SPRING/SUMMER 2019

Horticulture

University of Minnesota | CFANS College of Food, Agricultural and Natural Resource Sciences

ON THE COVER

Photo courtesy of Shannon Lab

The Shannon Lab

Prospective new potato plant under consideration as part of a Shannon Lab breeding program trial at the North Central Research and Outreach Center. The Shannon Lab studies potato genomics, diversity, and evolution. They are also tasked with breeding and selecting potatoes for the red, russet, chip and table market classes to meet the needs of Minnesota potato growers.

For more information about the Shannon Lab and their research, visit potatogenetics.cfans.umn.edu

WHO WE ARE

Community. Diversity of thought. Excellence. Innovation. Impact.

Our Mission

The primary mission of the department is to discover, interpret, and transfer new knowledge for the purpose of improving quality of life through a) improving productivity, value, and use of horticulture crops; b) contributing to a quality environment; and c) educating students.

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SUPPORT US

Horticultural Science advances our vision to catalyze collaborative plant research and expand real-world learning opportunities for students in horticultural science.

horticulture.umn.edu/support

THANKS TO:

Samantha Grover
Lauren Matushin
Michele Schermann
Brian Horgan
Eric Lonsdorf
Chris Nootenboom
Ben Janke
Turf Team
Mia Boos
Sharon Perrone
HAFA
Grossman Lab
Kelsey Bogdanovich
Leslie McDougall

Photo by Vivian Wauters

Fixed that for you

Graduate student, Vivian Wauters, took 2nd place in the 2018 ACSESS Annual Photo Contest with

"Fixed that for you". z.umn.edu/3zwf

"Inside of these modules, microbes are harnessing an element that we all need for life! Rhizobia partner with legumes to convert atmospheric nitrogen into an organic form. This symbiotic process has been a key mechanism behind soil fertility for millennia."

— Vivian Wauters, Graduate Student

Photo by Kelsey Bogdanovich

Food Systems Career Panel

"It was wonderful to hear from successful alumni who are excelling in their careers. This panel was a great opportunity to gain insight on the curricular experiences that were most valuable to alumni as they transitioned into the workforce. We are happy that so many alumni of this program are doing wonderful things."

— Mary Rogers, Assistant Professor

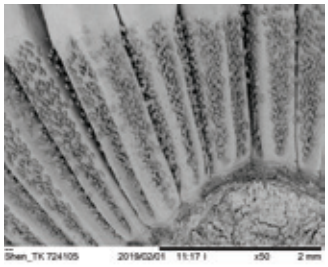


Photo by Anderson Lab

"This is a typical image for our research in the Anderson flower lab. We image Pyrethrum flowers in cross-section and then count the trichomes (the small oval shaped structures). There are approximately 52,000-135,000 trichomes per flower. We image 3 flowers per genotype to help determine which of our plants might be good parents or good for production. This year we counted trichomes on 624 flowers representing 179 genotypes."

