Center for Sustaining Agriculture & Natural Resources

Science In Action to Improve the Sustainability of Agriculture, Natural Resources, & Food Systems

2014 Annual Report
In the early 1990s, leaders in Washington’s agriculture and food communities had the vision to create an incubator for sustainable and organic agriculture research and education at Washington State University (WSU). Now more than two decades later the Center for Sustaining Agriculture & Natural Resources (CSANR) is a critical cog in that wheel. Thanks to the groundwork laid by those early visionaries (many who are still actively engaged), WSU is a place where students, faculty and partners eagerly engage in sustainable and organic agriculture research, extension and educational activities.

Articulating the breadth and depth of the Center’s work is a challenge. Our affiliated faculty, staff and students work on issues that range from nutritional quality of organic produce to alternative marketing, and from the fate of environmental contaminants in compost to trace gas emissions from soil. Our structure includes topically based programs that convene faculty, students and partners to advance the science and practice of sustainable agriculture. The string that ties the Center’s work together is our commitment to generating and disseminating scientific knowledge that improves the sustainability of agriculture, natural resource and food systems in Washington State.

In 2014, the Center awarded 11 new seed grants through our BIOAg grant program for faculty and students to initiate research inquiries in new areas and to provide educational training to Washington farmers and ranchers.

Through the diverse efforts of our affiliated faculty and students, more than $3.8 million in new extramural grants and contracts have been secured and nearly 60 new research papers published this year. In this report, you’ll read a few examples of the work from our affiliated faculty and students.

We welcome your ideas or suggested opportunities for new projects. Virtually every project we work on was spurred through a conversation with someone who cares about the sustainability of Washington’s food and agriculture system. Please feel free to contact me or the appropriate Program Team member in the area of your interest:

- **BIOAg, Climate Friendly Farming, Natural Resources**: Chad Kruger, cekruger@wsu.edu
- **Small Farms**: Marcy Ostrom, mrostrom@wsu.edu/Doug Collins, dpcollins@wsu.edu
- **Measure to Manage (M2M)**: Chuck Benbrook, cbenbrook@wsu.edu
- **Waste to Fuels (W2F)**: Craig Frear, cfrear@wsu.edu
- **Organic Agriculture**: David Granatstein, granats@wsu.edu

Please take a few minutes to peruse this report for a taste of what the Center is about. If you like what you see, I’d encourage you to dig deeper on our website (http://csanr.wsu.edu/) and blog (http://csanr.wsu.edu/category/blog/) or follow us via social media (https://www.facebook.com/CSANR, https://twitter.com/wsuCSANR).

Chad Kruger
Director
The Center for Sustaining Agriculture & Natural Resources administers the Biologically Intensive Agriculture & Organic Farming (BIOAg) grant program on a yearly basis. BIOAg is our internal competitive grant program that we use to initiate new research and education activities focusing on biologically intensive and organic approaches to sustainable agriculture.

Go to http://bit.ly/1zTH4d for the BIOAg grant database.

### New BIOAg Grant Projects Funded in 2014

**ID 141** Soil Quality Network 2014  
Principal Investigator: Donald McMorran

**ID 140** Cascadia Grains Conference and Growing Grains Extension Publication  
Principal Investigator: Lucas Patzek

**ID 139** A biologically intensive approach to induce the natural immunity of potatoes against the pathogens inciting Late Blight and Verticillium wilt  
Principal Investigator: Lee Hadwiger

**ID 138** Monitoring Uptake of Legume N by Apple Trees Using Nitrogen Isotope Discrimination  
Principal Investigator: David Granatstein

**ID 137** Impact of Arbuscular Mycorrhizal Fungi on Phosphorus Use Efficiency and Root Diseases of Onion Crops  
Principal Investigator: Lindsey du Toit

**ID 136** Searching for Organic Antimicrobials  
Principal Investigator: Meijun Zhu

**ID 135** Biodiversity and the Natural Suppression of Human Pathogens  
Principal Investigator: William Snyder

**ID 134** Introducing Organic Quinoa Production Systems in the Palouse  
Principal Investigator: John Reganold

**ID 133** Beyond beef and barley soup: Development of nutritionally dense, hulless food barley varieties for organic farmers  
Principal Investigator: Kevin Murphy

