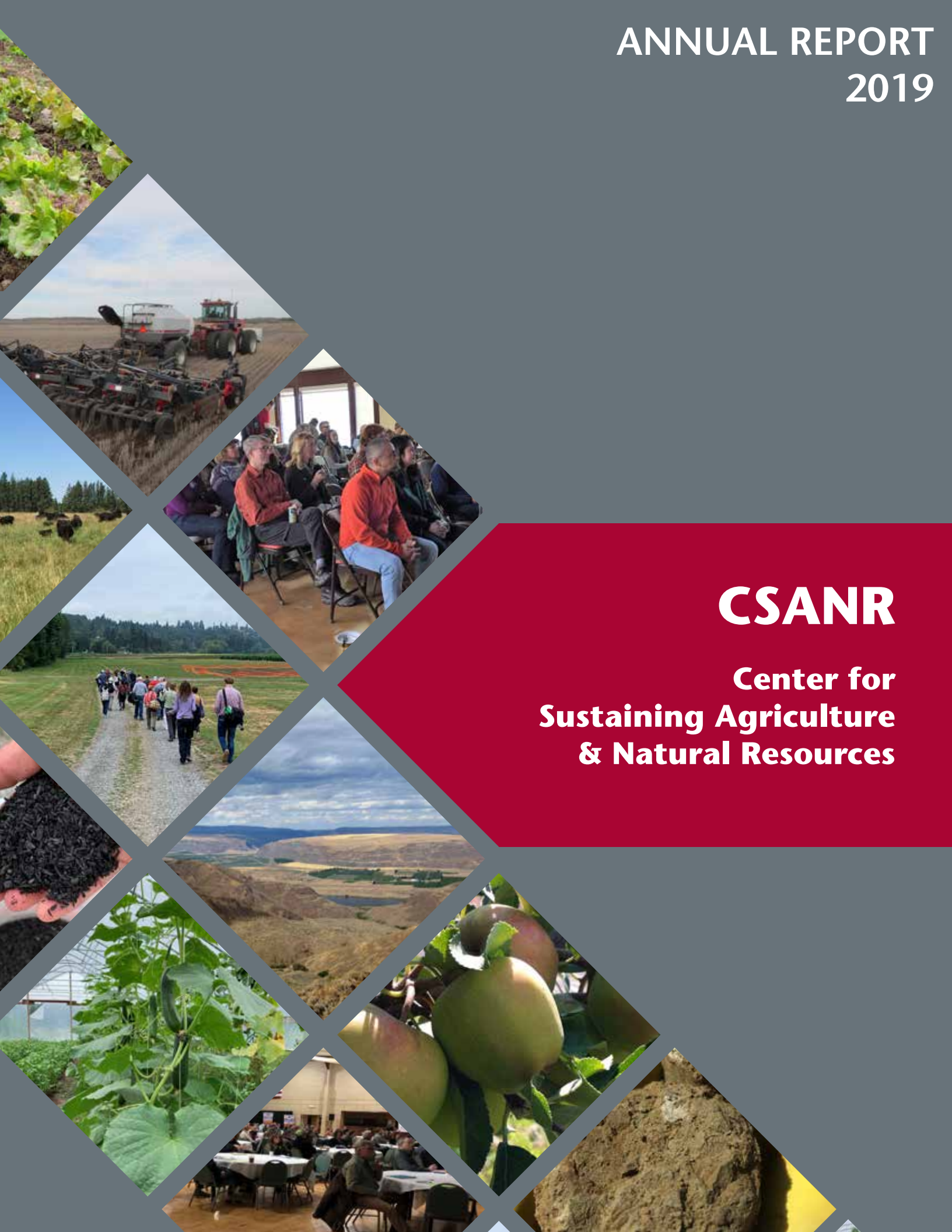


# ANNUAL REPORT 2019



## **CSANR**

**Center for  
Sustaining Agriculture  
& Natural Resources**

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## Director’s Message



One of the great pleasures of directing CSANR is the opportunity to work with our Advisory Committee. The basic structure of the Advisory Committee was outlined in the founding legislation ([RCW 15.92.040](#)) and we have worked hard to maintain the legislative intent of having a broad, representative committee that helps us strategize. Over the years we have focused on finding committee members who are big picture thinkers – who have helped us identify concerns and opportunities before they emerge in popular discussion. Twenty years ago, the topics of organic and biologically intensive agriculture and climate change were the center of Advisory Committee discussions. About ten years ago, soil health was a priority. For the past few years, it has been the two concepts of regenerative agriculture and true cost accounting.

Each of these ideas has grown within the Center, though with different developmental pathways. Our flagship internal grant program, BIOAg, continues to be a powerful catalyst for new work in organic and biologically intensive agricultural systems and practices. The original Climate Friendly Farming Project (the reason I joined CSANR in 2004) has evolved into numerous collaborative efforts across the University and with colleagues around the Pacific Northwest and country. Last year, the Legislature made an initial investment to establish the Washington State Soil Health Initiative.

