

**Agriculture in a Changing Climate Workshop**  
**March 9-11, 2016**  
**Workshop Breakout Session Notes Synopsis**

**Overall Objective: To create a five year roadmap that improves coordination for efforts related to climate change and mitigation in the Pacific Northwest.**

During this three day workshop...

- We will hear from experts in their fields from research, agency and industry on what their needs, goals, and plans are for the next five years.
- We will have focused breakout sessions to tease out information needs and future directions in climate mitigation and adaptation.
- Details and information from these breakout sessions will be pulled together in a white paper that can be used to coordinate efforts and lead to actionable team projects.

**Day 1: Production System Breakout Sessions**

***Track 1: Cropping Systems & Bioenergy Strategies***

**Breakout sessions:** Determine what the next steps are in mitigation strategies and where we should focus efforts for the next five years.

**Room 1A: Soil Carbon Sequestration**

**Facilitator – *Amanda Murphy***

1. *Introductions (name, affiliation) and ice breaker question: what do you hope to achieve during this track?*

Leslie Michel; Cornelius, Adewale WSU, Real time experience; Keith Harrington, NRCS; Bea Van Horn, FS; Diane Daley Lausen – REACCH; Katherine Vogel – EPA; Vincent Jones; Jim Amonette; Mark Fuchs – DOE; Mike Strobel; Dominique Bachelet; Laurie Houston; Dan Geller; Steve Ghan; Robert Compton – CCT; Steven Machado; Ben Thiel – RMA; Sonia Hall

2. *What are the mitigation strategies that focus on soil carbon sequestration?*

List of known strategies: No till, strip till, conservation tillage, low till, minimum till, direct seed (14), Biochar (5) + bury high lignin or resistant carbon material (charcoal), Cover crops (7), Conservation Reserve Program (2), Residue Management (2), Compost (1), Bio-Solids (1), Bio-Fuels/Bio-mass crops (2), Fertilization (1), Soil Health (1), Crop rotations (1), Carbon credits (1), Permaculture – avoid tilling the soil (1), Livestock integration into ag production (1), Holistic grazing (separate from livestock integration because more focused on rangeland/forest lands, rather than ag lands) (1), Land use policy – stop using the best ag land for housing (1), Organic farming (Prioritize organic farms, compost intensive) (1), Bio-refinery (to capture municipal organics, biochar, compost) (1)

3. *Among these strategies, what do we need to know more about and why?*

Biochar: What, Duration, Which feedstock. Need data, research, policy but where to start?

-Up until the 50s, ag soils were the main emitter of C. Soils have probably lost half of their C, and could be recovered, potentially. Additions of biochar, for example, could lead to even higher amounts sequestered. 50-100 GT C could be restored, another similar amount from biochar. 25-50% of the problem could potentially be addressed in this way.

Effectiveness: how are each effective? Economic impacts?

Impacts: How are they impacted by soil type, vegetation and climate?

Application: Relevant to forestry? Orchards? Vineyards?

Synergy: between strategies

Indicators: Microflora of soil(s)

Relationships: between CO<sub>2</sub> sequestration, and Implementation

Cost/Benefits: What factors influence, how do they vary spatially?

Implementation: How do we measure it? Value in qualitative but need quantitative to measure soil health improvement.

Understand: technical, economic, political linkages within each strategy.

4. *Among these mitigation strategies, which are closer/more promising in terms of being implemented and why? & 5. What are the barriers to implementation?*

**No Till:** Relatively easy implementation, it is a “known practice”. Critical mass of adopters, they can carry the message. It works-already in practice. Initial investment=commitment. International examples.

- Barriers- Perception, pride and beauty of field, initial investment, and emergence is slower due to cooler soils. On farm trials hard to fund and hard to show/demonstrate the practice. Yield impacts controversy. Researcher to farmer communication.

**Cover Crops (Soil Health)/Crop Rotation (Soil Health):**

Benefits already recognized, Communication – silos to collaboration, metrics to messaging. Need to get the messaging right; it can be very specific – site-specific, crop-specific. Cover crops will increase your C seq, soil health. Co-benefits are very important. E.g. cover crops have pest management benefits; or can change the pest issues.

Barrier-Economic, lack of experts and access to experts. Addressing barriers by focusing on co-benefits (climate change on top of other benefits that are already valued by growers). Growers tend to make decisions on their own since unclear where to get information.