**ID 132** Economic Costs and Benefits of Soil Improvement Practices  
Principal Investigator: Andy McGuire

**ID 131** Exploring Root Architecture as a Defense against Soil-Borne Pathogens  
Principal Investigator: Scot Hulbert

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### Featured BIOAg Projects

#### Expanding the Cider Apple Industry in Washington State

**Researchers:** Carol Miles, Suzette Galinato, Karina Gallardo

The Center awarded two BIOAg grants to Carol Miles and her team for approximately $48,000 since 2012 to research production and the sustainability of the emerging cider apple industry in Washington State (Project Summaries available at http://bit.ly/18q9TEx & http://bit.ly/1Gx84WA). These projects have focused on economics of the industry, the cost/return for establishing a cider orchard, how to develop a sustainable industry, and cider quality. Washington State is leading the hard cider industry revival and is a leader in cider research and education in the country, and WSU Mount Vernon NWREC boasts one of the most active hard cider programs in the country.

This project provided growers with knowledge and tools for establishing and producing cider orchards in western Washington. Tools developed include a cider production budget, break even prices and profitability information, and a guide based on orchard profitability to set fruit prices. The ultimate goal of the cider programming efforts is to provide a foundation for this growing industry in Washington State.

These projects led to an additional $80,000 in leveraged funds and the basis for the currently funded NIFA SCRI $50,000 planning grant project. For more WSU Cider information, visit http://bit.ly/1Ev0fbd.

#### Adapting Quinoa Varieties for Washington Environments

**Researchers:** Kevin Murphy, Chris Benedict, Kefyalew Desta, Brad Jaeckel

The rising popularity of quinoa in the Pacific Northwest has created the need for research designed to increase knowledge and awareness of appropriate farming practices and best adapted varieties of this regionally novel seed crop. In 2012, the Center provided $34,867 in BIOAg grant funding (project summary available at http://bit.ly/1JRifB6) for research that will lead to an improvement in quinoa varieties and an increase in quinoa production throughout Washington State. The objectives of this research are to develop varieties for targeted growing regions, expand trials of existing and readily available varieties, and develop relationships between farmers, processors, distributors, WSU research personnel, and end users, to effectively bring quinoa from farm to table.

This research has led to the identification of regionally specific varieties and agronomic practices that will allow growers to successfully produce this crop across most regions of Washington State. Multiple outreach products have been developed from this research, including an International Quinoa Research Symposium, hosted by WSU in Pullman, WA and multiple field days, webinars, oral and poster presentations, which have been reached stakeholders on local, national and international scale. Further grant funding totaling over $1.8M has also been secured to expand interdisciplinary, multi-state research on this popular crop.

For more information check out the article at http://bit.ly/1FZaZAg.
Researchers: Doug Collins, Andy Bary, Chris Benedict, Colleen Burrows, Craig Cogger, Andrew Corbin, Carol Miles

Organic Farming Research: Reduced Tillage and Cover Cropping for Long-Term Solutions

In 2010, the Center provided a group of six researchers a $40,000 BIOAg grant (http://bit.ly/1zU5bE) to investigate reduced tillage and cover cropping on western Washington organic vegetable farms. Since that time, the project has leveraged grants totaling over $1.2 million for research that will continue into 2016. Some results have already been published in the peer-reviewed journal Renewable Agriculture and Food Systems (http://dx.doi.org/10.1017/S1742170514000246).

The purpose of this research was to investigate the barriers to improved soil management, weed management and equipment access for organic vegetable farmers in western Washington.

From 2011-2014, the project was supported through funding from Western Sustainable Agriculture Research & Education (SARE) & from a NIFA USDA Organic Transitions project. The following summarizes the research scope and findings from those projects:

1) Identify production methods that effectively integrate cover crops and reduced tillage technologies to improve soil quality while reducing in-season weed pressure and seed bank populations on western WA organic farms.

- The reduced tillage technologies evaluated for soil preparation for planting or transplanting broccoli and squash included zone tillage (12-inch wide swath with a ground-driven strip tiller) and a no-till planting aid (disturbs a 2-inch swath of soil).
- Broccoli yields remained the same in all treatments throughout the three years of the study, however squash yields were higher in two of the three years in the full-tilled plots.
- Cover crops (3 grains, 5 vetches, and 7 mixes) were planted to evaluate variety, termination type, and termination time. Roller/crimper method was ineffective for vetches. Termination time influenced the effectiveness of rolling in grains (“early” was less effective than “late”) as well as the percent weed cover (2013 only; “early” had fewer weeds than “late”). Rolled grains had lower weed percentage cover than did flailed grains. Termination by rolling was more effective for rye than barley. Vetches contained between 117 and 179 kg ha⁻¹ N.