Our current Advisory Committee discussions on regenerative agriculture and true cost accounting continue in earnest as we try to determine how the University can best engage on these topics. It has always amazed me that as diverse as Advisory Committee members are, they have developed a disciplined and thoughtful approach to listening, learning from, and trusting each other. The CSANR Advisory Committee is proof that when people care a lot about an issue, and are willing to come together to gain understanding and forge solutions, success can be achieved. We’re not sure exactly how the regenerative agriculture and true cost accounting ideas will evolve, but I have a lot of confidence they will develop into actionable investments or programs as we move forward.

Thank you for taking a few moments to learn more about our work. We’d love to partner with you further as we seek to better understand the challenges facing our agricultural system, communities and environment - and forge practical solutions.

Sincerely,  
Chad Kruger, CSANR Director

## Advisory Committee

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Jim Baird, Baird Orchards  
Griffin Berger, Sauk Farm  
Kevin Corliss, Ste. Michelle Wine Estates  
Dan Coyne, Washington State Department of Agriculture  
Tim Crosby, Cascadia Foodshed Financing Project  
Laurie Davies, Washington Department of Ecology  
Nichole Embertson, Whatcom Conservation District  
Joe Gies, Gies Farms  
Miles McEvoy, Lacewing Auditing and Consulting LLC

Margaret Morales, Sightline Institute  
Maurice Robinette, Lazy R Ranch  
Rick Roeder, Irrigated Farmer  
Derek Sandison, Washington State Department of Agriculture  
Anne Schwartz, Blue Heron Farm  
Aimee Simpson, PCC Community Markets  
Jill Smith, Pure Eire Dairy  
Bill Warren, Diversified Producer  
Andy Wilcox, Wilcox Farms

## Leadership Team

Chris Benedict, Whatcom County Extension  
Ian Burke, Crop and Soil Sciences  
Jim Jensen, Energy Program  
Kris Johnson, Animal Sciences  
Steve Jones, Crop and Soil Sciences  
Laura Lavine, Entomology

Vicki McCracken, Economic Sciences  
Kevin Murphy, Crop and Soil Sciences  
Tim Murray, Plant Pathology  
Claudio Stöckle, Biological Systems Engineering  
Meijun Zhu, Food Science

## BIOAg Grant Program

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### 2019 Funded Projects

Human Health from Soil to Society: Barley  $\beta$ -glucan and Gycemic Control – Martine Perrigue, Alecia Kizonas, Pablo Monsivais, and Kevin Murphy

Impact of Process Emissions on Climate Offsets by Different Biochar Production Methods – Jim Amonette

Rotating Out of Weeds and into Soil Health: Optimizing Cover Crops in Three Columbia Basin Organic Production Systems – Doug Collins, Chris Benedict, Ian Burke, Nate Stacey, and Tim Waters

Evaluating Commercial Specialty Mushroom Production Feasibility for Diversified Farms and Small Woodland Owners in Western Washington – Justin O’Dea, Stephen Bramwell, and Patrick Shults.

Development of Multi-Scale Remote Sensing Methodologies to Classify and Monitor Riparian Vegetation Structure and Composition to Improve Agricultural Sustainability – Alex Fremier and Amanda Stahl

Evaluating Regulated Deficit Irrigation in Cider Apple Orchards for Improved Water Use Efficiency, Reduced Labor Input, and Improved Fruit Quality – Carol Miles and Gabe LaHue

Water, Land, and Nutrient Use Efficiency for Intercropping Systems in the Dryland Pacific Northwest – Isaac Madsen and Bill Pan

High-throughput Screening of Forage Crops for Environmentally Sustainable Crop Production – Sindhuja Sankaran, Lynne Carpenter-Boggs, and Rebecca McGee

Planning Grant: Artificial Intelligence and Related Digital Technologies to Support Production, Safety, and Sustainability of Irrigated Perennial High-Value Crops – Claudio Stöckle

Stone Fruit Cultivars for Puget Sound: A Peer-reviewed Extension Publication – Carol Miles and Travis Alexander



## Highlighted BIOAg Project: Biosecurity and Beyond: Exploring the Links Between Birds and Farms



Jeb Owen with a Western tanager, one of the birds found on organic farms. Photo credit: Dr. Dale Clayton

In 2014, Jeb Owen's lab in the Department of Entomology was awarded a small BioAg planning grant to develop collaborative relationships among WSU researchers and Washington State organic farmers. This allowed the team to establish research infrastructure for exploring the role of wild birds in pathogen and parasite transmission on organic farms, and collect preliminary data on wild bird diversity and activity on organic farms. Working with a number of other collaborators, they have leveraged this initial \$10,000 effort with several larger grant proposals, totaling approximately \$2.5 million in two separate awards from USDA's Organic Agriculture Research and Extension Initiative. By their completion, these projects will have supported 1 Ph.D. student, 2 M.S. students, and 2 postdoctoral researchers at WSU. Some of the data from those projects have been published and a number of additional publications are underway.

