GRADUATE STUDENT GRANT PROGRAM

SARE: Investing in the Next Generation of Agricultural Scientists

SUSTAINABLE AGRICULTURE RESEARCH & EDUCATION

Why a Graduate Student Grant Program?

The challenges that farmers and ranchers face today are growing more and more complex, and the cornerstone of the SARE program is the idea that sustainable solutions to these challenges arise when scientists, educators and producers work together to test theories in real-world, on-farm situations. However, for this approach itself to be sustainable, there must always be a strong pool of agricultural scientists rising through the ranks who believe in it too—professionals who know how to use collaborative, applied research to address the real-world needs of farmers and ranchers.

> ***"Through the SARE project, I experienced getting out of the lab by conducting field days, surveys and focus groups, all of which helped me learn to better communicate with producers. This solidified for me that I wanted to go into Extension.***

This is precisely why SARE offers research grants through its unique Graduate Student Grant program, and why we are proud to say we hit a major milestone in 2016 when we awarded our 600th Graduate Student grant. Since 2000, the four SARE regions have awarded a total of $7.2 million to 600 graduate students.

In this report, you will learn about the considerable impact of this investment on both the students and sustainable agriculture through the stories of eight grant recipients. This impact is a clear reflection of the program's primary objective, which is to foster the next generation of agricultural scientists and their interest in sustainable systems.

For the majority of master's and Ph.D. students who received a SARE grant, it was their first experience applying for and managing a grant of any kind. This, of course, represents a fundamental learning opportunity for anybody planning a career in agricultural research, education or Extension. Taken a step further, the SARE application process challenges students to consider how their research interests can be framed to be meaningful to farmers and ranchers, and to advance sustainable agriculture. As a result, this grant program gets students out of the lab, into the field and talking to farmers.

For example, see the story of Louis Nottingham, whose project on cultural pest management strategies for snap beans led to practical results that he is now sharing with growers (p. 11). Or the story of Laura Christianson, whose data on the cost efficiency of various nitrate loss reduction strategies, such as cover crops and wood chip bioreactors, has been incorporated into state-level nutrient management plans for Iowa and Illinois (p. 9).

From this foundation—managing a grant, conducting applied research, contributing to the body of agricultural knowledge—SARE graduate student grantees are equipped to launch their careers in research, Extension and teaching, and the majority do. Many use their experience to leverage larger grants, both from SARE and other sources. Shoshanah Inwood, now a faculty member at the University of Vermont, took the seed of her graduate student project and grew it into $1 million in USDA and state funding, which she now uses to address the unique health insurance needs of farm and ranch families (p. 4).

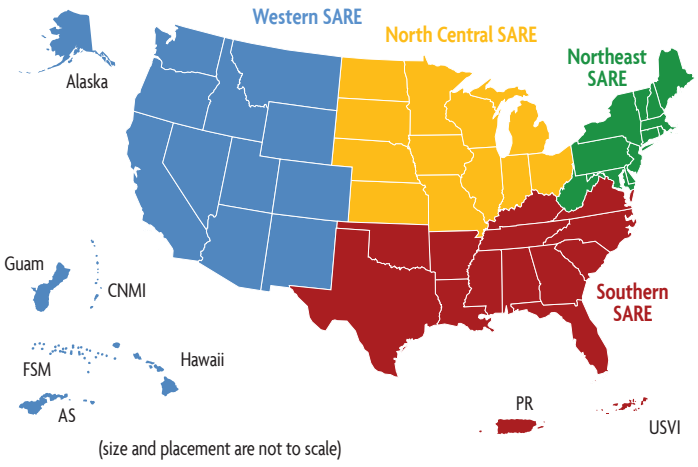
Finally, and perhaps most significantly, the SARE Graduate Student grant program encourages students to address agricultural challenges using the principles of sustainability. As you will see from reading this report, the next generation of agricultural scientists is already engaged, passionately and creatively, in this very pursuit.

