

'17

Annual Report



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DIRECTOR'S

It's hard to measure the value of an idea. 2017 marked a quarter century of CSANR at work. It's also hard to ignore the value of a good idea. In just the past decade, CSANR Affiliate Faculty and partners have used CSANR programs and support as a basis for securing nearly \$85 million in extramural funding for work on sustainable agriculture, food and natural resource concerns, published nearly 500 research articles and nearly 100 extension publications based on a CSANR investment. Not bad for an idea no one was quite sure would be successful!

It's also hard not to get comfortable when you know you have a good idea. This had become an increasing concern for me as I entered my 10th year of leading CSANR. From my work in climate, I know that the past isn't always a great indicator of the future, and that for CSANR to continue to be successful in the changing landscape of University-based agricultural research and education, we needed to make some changes and launch some new and revitalized ideas that might be our source of success over the next 5-10 years. You can read about a number of new CSANR people and initiatives in this report.

In early 2017, we invited Dr. Kirti Rajagopalan to join the Center as an Assistant Research Professor to lead our evolving work in climate and water resources. Kirti was certainly not new to working with CSANR (see our 2015 annual report for a feature on Kirti as a graduate student). Kirti brings a whole new research capacity with her background in climate and environmental modeling that enables us to further advance our efforts in evaluating how our regional agricultural systems may need to evolve to remain sustainable and competitive in a changing and uncertain future. Kirti has hit the ground running and is already involved in multiple funded projects of national, regional and local scope.

In late 2017 Dr. Laura Lewis was named the new WSU Food Systems Program Leader and assumed responsibility for overseeing our evolving efforts and activities related to research and extension in food systems (historically the Small Farms Program). In addition to research and extension, Laura will be working to build tighter connections between the Food Systems Program and our undergraduate degree programs within the College of Agricultural, Human and Natural Resource Sciences (CAHNRS).

While there have been some great examples of CAHNRS undergraduates connecting to CSANR's work (read the "Students at the Tilth Conference Series" on our CSANR Blog, tagged Tilth), we have never implemented a focused and sustained effort to engage undergraduates in the broader state-wide activities of our Affiliated Faculty – nor having many of our state-wide faculty and staff directly engaged in undergraduate education. For me, this is a win-win idea that has substantial potential to transform the future of WSU and Washington agriculture.

MESSAGE

A couple of our long-time CSANR faculty, Marcy Ostrom and David Granatstein, teamed up to teach a new graduate class in Agroecology last fall. It's been a long time since I had the desire to be a student in a class, but when this class was announced I actually looked at my semester schedule to see if I could figure out a way I could slip into the class unnoticed. Take a look at the article in this report that describes the course ... I think you might want to be a graduate student, too.

Anyone who has looked closely at my email signature in the past few months will notice that in 2017 I picked up another title: Director of the Puyallup Research & Extension Center. Now I have three. As has been the case throughout higher education, rising costs and tightening revenues have been a challenge for WSU. The specific change we implemented in 2017 involved an administrative reorganization of support services for CAHNRS' two Western Washington research facilities as well as CSANR and a variety of programmatic initiatives focused on building out CAHNRS presence in Western Washington. Part of reason for this plan was to reduce administrative costs (we had a nearly ~\$500k budget reduction to implement across the three units), but most of the reason was to better coordinate and synergize our programmatic support for serving clientele.

The fact that we had several dynamic new faculty and staff in CSANR with better ideas than me made it very easy to step out of their way and let them lead key CSANR programs and projects. Perhaps the most noticeable change from the outside is that Georgine Yorgey (Associate Director) and Kirti Rajagopalan are taking a more visible leadership role for our climate and waste management programs and projects. You can read more about the vision Georgine and Kirti have for this area of CSANR work in this report.

I've never been reluctant to accept and implement changes. The reality is that there isn't enough time or money to solve all the Grand Challenges we are facing as a society. We need good ideas, and we need to take risks in implementing those good ideas. Looking back at 25 years, CSANR was a good risk and a great investment. Looking forward 25 years, I can't help but think we desperately need to do more.

