North Central Region SARE

Farmers Forum Highlight

The North Central Region-Sustainable Agriculture Research and Education (NCR-SARE) Farmers Forum is an annual event that gives NCR-SARE grant recipients the chance to share information about sustainable agriculture practices with a regional audience. The talks focus on research, demonstration, and education projects that promote sustainable farming and ranching. The projects emphasize the three pillars of sustainable agriculture: environmental stewardship, profitability, and social responsibility. The next NCR-SARE Farmers Forum will be held on February 15-16, 2014 in Granville, Ohio, in conjunction with the 35th Annual Ohio Ecological Food and Farm Association (OEFFA) Conference. For more information, see the website: ***www.oeffa.org*** or call OEFFA at: 614-421-2022.

NCR-SARE is a United States Department of Agriculture–National Institute of Food and Agriculture (USDA-NIFA) program that supports and promotes sustainable farming and ranching by offering competitive grants and educational opportunities for farmers and ranchers, researchers, educators, students, institutions, organizations, and others exploring sustainable agriculture.

This highlight is a summary of reports and presentations from NCR-SARE Farmers Forums held in 2012 in Missouri and Wisconsin. They featured speakers who received awards from NCR-SARE's five grant programs: Farmer Rancher, Youth Educator, Graduate Student, Professional Development, and Research and Education. The letters and numbers listed above the project titles are NCR-SARE project numbers (e.g., FNC10-822). The letters identify the grant program: Farmer Rancher (FNC), Youth Educator (YENC), Graduate Student (GNC), Professional Development (ENC), and Research and Education (LNC). To read the full reports, go to the national SARE website at ***www.sare.org*** and click on the "Project Reports" tab; then click on "Search the Database." Enter the project number or a topic you want to search for in the "Search String" box.

SARE Sustainable Agriculture Research & Education

The Farmers Forum is one of many educational efforts NCR-SARE supports. Visit the NCR-SARE website to see a calendar of events, educational resources, grant opportunities, and more.

http://www.northcentralsare.org

Photo by Joan Benjamin

Stu Jacobson prepares the bee smoker as he gets ready to work with his bees. Smoke keeps the bees calm when Jacobson opens the hives.

FNC10-822 **Rochester, IL – Stu Jacobson**

Sustainable Beekeeping: Increasing Production and Utilization of Northern-adapted, Disease- and Mite-resistant Honey Bee Queens

Objective: To increase production of Illinois-adapted, disease- and mite-resistant bees and queens.

Results: Stu Jacobson owns Prairie Grove Queens and Bees, a family farm business on 2.6 acres. He has about 40 honey bee colonies, which primarily are devoted to producing queen bees and small colonies for sale, rather than honey production. About half the colonies are small ones (nucs) from which queens fly to mate. Jacobson's operation is sustainable, meaning no "hard" mite treatment chemicals have been used for eight years and no treatments for mites or for the pathogenic fungus Nosema have been used the last three years.

Research indicated that bee stocks acquired from Sunbelt states did not adapt as well to Illinois conditions as locally raised ones. Using northern-adapted, disease- and mite-resistant queens is critical to development of sustainable beekeeping in the region.

Since 2003, Jacobson has received four NCR-SARE grants for his work to increase understanding and adoption of disease- and mite-resistant lines of bees among beekeepers in Illinois and surrounding states. This project built on his earlier SARE projects and comprised a series of workshops on how to raise queen honey bees sustainably. Daylong workshops, half-day workshops and classes were conducted. Beekeepers had the opportunity to share their successes and failures. Jacobson said conducting a successful queening program is multifaceted. "Marketing is critical. A website is very important," he said.

Also, the project helped with identification of honey bee lines that are both disease- and mite-resistant and adapted to regional conditions in Illinois. Traits evaluated included maintaining mite loads below harmful levels, winter survival, spring population increase, productivity, and gentle behavior.

The project greatly increased awareness of buying locally produced queens and bees. The number of people raising honey bee queens for sale increased from 1 to 17 in fall 2012. Also, a new initiative is underway to provide nucs with locally adapted queens and bees to beginning beekeeper members of the Lincoln Land Beekeepers Association.

FNC10-840 Decorah, IA – Chris Blanchard

Scaling Up to Meet Market Demand for Local, Organic Broccoli

Objective: To increase production of organically grown broccoli to meet a growing need for locally grown foods.

Results: Chris Blanchard raises about 15 acres of certified organic vegetables and fresh herbs for community supported agriculture operations (CSAs) and wholesale customers in the Twin Cities, Rochester, and Decorah on his Rock Spring Farm on the Iowa-Minnesota state line. His farm has been recognized as a model for food safety, post-harvest handling, and good business.

Although broccoli is a popular staple vegetable that can be harvested for 20 weeks in the upper Midwest, the Twin Cities was experiencing a shortage of locally grown produce every summer. Local farmers found it difficult to scale up production to take advantage of demand.

A group of farms including Rock Spring Farm was able to attain a two-year agreement to guarantee the purchase of 100 percent of the satellite farms' broccoli crop at an agreed-upon minimum price if production acreage, production schedule, and quality standards were met. Throughout the project, data were collected about yields, economic performance, labor inputs, product quality, and more.

The project was hampered by severe weather conditions — in 2011, cold and wet conditions in the spring and spikes in temperatures in May and June, followed by drought; and in 2012, extreme drought. Therefore, demand for organic broccoli was not met even with the addition of three farms producing the vegetable. All participating farms had reduced yields but, given the weather, Blanchard said it has been difficult to determine whether a better-than-average yield by participating farms would meet local demand.

He said it also has been difficult to determine whether scaling up to grow broccoli for wholesale in this area would be economically viable for producers. Other challenges included transportation, training, unclear planting schedule instructions, and transplanting.

FNC08-745 Fremont, NE – Cathy Hanus

Using Commercially Available Mycorrhizae Inoculant, Compost, or Mycorrhizae Inoculant and Compost when Transplanting Small Berry Bushes

Objective: To help small farmers improve the growth and survival of transplants using commercially available mycorrhizae and/or commercially available compost.

Photo by Cathy Hanus

Cathy Hanus uses special equipment to photograph an aronia root stained to show mycorrhiza vesicles.

Results: Mychorriza is a beneficial fungus that has a symbiotic relationship with the roots of plants. Studies have shown that mycorrhiza inoculation helps plants in soils with heavy metals and that are low in nutrients. It also helps plants take up nutrients and moisture by increasing the surface area of the root systems up to 700 to 1,000 percent. Cathy Hanus wanted to see if the use of products that encourage mycorrhizae growth would help small berry growers establish productive plantings more quickly. She planted aronia and elderberry root cuttings in four groups: control, commercially available compost added, commercially available mycorrhizae added, and both commercially available compost and mycorrhiza added.

Based on her own earlier research, Hanus expected the group with both the commercially available compost and mycorrhizae to produce the most significant early growth. However, the early analysis indicated that compost only produced better results than compost/mycorrhizae together; mycorrhizae only treatments were nearly as good as compost. All plants had mycorrhizae inoculation by eight weeks, but the treated plants developed mycorrhizae four to six weeks earlier than the control which relied on naturally occurring mycorrhizae.

Analysis of the roots revealed that the compost-only group had very bushy feeder-like roots; the mycorrhizae group had roots similar to the compost group but they were obviously less full; the mycorrhizae/compost ("Both") group had very long roots with little fullness; and the control group had scrawny roots. It appeared that the compost treatment was preferable.

As time went on, the plants in the "Both" group produced taller plants, which are preferable, and had more production, even in a year with extreme heat and little rain. Currently, Hanus believes the "Both" treatment is the best option and that adding mycorrhizae is a simple way to increase the early growth of a plant.

She plans to continue the experiment to see if the early start of the composted plants makes a difference in plant growth over a longer period. She also plans to pay more attention to the root systems.

Evaluating the Effectiveness of Meeting Seasonal Labor Demands by Integrating a Farm Internship Program

Objective: To evaluate the efficiency of having a farmer train and manage seasonal farm interns, and the potential of a farm internship program to increase farm profitability and quality of life.

Results: The 16-acre Suncrest Gardens produces vegetables sold through community supported agriculture (CSA) subscriptions, raspberries, and a diversified line of homemade products including jams, handcrafted soaps, and wood-fired pizza. Owner Heather Secrist sought seasonal, low-cost labor to help with farmwork to increase production and free up time needed for other business activities, but she found hiring difficult due to cost and lack of worker availability.

Secrist explored developing a farm internship program in west central Wisconsin/ southeastern Minnesota to train and connect interns with area farmers, similar to the current Collaborative Regional Alliance for Farmer Training program in southern Wisconsin/northern Illinois.

Secrist's goals were to increase farm profitability, the number of sustainable practices used, and management efficiency in the off season.

Secrist used gross income data to compare production years. The year before the grant project began, one intermittent intern assisted on the farm. In 2007, two full-time interns committed, and gross income jumped $12,724. In 2008, one full-time intern and one CSA member fulfilled labor needs, and gross income increased $12,691 over the previous year. Secrist noted labor was only one factor contributing to the growth.

