The OutREACCH

A quarterly report by Regional Approaches to Climate Change

Pacific Northwest Agriculture

May 18, 2012 - Vol. I, Iss. I

Director's Corner: A Network in Progress

Sanford Eigenbrode, Project Director, UI

Greetings from REACCH! This column will appear in every issue of The OutREACCH with highlights and views from our project and observations about related activities and issues.

The theme of this issue's column is "Networking". REACCH is a product of extensive collaborations and networks for research, extension and education concerning agricultural sustainability that preceded it. Notably these include successful programs like STEEP (Solutions to Environmental and Economic Problems) and the Site-specific Climate-friendly Farming project. Our continued success depends upon nurturing collaboration and networking as we go forward. Here is how this is happening.

Local and Regional Networking. REACCH is strengthened by its partnerships with ongoing related projects in the region. These include Idaho EPSCoR2, the Idaho Regional Optical Network (IRON), a NASA-funded project "Collaborative Development of a Climate Change Curriculum for Classrooms in the Intermountain West" at UI, the Oregon Climate Change Research Institute, NOAA (Climate Impacts Research Consortium), the BioEarth Earth Systems Modeling Project and the Site-specific Climate-friendly Farming project both at WSU, and two NSF IGERT projects, one at UI and one at WSU, and others. These projects provide resources and expertise that help REACCH meets its goals. Partnering allows all of the projects to use of our federal funds efficiently. Going forward, we will welcome new partnerships like these with researchers, educators, extension personnel and stakeholders.

National Networking. REACCH was funded along with two other $20M coordinated agricultural projects focusing on climate and agriculture, but focusing on other systems: Midwest corn production (SustainableCorn.org) and southeastern loblolly pine (PINEMAP.org). Our three projects are partners, supporting and learning from one another. Project directors and other personnel are in regular contact, attend one another's project meetings and nurture collaborative opportunities. In 2015, the three projects will host a joint international meeting.

The USDA's Agricultural Research Service (ARS) has announced a new program to establish Long Term Agricultural Research sites (LTAR). Thanks to the efforts of Dave Huggins, the Cook Farm has been designated as one of these sites, effectively linking REACCH to the ARS network. Last month, I met with Mark Walbridge at ARS in DC to discuss strengthening cooperation between the LTAR network and projects like REACCH nationwide.
Our project is also partnering with the National Science Foundation's Long Term Ecological Research (LTER) program, specifically through our ties with the Kellogg Biological Station (KBS) at Michigan State University. Going forward we aim to build linkages to other national federal initiatives such as the NSF National Ecological Observatory Network (NEON).

International Networking. Our project is one of many internationally that are working on sustainable agriculture in the context of changing climates. We are linking to these through the Global Research Alliance on Agricultural Greenhouse Gases, the Global Agricultural Modeling Intercomparison Project and others.

By networking at all these levels, REACCH can be more effective for our region's agriculture and contribute to global sustainability.

Please let us know of other opportunities!

Creating Connections

You asked for it and here it is!!! We are working to improve the lines of communication between our project and our stakeholders.

This newsletter, will appear quarterly with short articles about activities and events within our project, a message from the director, and other links and resources.

A refurbished website, now contains complete information about our entire project, its goals, mission, personnel, current and planned activities, products and eventually interactive tools for stakeholders. Check it out soon at www.reacchpna.org.

Funded through Award #2011-68002-30191 from USDA National Institute for Food and Agriculture

The Earth Breathes

Dave Huggins, USDA-ARS Soil Scientist

Gases are constantly exchanging between the atmosphere and soil. Under aerobic conditions when soil oxygen is plentiful, many soil organisms feed on organic materials, consuming oxygen and releasing carbon dioxide in a process that is similar to many living organisms including humans. The earth does, in effect "breath". The REACCH project is currently using specialized equipment to closely monitor exchanges of greenhouse gases, notably carbon dioxide and nitrous oxide, under field environments.

