

2019-2020 SARE



SUSTAINABLE AGRICULTURE RESEARCH & EDUCATION



REPORT FROM THE FIELD

“This project is about supporting farmers and bringing fresh food to people who otherwise would not have access, while at the same time maintaining a financial bottom line that supports our families.”

Leah Penniman
Soul Fire Farm
(See story on page 19.)



ON THE COVER: The Future of Agriculture Depends on New Faces and New Ideas

“I grew up on this farm and had no desire to be a farmer,” Liz Brownlee says of the 250-acre property near Crothersville, Ind., where her parents spent 15 years raising beef cattle, corn, soybeans and other crops. They got out of farming during the 1980s farm crisis and instead began renting out their land.

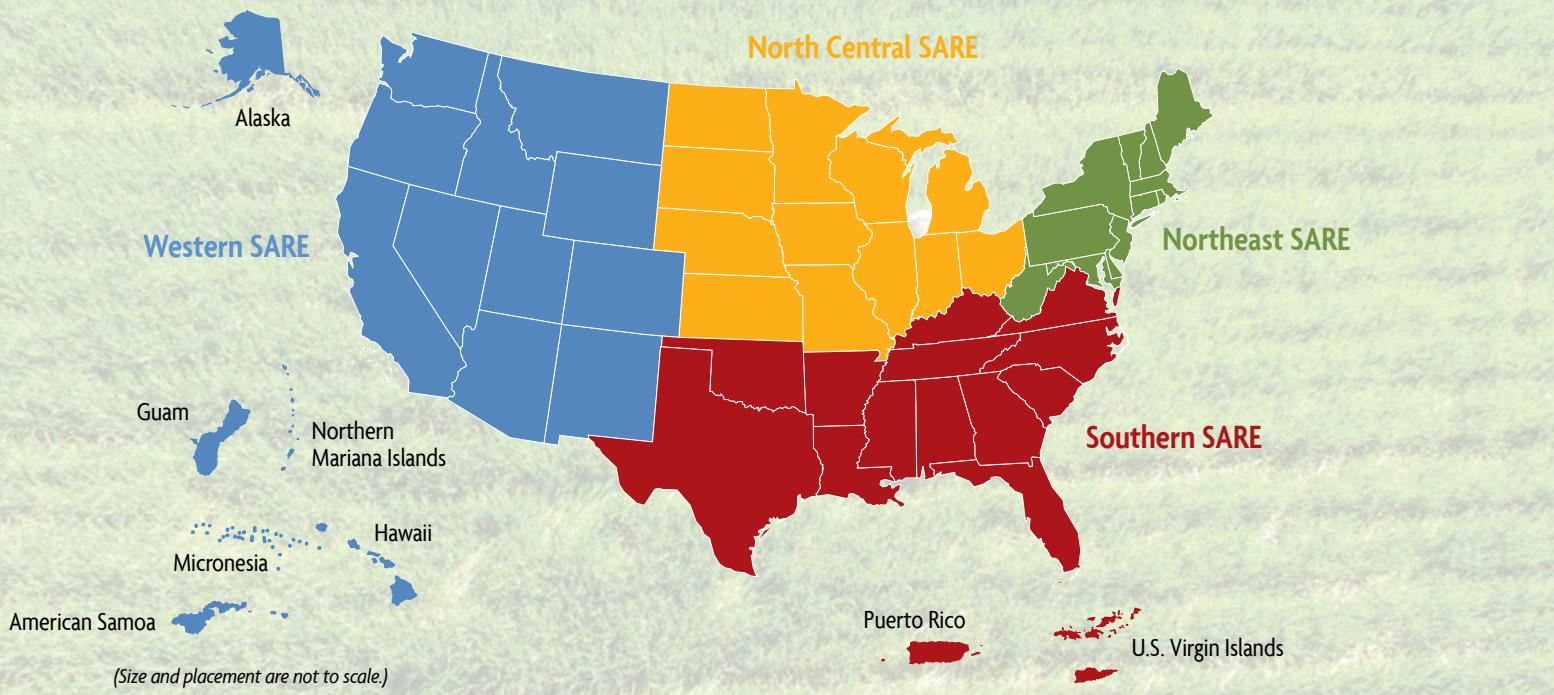
Eventually, that feeling changed for Brownlee and for her husband Nate, as they came to see farming as the ideal way to combine a passion for food with an ethic of environmental stewardship. After spending five years working on farms in the Northeast, the Brownlees came home in 2013 and started Nightfall Farm on the family property, where they raise hogs, turkeys, chickens and sheep using rotational grazing practices to sustain the land. They sell meat and eggs through a 50-share CSA, at farmers’ markets and directly to area chefs.

Recently, the Brownlees identified access to quality, small-scale meat processing as a barrier to meeting their farming goals. So in 2018, they teamed up with Indiana University specialists and another livestock farm in the area to tackle the issue. Supported by a SARE Farmer/Rancher grant, they are conducting a feasibility study on creating a small-scale butcher shop capable of serving producers who focus on direct sales. (To learn more, visit www.sare.org/project-reports and search for project FNC18-1115.)

Today, their ambitions go beyond their pastures. “We’re trying to be useful to our community here in Indiana,” says Liz Brownlee. That’s why they intend to compile and share the business planning documents from their feasibility study: to serve as a resource for other farmers who have a similar need. In addition, the Brownlees are founding members and officers of the Hoosier Young Farmers Coalition, a state chapter of the National Young Farmers Coalition.

For more than 30 years, SARE’s mission has been to support the ideas of farmers and ranchers who strive to improve the sustainability of U.S. agriculture. Part of that mission means supporting the next generation of farmers, like the Brownlees. Read on for more stories about recent SARE grantees and how they’re shaping the future of our nation’s agriculture.





(Size and placement are not to scale.)



SARE is...

INVESTMENT IN SUSTAINABLE FARMING AND RANCHING

Since 1988, more than \$24.9 million in research funds have gone directly to America's most innovative farmers and ranchers. In total, SARE has invested over \$292 million in more than 7,100 projects.

GRANTS FOR INNOVATIVE RESEARCH AND EDUCATION

SARE offers grants to farmers, ranchers, educators, researchers, graduate students and others for on-farm research, education, and professional and community development.

LOCAL LEADERSHIP, NATIONAL IMPACT

Four regional administrative councils—including farmers, educators, scientists, government, NGOs and other stakeholders—set priorities and make grant award decisions.