A qualitative scale, with a maximum score of 50, was used to measure how the farm's sustainable practices were changing. In 2004, 14 was scored; 2005, 15; 2006, 19; and 2007 and 2008, 34. The jump of the final two years correlated with more intern labor.

Secrist used off-season hours to identify farm priorities and schedule workers best matched to those needs. She recorded the number of intern hours worked over two growing seasons. In 2007, 1,048 hours were logged and in 2008, 984. Secrist plans to schedule an average of 1,000 hours of intern labor for each season.

For all the issues Secrist looked at, positive changes occurred. She found available, low cost seasonal labor; increased farm income and sustainable practices; improved quality of life; and raised the satisfaction of interns. The program Secrist created connects interns with local farms and provides a network through which future sustainable farmers are educated.

Photo courtesy of Heather Secrist

Intern Anna, from Oklahoma, spent the season at Suncrest Gardens learning about farming and running a diversified farm business.

As a way to reach potential interns and educate customers about Suncrest Gardens, an informational website — *www.suncrestgardensfarms.com* — was created by Secrist. She also participates in meetings to grow local awareness and tries to broaden interns' knowledge about sustainable farming.

Alternative Broiler Breeds in Three Pastured Poultry Systems

Objective: To investigate the performance and behavior of six hybrid breeds of broiler chickens to determine how they compare to the industry standard.

Results: The Cornish Rock Cross, the favored breed of large-scale poultry houses, has been bred for traits important to that production system; however, the birds have developed health issues as a result, and that's especially evident in pasture production systems. Kim Cassano, who raises poultry and other livestock on an 80-acre farm in northern Wisconsin, wanted to compare the performance of the Cornish Rock Cross to five other broiler breeds on pasture.

To determine the ability of each breed to meet profitability, sustainability, and quality of life goals, Cassano provided 50 chicks of each breed to three farms using common pasture production systems: free range as promoted by Herman Beck-Chenoweth; day range, using the Andy Lee pen style; and the enclosed pen model that Joel Salatin pioneered. The breeds used were Cornish Rock Cross, Freedom Ranger, Moyer's K-22, Silver Cross (aka Kosher King), Red Ranger, and Super Dixie.

As expected, the Cornish Rock Cross grew the fastest, ate the least feed to reach market weight, and had the highest carcass yield. Patterns were similar in data from both free range and day range farms.

Of the five alternative breeds, Freedom Rangers grew the fastest, ate the least, and had the highest carcass yield. The K-22s performed the worst, exhibiting the slowest growth, highest consumption of feed, and lowest carcass yield. The remaining breeds performed similarly to one another.

Cornish and K-22s suffered the greatest losses on the free range farm at 14 percent, while the Silver Crosses, Red Rangers, and Super Dixies lost less than 5 percent of their numbers over the course of the study. Flooding affected mortality on the day range farm. Discounting flood losses, Freedom Rangers showed the highest mortality rates at 18 percent, with Cornish Rocks, K-22s, and Red Rangers at 12 percent, and Silver Cross and Super Dixies below 5 percent. Mortality was consistently 6 percent for all breeds in the Salatin-style enclosed pens.

Comparing input costs (feed and chicks), on the free range farm, Cornish Rocks had considerably lower feed and chick costs despite the higher mortality rate. Input costs were more closely clustered on the day range farm, with Cornish Rocks being the least expensive and K-22s the most expensive. Input costs were highest in the Salatin-style pens.

While the Cornish Rock Cross showed the lowest input cost on all three farms, Cassano remains unhappy with the breed's mortality rate, lethargy, and limited genetic diversity. She plans to raise alternative breeds using the data collected in this project — likely a combination of Freedom Ranger, Silver Cross, and Red Ranger. She will refine her choice to those most suited to her farm as she continues to monitor performance and health.

Photos by Kim Cassano

Kim Cassano's Freedom Ranger broilers on pasture (top) compared to a Cornish Rock Cross broiler (bottom).

ENC09-109 University of Nebraska – Jim Crandall, Cheryl Burkhard-Kriesel, Connie Hancock, Charlotte Narjes

Business Feasibility, Marketing, and Online Direct Marketing: In-depth Training to Better Serve Sustainable Agriculture Businesses

Objective: To increase the small business knowledge, skills, and confidence of recognized public sector agricultural experts in Nebraska and neighboring states so they may better consult with sustainable agricultural producers as they formulate and develop business enterprises.

Results: University extension educators, resource conservation and development coordinators and assistants, and vocational agriculture instructors are often consulted for advice and guidance about sustainable agriculture practices. Unfortunately, these resource experts often feel unqualified when an entrepreneur wants to move a product or service to the marketplace. They need professional development on how to create a feasibility and marketing plan and how to conceptualize and organize an online direct marketing website.

This project provided a series of three face-to-face trainings and a series of follow-up Internet webinars customized to the individual audiences. Fifty-three participants registered for all three trainings, although attendance varied. Some participants represented various state and nonprofit providers. The diversity of public providers, who don't often get together to network, was considered an asset to the program and a significant recruiting accomplishment.

The training left many participants with increased confidence to answer entrepreneurial questions and to address topics in business educational programming. Based on assessments, the participants' level of confidence, as well as their skills, nearly doubled.

Information learned from this project was put to use in many ways. Several programs evolved and incorporated this training information within Nebraska, South Dakota, and Iowa Extension.

In addition to the training and webinars, an Agri-Marketing Toolbox — a Web-based "one-stop shop" for sustainable agriculture entrepreneurs and service providers — was developed and placed on the Nebraska SARE website (*nesare.unl.edu/agrimarketing)*. Video interviews with regionally relevant agri-entrepreneurs were added to the toolbox so participants can access them as they work with their clients. The toolbox has 21 media resources, 39 links to professional resources, 33 links to agri-marketing resources, and 44 links to programs and organizations.

"Direct Marketing of Specialty Food Products," a publication created in a Web-based interactive magazine-like format, also was developed to increase user interaction and reach broader audiences in the future.

Photo by Jim Crandall

Workshop participants learn how to better consult with sustainable agricultural producers as they formulate and develop business enterprises.

YENC10-034 Milwaukee, WI – Venice Williams

Fieldhands and Foodways: A Cultural and Historical Urban Farm Program

Objective: To educate urban Milwaukee youth and families about sustainable agriculture and African and African American agricultural and culinary traditions.

Results: For over 15 years Venice Williams has taught youth about sustainable agriculture at several community gardens, including Alice's Garden, a two-acre urban community garden in Milwaukee, Wisconsin. The land was once part of abolitionist Deacon Samuel Brown's farm, and the location is rich in African American history. In 2010, Williams started Fieldhands and Foodways, a program that blends agriculture education with African and African American history and culture.

In the first year of the program, fourth and fifth grade students from a nearby school participated in a five-week program. They learned the history associated with two gardens, a Master's Kitchen Garden and a Slave Huckpatch (an allotment garden plot), and grew vegetables that would have been planted in each. They used produce from the gardens to prepare traditional dishes. The students also visited the Kenosha Civil War Museum and studied stories and history about slavery, Black Indians, and the Underground Railroad in Wisconsin.

Undergraduate students from the University of Wisconsin–Milwaukee and students in the Garden Mosaics Earn and Learn project at Alice's Garden interviewed and gathered stories from African American men and women who had arrived in Milwaukee during the Great Migration. Excerpts of the stories were published in a neighborhood newspaper.

African immigrants from Uganda, Cameroon, Somalia, and Ghana, living in Milwaukee, served as culinary instructors. They taught about their country by making traditional foods from their homelands. Students learned to make fufu, peanut sauce, fish stew, shaah (Somali tea), potato and pea sambusa, and other dishes.

Guest speaker, Kimberly Simmons, came to Milwaukee to discuss slavery and the Underground Railroad. She made history come alive by telling the story of her great, great, great grandmother, Caroline Quarlls, a fugitive slave who found safe passage thanks to the help of Deacon Samuel Brown.

Since 2010, 181 students, grades 3 through 8, have participated in Fieldhands and Foodways. Pre- and post-tests showed their culinary and farming knowledge increased from 65 to 80 percent.

Family participants learned that African American families have been engaged in sustainable agriculture for generations, and gained a better understanding of the importance of traditional food and cultural celebrations. Many families that participated in the project now celebrate the African American holiday, Kwanzaa.

Williams found that the community is eager to learn about cultural traditions related to food and farming. Interest has been so great, there is now a waiting list for the project.

Photos by Josiah Williams

Alice's Garden is a two-acre, urban, community garden in Milwaukee, WI, nurturing families and organizations to restore cultural and family traditions connected to land and food.

Extending the Vegetable Growing Season with Low-cost Quick Hoops

Objective: To use low tunnels as an economical way to extend the growing season.