— Robert Hedberg
SARE Director
2016

ABOUT THE PROGRAM

SARE is a USDA-funded program that offers grants and educational opportunities to farmers, ranchers, researchers and educators to advance sustainable innovations in agriculture. In 2000, Southern SARE initiated the Graduate Student grants program as an investment in the next generation of sustainable agriculture leaders. The other SARE regions soon followed—all seeing the value in such a training opportunity for the future of agriculture. Since 2000, the four SARE regions have awarded a total of $7.2 million to 600 graduate students.

The goal of the program is the same in each SARE region, but the application criteria and awards can vary. Students are required to work with a faculty advisor. Depending on the region, grant amounts range from $11,000 to $25,000 with a maximum project duration of two or three years.



FOR MORE INFORMATION, VISIT WWW.SARE.ORG/GRANTS/APPLY-FOR-A-GRANT

The Graduate Student Grant Program By the Numbers

	North Central	Northeast	South	West
Year Grant Program Began	2002	2010	2000	2006
Number of Grants	230	138	161	71
Total Funding	$2,275,559	$1,930,828	$1,574,808	$1,374,117

COVER PHOTOS (counterclockwise): University of California, Berkeley graduate student Hillary Sardiñas (left) and her faculty advisor, Claire Kremen, check emergence traps they set up to monitor the abundance of native bees. Sardiñas used a SARE Graduate Student grant to evaluate whether hedgerows planted with native shrubs and forbs improved sunflower pollination by providing habitat for native bees. *Photo by Paul Kirchner Studios;* Emmanuel Omondi, *Photo by Jade Cortez, Rodale Institute Communications Specialist;* Shoshanah Inwood, *Photo by Debra Heleba, University of Vermont Extension;* Javier Garza, *Courtesy the West Virginia University Parasite Immunology Lab;* Louis Nottingham, *Photo by Ben Aigner.* **OPPOSITE PAGE (from top):** Utah State University graduate student Pakorn Sutitarnnontr (left) and his faculty advisor, Scott Jones, used a SARE Graduate Student grant to identify manure management practices that can help animal feeding operations reduce their greenhouse gas emissions. *Photo by Gary Neuenschwander;* SARE Director Robert Hedberg. *Photo by Marie Flanagan, North Central SARE.*

WHAT THE STUDENTS SAY

> *"This was a great experience in grant writing for me that has directly benefited my 10-plus year career in university research and Extension. I have encouraged graduate students I have worked with since receiving this to apply. Thanks SARE!*

> *"The SARE grant was integral to both the success of the research, as well as my professional development. It provided funds which allowed me to do activities I would not have been able to do otherwise, and it was a very valuable experience in learning the grant process.*

> *"The funding was much appreciated. It was a boost to both my confidence and my credentials, and likely helped me to obtain my current research position.*

SHOSHANAH INWOOD, The Ohio State University

Helping Farm Families Thrive From One Generation to the Next

The modest funding Shoshanah Inwood received through her SARE Graduate Student grant helped her uncover such important information about farm succession at the rural-urban interface (RUI), she later leveraged the results into more than $1 million in additional funding. First as a student at Ohio State University and now as an assistant professor at the University of Vermont, she is identifying strategies that help families pass their farm on to the next generation.

"There is the generalization that agriculture will decline in the face of development pressure," says Inwood. "But with the right policies that encourage the creativity and entrepreneurship that these families are exhibiting, they can restructure to survive the pressures of farming at the RUI."

Agriculture at the RUI is central to the viability of local food systems and the preservation of farmland and open spaces. Farm succession is a complex process that critically influences its trajectory.

The graduate student project, conducted in 2007-2009, identified several different strategies farm families employ to create opportunities for the next generation of farmers. Through long interviews with 35 Midwestern families, Inwood collected critical data that would inform both her current and future research, including the importance of accessibility and affordability of healthcare to the future of the family farm, a thread that would become the focus of much of her later work.

Agriculture is one of the most dangerous occupations in the country. For young and aging farmers, health insurance impacts their quality of life and health, as well as the financial viability of their farm business. If they have a large enough number of employees, farmers must provide them insurance, and requirements vary across states So, one of Inwood's more recent projects has led to the creation of a website (www. hirednag.net) that shares tools and information with farm and ranch families about their unique health insurance needs and options.