FARMER LEADERSHIP

As grantees and administrative council members, hundreds of farmers and ranchers from all corners of the nation share their on-farm research results and advise SARE.

EDUCATION AND TRAINING

SARE shares research results by funding trainings, requiring project outreach and producing a library of practical, how-to books, bulletins and other information products.

Learn more at www.sare.org.

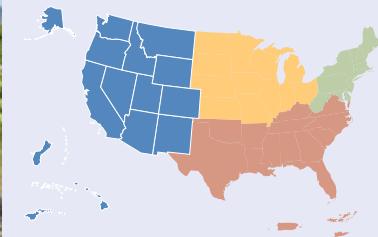
Cover photos by: Beth McRoberts (main photo); inset photos, from left: Stacie Clary, Western SARE; Yolanda Young; Oscar Liburd, University of Florida; Deb Heleba, Northeast SARE. **Left page:** (from top) Marie Flanagan, North Central SARE; Beth McRoberts. **This page:** inset photos, from left: Marie Flanagan; Darin Eastburn; Deb Heleba; Courtesy Southern SARE; Stacie Clary. **Credits:** Production by Andy Zieminski and Lizi Barba, SARE Outreach. Design by Kirsten Ankers, Citrine Sky Design. Printed by the University of Maryland Printing Services.



United States
Department of
Agriculture

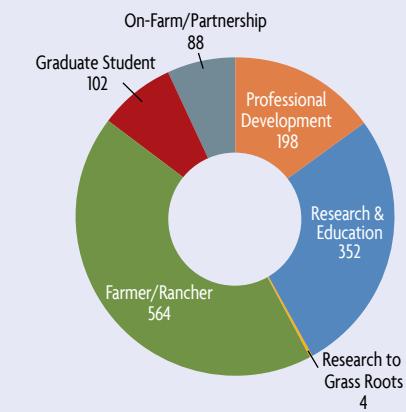
National Institute
of Food and
Agriculture

WESTERN SARE

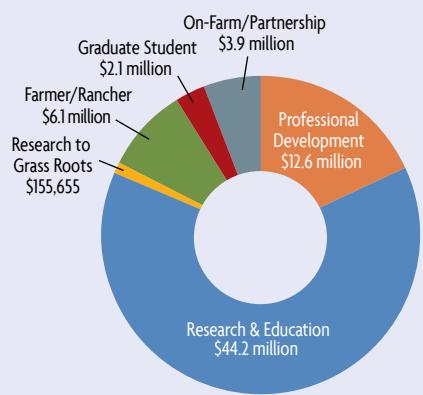


Total Grant Awards, 1988–2019¹

1,337 GRANTS



\$70.2 MILLION



Grant Proposals and Awards, 2018–2019

Grant Type	Preproposals Received ²	Full Proposals Invited	Full Proposals Received	Proposals Funded	Funding Total
Research and Education	147	65	64	18	\$5.7 million
Professional Development	N/A	N/A	49	21	\$1.6 million
Farmer/Rancher	N/A	N/A	72	35	\$782,595
On-Farm/Partnership	N/A	N/A	57	22	\$1 million
Graduate Student	N/A	N/A	152	48	\$789,040

¹ These totals exclude additional direct funding given each year to Cooperative Extension in every state to support state-level programming on sustainable agriculture.

² The use of a preproposal process varies by region. It serves to screen project ideas for the larger and more complex grant programs, and to reduce applicants' proposal preparation burden as well as the proposal review burden for SARE's volunteer reviewers.

Oregon Farmers Grow Winter Squash to Expand Off-Season Sales

“I no longer lose money on squash. I have a winter CSA so I need profitable winter crops; squash is now a profitable winter storage crop.”

Laura Masterson, Oregon farmer

THE CHALLENGE

Farmers in the Willamette Valley of Oregon with smaller, diversified operations and local markets are increasingly on the lookout for crops they can sell in the off season. Winter squash is a promising candidate. Sales of locally grown winter squash peak by November, then through the winter the majority of squash comes from California and Mexico. Making even a modest dent in this off-season market could collectively gross an estimated \$250,000 for local growers, according to Oregon State University (OSU).

But production and storage challenges have limited local sales in winter months. For growers to take advantage of this market, they need help managing the soilborne diseases that limit yield, and they need to know which squash varieties have the best characteristics in terms of disease resistance, storage, flavor and marketability.

THE ACTIONS TAKEN

OSU vegetable specialist Alexandra Stone approached this challenge from two angles, with funding from two SARE research grants that involved a combined 22 on-farm trials from 2015 to 2019. In one project, she took on diseases. She and her collaborators, including OSU plant pathologists Ken Johnson and Hannah Rivedal, equipped farmers with knowledge of fungal disease symptoms to aid them when scouting their fields. The team also evaluated a range of management strategies, including the use of disease-resistant varieties, crop rotation and fungicide treatments.

Participating farmer Jennifer Surdyk measures the Brix value of squash that was put in storage for sale in winter. Brix is a measure of sugar content that helps farmers assess how their production and storage practices affect the marketability of produce. *Photo by Alex Stone, Oregon State University*

Stone's second project focused on extending the market for winter squash into the winter months. Like her first project, this one involved a multi-pronged approach. Her team first conducted on-farm variety trials to learn which squash were most profitable to grow and store for winter sales. They also worked with local chefs to create recipes and to assess marketable characteristics such as flavor. Then they worked on the consumer end by packaging the information into marketing materials that they shared with area farmers, distributors, retailers and the public.

THE IMPACTS

One squash variety in particular, Tetsukabuto, emerged across both projects as a star. “Farmers are increasingly growing and storing Tetsukabuto for profitable deep winter sales with almost no storage losses, and consumers love them,” says Stone. Armed with new information in disease diagnosis, crop rotation, resistant varieties, fungicide use

and water management, Willamette Valley farmers now have a range of tools to grow winter squash profitably. Combined impacts include:

- **More sustainable practices:** 87 farmers adopted, or intended to adopt, a new practice based on Stone’s research.
- **Growing consumer demand:** The team organized squash festivals in Portland and launched a consumer-facing website, eatwintersquash.com, with recipes and other information.
- **Looking to the future:** The project team received five grants for follow-up activities and established five new collaborations with fellow stakeholders, ensuring their work will continue.

Learn More: Visit www.sare.org/project-reports and search for projects SW15-021 and OW16-008.