Results: Locally produced food is growing in popularity as consumers' interest in knowing where and under what conditions their food is grown is increasing. In the Midwest, though, most producers stop growing after the first frost and don't have produce for up to six months a year. There is also a two to three month period in the summer when it is too hot to produce lettuce. The Millsaps use high tunnels and heated greenhouses to extend the growing season. Low tunnels are a supplement to the way they grow year-round.

Millsap Farms is a 20-acre diversified farm near Springfield, Missouri, that includes five acres of vegetables, bedding plants and vegetable starts. The Millsaps sell produce through farmers' markets, grocery stores, a farm stand, and a community supported agriculture (CSA) program.

Curtis Millsap uses temporary low hoops with light coverings, sometimes referred to as quick hoops, as a way to extend the growing season and meet consumers' desire for local food year-round. The hoops are made of 10-ft. galvanized electrical conduit that is bent into 6-ft. diameter half circles. The ends of the hoops are stuck in to the ground 6 to 12 in. on each side and then covered with either a floating row cover or plastic.

In 2012, the farm covered about 1,800 linear feet, or 5,400 sq. ft., of growing bed, making nine low tunnels 100 ft. long and 6 ft. wide. Crops covered included carrots, baby lettuce, beets, chard, kale, head lettuce, radishes, scallions, and spinach. Representative areas of the same crops were left uncovered for comparison.

The farm has had considerable success overwintering and extending the season three months on most of the crops. Notable exceptions are radishes, which bolted much faster under the tunnels, and lettuce, which was frostbitten by relatively mild temperatures. Crops left uncovered are almost always decimated by Dec. 1, except kale and spinach, but the beets, carrots, spinach, arugula, and kale under the covers thrived until the covers began to rip in late December and January. Keeping covers tight and well anchored are key to avoiding rips, but once one starts, it's impossible to stop it.

Harvesting from a low tunnel is not as convenient as harvesting from a greenhouse or high tunnel, as it's usually quite muddy and cold in the field, but the cost of a low tunnel is so much less, it's worth it.

Next year, the Millsaps plan to expand low tunnel coverings and experiment with heavier coverings. They will continue efforts to set up effective temperature monitoring, installing devices at the beginning of the fall season.

Photos by Curtis Millsap

Low hoops covered with lightweight row cover provide a low-cost, low-risk method of season extension. In winter, they protect crops from frost; in summer they provide protection from intense heat.

FNC10-814 Tripoli, IA – Rob Faux

Maintaining Companion Plantings while Mechanizing in Diverse, Small-Farm Vegetable Operations

Objective: To identify equipment and develop techniques to mechanize planting and maintenance tasks in vegetable plantings with companion plants.

Results: The Genuine Faux Farm, operated by Rob and Tammy Faux since 2004, is a small family operation that grows a wide variety of vegetables that are sold and distributed to about 120 community supported agriculture (CSA) customers. Produce also is sold via farmers' markets and direct sales to a daycare, retirement center, and grocery store.

As vegetable production on the farm increases to meet demand and increase profits, weeding and other tasks that were done with hand tools have become too labor intensive. In a monoculture planting, where all plants have the same spacing, it's easy to use equipment to reduce labor. In a diverse system with companion plants, using equipment is challenging and requires more planning and different implements. Companion planting (intercropping) is used on the farm because planting different types of plants near each other can repel pests, attract pollinators, or provide other benefits.

Faux started by identifying appropriate tools and spacing for intercropping that would accommodate equipment. He located used implements to use with his Ford 8N/9N tractor including an S-tine cultivator — 14 ft. cut down to 7 ft. (half of the cultivator is used as an all-purpose "plow" for field preparation; half is used as a row cultivator to handle wheel track weeding) and a 6-ft. disk harrow.

Photo by Rob Faux

This Ford 8N tractor was used for maintenance of 40-in. beds on Rob Faux's farm. A 7-ft. tool bar was cut down from a 14-ft. bar to create two cultivators with gangs of S-tines.

The companions tested and expected benefits were: beans with potatoes (beans mask presence of potatoes to reduce loss to Colorado potato beetle); brassicas such as broccoli with alliums such as onions (alliums reduce damage by cabbage worm and cabbage looper/ reduce potential spread of onion diseases by splitting the crop); and winter squash or melons with companion flowers (reduce loss to vine borers, reduce squash bug population, increase predator and pollinator habitat near squash plants).

Trial companion plant spacing was compared with established (control) spacing that had been successful in the past. Control seed beds were the width of a walk-behind tiller. Potato rows were 65 in. apart, with double bean rows in between (the bean rows approximately 8 in. apart). The brassicas (broccoli, cabbage, etc.) and alliums (onion, leek, etc.) were similar, with rows of brassica 65 in. apart with a double row of the allium crop in between. Trial seed beds were developed at 40 in. wide (the distance between the tractor's wheels) with wheel tracks approximately 1 ft. wide. A single row of each companion was planted 8 in. in from the bed edge, giving approximately 24 in. of space between the two companion rows.

The trial spacing for potatoes and beans was successful with time saved in weeding and harvesting. Yield and pest control results were the same for trial and control spacing. The trial spacing for brassicas and alliums was successful only for the brassicas. A windstorm rolled most of the larger brassicas over onto the alliums, which resulted in stunted plants. Even with the use of a cultivator, weed control "in row" remained difficult, requiring extensive labor. Winter squash and flower spacing results were inconclusive.

FNC12-844 La Plata, MO – John Arbuckle

The Cheapest Way to Produce the Best Egg: Comparing How Different Supplemental Feeds Affect the Cost and Nutrient Density of Eggs from Heritage and Hybrid Pastured Hens

Objective: To examine the effects of feed type and chicken breed on egg quality and chicken health, with an eye toward helping producers control costs without sacrificing production or high nutritional standards.

Results: Singing Prairie Farm, owned by John and Holly Arbuckle, is on 50 acres in northeast Missouri. They raise beef cows, free range pigs, turkeys, fryer chickens, and laying hens. Although the operation is not certified organic, it offers the animals organic and/or non-GMO feed and follows organic standards. The Arbuckles sell their meat on farm and wholesale their eggs to grocery stores and restaurants in the area.

Arbuckle's experiment compared the cost effectiveness and nutrient density of formulated organic rations to sprouted wheat rations for supplemental feed. Sprouted wheat rations are less expensive than organic rations and are widely available. Also, some believe sprouting wheat increases protein content and releases vital nutrients and beneficial enzymes.

Arbuckle used four sample groups, with 50 chickens per group. The chickens were placed in portable pens on pasture. One group was Red Sex Link hens supplemented with formulated organic rations; a second group was Red Sex Link hens supplemented with sprouted wheat; a third group was Rhode Island Red hens fed organic rations; and the fourth was Rhode Island Red hens fed sprouted wheat rations.

Samples from each group were sent to a lab after four months for testing for protein, fatty acid profile, and a number of vitamins. In addition to quality, a statistician analyzed the cost-effectiveness of each group's output.

For the first five weeks, the wheat-fed chickens were the most profitable, laying 24 percent fewer eggs but costing 55 percent less in feed. A period of intense heat and drought — not good for chickens — had an impact the rest of the summer, reducing production significantly. During the better weather, group two (the hybrids fed wheat rations) were the most cost effective; that held true, too, during the intense heat and drought, though the difference was negligible since they produced so few eggs.

"When there was a daytime high of 85 degrees or less and precipitation of 1 in. or more each week, all populations were able to lay acceptably well," said Arbuckle. "During that time, purchasing a balanced ration was not necessary. We found out that our type of rolling cow pasture was capable of producing enough of what the wheat was lacking to allow competitive egg production."

FNC10-795 Butler, MO – Joe Gaylord

Adding Value to Missouri Family Farm by Incorporating Aquaculture Into Existing Farm Operation

Objective: To add prawn and trout into an existing hybrid bluegill operation in a one-year cycle.

Results: Joe Gaylord has a 100-acre farm and rents additional acreage for his 120 cow/calf operation. To offset rising fuel and input costs, he sought another source of income. Since his farm has a large pond with an excellent water supply, he decided a fish and prawn operation would be a good fit.

"It takes little to no machinery for this to work," Gaylord said. "We have a four-wheeler, a boat, and three or four 5-gallon buckets. That's the beauty of this."

Gaylord researched pond design; construction of fish cages; fish variety; feed type and quantity; how to test water quality, water temperature, and oxygen levels; and pond fertilization. Gaylord said the information and assistance he received from personnel at Lincoln University's Carver Farm in Jefferson City, Missouri, was invaluable as he conducted his research.

Gaylord started with 10,000 bluegill. He added 50 pounds of freshwater prawn.

Due to a short growing season, yield was low for the prawn. Gaylord said water temperature is a major factor for prawn survival. To take advantage of periods of colder water temperatures, Gaylord added rainbow trout during the winter months. The trout grew well, but Gaylord didn't have the market for them.

Gaylord found that bluegill and prawns are incompatible species to raise together. Harvesting prawn requires the pond to be drained, making it necessary to transfer the bluegill from the cages to another pond, and then return them. Given the short growing season for prawn, the extra labor required is inefficient. However, the prawn harvest brings many customers and curious visitors to the farm. Members of DeMolay, a fraternal organization for young men, have provided labor.