**Biochar:** Increases total overall sequestration, “permanent” sequestration 50%+/-, existing example ag energy (Spokane), soil benefits?

Barriers: Lack of knowledge/familiarity. Working in silos, risk, learning curve with any new strategy (need financial incentives, technical experts, application and testing). Need to capture producer opinions.

**Training:** Existing College Ag Programs, Tech, k-12 programs

**Municipal waste/ag production:** Existing Carbon Streams

6. *How might these barriers be addressed?*

Message barriers, about who/how message is delivered; More training (extension, agency, policy); Building knowledge/identifying the co-benefits; Clear messaging; transition incentives (\$, access to info); Tailoring strategies to unique needs/situations; Engaging & educating next generation for better understanding.

7. *What's missing from the discussion so far? What would you like to add?*

- There are a lot of strategies to use, what's missing is coming together and communicating better across them. Transferring it in a useful way to users
- Strategies known, can happen and should be a cohesive package that people can pick and choose from. Package of tools for farmers.
- There's question of quantitative vs qualitative. Also traditional ecological knowledge. How to translate for policy maker, who wants one number? Communicating it is the challenge.
- Programmatic funding could be geared more to communications and outreach
- How do you build the momentum to change policies that can make a difference
- How to apply to forestry??
- Ag producers and industry missing from conversation; social science/human behavior; Programmatic funding gear to education and outreach.

## **Nitrogen Management**

### **Facilitator – Chris Page**

Goal: Determine next steps in N mitigation technologies and where we should focus efforts in the next 5 years?

1. *Introductions (name, affiliation) and ice breaker question: what do you hope to achieve during this track?* Sanford Eigenbrode, UI; Doug Fincklenberg, UI Extension; Rich Koenig, WSU extension crop and soil; Georgine Yorgey, WSU CSANR; Greg Johnson, NRCS; Glenn Reily, NRCS Pasco; Hal Collins, USDA ARS; Rachel Steele, USDA Climate Hubs; Liz Allen, WSU (notes); Stewart Higgins, WSU
2. *What are the mitigation strategies that focus on nitrogen management?*
  - 4 Rs of stewardship: right time, right place, right rate, right source
  - Incentives for tech adoption
  - Precision agriculture/ Variable rate application
  - Conservation Reserve Program (No till, Mulch crop)

- Collaboration with industry for identifying best management practices
- Irrigation management (linked to reduced NO<sub>x</sub> emissions)
- Reducing soil compaction—more aeration, changing microbial action
- Nitrogen inhibitors

### 3. *Among these strategies, what do we need to know more about and why?*

#### *Monitoring & Data:*

- Baseline N<sub>2</sub>O in region
- Hot spots? Atmospheric vs. aquatic transport?
- Impacts of cover cropping—can they have negative N<sub>2</sub>O impacts if fertilized?
- If we don't know what emissions are in the region, how do we know what the appropriate strategies are? May be considerably higher than IPCC projections of N emissions
- Management, accessibility and handling of data
- Decision support tools, which need open source platforms or protected

#### *Economics and Risk:*

- Optimizing return of precision application technology
- How low can we go in terms of N<sub>2</sub>O emissions?
- Yield and economics playing out in N management in various systems
- How to make Precision N application technology profitable
- Are there pilot projects?
- Scaling of precision agriculture for farms of different size. Cost of technologies?
- Cost effectiveness and best management for N inhibitors?

#### *Other:*

- Revisit management recommendations, university guidelines for N application are often too high.
- Spatial aspect needs to be included in recommendations to producers.
- Offset of carbon capture for N is really unbalanced. Interesting to think about whether N emissions from natural systems are a reasonable target.
- Need better decision support to pick among N inhibitors and Precision application.

### 4. *Among these mitigation strategies, which are closer/more promising in terms of being implemented and why?*

- Research shows that high potential to increase efficiency with variable rate technology Precision ag.—but what about small/subsistence farms?
- Irrigation management may be an important opportunity, low cost of water may be a barrier
- N inhibitors
- Genetic discussion—not sure how close we are to this being feasible... It is in the future, but it might be a viable strategy down the road.
- Is precision N application technology being used widely in irrigated systems?
- N inhibitors are really part of the 4 Rs, managing source of N. It's a pretty rough calculation of how much N from mineralization (can vary 100% annually depending on precipitation and temperature). Recommendations rarely updated.

