The OutREACCH

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Pacific Northwest Agriculture

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Director's Corner: Summer interns help keep REACCH integrated

Sanford Eigenbrode, REACCH Project Director

Once again REACCH has all hands on deck for the summer season. Our graduate students and scientists are busy with fieldwork and presentations at field days; industry personnel and other stakeholders are managing the vast acres of wheat across the footprint of our project; and, a highlight of the project, our undergraduate interns are hard at work learning and working with their teams and producers.

Each summer we have hosted 12 to 15 undergraduate students from across the country, providing them with opportunities to conduct research, learn about the project and contribute to our overall efforts. These students work closely with researchers, and they are also provided with special training in skills required for collaboration and communication, and with guidance and advice about how best to pursue their career interests in research and service. The selection process is competitive, so these students are the best and brightest. We do our best to send them home after 9 weeks at WSU, UI and OSU better prepared for success and with a better understanding of the complexities of food production and climate change.

An ancillary benefit of hosting these young people is the incentive they provide to us for strengthening our integration. Each Monday, the students participate in training on aspects of the REACCH project. Our PIs contribute to these trainings, which help the students and presenters see how disciplines work together in a project like REACCH. Before they leave us in August, a symposium of presentations by the interns brings together PIs and graduate students across the project. The benefits of this activity are mutual for the students and the project as a whole.

REACCH Summer Interns receive an introduction to life on the Palouse through a BBQ, June 9 at Prof. Jodi Johnson-Maynard's home.

One of the challenges for working with our summer interns is distance. This summer, six interns are located in Moscow/Pullman, one in Pendleton and five in Corvallis. The challenge of long-distance collaboration mirrors the one REACCH faces. It is a challenge that will affect research and outreach enterprise going forward. This summer, we are paying special attention to improving the quality of virtual collaboration activities for these students. Christina Wasson, associate professor of anthropology at North Texas University, and a specialist on virtual communication, is spending time with us to improve how we use virtual and online tools to bring students, and the rest of us, together.

The summer internship program in REACCH is made possible by the efforts of Jodi Johnson-Maynard, the leader for our education activities; Leigh Bernacchi, communication specialist; and especially, Marijka Haverhals, coordinator for the intern program. The project is indebted to these people for making the intern program a success.

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Integration at its Finest! REACCH, Site-Specific Climate Friendly Farming & University of Idaho Extension Host a Precision Ag. Demonstration Day

Kristy Borrelli, REACCH Extension Specialist, University of Idaho

Due to the immense interest in using Precision Agriculture technology in Pacific Northwest wheat-based farming systems, a great opportunity arose to get everyone together for a field day!

The goal of the demonstration day was to help wheat producers and their associates overcome known adoption barriers by narrowing the knowledge gap. For this reason, it was important that presenters demonstrate equipment that is ready, or will be soon, for use in the field.

Nearly 100 growers, agribusiness associates, researchers, students and conservation affiliates joined us for the event that took place on June 5, 2014 at the University of Idaho's Parker Farm in Moscow, ID. It was a collaborative effort among REACCH, Site-Specific Climate Friendly Farming (SCF) and University of Idaho Extension faculty.

Field equipment was demonstrated by researchers and students involved in both REACCH and SCF. The event was hands-on, interactive and fun. Researchers demonstrated different monitors and sensors, and allowed participants to try them out themselves. Featured equipment included ATVs with soil pH monitors, hand-held chlorophyll monitors, scouting cameras, sensors mounted to GiddingsTM probes, and non-contact electromagnetic inductive sensors.

What started as a hobby for Robert Blair, a Kendrick, ID farmer, has led to research partnerships and improved farm information and management responses.

REACCH Extension Specialist Kristy Borrelli partnered with many experts, especially University of Idaho Extension Educator Doug Finkelnburg to expose some of the latest and greatest technologies at the Precision Agriculture Demonstration Day.