Aquaculture is new to Bates County, Missouri, where Gaylord's farm is located. He provides tours, speaks at area clubs, and has helped a new prawn farmer get started.

Phase 1 and 2: Truffle Orchard Establishment — The Burgundy Truffle

Objective: To cultivate the European burgundy truffle to be marketed alongside the farm's current mushroom crop in the St. Louis region.

Results: Ozark Forest Mushrooms (OFM), owned by Nicola Macpherson Hellmuth, specializes in log-grown shiitake mushrooms, and oyster mushrooms grown on bagged agricultural waste substrate. Additionally, OFM sells imported truffles. Hellmuth viewed growing truffles as an opportunity to introduce an exciting new agroforesty product into an area of high unemployment, and to provide an additional culinary highlight and agro-tourism attraction in the region. With SARE support, she has been working to cultivate the European burgundy truffle.

Hellmuth is working with Dr. Johann Bruhn of the Division of Plant Sciences and the Center for Agroforestry at the University of Missouri in Columbia. Dr. Bruhn believes that under proper conditions Burgundy truffle production could reach 60 lbs. per acre annually by the time the orchard is 10 years old.

A key problem addressed in phase 1 of the project was how to alter the soil, which is naturally acidic, to a pH of 7.5 and keep it there. In all other aspects, this area of the Ozarks is very similar to the Burgundy truffle-growing regions in Europe. Lime was added to the soil to raise the pH level.

In phase 2 of the project, organic matter was added to the soil using the most cost effective options — resources close at hand. Milfoil or "lake weed" was harvested from a nearby lake. When dried and ground, it produced a peat-moss-like bedding material encrusted with lime that helped suppress weeds while adding additional organic content to the soil. Also, white oak wood chips derived from "spent" shiitake substrate logs were worked into the soil in early spring, as was hay. OFM has also looked at different ways to produce a large amount of biochar using chips from Missouri Mulch. The wood chips are a byproduct of the bourbon barrel cooperage industry. Presently, 200 cubic yards of double ground white oak bark from the cooperage industry at Salem Wood Products are being added to the soil and will be disked in prior to tree planting this fall.

After the beds have been formed with a Rice Levee plow, the host white RPM oak trees from Forrest Keeling Nursery will be planted late this fall in conjunction with the Swedish Burgundy truffle season. Swedish truffles will be used as an inoculant. An irrigation system and deer fence will be installed to water the tree seedlings and protect them from deer damage. An open house is planned for spring 2014.

Photos by Daniel Hellmuth

Johann Bruhn (left) along with his Mizzou Advantage Undergraduate Research Team students, Mary Hendrickson (Sustainable Agriculture Program, University of Missouri), David Emerich (biochemistry and bacteriology, University of Missouri), and David English (prospective truffle grower with a farm near Herman, MO) came to the farm to look at the interdisciplinary effect of truffle cultivation in Missouri, including the economic, eco-tourism, agricultural, and agroforestry benefits.

David English, David Emerich, and Johann Bruhn inspect a soil sensor dug up at the Hellmuth truffle orchard.

GNC10-145 Columbia, MO – Kizzi Roberts

A Survey of Relationships among Rare Breeds of Pigs

Objective: To conduct a survey of the relatedness within three rare pig breeds in order to better inform farmers seeking to preserve those rare breeds and preserve overall genetic diversity in swine.

Results: There are more than 70 breeds of pigs worldwide, but only seven are used in most large pork-producing operations. Though benefits of biodiversity are often overlooked, there are farmers and organizations interested in preserving rare and endangered breeds for future generations.

A constraint faced by many is the lack of pedigree data available for these rare breeds, which makes it difficult to plan matings to avoid inbreeding.

Kizzi Roberts, a graduate student at the University of Missouri, wanted to determine the relationships within rare breeds that lacked pedigree information. She obtained samples from three rare breeds of swine (Guinea, Red Wattle, and Ossabaw Island) and compared the alleles within the rare breeds.

Her preliminary research indicates that within the tested breeds, there was often a high level of relatedness, implying high inbreeding. This information could be helpful for producers who might be under the assumption that certain animals are unrelated, when, in fact, they are closely related.

Accurate swine relationship data will help producers plan swine mating to maintain genetic diversity. Greater genetic variation will allow rare breeds to remain viable for future generations, which will give farmers opportunities for niche marketing.

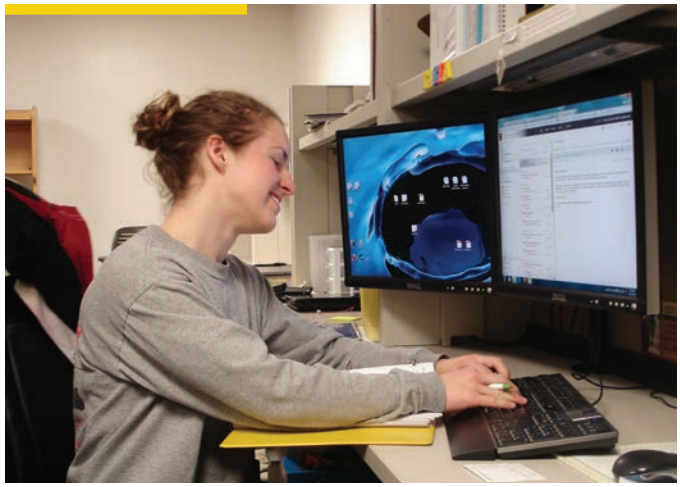


Photo by Tasia Taxis

Kizzi Roberts compiles results from the survey she conducted about relationships of rare pig breeds.

FNC08-712 Madison, WI – Claire Strader

Developing Harvest Task Checklists to Assist Farmers in Managing Harvest Crews

Objective: To develop 10 harvest checklists to reinforce training and instruction on specific harvest tasks so farm workers can work more independently and produce a more consistent product.

Results: Troy Community Farms is a five-acre urban farm that produces certified organic vegetables sold through a CSA, farm stand, and grocery store accounts. Given the farm's location on the north side of Madison, people of all ages and abilities have easy access and are attracted to the farm as a place to learn about food and food production. One of Claire Strader's challenges as farm director was training and managing a large and diverse workforce of interns, worker shares, and volunteers.

Strader found that even with training and clear instruction, it was difficult to ensure harvest tasks were completed efficiently and produced a consistent product. To address this, she identified 10 priority crops that crews would likely harvest multiple times throughout the season and developed task sheets for each crop.

Task sheets included tools needed, field harvest procedures, wash shed cleaning, and packing procedures. Strader piloted and revised the sheets for each crop based on farmer and harvest crew feedback. The final version was printed and laminated for use in the field.

To measure effectiveness, Strader distributed questionnaires to harvest crews, collecting data on the amount of time taken to complete a task and crew member confidence about the task. Farmers were surveyed to gauge satisfaction of harvested products. Results were inconclusive.

To measure impact on time used per task, Strader planned to give task sheets to crews working Wednesday harvests but not to those working Friday harvests. Due to a marketing change that significantly reduced Friday harvests, she wasn't able to make comparisons. She also found that crew composition fluctuated as workers moved from crop to crop to complete tasks as needed, thus affecting the number of tasks a person completed for each crop.

Workers reported feeling slightly more confident when using the task sheets, and in general their confidence on performing harvest tasks was high. Strader found farmer satisfaction increased somewhat when the task lists were used.

Strader believes the farm will benefit from the task sheets. She continued to refine them, believing a streamlined list would be more effective in the field. The Troy Community Farm's harvest task checklists are available on the MySARE reporting website. Go to *www.sare.org* and click on Project Reports. Search the database for project number FNC08-712.

FNC12-876 Hermann, MO – Pieter Los

Hoeing Hens

Objective: To incorporate movable coops for laying hens into a sustainable farming system to reduce weeds, tillage, and nutrient losses, and to increase income, soil fertility, and farm diversity.

Photos by Pieter Los

Pieter Los converted two hay wagons into moveable houses for laying hens so the birds can weed, fertilize, and "till" growing areas in addition to providing eggs.

Results: Wil Farm, owned by Pieter Los, consists of 18 acres near Hermann, Missouri — approximately 2 acres are used to raise flowers, produce, strawberries, and laying hens.

Los converted two hay wagons into hen coops that can each house up to 125 chickens. He gathers eggs from laying boxes that are accessible from the outside of the wagons. The wagons can be moved with a four-wheeler, four-wheel drive truck, a small tractor, or two people. Construction costs were approximately $1,000 per wagon.

Both wagons are placed within a moveable solar-powered electric netting fence. So far, the electric fence has kept out all predators. Because the coops are open, Los uses plastic sheeting as a windbreak on one side of the wagon during winter. He also places roofing tin around the bottom of the wagons during blizzards.

A plastic tarp is placed on the ground under each wagon to collect manure so it can be distributed to other areas. Feeding and watering as far away from the coops as practical increases uniform distribution of the manure.