## 5. *What are the barriers to implementation?*

### Cost/ Economics:

- cost of technology
- economy of scale
- cost of inhibitors
- lack of incentives and market mechanisms or policy structure conducive for making this economically attainable

### Outreach:

- Information and culture—reluctance to accept new ideas
- History and tradition
- Linking technology to information exchange
- Need more information for extension educators (Train the trainers)
- Make information tools available—meet producers' demand for more information about N efficiency technology
- Complexity of issues and technologies (tendency to over-engineer a solution. Don't let the perfect be the enemy of the good)

### Other:

- Producers look to: 1) industry reps, who may get THEIR information from extension, but not always, 2) also get information from neighbors, and 3) extension. Extension sometimes has an indirect route to producers. Field days were a traditional forum for information sharing.
- Industry shift, so much competition that they get only a little profit from sale, but they can provide information and profit that way – proprietary information about Precision ag—each company has its own tools.
- Industry people often have a lifetime of trust built in with farmers. Extension also tries to sell objectivity. Monsanto lines up information about climate and N application for producers. But a lot of the underlying information is suspect-- it doesn't meet the levels of rigor expected for published study.

## 6. *How might these barriers be addressed?*

### Economics:

- Incentives
- Market transparency
- Policy solutions/ structures
  - There are disincentives in crop insurance structure to increasing efficiency. This is a barrier to be addressed. Policy change could address this.
- Insurance type products—insure against risks of managing N more efficiently
  - Reverse insurance-- When you manage N application more perfectly you are taking risk of lower yield (in perfect conditions reverse insurance would compensate for the extra you didn't grow.)
  - By increasing efficiency, you may have damaged your enterprise. Farmers care about profit, not yield per se. Restructure insurance systems to reward N use efficiency even if total crop yield is slightly reduced.

### *Demonstration projects*

- Education modules
- Information exchange—change culture and get buy-in
- Focus on new young growers
- Training trainers (extension professionals)
- Better leverage existing partnerships and resources (public-private partnerships)
- Applied research and translational investments (decision support tools)

### 7. What's missing from the discussion so far? What would you like to add?

- Would more information about regional scale sources and sinks aid in better decisions about N management strategies to promote and approaches to take?
- But it's hard to say if information at this large scale would actually be meaningful... More precision is better.
- Zone specific information—irrigated systems vs. dryland, PNW vs. other parts of country, crops vs. animal agriculture emissions?

### **Track 2: Livestock Systems & Bioenergy Strategies**

Facilitator – *Molly Stenovec*

**Breakout sessions:** Determine what the next steps are in mitigation strategies and where we should focus efforts for the next five years.

1. *Introductions (name, affiliation) and ice breaker question: what do you hope to achieve during this track?*
2. *What are the GHG mitigation strategies that focus on livestock systems and bio energy strategies?*
3. *Among these strategies, what do we need to know more about and why?*
4. *Among these mitigation strategies, which are closer/more promising in terms of being implemented and why?*
5. *What are the barriers to implementation?*
6. *How might these barriers be addressed?*
7. *What's missing from the discussion so far? What would you like to add?*

### **Main Points Summary**

Themes:

- (1) Manure management & technology;
- (2) Nutrient Management (manure nutrients);
- (3) Animal Production Management (Productivity Improvement based on diet, genetic factors, feed conversion, fertility rate- all these impact efficiency of animal – choice of species and species mixing)
- (4) Soil Health and Grazing Management (cropping agronomy component)
- (5) Alternate Feed Sources (cropping system, agronomy component, local or outside imports)
- (6) Diversification System Management
- (7) Land Use Change Implications?

Note: Challenges of lumping and splitting actually point to some of the concerns we have in that people don't see how parts of the system fit together and impact each other. We need to look at the systems rather than each individual component.