2) Evaluate profitability and greenhouse gas impacts of reduced tillage cropping systems on these farms.

- Soil respiration and CO₂ emissions were consistently higher in the full-tillage treatment than in the reduced or no tillage treatment for the first 7 days after tillage.
- From an economic perspective, there was no significant difference among treatments in broccoli in terms of yield and time spent weeding.

3) Facilitate adoption of reduced tillage technologies and ideas to a wide audience.

Along with the research, multiple field day events were held reaching approximately 210 producers and professionals leading to increased knowledge and the beginning of technique adoption by farmers. The following publication profiles two of these farms: Wayman, S. and D. Collins. 2013. For the life of the soil: Farmer perspectives and experiences adopting reduced tillage organic agriculture. Tilth Producers Quarterly. 23(4): 1, 4-5.

Interest in incorporating cover crops and reducing tillage to improve soil quality is high among organic growers in Washington. Weed management is an impediment to further farm adoption. Despite high cover crop biomass and small percentages of weeds prior to termination, weeds will find their way through the terminated cover crop mulch.

Despite the barriers still to be studied, the interest in reduced tillage organic agriculture continues to be high and our early results indicate there are reasons to be optimistic. The potential for further adoption by organic farmers is greater as new strategies are developed and equipment becomes more available.

The research findings in this study have proven the need for further study to focus on reducing risks for early adopters and increase the adoption of reduced tillage in the maritime Northwest. This current research project will continue at least into 2016 with additional funding secured from Western SARE.

Featured BIOAg Projects

Organic Farming Research: Reduced Tillage and Cover Cropping for Long-Term Solutions

Researchers: Doug Collins, Andy Bary, Chris Benedict, Colleen Burrows, Craig Cogger, Andrew Corbin, Carol Miles

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The organic agriculture program did an analysis of data from Washington organic growers for select specialty crops. Many growers have yields lower than state averages, prices above state averages, and gross returns per acre that generally equal or exceed “conventional” production. These results varied by crop, with organic raspberry, snap beans, and hops averaging 40% or more yield reduction, while organic carrots, onions, and juice grapes equalled or exceeded average conventional yields. A new extension fact sheet series on trends in organic crop production was launched to make these results accessible. Additionally, the program continued to work regionally and nationally on alternative fire blight controls for organic apple and pear, and is part of a new OREI grant on this topic.

**Program Updates**

**CSANR’s work is managed through a diverse and evolving set of topical Programs. Each of these programs represents a concentration of people and funding focused on advancing science and practical solutions to sustainability challenges facing Washington’s agriculture, food and natural resource systems. In the next few pages, you’ll read brief highlights from each of our program areas with longer features about Climate Friendly Farming and Small Farms & Food Systems.**

**Organic Agriculture**

David Granatstein

**BIOAg**

We held the 2014 Building Soils for Better Crops workshop in Moses Lake, with 140 attendees representing approximately 192,000 acres. Attendees reported using organic amendments on 76,667 acres, green manures/cover crops on 67,453 acres, and high residue farming on 62,954. 69% of the growers present increased use of soil building practices in the past two years due to WSU programs (46,087 acres) and 76% plan to increase their use of soil building practices. The main benefits experienced are improved control of wind erosion, higher yields, and reduced fertilizer costs.

Andy McGuire

**Waste to Fuels (W2F)**

From a research perspective, 2014 highlights are the leveraging of years of anaerobic digestion and nutrient work into a prestigious EPA Star grant, partnering with the Water Environment Research Foundation on one of four regional centers. A related accomplishment is the growth of our national reputation, being asked to serve as technical expert on several federal agency programs related to release of reactive nitrogen (EPA), conversion of wet organic waste to fuels (DOE), Biogas Roadmap (EPA, USDA), CAFO nitrate concerns (EPA) and nutrient cycling (USDA, Dairy Innovation Center). From an extension perspective, 2014 led to the development of several peer-reviewed extension documents as well as continued work with state stakeholders on project development.