Since completing her graduate work, Inwood has expanded her research to explore the succession of all farm types in 10 states across the country. Her major funders now include the USDA Agriculture and Food Research Initiative and state sources.

Inwood credits the SARE program for not only providing an opportunity for a graduate student to conduct research, but also for investing in the social sciences. "The social sciences are so important to the future of farming, but results can be intangible," she says. "The policies that play out throughout agriculture and that impact farmers are nuanced, long-term issues. SARE's investment in understanding these complex questions is incredibly important and critical to building a stronger, more resilient food and agriculture system."

For more information, go to www.sare.org/project-reports and search for GNC06-070.

Photo by Debra Heleba, University of Vermont Extension

WHERE SHE IS NOW

Assistant Professor
University of Vermont

SELECTED PUBLICATIONS

The Health Insurance, Rural Economic Development and Agriculture website shares information about the health insurance needs of farm families, at www.hirednag.net.

See scholarly publications at https://blog.uvm.edu/sinwood-sinwood/publications.

DOUG COLLINS, Washington State University

Dedicated to Improving Soil Health for Northwestern Growers

As a graduate student at Washington State University (WSU), Doug Collins focused his research efforts on a topic of great interest to the region's specialty crop growers, and one that would shape his Extension career to come: improving our understanding of complex soil processes and their role in farm productivity.

With support from a 2006 SARE Graduate Student grant, he studied the spatial variation of microorganisms and other soil properties on a local organic vegetable farm. "Many high-value specialty crop growers are increasingly interested in information about the biological status of their soil but are unsure how to sample for organisms and leverage biological data for improved, site-specific management," Collins noted at the time.

Through the data he collected, he was able to recommend general biological sampling methods and interpretation guidelines to optimize farm productivity and profitability through improved management decisions.

Based on the graduate student project, Collins authored a fact sheet on soil sampling strategies for diverse vegetable farmers. The fact sheet encourages farmers to map the variability of soil physical properties on their farm and to account for it when conducting soil fertility sampling.

One objective of the Graduate Student grant program is to expose students to the rigors of grant writing and on-farm, applied research in order to better prepare them as future applicants for SARE's larger, multi-year research grants. This has held true with Collins.

Now, as an Extension faculty member with WSU's Small Farms Program, Collins has received more than $500,000 in subsequent SARE funding to conduct three additional projects aimed at improving soil management on organic farms, notably through cover crops and reduced tillage.

"We find these kinds of projects to be instrumental for developing progressive organic soil practices," says Jim Baird of Cloudview EcoFarms, who collaborated with Collins to design one of these projects. "This information is very much needed in our agricultural world."

When Collins brought together a research and producer group, they identified a critical barrier to adopting reduced tillage: a lack of research on successful reduced-tillage practices for systems like theirs in the Northwestern maritime climate. So, his four projects have studied soil properties, tillage practices, cover crops, weed management and nitrogen management in real-world, onfarm situations. All projects have reached over 200 Washington farmers, providing useful information on managing soil on organic farms. Farmer surveys over the course of the projects reveal that while barriers still exist, some are beginning to use aspects of reduced tillage, including terminating cover crops with flail mowers or homemade crimpers, using broad forks to open the soil for planting, and mulching with burlap sacks or straw.

For more information, go to www.sare.org/project-reports and search for GW06-011, SW11-072, SW14-013 and OW15-008.

> ***"Collins has received more than $500,000 in subsequent SARE funding to conduct three additional projects aimed at improving soil management on organic farms.***

Photo by Andrew Mack, Washington State University

WHERE HE IS NOW

Small Farms Extension Specialist, Washington State University

SELECTED PUBLICATIONS

See publications at http://csanr.wsu.edu/people/doug-collins.

A WSU Extension publication created during this project, *Soil Testing: A Guide for Farms With Diverse Vegetable Crops*, is at http://cru.cahe.wsu.edu/CEPublications/EM050E/EM050E.pdf.