Robert Blair, a Kendrick, ID farmer (pictured below), took his unmanned aerial vehicle (UAV) for a spin before lunch and demonstrated the field photos it collected later in the day. Several regional businesses (CHS Primeland, ATI Solutions,Trimble, and Decagon Devices) showed off some of their field equipment including newly developed soil sensors, precision sprayers and dry fertilizer applicators that resembled something from the Transformers movies!

Three regional Conservation District and NRCS directors discussed cost-share programs that support growers in using precision agriculture and establishing other conservation efforts. Participants enjoyed the event, commenting that they learned a lot and appreciated the engagement and involvement with researchers. The event received an incredible, positive response from regional press prior, during and after the event.

A complete agenda for the day, including topics and speakers, is available at:

extension.reacchpna.org

Local Students Appreciate Conservation, Farming and Culture

Kristy Borrelli and Lauren Young, Student and Coordinator, WSU

Early this June, REACCH helped the WSU College of Education celebrate the 10th anniversary of its **Leadership Development Camp**. The week-long residential camp is directed by Paula Groves Price and Cedric Price as part of an education partnership program with the Coeur d' Alene Tribe and WSU. The camp is designed to introduce middle and high school students to STEM (Science, Technology, Engineering and Math) disciplines, natural resource conservation and native culture education. Through team building, sports, and seminars, the students gain leadership and academic skills while embracing their cultural and scientific identities. At this year's camp, REACCH graduate students Hilary Davis, Tai McClellan Maaz, Chelsea Walsh, and Lauren Young and Prof. Jodi Johnson-Maynard discussed the importance of soil erosion and resource conservation on wheat farms with 40 thirteen- to fifteen-year-olds.

Chelsea Walsh demonstrates the importance of crop residue at protecting soil from erosion and loss through a simple simulation.

Coeur d' Alene land is located in the major wheat producing region of the Idaho Panhandle. REACCH's wheat focus related directly to the student's local environment and complimented other camp sessions on water quality. REACCH was fortunate to be joined by Jim Kackman, Coeur d' Alene Tribe Public Works Director, who manages the tribal farm. Jim spent an hour familiarizing the kids with maps of the tribe's farmlands, pointing out specific regions where camp participant's families farmed. He introduced them to equipment used on the farm and discussed their efforts to improve conservation using precision management. Jim also taught the students about the Dawes Act of 1887, a law which divided tribal land into individual allotments in exchange for U.S. citizenship, and the tribe's efforts and abilities to reclaim farmland.

Tai Maaz leads students through an activity that demonstrates how different environmental and management factors can impact soil erosion, crop development and profit.

The REACCH team discussed crops, soils, and the importance of conservation in farming systems. In a hands-on soil erosion simulation, the students understood how parts of a cropping system build on and impact one another. Comparing the economic impact of erosion on wheat yield under different scenarios proved to be impactful as one student exclaimed, "$35,000 lost!! That's enough to buy a new car!" The students' understanding of erosion was further strengthened through a soil erosion demonstration using simple bread pans, water, and crop residue to simulate erosion in the field.

The session was an overall success and everyone had a great time. The kids were most excited to learn about the financial costs associated with soil erosion, but they thought that earthworms were fascinating too. However, they responded most to their discussion with Mr. Kackman, who helped them realize that they are stakeholders to their own land. Pride in home and culture is a key component to understanding and appreciating conservation.

Making Farming "Climate Friendly": What is the impact of nitrous oxide?

Georgine Yorgey, Research Associate, CSANR, Washington State University

If you are interested in ensuring that farming is climate friendly you are likely to start thinking about nitrous oxide (N2O). Nitrous oxide is a powerful greenhouse gas (298 times as powerful as carbon dioxide, over a 100-year time frame). And nitrous oxide from agricultural soils is the single biggest contributor to agriculture's direct greenhouse gas emissions. In Washington State, one source estimated that nitrous oxide from soils accounted for 46% of direct greenhouse gas emissions from agriculture in 2008.