Craig Frear

**Natural Resources**

We have traditionally defined the “NR” in CSANR as natural resources programming at the intersection with agricultural production systems, and we do most of this work in partnership with other units. The most prominent focus of recent natural resources efforts is the development of the BioEarth Model and it’s application in the Columbia River Supply & Demand Forecast Project, a partnership that includes WSU’s Center for Environmental Research, Education and Outreach (CEREO) and the State of Washington Water Research Center. The Forecast is critical to helping the State of Washington prioritize investments in future water supply to balance agriculture, fish, municipal and hydropower needs.

Chad Kruger

**Measure 2 Manage (M2M)**

This year M2M focused on developing online tools that allow you to answer basic questions about pesticide use in the U.S., and to compare the dietary risks from pesticide residues between domestic and imported foods, or conventional and organic foods. We also published peer-reviewed papers comparing the nutritional quality of organic and conventional crops and milk. M2M’s blogs also discussed a variety of topics, including the risks associated with herbicides’ dominant role in weed management and soil quality’s impact on productivity.

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Chad Kruger
Program Update: Climate Friendly Farming

Program Leader: Chad Kruger

In late 2003, with a seven year, $3.75 million investment from the Paul G. Allen Family Foundation (PGAFF), the Climate Friendly Farming (CFF) Project was established at WSU's Center for Sustaining Agriculture and Natural Resources (CSANR). This unprecedented investment was the first "trans-disciplinary" project on climate and agriculture in the region. It thus laid the groundwork for a wealth of ongoing research and education focusing on the intersection of climate, food, energy, and water.

The original PGAFF investment aimed to better understand the connections between agricultural management, climate change, and greenhouse gas emissions in dairies, wheat-based dryland systems, and irrigated cropping systems. Specific goals were to develop and evaluate technologies that reduce greenhouse gas emissions, to identify climate resilient agro-ecosystems, to restore terrestrial carbon through carbon sequestration, and to replace fossil-fuel-derived energy with agriculturally derived biomass (Figure 1).

While the original PGAFF project generated a substantial number of academic journal publications and patents, the collaboration also resulted in a combination of significant scientific innovation and meaningful real-world impact by transferring knowledge and technology to producers, land-managers, and the regulatory and policy community.

I think it’s fair to say that when the CFF Team set out together we had no idea where we’d be a decade later. While we anticipated advances in our understanding of agricultural management and climate change, it was virtually impossible to predict how the greater context of policy, farm management, and scientific funding would change. For example, the CFF program was founded before the energy price shocks of the mid-2000s impacted agriculture and created a biofuel craze. While there had been floundering activity in soil carbon markets and manure digesters in the region, neither was the topic of dinner conversation over farm tables much less tables of the lay public [I’ve discovered manure is actually a great dinner-table topic]. Very few people were even thinking about questions of climate change and agricultural resilience at that point. And finally, because climate change was not a funding priority of USDA or other federal agencies at the time, CFF actually represented a fairly risky strategy for scientists whose careers are evaluated by competitive funding and publication.

The timelines of CFF was largely validated in the first couple years of the project. By 2005, drought, the energy crisis, and uncertainty regarding atmospheric and air quality regulations had many agricultural leaders in the Pacific Northwest looking for new options. Meanwhile, work completed through CFF and elsewhere contributed to making conservation tillage, precision agriculture, and biofuel cropping systems more realistic in our region. CFF collaborations with industry and regulatory agencies positioned the Pacific Northwest to improve livestock manure management through commercial-scale anaerobic digestion technologies.

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Biophysical and economic modeling capabilities enhanced by CFF provided a foundation that is continuing to be used to address questions about long-term agricultural sustainability, agricultural carbon footprints, and responses to climate change. By 2009, CFF had received national recognition as an Innovative Program Model by USDA’s National Institute of Food and Agriculture (NIFA), which proceeded to establish the Climate Change Challenge program to fund research and education projects in this area.

The PGAFF-funded CFF Project culminated in early 2010 with the publication of a 28 chapter report entitled Climate Friendly Farming: Improving the Carbon Footprint of Agriculture in the Pacific Northwest. However, that wasn’t the end for climate change and agriculture research and education at WSU, at CSANR or in the Pacific Northwest. Team members and core capacities support numerous partnerships that have made the Pacific Northwest a leading center of climate change and agricultural science.

Ongoing efforts in our region include:

- **OFOOT – The Organic Farming Footprints Project**: This project explores strategies for measuring and improving the carbon footprint of organic farms. Funded by USDA NIFA.