The work has led to a variety of diverse findings with important implications. For example, surveys of birds on 52 farms that grew either primarily mixed vegetables and fruits alone, or that integrated livestock into production, demonstrated the influence that livestock integration can have on birds: crop-livestock systems

had higher native bird density and richness relative to crop-only farms. This is most likely due to a number of factors, such as higher habitat diversity or differences in food resources. More on this aspect of the work is available in the publication, "Highly diversified crop-livestock farming systems reshape wild bird communities" in *Ecological Applications*.

Meanwhile, in a review of existing scientific literature, collaborators Olivia Smith, Bill Snyder, and Jeb Owen found that there was not much evidence indicating whether or not there is a positive link between wild birds and three common pathogens that cause food-borne illnesses in humans: *E. coli*, *Salmonella* and *Campylobacter*. This is important because it indicates that recommendations to remove wild bird habitat from farms to reduce food safety risk may be premature, and not based on adequate data. The full publication is "Are we overestimating risk of enteric pathogen spillover from wild birds to humans?" in *Biological Reviews*.

The two projects that Owen and collaborators are wrapping up now are designed to generate data that will shed light on the links between wild birds and food-borne pathogens. In both projects, the team has found evidence of pathogenic bacteria on farms. With four seasons of data collection complete, the team is now in the process of analyzing and interpreting these data to determine what factors relating to wild birds make that risk higher or lower. This in turn could lead to more informed recommendations to farmers about actions they can take to minimize food safety risk on their farms, while minimizing negative impacts on wild birds to those areas that really matter. ❖

## Highlighted BIOAg Project: Pest Birds on Dairies: Exploring the Impact, and Implementing More Effective and Sustainable Deterrence Methods



Birds at the feed bunk. Photo credit: Amber Adams Progar

European starlings and other pest birds have become more of a problem on Pacific Northwest dairies over the last thirty years as dairies have used more open sheds with high-energy feeds and tarped, open-face bunker silos for corn silage and haylage. In some areas of Washington, the increase in nearby acreage devoted to blueberries and other fruit crops means that European starlings can feast on open commodity storage and bunker faces in fall, winter, and spring and then access ripening fruit in summer.

In 2015, after identifying this as a potential issue, WSU researcher Amber Adams Progar received BIOAg funding for a planning grant that allowed her to bring together colleagues Susan Kerr (WSU-Extension), Karen Steensma (Trinity Western University),

and Stephanie Shwiff (USDA- Animal and Plant Health Inspection Service) for a two-day meeting in Lynden, WA, and to create an initial factsheet on pest bird management. While the factsheet and an associated seminar for Washington dairy producers increased awareness, the planning grant also helped the team submit a successful proposal to Western Sustainable Agriculture Research and Education (Western SARE) to carry out research to help quantify and address the issue.

Under the Western SARE project, the team surveyed Washington State dairies. Results indicated bird presence on Washington State dairies (both West side and East side) is an important health and economic concern. Annual feed losses were estimated to be approximately \$5.5 million in the Western region, and \$9.2 million in the Eastern region. Birds were also associated with an increased presence of Johne's disease and Salmonella in dairy cows. Dairy operators also suggested they lack effective options for managing birds, with the vast majority using shooting, which 88% described as "somewhat" effective. Few were using other techniques.

Results from other areas and crops have suggested that falconry may be a sustainable, economical, and biologically-based management option. The installation of nest boxes and perches to attract raptors to farms has been shown to deter pest birds from fruit crop fields in Washington and may be an effective option for dairies. To test this idea, the research team installed kestrel nest boxes at the WSU Knott Dairy Center and will install kestrel nest boxes on two additional Washington dairies. Attracting kestrels to dairies is expected to not only deter invasive pest birds but also provide much-needed nesting sites for kestrels, a native raptor. ❖

### ***Highlighted BIOAg Project: Videos Support Knowledge of Honey Bee Breeding Methods***



*Breeder Queen G12 - part of a Closed Population Breeding selection and breeding program. Photo credit: Matt Ziegler, CAHNRS Communications*

There is increasing interest worldwide for honey bee stock improvement in response to the many issues facing the honey bee. In the United States, the varroa mite and the associated pathogens primarily responsible for honey bee decline, dictate the need to focus on enhancing the presence of behavioral characteristics that reduce the susceptibility of these threats. Additional concerns, such as the introduction of the African honey bee, further emphasize the need to focus on stock improvement. To support nascent and established honey bee breeding programs, Susan Cobey, Tim Lawrence, and Steve Sheppard worked with videographers Darrell Kilgore and Matt Ziegler at WSU College of Agriculture Human and Nature Resource Sciences Communications to produce a video that provides information about selection methods and a pragmatic approach to breeding honey bees. Their work was supported with a BIOAg extension grant, which helped leverage additional funding from Western Sustainable Agriculture Research & Education (Western SARE).