At a 2017 field day, Washington state ranchers and scientists explained how they use cattle grazing, herbicides and seeding of perennial grasses to control invasive weeds and restore rangelands at large scales. *Photo by Juan Villalba, Utah State University*

Grazing Cattle and Seeding Perennials to Restore Degraded Rangelands

“The knowledge gained with our research and education activities is providing ranchers low-cost and environmentally sound tools to reduce medusahead invasions and enhance ecosystem services.”

Juan Villalba, Utah State University

THE CHALLENGE

Frequent fires and invasive weeds in the Channeled Scablands of eastern Washington are degrading rangelands and threatening the livelihoods of ranchers who raise cattle there. Over the last 25 years, the invasive species medusahead emerged as the most dominant weed in the region. The expanding presence of this annual grass has caused a sharp decline in forage quality and stocking rates of cattle, conditions that are hurting the profitability of ranching. One rancher reported that he has cut his stocking rate by 50% since 1990. As pastures degrade, related ecological problems are arising, including an increased risk of wildfires, reduced habitat for wildlife and the loss of important pollinators.

THE ACTIONS TAKEN

Rangeland specialists with Utah State University and the USDA Agricultural Research Service partnered with ranchers to tackle the problem of medusahead from two directions. First, they studied perennial grasses and forbs that could be planted to compete with medusahead, provide quality forage and improve the resilience of rangelands. Then, they evaluated management techniques that would encourage cattle to eat medusahead and gradually shift the plant composition of pastures away from invasive weeds and toward the best perennial forages they identified. Both projects were conducted on working ranches and were funded by multi-year SARE research grants spanning 2013 to 2017.

The idea behind the management techniques was to create a positive loop that would gradually restore rangeland health. First, cattle would graze in areas infested with medusahead. This grazing creates favorable conditions for planting new species, so ranchers would come into those areas after their cattle and seed them with perennials. Eventually the ranchers would rotate their cattle between these improved areas and the areas still infested with medusahead, and would repeat the seeding process.

THE IMPACTS

The initial results of these projects have been highly encouraging, and ranchers in the area have started to pay attention. “Stakeholders understand the serious implications of invasive species and are very receptive to the work we are doing in this region,” says ARS scientist Kip Panter, who led one of the projects. Impacts include:

- **Improved forage production:** In the first project, researchers found that perennial grasses improved forage production and quality of pastures by 25%, and that medusahead did not reinvoke those areas.
- **Stakeholder engagement:** A field day demonstrating this research brought together 45 ranchers and Extension professionals, and both fact sheets and a website were developed. One of the projects trained eight undergraduate students and two graduate students.
- **Rancher adoption:** Participating ranchers had planted perennials on 600 acres by the end of the first project in 2015.

Learn More: Visit www.sare.org/project-reports and search for projects OW13-005 and SW15-003.

Equipping Farmers with Tools to Manage Herbicide-Resistant Weeds

“Montana State University Extension agents and crop consultants mentioned that this was a much-needed educational program for dealing with herbicide resistance.”

Prashant Jha, Montana State University

THE CHALLENGE

Herbicide-resistant weeds have emerged in many parts of the country as one of the biggest threats to the sustainability of agriculture. A recent survey revealed that 59% of row crop farmers have such weeds in some of their fields. In Montana, Wyoming and neighboring states, a handful of weed species have developed resistance to one or more herbicide groups and pose a particular threat to no-till wheat growers. The likelihood is low that new herbicide groups will appear on the market in the near future, so farmers must instead rely on a more diversified suite of strategies to manage these “superweeds” and slow their spread, including the use of tillage, cover crops, crop rotations and best practices regarding herbicide application. But many farmers are reluctant to change their weed control practices, partly to protect short-term economic returns and partly due to a lack of knowledge about diversified strategies.

This lack of knowledge oftentimes extends to

the agricultural professionals who support farmers.

THE ACTIONS TAKEN

Montana State University (MSU) weed scientist Prashant Jha used a 2016 SARE Professional Development Program grant to help jumpstart the battle against herbicide-resistant weeds in the Northern Great Plains. (Note: Jha has since taken a position at Iowa State University.) His project focused on compiling information on best management practices for herbicide-resistant weeds and sharing it with Extension educators and other ag professionals. His team worked with MSU specialists to develop a curriculum and other resources that described the kinds of superweeds present in the region, their impact on agriculture and the diversified set of management practices that could be used to limit their impact.

Then over two years, Jha and his collaborators delivered this information to hundreds of farmers, Extension specialists and other ag service providers via dozens of workshops, on-farm demonstrations, field days, presentations, webinars and publications.

THE IMPACTS

This multi-year educational effort included an evaluation process that revealed the following impacts:

- **New knowledge:** Across Montana and Wyoming, 600 growers, crop consultants, Extension agents, agronomists and others reported gaining a better understanding of the factors that contribute to herbicide resistance in weeds. Participants also reported learning about using crop rotations, strategic tillage, cover crops and other techniques for integrated weed management.

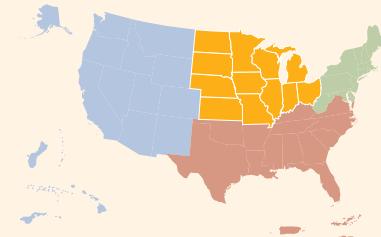
- **Adopting crop rotation:** Several farmers reported switching from a continuous wheat-fallow system to a wheat-pulse rotation, which improves weed control options while increasing the overall sustainability of the farm.
- **Adopting conservation tillage:** More than 100 growers adopted conservation tillage or strategic tillage to deplete weed seed banks and to reduce their reliance on herbicides.
- **Changing herbicide practices:** By the end of the project, almost 60% of Montana growers facing glyphosate- and dicamba-resistant kochia on their farms changed their herbicide application practices in response to the challenge.

Learn More: Visit www.sare.org/project-reports and search for project EW16-029.