Last fall, 64 automated gas monitoring chambers (LI-COR, LI-8100A Automated Soil CO_2 Flux System) were deployed at the WSU Cook Agronomy Farm following winter wheat planting (Figure 1). The chambers were placed in a micro-plot experiment with four Nitrogen (N) and two glucose levels replicated eight times. Applying the N and glucose treatments took a bit of ingenuity. Dave Uberuaga, USDA-ARS, constructed an injection template (angle iron and nails) that would accommodate the insertion of pipette tips and facilitate the systematic injection of treatment solutions of N and glucose (Figure 2). Following treatment applications, the chambers were placed in each micro-plot and connected via tubing to infrared gas analyzers located in each of two trailers (Figure 3). The chamber system can be programmed to measure gas fluxes from the soil as frequently as once every hour, allowing us to literally monitor the earth as it "breathes". Early preliminary data on carbon dioxide fluxes from the soil show daily variations (Figure 4). In addition to carbon dioxide, we are interested in monitoring nitrous oxide, which requires additional equipment. Here, we needed to couple the nitrous oxide monitoring equipment manufactured by Teledyne with the LI-COR equipment, again requiring ingenuity and testing, this time accomplished by Dr. Kirill Kostyanovsky, a post-doctorate working with Drs. Claudio Stöckle and Dave Huggins on the project.

What will we find out? Our treatments consisting of differing N fertilizer rates will allow us to assess how N supplies impact the release of nitrous oxide from the soil. We expect that as N rates exceed amounts required to meet the nutritional requirements of wheat, that nitrous oxide emissions will increase, possibly exponentially, but we really do not know. Furthermore, nitrous oxide production could be stimulated if we provide glucose that may help fuel microbes producing nitrous oxide. All of these results, of course, are highly dependent on environmental conditions particularly soil water and temperature. Interestingly, the microbes responsible for nitrous oxide production respond very rapidly to changes in environmental conditions, on the order of minutes and hours. Therefore, the need for automated monitoring chambers that capture responses and record gas fluxes as the earth breathes throughout the day and night.

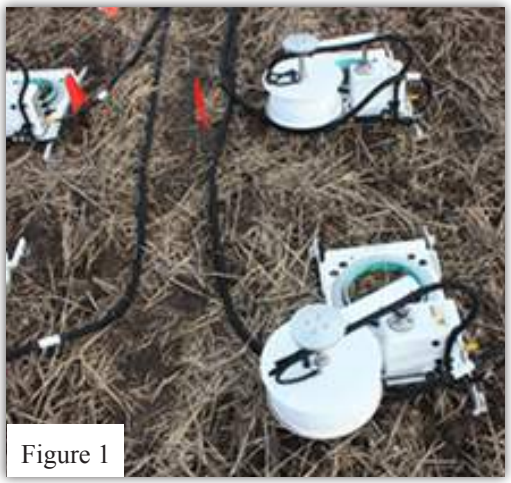


Figure 1

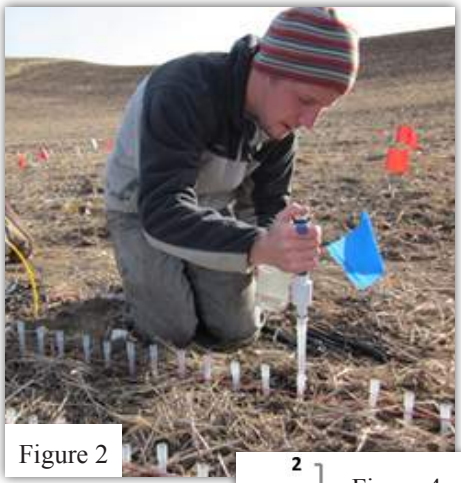


Figure 2

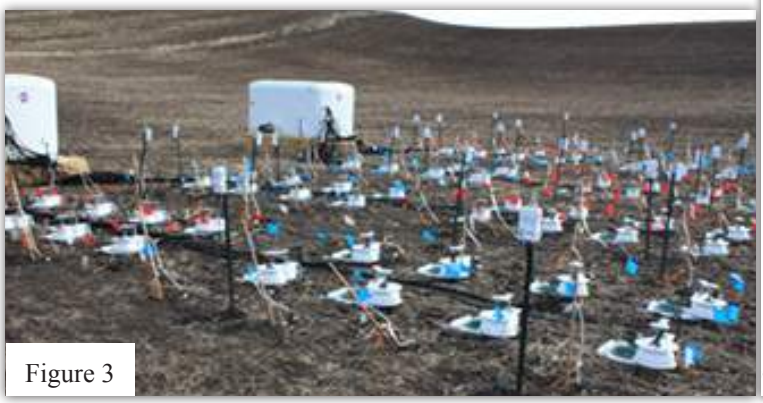
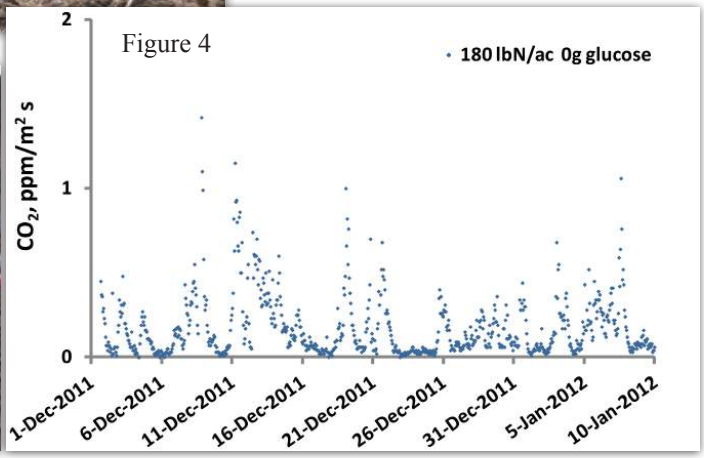