Honey bees are unique in that selection is primarily based upon behavioral traits at the colony level. The colony is a dynamic and complex social unit, highly responsive to changing environmental conditions. Sensitive to inbreeding, colony productivity and fitness are dependent upon the maintenance of adequate genetic diversity. A colony is a dynamic unit, and selection is based upon evaluating several traits under changing conditions. A unique challenge for the breeder is to select for uniformity and consistency while maintaining adequate genetic diversity to ensure fitness. The video provides a straightforward methodology to select productive colonies with reduced incidence of pests and diseases from within large populations, while avoiding inherent inbreeding problems. The basic concepts presented are relevant to the interests and needs of individual beekeepers, beekeeping clubs, commercial queen producers, and beekeeping organizations.

The [video](#) is freely available, and will be integrated into ongoing extension efforts across the state, region, and nation. It was viewed nearly 1000 times in the first ten days it was available. Building on this work, the team was also successful in acquiring additional funding from Western SARE that contributed to the video. Funding from SARE will also be used to develop a new video on cryopreservation, update a 2006 award-winning video on Honey Bee Instrumental Insemination and Queen Rearing, and hold a conference on these topics. ❖

# Program Features

## Soil Health in Potatoes

Potato production does not lend itself to improved soil health. Tillage is the main culprit: tillage for planting, tillage to harvest, and tillage to ready the field for the next crop. It would seem to be the last crop where building soil health would be a goal, but potato growers in the Columbia Basin want to see what is possible and CSANR has been working with them for two decades.



*Wind erosion research being conducted after incorporation of a mustard green manure. Photo credit: Andy McGuire*

Starting in 2000, CSANR Extension agronomist Andy McGuire has tested various aspects of using mustard green manures in potato production. An increasing number of growers have been using this practice to improve their soils. McGuire also organized a series of annual conferences from 2016 through 2018 focused on potato soil health. Recently, with funding from the potato industry, CSANR research associate Karen Hills led a team in summarizing the current state of research results into a [report](#), available on the CSANR website and later developed into a peer reviewed [article](#).



*CSANR's Andy McGuire and David Granatstein evaluated infiltration rates of soils in the Columbia Basin in 2016. Photo credit: Andy McGuire*

This team concluded that soil health in Pacific Northwest potato production is mainly supported by suppression of soilborne diseases like *Verticillium* wilt, and pests like the Columbia root-knot nematode through strategic crop rotation and cover cropping. These efforts will gain momentum in 2020 with the addition of a potato-industry funded endowment for a potato soil health researcher at WSU. ❖