Nitrous oxide emissions occur soils when microbes in the soil transform nitrogen from one form to another, specifically during the processes of nitrification and denitrification. However, more nitrous oxide is produced under some conditions than others: when nitrogen is added to soils—as in fertilizer in most farming systems, and when oxygen in soils is limited—for example, when soils are saturated with water from rainfall or melting snow.

Most research on nitrous oxide in the Pacific Northwest has been done since 2000, limiting the quantity of data. However, existing data suggest that **emissions from inland PNW croplands may be on the low side compared to other regions** of the U.S. and world. Kristy Borrelli, Chad Kruger, and I, in preparation for recent webinars about nitrous oxide emissions and nitrogen management in PNW croplands, created a chart showing cropping system emissions factors of nitrous oxide (Fig. 1).

Ongoing work in the Pacific Northwest, through the REACCH project, the Site Specific Climate Friendly Farming Project (SCF) , and others are seeking to confirm this tentative conclusion. Methods employed for emissions calculations are based on experimental efforts such as sophisticated flux towers and modelling efforts.

The answers that we get will likely have implications for how we might try to decrease nitrous oxide emissions in our region. If emissions are fairly low, one implication is that any efforts to reduce nitrous oxide emissions through management should focus on strategies that offer strong co-benefits such as raising yields or saving water. This is because with lower overall emissions, any strategies that reduce greenhouse gas emissions will also have relatively smaller incentives; therefore strong co-benefits will likely be important for adoption.

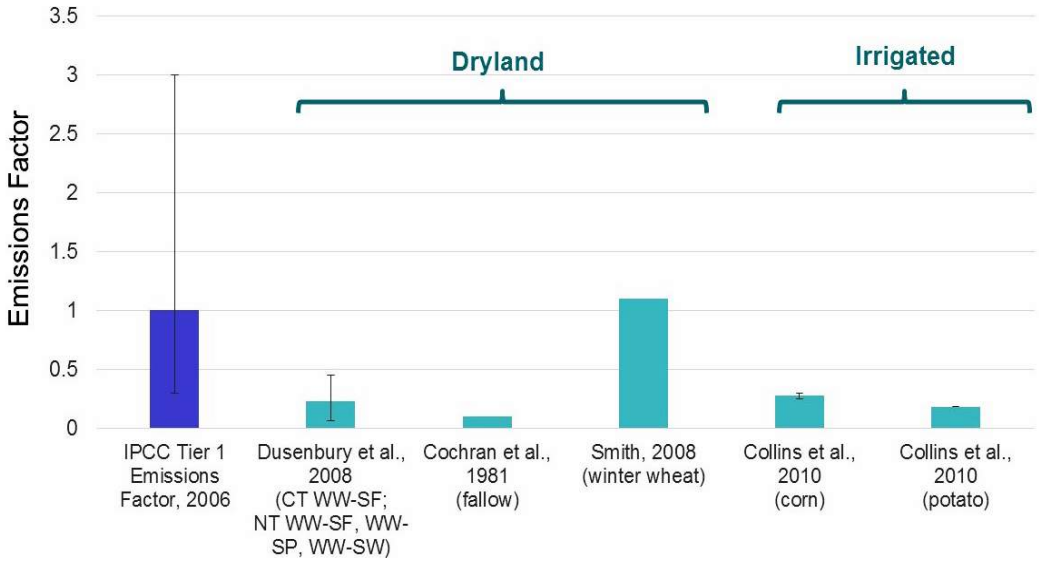


Figure 1. Percent nitrogen emissions per application of fertilizer in different cropping systems. Intergovernmental Panel on Climate Change (IPCC) described a "Tier 1 Emissions Factor," indicating that in the absence of more specific data, it should be assumed that 1% of N applied as fertilizer is emitted as nitrous oxide. In recognition of high amounts of variability in the data, they suggest a confidence interval range of 0.3-3%. Local research shows that emissions for the PNW may be lower than global emissions (e.g. Dunesbury et al.). For detailed notes, further explanation of the graph, and coverage of modeling results, see the webinar "Nitrous Oxide Emissions in Inland Pacific Northwest Cropping Systems."