The BioEarth and the Columbia River Basin Long-Term Water Supply and Demand Forecast Projects – These projects are developing an earth systems modeling platform to help answer long-term climate change questions such as those about the availability of water supply for irrigated agriculture. Funded by USDA NIFA and the Washington State Department of Ecology.

- **The Regional Approaches to Climate Change for Pacific Northwest Agriculture (REACHC)**, Site-Specific Climate Friendly Farming Project and the Cook Farm Long-Term Agroecological Research Site (Cook Farm LTAR) – These interrelated projects explore sustainability of cereal production systems in the Inland Northwest. Funded by USDA NIFA and the USDA Agricultural Research Service.

- **Waste to Fuels Technology** – This project investigates the bioconversion of food and green waste to energy and soil amendments. Funded by the Washington State Department of Ecology.

- **Anaerobic Digestion Systems** – This project aims to integrate anaerobic digestion with add-on technologies to generate value added fuels, power, and other products. Funded by USDA NIFA, the Natural Resources Conservation Service (NRCS) and WSU Biomass Project.
In 2014 the Small Farms Program offered a diverse array of educational opportunities for farmers, including evening Cultivating Success courses in sustainable farming and business planning, online short courses, workshops, and field days. Our Farm Walk series partnership with the Tilth Producers of Washington attracted 369 participants who managed a combined total of 23,000 acres. Our Small Farms Program secured 5 new grants to investigate topics ranging from regional marketing and distribution strategies to soil management solutions for organic farming systems.

The Potential and Dilemmas of Direct Marketing Farms in Washington State

As we enter 2015, it’s tempting to think that “local foods” have become a mainstream fixture of our food system. Culturally, this may be the case. The iconography of local foods can be found from Safeway to celebrity cooking shows and throughout the popular press. It is no longer just the “locavores” who expect to have at least seasonal access to farm-direct products. In Washington, purchasing authentic products from regional farms typically means seeking out farm stands, a Community Supported Agriculture Program (CSA), a home delivery service, an independent grocery store or food cooperative, or one of 160 farmers markets. Telephone polls by WSU researchers Marcy Ostrom and Raymond Jussaume have found consistently high levels of consumer interest in increased direct purchasing from local farms. In a 2010 poll of 1,027 Washington residents, over 83% said they would like purchasing from local farms. In a 2010 poll of 1,027 Washington residents, over 83% said they would like purchasing from local farms. In a 2010 poll of 1,027 Washington residents, over 83% said they would like purchasing from local farms.

Direct sales channels theoretically offer farmers more control over how they sell and price their products, as well as greater flexibility in deciding what to produce. However, despite the seemingly large market demand and a sympathetic public, the direct sales reported by Washington farmers on the 2012 U.S. Census of Agriculture appear low. While there are many potential problems with these numbers, this is the only data that is systematically collected on direct marketing throughout the state and nationally. In Washington, 5,640 out of 37,249 farms, or just over 15% reported having direct-to-consumer sales. While the sales reported by these farms rose 3.6 percent from the 2007 agricultural census they totaled just over $45 million, only a tiny fraction of total farm sales in the state. Moreover, only 30% of the farms who reported having direct sales on the agricultural census had total farm sales above $10,000. In comparison, of the 31,609 farms that did not report any direct sales, 35% had sales over $10,000. Thus, hard questions remain for Washington’s direct sales, 35% had sales over $10,000. Thus, hard questions remain for Washington’s direct sales.

Little of this work would be possible without the strong partnerships the Small Farms Program has cultivated throughout the state and nationally. In Washington, the Small Farms Program and the Tilth Producers of Washington have cross-cultural communication strategies. Market representatives tend to be more culturally diverse than other farmers and span the rural-urban agricultural divide in unique ways. Managers have a unique opportunity to work with their vendors to improve their marketing strategies. On workshop evaluations, 86% of managers agreed and 14% somewhat agreed that they had gained useful ideas for more effective cross-cultural communication with their vendors.

Increasing Public Trust

• Providing training to 29 farmers market managers in cross cultural communication strategies. Market vendors tend to be more culturally diverse than other farmers and span the rural-urban agricultural divide in unique ways. Managers have a unique opportunity to work with their vendors to improve their marketing strategies. On workshop evaluations, 86% of managers agreed and 14% somewhat agreed that they had gained useful ideas for more effective cross-cultural communication with their vendors.