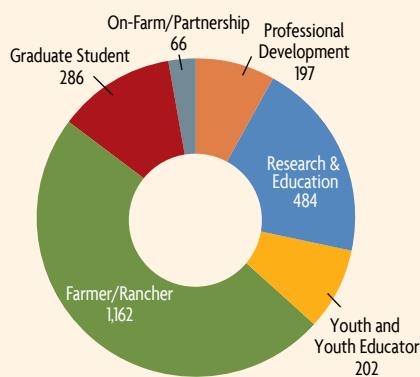
Seed samples taken from weeds suspected to have developed herbicide resistance are grown at a Montana State University research facility. Sent in by area farmers, these samples helped Extension specialists determine the prevalence of herbicide resistance in the state. Photo by Prashant Jha, Montana State University

NORTH CENTRAL SARE

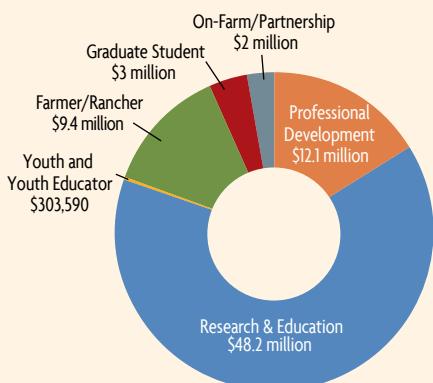


Total Grant Awards, 1988–2019¹

2,410 GRANTS



\$76.4 MILLION



Grant Proposals and Awards, 2018–2019

Grant Type	Preproposals Received ²	Full Proposals Invited	Full Proposals Received	Proposals Funded	Funding Total
Research and Education	293	61	57	33	\$6.1 million
Professional Development	N/A	N/A	48	24	\$1.8 million
Farmer/Rancher	N/A	N/A	238	89	\$1.2 million
On-Farm/Partnership	N/A	N/A	83	29	\$974,900
Graduate Student	N/A	N/A	93	40	\$513,975

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² The use of a preproposal process varies by region. It serves to screen project ideas for the larger and more complex grant programs, and to reduce applicants' proposal preparation burden as well as the proposal review burden for SARE's volunteer reviewers.

Photos (clockwise from left): Joan Benjamin, North Central SARE; Marie Flanagan, North Central SARE; Yolanda Young

Recent Highlights from the North Central Region

- Beginning farmers and ranchers are some of agriculture's greatest innovators and experimenters, and North Central SARE has made it a priority to foster them. In October 2019, our Professional Development Program held a train-the-trainer workshop, "Enhancing the Success and Sustainability of Beginning Farmers and Ranchers," to give regional educators the tools they need to work with beginning farmers in their states.
- We're working to promote fuller participation with SARE in the North Central region by building stronger relationships with a diversity of producers, researchers and educators. On a SARE-sponsored sustainable agriculture bus tour during the 2019 Minorities in Agriculture, Natural Resources and Related Sciences Conference, we had the opportunity to showcase some of the unique sustainable growing practices and practitioners in and around Kansas City.
- Systems-level research and education projects are complex and usually take more time to complete than our typical funding cycle can cover. New in 2020, our Research and Education grant program will have an option to apply for a long-term (more than three years) grant, giving us a new way to support collaborative, multidisciplinary projects.

Urban Farmers Adopt More Efficient Soil Management Practices

“It would not be an overstatement to say this system is revolutionizing our operation.”

Adam Millsap, Urban Roots Farm

THE CHALLENGE

When it comes to keeping their soils healthy and productive, most farmers willingly put in the work. For urban growers like Adam and Melissa Millsap, who operate Urban Roots Farm, an intensive production system on less than one acre near downtown Springfield, Mo., soil management can come with unique challenges. They say that trying to manage the nutrient cycle on their vegetable beds

while maximizing crop outputs was a time-consuming job that led to degraded soil. Instead of letting crop residue decompose gradually on beds after harvest, they had to haul it off to compost piles and return with fresh compost so that they could quickly plant the next crop. They also relied on tillage to incorporate the compost and prepare seedbeds, which led to weed seed emergence, compaction and poor soil structure.

THE ACTIONS TAKEN

Interested in ways they could maintain sustainability while improving their efficiency, the Millsaps received a 2015 SARE Farmer/Rancher grant to try a completely new

approach. They had read about it in a book, but nobody in their area was trying it. The first step after harvest is to pulverize crop residue with a flail mower and leave it on the bed. Then, cover the bed with an opaque plastic sheet for one to three weeks, which creates a warm, dark and moist environment. During this time, the residue decomposition speeds up and weed seeds germinate, then die due to a lack of light. Lastly, remove the sheet and plant the next crop.

During their SARE-funded project, the Millsaps compared this technique to their typical management over two years. They also used a reduced tillage technique on the test plot to prepare the bed for planting, which resulted in less soil disturbance.

THE IMPACTS

The new system was so successful that the Millsaps began using it on their entire farm, except for their control plot, before they had finished their two-year trial. The impacts include:

- **Better soil structure:** While the Millsaps did not observe a difference in organic matter, the new system greatly improved soil structure, allowing them to significantly cut back on pre-plant tillage.
- **Reduced weed pressure:** “The change was large in scale and almost immediate,” Adam Millsap says.
- **Less labor:** With less cultivation and no need for residue management, the new system reduced labor requirements.
- **Productivity:** Because of the reduced weed pressure and labor requirement, the Millsaps anticipate this system will allow them to have more beds in production at any given time.

(Note: In late 2018 the Millsaps began working with a new venture in Arkansas that integrates agriculture into residential real estate development. They retain ownership of Urban Roots Farm.)

Learn More: Visit www.sare.org/project-reports and search for project FNC15-1006.



The owners of Urban Roots Farm in Springfield, Mo., decided to cover beds with plastic between crops to accelerate the decomposition of plant residue, which saved them time and labor. Photo by Adam Millsap, Urban Roots Farm

North Dakota Farmers Pursue Soil Stewardship Through Cover Crops

“We are building a soil health network of farmers, scientists, consultants, state organizations, industry and Extension.”

Abbey Wick, North Dakota State University

THE CHALLENGE

The practice of planting a cover crop holds many opportunities for farmers. Cover crops can build soil health, curb erosion, control weeds, improve water and nutrient management, and increase the bottom line. In North Dakota, they have the potential to reduce

soil salinity by using excess water, which is a problem on hundreds of thousands of acres. Cover crop acreage increased 50% nationwide from 2012 to 2017, according to the Census of Agriculture, yet North Dakota farmers lag behind their Midwestern neighbors in adoption. This lag is largely due to limited local knowledge about how to fit cover crops into a short growing season.

THE ACTIONS TAKEN

North Dakota State University Soil Health Specialist Abbey Wick used a 2015 SARE Partnership grant to partner with producers in the Red River Valley, where salinity is

widespread, to establish replicated plots of cover crops and monitor their performance over two years. The team planted a basic mix of cereal rye, radishes and turnips, plus other mixes that built on that combination. The goal was to learn how various cover crops perform in North Dakota, thereby giving farmers a range of options to meet their particular needs.

