaves and fruit. Apple scab has affected 50 to 70% of the total apple leaf area of the orchard in the past few years.

Results

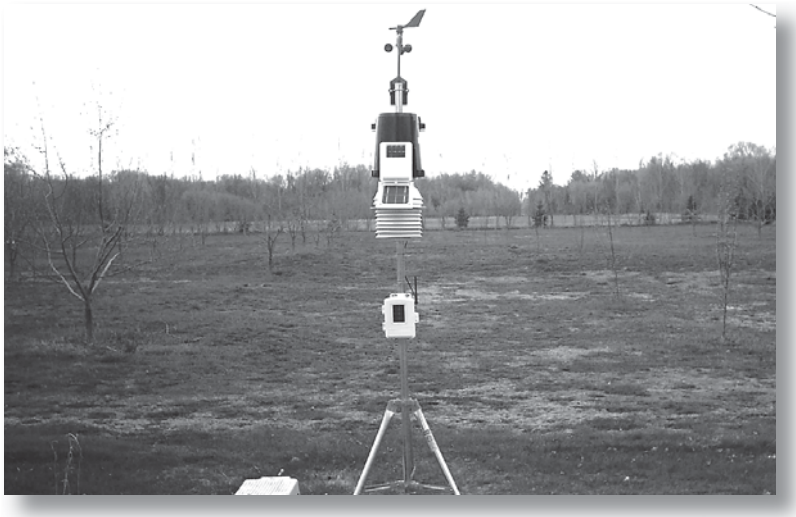
Our first application was a lime/sulfur spray on April 17, 2005 at a rate of five gallons of lime/sulfur for every 100 gallons of water sprayed on 2.5 acres. The lime/sulfur was used to eliminate any over-wintering spores. We began tracking degree days and leaf wetness using a weather station on April 30, 2005. Based on Dr. W.D. Mills' studies and our weather monitor, our primary scab season started in the middle of May at 300 degree days.

Our second application of sulfur spray was on June 5, 2005 at a rate of 1.25 gallons of sulfur for every 100 gallons of water sprayed on 2.5 acres. The second spray timing was a futile attempt to protect the trees from previous ascospore events. Due to the unusual early warm temperatures and spring rains, earlier applications of sulfur sprays would have been more effective. By the time our weather monitor was installed, we may well have been into the primary scab infection period and past the 300 degree day mark when sprays may have been more appropriately timed. By mid-June we were well past the primary scab season where secondary scab infections had a foothold and obvious mottling of the tree leaves was evident.

After reviewing the data collected from the weather monitoring equipment, our primary scab infection period (300 degree day reached) started on May 17 and ended on June 4 for the 2005 growing season. Using the leaf wetness sensor, sulfur should have been applied May 18, 19, 27, and 28. The other days where the leaf sensor indicated wetness periods longer than six hours, had either occurred at night, early morning, or evening when the exposure to red light was not present.

Discussion

The biggest surprise for our farm was how early the primary scab season started and ended. Without the weather monitoring equipment for tracking degree days, we had always assumed sulfur applications were best timed when the apple trees have leafed out. Even with the late installation of the weather monitoring equipment, it did not take long to reach the 300 degree days and the end of the primary scab season at 700 degree days. We'll test our theory by starting sulfur sprays much earlier in the 2006 season, perhaps even at the green tip stage of the tree.



Weather data logger in orchard.

Management Tips

1. There is no need to start with a lime/sulfur application. We suspect that the cold weather climate in Minnesota takes care of the majority of overwintering ascospores.

2. Use flowable sulfur which mixes easily in a mixer tank for doing quick applications.

3. Clean the spray equipment thoroughly after each application, otherwise the sulfur will accumulate on the sprayer and it becomes very difficult to remove the dried sulfur.

Cooperators

Patrick Lynch, Breezy Hill Orchard, Maple Lake, MN

Project Location

From Minneapolis/St. Paul, take I-35 north to North Branch. Turn onto Hwy. 95 east through Almelund to mile marker 70. Take gravel road north (Teal Ave.) to the first red farmhouse on the left.

Other Resources

Earles, Richard, et.al. 1999. Organic and Low-Spray Apple Production. 38 pp. Available from Appropriate Technology Transfer for Rural Areas (ATTRA) – USDA. Web site: http://attra.ncat.org/attra-pub/summaries/apple.html or 800-346-9140.

Phillips, Michael. 2005. The Apple Grower, A Guide for the Organic Orchardist, 2nd Edition. Chelsea Green Publishing. 320 pp. Available at: 800-639-4099.

Sweezy, Sean L., et. al. 2000. Organic Apple Production Manual. University of California. Pub. No. 3403. 72 pp. Available at: 800-994-8849.

Damage to apple leaves caused by scab.

Establishing Healthy Organic Asparagus While Utilizing Minimal Labor and Maintaining Proper Soil Nutrition

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Project Duration

2005 to 2007

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651-201-6217

Keywords

asparagus, organic production, soil pH, weed management

Project Summary

We are Breezy Hill Organic Orchard and Gardens, located about 50 miles west of the metropolitan area in Maple Lake, MN. We believe in respecting our environment by growing organic and certifying organic through an organic certifying agency. Because of our desire to diversify our farm and our customers' wish for fresh organic asparagus, we have begun to grow asparagus. There is an increasing demand for locally grown organic asparagus and we hope to go into commercial production by the year 2007. In the meantime, we hope to develop a strategy for effective weed control while keeping costs down and maintaining our organic integrity.

Project Description

We own a 60 acre farm that was purchased from Patrick's parents in 2000. We have been certified organic since 2002 by the Midwest Organic Service Association. The major part of our production is apples and raspberries. We also grow and harvest pears, plums, rhubarb, tomatoes, and pumpkins. We ventured into asparagus production because we wanted crop diversification.

We began this project with three test rows of asparagus in our garden. Each row is 25' in length and spaced intermittently within our garden space. Two of the rows are hand weeded while the third row has recycled tin and wood chips as a weed barrier. The tin is covered consistently by a foot of wood chips. The weeds grow sparingly between the spears and are hand weeded fairly easy. However, the tin does shift at times and can inhibit the growth of the asparagus spears. The two rows, without any weed barrier, can consume up to eight hours every other week to weed and maintain. For a small farmer, hiring help to do the weeding can be costly but with other ongoing projects, this is the only option.

The test rows are in their third year of growth, and now produce spears of 1/4" to 1/2" in width and can be cut at 7 plus inches in length. We have found that a straight spear at 7" to 10" in length is marketable.

Because of the growth of the test rows and ability to harvest marketable spears, we were encouraged to try other weed barriers in attempting a commercial size plot of organic asparagus. In addition to the three original test rows described above, we added a 1/2 acre planting of asparagus as part of our project. On the 1/2 acre, we covered half with black plastic mulch and half with landscape fabric to act as the weed controls. We will compare them to the tin and hand weeding for labor used in weed control.

Results

Our goals for this project are to cultivate plants, maintain the asparagus within a budget, and monitor the asparagus for three years until the first harvest. We are comparing the recycled tin to the black plastic mulch and landscape fabric for weed barriers. We are focusing on organic methods while keeping labor to a minimum. We want to maintain a healthy soil and environment for the asparagus.

In 2005, we set out to plant the new asparagus in 7' row spacing with 1 1/2' between the plants. We did accomplish this although it took the better part of spring and most of the summer due to rain. We received a lot of rain from mid-May through late summer. Our field remained wet through most of the summer. We laid the landscape fabric by late

August and decided to forgo the black plastic until next spring. We thought it was too late in the summer to put the black plastic down only to rip it back up a month later. Our labor costs for the first summer went to planting, laying the landscape fabric, and weeding. We cultivated twice between the rows in early fall to keep the weeds turned over.

Asparagus likes a soil pH at 6.5-7.5. In early May, we sampled the soil. The pH level was 7 with a good ball of loamy soil. In the fall, the soil pH was still 7 with a good ball of loamy soil. The field has rich black loamy soil over clay. We have good drainage as well. The new asparagus were thriving when fall wrapped up.

Our cooperators, students from the Future Farmers of America (FFA) at Howard Lake, had some scheduling problems through the summer months and were not on hand to work. We had to hire local teenagers who provided good backs for digging and planting as well as weeding when necessary. We did extend an invitation for the FFA students to get involved next summer.

The weather really affected our first year. We did not anticipate the amount of rainfall we received through the summer months topped off with record high temperatures. We also didn't anticipate how long the planting process would take. Planting the asparagus proved to be time consuming and labor intensive. We were determined to get the field planted and established by year end and we did achieve that.

Management Tips

1. Select a field based on good soil and good drainage.

2. Select a field that you want to invest 10-15 years into one type of production. Make sure any soil amendments are applied before planting.

3. Planting requires a lot of labor.

4. Base row spacing on equipment for ease of cultivation.

Cooperators:

Future Farmers of America, Howard Lake, MN

Project Location

We are located 50 miles west of Minneapolis off of Hwy. 55. Go west from 494 to Cty. Rd. 37 just past Maple Lake. Take 37 south to Iresfeld Ave. NW and take a left to the first farm on the hill.

Other Resources

Kuepper, George and Thomas Raeven. 2001. Organic Asparagus Production. Available from USDA Appropriate Technology Transfer for Rural Areas (ATTRA). Web site: www.attra.org/attra-pub/summaries/asparagus.html or 1-800-346-9140.

University of Minnesota Extension Service. Growing Asparagus in Minnesota - A Production Guide. Revised 2005. Pub. No. WW-01861. Web site: www.extension.umn.edu/distribution/horticulture/dg1861.html

Gardening with the Three Sisters: Sustainable Production of Traditional Foods

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Project Duration

2005 to 2007

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Keywords

indigenous plants, passive solar energy, Three Sisters Gardening, traditional agricultural practices

Project Summary

A Three Sisters Garden is the optimum venue for planting and preserving traditional corn, beans, and squash. These nonlinear mounds of corn, beans, and squash create a holistic garden where everything from soil chemistry to weed control is sustained by this vegetable concert. In addition to its physical contribution to sustainability, a Three Sisters Garden carries on our culture as Indigenous farmers, and we sustain the land as we feed ourselves. Restoration of the Three Sisters Gardens allows us to share our traditional ways and knowledge with the community.

We hoped to accomplish several things including: an increased production of our traditional corn, beans, and squash to serve these foods to our people as well as to market; education to the community to assist in the restoration of our traditional gardening heritage and to increase the use of "closed-system" agriculture in gardens across the region; and an increased ability to provide members of our community with the tools they need to have success in growing traditional food.

Project Description

The White Earth Land Recovery Project has over ten years of experience in sustainable, traditional, and organic farming operations. To date, we have two acres of organic raspberries, one acre of organic strawberries, ten acres of White Flint corn, one-half acre of Three Sisters Garden, and 220 acres of sugar maple trees. In our berry patches we hand weed during the months of May and June. We use certified organic soil additives such as pyganic, calcium, and fish kelp for pest control and fortification for the plants.

In our corn, we control weeds by a method of slow dragging when the plants are only a few inches tall. Weed control is maintained with regular cultivation during the early stages of corn growth. For organic farm advice, we consult with Curtis Ballard and our Traditional Agriculture Steering Committee (established 2004-2005). In our pristine sugarbush, we are completing the final stages of Forest Stewardship Council certification through Smartwood, and the forest is managed according to the ecological management plan developed with Smartwood foresters. During the maple syrup season, we tap over 4,000 trees and collect the sap without the use of a pipeline system. Sap is collected by hand and carried to the evaporator by Percheron horses pulling a large tank on a homemade sled. This process is very labor intensive and requires the resources of our community and is consistent with our cultural teachings.

In our project we plan to establish larger sites for Three Sisters Gardening throughout the White Earth Reservation, going from one-quarter of an acre to approximately three acres. We have additional acreage that can be developed. We will do soil testing to see if there are any contaminants from nearby farming operations. The soil testing and the Three Sisters Garden planning will involve the community in the form of ongoing workshops that educate and demonstrate traditional and sustainable agriculture.