Precision Agriculture Offers Farmers Exciting Conservation Opportunities

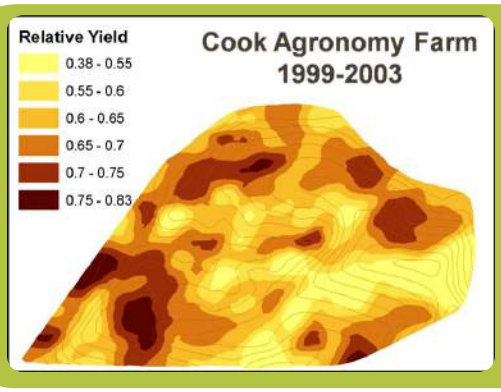
Kristy Borrelli

When I began working with REACCH last year, it was interesting that no matter who I spoke to, the topic of precision agriculture came up. Researchers, farmers, professors, businesses and conservation agencies were into it. Exactly what is precision agriculture and why is everyone so interested?

Precision agriculture is also referred to as site-specific farming. Simply, it allows farmers to address field variability (below), rather than treating the whole field the same. Because fields are rarely uniform, crops often have different needs depending on where they grow. For example, erosion on hilltops reduces soil quality *and* reduces crop yield. Crop yield will remain low on the hilltops regardless of how a farmer manages, easily rationalizing application of less fertilizer to that location and allocation of more to other places in the field with higher yield potentials. Similarly, precision equipment allows farmers to treat patches of weeds and diseases, rather than spraying the entire field. Applying inputs only where they will be used by the crop reduces costs, decreases losses, and increases efficient use of resources.

Variations in soil depth, organic matter, moisture can impact crop performance within a field, especially on hillslopes. Photo courtesy of Guy Swanson

Although it is possible to practice precision agriculture without technology, advances in high-tech imaging devices involving satellites, unmanned aerial systems (UASs) and lasers have made precision agriculture technology (PAT) the norm.



By incorporating historical data into GIS models, maps identifies areas of low and high yield within a specific field. Map courtesy of Dave Huggins.

Farmers can create advanced maps, monitor crop performance and soil variations and make more informed decisions (above).

As part of a collaborative effort between REACCH and another regional project addressing climate change and agriculture (Site-Specific Climate Friendly Farming, USDA-NIFA) variable rate nitrogen (N) application is being examined near Genesee, ID. Winter wheat yields vary from 35 to 150 bu/acre across farm fields. By using auto-steer and variable rate equipment and software to manage N application in four different field zones (Low yield 35-55 bu/acre; Medium yield 1 80-90 bu/acre; Medium yield 2 100-110 bu/acre; and High yield 130-150 bu/acre) the grower reduced N inputs by 15% and saved approximately $8.50/acre.

Because it often focuses on N-management, precision farming can mitigate climate change: reducing reactive soil nitrogen reduces agricultural N2O emissions. Furthermore, when farmers reduce the amount of fertilizers or other inputs (e.g. pesticides or lime), they also reduce natural gas use and GHG emissions from manufacturing and transport.

Overall, climate change adaptation and mitigation strategies are actually about conservation and sustainability. Reducing unnecessary inputs on farms not only helps to mitigate climate change, but reduces resource and economic losses that can lead to pollution and less profitable farms. By allowing farmers to actively understand their farm and address its specific needs, precision agriculture helps keep conservation and farming possible.

The OutREACCH
Edited by Leigh Bernacchi
For more info: Dianne Daley Laursen
diannedl@uidaho.edu

Washington State University · University of Idaho · Oregon State University
REACCH Regional Approaches to Climate Change – Pacific Northwest Agriculture
USDA ARS · USDA NIFA