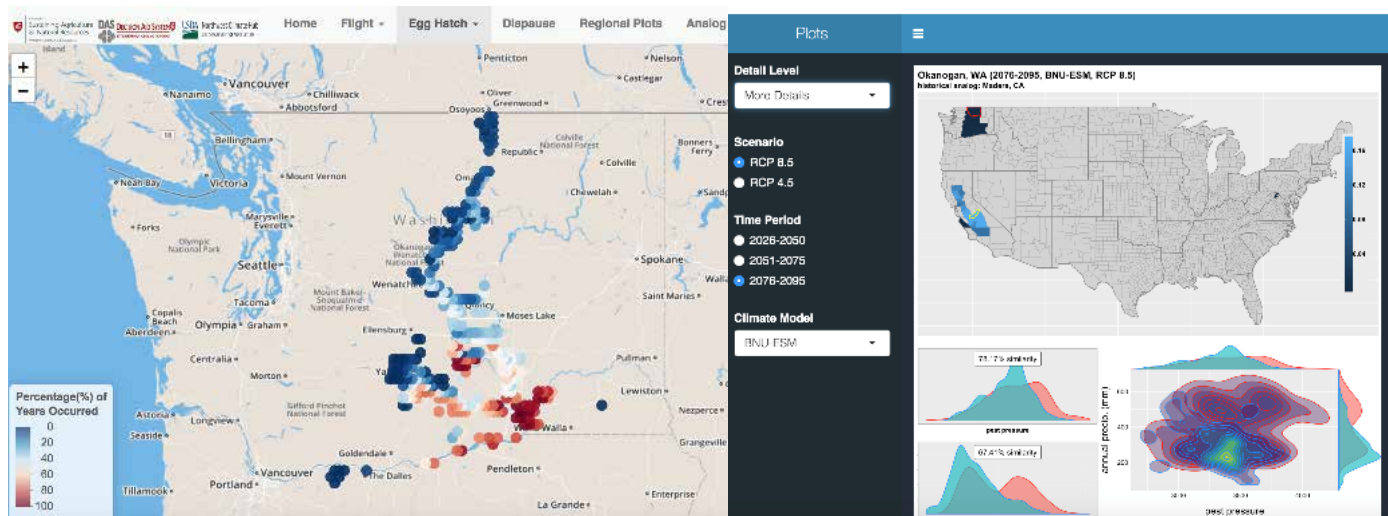


## Warming, Pest Pressures and Pest Management

There is a significant body of research that seeks to understand how warmer temperatures will impact crop phenology and yields. In contrast, we still know very little about the implications for pest pressures. Now, with funding from the USDA Northwest Climate Hub, CSANR affiliates Kirti Rajagopalan and Hossein Noorazar, with Vince Jones (WSU Tree Fruit Research and Extension Center) are looking at these questions using the codling moth, a major pest of apples and pears, as a model system. CSANR faculty Georgine Yorgey and Sonia Hall are also contributing to the effort. The team tried to understand the implications of warmer temperatures for codling moth pest pressures, its management, including pesticide efficacy. Key insights from the work include:

- Increased pest risk implies the need for additional sprays, a larger range of chemicals, and an increased cost of pest control. It also implies increased pesticide resistance risks.
- Timing of sprays will need to shift as development stages shift. Traps will likely need to be set earlier than typical in the region, or the ideal window for control measures might be missed.
- Under future conditions, the window of opportunity for control is shorter, and it is critical to capture it right. However, if captured correctly, there might be benefits in terms of more effective control, as control mechanisms such as pesticides and mating disruption could work better under warmer climates.

We have developed an online tool to help explore aspects of codling moth control: [http://agclimatetools.cahnr.wsu.edu/users/hnoorazar/codling\\_moth/](http://agclimatetools.cahnr.wsu.edu/users/hnoorazar/codling_moth/)



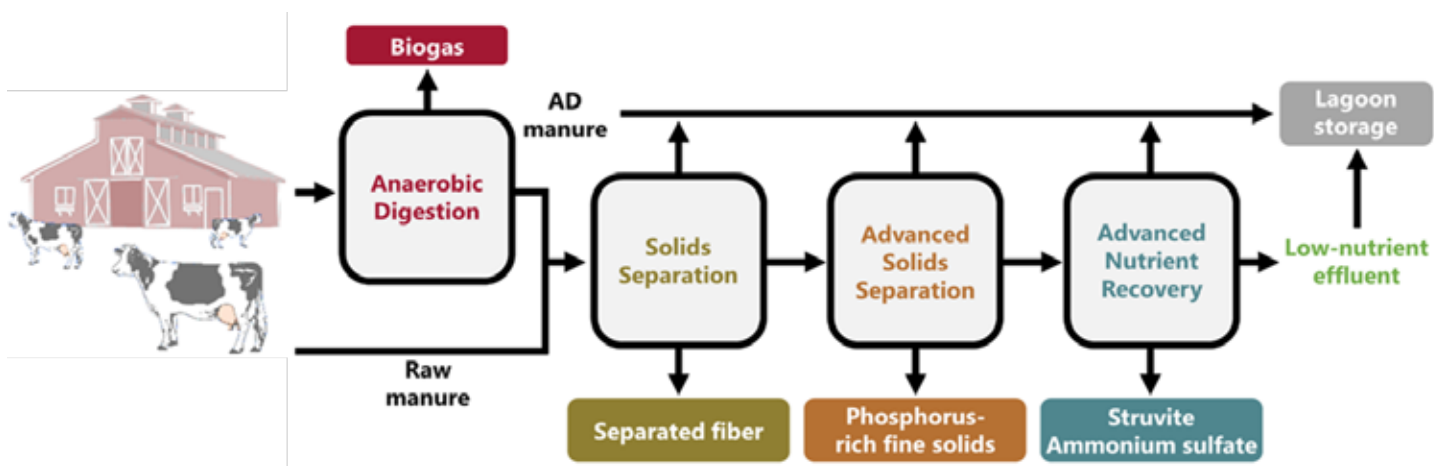
Screenshots from the online codling moth tool.

This work is part of a broader effort by CSANR to advance our understanding of critical but currently overlooked or poorly understood aspects of implications of warming on agriculture. This includes understanding the impacts of warming on factors such as honeybee population dynamics and pollination management, winter season dynamics and cold damage in vineyards, and extreme temperature effects such as sunburn in apples. This ongoing work is being carried out by Kirti Rajagopalan and Hossein Noorazar in collaboration with Vince Jones, Gloria Hoffman, Markus Keller, Lee Kalcsits, Tobin Northwood, Claudio Stöckle, and Chad Kruger, and is funded by a WSDA Specialty Crop Block Grant. ❖

## Can Emerging Technologies Help Recover Nutrients from Dairies and Make Them More Appealing for Berries and Other Non-Dairy Crops?