Another component of our project is utilizing greenhouses to start seeds early, therefore eliminating some of the labor in weed maintenance. In our previous test plot, weed management (even though we had only 75 mounds) was labor intensive until the squash took over as ground cover. With utilization

of greenhouses, seeds can be started early and transferred to the mounds. The mounds can be built and maintained as the seeds germinate and grow in the greenhouses. The transplanted squash will be big enough to cover the ground, the beans ready to produce runners, and the corn ready to make stalks. Reducing the labor that goes into a Three Sisters Garden plot will allow us to increase the acreage and lower the cost of production when we are able to produce enough to take to market.

In order to start seeds early, the White Earth Land Recovery Project built five greenhouses and turned management of them over to experienced gardeners in each of the five reservation communities. The 12' x 14' greenhouses were constructed with untreated pine framed ends and two support sections framed with salvaged PVC pipe. The recycled pipe was sunk into the ground through an untreated cedar bottom plate. The greenhouses were then covered with greenhouse grade plastic that measured approximately 15' x 25'.

Our greenhouses became hot houses because the single-layer plastic shell was unable to provide a thermal barrier. When the sun was out, the houses quickly heated up in excess of 90°F even with the doors open. When the sun went down, the heat quickly escaped. Because of these thermal swings, greenhouse caretakers had the unfortunate experience of "cooking" their vegetable plants before they were able to produce any vegetables. A temperature control system would need to be implemented in order for the greenhouses to be effective. Each greenhouse would need to be covered with an additional plastic shell and have a blower motor attached. The blower would vent into the outer layer of greenhouse plastic and blow cool outside air in between the two plastic shells. This process would create an air gap between the two sheets of plastic and prevent the greenhouse from burning the plants on a hot day. This extra shell would also help the house shed wind, resist weather, and preserve the inner shell.

Reducing temperatures during the day will keep the plants from overheating; however, it could freeze the plants in the cold of night. The greenhouses are supposed to provide our gardeners with the opportunity to successfully grow and save seeds, but, with the risk of frost, this cannot be accomplished. Our solution was to devise a passive solar heating system with propane backup, which was inspired by heating units examined at other sites in Minnesota. For our greenhouses, we planned to use a 30 gallon propane water heating tank that is in a closed system with passive solar water heaters. Piping from the tank to the heaters will run through the greenhouse in a 12" x 12" grid. The piping will be buried under a mixture of sand, manure, and soil and at night the heat for the greenhouse will rise from the water heated biomass covering its floor. The passive solar heaters will replenish the reserve of hot water on a sunny day and should be enough to keep the house warm at night. If there isn't enough solar heated water or not enough sun to heat the water, the system will utilize the propane backup. This process will involve community youth in the installation process and the heaters will be monitored during a six month period. If they work, we will install these heating systems in each of the community greenhouses.

Results

Work still continues through the fall including: obtaining organic manure (for gardens and greenhouses) from a local organic farmer; planting 250 heads of garlic for the 2006 growing season; working with local tribal schools to implement vegetable patches focusing on squash production as they learn about seed saving techniques, tilling, and resource management; and seeking donations from various seed organizations of traditional seeds for the upcoming season.

Problems arose in a couple of areas, most importantly, the greenhouses. The use of passive solar heaters was thought to be the ticket to maintaining temperature during the night, but in turn, the intensity of the heat build-up led to multiple fires. An alternative method for heating the greenhouses is being researched. Weed and pest control were other areas that experienced some major problems. Beginning with our organic strawberries, right before the picking season, the plants were invaded by slugs. This was due to a rainy spring season. Even picking the slugs off by hand and other methods of removal did not deter these pests from virtually destroying the picking season for our strawberries. With our Three Sisters Gardens, we experienced heavy populations of Canadian thistles and the only way we were able to remove them was by physically pulling them. We came to the conclusion that the horse manure we used was full of thistle seed, so organic manure was located to replace it.

Cooperators

Traditional Agriculture Steering Committee:
Curtis Ballard, Organic Farmer, Ogema, MN
Steven Dahlberg, White Earth Tribal and Community College, White Earth, MN
Toni Vizenor, Traditional Gardener, White Earth, MN
Steven Roberts, Rancher, Strawberry Lake, MN
Ronald Chilton, Sustainable Communities Coordinator for the White Earth Land Recovery Project, Ogema, MN
Mike Swan, Organic Gardener and White Earth Commissioner of Natural Resources, Ponsford, MN

Project Location

The White Earth Land Recovery Project is located approximately 210 miles northwest of Minneapolis on the

White Earth Indian Reservation. To get to the farm from Minneapolis, take I-94 to US Hwy. 10 West (Clearwater/ Clear Lake exit). Stay on US Hwy. 10 for approximately 130 miles until you reach Detroit Lakes. In Detroit Lakes, at the first set of stoplights, (Hwy. 10 and Roosevelt) take a right, go to the second set of stoplights (Roosevelt & Hwy. 34) take a right (onto Hwy. 34) Going east on Hwy. 34 until your reach Cty. Hwy. 37 (approximately 17 miles) take a left onto Cty. Hwy. 37. Go North on Hwy. 37 approximately 12 miles to the intersection of Cty. Hwy. 35 and 124, taking a left onto Cty. Hwy. 35. Go West on Cty. Hwy. 35 past Ice Cracking Lodge (approx. 6 miles) to the East Round Lake Rd. Take a right, go about 1¾ miles down the gravel East Round Lake Rd. the WELRP Farm is the last place on the right.

Other Resources

LaDuke, Winona. Food Is Medicine. White Earth Land Recovery Project and Honor the Earth Publishing. Book on traditional agriculture and the importance of traditional foods for Native people. Web site: www.nativeharvest.com

Seed Savers Network. Web site: www.seedsavers.org Source of traditional and heritage varieties of seeds.

Feasibility of Winter Wheat Following Soybeans in Northwest Minnesota

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Project Duration

2005

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Keywords

crop rotation, hard red winter wheat performance, winterkill

Project Summary

This project demonstrated the feasibility and benefits of winter wheat following soybeans in northwest Minnesota. The objective of the research was to evaluate the performance of 16 different Hard Red Winter Wheat (HRWW) varieties following soybeans in northwest Minnesota.

Project Description

The number of HRWW acres in Minnesota is historically very low when compared to hard red spring wheat (HRSW) acreage. Lack of a suitable previous crop and the risk of winterkill are two main reasons why winter wheat acreage is small. Winter wheat offers a number of advantages over HRSW. First, inclusion of winter wheat in the crop rotation allows for more efficient use of labor and equipment by spreading out the labor. Thus, inclusion of HRWW in a crop rotation has the potential to reduce fixed cost per acre in both winter wheat as well as the other cereals, improving the profitability of those enterprises indirectly. Second, HRWW offers the potential to reduce the need for crop protection inputs. The canopy of HRWW establishes much earlier than HRSW. HRWW may be able to out-compete annual broadleaf and grassy weeds. This eliminates the need for a selective herbicide, and lowers the variable inputs per acre. Finally, HRWW may have a higher grain yield potential than HRSW because the crop is already established in the spring and growing when HRSW still needs to be planted. This may also mean that the period of grain fill occurs earlier in HRWW (partially) escaping the summer heat thus increasing the grain yield potential.

The risk of winterkill can be greatly reduced if and when a snow cover protects the dormant wheat seedling. Even a few inches of snow greatly reduces the risk of winterkill. No-till cropping systems that maintain as much standing stubble as possible enhance snow trapping and provide the needed protection for HRWW. In addition, no-till systems offer the advantage of preserving soil moisture at planting which increases the odds that germination and emergence will be faster and more even. Finally, no-till systems can reduce wind and water erosion in the fall and spring. No-till production systems have steadily allowed HRWW acreage to increase in the Canadian provinces in the past decade. Implementation of no-till practices in Minnesota in general and northwest Minnesota in particular has been limited because of the short growing season and the delays that no-till systems generally cause with seedbed preparation in the spring.

A suitable previous crop to HRWW would preferably be something other than HRSW. Soybeans are an excellent previous crop to HRSW. Soybean acres have dramatically increased in the past five years across northwest Minnesota. In 1994, just over 200,000 acres of soybeans were grown in this part of the state. By 2003, this number had increased to over one million acres (Minnesota Agricultural Statistics Service, 2003). HRWW is traditionally planted in the last week of August and the first week of September. At that time, the soybean crop has not yet matured. When soybeans serve as a previous crop to HRWW in northwest Minnesota, planting of HRWW is delayed by a month to the last week of September or first week of October.

Previous research had demonstrated that winter wheat could be established successfully following soybeans (Wiersma et. al., 2004). In this research, the authors used only three well established cultivars

that differed in their winter hardiness ratings. To evaluate the performance of additional HRWW varieties following soybeans in northwest Minnesota, two yield trials were established in the fall of 2004 at two on-farm locations in northwest Minnesota. These two trial locations were also used as demonstration plots and a field day was organized to discuss benefits of HRWW in the crop rotation as well as the characteristics of the different HRWW in the trials with producers in the region.

The trials were located with Vig Farms in Fosston and AWG Farms in Crookston. In each location, a randomized complete block design was used with 16 HRWW varieties planted in three replicates. The trials were planted on September 30, 2004 and October 1, 2004 in Fosston and Crookston, respectively. Site preparation included a single pass with a harrow to spread the soybean residue evenly across the field. Care was taken not to disturb the standing soybean stubble. No tillage operations were performed to prepare a seedbed. Plots were directly seeded with an Almaco plot drill. The seeding rate for each variety was adjusted for percent germination and kernel weight to a goal of 25 plants/ft^2 for all varieties. The plot size was 5 x 15'.

Although not recommended as a practice, all fertilizer was broadcast applied 21 days after planting according to soil test recommendations for a 60 bu/A yield goal. The preferred practice would be the use of a starter fertilizer at planting and application of the balance of the fertility requirement in early spring as the crop breaks dormancy. Both logistical constraints and a plot drill that did not have a fertilizer attachment forced us to apply all fertilizer immediately following planting in the fall. Weeds were controlled with a tank mix of Puma and Bronate Advanced at label rates applied at the 5-leaf stage of wheat using a tractor-mounted sprayer equipped with 8001 flat fan nozzles delivering 10 gal/A.

Initial emergence in the fall was recorded 21 days after planting. Initial stand was recorded in the first week of May. The percent winterkill was calculated as the difference between the intended stand (25 plants/ft^2) minus the stand recorded in the spring divided by the intended stand. To estimate grain yield, the entire plot was harvested with a small plot combine. Harvested grain was cleaned with a Clipper Office Tester and Cleaner, (Seedburo Equipment Co., Chicago, IL 60607) and grain yield and test weight were expressed on a 13.5% moisture basis as bu/A and lb/bu, respectively. Grain protein content was determined on a one pound subsample by near infrared transmission using a Tecator Infratec 1229 Grain Analyzer (Foss North America, Inc., Eden Prairie, MN 55344). The data were analyzed using Statistix 8 (Analytical Software, Tallahassee, FL 32317) assuming all effects as fixed.

Results

Yield Trials - The amount of winterkill averaged 17 to 18% across varieties. Varieties differed for the amount of winterkill in Crookston. 'Infinity CL' and 'Nekota' showed significantly less winterkill than any other variety while 'CDC Raptor' showed significantly more winterkill (Table 1). No significant differences for winterkill were observed among varieties in Fosston (Table 2). Grain yield is expressed as percentage of the trial mean. 'Arapahoe', 'Infinity CL', 'Jerry', and 'Millennium' were among the top yielding varieties in both Crookston and Fosston.

Test weight averaged 60.5 lb/bu and 59.7 lb/bu in Crookston and Fosston, respectively. 'Jagalene' and 'CDC Falcon' had significantly lower test weight than any other variety in both Crookston and Fosston.

Grain protein averaged 11.1% and 12.2% in Crookston and Fosston, respectively. Significant differences were detected among varieties. 'Roughrider' and 'Jerry' were among the varieties with the highest grain protein content.

Management Tips

1. Winter wheat can be established successfully following soybeans in northwest Minnesota.

2. Percentage of winterkill will likely decrease with use of a no-till drill or air seeder with narrow shanks to plant the winter wheat.

3. Weed control may not be needed in the winter wheat following soybeans.

4. Control of leaf rust with a fungicide may be warranted in years when leaf rust is able to infect susceptible cultivars prior to flag leaf emergence. Active scouting for leaf rust (and potentially stripe rust) is needed as many of the tested winter wheat varieties are, at a minimum, moderately susceptible to leaf rust.