LILY CALDERWOOD, University of Vermont

Finding Better Ways to Battle Bugs

When it comes to managing pests, many growers are working to find ecological strategies that reduce pesticide use and favor beneficial insects and pollinators. As desirable as this approach is, it also takes greater understanding of pests, crops and the local environment.

So, while a graduate student at the University of Vermont, Lily Calderwood sought to provide growers with the information they need to implement ecological pest control strategies, by studying how the state's expanding hops industry could reduce pesticide use through beneficial insects and flowering cover crops. She received a 2012 SARE Graduate Student grant to evaluate how cover crop plant species diversity and flowering affect the number of pest and natural predators in hop yards.

After finishing her graduate student project, Calderwood reported that her SARE award was integral to her doctoral research. "The hop cover crop project would not have continued into its second and third years without SARE's support," she says.

Now a senior commercial horticulture educator for Cornell Cooperative Extension, Calderwood gives back to the program that was important to her by having served on the Northeast SARE technical committee that reviewed 2016 Graduate Student grant proposals. In this role, she provided the perspective of someone who has been through the process. "It is a great program, and I'm glad to be part of it," she says.

For her graduate student project, Calderwood worked in an Alburgh, Vt., hop yard with established cover crop plots. She identified beneficial and pest arthropods, correlating them with cover crop development, hop yield and hop quality. After identifying three major pests—two-spotted spider mites, potato leafhoppers and hop aphids—she also identified their natural enemy groups. Calderwood discovered that a large, established stand of unmowed red clover could be used in hop yards as a trap crop for potato leafhoppers.

Calderwood reached hundreds of current and potential hops growers with her findings, including a presentation at the state's 2015 Hop Conference. Out of 31 farmers who responded to a survey, 20 indicated that their knowledge of insect pest identification and scouting had increased, and half are actively scouting for the three major pests. Six of the respondents are currently spraying insecticides and are very interested in learning more about clover as a trap cover crop.

With Cornell Extension, Calderwood continues to research sustainable pest management and biocontrol strategies, while supporting farmers in six New York counties.

Following her SARE-funded work, Calderwood received funding from the EPA to study the potato leafhopper. In addition, she is the technical advisor on a 2016 SARE Farmer/Rancher grant project in Massachusetts, in which she and a hops grower are planning to do an on-farm evaluation of alfalfa as a trap cover crop for potato leafhoppers.

As Calderwood progresses in her career and works with different crops, she finds that "everything can be made more sustainable. That is why this work is rewarding."

For more information, go to www.sare.org/project-reports and search for GNE12-033.

"Calderwood also discovered that a large, established stand of unmowed red clover could be used in hop yards as a trap crop for potato leafhoppers.

WHERE SHE IS NOW

Commercial Horticulture Educator, Cornell Cooperative Extension, Albany County

SELECTED PUBLICATIONS

L. B. Calderwood, S. A. Lewins, H. M. Darby. Survey of Northeastern Hop Arthropod Pests and Their Natural Enemies. Journal of Integrated Pest Management, 2015; 6 (1): 18 DOI: 10.1093/jipm/pmv017

Photos courtesy UVM Extension Northwest Crops and Soils Program

JAVIER GARZA, Louisiana State University

Controlling Sheep Parasites with Alternative Dewormer Treatments

Overuse of dewormers to control internal parasites in sheep has made certain parasites resistant and almost impossible to manage. This poses a serious threat to profitability for farmers, and has caused many researchers to focus on finding alternative treatments.

At Louisiana State University (LSU), Javier Garza used a 2009 SARE Graduate Student grant to research alternative treatments for the gastrointestinal nematode parasite *Haemonchus contortus*. This parasite is a blood feeder that impacts profitable small ruminant production in the Southeastern United States and worldwide. "The problem has become so severe that it is threatening viability of small-scale and limited-resource small ruminant farm operations despite continued high demand for sheep and goat products," Garza says.

Garza's research teamed him up with LSU professor James Miller, who has made good use of the SARE Graduate Student grant program in his work to evaluate and promote alternative, non-chemical methods for controlling parasites in small ruminants.