Wick received a second SARE Partnership grant in 2017 to evaluate some of the longer-term changes to soil health that cover crops cause and to address emerging interests from her farmer partners. In particular, they wanted to explore the practice of “planting green,” or seeding a cash crop such as corn or soybeans into a standing cover crop in the spring. Planting green extends the amount of time a cover crop can grow and provide its benefits.

THE IMPACTS

While varying weather conditions led to mixed results across field locations, treatments and years, Wick’s team is well on their way to accomplishing their primary goal: to create and share a body of knowledge about cover crops in North Dakota. Impacts include:

- **Expansive outreach:** Through dozens of workshops, tours, articles and videos, each project reached 2,000 farmers and more than 300 professionals with cover crop information. More than 1,100 farmers reported learning something new.
- **Adopting new practices:** According to project surveys, 275 farmers changed or adopted a production practice based on this outreach.
- **New information:** The team has begun to discover useful information about managing cover crops. For example, they demonstrated that cover crops can control weeds and maintain consistent soybean yields, and weather challenges have helped them home in on the optimal time for seeding cover crops in North Dakota.

Learn More: Visit www.sare.org/project-reports and search for projects ONC15-012 and ONC17-036.



North Dakota State University Soil Health Specialist Abbey Wick worked with Doug Toussaint and other farmers to evaluate how cover crops affect soil health. Reprinted with permission from Successful Farming; copyright 2018 Meredith Corporation; all rights reserved



University of Nebraska-Lincoln Extension educator Strahinja Stepanovic (right) worked with farmers such as Steve Tucker of Venango, Neb., to begin growing field peas as a soil-building alternative to fallow. Courtesy Strahinja Stepanovic, University of Nebraska-Lincoln

Field Peas: A New Crop to Replace Fallow and Diversify the Farm

“As a result of this project, field peas became an established crop in southwest Nebraska, and we built a foundation for a successful and long-term pulse industry.”

Strahinja Stepanovic, University of Nebraska-Lincoln

THE CHALLENGE

In semi-arid regions, farmers without irrigation oftentimes conserve precious soil water by rotating cereal crops such as corn or wheat with a period of summer fallow. More recently, though, some farmers in the High Plains have begun to use spring-planted pulse crops as an alternative to summer fallow. Pulse crops are legumes that are harvested for their beans and include chickpeas, lentils and field peas. Replacing fallow with a pulse crop can help farmers cope with weather- and market-related fluctuations by improving soil health and diversifying the crop mix. However, while many farmers in Nebraska are interested in pulse crops, they have been reluctant to adopt them due to a lack of local markets and research-based information on growing pulses in local conditions.

THE ACTIONS TAKEN

In 2016, University of Nebraska-Lincoln (UNL) Extension educator Strahinja Stepanovic organized a team of researchers and farmers to develop agronomic best practices for growing field peas and to spur farmer adoption. Using a two-year SARE Partnership grant, the team compared the impact of field peas and fallow on water use, soil fertility, wheat yield and profitability. They also conducted variety trials to identify the highest-yielding field pea varieties for the region and looked at optimal planting strategies. Finally, they created educational materials and held workshops to encourage farmers to begin growing field peas.

In 2017, a UNL graduate student, Alexandre Tonon Rosa, received a related SARE grant to work with Stepanovic on using field peas in alternative cropping systems to corn/soybean rotations. Rosa is looking at rotations involving cover crops, forages, field peas and short-season crops.

THE IMPACTS

Stepanovic's team found that in general, field peas are a viable alternative to summer fallow. In their research, field peas improved the soil in multiple ways: They increased both water infiltration and microbial activity, and

provided habitat for beneficial insects and microorganisms. An economic analysis found peas were more profitable than summer fallow. Now, the word is getting out. Impacts include:

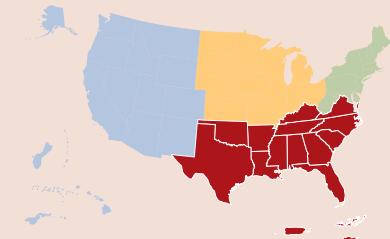
- Valuable knowledge:** Thanks to outreach activities, more than 220 farmers gained knowledge about field pea production. In surveys, they estimated the production value of that knowledge at \$15–\$30 per acre. An additional 200 farmers reported making a change in their practices as a result of this work.

- Widespread adoption:** Surveys conducted during the project about Nebraska producers' interest in field peas correlated with a 62% increase in acreage planted to field peas in the state over two years, which rose to 55,000 acres in 2017.

- Supporting the local economy:** Motivated by this growth in acreage, the number of certified seed dealers in Nebraska increased from two to seven, and three field pea processing facilities opened. Three food brands began offering marketing opportunities to field pea growers.

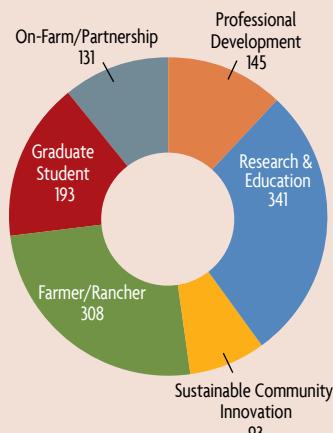
Learn More: Visit www.sare.org/project-reports and search for projects ONC16-021 and GNC18-271.

SOUTHERN SARE

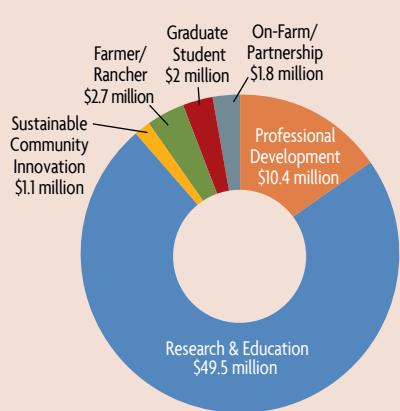


Total Grant Awards, 1988–2019¹

1,278 GRANTS



\$69.5 MILLION



Grant Proposals and Awards, 2018–2019

Grant Type	Preproposals Received ²	Full Proposals Invited	Full Proposals Received	Proposals Funded	Funding Total
Research and Education	246	94	87	33	\$6 million
Professional Development	37	21	19	13	\$896,778
Farmer/Rancher	N/A	N/A	73	16	\$141,063
On-Farm/Partnership	N/A	N/A	62	22	\$315,028
Graduate Student	N/A	N/A	173	40	\$590,625

¹ These totals exclude additional direct funding given each year to Cooperative Extension in every state to support state-level programming on sustainable agriculture.