Chad Kruger
CSANR Director



2017 BIOAg Funded Projects

PI: Lisa Wasko-DeVetter

Evaluating the impacts of border vegetation patterns on multifunctional biodiversity and crop production in Washington blueberry

PI: Haiying Tao

Sustainable crop-livestock integration for system health in the dryland inland Pacific Northwest

PI: Lynn Sosnoskie

Breaking bindweed: Can plant growth regulators disrupt apical dominance, deplete a persistent bud bank, and improve the control of perennial weed species in specialty crops?

PI: Timothy Lawrence

Methods for practical field selection of honey bee colonies, and the rearing of queens and drones

PI: Andrei Smertenko

Capturing drought-avoidance genotypes using peroxisome proliferation readout

PI: David Crowder

Examining microbial mediation of disease resistance, pollinator attraction, and crop yield in apple crops

PI: Kiwamu Tanaka

Biodegradable peptides as triggers of plant defense against pathogens and pests

PI: Mike Kahn

Increasing legume nodulation for improved symbiotic nitrogen fixation

PI: Stephen Bramwell

From Ground to Glass: Evaluation of unique barley varieties for western Washington craft malting, brewing and distilling

Impact of fungal root endophytes on *Verticillium* wilt using cucurbits as model hosts

Researchers: Debra Inglis, Lydia Tymon & Carol Miles



Figure 1. In plantae *Verticillium* wilt-endophyte interaction assay in the greenhouse: Four-week old pumpkin plants with or without endophytes, growing in pasteurized potting mix infested or not infested with *V. dahliae*. Note variation in plant size and vigor.

Verticillium dahliae is a soilborne fungus that infects a broad range of economically important crops like potato, mint, pumpkin, and watermelon. Infection by *V. dahliae* results in wilting and death when the pathogen colonizes and reproduces within the vascular tissue. Management is targeted towards either preventing or reducing the number of soilborne microsclerotia, which serve as survival structures for the fungus and primary inoculum during the following season. Crop

rotation and soil fumigation are the primary means of control. However, the pathogen's wide host range makes crop rotation challenging, and soil fumigation is economically and environmentally costly and must be done repeatedly at high rates due to the resilience and long-term survival of the microsclerotia. Because of such limitations, biological organisms need to be considered as new options for *Verticillium* wilt control.

Endophytes are microorganisms hosted within plant tissues, much like those in the gut of humans, and do not cause disease. Endophytes can be isolated from every plant and they provide valuable plant services like tolerance to heat, salt, herbivory, and plant pathogens. Although the benefits of bacterial endophytes are increasingly recognized, less is known about fungal endophytic associations. This project investigated whether selected fungal endophytes confer resistance to *Verticillium* wilt in cucurbits.

Putative endophyte isolates were isolated from *Verticillium* wilt susceptible and resistant cucurbit roots recovered from experimental field trials at WSU-Mount Vernon NWREC in 2015 and 2016. Altogether 186 of 485 endophyte isolates (38% of total) were recovered from *Verticillium* wilt tolerant 'Cinnamon Girl' pumpkin while fewer, 139 of 485 (28% of total), were recovered from *Verticillium* wilt susceptible 'Sugar Baby' watermelon.

Amplification and sequencing of the ITS region of select morphotypes identified *Actinomicor* sp., *Chaetomium* sp., *Clonostachys* sp., *Dendryphion* sp., *Diaporthe* sp., *Epicoccum* sp., *Fusarium* *equiseti*, *Microdochium* sp., and *Schizothecium* sp. Isolates of these nine types

were tested against *V. dahliae* in a laboratory assay. Plating with *Chaetomium* sp., *Epicoccum* sp., *Microdochium* sp. and *Schizothecium* sp. resulted in antagonistic reactions. These four endophytes then were increased and used in a subsequent greenhouse assay to examine endophyte-colonized 'Cinnamon Girl' seedlings planted into pasteurized soils, either inoculated with *V. dahliae* microsclerotia or not. Observations revealed no differences in disease severity, or plant or root weights for the *Chaetomium* sp. ($P = 0.1440$), *Epicoccum* sp. ($P = 0.35$), *Microdochium* sp. ($P = 0.41$), and *Schizothecium* sp. ($P = 0.3883$) treatments.