— Michele Schermann, Researcher

Photo courtesy of Crop Science Society of America

Honoring Professor Eric Watkins

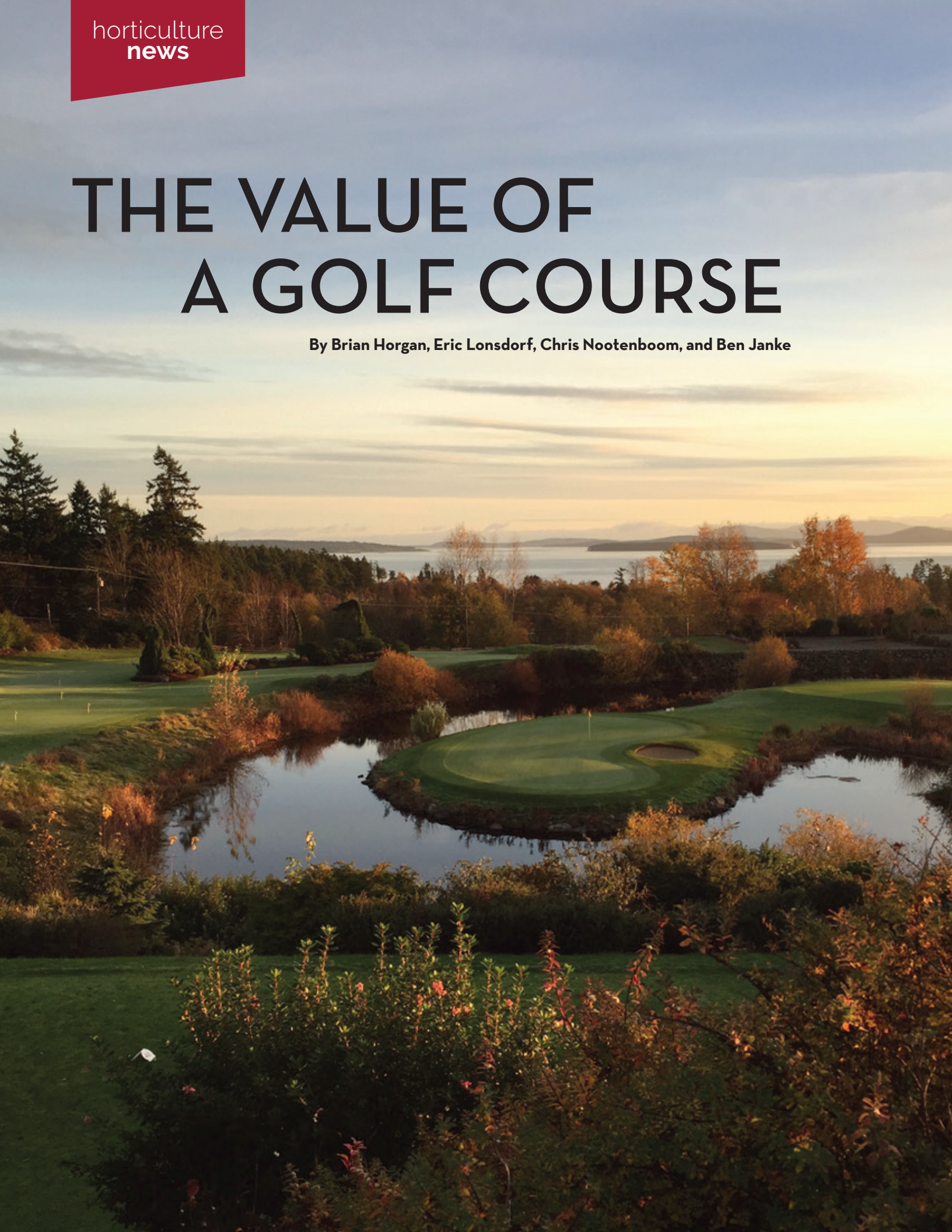
Eric Watkins was awarded the 2018 Crop Science Teaching Award from the Crop Science Society of America.

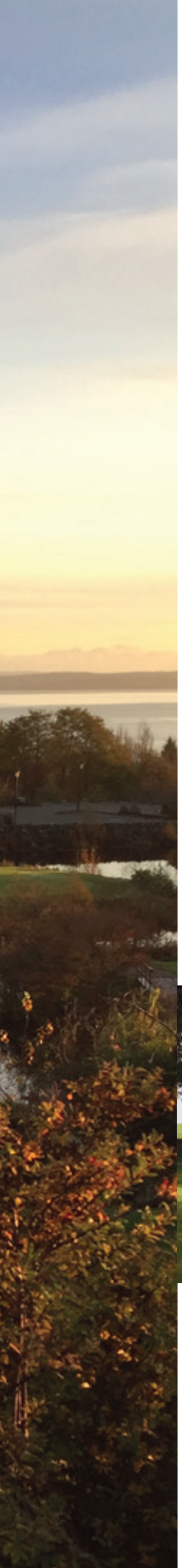
"The Crop Science Teaching Award is an honor I will soon not forget; to win such an award from a major professional organization is possibly the highlight of my career."