² The use of a preproposal process varies by region. It serves to screen project ideas for the larger and more complex grant programs, and to reduce applicants' proposal preparation burden as well as the proposal review burden for SARE's volunteer reviewers.

Using Locally Sourced Wood Chips for Effective Weed Management

“Locally available hardwood mulch not only controls weeds when properly applied, but also helps with water retention, and can help increase production of vegetable crops.”

Patrick Johnson, NANIH Farm and Garden

THE CHALLENGE

Weed control can be a constant struggle for organic growers, who cannot use the herbicides typically employed by conventional farmers. In fact, weed control ranks as the number one barrier to organic production and can account for as much as 50% of production costs. Organic farmers practice a variety of methods to fight weeds: cover crops, tillage, solarization, mechanical removal, mulching and organic-approved herbicides. Plastic tends to be the preferred mulch of organic growers, but Patrick Johnson became interested in using a more traditional approach, wood chips, on his urban Virginia farm because it produces no waste and can provide a variety of soil health benefits. However, when it came time to try

out the wood chips, Johnson couldn't find research that demonstrated it was an effective strategy on farms like his.

THE ACTIONS TAKEN

Johnson, owner of NANIH Farm and Garden in Sandston, Va., used a 2018 SARE Farmer/Rancher grant to source locally available single- and double-shredded hardwood bark for a randomized experimental design, which included 20 experimental plots each measuring approximately 200 square feet. Two mulch treatments were applied at a depth of 4 inches and were replicated five times. The control plots received no mulch. The project objectives were to determine differences in weed growth and/or suppression, evaluate changes in water-holding capacity, observe whether soil temperature differs between treatment and control, establish any difference in efficacy between single- and double-shredded wood chip mulch, and identify weed species in the test plots. All plots were rain fed and included multiple vegetables and herbs. Marketable and harvestable yield were recorded for each plot, while weed infestation and identification were determined by observation and random sampling.

THE IMPACTS

Johnson and his team are now confident in the efficacy of wood chip mulch as a sustainable and affordable alternative to plastic mulch and other less sustainable weed-control methods. Specific results include:

- **Positive results:** In the plots treated with wood chips, average weed mass was significantly lower and water-holding capacity was higher than the control plot. Johnson tested two kinds of mulch and found no difference in their effectiveness.
- **Improved yields:** Due to reduced weed pressure, one crop, okra, yielded significantly higher when grown with a wood chip mulch.
- **Getting the word out:** More than 1,500 farmers and educators learned about the project results at conferences and events, through social media or by viewing the team's mulch video online.

Learn More: Visit www.sare.org/project-reports and search for project FS18-308.



Virginia farmer Patrick Johnson used a SARE grant to evaluate the effectiveness of locally available wood chips as a weed-suppressing mulch. Photo by Jermaine Hinds, SARE Outreach

North Carolina Graduate Student Tackles On-Farm Food Waste

“Not only does the loss of specialty crops reduce farm efficiency and sustainability, but the recovery of those crops can increase farm profitability and availability of fresh fruits and vegetables.”

Lisa Johnson, North Carolina State University

THE CHALLENGE

Fruit and vegetable farmers are all too familiar with food waste, as they are forced to leave unmarketable but edible produce in their fields after harvest because it doesn't meet industry grade standards. While farmers

might look over their fields and appreciate the scale of what was left behind, they may lack a clear idea of both the true amount of waste produced and the amount of edible produce that could still be sold or distributed through secondary channels.

Limited data exists on how much edible produce is left in fields. If farmers had that information, they could determine whether to continue harvesting their fields and whether to sell this extra haul to buyers or donate it locally. With an estimated 40% of food lost across the U.S. food system supply chain, efforts to recover and use any edible produce that would otherwise be lost have huge potential to improve farm profitability while addressing food security.



North Carolina State University graduate student Lisa Johnson developed a tool that farmers can use to estimate how much marketable produce they're leaving behind after harvest, a first step in helping them reduce waste. *Courtesy Lisa Johnson, North Carolina State University*

THE ACTIONS TAKEN

North Carolina State University graduate student Lisa Johnson used a SARE Graduate Student grant to evaluate vegetable crop yields on 13 fields of a 300-acre vegetable and commodity farm, which included crops like squash, zucchini, cucumbers and eggplant. Working with researchers at the Center for Environmental Farming Systems (CEFS), Johnson crunched the numbers and estimated that unharvested crops that were edible and undamaged totaled 7,887 pounds per acre, an amount equal to 57% of the crop that was harvested and sold. From there, the project team developed an easy-to-use tool that enables farmers to more accurately estimate how much produce is left unharvested after the primary harvest. The tool uses field samples that were scaled into volume estimates using row spacing, field acreage, yield and buyer specifications provided by the grower.

THE IMPACTS

The potential effect of giving farmers tools to determine the value of unharvested produce is huge. One study estimated that in North Carolina alone, 117 million pounds of produce were left in fields in 2013. Specific project impacts include:

- **An effective tool:** The tool developed by Johnson showed huge potential in a case study on a commercial farm. It revealed that an estimated 7,900 pounds per acre of edible vegetables were left unharvested, 37% of which met buyers' standards.
- **Outreach and adoption:** During the project, information was shared with 70 farmers and 45 agriculture professionals.
- **Win-win solutions:** The promising results of this project led to a CEFS team receiving a 2017 Research and Education grant to expand growers' use of this food waste tool to improve their understanding of the economic value of unharvested crops and to provide them with win-win solutions for edible but unharvested produce. Johnson, now a senior research scholar, has since produced a body of research on this subject as a direct result of this SARE grant.

Learn More: Visit www.sare.org/project-reports and search for projects GS15-142 and LS17-280.



Reduced weed pressure is one of the benefits Clemson University researchers found from interseeding, or planting a new crop into an existing crop just before its harvest. Peanuts planted into standing wheat (left) have fewer weeds to compete with compared to peanuts planted into bare soil (right). *Photo by Ahmad Khalilian, Clemson University*

Promoting the Adoption of Interseeding for Increased Sustainability

“We feel interseeding has real potential, and thanks to SARE, we were able to demonstrate its efficacy and encourage its use in South Carolina.”