Depending on the area Los is grazing or clearing out, he can configure the electric netting to change stocking density from 5 sq. ft. to 100 sq. ft. per chicken. In summer, he has the birds clean areas up to 3,000 sq. ft. every 10 days or so. In winter the birds aren't moved as often and have access to 9,000 sq. ft. at a time. Los has put the hens in waist-high foxtail. In about two weeks, they reduced the weed stalks to stubble. The chickens also have removed fescue and foxtail seed.

Los tried placing the chickens in a high tunnel to clean the area, and they removed the plant residue in about two weeks. The hens also clean and fertilize asparagus in early spring.

In areas where the chickens have "grazed," Los only has to rototill to prepare the soil for planting. In areas where the chickens haven't spent time, Los has to mow, possibly disk, and then rototill.

LNC09-309 Columbia, MO – William Sexten

Using Grazing Wedges to Match Beef Cattle Nutrient Need with Pasture Resources while Reducing Feed and Fertility Costs

Objective: To sample pastures managed using a grazing wedge to determine forage quality for a beef operation, in order to improve profitability, increase forage utilization, and reduce or strategically alter feed and fertilizer use.

Results: The grazing wedge is a tool for visualizing forage inventory in different pastures. It visually represents the quality and quantity of forage dry matter available both now and during the next round of grazing, enabling farmers to plan pasture management accordingly. Cattle graze good quality forage (not too mature) without overgrazing and risking poor regrowth. University of Missouri Extension provides an online grazing wedge calculator for producers at *www.grazingbeef.missouri.edu*.

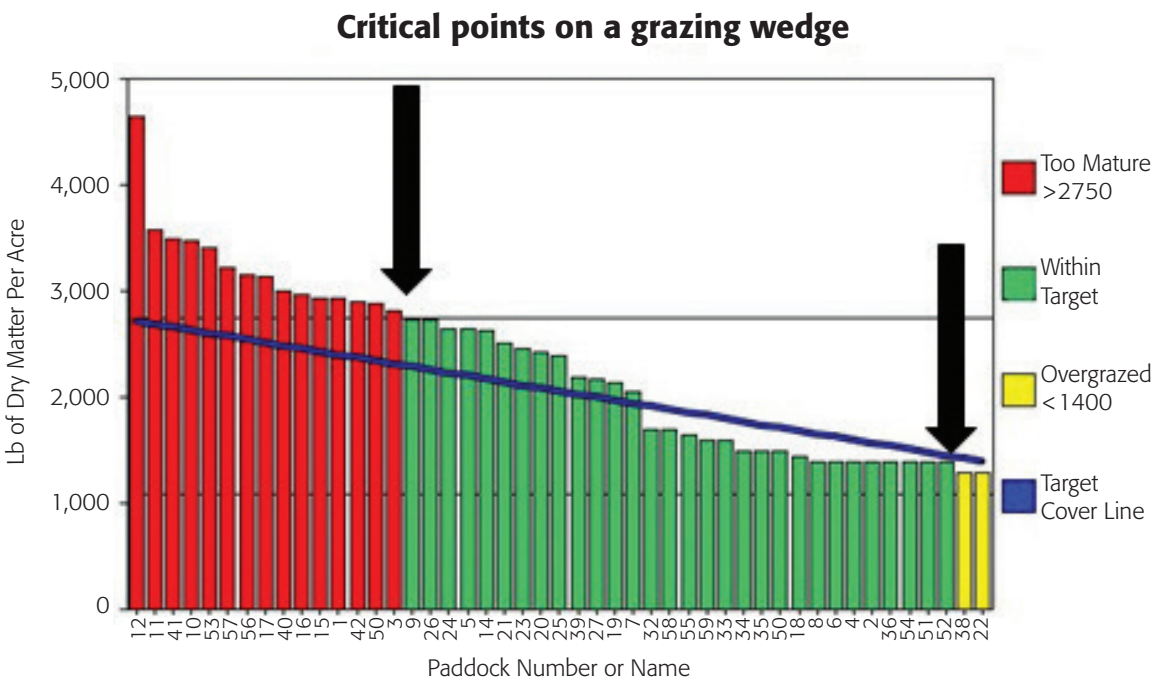
Beef producers sampled pastures managed with grazing wedges to determine forage quality. Grazing proved to be a challenge because of the historic drought experienced by producers across the Midwest. Producers had to address not only recovery from the 2011 drought but had to deal with excessive heat in June and July of 2012. The seven Missouri producers who participated in the project in 2011 continued to collect forage quality samples, but the number of samples was reduced in 2012 due to the drought.

By early July, most producers observed little or no forage regrowth. They were encouraged to stop grazing pastures at a residual height of 1,500 pounds of dry matter per acre to minimize opportunities for weed growth, and to allow rapid regrowth when rain returned. Producers who were able to keep cattle from grazing residual forage observed increased regrowth when a late-season storm system brought rain to most of the state.

The results of the 2012 forage sampling indicate crude protein and energy (TDN%) were sufficient to excessive for all stages of beef cattle production. Generally, fiber concentrations (NDF%) increase and NDF digestibility declines as the growing season progresses, indicating the optimal time to harvest excess forages is before June. The data continue to indicate that forage quality in pastures managed with a grazing wedge could provide sufficient nutrient concentrations to meet or exceed nutrient requirements of cow-calf systems.

The use of grazing wedges improved the ability of the producers to maintain ideal pasture residual to optimize regrowth while minimizing weed infestation following drought. Once pasture growth resumed, producers used the grazing wedges to inventory pastures and determine the availability of stockpiled forage. Feed and forage purchases were based on inventory at the end of the growing season.

Producers agreed with forage quality tests, which suggested that producers rarely lack forage quality but more often lack forage quantity.



A grazing wedge indicates which paddocks are best for grazing—not too mature which would have reduced quality, and not overgrazed which will limit capacity for regrowth.

Skip-Row Corn Planting Techniques with Cover Crops for Sustainable Grazing

Objective: To find out if skipping planter rows of corn to increase soil and light exposure would result in an earlier emerging and more robust winter cover crop for livestock grazing.

Results: Harry Cope grazes 100 head of cattle, 400 ewes, and occasionally 400 head of feeder goats. He wanted to switch from supplementing pasture with harvested grains to a year-round grazing system that included standing corn interplanted with cover crops.

Getting good soil contact and enough light are challenges when planting cover crops into a standing corn crop. Skip-row planting (skipping some rows of corn when planting) looked like a solution that would allow Cope to establish a cover crop mix of oats, cereal rye, red clover, Winford turnip kale, Graza radish, and cow peas. If successful, he could extend the length of time his animals could graze forages (cover crops), reduce labor and input costs, and increase profitability. Skip rows would also make it easier to set up controlled grazing with portable electric fencing.

Cope planted the cover crops in mid June in 2010 and in late July in 2011. He seeded a mixture of the cover crop species into standing corn using available high clearance seeding equipment (John Deere high boy tractor with a spinner box attached). A skip-row planting of four rows out of six rows was compared to conventional solid stand six rows with two seeding rates. The two skip-row/corn population treatments were 26,000/acre and 32,000/acre. The solid-stand corn population treatments were 20,000/acre and a control of 26,000/acre. Cope used a randomized complete block research design of four treatments with five replications in a 20-acre field. There were 20 1-acre plots in the design.

In 2010, field peas and Winford turnip kale dominated the cover crops with some spring oats. Cereal rye and radish did not germinate. In 2011, weather forced a corn replant and limited corn yields. Cereal rye was dropped from the cover crop mix and annual ryegrass was added. Oats and Winford turnip kale dominated the cover crop mix. The radish did not germinate.

In 2011, to test whether the cover crop was sufficient for grazing in either the skip-row or solid-row treatment, feeder lambs were assigned to solid-row treatments and to skip-row treatments, to determine if grazing cover crops could provide enough nutrition to replace supplemental grain. Tagged lambs were individually weighed both in and out of the treatment replications. The balance of the lambs grazed free choice in the rest of the corn/cover crop field (both treatments) and an adjacent mixed legume-grass pasture. These animals were weighed as a group on a trailer. The treatment lambs quickly ran out of cover crops and started losing weight. To remedy the situation, a small square bale of hay was added each day to balance the treatment animals' nutritional requirements, and they began to put on weight again.

In 2012, a water system and permanent fence was installed to make the trials easier to set up but no data was gathered due to drought. For 2013, some cover crop species were changed and seeding rates were increased to try to provide enough cover crop feed for livestock to gain weight. Radishes and kale were dropped from the cover crop mix; soybeans, crimson clover, and swede (a brassica) were added. Seeding rates for oats and annual ryegrass were increased. The skip-rows were planted with soybeans at corn planting to generate more pounds of dry matter per acre and prevent late-season weeds from reducing cover crop yields. The soybeans germinated but were killed by an herbicide application. The other cover crops, which were planted later, germinated and were used to continue the study.