### **Highlights**

- Moving from reactionary or short-term to systems approaches
  - We rely on technological band-aid approach and we need to be thinking about systems.
- Outreach and Education lots of opportunities across topics
  - Conveying research findings to on the ground implementers – “On the ground” (vice versa)
  - Producer Education
  - Consumer Education
  - Policy makers Education
  - Technical Assistants Education
- Regional vs. Farm –scale is important
- Policy and Regulation – barriers and huge driver of change
- Conveying benefits to producer land owner – Economics, Land and Social – win win scenarios, cost/benefits. Education based not fear-based.
- We need to learn more about quantifying soil C and GHG from livestock
- More attention to Soil Health – redundancy in research is okay due to variability to systems and regions e.g., how can livestock mitigate GHG by improving soil health, quantification of carbon and emissions (lots done in cropping systems in PNW, but not much done in livestock mgmt. systems)
- Climate prediction models exist, but not much certainty on how that will look in 10-15 years. Uncertainty in projections concern producers. Find a better way to deliver this information. Better models and better interpretation models. Farm-level relevancy is important.

## Thursday Breakouts

### Track 1: Identify critical knowledge gaps related to climate change adaptation and agriculture in the NW?

**Track 1 Goal:** Identify knowledge gaps and coordinate focused research needs to address adaptation planning for agriculture in the PNW.

**Facilitators:** *Amanda Murphy, Chris Page, Molly Stenovec*

Stephen Machado, Chad Kruger, Glenn, EPA Ag, Citizens' climate Lobby, Nichole Embertson—Whatcom Conservation Dist. Livestock systems, Corneilius Adewale WSU, Mark Fuchs WSU, Ben Teal—USDA, Amanda Wood- Foster Creek conservation Dis, Liz Whitefield—Puyallup research extension center, WA Dept Ag, Derek Sandison—WA Dept Ag, Leslie Michel –cover crops, Nadeja (sp.?)– UNDP/ FAO Biodiversity and climate change adaptation, Blake Rowe –OR Wheat grower's league

1. What researchable questions remain about climate change adaptation in the region?

SCIENCE AND MANAGEMENT QUESTIONS

- Need specialized information for regions, targeted microclimates (local, watershed scale)
- Intercropping, diversity of cropping systems – maybe big opportunities for increasing crop diversity
- Crop protection – need a stronger grasp on weeds, diseases and pest pressures
- Test solutions in a variety of contexts – regions, cropping systems, growing
- Help farmers/producers talk about inputs, land stewardship & quantification of carbon storage.
- Ecosystem change projections (pest populations for example)

POLICY AND ECONOMIC RESEARCH NEEDS

- Economic and policy research to assess what is viable within producers' planning horizons. Put costs and benefits in the same units—think about what it costs to change a practice and then the benefits have to match up in the same currency the grower sees—so that the same group that bears the cost will reap the benefits
  - Current cost/benefit analysis doesn't fit with climate change impacts which occur over long periods of time (plan for more extremes)
- More understanding of land use changes from an adaptation standpoint. Understand what crops may be more or less viable in the future? What will social structures look like?
- Better understanding of decision making framework for producers—they are integrators of many different insights about markets and environmental and political variable. In a research framework we don't have a good way to deal with that.



## SOURCES FOR INFORMATION/ COMMUNICATION

- Deliver information in a form that is motivating—need on-the ground demonstration of effectiveness of new practices ADAPTATION to change has always been happening
  - Connect the tech savvy younger farmers with the knowledge sources promoting intergenerational knowledge.
  - Figure out what PRODUCERS want to know and communicate it effectively. Utilize a variety of styles (i.e. story telling).
2. What impact would answering these questions have in terms of adaptation/resilience?
- Clear concise messaging at the right scales. Must close communication gap: know what terms will be welcomed.
    - Gain a better understanding of motivations and objectives—get regionally specific information and start speaking more of the same language.
    - SHOW benefits without using the word climate change. Contextualize recommendations to audience
  - Potential to inform long term infrastructure planning
  - Put an economic value on these things that producers value (soil moisture, soil quality, resilience)
  - Cost sharing programs = tool to incentivize growers but not be too burdensome in mandates
  - Answers can inform policies
3. Which parts of adaptation do you think will be challenging and why? What opportunities exist for addressing these challenges?