Miller has served as advisor on four Graduate Student grant projects, a program he views as important for generating data to support hypotheses about alternative strategies. Plus, "we've found no bad results yet," he claims.

Garza's project compared the efficacy of two cost-effective treatments of *H. contortus* infection: copper oxide wire particles and copper sulfate. He found that copper oxide wire particles was the more efficacious treatment. Some producers, knowing of copper sulfate's low cost and possible effectiveness, were putting it in feed every day to keep copper levels up. This practice concerned Miller and Garza because it can cause toxicity through the accumulation of copper in the liver, which destroys blood cells. So, their project focused on administering these copper-based treatments as a drench, not through feed. They found that administering copper oxide wire particles two times at five-week intervals provided effective control and caused no liver toxicity.

As a result of their work, numerous sheep producers have inquired about using copper oxide wire particles for controlling *H. contortus* infections. Their feedback has been positive and encouraging, say both Miller and Garza.

As of 2016, Garza continued his research on the parasite as a Ph.D. candidate at West Virginia University. He remained focused on alternative control methods by studying host-parasite reactions and natural immune responses. Miller stresses the importance of the four graduate student projects in providing sheep producers with an integrated set of alternatives, rather than attempting to identify a single solution. "Producers want the best treatment, but there isn't a best treatment," Miller says.

For more information, go to www.sare.org/project-reports and search for the graduate projects Miller has coordinated: GS05-047, GS07-059, GS08-071 and GS09-083.

Courtesy the West Virginia University Parasite Immunology Lab

WHERE HE IS NOW

Post-Doctoral Fellow
West Virginia University
Parasite Immunology Lab

SELECTED PUBLICATIONS

See scholarly publications at www.researchgate.net/profile/Javier_Garza2.

EMMANUEL OMONDI, University of Wyoming

Keeping an Open Mind

Courtesy the Sustainable Agriculture Research and Extension Center, University of Wyoming

Dry beans, Wyoming's fourth-largest crop by value, can suffer reduced yield and quality due to deficiencies of the micronutrients iron and zinc. This is a normal occurrence in soils with low organic matter and a high pH, which are common in Wyoming. The most conventional solution is to add micronutrients through repeated chemical sprays, but a potentially cheaper alternative explored by a SARE-funded graduate student and some inquisitive farmers lies in something much simpler: grass.

This idea germinated when Mike and Cindy Ridenour observed this benefit of ryegrass on their farm and tested it with a 2006 SARE Farmer/Rancher grant.

"The results of the experiment were encouraging and clearly indicated that there existed some form of symbiosis between the grass and the beans," Mike Ridenour says.

That is where University of Wyoming graduate student Emmanuel Omondi came in. Brought on to the Ridenour's field experiment as a research assistant, Omondi saw the remarkable results and jumped on the opportunity to further the research by studying how intercropping annual ryegrass with dry beans alleviated micronutrient deficiency chlorosis and produced better yields compared to growing beans alone.

Funded by a 2008 SARE Graduate Student grant, Omondi originally focused on pH, organic matter and other soil characteristics. Looking back, he notes that this specific premise "kept his mind in a box" and limited results. However, after he finished his master's degree and started working on his Ph.D., he had a flash of insight that opened his mind to other possibilities.

This "flash" led Omondi to consider the contribution of other soil nutrients toward iron deficiency. Further research showed that surplus nitrogen, and manganese to a degree, were responsible for the deficiency. Ryegrass reduced the concentration of these nutrients in the soil and thus alleviated the iron deficiency that reduces yields.

While more research is needed to make intercropping ryegrass viable commercially, it can potentially save farmers money by reducing the need to spray micronutrients such as iron sulfate. In 2008, Omondi noted that farmers forced to spray iron sulfate two to three times per season would spend $10 to $35 per acre, money that would be saved if ryegrass could do the job just as well. In addition, as a non-chemical cultural practice, intercropping ryegrass would be a welcome alternative for organic and natural bean producers, as well as for farmers in Omondi's native Kenya.