As herd productivity and size has increased over the last half century, the dairy industry has had to manage increasing concentrations of manure. Handling, storage and application of manures and the associated nutrients to soils have in some areas contributed to air and water quality impairment. Distribution to adjacent horticultural farms, where nutrients are needed, could be helpful. However, in practice this has been limited due to handling and transport costs, problematic nutrient balance, and concern about food safety.

With financial support from the Natural Resources Conservation Service, WSU researchers Chris Benedict, Chad Kruger, Karen Hills, and Georgine Yorgey (all with CSANR), Betsy Schact (Whatcom County Extension), Meijun Zhu (School of Food Science) and Joe Cook (School of Economic Sciences) assessed the potential of new nutrient-recovery technologies that can recover nitrogen, phosphorus, and other nutrients in concentrated products that can be more easily transported off farm. Two manure-derived fertilizer products, ammonium sulfate and phosphorus-rich fine solids, were applied to commercial fields of red raspberries and blueberries in Whatcom County. Researchers tested whether these products could adequately replace industry standard chemical fertilizer applications, and whether these products might exacerbate food safety risks compared to chemical fertilizers. They also quantified the willingness to pay for such products and explored the ability of such products to meet nearby crop demands through an analysis of county-wide nutrient flows.



One possible integration of nutrient recovery technology with existing manure management, either with or without anaerobic digestion. Manure management technologies are shown in white boxes; potential revenue-generating co-products are shown in colored boxes. This project investigated the use of phosphorus-rich fine solids and ammonium sulfate generated from digested manure. Figure modified from original by Timothy Ewing; Hall et al. 2018.



The two dairy manure-derived fertilizers, ammonium sulfate liquid (left) and phosphorus-rich fine solids (right), were applied to blueberry (ammonium sulfate only) and red raspberry (both products) fields. Photo credits: Regenis



Field trials indicated that it was possible to substitute manure-derived synthetic nutrient sources, and that there was little food safety risk associated with the use of manure-derived fertilizers. If costs of manure-derived fertilizers are substantially lower than conventional fertilizers, and the form is appealing (such as in an air-dried or pelletized form), uptake could be substantial. For example, when price is half of current costs (on a nitrogen basis), results from a hypothetical choice experiment with growers suggested that 86% would choose an air-dried product and 95% would choose a pelletized product over their current fertilizer.

However, the project also highlighted important remaining barriers. First, producers of foods that are generally eaten raw are quite risk averse: perceived food safety risk may limit adoption, independent of true risk. Crops that are generally not eaten raw may be better initial targets. Crop producers also preferred manure-derived fertilizers in dried or pelletized form, but the additional costs of drying and pelletizing would need to be carefully weighed.



*Randy Honcoop, a berry farmer, hosting the on-farm trials discusses his experience during a field day. Photo credit: Vincent Alvarez.*

Manure-derived fertilizers could contribute to improved nutrient balances in areas with concentrated dairies and interspersed dairies and non-dairy croplands, by greatly reducing transportation costs compared to manure. However, to achieve overall nutrient-related goals, nutrient recovery would need to be part of a comprehensive strategy to ensure appropriate nutrient application timing and methodology at the farm level, and to address issues of nutrient balance at the watershed level. ❖

## Composting with Biochar to Reduce Emissions and Improve Compost

Biochar has gained attention in recent years for its positive effects on soil properties. The carbon-rich product is produced when biomass such as wood, leaves, or manure is heated with little or no oxygen. Biochar is distinguished from charcoal by the end-use application: charcoal is used for fuel or energy while biochar is used for carbon sequestration and environmental management. Biochar has exceptional surface area and when mixed with soil it increases water-holding capacity and nutrient exchange. More than 12% of Washington's solid waste stream is wood waste, providing a resource that could be used for biochar production and utilization. One potential use for biochar is to mix it with compost feedstocks prior to the composting process. Co-composting, as this process is known, can reduce the loss of gaseous emissions from the compost pile and may also improve the positive effects of biochar and compost in soil.

As part of an ongoing partnership between Washington State University and the Washington Department of Ecology, Doug Collins, Nate Stacey (both with CSANR), Andy Bary, Liz Myhre (both with WSU Puyallup) and Thida Tea (an undergraduate intern from Pacific Lutheran) experimented with biochar mixed with chicken manure and wood shavings. The goal was to evaluate how biochar affected the compost process and nitrogen content of the finished product. Biochar was added at 20% and 40% biochar by volume (10% and 22% by weight) along with a 0% control. Because biochar is a more stable form of carbon, the researchers anticipated that the largest rate of char would slow or stop the compost process. Surprisingly, the pile with 40% biochar by volume heated up more quickly than the 0% pile and had no trouble composting (likely due to the increased porosity provided by the biochar). Biochar proved to do an excellent job of reducing nitrogen losses from the ammonia-rich chicken manure during composting, though some nitrogen loss still occurred.