### Challenges:

- Universities have no metrics for evaluating relationships with producers. Work depends on this, but the university doesn't assess those relationships in evaluating program performance STRUCTURAL BARRIERS
- Convincing lending agencies that changes are going to be effective, worth investments (for example with direct seed)
- Limited time, requirements on commitments > extension system is stretched and not able to make effective connections with conservation districts for example. Lack of capacity. Shifting responsibilities—private sector and CDs are stepping into the role that extension used to have
- Available info not credible science (internet dilution of scientific validity)
- Demand for adaption strategies vs. time it takes to get them there

### Opportunities:

- We have to help producers to sort out a mess of different data
  - Industries demanding new research
  - Consumers informed and advocating for something climate change related (Cascadia grains—breweries want to be able to put those labels on bottles saying product is sustainably produced). Match niche markets.
  - Brand new crops (almonds? Grapes on the west side? Carrots. Hammond company is exploring Columbia river gorge)
  - Diversification of cropping systems
  - Home grown energy as supplemental income on farms
  - Educating technical assistance layer—crop consultants and other advisors better targeted by addressing these topics more effectively Producers don't need climate change education—but they listen to these crop advisors.
  - Involve producers in the whole process. That takes time and trust. Target the innovative individuals in the farming community. Peer-to-peer education and outreach. Family and friends, neighbors, then consultant advisor, then seed dealer—this is who people take farming advice from
  - Partnerships to augment extension (i.e. conservation districts)
  - Target innovators and influencers
  - Opportunities for specific industries to drive research (gov. money low, producers can help supplement funding)
4. What barriers exist to agriculture adapting to climate change? How best can these barriers be addressed?
- Universities have no metrics for evaluating relationships with producers. Work depends on this, but the university doesn't assess those relationships in evaluating program performance STRUCTURAL BARRIERS
  - Land ownership – give owners incentives
  - UNCERTAINTY—predictive models are only so good
  - Perception of 'Climate Change' term – frame in terms of soil health or other benefits
  - Messaging, need right-sizing solutions: different scales or farming types (subsistence to industry) need different solutions/tools
  - Convincing lenders to support (i.e. no till)
  - The why should I care excuse?? China/India contributes more, what I do doesn't matter.

DISTILLING THIS DOWN: Priorities for research

- Defining dollar value on resilience and sustainability (ecosystem services framework?) for example, soil fertility—define tangible benefits of certain practices
- Take stock of the information we have—make concrete recommendations for farmers. Integrate information from experimental science and economics
- Replication (redundancy) of research trials- need to demonstrate relevance of recommendations for different locations

#### CONNECTING RESEARCH TO PRODUCERS

- Economics: define benefits to both climate and growers
- Strategies to help farmers – cross disciplinary researchers partner (link models to economy)
- Partnerships (extension – conservation districts, government – industry)
- Translating big data into customized local scales (like soil surveys that exist for every WA county)
- Communication: researchers and agencies need to understand what information is actually meaningful and useful for producers. Also, ensure that policy makers get good science.

## Decision Support Tools

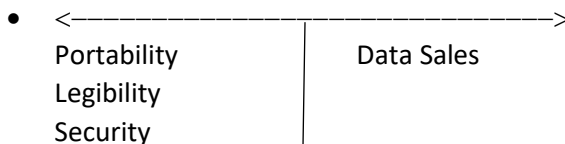
### Track 2: Improve coordination, utility, and usefulness of climate decision-support tools that exist, are being generated or envisioned for the region.

Presentations given by Vince Jones, Kristy Borrelli, and John Abatzoglou

#### Part I: Needs, Interests and priorities

*What information or technologies are the most important for AG industries and growers to improve competitiveness in the face of climate changes and other large-scale changes?*

- Market Knowledge, Economics, Global Linkages, Near-Term Forecasts, ≠ average events (extremes), smart phone/tablet/desk



Technical Assistance/assistants, Funding/incentives <--> tool/data (eg. Equipment – cons. Funding, irrigation scheduling + site visit)

- Alternative varieties and crops: adaptability; agronomic
- Indirect impacts: pests
- Incentive programs
- Relevant to where they are local place based
- Tech assistance – personal site visits to farmers to help use data (WSU)
- EQIP dollars of matching funds to put in center pivots.

*What tool/element would you add to a shared decision support system?*

- Maintenance – keep the tool going
- Versioning of data – how old/new the data used/showed is
- Effect of climate change on crop yields/forage yields
- Platform for connecting/facilitating social network of users, to ask questions – local groups of users is most useful
- Chris Swanston at Institute of Northern Forestry: Place for people to put their solutions to climate change on the website
- Carbon footprint per unit production
- Quantification of uncertainty around a management recommendation
- Real-time data
- Seasonal risk forecast for detrimental condition
- Personalization/customization of tools
- Pest/disease using climate forecasts

- Field data
- Suitability of crops under climate change
- Data sharing and reuse among models
- Real time CO2 release and tips or recommendations for alternatives
- Reference model assumptions and, if known, impact for decision support – direction of possible shift, if it doesn't exactly fit their situation and they "violate" some of the assumptions. Make sure the complex stuff is there somewhere
- Insect models
- Irrigation scheduling
- Middle range forecasts
- Monitoring
- Information display – place-based information
- Consumer education tool – virtual farm. Like COMET but targeting consumer.