"Cindy and I are pleased to have been a part of Dr. Omondi's master's and doctoral work," Mike Ridenour says. "Through the grants from Western SARE, Emmanuel was enabled to take his enthusiasm and curiosity to expand our scientific understanding of plant-soil interactions, and to become a learned professional within the global agricultural research community."

Now, as the research director for the long-term Farming Systems Trial at the Rodale Institute in Pennsylvania, Omondi appreciates the opportunity he had in Wyoming to bring sustainable solutions to the problems faced in conventional production systems.

For more information, go to www.sare.org/project-reports and search for GW08-016 and FW06-021.

> ***"Omondi noted that farmers forced to spray iron sulfate two to three times per season would spend $10 to $35 per acre, money that would be saved if ryegrass could do the job just as well.***

Photo by Jade Cortez, Rodale Institute

WHERE HE IS NOW

Research Director for Farming Systems Trial
Rodale Institute

SELECTED PUBLICATIONS

See scholarly publications at www.researchgate.net/profile/Emmanuel_Omondi2/publications.

LAURA CHRISTIANSON, Iowa State University

Achieving Cleaner Water Through Nitrate Loss Reduction

The challenge is vast: The Corn Belt includes 38 million acres with tile drainage, and while tiling makes the land easier to farm, it also increases the amount of nitrate leaving fields and ultimately degrades the quality of Midwestern streams, rivers and lakes, and the Gulf of Mexico.

So, Laura Christianson turned her attention to strategies that can make tile drainage cleaner for Midwestern corn and soybean farmers. Using a 2009 SARE Graduate Student grant while at Iowa State University, she evaluated the costs, ecosystem services and farmer perceptions of seven nitrate reduction strategies: wetlands, controlled drainage, cover crops, crop rotation, fertilizer rate reduction, fertilizer timing modification and denitrification bioreactors.

Christianson also compiled cost-efficiency numbers, conducted surveys and held farmer discussion groups, collecting data that continues to inform her water quality work at the University of Illinois, where she is an assistant professor.

For example, the cost-efficiency numbers she compiled were used in the nutrient reduction strategies in Iowa and Illinois. These are research- and technology-based frameworks for coordinating state-level changes that reduce nutrient runoff. She views this as "a huge impact that I am really proud of," Christianson says. "I did work as a graduate student that became part of state-level strategies impacting policy decisions."

With SARE funding, Christianson researched denitrification bioreactors, trenches filled with wood chips through which drainage water is routed. She was drawn to this concept because of its simplicity; bacteria in the wood chips convert nitrates into nitrogen gas, and can remove 15-60 percent of the nitrate load from water that comes from fields. Bioreactors can be placed at field edges, requiring no land to be taken out of production. Although denitrification produces nitrous oxide, a greenhouse gas, research suggests it is a small amount of the nitrate entering the system, and through good design and management, emissions may be minimized.

In her research, Christianson also found that although cover crops are more expensive per unit of nitrate treated than some of the other reduction strategies, farmers expressed more willingness to use them. Gaining in popularity nationwide, cover crops provide a wide range of ecosystem services and production benefits that go beyond nitrate loss reduction, such as soil retention, increased biodiversity and weed suppression.

"I think a better understanding of the costs of conservation practices helps contribute to sustainable agriculture," Christianson says. "But a better understanding of what farmers' perceptions are of certain practices is important, too."

Christianson is applying her knowledge in other important ways: She serves as the Illinois SARE co-coordinator, responsible for sharing information about sustainable agriculture with educators and other professionals in her state.

For more information, go to www.sare.org/project-reports and search for GNC09-103.

Photo by C. Pederson, Iowa State University

WHERE SHE IS NOW

Assistant Professor
of Water Quality
University of Illinois

Illinois SARE Co-Coordinator

SELECTED PUBLICATIONS

The Ag Water Management website has information on wood chip bioreactors, at http://agwatermgmt.ae.iastate.edu/content/denitrifying-woodchip-bioreactors.

See scholarly publications at www.researchgate.net/profile/Laura_Christianson/publications.