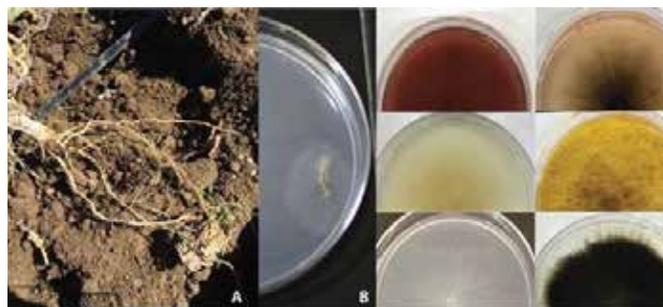


Figure 2. (A) Excavated roots of field-grown 'Cinnamon Girl' pumpkin. (B) Laboratory isolation of endophytes from disinfested roots. (C) Morphotypes of some endophytic fungi acquired from pumpkin roots.

These results indicate that when certain endophytes are present in pumpkin roots, *V. dahliae* seems to be a poor root colonizer enabling plants to better resist infection. This project provided an opportunity to learn about potential fungal endophytes in a Washington cropping system. Of the likely fungal endophytes identified to genus in this study, many have been documented as antagonistic to plant pathogens in other reports. In the future, commercial production of seedlings for cucurbit transplant operations might benefit if endophytes could be formulated to amend greenhouse potting mixes or used to pre-colonize cucurbit rootstocks grown for vegetable grafting with *Verticillium* wilt susceptible scions. Reducing *Verticillium* wilt severity in field settings would eliminate the need for long crop rotations and help reduce the negative impacts of soil fumigation on the environment.

USDA NIFA SCRI CAPS (Miles et al.) – Grafting watermelon: A new sustainable management practice for soilborne disease and a new value-added enterprise for Washington (\$42,386).

Northwest Ag Research Foundation (Tymon et al.) – A potential alternative for managing *Verticillium dahliae* in cucurbit cropping systems in western Washington (\$5,400).

Mob Grazing and Soil Health Research

Researchers: Tip Hudson, Lynne Carpenter-Boggs, & Maurice Robinette

In most Intermountain West pasture or rangeland settings, efficient nutrient cycling is as limiting as water. Soil and plant researchers have learned recently that soil microbes mediate nutrient cycling far more than previously known. Scientists and ranchers are seeing evidence that grazing cattle may be managed in such a way to improve the productive capacity and health of the land that supports them by directly addressing limiting factors to plant growth or ecosystem function. PIs Lynne Carpenter-Boggs and Tip Hudson and cooperator Maurice Robinette of the Lazy R Ranch near Cheney, WA hypothesized that the difference in conditions created at the plant-soil interface by very high-density livestock grazing and long recovery periods would amplify the microbiological community that is responsible for making nutrients already in the pasture ecosystem available to plants.

This research project, initially funded by the BIOAg Program in 2015 at \$31,287, assessed soil health and productivity of a certified organic ranch pasture under a variety of grazing and fertility treatments in order to evaluate grazing treatments independently as well as possible synergistic interactions between grazing regimes and fertility treatments. The study compared sustainable low-density (2,000 lbs animal/ac) continuous stocking with very high density but short-term exposure of the plant community to grazing animals (100,000 lbs animal/ac for less than 24 hours). These two grazing strategies were overlaid with four soil fertility treatments (none, organic P and S, supplemental manure, and compost tea). In both high and low density grazing, areas treated with manure tea exhibited higher forage yield than unfertilized areas. Mineral fertilizer and manure treatments also produced more dry biomass in the high density grazed area but not in low density or in green matter measures, potentially demonstrating that high-density grazing supports the soil microbiological community better than low-density continuous grazing by limiting soil compaction, maximizing soil litter coverage, and maximizing plant root occupation of the soil profile. More research is needed to demonstrate a causal mechanism, and the cooperator is continuing the grazing treatments in order to allow microbiological analysis at a future date.