The livestock feeding portion of the study was expanded in 2013 from just looking for weight gain to determining which system gives the most pounds of lamb per acre and at what cost. Individual lambs were selected and weighed prior to being assigned to one of three treatments: pasture grazing only; free choice standing corn/cover crops and pasture (animals choose what to eat based on their nutritional needs); and standing corn/cover crops only (with hay if needed). The results from the 2013 feeding study are being analyzed.

Cope presented the preliminary results of his study at the National Association of County Agriculture Agents national meeting, the Illinois Soil and Water Conservation Society conference, and via a SARE webinar and cover crop field days.

Developing Successful Marketing Strategies for Elderberry Growers and Value-Added Processors: A Model for Specialty Crop Development in the U.S. Midwest

Objective: To increase the knowledge of elderberry growers and value-added producers about the elderberry market, future trends, and growth potential, and to expand value-added production opportunities.

Results: Elderberries are a rapidly growing specialty crop in the Midwest. They have multiple functions in a cropping system because they are perennial, ornamental, a wildlife food source, and they can be planted in low-lying wet areas as a buffer. They can be used to produce value-added products like jams, jellies, wines, and juices. Elderberries are also in demand due to their high antioxidant content and health benefits. They can be an income opportunity for family farms.

In-depth information was developed to support the producer decision-making process for on-farm and associated value-added elderberry enterprise opportunities. Research results were disseminated through workshops, outreach guides, decision-support tools, and peer-reviewed journal articles.

The Elderberry Financial Decision Support Tool was launched. Housed on the University of Missouri Agroforestry website (*www.centerforagroforestry.org/profit/elderberryfinance.php*), the tool is designed to assist decision-makers, from the family farmer to the agricultural lender. This tool allows users to select multiple options from a list of the most common establishment, management, harvesting, and marketing techniques to determine the techniques that will generate the best economic returns.

Photo by Michael Gold

A group of workshop participants learn about potential elderberry insects and diseases at Eridu Farms.

More than 100 people attended the Comprehensive Elderberry Workshop and Farm Tour in June 2012. Pre- and post-surveys indicated that the workshop strengthened communication among people interested in elderberry production, including connections between participants and established producers, and connections between participants and researchers.

The post-workshop survey indicated a significant gain in knowledge that improved the understanding of elderberry production. Most respondents indicated an increased interest in elderberries.

Based on their initial involvement, some plan to pursue commercial production, others plan to start growing elderberries, while others intend to "spread the word" about elderberries. The workshop also helped to support future adoption of elderberries as a profitable crop across Missouri and the U.S.

Fifty people attended an elderberry winemaking workshop, which strengthened communication among people interested in winemaking and elderberry production as well as successful winemakers and researchers. The post-survey indicated a significant gain in knowledge that improved the understanding of the winemaking process. The workshop also helped support the potential growth in value-added elderberry production.

ENC08-102 Lincoln University of Missouri – Sanjun Gu

Vegetable Grafting Training for Agricultural Professionals

Objective: To train horticulture and agronomy Extension educators on emerging vegetable grafting technology and the relevant physiological bases.

Results: Sanjun Gu knew grafting was used to produce high-value vegetables in greenhouses and high tunnels in many Asian and European countries. He believed the technique could be successful in the United States. "Grafting improves plant production, reduces disease susceptibility, and increases soil use," he said.

In 2009, Gu developed a program to train Extension educators from Missouri and surrounding states in the technique of grafting so they, in turn, could train interested producers.

Workshops were offered on Solanum (tomato, pepper, and eggplant) and Cucurbit (watermelon and cucumber) grafting. The training integrated presentations, video, demonstration, hands-on exercises, and greenhouse tours. In 2010, Gu constructed a 30 ft. x 96 ft. high tunnel for vegetable grafting education and demonstration. The next year he produced a high definition DVD that covered various grafting methods.

Since 2009, Gu has educated over 3,000 farmers, Master Gardeners, Extension educators, and other agricultural professionals.

As a result of his workshops, horticultural professionals in Missouri and neighboring states have a thorough understanding of the history and physiology of vegetable grafting, grafting techniques including rootstock and scion selection, acclimation of grafts, management of grafted transplants, grafting robots, and the economics of vegetable grafting.

Tomato grafting has been widely accepted by high tunnel vegetable growers. Gu said more than 75 percent of the farmers who participated in workshops have tried grafting tomatoes or other fruiting vegetables on their farms.

Photo by Lin Zhao

Sanjun Gu conducted heirloom tomato trials in a high tunnel at the Lincoln University George Washington Carver Farm in Jefferson City, MO.

YENC10-032 Allendale, MI – Levi Gardner

GVSU Upward Bound TRiO Flower and Herb Garden at the GVSU Sustainable Agriculture Project

Objective: To expand the sustainable agriculture and food systems knowledge base of students in the Upward Bound TRiO program at Grand Valley State University

Results: Through the Grand Valley State University (GVSU) Sustainable Agriculture Project, Levi Gardner helps students learn about food production and gain an appreciation for the process of planning, growing, harvesting, and selling horticulture and floriculture products. The project is growing at a regional public university with a limited history of agriculture or food systems education.

With support from a SARE grant, high school students without previous exposure to farming, gardening, or environmental education were hosted at the university during a five-week summer program. Students were introduced to collegiate life and took a course on sustainable agriculture that was developed to expose them to integrative and experiential learning. Students cooked and shared a meal together from foods they helped grow. Gardner said many students had never seen a tomato plant or a recently harvested onion, or had tasted fresh garlic.

Sixteen students participated in 2011, while 22 participated in 2012.

A freshman stated in his final project, "As a citizen I want to try and help people understand that sustainable agriculture is important because many people don't know about what goes on behind the scene. They don't know where their food really comes from so I want to help them understand."

In the future, as the program grows, Gardner said the group will seek more publicity for their work. They also would like to visit a farm. He said they will continue to focus on how to integrate this work into the students' academic and professional goals.

LNC11-337 Columbia, MO – Hank Stelzer

Sustainability of a Short-Rotation Woody Biofuel System Compared to Grass Biofuel and Grain Cropping Systems

Objective: To study whether underperforming grain crops grown on claypan soil could be replaced with a short-rotation willow biofuel cropping system to improve crop profitability.

Results: The North Central region has over 11 million acres of claypan and claypan-like soil areas that are disproportionate sources of nonpoint pollution and soil quality degradation when used for grain production.

Hank Stelzer wanted to determine whether a short-rotation willow biofuel cropping system on claypan soil could improve crop profitability, but establishing a willow crop during the 2011 and 2012 growing seasons on a Centralia, Missouri, research site was especially difficult because of severe drought.

On April 5, 2011, 13,000 willow cuttings approximately 25 cm long were hand-planted on three 0.85-acre plots. Planting was ideal, and by early June about 90 percent of the cuttings produced growing plants. Early-season weed control seemed to be sufficient.

During the dry and hot weather in late summer, about 40 percent of the plants died. The condition of the surviving plants ranged from poor to good.

Replacement cuttings approximately 50 cm long were planted in early April 2012. Again, planting conditions were ideal and the cuttings were pushed into moist soil. Weed control continued with targeted spraying using glyphosate and mowing.

The heat and dry conditions in 2012 were more extreme than in 2011. By the end of the summer, all but a few of the replants from that spring were dead and an additional 20 percent of the first year's plantings also had died. At the end of the 2012 growing season, only 35 to 40 percent of the plants were alive. The condition of these plants ranged from poor to good, but wood growth from the 2012 growing season was minimal.

Although these two growing seasons made it especially difficult to establish the willow crop, the consensus of the research team was that the droughty nature of upland claypan soils will make it extremely difficult to establish a viable short-rotation willow biofuel cropping system.

The farmer advisory board supported the research team's conclusion. Board members suggested that farmers would be reluctant to try the willow cropping system because of the outcome of this project.

In October and November 2012, the research team began to consider alternative bioenergy crops such as Miscanthus, a perennial grass, as a replacement for the willow cropping system. The research team believes that farms and educators will continue to increase their knowledge of the soil-enhancing benefits of producing bioenergy crops on claypan soils and will learn how to produce these crops.

Photo by Hank Stelzer

Agricultural Research Service (ARS) scientist Newell Kitchen (kneeling) and graduate student Dianthe Hingson inspect 5-month-old willow plants at the project's research site in Centralia, MO.

YENC12-053 Ferguson, MO – Rachel Levi

Organic Farm to Summer Camp Table: Opportunities for Youth on an Organic Farm

Objective: To plan and conduct special camps for middle school students to teach them about farm-to-table agriculture and why a local, plant-based diet is healthful and environmentally responsible.

Results: In December 2011, EarthDance proposed to host two week-long sessions of Camp EarthDance, a farm-to-table summer camp for middle-schoolers. Plans for the camp were fine-tuned in spring 2012, and publicity materials were developed.