Dan Anco, Clemson University

THE CHALLENGE

Commodity growers in the southern United States face relatively new production problems that can affect farm profits and threaten soil health. Many come in the form of pests, which thrive in southern climates. Herbicide-resistant weeds are difficult to manage, often forcing growers to adopt more expensive control strategies. Insects further reduce revenue and add to production costs. Cotton producers, for example, lost an estimated \$100 million to thrips between 2008–2010. Then there are the nematodes, which cause losses in the hundreds of millions of dollars for soybean, peanut and cotton growers. And on top of pests, there is the increasing cost of fuel—sometimes accounting for more than 30% of tractor ownership and operation expenses. Innovative production methods are needed, and a promising SARE On-Farm Research grant has demonstrated that interseeding

(planting one crop into a second crop ahead of harvesting the second crop) has the potential to help address these new problems.

THE ACTIONS TAKEN

A team from Clemson University set up a demonstration project on four farms to showcase the advantages of interseeding technology in rotations with cotton, peanuts, soybeans and wheat. Interseeding can enhance soil properties and farm profits while reducing fuel costs and consumption, and pest occurrence. To assist their farmer partners, the team modified preexisting farm equipment to allow for interseeding, provided training and support to ensure its proper use, and then implemented a training program to spread the word about interseeding technology to others.

Equipment modifications included adjusting conventional grain drills and a vacuum planter in unique ways to suit different types of planting without requiring additional labor or machinery. The on-farm demonstration sites were planted with skip-row wheat, with soybeans, cotton and peanuts being interseeded later into the standing wheat. One research site featured insect, nematode and weed treatments to compare the effect of interseeding on pest incidence. Yields were

evaluated at harvest and soil samples were analyzed. Another site included a two-year study of how interseeding and various irrigation strategies influenced peanut yields.

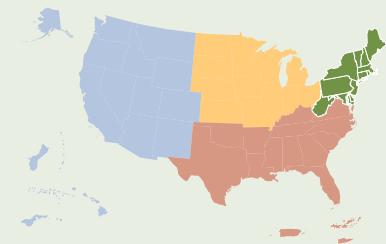
THE IMPACTS

The project generated new information and helpful strategies for farmers interested in adopting interseeding as a production practice. Specific impacts include:

- **Promising results:** Interseeding had a positive or neutral effect on crop yields, reduced weed densities and nematode populations, increased revenues from the wheat harvest and increased plant-available nutrients in the soil.
- **Farmer adoption:** The four participating farmers learned to modify their existing equipment to incorporate interseeding into their production without requiring additional costs or new machinery.
- **Broad engagement:** The team shared project results with 800 farmers and 150 agriculture professionals across South Carolina through field days, workshops and grower meetings.

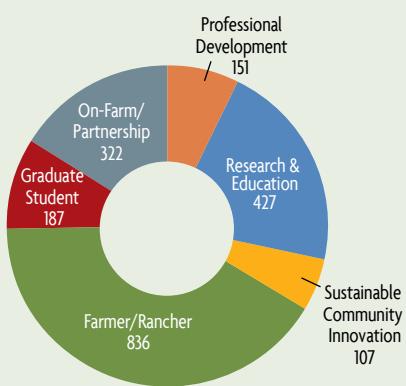
Learn More: Visit www.sare.org/project-reports and search for project OS16-093.

NORTHEAST SARE

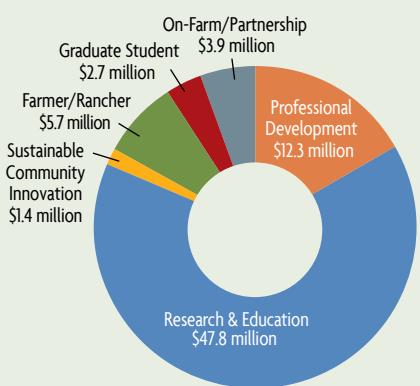


Total Grant Awards, 1988–2019¹

2,090 GRANTS



\$76.2 MILLION



Grant Proposals and Awards, 2018–2019

Grant Type	Preproposals Received ²	Full Proposals Invited	Full Proposals Received	Proposals Funded	Funding Total
Research and Education	255	112	91	33	\$5.5 million
Professional Development	34	21	16	6	\$1.4 million
Farmer/Rancher	N/A	N/A	119	62	\$765,148
On-Farm/Partnership	N/A	N/A	110	60	\$1 million
Graduate Student	N/A	N/A	116	64	\$901,290

¹ These totals exclude additional direct funding given each year to Cooperative Extension in every state to support state-level programming on sustainable agriculture.

² The use of a preproposal process varies by region. It serves to screen project ideas for the larger and more complex grant programs, and to reduce applicants' proposal preparation burden as well as the proposal review burden for SARE's volunteer reviewers.

Strengthening Interpersonal Relationships On and Off the Farm

“[This project] has been an important reminder that effective communication and planning are as key to a successful farm as good books and sound production practices.”

A training participant

THE CHALLENGE

Farmers have long relied on agricultural service providers (ASPs) for their technical expertise on a range of issues related to production, marketing and farm management. Yet when it comes to interpersonal skills—another critical aspect of running a successful business—ASPs often feel less qualified to provide meaningful help. Just as farmers require certain skills to raise and market products in a profitable and environmentally sustainable manner, they need skills in communication, decision making, goal setting and time management in order to run successful businesses while maintaining quality of life. Training ASPs to be better at providing guidance on interpersonal skills

can greatly increase the value they provide their farmer clients.

THE ACTIONS TAKEN

With funding from a SARE Professional Development Program grant, University of Maine Cooperative Extension Human Development Specialist Leslie Forstadt and her team first conducted focus groups with farmers to better understand the interpersonal needs they have at different stages of their farms' development. The team then took what they learned and developed materials, including a toolkit, consultation checklist and other resources, to train ASPs on skills that would help them provide guidance on the issues listed by the surveyed farmers.

Each training focused on improving communication skills, understanding the interpersonal needs of farmers at each stage of their development (from novice to expert), and learning to provide guidance on decision making, goal setting and time management. ASPs were also taught to consider approaching their work from the perspective of a “guide” rather than as an “expert” to improve

communication with farmers and to better understand their needs.

THE IMPACTS

Equipping ASPs with this information can help all farmers, particularly beginning farmers, who often need access to a wide range of technical assistance. Specific impacts include:

- **In-depth training:** 53 ASPs were trained through one or more of the project's events: one-and-a-half-day workshops, four working groups and two webinars.
- **Adoption of skills:** 44% of participants who responded to a final project survey indicated an increase in their comfort level in addressing interpersonal skills.
- **Sharing with farmers:** 23 participants who responded to a final project survey (43% of trainees) reported holding a combined 291 one-on-one consultations with farmers who manage a total of 73,855 acres.