JILL ANN FITZSIMMONS, University of Massachusetts, Amherst

Navigating the Costs and Returns of Farm-to-Institution Markets

Chef Jeff Space of the Pen Bay Medical Center in Rockport, Maine, holds a cooking demonstration during an event for university dining service professionals who want to use more local ingredients. University of Massachusetts, Amherst graduate student Jill Fitzsimmons collaborated with the host, Farm to Institution New England, during her research on the economics of farm-to-institution sales. *Photo by Kaitlin Haskins, Farm to Institution New England*

Large institutions such as hospitals, universities, schools and government agencies are increasingly willing to buy from local and regional farmers, an opportunity that benefits the farm economy, public health and communities. To support this growing farm-to-institution market, farmers, institutions and supply-chain intermediaries need information about the costs and returns associated with different distribution models.

While exploring the issue as a graduate student at the University of Massachusetts, Amherst, Jill Ann Fitzsimmons gained valuable insights that go deeper than the straightforward economics of different supply chain models. She learned about, and was able to address, some of the top questions farmers have when they consider marketing to institutions.

Photo by John Solem, University of Massachusetts, Amherst

"What emerged as most important was discovering the other issues that mattered to farmers; it was unexpected and unplanned, but an important consequence of my work," Fitzsimmons says.

Funded by a 2013 SARE Graduate Student grant, Fitzsimmons set out to identify the costs and returns associated with various supply chain models, from direct sales to arrangements involving multiple intermediaries such as processors, aggregators and distributors. Partnering with a regional collaborative network, she conducted indepth interviews with 11 farmers.

However, while talking with the farmers, Fitzsimmons also learned what was on their minds, and in the process identified three emerging topics that affect their profitability in the farm-to-institution market. Farmers wanted to know if online brokerage platforms could reduce transaction costs. They also wondered about the increased risk of violating federal labor and wage regulations as a result of adopting new activities when serving institutional markets. Finally, they asked, how might value-added processing affect the long-term profitability of farm-to-institution sales?

Fitzsimmons developed publications addressing these topics and farmers' questions about them. The publications provide farmers with information and resources they need to make informed choices about whether and how to sell to institutional markets. Fitzsimmons believes that the information she gathered is also important for institutions, researchers and other practitioners who have struggled to clearly understand the role of farm-to-institution marketing in a sustainable farm business plan.

Given the interest she has seen in online brokerage platforms and labor regulations, Fitzsimmons is seeking funding to continue studying these issues. Online brokerage platforms have emerged in the last few years and have the potential to improve farmers' ability to find buyers, negotiate prices and make sales. "Getting better information about these issues through future research would be huge," Fitzsimmons says.

For more information, go to www.sare.org/project-reports and search for GNE13-058.

WHERE SHE IS NOW

Ph.D. candidate in Resource Economics
University of Massachusetts, Amherst

SELECTED PUBLICATIONS

The following Extension publications are available at http://mysare.sare.org/sare_project/gne13-058/:

- *Federal Labor Laws and Farm-to-Institution Sales in New England*
- *Non-Profit Brokers and Farm-to-Institution Sales in New England*
- *Value-Added Local Food and Farm-to-Institution Sales in New England*

LOUIS NOTTINGHAM, Virginia Tech

Identifying Alternative Practices for Controlling a Snap Bean Pest

After receiving an undergraduate education in biology and working in fish and wildlife management, Louis Nottingham developed an interest in sustainable agriculture, appreciating its "real-world" applications, especially in horticulture and field crops. While searching for a graduate program, he ran into entomology professor Thomas Kuhar at a Virginia Tech research field, where the two discussed the importance of sustainable pest management. A short two months later, Nottingham moved to Virginia to work with Kuhar.

In the course of his studies, Nottingham received a 2013 SARE Graduate Student grant to research cultural strategies for controlling Mexican bean beetles in snap beans, grown on over 5,500 acres in Virginia and considered an important crop in the state.

Kuhar, who has served as faculty advisor on three other SARE Graduate Student grant projects and is a fan of the program, was Nottingham's advisor.