A First Step Towards the Development of Real-Time Manure Sensors to Improve Dairy Manure Application to Croplands

Researchers: Pius Ndegwa, Lav Khot, & Gopi Kafle

Excess manure application to cropland can adversely affect water quality, while under-application lowers crop yield potential. However, manure is currently applied with the incorrect assumption that nutrient concentrations are uniform throughout manure wastewater from one source, which may lead to over- and/or under-application. Dr. Pius Ndegwa, alongside co-investigators Drs. Lav Khot and Gopi Kafle, and graduate student Iftikhar Zeb, have explored some first steps toward the development of near infrared spectroscopy (NIRS) sensors for precision manure application.

NIRS is a rapid, non-destructive method of composition analysis, already used for sensing plant stressors and produce quality. NIRS quantifies changes in reflectance of a sample in the portion of the electromagnetic spectrum from about 700 nm to 2500 nm. In this project, the team's goal was to identify suitable and effective NIR spectral bands and develop computational algorithms to effectively estimate key manure nutrient levels of field manure samples.

Primarily, team developed NIRS-based methods for sensing nutrient composition in manure from a single farm. The most relevant spectral bands were identified for both stationary and moving manure samples, and several different linear and non-linear models to relate changes in reflectance with nutrient composition were developed and evaluated. Experiments were then repeated for a set of 30 different manure samples from lagoons, anaerobic digesters, and barns from seven different dairy farms in Washington.

The initial work not only identified two important common spectral bands, but also some spectral bands that differed between the experiments. This is most likely due to the high level of variability in manure, with the potential for other constituents in some manure samples that suppress existing common bands. The team is currently seeking additional support to carry out further studies with datasets in the range of 200-400 samples in order to improve upon preliminary findings and develop robust manure nutrient estimation models.

While this work is still in the early stages of development, it may lead to important technology to help dairies protect surface and groundwater while maximizing crop yield.

Climate and Ag: Providing Useful and Usable Decision Support

Researchers: Georgine Yorgey & Kirti Rajagopalan

Over the last decade, decision support systems (DSS) have become an increasingly important way to provide information to crop advisors and producers to help them manage complex situations. The best-known regional example is probably the WSU tree fruit decision aid system (DAS), which contains a variety of decision support tools that provide time-sensitive information for management in Washington State tree fruits. The DAS is used on a regular basis by managers and management consultants for integrated pest management, impacting more than 90% of the tree fruit acreage in Washington.

Given this type of success, it may not be a surprise that DSS have been suggested as one way to help agricultural stakeholders incorporate climate considerations into their decisions. However, to ensure that climate-related DSS achieve their potential, we at CSANR felt that it was important to prompt a deeper conversation with collaborators about how to best make them truly useful, useable, and impactful. We facilitated this conversation in multiple formal and informal settings, one of which was the "Agriculture in a Changing Climate Conference," hosted by CSANR in Kennewick, in late 2016. Over the following year, we worked with regional partners to identify gaps and priorities, which we captured in our 2017 publication "Northwest U.S. Agriculture in a Changing Climate: Collaboratively Defined Research and Extension Priorities."



Following up on these efforts, we are trying to incorporate key insights into our ongoing work developing climate-related DSS. One of the key insights collectively identified to ensure development of useful, useable, and impactful products is to **"Integrate climate change related DSS with existing DSS tools"**. In collaboration

with the DAS team, we are working on a DSS to inform tree fruit crop advisors and growers about the management implications of changing codling moth pest pressures under a warmer climate. By integrating our efforts with a management-oriented DSS already in use by our target user-base, we hope the DSS will be more impactful. We are continuing to take this approach as we expand our climate-related DSS efforts to other aspects of tree fruit production as well as other agricultural crops.