5. Apply a starter fertilizer at planting of hard red winter wheat. Apply the balance of the recommended fertilizer in early spring as the crop breaks dormancy.

Table 1: 2005 Grain Yield, Grain Quality, and Winterhardiness of Hard Red Winter Wheat Varieties in Crookston, MN

Variety	Spring Stand	Winterkill	Yield	Test Weight	Grain Protein
	(lb/ft^2)	(%)	(% of mean)	(lb/bu)	(%)
Arapahoe	19.8	20.9	134.0	61.6	11.1
CDC Buteo	20.7	17.3	94.0	63.8	10.3
CDC Falcon	19.2	23.1	111.0	56.9	11.8
CDC Raptor	17.1	31.5	92.0	60.2	10.6
Expedition	20.8	16.9	91.0	60.7	10.2
Infinity CL	25.0	0.0	131.0	61.6	11.0
Jagalene	19.4	22.2	88.0	55.4	11.3
Jerry	20.4	18.2	126.0	60.7	11.9
Millenium	20.7	17.3	123.0	61.8	11.3
Nekota	24.1	3.6	109.0	61.5	10.2
Ransom	20.4	18.2	105.0	60.1	11.5
Roughrider	20.3	18.7	85.0	60.6	12.2
Seward	20.8	16.9	104.0	62.7	10.3
Wendy	21.7	13.3	105.0	61.0	10.7
Mean	20.5	17.8	60.3	60.5	11.1
LSD (0.05)	3.5	14.1	18.0	3.2	1.3

Table 2: 2005 Performance of Hard Red Winter Wheat Varieties in Fosston, MN

Variety	Spring Stand	Winterkill	Yield	Test Weight	Grain Protein
	(lb/ft^2)	(%)	(% of mean)	(lb/bu)	(%)
Arapahoe	22.1	11.5	123.0	61.9	12.3
CDC Buteo	19.9	20.4	98.0	60.8	11.7
CDC Falcon	18.5	26.2	108.0	58.0	12.3
CDC Raptor	19.7	21.3	84.0	54.4	12.4
Expedition	20.7	17.3	110.0	59.9	11.4
Infinity CL	23.4	6.2	114.0	61.6	11.8
Jagalene	20.5	18.2	87.0	55.4	12.6
Jerry	20.2	19.1	108.0	60.3	12.7
Millenium	20.3	18.7	121.0	61.3	12.2
Nekota	21.1	15.6	100.0	60.1	11.8
Ransom	20.1	19.6	101.0	60.2	12.2
Roughrider	20.8	16.9	86.0	61.3	12.9
Seward	20.8	16.9	94.0	61.0	11.7
Wendy	21.3	14.7	95.0	59.2	12.5
Mean	20.5	18.1	69.3	59.7	12.2
LSD (0.05)	ns	ns	12.0	3.7	0.6

Cooperators

AWG Farms Inc., Crookston, MN
Vig Farms, Fosston, MN

Project Location

For specific locations, call the Northwest Research and Outreach Center at 218-281-8629 or email at wiers002@umn.edu.

Other Resources

University of Minnesota Extension Service. 2002. Small Grains Field Guide. Publication No. MI-07488. University of Minnesota Extension, St. Paul, MN, 612-625-8173 or 800-876-8636.

Wiersma, J.J., H. Kandel, and Z. Fore. 2004. Feasibility of Winter Wheat Following Soybeans in the Northern Great Plains. Agronomy. Abstracts.

Field Windbreak/Living Snow Fence Crop Yield Assessment

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Project Duration

2005 to 2007

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Keywords

blowing and drifting snow, field windbreaks, living snow fences, soil erosion

Project Summary

Modern farming practices and the trend to till all available land for annual crop production has encouraged less surface crop residue and vegetative plantings. This has allowed our rural landscapes to become vulnerable to increasing soil erosion and blowing and drifting snow six months of the year. Field windbreaks and living snow fences (LSF), when placed in the proper locations, can serve a useful purpose and be very beneficial in enhancing rural landscapes.

The goals of this project are:

1. compile crop yield data (using modern yield monitoring/GPS systems) for crops planted around field windbreaks and living snow fences,

2. document variables at these sites, and

3. summarize the data and share it with producers and other ag. professionals.

Project Description

Field windbreaks and living snow fences can serve a useful purpose and be very beneficial in enhancing rural landscapes. When placed in the proper locations, they benefit wildlife, enhance rural aesthetics, reduce blowing snow problems, protect topsoil, and much more. Previous USDA research suggests that there are yield advantages to these conservation plantings. These plantings showed an increase in yield of 12% in corn and 8% in soybeans in areas around the windbreak and LSF. We would like to verify and update this research using plantings in Minnesota. It is important to record crop yields around these plantings using modern yield monitoring equipment to show producers where the yield differences are, including yield increases and other positive benefits of these plantings. If crop yields are higher or equal to field averages, more producers may be encouraged to establish these plantings on their farm. The USDA cost share and continuous-CRP payments for these practices are economically beneficial to producers.

Identification of sites with existing plantings will be the largest challenge. We are identifying crop fields that not only have an established (2-30 year) windbreak/LSF planting but a farmer that has yield monitoring/mapping capabilities. We are working with NRCS/SWCD staff and regional crop consultants to identify fields that would make good sites to study over a three year period. We would like to select ten sites for this project.

After the sites are selected, data collection from the yield monitoring systems should be fairly easy to compile by farmers and/or crop consultants. Yield from strips the width of the combine will be measured and documented. The number of combine strips or distance from the windbreak/LSF planting will depend on the heights of the woody planting (trees or shrubs) and other variables. A current yield assessment around these windbreaks will be very useful to producers and agency staff. Documenting the direction of planting (N-S or E-W), soil types, age of the planting, specie of tree or shrub, slope, land use history, snow cover, farmer observations, compare and contrast data, erosion protection benefit, wildlife benefit, and spring delays will all be very useful information. Seasonal photographs of each site will be useful in developing final reports.

Sharing the data collected in this project is the reason we are conducting the project. We want to update crop yields from crops that are planted around tree and shrub plantings in the field used for conservation practices with modern yielding monitoring systems. We assume there are yield differences but we want to display this in data from current farming practices. The yield benefits may be in the shape of a bell-curve, lowest near the woody planting then peak at five times or so of the planting height then level out to the field average yield.

Results

We are in the first year of the study and are still compiling yield data from the initial sites we were able to identify. We are completing the identification of additional windbreak and living snow fences sites. We hope to contract ten sites for this three year study. The challenge is to locate a successful field windbreak or living snow fence which has the same crop planted around the practice and the operator has a GPS/yield monitoring system on the combine. This has been the hardest part of this project so far.

The results from one of the sites are described here. The site is a living snow fence protecting a state highway with a single 10' high honeysuckle shrub row. It is on top of a hill and has poorer soil on the leeward side (south) of the planting toward the highway. The field average corn yield was 161 bu/A. We gathered the yield for ten combine passes (header width is 30') on the north and south side of the planting. The shrub row is an east/west planting.

The yield followed a bell-curve as you moved out from each side of the planting. Below average yields were realized on the south side of the planting while increased yields were found on the north. On the north side, yield steadily increased from 60' from the planting and peaked at 240' then decreased to field averages. Other variables may have affected this yield but the honeysuckle row may have offered spring and summer wind protection to the young emerging crop. The average yield increase from the 20 combine passes on the north and south side totaled 17.7/bu above the field average or 11% increase. Yield increases on the south side of plantings are usually due to more available moisture from the winter snows. At this site, yields south of the planting were less than the north. This is probably due to poorer producing soils.

The producer who farms this site says, "Field windbreaks should be planted at every half mile section on field borders. We would have less blowing snow, increased visibility and less icy conditions in the winter time and less blowing soil in the spring and summer. Plantings of tall native grasses, trees, and shrubs all are beneficial to rural areas."

Management Tips

1. All landowners should assess their crops fields and property to see if a field windbreak or living snow fence would benefit their land, property, or neighborhood.

2. Contact the County FSA/NRCS/SWCD office to learn more about the cost share and continuous CRP incentive programs that you may be eligible for.

3. Yes, there is a crop yield reduction near the planting; however, there is a bump in crop yield further away from the planting. Overall, there seems to be an increase in yield above field averages at these sites.

4. Other benefits of field windbreaks and living snow fences include protection of topsoil from wind erosion, increased wildlife habitat, improved rural aesthetics, and reduced blowing and drifting snow on community roadways.

Cooperators

The ten cooperators for this project are not selected at the date of this printing. Participants will be listed in the 2007 Greenbook.

The role of the cooperator is to:

- Plant the same crop variety on either side of the selected practice.
- Manage both sides equally.
- Document notable characteristics of the plot and growing season.
- Make sure the GPS and yield monitoring equipment are working properly.
- Send the yield maps and documentation to me for review and recording.

Other Resources

Gullickson, Dan, Scott Josiah, and Paul Flynn. 1999. Catching the Snow with Living Snow Fences. University of Minnesota Extension Service. Pub. # MS-07311. Web site: www.extension.umn.edu/distribution/naturalresources/DD7311.html

Josiah, Scott, and Mike Majeski. 1999. Living Snow Fences. University of Minnesota Extension Service. Pub. # FO-07277-GO. Web site: www.extension.umn.edu/distribution/naturalresources/DD7277.html

Comparing Alternative Laying Hen Breeds

Principal Investigator

Suzanne Peterson
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Morrison County

Project Duration

2005 to 2007

Staff Contact

Meg Moynihan
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Keywords

Buff Rock, chickens, eggs, hens, layers, Leghorn, Silver Gray Dorking, Speckled Sussex

Project Summary

This project was designed to help me determine the feasibility of raising alternative breeds of laying hens. If successful, it will help me diversify my farm operation, as well as demonstrating to other farmers the potential benefit of raising alternative breeds. Ideally, I would like to have a flock in which individual birds only need to be replaced every four to five years. I think that doing this project is very important in order to offer farmers alternatives to a single popular breed of laying hens.

Project Description

Most egg-laying operations consist of commercial Leghorn breed chickens, which must be replaced every one to two years. Alternative breeds, which live and produce longer, may enable savings by reducing the frequency with which hens need to be replaced. This study compares Leghorns directly with other breeds of chickens with the goal of showing whether or not the other breeds can compete with the Leghorns over time. Other objectives include comparing the cost of production of eggs between and among breeds and comparing customer preference for egg color, shape, and size.

The breeds I used are listed in Table 1. Speckled Sussex and Silver Gray Dorkings are long-established European breeds, while Buff Rocks are a traditional American breed. All three breeds cost roughly 1.5 to 2 times as much as Leghorns (which originated in Italy). The Dorking, Sussex, and Buff Rock birds are all larger than Leghorns and have a longer life expectancy.

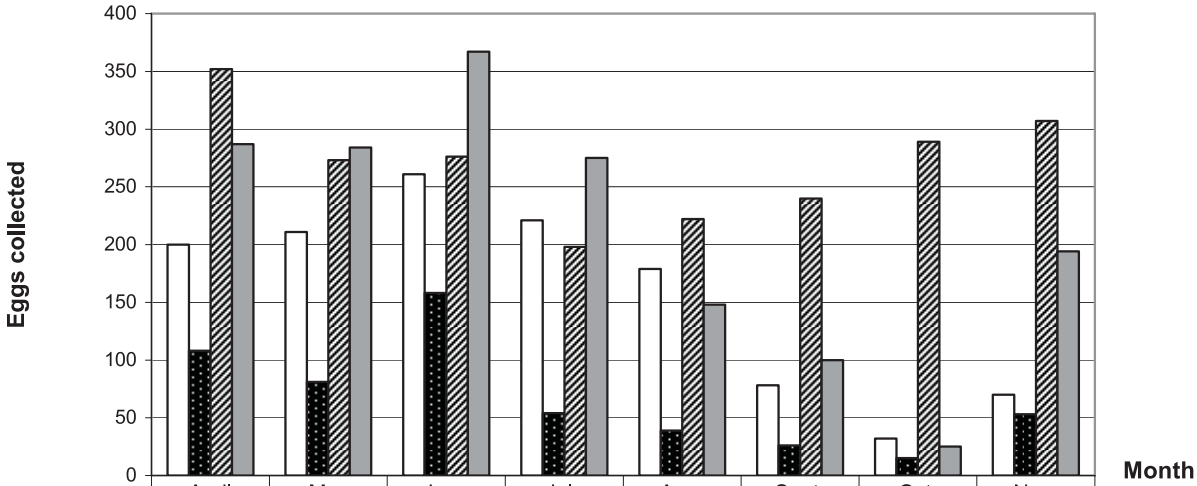
I began the project on April 1, 2005 with one rooster and 15 hens of each breed (except Dorkings, for which I had 14 hens). The birds were about a year old and already laying when the project started. I kept the birds in two pens inside a converted dairy barn. Each pen contained one white egg breed and one brown egg breed, along with a nesting box and roosting area. Speckled Sussex and Dorking birds were housed together in one pen; Buff Rocks and Leghorns were housed together in the other. My research indicated that there was not a significant difference in feed consumption between breeds, so I set them up this way to make daily chores easier. Separating breeds that lay the same color eggs reduced the possibility of recording errors in monitoring egg production. The hens were allowed to go outside when the weather was warmer than freezing, and they were given continuous and unlimited access to fresh water, feed, oyster shells, and grit (winter only).