*What scale/scope is most helpful? [Abstract/Large -----Concrete/Small]*

- How do people deal with uncertainty? Decision support needs to be simple and as accurate as possible
- People are used to work with risk – they want some measure of risk, and probability of that event occurring
- DAS not providing risk. Tell them what the models are saying on pest populations (for example), not what to do.
- Developing a tool on water needs for trees. Give certainty of temperature projections, but show uncertainty in precip projections
- Personalization of tools – examples: type of fertilizer, location, save your own parameters, Facebook-type learning to show you more of what you pay attention to
  - Pest/disease using climate forecasts
- Links complex items together, specifics involved, but linking is abstract
- All of these tools and ideas are supposed to be used at specific locations. If not, not useful.
- Needs to be concrete – so it's interdisciplinary: not just get forecasts from John, but interpretation of the information by experts for specific crops
- "scale" could be spatial, temporal, level of risk
- Consumers' willingness to pay is reflected in where they buy – farmer's market vs box store. Have it as an app
- How to collect information back from users to affect policy – two way sharing of information
- Have to go through a big process to collect that kind of data.
- People are sometimes reluctant to share information. One way to help is to give people alternative of being anonymous
- Challenge to have location-specific information while remaining anonymous
- Real-time data also getting at two-way communications. Can download and upload
- Social networks as well are about two-way communication
- One alternative is paying for the information, and farmer gets a share of the information.

## Part II: Existing and Emerging Information and Resources

*What existing research or projects might be a natural fit to include in a decision support system that could benefit multiple industries?*

*What tools are used in other regions or in different systems that could provide a model for NW agriculture?*

- WSU and OSU have office of commercialization. OSU has 80-20 rule. 80% stay in free version, 20% upgrade.
- Many are public funded, so see it as public domain. Need to work out if it is university property.
- Public funding to build it, private to maintain it
- Google-ize it – advertisements. E.g. Could have Dow as a sponsor of the tool, but not an active link to Dow from the WSU website.
- Royalties to university, to the college, to the inventor. Could the royalties go back to a collaboration specific to the group that needs it? Some overhead goes to university.
- Basic free model, upgrade to paid version.
- Commodity commissions – though they'd see it as infrastructure
- There is no hard funding to maintain underlying data. No grants for that type of efforts. Projects support collection, but don't maintain it after end of the project.
- Dairy – kickback of the milk tax? Not working? They went really big, and idea was to use NASA based big management data systems. Go out and touch many models, and bring it together and produce a specific report. It crashed.
- Distinguish between mitigation and adaptation tools
- Distinguish between educational tool, vs decision support tool that makes them a profit
- Google has grants to support data management, for a while
- Ideal: one center where all universities support data management
  - Universities will cover part of the cost, but likely not all of it
  - Likely to be cut every time budgets are
- Possible collaboration with agencies – challenges to working with data.gov
- Lots of people don't want to sell the tool, because don't own the underlying the data.
- Extension is unbiased (or should be), commercial interests might not be.
- USFS has a DDS – rather complex – then passed it on to Univ Redlands and ESRI, and they've expanded the tool.
- If you could show value to all commodities, then can go to state to get “permanent” budget item to support it.
- If you sell license, you can keep ownership and control of what they do with it – the university would need to approve it.
- Possibility of looking for partnership with other countries, and get funding to train other countries' technical efforts.
- Possibly: broaden the pool of users, and find partners, collectively funding this. Note there's cost associated with that expansion.
- Looking at Canada to license their use of it, while WSU keeps the tool.