— Eric Watkins, Professor

THE VALUE OF A GOLF COURSE

By Brian Horgan, Eric Lonsdorf, Chris Nootenboom, and Ben Janke





Golf courses are often viewed as elitist playgrounds that consume land and require extensive inputs of fertilizers, pesticides, and water. They tend to be contained within a community and are only identified as valuable assets by those that use them for recreation. Unfortunately, these statements are both true and false. Since the last recession, approximately 7% of domestic golf courses have shuttered; some for real estate and some due to fewer golfers and declining revenue coupled with rising expenses. Now, there are just over 14,000 golf facilities across the United States and, while the direct costs and benefits are fairly clear, the indirect contribution to the public is not. So the question remains: are golf courses valuable to surrounding communities beyond recreation?

To answer these challenging questions, a research partnership was established between the United States Golf Association and turfgrass science faculty within the Department of Horticultural Science and the Institute on the Environment Natural Capital Project at the University of Minnesota. Stakeholders within the golf industry, local residents, community members, resource managers, conservationists, and local government were engaged to advocate their interests during a recent workshop. The goal was to determine what contributes to the potential value of the space a golf course occupies. What was found was that golf courses have the potential to positively impact their surrounding environment through multiple facets, urban heat island effect.

Land Use Change Impacts on UHI – If all 135 golf courses in the Twin Cities were to be converted to residential housing, the resulting temperature increase covering 350 square miles would be up to 0.83°C.

"Natural Value"

Urban landscapes are complex, involving multiple land uses (e.g. ownership parcels, zoning overlays) and potential land covers (e.g. tree canopy, pavement, building). The landscape serves the environment based on these land uses and covers. To assess changes in ecosystem service resulting from land use change —for example, changing a space from a golf course to a residential development— the team developed a "wallpaper method", a boiled down copy-and-paste which takes a land use elsewhere in the city and applies it to the new space.

This allows any space to temporarily switch its land use to a generalized alternative. For this project, six alternative scenarios were created for golf courses in the Twin Cities: agriculture, city park, industrial area, mixed natural area, residential development, and suburban development. The scenarios were applied to each of the 135 Twin Cities Metro Area golf courses. Combined with the original golf course scenario, this provided 945 individual scenarios to evaluate ecosystem services.

The Urban Heat Island The Urban Heat Island effect is the difference in temperature in the built environment compared to the surrounding natural environment. Built environment materials tend to absorb and store more heat and reflect less sunlight than vegetation-covered ground. Anyone who has ever walked barefoot on pavement during the summer and quickly runs to the cool grass knows the feeling.

Golf courses make up a significant proportion of green space in cities across the country, and they provide

a substantial service to the surrounding ecosystem despite their extensive management regimes. The NatCap Golf Analysis aims to contextualize that value and illustrate the ecosystem service tradeoffs. In the Twin Cities area, golf courses function as urban green space and provide many of the same ecosystem service benefits as natural areas and city parks; their vegetated land cover provides similar urban heat island reduction to other urban green spaces.

However, unlike municipally-owned city parks and nature preserves, many golf courses are privately owned, but still open to the public. This leaves them at risk to the economic pressures of urban development, with little regard to the associated loss of ecosystem services. It becomes a challenge when a privately owned enterprise managed for private benefit provides a suite of public benefits in the form of ecosystem services. For example, if all 135 golf courses in the metro area closed, 350 square miles of land would see an increase of temperature as much as 0.83°C per night.

It's worth recognizing that more golf courses will inevitably close, due to declining popularity or increasing cost, and be converted into some form of housing or commercial use. Research, like that conducted by the US GA-UMN partnership, will guide local governments and urban planners with an eye to the public good.