I started with transitional 17% protein egg mash, but quickly switched to 19%. My idea was to produce organic eggs, but the cost of the premixed feed and transportation were prohibitive and feed costs have exceeded egg revenue. I decided to buy the feed components (corn, soybeans, and mineral salts) separately from our local cooperative

Table 1. Layer Species Used in the Project

Breed	Egg Color
Buff Rock	Dark Brown
Dorking (Silver Gray Dorking)	White
Leghorn	White
Speckled Sussex	Light Brown

Figure 1. Monthly Egg Production (Per Breed) April - November 2005



	April	May	June	July	Aug.	Sept.	Oct.	Nov.
Buff Rock	200	211	261	221	179	78	32	70
Dorking	108	81	158	54	39	26	15	53
Leghorn	352	273	276	198	222	240	289	307
Sussex	287	284	367	275	148	100	25	194

Note: Two Dorkings died in August/September, and two Buff Rocks died in October

feed mill instead and am now feeding a bulk 19% protein mixture that I blend myself. I started with a corn/soybean meal mixture, but subsequently switched from soybean to fish meal (which our co-op orders for me), because the chickens did not seem to like the soybean meal very well.

For the first eight months of the project, my organic feed bill totaled about $800 (plus 160 miles transportation). I expect the local feed components will cost about $375 for the next eight months. Fish meal costs more than soybean meal, but I am still saving money on feed costs by mixing my own compared to purchasing ready-mixed feed. I am currently searching for a local transitional or organic farmer from whom I can buy feed directly, but so far have been unsuccessful.

Our farm held a field day on September 30, 2005 in conjunction with a Harvest Festival hosted by the Sustainable Farming Association of Minnesota – Central Chapter. A total of 28 people attended our field day. I also participated in a "petting zoo" at a church event in Milaca, showing two breeds of the chickens I am using and explaining the project to children and their parents. My son, David Stanislow, who collected data for the project, created a 4-H poster about it for the Morrison County Fair and received a red ribbon.

Results

Figure 1 shows egg production of the various breeds between April and November of 2005, while Tables 2 and 3 show total egg production for each breed. Since the project began, we have gathered and sold approximately 450 dozen eggs at the St. Cloud Farmers Market and right off the farm to individual customers for a gross income of approximately $600. So far, the Leghorns are substantially ahead of the other birds, with the Speckled Sussex at about 78% of the Leghorn production. The other birds are so far behind that I think it is unlikely they will be able to match the Leghorns. I plan to keep all four breeds in the demonstration in order to verify these results.

In general, egg production fell off from July through October, with only the Leghorns showing a minimal decline. The production of the other species dropped

Table 2. Total Egg Production

Buff Rock	1,252
Dorking	534
Leghorn	2,157
Sussex	1,680

substantially and only began to come back up in November, when artificial light was introduced. Beginning November 1, I provided 14 to 16 hours of light per day and saw an immediate response in egg production compared to October.

When I increased the mash protein from 17% to 19% at the beginning of the project, the egg production of all breeds except the Leghorns, improved. The change did not seem to affect feed consumption significantly, though, which was about 250 lb/mo for both the Sussex/Dorking pen and the Buff Rock/Leghorn pen. It will be interesting to see the results of mixing my own feed which I started in December, 2005.

To date, I have lost two Dorking hens (in August/ September) and two Buff Rock hens (in October). Those losses are factored into the per-bird egg production in Table 3.

Production, mortality rate, cost of production, and customer satisfaction information collected during the next two years of this project will show how feasible it is to raise laying breeds other than the popular Leghorn. I have already noticed that most of my customers prefer brown eggs from my Buff Rocks and Speckled Sussex hens over the white eggs that the Dorkings and Leghorns lay.

Table 3. Monthly Average Egg Production Per Bird

	Buff Rock	Dorking	Leghorn	Sussex
April	13.3	7.7	23.5	19.1
May	14.1	5.8	18.2	18.9
June	17.4	11.3	18.4	24.5
July	14.7	3.9	13.2	18.3
Aug.	11.9	2.8	14.8	9.9
Sept.	5.2	2.2	16.0	6.7
Oct.	2.5	1.3	19.3	1.7
Nov.	5.4	4.4	20.5	12.9
Total	84.5	39.3	143.8	112.0

Management Tips

1. Artificial light can boost egg production significantly during short winter days.

2. Temperature does not appear to make a significant impact on production, although keeping the birds' living area above freezing is a good idea.

3. Higher protein egg mash makes a difference in egg production of some species, but had little effect on the Leghorns.

4. Pay attention to which eggs sell first; our farmers market and direct market customers prefer brown eggs to white, and darker brown eggs over lighter brown eggs.

Cooperators

David Stanislow, Foley, MN

Project Location

From St. Cloud, take US Hwy. 10 west to Sauk Rapids. Turn right on Golden Spike Rd. (Benton Cty. 3). Follow Benton Cty. 3 until it becomes Morrison Cty. 30. Continue on Morrison Cty. 30 to a "T" and turn right onto Nature Rd. Go approximately 1.5 miles. Farm is on the right (north) side of the road. Sign says "Azariah Acres Farm."

Other Resources

American Pastured Poultry Producers Association. 6475 Norton Creek Rd., Blodgett, OR 97326, 541-453-4557, www.apppa.org

ATTRA-National Sustainable Agriculture Information Service. Various poultry publications available free of charge in English and Spanish. 800-346-9140 or www.attra.ncat.org

Local chapters of the Sustainable Farming Association of Minnesota offer many field days and workshops. You can find your local chapter at: www.sfa-mn.org

Poultry Your Way. 2005. Minnesota Department of Agriculture. Available by calling 651-201-6012 or at: www.mda.state.mn.us/pubs.htm (contains a chapter on pastured poultry and an extensive "Resources" section).

Salatin, Joel. 1993. Pastured Poultry Profits. 1993. Available from some libraries and booksellers and from Polyface, Inc., 43 Pure Meadows Ln., Swoope, VA 24479, 540-885-3590.

Managing Hoops and Bedding and Sorting Without Extra Labor

Principal Investigator

Steve Stassen
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Swift County

Project Duration

2005 to 2006

Staff Contact

Wayne Monsen
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Keywords

alleyway, bedding, hogs, hoop barns, sorting

Project Summary

Hoop barns are economical and environmentally friendly, but there always seems to be the same questions: how do you sort pigs in an alleyway and how do you bed your hoops? These problems are not unique to our farm. Other hog producers who use hoop barns are facing the same problems. After talking to other producers and looking at different ideas, we set up an outside alleyway on one end of the hoops with a gating system design in our hoops, which we feel will allow one person to bed a hoop building without any additional laborers. Also, we feel that with this design, we can sort hogs in hoop buildings with only two people.

Project Description

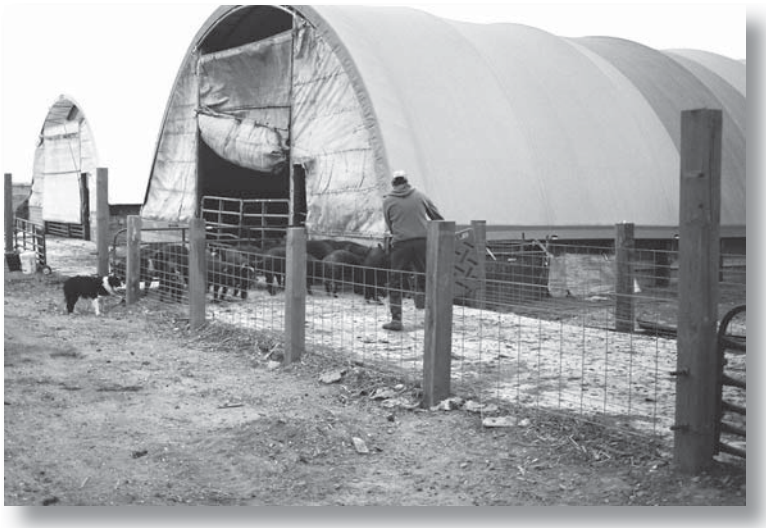
Our family includes me, my wife Jane and our children, Amber (21), Kimberly (18), Stephanie (16), and Matthew (14). Our farming operation consists of hogs, cattle, and sheep. We raise 40 purebred Berkshire hogs that we sell as breeding stock as well as market into a specialty market for export to Japan. We also have a small herd of beef cows and sell the calves for butcher. The small herd of sheep is raised for 4-H and FFA projects for our children.

The way we used to sort pigs would be to back the trailer up to the north side of the hoop and open the gate part way. We would use sorting panels to sort pigs out one at a time until we had all the pigs we needed. What an adventure! As with any operation, sorting pigs can be a very stressful experience for the pigs and especially the family.

When we cleaned the hoops in the past, we had to have all the pigs sold and out of the hoops. At times we needed to clean and spread manure before planting or before the snow flies which may not coincide with having the hoop empty.

The problem with all of this is that our children are active in sports and other school activities and not always available to help when extra sets of hands are needed. We would have to work around their schedules to sort pigs or bed the hoops instead of doing the bedding when it was needed. As you can see by the ages of my children, it will not be long before they have all graduated and left home. At that point, we would have to evaluate how to get things done or quit raising hogs, which we don't want to do.

We made the decision to construct a 12' outside alleyway because, in the past, every time we needed to bed the hoops we needed at least two of our children to help open gates and



Steve sorting pigs in the alleyway.

keep the pigs from running all over the yard. Also, when we needed to sort off gilts for sale as breeding stock or market hogs, we needed all our children to help as well.

2005 Results

The 12' outside alleyway was used for the first time in 2005 and really reduced the work and the number of people needed to sort hogs, bed, and clean the hoops. The alleyway is built along one end of each of our three hoops. It is concrete with hog panels attached to posts on the outside of the concrete. Gates were setup along the fence to make it easy to go into the hoop for cleaning and sorting. We used concrete because it will be easier to clean and it will prevent the pigs from rutting as they will be spending a fair amount of time in the alleyway.

Here is a brief explanation on how I bed the hoops now. I bring as many round bales into the alleyway as we need to put into the hoops, usually two to three bales. Then I close the end gate to the hoop and open the gates into the hoop barn. The pigs are free to go into the alleyway if they want. I then use the skid steer to bring the bales in and put them where I want them and then back the skid steer down the alleyway. Finally, I chase the pigs back into the hoop and I am done bedding the hoop all by myself.

The alleyway makes it relatively fast and easy to bed the hoops. We have timed both methods and it only takes half the time with the alleyway system. Matthew beds the hoop by himself and I am sure the girls could do it also, but Matthew won't let them run the skid steer.

The sorting system is also working fine. I feel the system is less stressful for the pigs as well as the family. I let the pigs out in the alleyway where I mark the pigs I want with a paint stick. Then with one helper, we use sorting panels to work the unmarked pigs back into the hoop barn and shut the gates. I back the livestock trailer to the end alleyway and load the pigs.

I want to try another gate system in the alleyway that would allow the pigs to sort themselves. The gate would let small pigs through and keep the big ones back.