The work with the Department of Ecology has led to further research. Midnight's Farm is a diverse farm operation on Lopez Island that raises beef cattle and operates a commercial composting facility. Owners David Bill and Faith Van De Putte approached WSU about researching how biochar could enhance their manure management, composting process, and final product. With the collaboration of several diversified vegetable producers and a Western SARE Professional and Producer Grant, the team will see how biochar mixed with steer manure affects the compost process and the nutrient status of the resulting product. Midnight's Farm is facilitating the composting research and Helsing Junction Farm and Lopez Harvest Farm will host field trials in summer 2020 where the materials will be applied to soil for vegetable production.



TOP - Left: Biochar mixed with chicken manure and wood shavings for composting at WSU Puyallup, May 2019. Middle: Mixing chicken manure and wood shavings for co-composting research at WSU Puyallup, May 2019. Filling experimental compost bins at WSU Puyallup, May 2019. Right: Mark Fuchs (Ecology) (left) pitches in to fill compost bins with Andy Bary, Liz Myhre, and Nathan Stacey. Photo credits: Doug Collins ❖

## Improving Drainage Through Integrated Floodplain Management



*A key agricultural drainage ditch with high water levels and poor flow in Puyallup, WA. Photo credit: Jordan Jobe*

Drainage issues impact agriculture, but also multiple other sectors, including development, flood risk, and fish habitat. The Farming in the Floodplain Project (FFP), the agricultural component of the [Floodplains for the Future Partnership](#) (FFTF), thus aims to take an integrated approach, working with 22 partner organizations to support the recovery of floodplain functions and collaborating to support, fund, and implement multi-benefit floodplain projects in the Puyallup River watershed in Pierce County, WA.

The Farming in the Floodplain Project began working in 2015 with producers in the Clear Creek area, one of the most frequently flooded areas in Pierce County. The County had planned a massive levee setback project to reduce flooding. However, after engaging with agricultural landowners and analyzing various agricultural viability issues, the County ultimately decided the project was incompatible with agricultural production. Partners are now collaborating to develop a flood risk reduction and habitat restoration project that will improve agricultural viability. In January 2018, the Project moved to WSU-

Puyallup and CSANR under Jordan Jobe's leadership, leveraging WSU's strong academic and technical resources, and trust among farmers.

Challenges producers face in Pierce County are similar to those in other Puget Sound areas, including intense pressure from development, poor drainage, a complex regulatory environment, challenging economic conditions, and a need for solid data about future climate change impacts. Pierce County has less than 45,000 acres in agricultural production, and the average farm size has declined to approximately 28 acres, though there has been a rise in the use of sustainable agricultural production methods.



*Soggy field with poor drainage in mid April, in Puyallup WA. Photo credit: Jordan Jobe*

Partners are specifically working to address poor agricultural drainage and find a path forward to address years of deferred maintenance on key agricultural ditches through improvements to policies and regulatory conditions. In 2020, the team will also be working on a Gap Analysis of current conditions for agriculture at a Puyallup Watershed scale to determine where more data, support, coordination, or research is needed. Jobe is also taking a leadership role in the newly-formed Pierce County Drainage Task Force and leading development of a Clear Creek Agricultural Resilience Action Plan that will identify actions and develop implementation plans to increase agricultural viability and enhance the resilience of the agricultural community.

For more information, see [www.farminginthefloodplain.org](http://www.farminginthefloodplain.org). ❖



# Soil Health Initiative

## CSANR Leading the New Soil Health Initiative

Soil health has been a longstanding priority for CSANR. In 2019, we were excited to see this idea take shape, as the State of Washington legislature established the new Soil Health Initiative (SHI) with two years of proviso funding (at \$250,000 per year). This Initiative is “housed” in CSANR and we are responsible for its implementation. The SHI is a partnership between WSU, the Washington State Department of Agriculture, and the Washington Conservation Commission. Under the day-to-day leadership of Chris Benedict, and guided by a Leadership Team from across WSU, we’ve already dug in, so to speak!

The initial funding will be used in some first steps that contribute to the goals of the SHI: to **advance our understanding of soil health** in Washington State, conduct a **baseline statewide soil health assessment, develop and evaluate management options** for improving soil health, and support **on-farm implementation** of soil health practices. Right now, we’re working to establish an initial long-term research and extension (LTARE) site at the Mount Vernon Research and Extension Center.

During the 2020 Supplemental Session, the House and Senate have both passed the Initiative with full funding (\$1.038m annually) and it now awaits the Governor’s signature. If fully funded, the SHI will establish **a soil health network of additional LTARE sites** representing major cropping systems in the state and add new capacity to focus on understanding, evaluating and incentivizing soil health measures and management practices across the diverse agricultural systems in Washington. Leveraging both state and federal (competitive) funds, the objectives of the fully-funded SHI will include developing a statewide soil health investment roadmap (including baselines and goals for soil health outcomes); establishing near-term and long-term **soil health research priorities** for each regional production system; and ultimately, **the adoption of soil health management practices on farms** statewide.