• Creating a “Vendor Booth Guide” with marketing tips, reminders and resources in English and Spanish to help increase sales. In partnership with the Washington State Farmers Market Association (WSFMA), over 200 guides have been distributed to farmers, farm employees, and market managers.

• Public trust is critical to direct sales. Our surveys show that over 75% of farmers market farmers think there should be a way to verify that farms grow what they sell, and 91% of market managers are concerned. To address this need, an advisory group was created and funds were obtained to initiate research on ways to ensure integrity at farmers markets in Washington.

• Our research shows that well-managed markets attract more consistent shoppers and enhance farmer sales. A new project in partnership with the WSFMA will enhance training opportunities for market managers, including four new chapters of the “Washington State Farmers Market Management Toolkit.”

Accurately measuring direct sales is challenging due to the informal nature and cash basis of many transactions. To address underreporting and improve future research, a USDA funded project will create new protocols for standardized data collection at markets.

In Washington, purchasing authentic products from regional farms typically means seeking out farm stands, a Community Supported Agriculture Program (CSA), a home delivery service, an independent grocery store or food cooperative, or one of 160 farmers markets. Telephone polls by WSU researchers Marcy Ostrom and Raymond Jussaume have found consistently high levels of consumer interest in increased direct purchasing from local farms. In a 2010 poll of 1,027 Washington residents, over 83% said they would like purchasing from local farms. In a 2010 poll of 1,027 Washington residents, over 83% said they would like purchasing from local farms. In a 2010 poll of 1,027 Washington residents, over 83% said they would like purchasing from local farms. In a 2010 poll of 1,027 Washington residents, over 83% said they would like purchasing from local farms. In a 2010 poll of 1,027 Washington residents, over 83% said they would like purchasing from local farms. In a 2010 poll of 1,027 Washington residents, over 83% said they would like purchasing from local farms.
Cornelius Adewale, Ph.D. Student in Soil Science

Cornelius Adewale came to WSU from Ilesa, Nigeria. Being from an agricultural based community set the stage for Cornelius to find his passion and field of study throughout his education. As an undergrad, his major was agricultural economics at Obafemi Awolowo University (OAU) where he became a national leader for agricultural students in Nigeria. This experience allowed him to shape policies and have an impact in the “Youth in Agriculture” program within the Federal Ministry of Agriculture in Nigeria. Sustainable agriculture proved to be his passion and during college he established an organic vegetable farm in which he worked after schooling until heading to WSU for graduate school. The opportunity to learn and focus on organic farming and sustainable agriculture was the draw of WSU.

As a Ph.D candidate in the Environmental Science and Natural Resources department, Cornelius’ research focuses on the carbon footprint on the organic farming system. His work is part of the OFoot project, a USDA funded project responsible for development of an organic carbon footprint calculator tool. The ability to work on a team focusing on the development of models, tools and the integration of those on solving global scale issues was always one of his aspirations. The education and experience that Cornelius has gained throughout his time at WSU will provide him with the basis to achieve his career goal of working in the area of global food security and sustainable living. An area that has been the center of his focus for most of his life.

Sarah Waldo, Ph.D. Student in Civil and Environmental Engineering

Sarah Waldo hails from Dracut, Massachusetts by way of Colorado. She is a Ph.D. candidate in Civil and Environmental Engineering within the Laboratory for Atmospheric Research focusing on nitrogen cycling and greenhouse gas budgets within agroecosystems. As an undergrad at a small liberal arts college in Colorado, Sarah was able to work with scientists from the National Center for Atmospheric Research (NCAR) measuring natural tree emissions and their contributions to air pollution. This opportunity provided networking with scientists eventually leading her to apply for a policy and science degree program thus leading her to WSU.

Her graduate research focuses on monitoring the greenhouse gases (GHGs) carbon dioxide (CO2) and nitrous oxide (N2O) budgets in agricultural fields across the region as part of the Regional Approaches to Climate Change for Pacific Northwest Agriculture (REACCH) project. REACCH is a multi-state project funded by USDA focused on improving the sustainability of cereal grain production in the Inland Northwest. Through this research, Sarah and her team measure gas transport in local air flows over cropping systems to quantify GHG emissions and uptake at the field-scale. This area of sustainability has always appealed to Sarah based on her love of the outdoors as well as concern for the long-term health and stability of our natural resources (including the often overlooked soil). With her interest in the area of science-policy interface, she hopes to have a career conducting field-based research that will guide future environmental management decisions. CSANR is proud to be part of Sarah’s journey.

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