Management Tips

1. Let the pigs out in the alleyway from time to time so they become trained to go in and out with little effort.

2. One of the most important pieces of equipment for operating hoop barns is the skid steer. The skid steer must be large enough to handle round bales and clean out the hoop.

3. Cleaning a hoop with a skid steer with a manure fork and grapple hook takes one-half the time and less than half the fuel as cleaning with a tractor with a loader and manure bucket.

Cooperator

Wayne Martin, Alternative Swine Production Systems Program, University of Minnesota, St. Paul, MN

Project Location

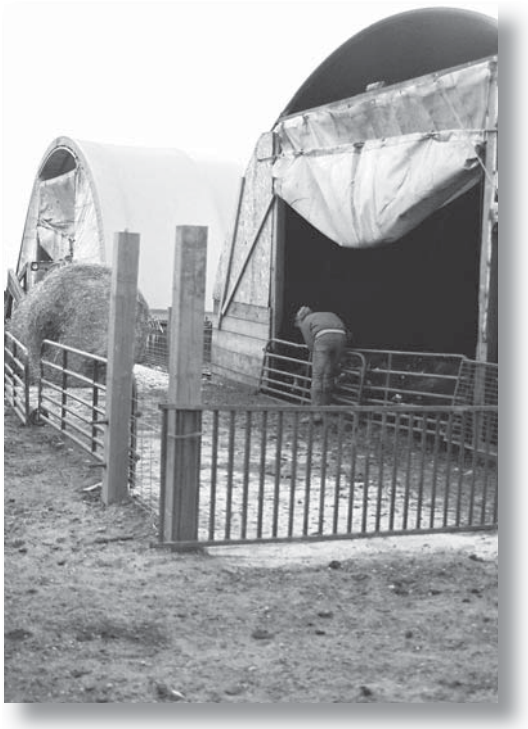
From Kerkhoven go 1 mile south on Swift Cty. 35. Go straight ahead (south) on the gravel road for 1 mile. The Stassen farm is on the east side of the road.

Other Resources

Alternative Swine Production Systems Program, University of Minnesota Extension, 385 Animal Science Building, 1988 Fitch Ave., St Paul, MN 55108, 612-625-6224.

University of Minnesota Extension Service. 2001. Hogs Your Way: Choosing a hog production system in the Upper Midwest. Publication No. BU-7641-S. University of Minnesota Extension, St. Paul, MN, 612-625-8173 or 800-876-8636.

University of Minnesota Extension Service. 1999. Swine source book: Alternatives for pork producers. Publication No. PC-7289-S. University of Minnesota Extension, St. Paul, MN, 612-625-8173 or 800-876-8636.



Moving bedding bale into the alleyway.

New Demonstration Grant Projects - 2006

Alternative Markets and Specialty Crops

Dream of Wild Health - Farm Indigenous Corn Propagation Project

Sally Auger
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459 N. Wheeler St.
St. Paul, MN 55104
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odawa@comcast.net
Washington County
3 years

This project will start with the regeneration of at least four of the ten varieties of heirloom indigenous corn. We will document and report on all phases of the project—cost, labor, and the process to grow and preserve our heirloom corn and at the end of the project we hope to have developed the entire collection of our heirloom seeds.

Fruits and Vegetables

Chokecherry Production

Todd and Michelle Andresen
22332 - 240th St.
Detroit Lakes, MN 56501
218-439-6149
Becker County
3 years

This project will compare the cost and quality of plants grown from wild plants with those ordered or grown in a nursery. The objectives are to find out if growing chokecherries is commercially beneficial, if some plants produce better and are of a better quality, and to decide if chokecherry production is compatible with livestock grazing.

Novel Preplant Strategies for Successful Strawberry Production

Steven Poppe
University of Minnesota, WCROC
Morris, MN 56267
320-589-1711
poppest@morris.umn.edu
Steven and Douglas Counties
1½ years

Our project will examine the effect that the combination of pre-plant soil solarization and canola degradation have on weed seed germination with the long term objective of reducing weed competition for strawberry plants. We will test two biodegradable plastics in combination with canola, to produce an almost weed-free planting bed for strawberry plants. After the pre-plant treatments, strawberries will be planted in early August, overwintered, and produce fruit potentially earlier in June.

Cropping Systems and Soil Fertility

Rotational Use of High-Quality Land: A Three - Year Rotation of Pastured Pigs, Vegetable Production, and Annual Forage

Gale Woods Farm – Three Rivers Park District
Tim Reese
7210 County Rd. 110 W.
Minnetrista, MN 55364
763-694-2002
treese@threeriversparkdistrict.org
Hennepin County
3 years

This project will demonstrate a three-year rotation of pastured pigs, annual vegetable production, and annual forage for finishing market lambs. We will divide a pasture into three sections; each section will have one of the three components each year. The order of rotation will start with pastured pigs, whose tillage will prepare the soil for the next season's garden crop. The third year will follow with an annual forage for finishing market lambs. The cycle will then start again with pigs.

Keeping It Green, an Aerial Seeding Concept

Andy Hart
10723 County Rd. 11 NE
Elgin, MN 55932
507-876-2256
Hart@starband.net
Olmsted County
3 years

This project will implement the new concept of seeding winter rye using a helicopter. The objectives of the project are to encourage cover cropping of row crops in the Zumbro River Watershed in SE Minnesota, work with at least four different farmers to set up aerial seeding demonstration fields, measure field residue levels in fall and spring, and study nitrates in soil in relation to the winter rye. We want to establish the cover crop 2-6 weeks earlier than normal, increasing fall forage growth and conservation benefits for this type of cover cropping practice.

Beneficial Bug Habitats

Noreen Thomas
12506 - 20th St. N.
Moorhead, MN 56560
218-233-8066
heirloomfarmocy@aol.com
Clay County
3 years

We would like to create diversity in cropping systems by providing a long-term border around crops and conserving habitat for beneficial insects. We will then see the effects these changes have on pest insects and what beneficial insects we can attract.

Livestock

Composting Bedded Pack Barns for Dairy Cows

Marcia Endres
University of Minnesota, Dept. of Animal Science
1364 Eckles Ave., 225C Haecker Hall
St. Paul, MN 55108
612-624-5391
miendres@umn.edu
Various counties
1 year

Our project is a descriptive analysis of an alternative housing system for dairy cows, generally known as compost barns. This project will characterize the compost bedded pack system, evaluate cow comfort under this system, and collect producers' experiences with this system.

Demonstration of How Feeding In-Line Wrapped High Moisture Alfalfa/Grass Bales will Eliminate Our Fall and Winter "Flat Spot" in Grassfed Beef Production

Donald Struxness
14015 Hwy. 40 NW
Milan, MN 56262
320-734-4877
dbstruxness@fedteldirect.net
Chippewa County
3 years

The objectives of this project are to find a way to store forage for winter feed that is close to grazing quality yet simple to do, get consistently high rates of grain throughout the year, keep costs of grain low, and demonstrate the profit potential if finished animals achieve quality standards.

Completed Grant Projects...

Final Greenbook Article	Title of Project	Grantee

Alternative Markets and Speciality Crops

2005

Creating Public Recognition of and Demand for "Grass-Fed" Dairy Products Through the Development of Brand Standards and Promotion of These Standards to the Public . . . . . Dan French

2004

Collaborative Character Wood Production and Marketing Project . . . . . Cooperative Development Services/Isaac Nadeau

Creating Consumer Demand for Sustainable Squash with Labels and Education . . . . . Gary Pahl

Integrated Demonstration of Native Forb Seed Production Systems and Prairie Land Restoration . . . . . Michael Reese

Pride of the Prairie: Charting the Course from Sustainable Farms to Local Dinner Plates . . . . . Kathleen Fernholz

2003

Demonstrating the Market Potential for Sustainable Pork . . . . . Prairie Farmers Co-op/Dennis Timmerman

Evaluating the Benefits of Compost Teas to the Small Market Grower . . . . . Pat Bailey

Flour Corn as an Alternative Crop . . . . . Lynda Converse

2002

Increasing Red Clover Seed Production by Saturation of Pollinators . . . . . Leland Buchholz

Propagation of Native Grasses and Wildflowers for Seed Production . . . . . Joshua Zeithamer

2001

Establishing Agroforestry Demonstration Sites in Minnesota . . . . . Erik Streed/CINRAM

Managed Production of Woods-grown and Simulated Wild Ginseng . . . . . Willis Runck

Midwest Food Connection: Children Monitor on Farms . . . . . Midwest Food Connection

Phosphorus Mobilization and Weed Suppression by Buckwheat . . . . . Curt Petrich

2000

Converting a Whole Farm Cash Crop System to Keeping an Eye on Quality of Life and the Bottom Line in Sustainable Agriculture by Using Key Farm Economic Ratios to Aid in Decision Making . . . . . Red Cardinal Farm

Dry Edible Beans as an Alternative Crop in a Direct Marketing Operation . . Bruce & Diane Milan

Native Minnesota Medicinal Plant Production . . . . . Renne Soberg

1999

An Alternative Management System in an Organic, Community Supported Market . . . . . Candace Mullen

Cultural and Management Techniques for Buckwheat Production and Marketing . . . Tom Bilek

Pond Production of Yellow Perch . . . . . John Reynolds

Final Greenbook Article	Title of Project	Grantee
1998	Establishing and Maintaining Warm Season Grasses (Native Grasses)	Pope County SWCD
	On-farm Forest Utilization & Processing Demonstrations	Hiawatha Valley RC&D
1995	Cash Crop Windbreak Demonstration/Development	Phil Rutter
	Cutter Bee Propagation Under Humid Conditions	Theodore L. Rolling
	Red Deer Farming as an Alternative Income	Peter Bingham
	Wildflower Seeds as a Low-input Perennial Crop	Grace Tinderholt & Frank Kutka
1992	Alternative Mulch Systems for Intensive Specialty Crop Production	Ron Roller/Lindentree Farm
	Benefits of Crop Rotation in Reducing Chemical Inputs and Increasing Profits in Wild Rice Production	George Shetka
	Benefits of Weeder Geese and Composted Manures in Commercial Strawberry Production	Joan Weyandt-Fulton
	Common Harvest Community Farm	Dan Guenthner
	Mechanical Mulching of Tree Seedlings	Timothy & Susan Gossman
	Minnesota Integrated Pest Management Apple Project	John Jacobson

Cropping Systems/Soil Fertility

2005	Chickling Vetch—A New Green Manure Crop and Organic Control of Canada Thistle in Northwest Minnesota	Dan Juneau
	Treating Field Runoff through Storage and Gravity-fed Drip Irrigation System for Grape and Hardwood Production	Tim Gieseke
	Use of Rye as a Cover Crop Prior to Soybean	Paul Porter
2004	Development of Eastern Gamagrass Production	Nathan Converse
	In-field Winter Drying and Storage of Corn: An Economic Analysis of Costs and Returns	Marvin Jensen
	Mechanical Tillage to Promote Aeration, Improve Water Infiltration, and Rejuvenate Pasture and Hay Land	Robert Schelhaas
	Native Perennial Grass – Illinois Bundleflower Mixtures for Forage and Biofuel	Craig Sheaffer
	Northwest Minnesota Compost Demonstration	John Schmidt & Russ Severson
	Potassium Rate Trial on an Established Grass/Legume Pasture: Determining Economic Rates for Grazing/Haying Systems	Dan & Cara Miller
	Woolly Cupgrass Research	Leo Seykora
	Yield and Feeding Value of Annual Crops Planted for Emergency Forage	Marcia Endres
2003	Aerial Seeding of Winter Rye into No-till Corn and Soybeans	Ray Rauenhorst
	Dairy Manure Application Methods and Nutrient Loss From Alfalfa	Neil C. Hansen
	Manure Spreader Calibration Demonstration and Nutrient Management	Jim Straskowski
	Replacing Open Tile Intakes with Rock Inlets in Faribault County	Faribault County SWCD/Shane Johnson
	Soil Conservation of Canning Crop Fields	Andy Hart