Read this article online with added bonus content at z.umn.edu/Newsletter19_Turf. To see what the Turf Team is up to next visit: turf.umn.edu.

LAND OF TEN THOUSAND BREWS:

Swapping brewery wastewater for traditional fertilizers

By Lauren Matushin

With over 150 local breweries stretching from Luverne to Ranier, Minnesota might very well be the land of ten thousand beers, producing over six hundred thousand barrels per year. Combine Minnesota's rich agricultural industry with dozens of breweries opening in rural and urban farming communities, and a unique collaboration opportunity arises. Department of Horticultural Science graduate student, Naxo Riera Vila, is hoping to combine Minnesota's love of beer and agriculture in an unlikely way: wastewater.

Working in the U's partnership with Fulton Brewing and the Department of Civil, Environmental, and Geo-Engineering, Riera Vila is hoping to create an integrated system that treats brewery wastewater more efficiently. The system would use anaerobic digestion to treat the water, simultaneously producing the energy needed to run the system, before using the treated water as a substitute for traditional fertilizer. "Breweries produce a lot of wastewater," Riera Vila says. "It's rich in organic matter and it was made in a system for human consumption. It's ideal - lots of nutrients, no pathogens."

While it may seem like a perfect fit, little research exists on utilizing treated wastewater as a fertilizer, and the project was slow to start. After perfecting their anaerobic digestion process and switching from a hydroponic system to standard pot watering, the data showed an exciting result. The mustard, basil, and lettuce plants that received treated wastewater grew just as well as those receiving traditional fertilizer.

"Even the plants getting untreated wastewater grew well!" Riera Vila says. "Not as well as treated, but still." He wants to start testing on a larger scale, using wastewater from multiple breweries. "A larger scale means different problems. Sure, eighty plants worked, but could we do it with thousands and still see the same success?"

Beyond success in the greenhouse, there's the question of industry acceptance. An integrated system of wastewater treatment and crop fertilizing would require interest and commitment from both brewers and growers. But as a leader in sustainable agriculture, Minnesota seems like the ideal location. "We want to see a brewery partner with an urban grower to have a space where you produce the beer, get the wastewater, go right next door, and grow the plants. All on one site!" We'll toast to that.

Riera Vila's work is supported in part by funding from the Grand Challenges Exploratory Research Grant. To learn more about industry-university partnerships and research in the department, visit horticulture.umn.edu/research-outreach.

"We want to see a brewery partner with an urban grower to have a space where you produce the beer, get the wastewater, go right next door, and grow the plants."

BEAUTIFUL LAWNS, NATURALLY

By Mia Boos

Shay Lunseth created something because she needed it. After the Master of Professional Studies in Horticulture student and her husband had their first daughter, she grew increasingly uncomfortable about the amount of chemicals they were using on their lawn.

Lunseth had always been environmentally conscious and could see the potential in organics. She and her husband, who has his own commercial lawn care business, decided to get ahead of the curve, and in 2010 started Organic Lawns by Lunseth.

"The first year we had 10 customers, then 30, 60, 200, now around 600. We were in our garage, then a shop, an office, now a building," Lunseth says. "People find us because there aren't a lot of options in organic lawn care."

Planting the Seed

Lunseth obtained an undergraduate degree focusing on the designed environment from the University of Minnesota. After working in property management, sales, and publishing, she realized what she really wanted to do was help develop the family business.

"I was tired of asking my husband basic lawn care questions about why things were done a certain way." How can we use products if we don't know everything about them, she asked herself. Her husband encouraged her to start researching natural tools and approaches. She took it a step further and decided to go back to school.

"I wanted to know the science behind what we were doing and make sure we were doing it right," she explains. "I already had the job; I wanted the education to do it better. And here I had the opportunity to study specifically what I was doing in my work."

Cultivating Growth

Lunseth talked to advisers and faculty about the best route for her degree. She was able to take courses and choose projects that were geared specifically toward organic lawn care and turf management.