Figure 3

Figure 4



Effects of Management on Carbon export by Water Erosion in the High Precipitation Agroclimatic Zone

Erin Brooks, University of Idaho and Ryan Boylan, MS Graduate Student

The high precipitation Agroclimatic Zone of the Palouse region is historically known for high soil erosion rates. From 1939 to 1960 it was estimated that on average, a ton of soil was lost for every bushel of wheat produced. In the Palouse basin it was estimated that ¼ to ¾ of all the topsoil was lost from 80% of the area. With this loss of topsoil, much soil carbon was lost to regional creeks and streams. Over the last thirty years the increased use of conservation tillage including no-tillage has significantly reduced soil losses in the region. Despite a long history of soil erosion research in the region there are few comparisons of the dissolved and particulate organic carbon losses from fields managed using no-tillage versus conventional tillage practices. Importantly, it is unknown whether a reduction in particulate organic carbon under no-tillage is accompanied by increased dissolved organic carbon losses as water moves through the more carbon-rich topsoil of the no-till fields. To answer this question as a part of the REACCH project, Dr. Erin Brooks in the Biological and Agricultural Engineering department at the University of Idaho along with REACCH graduate student Ryan Boylan, have instrumented two field catchment sites with flumes and automated water samplers (Figure 1) to monitor annual dissolved and particulate carbon delivery from both a no-tillage and conventional tillage site. These automated samplers are controlled by dataloggers, which use water depth readings to increase sample frequency during storm events (Figure 2). In addition to particulate and dissolved organic carbon, water samples are tested for suspended sediment, nitrate/ammonia, and total nitrogen concentrations. The winter and spring months of 2012 were particularly wet and led to abnormally high soil erosion and surface runoff rates. One of the worst-case scenarios for soil erosion in the Palouse is runoff on thawing soils. Soils in the Palouse were either completely frozen or partially thawed over much of the months of December through February. The Moscow COOP weather station, which has precipitation records dating back to 1893, recorded 7.84 inches of precipitation in March. This was more that 2 inches greater than the maximum precipitation ever recorded in March at this station. As a result, runoff in erosion losses were very high in March. Data collection will continue at both these sites will continue over the next four years. This extreme water year will provide a valuable data set to test and validate soil erosion and carbon transport models and will provide a valuable benchmark for comparing impacts of management on soil carbon export during future years.

Figure 1

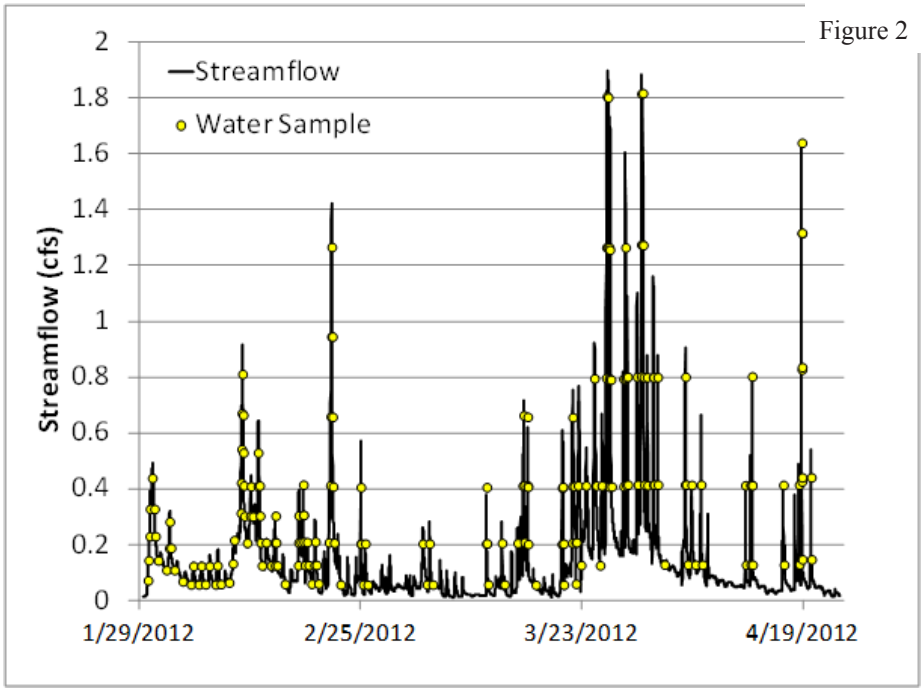


Figure 2

Summer Field Tour

June 19-20, 2012

Join us for an optional gathering of all REACCH team members and stakeholders on the REACCH Summer Tour! On June 19 the tour will leave Moscow at 11:30 am for St. John, WA, where Dave Huggins, USDA-ARS and– Dan Harwood, Palouse-Rock Lake Conservation District and PNDSA board member, will highlight direct seeding and alternative management systems. In the afternoon we will visit Cook Farm to discuss site specific nitrogen, crop and crop residue management, nitrogen cycling, monitoring greenhouse gas emission from soils, and soil carbon sequestration. We will return to Moscow by 5 for a potluck and a REACCH band performance. June 20 we will depart Moscow to attend the Wilke Farm Field Day in Davenport, WA where farm scale crop rotation studies are ongoing. Researchers will present information about a new oilseed-wheat rotation study, herbicide carryover effects on oilseeds, and nitrogen cycling in canola-spring wheat/legume –winter wheat rotations. Lunch will be provided by WSU. Then the group will travel to the Ron Jirava Farm in Ritzville, WA to look at long-term crop rotation experiments, water use efficiency, residue management with an undercutter, crop diversification with oilseeds and legumes, and large scale land application of regional biosolids onto wheat fields. The last stop will be the Curtis Hennings'Farm in Ritzville where there are crop rotation experiments, crop intensification and diversification, high residue management trials with a stripper header, and a look at C/N dynamics. We will chat about the future of oilseed production and end the day with a social and picnic before we head back to Moscow. Anyone can join us for the whole tour or at any stop. Watch our new website, www.reacchpna.org for the final itinerary and more details. You can register by emailing Dianne at diannedl@uidaho.edu. We hope you can join us!

*The Out***REACCH**

Editor, Lenea Pierzchanowski
To receive a print copy,
please email leneap@uidaho.edu

Education Opportunities

Jodi Johnson-Maynard, University of Idaho

Summer 2012 is shaping up to be a very exciting time for REACCH educators. We have accepted a group of 13 high achieving and enthusiastic undergraduates who will work on independent research projects alongside REACCH scientists at UI, WSU, OSU and USDA-ARS. The students will be taking part in a 9-week paid internship program funded through the REACCH program. This program will provide the first opportunity for many of these students to experience research. In addition, students will attend workshops on ethics in science and preparing for graduate school. We hope at the end of the program students will return to their home institutions with a better understanding of the challenges and opportunities surrounding climate change mitigation/adaptation in agricultural systems.

In the area of K-12 education, REACCH will partner with the NASA-funded ICE-Net project (http://www.uidaho.edu/ed/research/signatureareas/nasagcce) to offer a hands-on, teacher professional development workshop focused on climate change and agroecological systems. This workshop will be held in Moscow, June 19-21.

During the 3-day workshop teachers will be exposed to current, state-of-the-art research in the areas of sustainable agriculture and how they may be able to incorporate REACCH data into classroom activities in the future. Teachers will also gain experience using climate change-related data bases and online materials, be exposed to the principles of adventure-based learning and have a chance to develop lesson plans with other teachers and scientists.

Certain segments of the workshop will be available online to allow teachers throughout the REACCH study area to participate. Continuing education credits will be available for participating teachers and a limited number of stipends are also available to help cover travel, lodging and food.

For further information regarding this opportunity, please contact Jodi Johnson-Maynard (jmaynard@uidaho.edu, 208 885-9245) or Kattlyn Wolf (kwolf@uidaho.edu, 208 885-6358).

REACCH Regional Approaches to Climate Change – Pacific Northwest Agriculture
Agricultural Research Service
University of Idaho A LEGACY OF LEADING
OSU Oregon State University
USDA United States Department of Agriculture
National Institute of Food and Agriculture
Washington State University