Final Greenbook Article	Title of Project	Grantee
	Using Liquid Hog Manure as Starter Fertilizer and Maximizing Nutrients from Heavily Bedded Swine Manure	Dakota County SWCD/Brad Becker
2002	Agricultural Use of Rock Fines as a Sustainable Soil Amendment	Carl Rosen
	A Low-cost Mechanism for Inter-seeding Cover Crops in Corn	Tony Thompson
	Annual Medic as a Protein Source in Grazing Corn and Weed Suppressant in Soybeans	Joseph Rolling
	Evaluation of Dairy Manure Application Methods and Nutrient Loss from Alfalfa	Stearns County SWCD
	Increased Forage Production Through Control of Water Runoff and Nutrient Recycling	James Sovell
	Land Application of Mortality Compost to Improve Soil and Water Quality	Neil C. Hansen
	Turkey Litter: More is Not Always Better	Meierhofer Farms
2001	Applying Manure to Corn at Agronomic Rates	Tim Becket & Jeremy Geske/Dakota County Extension & SWCD
	Cereal Rye for Reduced Input Pasture Establishment and Early Grazing	Greg Cuomo
	Establishing a Rotational Grazing System in a Semi-wooded Ecosystem: Frost Seeding vs. Impaction Seeding on CRP Land and Wooded Hillsides Using Sheep	James Scaife
	Living Snow Fences for Improved Pasture Production	Mike Hansen
	Managing Dairy Manure Nutrients in a Recycling Compost Program	Norman & Sallie Volkmann
	Reducing Chemical Usage by Using Soy Oil on Corn and Soybean	Donald Wheeler
	Techniques for More Efficient Utilization of a Vetch Cover Crop for Corn Production	Carmen Fernholz
	Using Nutrient Balances to Benefit Farmers and the Environment	Mark Muller/IATP
2000	Forage Mixture Performance	Itasca County SWCD
	Inter-seeding Hairy Vetch in Sunflower and Corn	Red Lake County Extension
	Growing Corn with Companion Crop Legumes for High Protein Silage	Stanley Smith
	Legume Cover Crops Inter-seeded in Corn as a Source of Nitrogen	Alan Olness & Dian Lopez
	Surface Application of Liming Materials	Jane Grimsbo Jewett
	The Introduction of Feed Peas and Feed Barley into Whole Farm Planning	Ken Winsel
1999	CRP in a Crop Rotation Program	Jaime DeRosier
	Evaluating Kura Clover for Long-term Persistence	Bob & Patty Durovec
	The Winona Farm Compost Strategies	Richard J. Gallien
	Timing Cultivation to Reduce Herbicide Use in Ridge-till Soybeans	Ed Huseby
1998	An Evaluation of Variable Rate Fertility Use on Ridged Corn and Soybeans	Howard Kittleson
	Farming Practices for Improving Soil Quality	Sustainable Farming Association of SC MN
	Sustainable Agriculture in Schools	Toivola-Meadowlands School/Jim Postance
1997	Converting from a Corn-Soybean to a Corn-Soybean-Oat-Alfalfa Rotation	Eugene Bakko
	Manure Application on Ridge-till: Fall vs. Spring	Dwight Ault

Final Greenbook Article	Title of Project	Grantee
1996	Biological vs. Conventional Crop Systems Demonstration	Gary Wyatt
	Building Soil Humus Without Animal Manures	Gerry Wass
	Controlled Microbial Composting to Improve Soil Fertility	Howard & Mable Brelje
	Living Mulches in West Central Minnesota Wheat Production	Dave Birong
	Making the Transition to Certified Organic Production	Craig Murphy
	No-till Barley and Field Peas into Corn Stalks, Developing Pastures on These Bare Acres	Jerry Wiebusch
	Weed Control and Fertility Benefits of Several Mulches and Winter Rye Cover Crop	Gary & Maureen Vosejpka
1995	Annual Medics: Cover Crops for Nitrogen Sources	Craig C. Sheaffer
	Integration of Nutrient Management Strategies with Conservation Tillage Systems for Protection of Highly Eroded Land and Lakes in West Otter Tail County	Harold Stanislawski
	Manure Management/Utilization Demonstration	Timothy Arlt
	Reducing Soil Insecticide Use on Corn Through Integrated Pest Management	Ken Ostlie
	Taconite as a Soil Amendment	Donald E. Anderson
1994	Biological Weed Control in Field Windbreaks	Tim Finseth
	Energy Conserving Strip Cropping Systems	Gyles Randall
	Fine-tuning Low-input Weed Control	David Baird
	Flame Weeding of Corn to Reduce Herbicide Reliance	Mille Lacs County Extension
1993	Chemical Free Double-cropping	Jeff Mueller
	Cooperative Manure Composting Demonstration and Experiment	Rich Vander Ziel
	Early Tall Oat and Soybean Double Crop	Charles D. Weber
	NITRO Alfalfa, Hog Manure, and Urea as Nitrogen Sources in a Small Grain, Corn, Soybean Crop Rotation	Carmen M. Fernholz
	Nitrogen Utilization from Legume Residue in Western Minnesota	Arvid Johnson
1992	Demonstration of Land Stewardship Techniques in the Red River Valley	Donald H. Ogaard
	Demonstration of Tillage Effects on Utilization of Dairy and Hog Manure in Southeast Minnesota	John Moncrief
	Economically and Environmentally Sound Management of Livestock Waste	Fred G. Bergsrud
	Herbicide Ban? Could You Adapt on a Budget?	David Michaelson
	Improving Groundwater Quality and Agricultural Profitability in East Central Minnesota	Steven Grosland & Kathy Zeman
	Modified Ridge-till System for Sugar Beet Production	Alan Brutlag
	Soil Building and Maintenance	Larry H. Olson
	Strip-cropping Legumes with Specialty Crops for Low-cost Mulching and Reduced Fertilizer/Herbicide Inputs	Mark Zumwinkle
	Using Nitro Alfalfa in a No-till Corn and Soybean Rotation	Jeff Johnson
1991	Alternative Methods of Weed Control in Corn	Sr. Esther Nickel
	Hairy Vetch and Winter Rye as Cover Crops	Mark Ackland

Final Greenbook Article	Title of Project	Grantee

Fruits and Vegetables

2005	Organic Strawberry Production in Minnesota	Brian Wilson & Laura Kangas
2003	Research and Demonstration Gardens for New Immigrant Farmers	Nigatu Tadesse
	Root Cellaring and Computer-controlled Ventilation for Efficient Storage of Organic Vegetables in a Northern Market	John Fisher-Merritt
	Viability of Wine Quality Grapes as an Alternative Crop for the Family Farm	Donald Reding
2002	Development and Continuation of a Community Based Sustainable Organic Grower's Cooperative and Marketing System	Patty Dease
	Flame Burning for Weed Control and Renovation with Strawberries	David Wildung
	Integrating Livestock Profitably into a Fruit and Vegetable Operation	David & Lise Abazs
	Soil Ecology and Managed Soil Surfaces	Peter Seim & Bruce Bacon
	Value Adding to Small Farms Through Processing Excess Production	Jeffrey & Mary Adelmann
2001	Bio-based Weed Control in Strawberries Using Sheep Wool Mulch, Canola Mulch and Canola Green Manure	Emily Hoover
	Biological Control of Alfalfa Blotch Leafminer	George Heimpel
	Cover Crops and Living Mulch for Strawberry Establishment	Joe Riehle
	Sustainable Weed Control in a Commercial Vineyard	Catherine Friend & Melissa Peteler
1999	Development of Mating Disruption and Mass Trapping Strategy for Apple Leafminer	Bernard & Rosanne Buehler
1998	Alternative Point Sources of Water	Joseph & Mary Routh
	Comparison of Alternative and Conventional Management of Carrot Aster Leafhoppers	MN Fruit & Vegetable Growers Association
	Jessenland Organic Fruits Project	MN New Country School
	Propane Flame Weeding Vegetable Crops	Jean Peterson & Al Sterner
	Soil Quality Factors Affecting Garlic Production	Tim King
	Wine Quality Grapes in Otter Tail County	Michael & Vicki Burke
1997	Community Shared Agriculture and Season Extension for Northern Minnesota	John Fisher-Merritt
	Living Mulch, Organic Mulch, Bare Ground Comparison	Dan & Gilda Gieske

Livestock

2005	Performance Comparison of Hoop Barns vs. Slatted Barns	Kent Dornink
	Raising Cattle and Timber for Profit: Making Informed Decisions about Woodland Grazing	Michael Demchik
	Using a 24' x 48' Deep Bedded Hoop Barn for Nursery Age Pigs	Trent & Jennifer Nelson

Final Greenbook Article	Title of Project	Grantee
2004	Comparing Performance of Hoop Buildings to an Older Conventional Building for Finishing Hogs	Kevin Connolly
	High Value Pork Production for Niman Ranch Using a Modified Swedish System	David & Diane Serfling
	Low Cost Fall Grazing and Wintering Systems for Cattle	Ralph Lentz
2003	Can New Perennial Grasses Extend Minnesota's Grazing Season	Paul Peterson
	Enhancement of On-farm Alfalfa Grazing for Beef and Dairy Heifer Production	Dennis Johnson
	Farrowing Crates vs. Pens vs. Nest Boxes	Steve Stassen
	Forage Production to Maintain One Mature Animal Per Acre for 12 Months	Ralph Stelling
	High Quality – Low Input Forages for Winter Feeding Lactating Dairy Cows	Mark Simon
	Pasture Aeration and its Effects on Productivity Using a Variety of Inputs	Carlton County Extension
	Potential of Medicinal Plants for Rotational Grazing	Management Intensive Grazing Groups/Dave Minar
	Programmatic Approach to Pasture Renovation for Cell Grazing	Daniel Persons
2002	Adding Value for the Small Producers via Natural Production Methods and Direct Marketing	Pete Schilling
	Grazing Beef Cattle as a Sustainable Agriculture Product in Riparian Areas	Frank & Cathy Schiefelbein
	Improvement of Pastures for Horses Through Management Practices	Wright County Extension
	Increasing Quality and Quantity of Pasture Forage with Management Intensive Grazing as an Alternative to the Grazing of Wooded Land	Michael Harmon
	Supplement Feeding Dairy Cattle on Pasture with Automated Concentrate Feeder	Northwest MN Grazing Group
	Viability of Strip Grazing Corn Inter-seeded with a Grass/Legume Mixture	Stephen & Patricia Dingels
2001	Annual Medic as a Protein Source in Grazing Corn	Joseph Rolling
	First and Second year Grazers in a Year Round Pasture Setting Served by a Frost Free Water System	Don & Dan Struxness
	Low Input Conversion of CRP Land to a High Profitability Management Intensive Grazing and Haying System	Dan & Cara Miller
	Reviving and Enhancing Soils for Maximizing Performance of Pastures and Livestock	Doug Rathke & Connie Karstens
	Whole System Management vs. Enterprise Management	Dennis Rabe
	Working Prairie – Roots of the Past Sustaining the Future	John & Leila Arndt
2000	Converting a Whole Farm Cash System to Sustainable Livestock Production with Intensive Rotational Grazing	Edgar Persons
	Dairy Steers and Replacement Heifers Raised on Pastures	Melissa Nelson
	Establishing Pasture Forages by Feeding Seed to Cattle	Art Thicke