> **"I already had the job; I wanted the education to do it better."**

"My first big project in school was organic weed control. Is it a possibility? It is! But there is no quick and easy method. You don't get overnight results; you need to do it over time."

Lunseth says that 90% percent of organic lawn care is just taking proper care of the species of grass you have. "If you water it too often or apply too many chemicals, the roots don't have the tools to reach the nutrients in the soil on its own because its used to the synthetics that it's getting close to the surface. Eventually, you'll teach your roots to grow deep so they're more drought resistant."

The organic method her company recommends typically takes three years to reap the full benefits. "We don't need to see your lawn before you start the process. It will work on any type of soil," she says. "I wouldn't be able to do this if I hadn't taken all these turf courses and understood how it works."

Branching Out

Today, Organic Lawns by Lunseth and Lunseth Lawn Care Professionals serves residents across the state, including Rochester, Ramsey, Andover, Corcoran, and Saint Michael. They combine traditional and organic techniques for many townhome and condo associations, but they refrain from using chemicals on private residential lawns.

"I think we're at a tipping point," Lunseth says. "Many people don't know that there is an organic option. Or they don't really care about their lawns but their neighbors do, so they'll opt for an organic option."

With both the commercial and the organic sides of the business successfully established, what's next for Lunseth? She is eager to devote more time to outreach and attending public events to spread the word about organic options.

"I'd like to give talks that motivate people to do this themselves, not just to sell our products, but to encourage them to use fewer chemicals. We buy organic food, but we don't think about it when it applies to our lawns. Chemicals will never go away, but we need to be smart about how we use them."

To learn more about the Masters of Professional Studies in Horticultural Science visit: z.umn.edu/MPSHorticulture

WEEDS IN THE WALKWAYS

By Sharon Perrone

Mai Moua is no stranger to cover crops; but neither is she a follower. She's an innovator. Moua is a farmer member of the Hmong American Farmers Association (HAFA), a land cooperative food hub in Vermillion Township, MN, meaning that HAFA growers rent parcels of land owned by the organization and share tools, processing facilities, and contracts. Moua grows a variety of vegetables and flowers for local farmers markets, food co-ops and the HAFA Flower CSA, and her practices helped inspire a collaborative research project between HAFA and Dr. Julie Grossman's lab at the University of Minnesota's Department of Horticultural Science.

Cover crops are plants grown in either temporally or spatially distinct spaces from cash crops, primarily in order to improve soil health. By keeping portions of the soil covered that would otherwise remain bare, cover crops can prevent soil erosion, feed soil microbes through root exudates, reduce soil compaction, and maintain soil temperature and moisture. Growers choose a variety of cover crops to meet different goals, constraints, and intended outcomes. As for Moua, she has been growing weeds in the walkways as a "living mulch" between her dahlias in order to improve trafficability of the field after a rainfall (i.e., avoid muddy soil compaction) and to reduce soil splash, which can spread disease.

HAFA executive director, Pakou Hang, approached Grossman in 2017 with the hopes of developing a project that would compare practices used by growers at HAFA farm to legume cover crops that have shown to be successful in our region. Legumes are a specific type of cover crop that partner with soil bacteria to fix atmospheric nitrogen into a biological form, essentially bringing 'free' nitrogen to the soil system to feed plants ecologically. "Chosen carefully, legumes may provide the same benefits as Moua's living mulch with the additional nitrogen fertility," explained Ph.D. student Sharon Perrone, the graduate student project lead.

The project was funded in 2018 by the University of Minnesota's Health Food, Healthy Lives Institute as part of their Community-University Partnership grant program, with the primary goal of improving Hmong farmers' capacity and self-efficacy to tackle soil fertility issues. Because Hmong farmers have traditionally

"On-farm research such as this allows farmers to evaluate their options and then choose the system that is right for them" said Dr. Julie Grossman.

faced barriers to land tenure, soil health – which may take years to improve – has been difficult for farmers to invest in or observe. During the annual spring orientation meeting, Perrone and growers worked together to address growers concerns such as crop bed width and walkways. In the end, Perrone and growers decided to use white Dutch clover as the cover crop species due to its short stature and non-spreading growth habit.