Another ongoing consideration with climate-related DSS is that there is a need to rethink information delivery. Traditionally, climate change impacts have been delivered as a "level of change" as compared to baseline historical conditions, and this has not resonated with stakeholder groups in an impactful way. We are exploring an alternate approach in our DSS development efforts through the concept of spatial analogs. ***Spatial analogs emphasize viewing climate risk through a lens of historical experiences in analogous regions, and using these experiences to help users more intuitively understand management implications and chart realistic courses of action.*** In our ongoing codling moth DSS work we ask the question: Are there other tree fruit growing areas in the US where current pest pressures are similar to what we might expect in Washington State in 20 years? The premise is that the codling moth currently occurs—and is managed—under a wide range of climatic conditions across the continental U.S., and a rich body of location and climate-specific management knowledge already exists. Analog identification taps into this historical context, and provides insights into emerging risks and potential management adaptations for Washington State based on experiences of peers in other regions who have already fine-tuned management for these conditions.

Agriculture in the Northwest US has the potential to continue being a global leader. What DSS tools can the research and Extension community provide in support of this, and how shall we provide it? In partnership with our collaborators and funders, CSANR aspires to be at the forefront of addressing this question. As we expand our work on DSS development, we continue to challenge our approaches and modify them with the aim of providing practical management-oriented information that can support strategic decision-making.

New Agroecology Course Taught in Fall 2017

Researchers: Marcy Ostrom and David Granatstein

Agroecology as both an interdisciplinary field of study and an agricultural and food system development strategy is gaining attention nationally and globally. A group of faculty at WSU has been discussing how to expand our work in this area and provide more opportunities for interested students. An undergraduate agroecology course, Agriculture and Food Systems 302, has been offered for a number of years, but there were no graduate level courses available. Prompted by the recent faculty and student interest, we revived and updated a course that was taught once in 2012 through the School of the Environment.

Based on our complementary expertise, we designed the course, Graduate Agroecology (Environmental Science 540), to investigate the environmental, cultural, institutional, and economic dynamics that shape farming practices, agricultural communities, food distribution and consumption, and food movements. It included an in-depth analysis of the evolution of organic farming systems as practice, movement, and politics. The course was taught via the AMS videoconferencing system, originating in Wenatchee and reaching students in Pullman, Mt. Vernon, Vancouver, Snohomish County, and Wenatchee. The 10 students enrolled in the course had diverse backgrounds, hailing from many different regions of the U.S. as well as Saudi Arabia and Rwanda. Several had international agricultural experience and their disciplinary backgrounds ranged from sociology to environmental science to crops and soils.

The course was structured as a seminar with weekly lectures and discussion, supplemented by online reading and reflection assignments. Each student led an AMS discussion session once during the semester. A lively debate in the final class where teams of students were assigned to defend different positions on the topic of livestock and grazing was a highlight.

We were encouraged by the feedback and evaluation data from students; most indicated satisfaction with the quality of their learning experience, and most were enthusiastic to be a part of creating something from the ground floor. Students knew they were "guinea pigs" both in the sense of the new course content we were exploring and the distance learning format that combined multiple sites.

The desire for more discussion and lecture

time was a common theme in evaluations, which may require expanding the AMS class time or using the on-line Blackboard system for more interaction among students.

Given the diverse student backgrounds and the broad universe of themes to be explored, a balance had to be struck in terms of introducing topics for which some students had no background while others were quite well-versed. A primary goal was to enable students to think outside of their own disciplines, consider more aspects of an issue, be able to recognize their biases and stereotypes, and build overall capacity to critically analyze interconnected issues in agricultural and food systems. We were gratified to see that in spite of the video technology all of the students who completed the online course evaluations said they felt connected to students from other sites and felt comfortable speaking/participating in the class.

Overall, we enjoyed teaching the course and viewed it as a success. Hopefully it can be continued and offered to more students in the future. We worked well together as co-instructors and learned a lot from each other during the process.