Although there were not enough registrants to conduct the first camp, the second camp included 16 students. During the camp, at Mueller Farm, participants took field walks to observe crops and wildlife. Other activities included a scavenger hunt to find different aspects of the farm's ecosystem; a few rounds of the game "nutrient cycle freeze-tag" to better understand the process by which decomposer organisms help build healthy soil; and role-playing a mock farmers' market. EarthDance staff also taught campers how to use hula hoes to weed a bed of beans, carefully transplant scallion seedlings from trays to the soil, and how to harvest delicate Taverna green beans for market.

When campers returned to Ferguson Middle School, a teacher and two interns oversaw lunch preparations. "As a former high school teacher, I saw plenty of kids who perceived lunch as a bag of hot Cheetos and a cola," camp director Rachel Levi said. "We wanted to instill in youth that food grown from the ground is something they want to eat."

Highlights of the week's meals included couscous cakes, fruit salad with camper-made poppy-seed dressing, and personal pizzas with farm-fresh toppings. After meal time a dietitian led several lessons on healthy choices. Campers discussed nutrition labels and "traffic light eating," a reference to "red-light foods," like French fries and sodas, that should cause people to stop and think and perhaps choose a smaller portion or make a healthier choice from "green-light foods" like colorful vegetables and fruits.

Each day ended with a physical activity. Swimming, yoga, and hula-hoop fitness gave campers the opportunity to relax and have fun.

A camper, Torrian, prepares fresh greens at EarthDance summer camp.

Photos by Rachel Levi

Rachel Levi (top left) facilitates transformative hands-on learning for adults and children through EarthDance's apprenticeship and youth programming.

ENC09-107 | Kansas State University – Cary Rivard and Jeffrey Callaway
University of Missouri – Marlin Bates and Mary Hendrickson

Developing Extension Competence in Good Agricultural Practices and Farm Food Safety Planning for Fruit and Vegetable Growers in Kansas and Missouri

Objective: To train Extension agents/educators and other agricultural professionals on how to help producers develop and implement food safety plans and obtain Good Agricultural Practices (GAPs) certification.

Results: Due to recent outbreaks of foodborne illnesses, consumers are concerned about food safety, and an increasing number of wholesale and institutional buyers are requiring growers to have GAPs certification, which focuses on reducing microbial risks to fresh fruits and vegetables.

Cary Rivard and Jeffrey Callaway developed a program to train agricultural professionals, including Extension agents, Department of Agriculture personnel, and other agricultural educators, in Kansas and Missouri on how to help fruit and vegetable growers develop and implement farm food safety plans and obtain GAPs certification.

In 2010, 19 agricultural professionals attended GAPs and food safety training in Owensville, Missouri. Of those, 15 were selected to participate in the national GAPs Online Food Safety Training program. A follow-up survey conducted 15 months later found that respondents were better able to answer questions and had assisted 116 producers, new ideas had been incorporated into programming and used in at least 40 programs, eight special programs had been developed, and participants had written at least three newspaper columns and contributed to one radio talk show on the topic of food safety.

In 2011, 20 horticulture/agriculture Extension agents from Kansas, eight Kansas State University faculty/staff, and two educators from nongovernmental organizations attended a food safety workshop in Olathe, Kansas.

In 2012, the agricultural professionals used their training to help over 120 growers increase their knowledge of food safety and GAPs. As a result, at least two attendees achieved certification.

Rivard and Callaway added Tier 2 GAPs training in 2013 with the goal of providing agricultural professionals with advanced technical knowledge on water testing and other practices that can be barriers to implementing GAPs.

YENC12-038 | Mexico, MO – Laura Worstell

Wild Eating: Bringing Food Production Back to Nature

Objective: To help young people understand the importance of native edible trees, shrubs, and flowers.

Results: Scattering Farms is a 47-acre outdoor learning center with a history of helping children learn about teamwork and nature. In 2012, an urban 4-H Club from Mexico, Missouri, with no experience being in the woods, was invited to work with Master Gardeners and garden club members to plant 18 kinds of native edible trees, shrubs, and flowers in a designated area along a trail.

Photo courtesy of Laura Worstell

4-H Club members, with help from Master Gardeners and garden club members, set out 50 trees and shrubs.

Youth learned how to use gardening tools, prepare the ground for planting, sustainable growing methods, and how to choose a proper location based on a plant's need for sunlight and nutrients. Later the youth learned to label and mulch each of the plantings. They returned to taste some of the wild edibles already growing in that space.

"They learned how their health and happiness can improve by getting outdoors and working in the soil—planting something, collecting it, and then eating it," Worstell said.

Scattering Farms is virgin woods and grows native species readily. Most of the plantings survived but the summer drought forced replanting of some in 2013. The Wild Eating sign by the trail created much interest in the plantings from others passing by on the trail.

The Master Gardeners held meetings at Scattering Farms and viewed the Wild Edibles area, and middle school students visited. An annual Wild Edibles Day in May and Grandparents Day in September also spread the word.

In 2013, replanting was done where needed and public information days were conducted to inform youth and others about the health and taste benefits of wild edibles.

Worstell said although none of the youth are likely to become farmers, they learned that growing plants is fun. One boy expressed his excitement to Worstell: "He came to me to say, 'Now I can get a free tree and take it home and plant it in my garden.'"

Integrated Pest Management for Small Hive Beetles

Objective: To use an integrated pest management approach to kill small hive beetle larvae and potentially eliminate the small hive beetle.

Results: The small hive beetle has the ability to destroy a colony of bees. John Henry Nenninger recognized that the larval stage is the weakest link in a small hive beetle's lifecycle. He developed a non-chemical product he calls a salt box to stop larvae from reaching suitable soil to pupate.

The salt boxes are placed beneath the hive body boxes so larvae will fall into the salt boxes before reaching the soil. The hives are supported above the boxes using 4 ft. x 4 ft. pressure-treated wood cut to 24-in. lengths. The boxes sit on top of a layer of 30-pound roofing paper.

In 2011, Nenninger divided one test box into 10 sections and ran three tests using 37, 47, and 17 larvae, respectively. No larvae were observed getting through but he couldn't determine if they had died, were living in the box, or had escaped. In 2012, he suspended the box over a metal tray, making it possible to see larvae drop if they got through. Larvae next to the edges escaped but those placed into the interior sections did not.

He performed four sample tests using sand, topsoil, pea rock covered with rock salt, and topsoil covering the rock and salt combination and determined the latter combination was most effective. Of the 88 small hive beetle larvae used to test this combination in a salt box, zero made it through. Larvae burrowed into the soil quickly then got trapped in the rock and salt layer. Nenninger performed this part of the test three more times, using 72, 77 and 82 small hive beetle larvae. No larvae survived this procedure.

Nenninger determined the salt box method does work on small hive beetle larvae. He is in the process of developing a product he can sell that can help control small hive beetles.

John Nenninger used a salt box method for an integrated pest management approach to kill and potentially eliminate small hive beetles.

Photos by John Nenninger

FNC05-584 Downing, WI – Larry Jacoby

Development of Humane Slaughter Systems for Small-Scale Operations

Objective: To see if a humane mobile slaughter system suitable for kosher and halal animal slaughter and designed for small-scale operations could be built at a reasonable cost.

Photo by Judith Moses

Larry Jacoby demonstrates a humane slaughter system for small-scale operations in a mobile facility he designed and constructed in collaboration with the Wisconsin Department of Trade and Consumer Protection.

Results: As family farmers in northwest Wisconsin, Larry Jacoby and his partner raise premium sheep and goats. In attempting to market their meat as a value-added product, they came to realize that good, small-scale equipment simply did not exist for humane, animal-welfare friendly slaughter. They wanted to develop a mobile slaughter unit that could be produced at a reasonable cost.

Jacoby researched the design and construction of a mobile slaughter unit for sheep and goats with an upright animal restraint to facilitate a humane slaughter. They worked with animal welfare experts Dr. Joe Regenstein and Dr. Temple Grandin to develop a restraint system that allowed proper and humane slaughter, ensuring their meat products were consistently high quality. The unit was designed for small scale custom and low volume state and federally inspected facilities.

Bringing years of experience as sheep and goat farmers and many useful skills from other jobs over the years, they found the units could be built at a reasonable cost. However, they discovered that regulations vary state by state, which prevented them from selling the units. Jacoby said it is very important that anyone interested in building their own unit contact the proper departments in their state for rules and regulations.

At the time Jacoby was researching and building these units, an ethnic market for halal goat was thriving. However, it was discovered that culturally diverse customers needed to purchase the lower cost imported alternatives, except for special occasions, due to the lack of discretionary income. As a result, they now sell regularly to local, high-end restaurants and less frequently to culturally diverse customers. Currently their equipment is used as a standard in one of the local USDA facilities for all types of goat and lamb slaughter — not just religious slaughter. See more at *www.spiritofhumane.com*.

FNC12-845 Jefferson City, MO – Kevin Backes

Teaching Pastured-Poultry Producers On-Farm Processing Best Management Practices for a Safer Product

Objective: To help poultry farmers who slaughter poultry have safer handling practices and safer products.

Results: Kevin Backes and his family operate Backes Poultry Company. They raise and slaughter 5,000 to 6,000 of their own chickens annually and slaughter 15,000-18,000 birds for others in their state-inspected processing facility each year.

The Backes surveyed people who brought birds to their plant for slaughter and determined that the most common errors occurred in safe handl-ing of the birds in both pre- and post-slaughtering. For example, most of those surveyed said they didn't know that bacteria can be reduced in pre-slaughter by cutting down on cross contamination with other animals and by providing open air and dry conditions for the birds. Most processors surveyed also didn't know that post-slaughter, chickens must be cooled to 40 degrees to stop the bacterial growth that can potentially cause illness in humans.

The Backes conducted two workshops and a webinar attended by various groups of farmers, from the inexperienced to those currently slaughtering pasture-raised chickens. Sixty people attended the workshops, which included hands-on opportunities to process chickens.

The Backes were able to show workshop attendees how they could apply the same practices that the Backes use in their state-inspected facility, without incurring great expense. For example, some processors mistakenly think that putting slaughtered birds in freezer bags and cooling them in their freezer makes the birds safe to eat. The Backes place their post-slaughter poultry in a container of ice water with sufficient ice to cool the birds to 40 degrees as quickly as possible, which decreases the potential for bacterial growth. In addition to safety information, the Backes demonstrated how to process chickens more effectively. Those attending received a take-home booklet that provided information covered in the workshops.

In a post-workshop survey, attendees indicated that the workshop provided new information that will help them when they process their birds in the future.

YENC12-050 DeKalb, IL – Dan Kenney

Growing a Future

Objective: To use school and community gardens to show youth where their food comes from and to teach them responsibility, leadership skills, and sustainable agricultural methods.

Results: At the time of this project, Dan Kenney was a school teacher and coordinator of DeKalb County Community Gardens (DCCG), a nonprofit organization that helps establish school and neighborhood gardens throughout DeKalb County.

Kenney noticed that many of his students didn't make the connection that the foods they ate were a result of the agricultural activities they saw going on around them. With approximately 14 percent of the county's residents considered food insecure and about half of the students in the county receiving reduced or free lunches, chances were they weren't getting much fresh food. Kenney said, "If you rely on food pantries, most of that food is going to be canned or boxed and so you don't get a chance to have fresh, wholesome vegetables." He believed school and community gardens would provide access to healthy food and help students learn responsibility, leadership skills, business planning, marketing, sustainable agriculture methods, and social service learning.

In 2006, Kenney started working with school gardens by enlisting the help of middle school students who were in an in-school suspension program. Together they built three 10 ft. x 10 ft. raised garden beds behind the school. More recently, Kenney and a class of fourth graders built a 5 ft. x 10 ft. raised bed. The next year, with the help of another teacher, the garden was expanded to eleven beds so that each classroom had their own raised bed. The kids took home some of the produce, and donated the rest to local food pantries. The idea took off. Kenney started an afterschool program for fourth and fifth grade students called the Green Club.

In 2012, the grant project started when two area farmers spoke to Green Club members about sustainable agriculture and how it differs from much of the agriculture practiced throughout the county. They helped students with a seed starting activity, and the seedlings were later transplanted to the school garden.

Next, Kenney organized a community seed starting event. Adults, young adults, teens, and small children worked together to make seed blocks. The seeded trays were taken to the local high school for the FFA students to tend in the greenhouse. The plants were planted in a community garden.

Larger efforts began. DCCG partnered with the DeKalb County Community Services Department and the County WIC program to create 30 garden beds with the help of 50 volunteers ages 3 to 80 plus. Northern Illinois University students will use the gardens to help provide educational and leadership skill opportunities for many young people.

There are many other efforts and the project has expanded to include over 36 school and community garden sites, totaling 10 acres. DCCG works with over 70 partners and sponsors throughout the county. Partners include Live Healthy DeKalb County, Kishwaukee Family YMCA, Kish Health Systems, and numerous other organizations, nonprofits, businesses, and municipalities.

Kenney is now managing director and president of the board of DeKalb County Community Gardens.

Two Northern Illinois University student volunteers prepare soil for seed blocks during a seed-starting party. Volunteers ranged in age from 5 to 75 years old.

Photos by Dan Kenney

Volunteers from the university and community work together to plant one of the garden beds at the DeKalb County Government Outreach Campus. The vegetables raised at the garden provide fresh, wholesome vegetables to WIC clients and others who use the DeKalb County Health Department.

FNC10-827 Sedgwick, KS – Kay Neff

Examining the Practicality of Incorporating Chickens into a Diversified High Tunnel Rotation System

Objective: To explore if integrating chickens into a chemical-free high tunnel system would reduce fuel costs, as well as improve soil fertility and help control insects.

Results: The Neff Family Farm is on 13 acres, 10 tilled. The Neffs grow vegetables and herbs on old wheat ground. The soil was damaged and not very productive. Poultry has been part of the operation for a long time but the birds had not been incorporated into the rest of the farm in a sustainable manner.

The Neffs created six study plots, each measuring 20 ft. x 24 ft., and implemented a two-year rotation that included various combinations of herbs, vegetables, strawberries, chickens, and fallow. Straw and wood chips were used as a weed barrier.

- Plot 1 had a low tunnel that received two crop rotations each year.
- Plot 2 had no tunnel.

Four plots had high tunnels, each a different style:

- Tunnel 1 – 3-ft. sidewalls with roll-up sides; tallest tunnel at 15 ½ ft. tall. The chickens spent the most time in this tunnel (two rotations).
- Tunnel 2 – 7-ft. Lexan (rigid) sidewalls
- Tunnel 3 – Quonset style with roll-up sides
- Tunnel 4 – 3-ft. sidewalls

Coverings used for high and low tunnels included plastic, shade cloth, insect fabric, and spun row cover (floating row cover); sometimes high and low tunnels were uncovered. Chickens were rotated through the plots to provide heat inside tunnels, fertilization, insect control, and ground maintenance.

Photos by Kay Neff

Neff created four study plots using high tunnels with: 3-ft. sidewalls with roll-up sides (1), 7 ft. rigid sidewalls (2), Quonset-style with roll-up sides (3), and 3-ft sidewalls (4). Roll-up sides help control temperatures during the summer, and straight sides allow chicken wire to be attached to contain the chickens.

The Neffs offset the chickens' tendency to "home" — go back to their original location — by making their night quarters mobile so that when they were relocated, they still identified with their house.

The first year chickens were moved through Tunnels 1 and 2 and Plot 1. The pH of these plots showed no significant change but nitrogen increased when tested at six months. In Tunnel 1, yields were up 50 percent in lettuce, Swiss chard, and okra. In plots where poultry cleared past plant material, organic matter was higher at the 18-month test.

Only Plot 2 with no covering had no significant change in nitrogen; chicken manure broke down faster on covered plots. On plots with chickens, grasshoppers were reduced; other pests seemed more controlled under spun row cover.

The greatest success was in heat management. The Neffs ran brooder chicks under the plant benches in Tunnel 3 which was used for transplants. The heat from the chicks kept the tunnel from freezing even when the temperature dropped to 20 degrees outside. The chicks' body heat was enough to melt snow off the high tunnels, and it proved sufficient to maintain the health of tomato transplants without additional heat.

YENC12-039 Maplewood, MO – Robert Dillon

Rethinking Urban Agriculture: An Aquaponics Approach

Objective: To help students in the Maplewood Richmond Heights School District in Maplewood, Missouri, learn about sustainable agriculture, food scarcity, and limited water resources by growing vegetables and raising fish in a recirculating aquaponics system.

Results: Aquaponics is a food production system that combines aquaculture, the raising of fish, with hydroponics, the soil-less growing of plants in water, into an integrated system. The first year of this project included purchasing and building an aquaponics system consisting of a grow bed, breeding tank, growing tank, and scientific equipment to maintain water quality and quality control throughout the system. The project began with one tank. Currently, there are three tanks with more expansion planned.

All of the students participating in the project had an opportunity to work with aquaponics, and many developed a passion about the daily work surrounding the upkeep of the system. The students observed lettuce and tomatoes growing in this closed-loop environment, and they learned about raising fish, and the importance of temperature control in the fish environment. Many lessons about systems thinking also were taught.

Currently, Redear, Bluegill, Hybrid Bluegill, Black Crappie, and Tilapia fish are being grown. The Redear and Tilapia were purchased, and the Black Crappie and Bluegill were donated by Lincoln University in Jefferson City, Missouri. The knowledge provided by Dr. James Wetzel at Lincoln University motivated the students and inspired them to think about expanding and improving the aquaponics system.

Photo by Michael Dittrich

Maplewood Richmond Heights students built an aquaponic grow bed, breeding tank, and growing tank and are producing tomatoes and lettuce.

A variety of community partners are interested in the project. One member of the community, for example, was impressed with the project and donated three aquariums and supplies.

Parents and community members are learning about the program through social media and other communications forums. Nearly 700 people have interacted with the project at some level.

To find out more about NCR-SARE Grants, please contact:

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