*Potential sites for a Soil Health long term research and extension site network across the State.*

The opportunities and potential of the ambitious Soil Health Initiative are exciting! Successful projects such as [Regional Approaches to Climate Change \(REACCH\)](#) and the national [Long-Term Agroecosystems Research](#) Network offer organizational models for the SHI, as well as an opportunity to leverage these existing datasets for soil health assessment and enhancement in Washington. Follow along for information and products from the SHI at <https://soilhealth.wsu.edu/>.



*Farmers and consultants from Northwest Washington participate in a roadmap activity with Deirdre Griffin, Soil Scientist at WSU Mount Vernon Northwest Research and Extension Center in December 2019. Photo Credit: Chris Benedict.*



### ***2019 Awarded Soil Health Extension Mini-Grants***

Adopting cover crops for soil health in the Pacific Northwest – Nathan Stacey and Doug Collins

Digging Deeper, Co-Innovating Soil Health Solutions in Eastern Washington – Maren Friesen, Carol McFarland, and Haiying Tao

Soil health field assessment for the Hispanic tree fruit community - Bernardita Sallato-Carmona and Melba Salazar-Gutierrez

### ***2019 Verle Kaiser Grant***

Developing Elementary-Level Curriculum in Soil (Health) Appreciation –Tarah Sullivan and Bill Pan



## Grad Student & Post-Doctoral Profiles



**Xiaoye Shen** is a Ph.D. student in the School of Food Science, studying food microbiology and safety, with a focus on fresh produce safety, under Associate Professor Meijun Zhu. Shen, originally from China, came to Washington State University after earning her M.S. degree in Food Microbiology and Food Safety from Oregon State University and working for a food company in Portland, Oregon. Current food safety issues that we hear about in the news, along with her interest in microbiological food safety research, brought her here to continue her studies.

Shen is currently working on a BIOAg-funded project: “Impact of manure-derived fertilizers on bacterial community and antibiotic resistance genes in Washington red raspberry fields.” Shen explains, “Manure and manure-derived soil amendments are key components of sustainable agriculture. However, from a food safety perspective, manure can be a source of introduced foodborne pathogens to the crop production system and a major contributor of antibiotic resistant genes in soils. The microbial safety of the production environment is directly associated with produce safety and human health risk, so we are evaluating impacts of these soil amendments.”

Ultimately, Shen’s goal is to become a faculty member at a major university, conducting research in microbial food safety. She is also eager to mentor future food scientists and deliver food safety knowledge to both academia and industry, to help solve emerging food safety issues. ❖



**Nathan (Nate) Stacey** is currently a Postdoctoral Research Associate with CSANR. Originally from St. Louis, Missouri, he’s an avid reader and runner and enjoys cooking and exploring the outdoors with friends and family.

Stacey received a B.A in Communications from Truman State University, and a certificate in Turfgrass Management from Rutgers State University. After working in the landscape and turfgrass industries for several years, his curiosity drove him towards a career in research. He was hired as a Research Technologist for the Turf Program at WSU-Puyallup REC, where he worked for two years. When he was offered the chance to pursue a Ph.D. in Soil Science at WSU, he took the opportunity. While working towards his Ph.D., and thanks to Doug Collins, Stacey was exposed to organic and sustainable farming practices. He chose to pursue this line of research as a way to meld his interest in soils and desire to foster land conservation and stewardship. He graduated in December of 2017 with his Ph.D.

His current postdoctoral research focuses on the effective use of recycled organic materials in agroecosystems. He has worked with biosolids, manures, and more recently with biochars. His specific interests lie in optimizing the use of these materials as a way to supplement plant nutrient needs. In addition, he’s also interested in other sustainable management practices like cover cropping. Moving forward, Stacey hopes to continue this type of research, along with exposing and educating those with little contact to the wonderful world of soil. As he says “I feel fortunate to have found a career that marries my interest in the natural world with the opportunity to improve, and share, sustainable land management practices.” ❖



# CSANR Faculty & Staff



Jim Amonette, Adjunct Research Professor



Embrey Bronstad, Bioenergy and Bioproducts Specialist



Doug Collins, Extension Specialist, WSU Extension Ag & Natural Resources



David Granatstein, Sustainable Agriculture Specialist, Emeritus



Sonia Hall, Associate in Research



Karen Hills, Research Associate



Jordan Jobe, Farming in the Floodplain Project Manager



Chad Kruger, Director



Andrew McGuire, Irrigated Cropping Systems Agronomist



Ryan Niemeyer, Adjunct Faculty



Hossein Noorazar, Postdoctoral Research Associate



Matthew Pruett, Scientific Assistant



Kirti Rajagopalan, Assistant Professor, Biological Systems Engineering



Brooke Saari, Extension Coordinator



Nate Stacey, Postdoctoral Associate



Georgine Yorgey, Associate Director



Tara Zimmerman, Associate in Research



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