Food



Program Leader: Laura Lewis

Since 2017, CSANR and the larger University have been incrementally introducing collaborators and stakeholders to the new Food Systems Program (FSP). The program is an evolution of the WSU Small Farms Team, which began almost 20 years ago to address small-acreage, diversified production and marketing needs for farmers and ranchers across the state. Through several processes, both internal and external to WSU, CSANR's Food Systems Program was developed. The FSP currently supports three full-time faculty, a statewide program coordinator, and several part-time support staff across the state. In November 2017, I accepted the position as statewide program leader for the WSU FSP and began transitioning from my regional work with WSU on the Olympic Peninsula.

It has been an exciting few months for the FSP: I have been working to engage partners and potential collaborators across the state; the FSP hosted the 6th annual Cascadia Grains Conference in Olympia, WA at the beginning of 2018; and I recently submitted a USDA Beginning Farmer and Rancher Development Program grant to expand and fund the coordination of our successful Cultivating Success Farmer Mentor and Internship program. I feel very fortunate to be working with such a stellar group of WSU Faculty, staff, and external partners across academia, research, and extension. For the past 25 years, I have been working professionally and personally to strengthen food systems locally, regionally, nationally, and internationally.

This new endeavor of providing leadership for the WSU FSP is a welcome challenge and a return to the passion that influenced me 25 years ago as an undergraduate at WSU to commit my career to supporting farmers, educators, consumers, businesses, and communities connected through the food system.

One of the early objectives for the FSP is to build capacity for transdisciplinary scholarship and research across academic, research, and extension programs and regionally across Washington. Our Vision for the WSU Food System Program (FSP) is: we are regionally and nationally recognized for supporting sustainable food production, agroecosystems, and food economies aimed at providing communities with equitable access to healthy foods.

Furthermore, our Mission states: the WSU Food Systems Program works with communities to establish vibrant local and regional food systems that:

- foster profitable farms and food-related enterprises
- provide effective resource stewardship
- promote localized food processing and distribution and increased access to healthy food



Systems

The Food Systems Team, supported by WSU's CSANR, includes extension, research, and academic faculty and staff, plus critical external partners. Together, we are developing specific food system initiatives that promote research, implement change, and provide unparalleled educational opportunities for undergraduate and graduate students, and communities across Washington.

Initiatives will integrate work across the various areas of food systems, including:

- 1. Production/Environment. Create a stable base of farmers who supply community and regional food markets using sustainable production practices.*
- 2. Access. Improve physical and financial access to healthy foods for all community members.*
- 3. Waste reduction. Optimize energy efficiency and waste management along the entire food supply chain by tightening production and consumption loops, encouraging holistic use of all plant and animal parts, coordinating with food networks, and other strategies as appropriate.*
- 4. Processing and distribution. Address barriers to sustainable, appropriately scaled regional processing, aggregation, distribution, and marketing infrastructure.*
- 5. Policy and regulation. Generate comprehensive research and education on the biological, ecological, social, culinary/cultural, and economic characteristics of viable local food and farming systems, and policies that support them.*
- 6. Economic benefits. Enable food and agriculture businesses that create quality jobs, employ fair labor practices, re-circulate financial capital, and contribute to community economic development.*
- 7. Farmland resource protection. Promote stewardship and restoration of natural resources required for farming, climate change adaptation, and succession planning.*



Graduate Students

Kate Smith grew up in Anacortes, WA and is working towards her Masters in Environmental Science through the WSU School of Environment under Dr. Marcy Ostrom. Kate is pursuing her graduate degree while also maintaining her employment with CSANR as a Northwest Small and Latino Farm Educator.