"We are thrilled to see farmers learning about legume cover crops through this research project. On-farm research such as this allows farmers to evaluate their options and then choose the system that is right for them," said Grossman.

And the results? "We see little difference in terms of soil health parameters between the Hmong living mulch system and the white Dutch clover," said Perrone. "That's not discouraging – it appears that in year one, farmers have the option of which system they prefer. For example, white Dutch clover required frequent mowing early in the summer to outcompete weeds and establish fully, but weedy living mulches require more frequent mowing towards the end of the summer to prevent heading and spread of weedy species. A grower can think in advance about points in the season when labor is in lower need and choose a method accordingly."

Perrone also noted that white Dutch clover is a biennial species, meaning that it puts on its best growth in year two, and that changes in soil health are more likely to be observed when the cover crop is tilled into the soil and decomposed at the end of a season or life cycle. Although funding for the project has ended, some of the growers have left the clover to overwinter and are looking forward to seeing how it performs after the first year and observing how it impacts their soils after termination.

Ka Yang, HAFA's research associate, says the iterative process of design and implementation between farmers and researchers was critical to the success of the project. "Because we can work so closely with farmers onsite, we are able to have a more realistic approach to tackling soil fertility. It's one thing to conceptualize better soil fertility, but growers are the ones facing this issue directly. Having this immediate feedback on what is or isn't both impacting soil health helps farmers build confidence in self-efficacy and decision-making while improving our practices and refining our research methods."

To learn more about the research going on in the Grossman Lab visit: grossmanlab.cfans.umn.edu

Photo courtesy of University of Minnesota

Call for nominations for the next Alumni Award

The Distinguished Alumnus Award for the Department of Horticultural Science recognizes distinguished achievement in the many and varied forms. Nominees are chosen based on a variety of factors; for some alumni, the award may recognize distinguished achievements in research and scholarship, whether in academic of non-academic settings. For other alumni the award may recognize distinguished achievements and/or leadership in their chosen professions, as well as notable service in the area of horticultural science. We hope to capture the diversity of distinguished achievements by those educated in our department with this award.

The recipient of this award will be recognized at the Kermit Olson Memorial Lecture.

Past winners have included:
Royal Heins (Ph.D. 1978), Eric Lee-Mader (M.Ag. 2005)
Phil Allen (Ph.D. 1990)

Visit z.umn.edu/hortalumniaward for more details on how to apply.

Photo courtesy of CFANS

"I'm so excited to have this incredible opportunity to continue my education and career exploration and preparation through Minnesota Studies in International Development Senegal."

National Security Education Program's David L. Scholarship Recipient Jace Galley

Food Systems major Jace Galley has been awarded the prestigious David L. Boren Scholarship by the National Security Education Program to support a year of study in Dakar, Senegal. A series of topical courses, from a freshman seminar on urban farming to a Grand Challenge course on agronomics, economics, and hunger, consolidated his interest in food security and sustainable agriculture, while studies in Francophone cultures have prepared him to address the particular issues of food systems and development in West Africa.

"I'm so excited to have this incredible opportunity to continue my education and career exploration and preparation through Minnesota Studies in International Development Senegal."

During his time in the department, Jace has been awarded a Markhart Scholarship, he worked as a research intern and farmhand for Cornucopia (UMN's student run organic farm), and most recently has been working on assessing the potential of chicken grazing and clover cover to develop soil fertility for organic farming – a project for his honors thesis with Professor Mary Rogers.

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GIVING

Your support makes a critical difference in what the Department of Horticultural Science is able to do together as a community - in the research we are able to advance, the new programs we are able to create, and the talented students we are able to support. Your spirit of giving is a tremendous vote of confidence in our shared endeavor.

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