Final Greenbook Article	Title of Project	Grantee
	Grass-and Forage-based Finishing of Beef, with Consumer Testing	Lake Superior Meats Cooperative
	Learning Advanced Management Intensive Grazing Through Mentoring	West Otter Tail SWCD
	Low Cost Sow Gestation in Hoop Structure	Steve Stassen
1999	Deep Straw Bedding Swine Finishing System Utilizing Hoop Buildings	Mark & Nancy Moulton
	Extending the Grazing Season with the use of Forage Brassicas, Grazing Corn and Silage Clamps	Jon Luhman
	Home on the Range Chicken Collaborative Project	Sustainable Farming Association of SE MN
	Hoop Houses and Pastures for Mainstream Hog Producers	Josh & Cindy Van Der Pol
	Management Intensive Grazing Groups	Dave Stish
	Renovation of River Bottom Pasture	Jon Peterson
	The Values Added Graziers: Building Relationships, Community and Soil	Values Added Graziers
1998	Buffalo: Animal From the Past, Key to the Future	Richard & Carolyn Brobjorg
	Marketing Development - Small Farm Strategies Project	Sustainable Farming Association of NE MN
	Pastured Poultry Production and Riparian Area Management	Todd Lein
1997	Butcher Hogs on Pasture	Michael & Linda Noble
	Developing Pastures Using Various Low-input Practices	Ralph Lentz
	Grass Based Farming in an Intensive Row Crop Community	Douglas Fuller
	Grazing Hogs on Standing Grain and Pasture	Michael & Jason Hartmann
	Grazing Sows on Pasture	Byron Bartz
	Low Input Systems for Feeding Beef Cattle or Sheep	Dennis Schentzel
	Raising Animals for Fiber	Patty Dease
	Rotational Grazing Improves Pastures	MISA Monitoring Team
	Seasonal Dairying and Value-added Enterprises in Southwest Minnesota	Robert & Sherril Van Maasdam
	Swedish Style Swine Facility	Nolan & Susan Jungclaus
1996	Dairy Waste Management Through Intensive Cell Grazing of Dairy Cattle	Scott Gaudette
	Establishing Trees in Paddocks	Dave & Diane Serfling
	Evaluating Pasture Quality and Quantity to Improve Management Skills	Land Stewardship Project
	Expanding into Outdoor Hog Production	James Van Der Pol
	Grazing Length: Season Length and Productivity	Doug & Ann Balow
1995	Evaluating Diatomaceous Earth as a Wormer for Sheep and Cattle	David Deutschlander
	Intensive Controlled Grazing and Pasture Rejuvenation on Fragile Land	Lyle & Nancy Gunderson

Final Greenbook Article	Title of Project	Grantee
	Intensive Rotational Grazing on Warm Season Grasses	Jim Sherwood
	Rotational Top-grazing as a Method of Increasing Profitability with a High-producing Dairy Herd	Alton Hanson
1994	Economics of Rotational Grazing vs. Row Crops	Harold Tilstra
1993	A Comparison Study of Intensive Rotational Grazing vs.Dry-lot Feeding of Sheep	R & K Shepherds
	Controlled Grazing of Ewes on Improved Pastures and Lambing on Birdsfoot Trefoil	Leatrice McEvilly
	Improving Permanent Pastures for Beef in Southwest Minnesota	David Larsen
	Intensive Rotational Grazing	Chad Hasbargen
	Research and Demonstration of Rotational Grazing Techniques for Dairy Farmers in Central Minnesota	Stearns County Extension
	Winter Grazing Study	Janet McNally & Brooke Rodgerson
1992	A Demonstration of an Intensive Rotational Grazing System for Dairy Cattle	Ken Tschumper
	Intensive Rotational Grazing in Sheep Production	James M. Robertson
	Using Sheep and Goats for Brush Control in a Pasture	Alan & Janice Ringer

Program Contact

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Integrated Pest Management (IPM) Program

Integrated pest management (IPM) looks at pest problems using a multi-strategy approach. IPM considers all aspects of the interactions between people and pests to find the easiest way to resolve problems with the lowest overall risk to people's health and the environment. IPM looks beyond the use of preventative regularly scheduled pesticide applications. It is a dynamic system that is adaptable to diverse management approaches. Factors that allow pests to become problems in the first place are considered, and a combination of physical, cultural, biological, and chemical pest management strategies are used.

Fruit and Vegetable IPM

The *Minnesota Fruit and Vegetable IPM News* is produced in cooperation with Dr. Bill Hutchison at the University of Minnesota (U of MN), Entomology Department. Partial funding for the newsletter was provided through partnership agreements with the Minnesota Fruit and Vegetable Growers Association and the United States Department of Agriculture – Risk Management Agency (RMA).

The newsletter is a multi-disciplinary approach to disseminating IPM strategies, educating producers, communicating timely pest pressure and control information to growers, and providing feedback information for use in prioritizing basic research. The newsletter is published May through August and is posted on the U of MN and MDA web sites on Fridays.

The MDA produced four insect manuals in 2003. They include: *Field Guide for Identification of Pest Insects, Diseases, and Beneficial Organisms in MN Apple Orchard; Integrated Pest Management Manual for MN Apple Orchard; Field Guide for Identification of Pest Insects, Diseases, and Beneficial Organisms in MN Strawberry Field;* and, *Integrated Pest Management Manual for MN Strawberry Fields*.

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IPM newsletter web site:
www.mda.state.mn.us/ipm/ipmnews
IPM manuals and other fruit IPM information web site: www.mda.state.mn.us/ipm/fandvipm.html

IPM for Kids

The MDA created "*Join Our Pest Patrol - A Backyard Activity Book for Kids - An Adventure in IPM*" for children in grades three and four. The book includes many fun activities and is available, along with and the companion "*Teacher Guide*" at: www.mda.state.mn.us/ipm/IPMPubs.html

In addition, the "*Pest Patrol Action Kit*," developed in 2005, is a series of hands-on classroom activities developed from ideas taken from "*Join Our Pest Patrol*." These activities are available at: www.mda.state.mn.us/ipm/pestpatrol/actionkit

Program Contact:
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jeanne.ciborowski@state.mn.us

Weed IPM Program

The MDA Weed IPM program (WIPM) was formed to assist landowners and managers in developing practical IPM strategies for dealing with nuisance plant species throughout Minnesota. The WIPM is responsible for the statewide coordination and implementation of the following activities:

1. Establishing and evaluating biological control for terrestrial weed species.

2. Conducting and coordinating annual surveys for nuisance and invasive weed species.

3. Developing research and demonstration projects to evaluate weed IPM methodologies.

4. Providing education, training, and outreach for professional and private land managers.

The WIPM has active biological control programs for leafy spurge and spotted knapweed. These programs are cooperator-based and depend upon the commitment of local entities to monitor for weed infestations, request biological control agents for releases in their area, and monitor sites following releases to determine establishment of agents and biological control success. The WIPM coordinates statewide collection and redistribution efforts for biological control agents and annually collects cooperator information pertaining to agent releases and site monitoring data that aids in tracking the distribution and impacts of these bioagents over time.

In addition, the WIPM is currently researching the potential for developing a biological control program for common tansy, an invasive weed of upland terrestrial landscapes. Exploration for potential biological control agents would occur in tansy's native range by European partners. This project would be an international effort driven by a consortium of US and Canadian agencies and organizations. Coordination of funding and dissemination of information would be through the Alberta Invasive Plant Council in Canada and the MDA's WIPM. Eventual research activities would include overseas exploration and host-specificity testing of potential bioagents.

Two research projects have been developed to examine the impacts that several species of insect biological control agents are having on spotted knapweed and Canada thistle in the state. The Legislative Commission on Minnesota Resources (LCMR) has provided funding for a WIPM research project to investigate the current status of spotted knapweed biological control in Minnesota. The WIPM has also initiated a research project in northwest Minnesota to test the efficacy of *Hadroplontus litura*, a biological control agent being released in portions of the Midwest for management of Canada thistle.

One important tool for any IPM program is the use of surveys to identify pest thresholds and management needs. To improve the methodologies for tracking and recording weed distributions, emergence, and shifts in weed types over time, the WIPM has developed a mobile global positioning system/geographic information system (GPS/GIS) for mapping important weeds throughout the state. Currently, several Minnesota counties, state and federal personnel, and private non-profit groups are teaming-up with the WIPM to survey a variety of weed species throughout the state. The WIPM is developing an ArcIMS web site dedicated to statewide weed data management that will allow land managers to upload their field survey data and have the ability to query specific data for their management needs. The goal of this project is to collect weed species presence and absence data to allow land managers and policy makers to make more informed decisions concerning invasive, exotic, and noxious weeds in Minnesota.

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Natasha Northrop, 651-201-6540
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WIPM web site: www.mda.state.mn.us/weedcontrol

Weed IPM Working Group

A multi-agency Weed IPM Working Group was formed as a result of the 1996 IPM on State Lands Plan. The MDA works cooperatively with the Minnesota Department of Natural Resources as co-chairs of the group. The Working Group developed the "*Thicket!*," a newsletter for integrated weed management in Minnesota. It is published in the late fall and early spring of each year.

"*Thicket!*" is for all land managers interested in weed management. It is a way to share information about the many weed management activities carried out in Minnesota by the different local, state, and federal agencies, and the U of MN. If you are interested in signing up to receive the electronic "*Thicket*," please send an email to either Jeanne or Anthony.

Program Contacts:
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Anthony Cortilet, 651-201-6608
anthony.cortilet@state.mn.us
"*Thicket!*" web site: www.mda.state.mn.us/ipm/thicket

Biological Control Project: The Biological Control Facility, Garden, and Laboratory

This year the Biological Control Facility (BCF), a multi-purpose greenhouse located on Metropolitan State University's main St. Paul campus, continued to serve as a greenhouse/classroom/insectary/ photographic studio that supports outreach activities related to the MDA Biological Control Program and other programs that work directly or indirectly with pest management.

Between January 2005 and April 2006, the Biological Control Facility hosted 28 groups on-site and helped provide live insects and plant materials for approximately 75 off-site presentations.

Specific examples of individuals and groups most often served by this project in 2004-2005 include:

- elementary students involved with insect study units;
- high school agriculture days, Earth Day events, science and/or environmental fairs;
- high school career days, yard and garden expos;
- youth participating in summer work programs and day camps;
- vegetable growers and home gardeners; and
- community gardeners and their organizations.

Topics of presentations include general information on insects and spiders, how to tell the difference between helpful or harmful insects, biological control concepts and how to apply them, IPM tools and how to use them, and collecting and/or mounting insects. Most presentations were focused on hands-on or close firsthand observations of insects; many involved making releases of live bioagents on infested BCF plants—followed by discussions of the process of releasing agents and other factors that contribute to effective biological control of plant-feeding insects and mites.

Other activities included producing a seven-minute video for the Pest Patrol Action Kit, available on the web at www.mda.state.mn.us/ipm/pestpatrol/actionkit. In August 2005, the BCF hosted a group from the American Community Gardening Association and also created a live and pinned insect display called *Bugnanza!* for the Minnesota State Fair in partnership with MDA's Ag in the Classroom. In the fall of 2005, the BCF also held a Shared Open House with the Media and Fine Arts Department of Metropolitan State University, located next door to the BCF.

The Beneficial Insect Garden added new informational signage in front of the BCF entrance. New native grasses and other plants were added to the southeastern corner of the greenhouse, as the garden outside the greenhouse is becoming used more often to show visitors about the process of transforming turf grass into native plantings without the use of herbicides.

This project also began offering free workshops on biological control products called *Biological Control Basics*. Four Biocontrol Basics workshops have been offered and have been attended by 12 people, most of whom are Master Gardeners. This program also began investigating an insect larval predator that has just recently been offered as a product, *Podisus maculiventris* (also known as the spined soldier bug) in order to observe at what stage soldier bug nymphs are best used to prey on plant-feeding caterpillars.

The Biological Control Laboratory serves as a support function for Biological Control programs. It contains environmental chambers used for rearing insects and growing plants needed to feed colonies. The lab's primary activities involve maintaining insect colonies for beneficial releases, research, educational projects, insect identification, and preservation. The laboratory also works on developing or modifying mass rearing systems and diets for pests and beneficial insects, field collection and distribution of biological control agents, and monitoring the establishment and success of released agents. The laboratory also houses the MDA's Insect Reference Collection which currently contains close to 20,000, mostly pinned, insect specimens and is cared for by Dr. John Luhman. Insect rearing procedures are available at: www.mda.state.mn.us/biocon/plantscape

Program Contacts:
Neil Cunningham, 651-201-6162
neil.cunningham@state.mn.us (For greenhouse tours and publications)
Dr. John Luhman, 651-201-6163
john.luhman@state.mn.us (For insect identification)
Web site: www.mda.state.mn.us/greenhouse

MDA Quarantine Facility

The MDA-U of MN quarantine facility is located within the current greenhouse complex of the U of MN, St. Paul Campus. It is a biological control research facility and insect quarantine facility licensed by USDA. Current U of MN research includes screening biocontrol agents of soybean aphid and garlic mustard.