Learn More: Visit www.sare.org/project-reports and search for project ENE16-142.



Agricultural service providers participate in a University of Maine training exercise where they learn how to build farmers' skills in the areas of communication, decision-making, time management and goal-setting. Photo by Abby Sadauskas, Apple Creek Farm

Driving Birds Away from Corn Fields with a Laser Scarecrow

“Under normal circumstances I’d lose 80–90% of the corn. Right now I’m losing maybe 7–8%. We developed this to be easy to use and build. It’s really promising.”

Ken Elliot, Elliot Farm

THE CHALLENGE

For years, Elliot Farm in Lakeville, Mass., struggled with crop damage from red-winged black birds and other bird pests, many of which are protected by the Migratory Bird Treaty Act. In 2016 alone, the farm suffered the loss of 80% of its sweet corn crop to bird damage, amounting to \$18,000 in lost

product. The usual management techniques—balloons, pyrotechnics, distress calls, repellents—just weren’t working. But when farm co-owner Ken Elliot joined a “laser scarecrow” feasibility study funded by a SARE Partnership grant in 2017, it soon became clear that using moving green laser beams to frighten birds could be an effective tool on his family’s farm. However, the prototype used during the study didn’t stand up to field conditions, and commercial units available on the market each cost \$3,000 or more. Therefore, Elliot wanted to design a reliable, effective and affordable unit.

THE ACTIONS TAKEN

Supported by a SARE Farmer grant, Elliot set out to design and manufacture a laser

scarecrow prototype of his own that could be reproduced for under \$500 per unit, which would create an affordable pest management strategy for him and other farmers to manage bird-related crop loss.

Working with engineers at Wentworth Institute of Technology, Elliot designed a prototype and then tested nine laser units on 40 acres of sweet corn. Pleased with the results, Elliot developed a manual for other farmers to build laser scarecrow units on their farms.

THE IMPACTS

- Effective pest control:** When using the laser units at the height of bird season, Elliot reported that only 20% of his crop was lost to bird damage, down from 80% without the units. When he installed the units prior to corn ripening and deployed them in conjunction with bird distress calls, crop damage was reduced to just 8%.
- Practical knowledge:** Elliot’s free how-to guide, which includes a parts list and step-by-step instructions for building a unit, is posted online for other vegetable and grain farmers to access. The free guide can be found at deannaelliot.wixsite.com/laserscarecrow.
- Getting the word out:** Through the 2017 feasibility study that Elliot joined, led by University of Rhode Island Vegetable Specialist Rebecca Brown, 250 regional farmers and service providers learned about this approach. Educators throughout New England have been testing laser units on area farms.

Learn More: Visit www.sare.org/project-reports and search for projects ONE17-291 and FNE18-893.

The laser scarecrow that Ken Elliot designed can be built for under \$500 per unit and can significantly lower the amount of crop damage caused by birds. *Photo by Carol Delaney, Northeast SARE*





Leah Penniman and her team at Soul Fire Farm in New York are working to remove the financial barriers to bringing fresh, nutritious foods to low-income communities. Photo by Carol Delaney, Northeast SARE

Balancing Farm Viability with Serving Local Low-Income Families

“This project is about supporting farmers and bringing fresh food to people who otherwise would not have access, while at the same time maintaining a financial bottom line that supports our families.”

Leah Penniman, Soul Fire Farm

THE CHALLENGE

Many farmers want to provide food to low-income families in their communities but struggle with the balance of offering lower prices for their products while maintaining their farms' economic viability. They can have difficulty finding business models that show them how to successfully balance their economic needs with their social justice goals. But Leah Penniman and her team at Soul Fire Farm in Grafton, N.Y., were determined to learn how they and other farmers could serve low-income communities while maintaining farm financial viability.

THE ACTIONS TAKEN

With funds from a SARE Farmer grant, Penniman and her team began their efforts by participating in neighborhood association meetings in communities that struggle with food access, and they heard from more than 130 residents. In addition, the Soul Fire Farm team surveyed all 80 members of their CSA and reached out to eight fellow farmers who also serve low-income customers. Their research found a number of barriers to local food access, including food costs, lack of transportation and lack of accessible markets selling local, fresh and nutritious foods.

Through their own experimentation and through interviews with other farmers, the project team learned that farmers can overcome these barriers by using a number of strategies: community and nonprofit partnerships, government grant and subsidy programs, community outreach and relationship building, accessible distribution approaches, and collaboration with other farmers. With this understanding, the team created a manual of best practices for

farmers interested in expanding their farm operations to better meet the needs of low-income communities.

THE IMPACTS

- **Practical training:** The *Sowing the Seeds of Food Justice* manual was published in 2018 and has been distributed to thousands of people through farmer networks and social media; a curriculum was developed to train more than 200 farmers in 2018.
- **Widespread outreach:** Project results were shared with 500 farmers through a combination of trainings, consultations, tours and public events.
- **Taking action:** More than 10 farmers have been in contact with the team to discuss specific changes they can make to implement the best practices offered in the manual.

Learn More: Visit www.sare.org/project-reports and search for project FNE17-879.

SARE Shares

SARE's work does not stop when it awards a grant; SARE follows through with a robust regional and national outreach effort to share useful findings with farmers and ranchers, researchers, and ag educators. Here are some of the ways SARE shares.

THE LEARNING CENTER

www.SARE.org/Learning-Center

Hundreds of educational resources on dozens of topics.

DATABASE OF PROJECT REPORTS

www.SARE.org/Project-Reports

Results from more than 7,100 SARE-funded research and education projects.

STATE PROGRAMS

www.SARE.org/State-Programs

SARE coordinators in every state and island protectorate offer learning opportunities.



Photo by Jack Rabin, Rutgers University

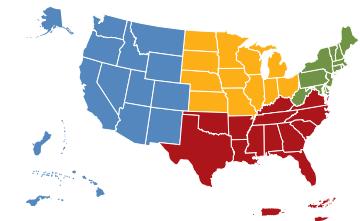


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This material is distributed by SARE Outreach for the SARE program and based upon work supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 2015-38640-23778. SARE Outreach operates under cooperative agreements with the University of Maryland to develop and disseminate information about sustainable agriculture. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture or SARE. USDA is an equal opportunity employer and service provider.