Kate earned her undergraduate B.S. degree in biology at University of Washington with a focus in Environment and Conservation and a minor in International Studies. As an undergraduate, Kate focused her research on seagrass at the University of Washington Friday Harbor Biology Labs. Through working in the field and laboratory, Kate realized that for her the research was missing a component; the connection to people and communities. She served as a Peace Corps Volunteer in Sustainable Agriculture in Panama where she worked in agroforestry with an indigenous community of cacao farmers. After some additional time in international development, Kate transitioned back to Seattle to focus on supporting farmers in Washington as Market Manager for the Neighborhood Farmers Market Alliance, where she supported over 150 farmers in WA sell their products direct to consumers. After a few years, she reflected that there were very few Latino farmers selling at the farmers markets, even though they make up most of the agricultural labor force and are the fastest growing farm owner demographic. This led her to transition to her position at CSANR based out of the WSU Skagit County Extension Office.

Kate's current research focuses on the effectiveness of farm incubator programs as a method for training the next generation of sustainable agriculture farmers. She has conducted a case study of Viva Farms, a bilingual farm incubator program in Western Washington to determine the influence of the program on farmers' use of sustainable agriculture practices, impact on rural development and sustainable food systems, and effectiveness as a method for reducing barriers to entry for beginning farmers.

For Kate, sustainable agriculture is the intersection of the things she is passionate about, environment, climate change, rural development, social justice and more. After graduation, Kate plans to continue working in sustainable agriculture and small farmer support through CSANR.



David Sullivan is originally from Little Rock, Arkansas and is pursuing his M.S. degree in Soil Science. David chose the WSU soils program specifically to study under CSANR's Dr. Doug Collins to conduct organic reduced tillage research. He became interested in organic no-till after hearing a talk by Jeff Moyer from the Rodale Institute. Dr. Collins' research was appealing to David because he was combining the benefits of both tillage and no-tillage in a cover crop based strip tillage system. This is the system David is focused on during his time at WSU. Research in organic systems has much room to expand in Washington State. As WSU continues to move in this direction, it will help strengthen its role as a national leader in organic production.

After his undergraduate studies at Colorado College, he spent a number of years working in agriculture with vegetable production systems and high density planned cattle grazing operations. Then, prior to WSU, he worked for Biological Capital on a project at Hana Ranch in Maui, Hawaii. Through his studies and work on sustainable resource use, he had become naturally inquisitive after seeing his family farm struggle with pasture soil health. In his current program, his projects involve cover crop based organic strip tillage. In one project, he looked at how cover crop termination timing affects above ground biomass production and the resulting effect of that cover crop mulch on weed suppression. The second project assesses how cover crop mulch and strip tillage affected field water use efficiency of organic squash production compared to a full width tillage system.

After graduation David will begin his recently accepted soil scientist position with Cascade Earth Sciences in Spokane, working on wastewater land application projects. He and his wife plan to continue their joint interest in organic seed production as well.



Leadership Team

Chris Benedict, Whatcom County Extension

Ian Burke, Crop and Soil Sciences

Jeremy Cowan, Spokane County Extension

Kate Evans, Horticulture

Jim Jensen, Energy Program

Kris Johnson, Animal Sciences

Steve Jones, Crop and Soil Sciences

Vicki McCracken, Economic Sciences

Kevin Murphy, Crop and Soil Sciences

Bill Snyder, Entomology

Claudio Stöckle, Biological Systems Engineering

Faculty & Staff



Liz Allen,
Research Associate



Cindy Armstrong,
Finance/Budget Manager



Doug Collins,
Extension Specialist



David Granatstein,
Sustainable Agriculture Specialist



Sonia Hall,
Research Associate



Karen Hills,
Research Associate



Elizabeth Kirby,
Associate in Research



Chad Kruger,
Director



Laura Lewis,
Food Systems Program Leader



Andy McGuire,
Irrigated Cropping Systems Agronomist



Marcy Ostrom,
Farm and Food Systems



Kirti Rajagopalan,
Assistant Research Professor



Brooke Saari,
Extension Coordinator



Kate Smith,
Extension Educator - Small and Latino Farms



Nicole Witham,
Extension Coordinator - Farm & Food Systems



Georgine Yorgey,
Associate Director



Tara Zimmerman,
Associate in Research

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