Kuhar appreciates the program because it teaches students grant writing and project management. The program encourages students, he says, to include additional research objectives to an ongoing project, especially ones that take a closer look at sustainability and help farmers with the challenges they face. It "clearly gets the students thinking about the research that they are doing and how it fits in the real world," Kuhar says.

This held true with Nottingham. His graduate research focused on cultural control strategies that could reduce the need for chemical foliar applications on snap beans. Originally he was not looking at mulch as a possible strategy, but was able to add it as a research objective when he got the SARE grant. Mulch wound up being the best alternative he found. "The grant allowed me to expand my research and dive deeper into some of the questions I had," Nottingham says.

The project found that reflective or metalized plastic mulches significantly reduce populations of Mexican bean beetles, a serious pest of snap beans, while increasing yields. The mulch produced significantly greater pod yields than all the other treatments—more than double that of bare soil plots.

Although metalized plastic mulch costs roughly $45 for 200 feet and black plastic costs about $30 for 200 feet, mulch is cost effective because growers can more than double their yield compared to bare soil, according to Kuhar.

True to the Graduate Student grant program's purpose, Nottingham recognizes the real-world benefit of his research. "Because our plastic mulch study is very applied and produced clear results, I encourage growers to try planting beans on metalized mulch, especially if they encounter large populations of Mexican bean beetle," he says.

In his Ph.D. program, Nottingham is pursuing some of the other strategies he evaluated, using the preliminary data he collected during his SARE project.

For more information, go to www.sare.org/project-reports and search for the graduate projects Kuhar has coordinated: GS09-081, GS13-120, GS14-131 and GS15-144.

Photo by Whitney Cranshaw, Colorado State University, Bugwood.org

> ***"The program … 'clearly gets the students thinking about the research that they are doing and how it fits in the real world.'***

Photo by Ben Aigner

WHERE HE IS NOW

Graduate Research Assistant and Ph.D. candidate
Virginia Tech

SELECTED PUBLICATIONS

The following Extension publications are available at http://pubs.ext.vt.edu/department/entomology-res.html:

- *Mexican Bean Beetle (ENTO-51NP)*
- *History, Distribution and Pest Status of the Mexican Bean Beetle (ENTO-62NP)*
- *Pediobius foveolatus - A Parasitoid of the Mexican Bean Beetle (ENTO-170NP)*

See scholarly publications at www.researchgate.net/profile/Louis_Nottingham.

WHAT FACULTY ADVISORS SAY

"I have found the SARE Graduate Student grants program to be particularly useful in helping train my Ph.D. students in the grant-writing process—from designing the project to planning and preparing the budget and everything in between. It helps them to really understand the time and effort needed to successfully plan and implement a research project. Students take a lot of ownership and pride in the fact they were able to successfully write a grant and carry out a project that is really "theirs." It is a fantastic resume builder for students and helps them on their journey to becoming independent researchers.

— Kristi Cammack, University of Wyoming

"I have found this to be a very effective program, for many reasons. The students learn to write a proposal, manage funds to get the research done and create a final report. The SARE funding is often seed money for further research. And very importantly, the students gain experience in communicating with the end user (producer) by giving presentations. Altogether this is a very valuable program.

— Mohammad Babadoost, University of Illinois

"I like the mission of the SARE program and encourage my students to apply for the Graduate Student grants. Often, through managing a SARE-funded project, the student, who may be focused on basic research, learns the importance of applied research and helping the farmer who is facing a real problem. The experience clearly helps the students think more about what they are doing and how it fits in the real world.

— Thomas Kuhar, Virginia Tech

Photos (from top left): *Photo by Lance Cheung, USDA.* University of Wisconsin graduate student Melanie Stock (far left) describes her research on the influence of manure management techniques on runoff and nutrient loss. *Photo by Marie Flanagan, NCR SARE.* Washington State University Extension Specialist Doug Collins, a former SARE Graduate Student grantee, works with a current graduate student on a reduced tillage organic agriculture experiment. *Courtesy Doug Collins.*

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