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Quarantine Facility web site:
www.mda.state.mn.us/quarantine

Project Coordinator

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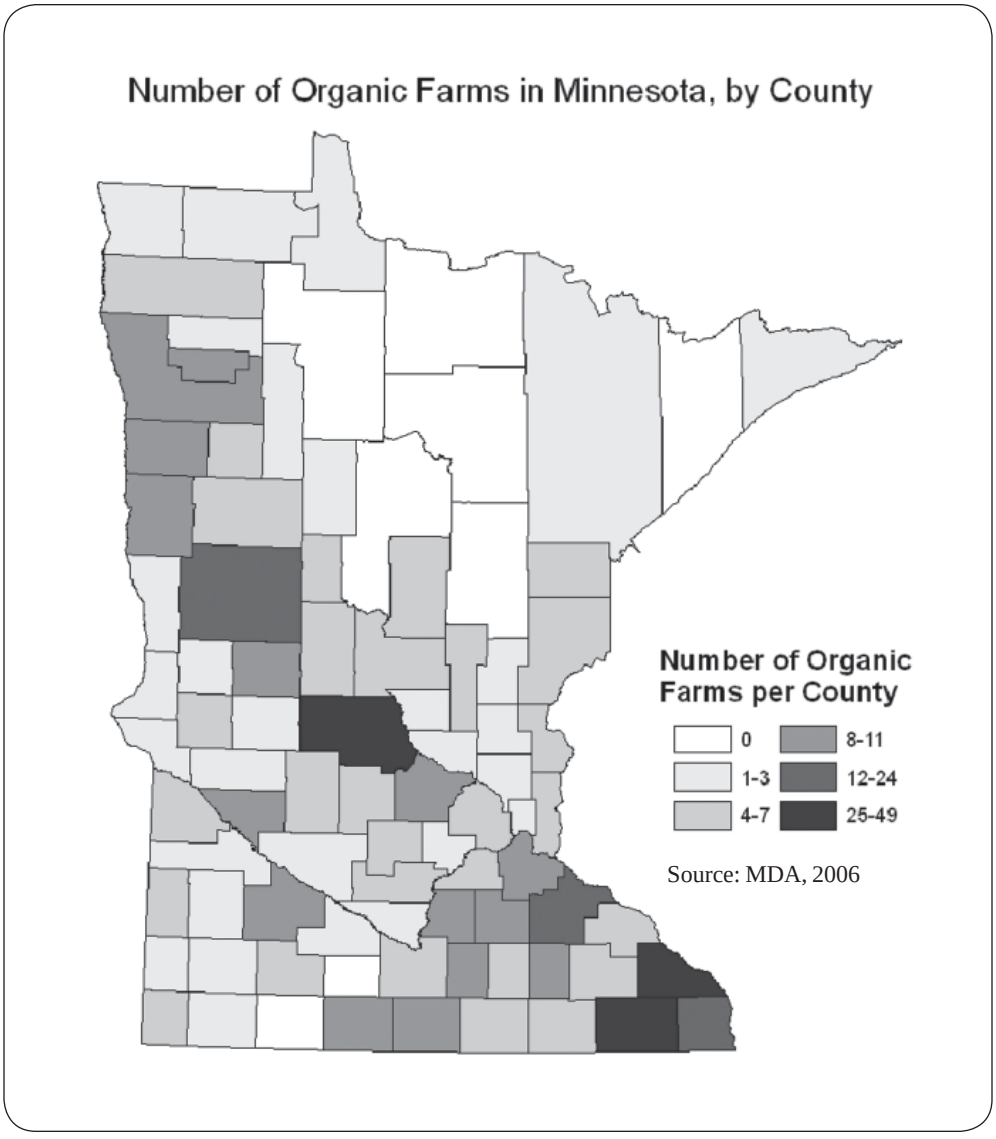
Organic Agriculture Program

Consumer purchases of organic food, beverages, and other items continue to grow, as does farmer interest in organic production. As of 2006, the MDA estimates there are more than 500 certified organic farms in Minnesota growing cash grains, vegetables, and fruit, and raising dairy, beef, poultry, and other livestock. This map shows how certified organic farms are distributed across the state.

The MDA Agricultural Resources Management and Development Division offers a number of programs geared to the unique needs of organic producers.

Organic Certification Cost Share Program

This program defrays the cost of certification by reimbursing a portion of certification-related costs incurred by farmers and processors.



Year	Applications Received	Disbursements
2002-2003	261	$98,460 federal funds
2003-2004	288	$115,716 federal funds
2003-2004	334	$67,250 federal funds $29,366 state funds *(growers only)*

Organic Farm Business Management Program —
Thousands of conventional farmers in many states use FINPACK, a farm financial management tool, and FINBIN, an associated benchmarking database, to help them assess the economic and production performance of their farming and ranching operations, and make informed farm business decisions. Until now, these tools have not been well adapted for the needs of organic producers.

This project is modifying the program and, with the help of farm business management instructors statewide, delivering it to 90 self-selected organic crop and livestock producers in Minnesota. The program will result in the first standardized collection of real world production, cost, and profitability data for organic agriculture. Access to reliable production and profitability information for organic farms will benefit existing organic operations and their efforts to manage multiple risks, as well as providing information useful to conventional operations that are considering transition to organic as well as public agencies and policymakers. More information is available at:
www.mda.state.mn.us/esap/organic
USDA Risk Management Agency provided $278,000 to support this three year program.

Minnesota Organic Conference —
This annual two day conference in St. Cloud features keynote speakers, breakout sessions in six concurrent tracks, locally-grown foods, and a 60-vendor trade show, and draws attendees from across Minnesota as well as from neighboring states. Attendance: 275 in 2004 and 300+ in 2005. The conference will be held on January 19 and 20, 2007.

Minnesota Organic Network —
MDA cosponsors this network that connects multiple stakeholders (63 individuals representing state and federal agencies, University, Extension, nonprofit, individual producers, and private industry), facilitates information sharing, and promotes collaboration around emerging organic opportunities through a listserv and monthly conference call.

Directory of USDA-Accredited Certifiers Active in Minnesota —
www.mda.state.mn.us/esap/organic

Minnesota Organic Advisory Task Force —
This 14-member committee meets quarterly to advise the Commissioner on organic opportunities and issues relevant to the MDA. www.mda.state.mn.us/esap/organic/oatf

Memorandum of Understanding on Organic Agriculture in Minnesota.
Signatories include: MDA, USDA Natural Resources Conservation Service, USDA Farm Service Agency, University of Minnesota, and University of Minnesota Extension.

Production and certification information and referrals via telephone, US mail, and e-mail.

The MDA is also an active member of the **National Association of State Organic Programs (NASOP)**, an affiliate of the National Association of State Departments of Agriculture (NASDA).

Sustainable Agriculture Loan Program

Loan Technical Review Panel for 2006

Gregg Bongard
Ag Lender

Robin Brekken
Farmer

Ralph Lentz
Farmer

Thaddeus McCamant
Farm Management Specialist

Bob Mueller
Farmer

Ray Rauenhorst
Farmer

Keith Schoenfeld
Ag Lender

Chuck Schwartau
Extension Educator

Program Purpose

The Sustainable Agriculture Loan Program was created to accelerate the adoption of sustainable farming information and technology in Minnesota. Loans of up to $25,000 per farmer or up to $100,000 for joint projects are made at a fixed 3% interest rate for a term of up to seven years. These low-interest loans are made to farmers for purchasing new or used equipment, or breeding livestock that helps make the farming system more sustainable.

Background

When this program began in 1988, the concepts of sustainable agriculture were less understood and less accepted by farmers and lenders than they are today. Many farmers had difficulty obtaining the capital necessary to refocus their farm operations since lenders were reluctant to finance changes during the volatile economy of the 1980s. The state chose to assist these farmers through direct lending.

The initial $1 million appropriation from the state legislature was set up as a revolving fund. As loans are repaid, the funds are pooled and redistributed to other farmers in the form of new loans. Many farmers will benefit from this continuing program with no additional cost to the state.

Evaluation Criteria

Applications for the Loan Program are accepted throughout the year and are competitively evaluated. A review panel representing a cross-section of agricultural professionals from various regions of the state determine which loan projects to recommend to the Commissioner of Agriculture for funding.

The loan proposals are evaluated based on the following criteria:

a) Long Term Plans for the Farm: How does this investment fit the long-term plans for the farm?
b) Effect on the Farming System: How will this investment lead to a more sustainable farm system?
c) Environmental Impact: Is there an environmental benefit to the proposed project?
d) Farm Income: What is the added return to the farming operation from the proposed project?
e) Input Reduction: Does the project reduce or make more efficient use of inputs?

Each proposal is judged on its relative merits. A farming method considered to be highly innovative in one region of the state may be commonplace in another region.

Impact of Program

The loans have given Minnesota farmers added incentive to make changes toward more efficient use of inputs while enhancing profitability and protecting the environment. More than 320 farmers have borrowed over $3.5 million from the Sustainable Agriculture Loan Program.

As loans are repaid and the funds redistributed, approximately $250,000 is available each year for new loans. When farmers implement innovative changes, their neighbors have an opportunity to observe and decide whether to adapt changes to their farming system. In this way, the farmers are demonstrating new, innovative, and alternative ways of farming and are serving to accelerate the rate of adoption of sustainable agriculture in Minnesota.

Project Categories

Loan projects typically fall into six categories: energy savings, livestock management, conservation tillage, weed management, nutrient management, and alternative crops. About one-third of loans have been made for livestock management and this category continues to be the most common. Projects have included fencing, livestock handling equipment, milk parlor upgrades, and breeding livestock. Conservation tillage projects account for about one-fourth of the loans and include the purchase of rotary hoes, precision ag equipment, no-till planters, and ridge tillage equipment.

About the Staff…..

The Greenbook staff brings a broad range and many years of experience in sustainable agriculture areas. Each staff person focuses on individual topic areas where they have expertise and interest.

Linda Bougie - Office Manager, has been working for the program since it began in 1988. Linda provides administrative and clerical support to the staff.

Jean Ciborowski - Integrated Pest Management (IPM) Coordinator, has been part of the staff since 1997. During her tenure at the MDA, she has coordinated the Biological Control Laboratory (1989-91) and the Exotic Pest Program (1991-97). Jean works on development and implementation of statewide strategies for increasing the use of IPM on private and state managed lands.

Alison Fish - Secretary, does desktop publishing and word processing for the program, helps design program brochures, handles mail requests, and maintains the Sustainable Agriculture Loan and Grant files.

Mary Hanks - Program Supervisor, works with staff to develop project goals and implementation strategies. Mary's training is in plant pathology with a research focus. She came to the MDA in 1990 from private industry.

Wayne Monsen - Alternative Livestock Systems Specialist, provides rotational grazing planning services for livestock producers (in cooperation with NRCS), and cooperates with local, state and federal agencies on livestock and non-point source pollution issues. He began working for MDA in 1992 after farming for 12 years near St. James, MN.

Meg Moynihan - Organic and Diversification Specialist, joined the Minnesota Department of Agriculture in 2002. She educates about and promotes crop, livestock, management and marketing options, including organic. She has also worked professionally as an educator and evaluator, and as a community development extension specialist with the U.S. Peace Corps in northern Thailand.

Mark Zumwinkle - Sustainable Agriculture Specialist, provides hands-on experience to farmers working on soil quality and acts as a liaison with university researchers and farmers coordinating the use of the rainfall simulator. Mark uses soil and cropping system health as focal points for farmers exploring management issues and options and provides the non-farm community with access to soil health information. Mark is a vegetable grower from North Central MN with research experience in living mulches and plant nutrition. Mark joined the ESAP staff in 1993.

Staff Resource Directory

	Jean Ciborowski	Mary Hanks	Wayne Monsen	Meg Moynihan	Mark Zumwinkle
Agroforestry			•		
Alternative Crops & Livestock			•	•	•
Community Supported Agriculture (CSA)		•		•	
Composting		•			•
ESAP Grants	•	•			
ESAP Loans		•			
Farming Systems/Tillage, Weed Control, Crop Rotation	•		•		•
Integrated Pest Management (IPM)	•	•			
Livestock Production			•		
Living Mulch					•
Management Intensive Grazing		•	•		
Manure Management					•
Organic Production/Livestock,Vegetables, Grain, Fruit				•	•
Organic Rules and Certification		•		•	
Plant Diseases/Insects	•	•			
Rotational Grazing Planning			•		
Soil Quality and Soil Fertility, Composting					•
Vegetable Production					•

Notes: