NCR-SARE Farmers Forum



www.northcentralsare.org

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.

This highlight is a summary of reports and presentations from the NCR-SARE Farmers Forums held at the 2019 Nebraska Sustainable Agriculture Society Conference and the 2019 Michigan Family Farms Conference. These events featured speakers who received awards from NCR-SARE's grant programs. To read the full reports from these projects, go to the national SARE website at https://projects.sare.org/ search-projects/ and use the project number (e.g., FNC10-809) to read more about the project. You can view videos of these presentations online at www.youtube.com/user/NCRSAREvideo

The next Farmers Forum will be held at the 6th National Conference for Women in Sustainable Agriculture, October 17-19, 2019 in Saint Paul, Minnesota.

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. Visit the NCR-SARE website to see a calendar of events, educational resources, grant opportunities, and more at www.northcentralsare.org. FNC17-1093 Kansas City, Kansas – Katie Nixon

Food Hub Development in the Rural Midwest

OBJECTIVE: to develop and strengthen a cooperatively owned farmer food hub serving the Kansas City region in its second year of operation with innovative approaches to the issues of food safety and logistics.

RESULTS: In 2015, a small farm cooperative in the Kansas City area had a dilemma. Fresh Farm HQ (FFHQ) Cooperative Association was helping small and medium sized farmers access wholesale markets in the Kansas City area, but with more than 18 produce distribution companies already operating in the area, they needed to differentiate themselves; they needed to change.

They had ten local farmer members with more than 160 years of combined growing experience; they boasted more than 180 acres in vegetable production and 35 high tunnels and greenhouses that extended the growing season; they were selling 45 different local products to corporate food service companies, grocery stores, institutions, and restaurants throughout the Kansas City metro area. Considering all this, they took a good look at their marketing, and with support from a \$22,493 NCR-SARE Farmer Rancher grant, they commenced work on brand building, food safety, and traceability.

After meeting with multiple brand and marketing consultants who recommended that FFHQ change their name and brand to something that would better align them with the Kansas City region, members voted on a new name, the Kansas City Food Hub. This name change proved to be a major advantage.

"We did not realize how disastrous our previous name (Fresh Farm HQ (FFHQ) Cooperative Association) was until we adopted the new brand: Kansas City Food Hub," explained food hub member, Katie Nixon. "The new name and professional material that was developed out of this effort raised the profile of the organization. When the project started we had ten members of the cooperative, we now have fifteen member, with three pending to sell through the 2019 season."



With support from SARE, Ken Barber, Katie Nixon, and several other farmers formed the 15-farm member Kansas City Food Hub in order to improve their distribution in the Kansas City metro area.

With the grant funds, they pursued technical assistance partnerships to learn more about USDA Food Safety requirements, and then prepared for USDA Good Agricultural Practices (GAP) certification. After initially considering getting GAP certification as a group (GroupGAP), members pursued individual GAP certification due to cost savings. The group also implemented traceability protocol through the use of Local Food Marketplace (LFM). LFM's software helped them create a printable label that traces products back to the original farm. They even launched a website and produced materials that would showcase their cooperative in the regional market. All of these efforts have made for a stronger cooperative.

"We are strengthening the middle market in the Kansas City region for these growers," said Nixon. "Our progress is informed by multiple perspectives and a deep well of expertise in our membership and partners that are demonstrating the viability of our cooperative approach." Auburn, Nebraska – Ashton Bohling

Farm Towers: Urban Agriculture Goes Vertical

OBJECTIVE: to build a farm tower for students in grades 8-12 to engage with them to learn about the economic, ecological, and social benefits of vertical food production, composting, and growing their own food.

RESULTS: In southeast Nebraska where corn and livestock fields dominate the agricultural landscape, Auburn High School agriculture teacher, Ashton Bohling, offers a variety of agricultural education opportunities for curious youth. Students have access to an aquaponics system (an aquaculture system with tilapia) and a 24x48' greenhouse. With support from a \$1,999 NCR-SARE Youth Educator grant, Bohling was able to add garden towers to the school's experiential learning opportunities. Garden towers are vertical, self-contained gardening and composting systems.

"As our population increases and urbanization increases, we are losing land," said Bohling. "The farm tower can visually show how to grow 50 plants in 4 square feet. The farm tower also utilizes a vermiculture composting system with worms. This is a neat way to teach students about organic matter and the benefits of earthworms."

After the initial purchase of the garden towers, students assembled the tower pieces and attached the wheels and casters to the towers. They also raised composting worms and added them to the towers, improving their understanding of vermiculture and composting.

"This project allowed students to think creatively about agriculture and recognize that agriculture doesn't have to be growing corn and doesn't need to have acres of land," said Bohling. "Students are able to see how they can include this type of agriculture in their future, regardless of what their career or lifestyle is."



As part of their experiential learning, high school students in Auburn, Nebraska assemble a garden tower.

Cover Crop-based Reduced Tillage for Fall Production of Cabbage, Cauliflower and Broccoli Using a Roller-Crimper and No-Till Planting Aid

OBJECTIVE: to trial methods of reduced tillage and cover crops for organic vegetable production.

RESULTS: When Thomas Ruggieri first planted cover crops on his vegetable farm in rural Missouri in 2004, he noticed improvements in soil fertility and plant health. Ruggieri and Rebecca Graff run Fair Share Farm, a diversified vegetable farm with a 140-member CSA in Kearney, Missouri. Vegetable growers can use cover crops to help reduce erosion, improve soil health, slow weeds, enhance nutrient and moisture availability, and control pests. Ruggieri and Graff wondered if they could use cover crops to minimize labor as well by reducing the need to hand-mulch crops. They wanted to trial a method that was developed by Dr. Ron Morse of Virginia Tech combining reduced tillage and cover crops as mulch. They received a \$7,480 NCR-SARE Farmer Rancher grant to conduct their cover crop mulch experiment.

"Summer heat and drought require mulch to conserve moisture, minimize labor associated with weeding, and keep the soil cool," said Ruggieri. "Growing our mulch in place using reduced tillage methods will save considerable time, energy, and money, while adding fertility to the soil."

During the course of the project they seeded cover crops, fabricated a no-till planting aid (NTPA) and seeder, rolled and crimped cover crops, and planted vegetable crops into the rolled beds. They fabricated their NTPA with a combination of on-farm implement parts and purchased items (toolbar clamps, coulters, fertilizer knives). The NTPA seemed to work well in their silt/clay soils, cutting a 6 to 8 inch deep furrow that would allow for the planting of transplants (see image, right). They fabricated their seeder with a new toolbar and four Cole Planter vegetable seeders. After some experimentation, the seeder worked adequately to produce a good stand of cover crops. The seeder served a dual purpose as well because they could also use it to seed cash crops.

They planted a rye/vetch cover crop in September, and then rolled it down in late May. Planting brassicas into rolled/ crimped cover crops proved to be challenging due to an abundance of rain in May and June. They found that it was difficult to keep weeds smothered during the period between rolldown and brassica planting in mid to late-July. The trial with tomatoes fared better. In one 100 foot bed, the cover crop was mowed and spaded in twice before they planted tomatoes, and they hay mulched the tomatoes. In the other bed, the vetch was rolled down and later mowed before planting tomatoes.

"The results show that the spaded and mulched bed performed over 300% better than the rolled/crimped bed," said Ruggieri. "While both beds experienced a significant amount of blossom end rot during the first week or so of harvesting, the hay mulched bed recovered the quickest and produced the most. In addition the hay mulched plants were a deeper green and were more vigorous in their growth and fruit-set."



Vegetable growers Tom Ruggieri and Rebecca Graff experimented with a cover crop mulch experiment on their Missouri farm. As part of their project, they fabricated a no-till planting aid (top) and a seeder (bottom). View more details about the NTPA and seeder online at https://projects.sare. org/project-reports/fnc14-973/.

Improving Nitrogen Use Efficiency in Sustainable Corn Production Through Use of Remote Sensors to Direct Site-specific Nitrogen Application

OBJECTIVE: to demonstrate in-season nitrogen management which is conducted without vehicles on the ground in the field.

RESULTS: From shooting photos from small planes, to using a powered parachute with the help of a sport pilot license, Dean Stevens has been taking to the sky to catch a glimpse of his family's southeast Nebraska farm fields for the better part of 30 years. With recent support from a \$15,000 NCR-SARE Farmer Rancher grant, he's taking aerial observation to the next level, using multi-spectral sensors carried on drones to inform his nitrogen (N) management.

Stevens says there are advantages associated with in-season N applications, but due to the rolling topography in their location, where contour and terrace farming techniques are practiced, ground-based, in-season N application is not common due to the risk of crop damage. Some farmers in the area do aerial N applications, but they aren't able to take advantage of the crop canopy sensor technology that is commonly available for high clearance applicators. Stevens wanted to be able to apply N fertilizer aerially during the growing season and then be able to monitor the crop with sensors.

Working with his daughter, a University of Nebraska-Lincoln Extension Educator, Laura Thompson, his son-in-law Nathan Thompson (both of whom are FAA licensed drone pilots), and Dale Yoesel, a farmer in Rulo, Nebraska, Stevens put together a project. They would conduct airplane-based aerial N applications, and then evaluate the fields with sensors mounted on drones to enable crop sensing to occur from the air.

The sensors they used collected Normalized Difference Red Edge (NDRE) values from three sites before and after in-season N application.

Among other things, NDRE technology shows users the chlorophyll content in leaves. High values of NDRE represent high levels of leaf chlorophyll content, so, for instance, yellowed leaves would have the lowest values (red), while healthy plants have the highest values (blue). In conjunction with the NDRE data, the team used algorithms and UNL's Hybrid-Maize models to calculate the optimal in-season N rate. They also evaluated two different N base rates to attempt to identify the optimum base rate for in-season N sensing and application. They used the data to evaluate final crop yield, N use efficiency, and net return. At all three sites, less N was applied when the drone and sensor method was used, than when the farmer's traditional method was used. With drone-based sensing, N savings were 25 lb N/ac, 35 lb N/ac, and 27 lb N/ac for the site in 2017, site 1 in 2018, and site 2 in 2018 respectively.

While yields were not different between the drone and sensor method and the farmer's traditional method, N use efficiency was greater for the drone and sensor method than the traditional method. Basically, it allowed them to target areas that needed more N.

"Drone sensors can be used successfully to monitor corn nitrogen needs in-season," said Stevens. "The varying N requirements can be met on entire corn fields with variable rate equipped planes. This is an excellent way to avoid pre-applying more N than a corn crop would be able to utilize if conditions became unfavorable during the pending growing season."

You can explore the flight imagery from the 2017 nitrogen study online here: https://goodlifeag. com/2017/07/28/explore-the-imagery/

> These two images depict the same field in June 2017. The true color image (left) and the NDRE (normalized difference red edge index) (right) show differences that are hard to see with the naked eye. Blue indicates a higher NDRE value while red indicates a lower NDRE value.

LNC14-361

Michigan State University – Doug Landis

Insectary Plants to Enhance Beneficial Insects: Expanding the Palette to Increase Options for Sustainable Crop Production in the NC Region

OBJECTIVE: to conduct research and education to increase the availability of insectary plants to enhance beneficial insects in the North Central region.

RESULTS: Whether building boxes for mason bees or planting habitat for predatory beetles, farmers seeking sustainability can encourage populations of pollinators and beneficial insects on the farm. Researcher Doug Landis knows that many native plant species are highly attractive to both pollinators and natural enemies, and with help from a \$199,887 NCR-SARE Research and Education grant, he and a team at Michigan State University received support to study native plants and learn more about their ability to naturally support native bees and other beneficial species and to identify those plants that are suitable for growth in dry soils. Together with a team of Michigan State University entomologists, they conducted weekly sampling of natural enemy and pollinator abundance on 54 species of plants found in Michigan.

"Overall, our data show that many native plant species are highly attractive to both pollinators and natural enemies with floral area being the best predictor of attractiveness," reported Landis. "Among the species we tested, plants can be selected from early, mid, and late bloom periods to provide continuous resources for pollinators and natural enemies throughout the growing season."

Because their results showcased a wide variety of plants and their attributes, they developed a portal website with information regarding native plants and the ecosystem services they provide. It includes a plant selection tool which allows users to identify native plants that are suitable for their locations and purposes. Users can also find detailed information about natural enemies and biological control, pollinators, and pollination services. Visit the site at www.canr.msu.edu/nativeplants/index.



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Richmond, Missouri – Jim Pierce

Berkshire Value Added Meat Product Marketing Coalition

OBJECTIVE: to create and produce local charcuterie products in Missouri.

RESULTS: Watching feed prices go up and pork prices go down can make value-added products attractive for a hog producer. Jim Pierce is a Farm Outreach Worker with Lincoln University's Innovative Small Farmers' Outreach Program and owns Of the Earth Farm Distillery, where he raises hogs and sheep, manages an orchard, and manufactures spirits with his partner, Sarah. They feed spent mash from their spirits to Berkshire hogs, and they wanted to add value to their hogs by developing locallymade charcuterie (cured meat) products with a group of local producers, processors, and chefs.

"Increasing demand for small farm hogs by serving a growing market for charcuterie sends the message to the producers to continue to raise hogs sustainably," explained Pierce. "Adding value to pork meat increases the value of an individual animal without increasing pressure on limited resources."

With support from a \$22,157 NCR-SARE Farmer Rancher grant, the team developed and tested recipes and worked on a Hazard Analysis Critical Control Point (HACCP) plan, which is a USDA food safety management system. Pierce says the HACCP plan was the single biggest challenge. He says a consultant would have been much more economical in time and money. Still, he's pleased with their progress this far.

"This grant allowed us to leverage our resources and make larger gains on moving closer to having premium, value-added farm products for sale," said Pierce. "The group is developing steps to move forward, continuing to pursue developing charcuterie products. Without leveraged funds our progress would have been much smaller."



A team of producers, chefs, and processors are adding value to hog operations by producing local charcuterie in Richmond, Missouri.

Integrated Wildlife Management For Sustainable Agriculture

OBJECTIVE: to economically resolve wildlife intrusion harmlessly and chemical-free with a sprinkler-based deterrent system.

RESULTS: Enhancing biodiversity on a farm can result in cleaner air and water and increased wildlife. But what happens when the wildlife gets a little too close to your crop? That's the problem sweet corn grower, Scott Kelly, was facing on his farm near Kearney, Missouri.

"The demands of growing produce sometimes seems never ending," said Kelly. "When you do finally get to put your head on the pillow, your thoughts turn to those pesky critters just waiting for you to nod off. Deer and raccoons can devastate a garden."

With support from a \$7,470 NCR-SARE Farmer Rancher grant, Kelly proposed to work with Jim Pierce with Lincoln University's Innovative Small Farmers' Outreach Program to develop "The Guardian," a sprinkler deterrent system. He wanted it to be harmless to the wildlife intruders, ecologically sound, and more economical and aesthetically appealing than fencing.

His farm, Cary's You-Pick, produces various vegetables and herbs for local customers, who want fresh produce and the experience of handpicking the crops themselves. The you-pick field is located near a wooded area, which brings deer and raccoons close to their crops. Kelly wanted to avoid having to use fencing as much as possible, due to the nature of their business.

"As the size of the garden expands it (fencing) becomes more cost prohibitive and not only restricts wildlife access but the people and equipment needed to work the garden," explained Kelly.

During the project, they developed a perimeter sprinkler system triggered by a laser tripwire, which essentially scares away wildlife intruders. Stevens says the system consists mainly of the aforementioned sprinklers, PVC pipe laid around the perimeter of the garden, and medium intensity lasers that are directed at photocell devices that activate a timer and electronic water valves. It is designed to be activated during periods of wildlife "attack" (i.e. dusk until dawn). So far, he's pleased with the results.

"Since becoming operational, we have had zero deer or raccoon intrusions, actually we don't even see any tracks inside the protected area, whereas last year we lost about 800 sweet corn plants and some tomatoes to deer and raccoon intrusion," said Kelly. "We feel the project was a total success, beyond what we anticipated."

Kelly says the next step is to further evaluate the system's tendency to change behavioral patterns of the wildlife intruders to avoid the protected area. He also wants to make the system more economical.

To see photos and videos of "The Guardian" in action, visit the Facebook page they set up for the project at www.facebook.com/TheGuardian.2014/.





With sprinklers, lasers, sensors, timers, electronic water valves, and 1,700 feet of PVC pipe, Cary's You-Pick Farm in Kearney, Missouri, devised a sprinkler deterent system which has greatly reduced racoon and deer pressure.

A Comparative, On-farm Study of Root Crop Production and Postharvest Systems for Scaling Up Diversified Vegetable Farms

OBJECTIVE: to compare production and postharvest system changes for root crops to reduce labor demands and overall cost of production.



A field day at Ten Hens Farms included discussion and demonstrations of equipment they used to improve their root crop production.

RESULTS: On five acres of land in central Michigan, Dru and Adam Montri grow vegetables with seasonal field production and six hoophouses. They sell their Ten Hens Farms produce at the farmers market, to local grocers, area restaurants, and a regional food distributor. They had a problem with root crops, and two other nearby vegetable growers did too; they could not meet the wholesale demand for potatoes, carrots, and beets during the winter months. Together, with the farmers from Green Gardens Community Farm and Presque Isle Farm, the Montris put their heads together to try to figure out how to meet the growing demand for root crops. They decided that labor needs and cost of production were barriers that they could address, and they applied for and received a \$22,241 NCR-SARE Farmer Rancher grant to investigate implementing mechanized production and postharvest handling of root crops on their three small-scale, diversified farms.

"The thinning, weeding, harvesting and washing of root crops by hand is hard on the body," said Dru Montri of Ten Hens Farm. "Each of the farms involved in this project has the potential to expand winter marketing opportunities by increasing harvested yields of root crops (carrots, beets, and potatoes). The limiting factors for each of the farms have been weed control, long harvesting times, precision seeding, and storage space."

Through the project, each farm considered the optimum sustainable solution for their farm with a focus on stewardship, improving quality of life, and increasing farm profitability. The farms began the work of transitioning from labor intensive systems to using precision seeding, tractor cultivation, mechanical harvesting, and root washing using a barrel washer.

To address weed control each farm chose cultivation or hilling equipment that would be appropriate for their specific tractor and production system. Ten Hens Farm chose a double tool bar with sweeps and shovels, Green Gardens Community Farm chose basket weeders for their carrot production. Presque Isle Farm chose a trencher and hiller to control weeds in their potatoes. Ten Hens Farm and Green Gardens Community Farm also chose a 30 inch flame weeder to use with their carrots.

To improve harvesting, Ten Hens Farm chose an undercutter and Presque Isle Farm chose a Spedo potato digger to reduce hand digging. Green Gardens already had an undercutter in place prior to the project.

For planting, Ten Hens Farm chose a Jang 3-row precision seeder for their carrots and beets so that they could optimize their seed use and spend less time thinning crops.

As for postharvest, Presque Isle Farm chose a cooler to be able to store their potatoes at a different temperature than their other crops in an existing cooler and also to be able to have the space to store the amount of potatoes they were growing. Green Gardens Community Farm and Ten Hens Farm chose barrel washers to wash their root crops.

Generally, the farms reported success with their new tools. While some tools worked well immediately, others required more time to learn to use effectively. Overall, Ten Hens Farm increased carrot, beet, radish, and hakurei turnip production while decreasing their labor. Presque Isle Farm was able to increase their potato production while decreasing labor, and Green Gardens Community Farm was able to produce more root crops for winter storage and sales in a shorter amount of time, which boosted profitability.

"On the whole, these three farms overcame the identified barrier of supplying more storage crops for winter markets while decreasing their labor needs for those specific crops and decreasing the wear and tear on their bodies," said Montri.

ONC18-038

Lawrence, Kansas – Tom Buller

Evaluating and Demonstrating Weed Control Options for Direct Seeded Fall Vegetable Crops

OBJECTIVE: to analyze and demonstrate the efficacy of several minimal tillage techniques to manage weeds.

RESULTS:

Managing and controlling weeds is an ongoing challenge and frustration for many farmers, but it can be especially cumbersome for organic producers, whose options for herbicides are limited. For these organic producers, no-till and conservation tillage systems can help conserve soil and can be used for weed control.

Tom Buller, a vegetable grower and extension agent with Kansas State University in Douglas County, knew that farmers in his area were struggling with pigweed. Buller was interested in trying some minimal tillage techniques to manage weeds using occultation, a power harrow, and flame weeding to create a stale seedbed. He received an NCR-SARE Partnership grant for \$29,495 to work with three nearby farmers to learn more about controlling pigweed in their fall-grown, direct-seeded spinach, beets, and carrots. The project is on-going, and was impacted by drought in 2018, but so far, Buller and the team have conducted multiple bed trials. Buller reported that the flame weeder worked well for small pigweed, but he speculates that a combination of the methods would be more effective.

"Overall using these methods alone seemed to show poor results with high weed pressure in test beds, however I suspect that using them together would more effective than using them by themselves," said Buller.



Tom Buller (far right) and this team of vegetable growers are working on reduced-tillage weed control in fall-seeded vegetable crops in Lawrence, Kansas.

Free SARE Resources for Soil Health and Cover Crops



Farmers around the country are planting cover crops on millions of acres to protect and improve the soil, and the more that farmers use cover crops, the more they

value this conservation practice. *Cover Crop Economics*, a new report published by USDA-SARE looks at the economics of cover crops to help farmers answer that big question: "When do cover crops pay?" Read it online for free at www.sare.org/Learning-Center/Bulletins/Cover-Crop-Economics



Cover Crops Profitably explores how and why cover crops work, and provides all the information needed to build cover

Managing

crops into any farming operation. Along with detailed management information on the most commonly used species including grasses, grains, brassicas and mustards, and legumes—*Managing Cover Crops Profitably* offers chapters on the role of cover crops in broader topics such as crop rotations, pests and conservation tillage. It also has appendices on seed suppliers and regional experts. Read it for free online at www.sare.org/Learning-Center/Books/Managing-Cover-Crops-Profitably-3rd-Edition

Do Cover Crops pay? Expanding a Learning Circle for Peer to Peer Cover Crop Promotion Using Economics as a Theme

OBJECTIVE: to measure the impact of multiple cover crops on yields of subsequent crops and use partial budget analysis to evaluate the economic impact.

RESULTS: Cover crops can improve a farmer's bottom line in many ways, whether it's by lowering fertilizer needs, reducing weed and pest pressure, or boosting yields, but as with any investment, there are things to take into consideration when planning. Jim Stute is a farmer in southeast Wisconsin, and a crop and soil researcher with the Michael Fields Agricultural Institute (MFAI), and he's been experimenting with cover crops for about 30 years. With support from a \$29,355 NCR-SARE Partnership grant, Stute is currently partnering with five grain farmers to collect data to determine the impact of various cover crops on crop yield and bottom lines. He has been using partial budget analysis, factoring in all additional costs and returns, to determine the effect on farm profitability.

"Farmers recognize soil health benefits of cover crops, yet are weighing every input purchase in the current market environment and may forgo this production expense at the risk of soil and environmental quality," said Stute. "SARE funded work has demonstrated yield benefits to crops which follow covers; we will document and demonstrate them at the local level and provide a financial incentive for adoption."

The project is ongoing, but strip-trials have been conducted with and without cover crops using the partnering farmers' cover crop of choice. The farmers, who are experienced cover crop users, have been following their routine field practices for establishing and terminating the cover crop. Their findings, thus far, have indicated:

- Cover crop use increased average corn yield by 6.4 bu/acre (3.2%) and soybean yield by 1.4 bu/acre (1.9%).
- At current commodity and input prices, break-even yield increases were 5.6% for corn and 3.9% for soybean.
- Additional yield partially offset cover crop cost, reducing the average cost from \$30.08 to \$16.89 per acre.

"We are using field-scale equipment and fieldlength strips with multiple replicates," said Stute. "Our analysis uses their actual costs and returns, eliminating the assumptions which often accompany economic analysis."

Stute wants to use the data to persuade nonusers to adopt cover crop in order to protect soil and water resources in the region. As results become available, he will engage in peer-to-peer promotion of cover crops to help to increase adoption.

"Cooperating farmers will be a key component of our outreach efforts, sharing their data and experiences," said Stute. "Research shows that peer-to-peer learning is highly effective for increasing adoption of sustainable practices. Also, the relationship between one of our cooperators (Tom Novak, crop consultant) and his clients gives us a large audience for our outreach efforts as well as a long-term tracking mechanism for adoption rates," explained Stute.

For more information, read Jim Stute's research brief at http://michaelfields.org/ wp-content/uploads/2019/03/2019-Research-Brief-CC-economics.pdf or email Stute at jstute@michaelfields.org.

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Big Muddy Urban Farm and Gifford Park Youth Garden Program

OBJECTIVE: to support Big Muddy Urban Farm's Aspiring Farmer Residents' facilitation of the Gifford Park Youth Garden Program.

RESULTS: Integrating agriculture into urban settings is not a new concept, but more and more, the benefits are being realized by communities, policy makers, and food-system entrepreneurs (NCAT-ATTRA 2018). One such entrepreneur is Brent Lubbert, whose nonprofit organization is growing vegetables and future farmers on six plots of land in the Gifford Park Neighborhood of Omaha, Nebraska. Big Muddy Urban Farm (BMUF) has a big mission, to not only run an 18-week CSA program, but to also train future farmers and engage with the community. One way BMUF fulfills their mission is through their Aspiring Farmer Residency; it's a 12-month program that supports five resident farmers, providing them with a place to live while they run the urban CSA, vend weekly at the Gifford Park Neighborhood market, facilitate the Gifford Park Youth Garden program, and engage in community partnerships.

"Residents learn the ropes of farming via our CSA and collaboratively managing our urban farm which operates by organic standards," explained Lubbert. "From this small scale, guided operation, they develop a more realistic understanding of what production-scale farming involves and what they would like moving forward. We teach sustainability by actually doing it...managing soils, analyzing a budget, having conversations about the food system, marketing produce, self-reflecting, cooking community meals with our produce, and following weather patterns."

In 2017, Lubbert was awarded a \$2,000 NCR-SARE

Youth Educator grant so that BMUF Aspiring Farmer Residents could develop programs for the Gifford Park Youth Garden Program, a free program for neighborhood youth.

"The 30 youth are provided with their own 2×2 raised garden plot to grow on and a group session each week focusing on different topics including but not limited to: seed germination, composting and soil nutrition, raising chickens, fruit and vegetable preservation, seed saving, and the life cycles of nature," explained Lubbert.

Through the grant funding, the BMUF Aspiring Farmer Resident held five youth garden sessions:

- Garden Design
- Planting your Garden
- Chicken Biology and Care
- Canning and Preserving
- Pizza Party with Garden Fresh Veggies

The Aspiring Farmer Residents also arranged for the youth to take a field trip to Honey Creek Creamery near Crescent, Iowa. Lubbert said that for a majority of youth gardeners, this was the first time being on a commercial farm. They toured the small scale cheese making facility, and had an opportunity to milk a goat.

"The SARE grant helped strengthen a partnership between Gifford Park Youth Garden programming and Big Muddy's Aspiring Farmer Residency by supporting resident's research and facilitation of youth garden lesson plans," said Lubbert. "This helps residents develop educational techniques while also providing valuable educational experiences for youth gardeners."



With support from SARE, Big Muddy Urban Farm's Aspiring Farmer Residents conducted programing with the Gifford Park Youth Garden in Omaha, Nebraska, including a field trip to a goat creamery.

FNC18-1141

Chicago, Illinois – Casey Campbell

Soil Remediation Techniques in Urban Agriculture

OBJECTIVE: to research a solution to the contamination problem in urban soils.

RESULTS: When we think of soil health, concepts like soil structure and water and nutrient holding capacity come to mind. For urban farmers managing contaminants such as lead and arsenic is another major soil health concern. Dirty Boots Flowers is an urban flower farm that shares a small parcel of land with two other farms in the East Garfield Park neighborhood of Chicago, Illinois. Dirty Boots grows more than 20 varieties of flowers which they sell for weddings, events, offices, and personal deliveries. One of their challenges has been soil remediation. With help from a \$14,975 NCR-SARE Farmer Rancher grant, Dirty Boots owner, Casey Campbell (nee Sabatka) is working with one of the neighboring farms, Chicago Patchwork Farms, on soil remediation.

"Two years ago, we discovered that the chickens at Chicago Patchwork Farms were able to transform wood chips and farm waste into 75 cubic yards of clean, healthy soil," said Campbell. "This made us wonder how else we may be able to affordably work with the toxic land in our communities."

The two farms will tackle their soil contamination problem with a two-part solution of phosphate induced metal stabilization (i.e. binding lead with fish bones) and phytoremediation with sunflowers, marigolds, native grasses, and ferns (plants which hyperaccumulate contaminants). The project is on-going, but base-lines tests have been conducted and plantings have been made. Chicago Safe Soils Initiative, a group that is working on a lead map of Chicago, has expressed interested in future collaborations.



Open Source Automated Irrigation System for Small Farms, Urban Farms, or Specialty Crops

OBJECTIVE: to develop and test a low cost, automated irrigation system that can be shared with other small and urban farmers.

RESULTS: Christian and Katie Flickinger were experienced urban farmers in Michigan who were farming eight plots in various locations. When they decided to consolidate their operation, and buy a 7-acre farm in Howell, Michigan, they faced the challenge of converting a long standing, non-rotated cornfield into the organic, heirloom farm of their dreams. Among the other items on their to-do list, they needed to install irrigation, and they wanted to automate it using open source hardware and software so they could share their plans with other farmers. They applied for an NCR-SARE Farmer Rancher grant and received \$7,442 to create an economical, efficient automated irrigation system using consumer-grade lawn irrigation equipment.

"Small and urban farms often employ polyculture cropping systems," explained Christian Flickinger. "Rather than a single, large crop covering multiple acres, small and urban farms will grow several different crops in small areas. Each crop may have its own irrigation requirements, some requiring more frequent irrigation and some requiring less frequent irrigation, which presents a unique challenge that this project aims to solve."



By splitting their field into smaller plots to separate their various crops, Renegade Acres was able to irrigate each crop differently, using a SARE grant to design and build an open-source, automated irrigation system.

To make sure the system was installed by their first planting on June 1st, they began work in late April 2016. The system they designed consisted of consumer-grade lawn irrigation valves, professionalgrade drip tape, and a consumer-grade open source lawn irrigation controller called OpenSprinkler. The controller is connected wirelessly to their network and the internet, and can be activated manually or using a mobile website.

"Within a few weeks of installing and testing the irrigation controller I had set up irrigation schedules and weather-related irrigation delays," said Flickinger. "The irrigation schedule was based on each plot's plant types and the water flow as measure at the drip tape itself. I wanted to water as infrequently as possible, but still maintain proper soil moisture."

The big eureka moment came in 2017, when they implemented their intelligent irrigation controls.

- In 2016, it rained 64 out of 153 days in the season (42%). They irrigated the crops 51 times (33%), and used an estimated 101,075 gallons of water. Each irrigation event was manual.
 - In 2017, it rained 75 out of 153 days in the season (49%). They irrigated the crops 35 times (23%), and used an estimated 42,907 gallons of water. Each irrigation event was automated.
 - In 2017, they used **58% less water (a savings of 58,168 gallons)**. They irrigated 16 fewer times, and for shorter periods each time. They also spent less time manually turning on the irrigation system.

"Overall, the system has outperformed our expectations," said Flickinger. "We continue to find value in the original investment, and have yet to purchase new drip tape. The amount of water we saved in year 2 compared to year 1 surprised us. We hope to continue to make improvements and possibly save more water."

Find more detailed information about their DIY automated irrigation system online at https://projects.sare.org/project-reports/fnc16-1033/.

To find out more about NCR-SARE's educational programs and grants, please contact:



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