### **Part III: Road Map to Collaboration ----Leaders and partners**

*DSTs take time to develop – what immediate steps would be useful to better understand the timing and severity of climate impacts on AG production systems?*

*-How could a DSS help prepare for change (EG: education, extension agents, common goals etc)*

*What could help turn “data” into “tools” into “decision support systems”?*

*How could DSS and outreach be: Paid for/Maintained/Updated/Evaluated*

- Does data update self? Data sources are always changing. \$\$ for updating
- WSU has office of commercialization and OSU
- University intellectual property – tools public domain
- Are they education tools vs. tools that make profit?
- Google pay...for x amount of time
- Western gov associations that funds for NW
- Different user – may be different funding
- WSU AgWeatherNet funding example
- Potential partnerships in other countries
- Other sustainability model in other sectors?
- Private sector outreach – endowment
- Collective access

#### *Final thoughts*

- Complicated issue, and funding challenges – knowing that it’s a tough task.
- sustainable funding is still a challenge, but common interest that is encouraging
- How important that “concrete” level is, and the complexity it brings with it
- Did not hear about user feedback – ensure I have a wide feedback to keep that window open as the tool is developed.
- DDL – big reality check: \$1M, 3 programmers, survey every two years, data collection
- add Ofoot – and follow with mitigation and
- ask Office of Commercialization for successful models. Likely require private funding. Vince and Clark will try to find models today.
- Overwhelming – not simple to put together. But people like Katherine are doing it, so there’s hope. Concrete examples, small bites.
- common themes with yesterday: solution is to take a little bit from everything – a suite of options to get solution.
- CAPS are losing their funding for their tools. Have a CAPS summit to agree and advocate for that kind of funding/support. DDL – Project directors annual meeting.

- What about the Drought Monitor? Useful, and people who need it. Based on crisis. Position ourselves for next crisis, and offer part of the solution, to get wild support.
- Foundations, endowments. Outreach with philanthropist.
- there will be some winners and losers with tools. Some of these tools will find some funding. Good for those to share their data
- set frustrations aside, but now tools are really targeting producers, not for academics' sake.
- add to the list: need to have one place to find the tools.
- Access User "Demand": Drought Monitor; identify who benefits from tools; how important is ownership (can tools/data be sold)
- USFS – Univ Redlands – ESRI (License agreements/control)
- International partners/consumers – languages (need a sustainable model: Canada, WSU Tree Fruit)
- Non-traditional partners
- User feedback
- CAP Conference



## Friday Talking Points

### Action Items:

1. Social Mapping: connecting projects & organizations (systems mapping)
  - Local networks/state networks/NW Regional/National/Global in a map. Use NIFA \$\$\$?
  - Contact – Sonia
    - Identify mapping work group: Sonia Hall, Mark Guchs, Amanda, Leslie, Robert, Dan , Nichole, Brooke, Dominique, Liz, Bea
  - Soil Health Grant-Leslie will send info to the workshop list serv
2. Widgets: Vince, Chad, Katherine Hegiwisz, Kirti, Stephen, Jim, John Abatzoglou, Clark, Claudio, Laurie, Dave Crouder, Nichole +
  - Applied economic workshops with producers.
  - Ext. Decision Support
    - ID “information bottlenecks” to developing tools [Claudio]
    - Wheat/Grain info-sharing system for producers “peer-to-peer”
    - Eg. USDA IPM PIPE; Pest/Diseases tools, multi-objective information.
  - Provide useful info for real-time on the ground decisions
    - What are we going to design/now use it in the world
    - Focus on solving acute problems
    - Where food comes from.
3. Motivations & Incentives: sit down with producers and ask “What do you need?”
  - Amanda, Sonia, Diane, Brooke, Chad, Stephen
  - Focus Groups
  - Get people in a room together – follow up/ action afterwards
    - Long term industry voice involvement, advice
    - Build trust, use economic drivers
    - Work with crop consultants
    - User survey: what tools do you need
    - Assemble multiple interest papers “binder” (eg. Chicago botanical gardens)
4. AgClimate.net
  - Diane, Chad, Brooke, Sonia, Liz, Stephen, Bea, Laurie
5. Review of NRCS Practices Standards
  - Laurie, Nichole (CDs), Amanda, Mike Strobel, Jim (Pvt sector)
  - Get info out when being reviewed – every 5 years
  - Identify groups
  - Linking irrigator tool (WSU) With CC Districts
  - Soil Health Grant

### Defining the order these things happen in is hard: Need to consider simultaneously

1. What do people care about?

- Motivations and incentives for decision-making. Some groups are already facing acute problems

## 2. What do we design?

- Research priorities and tools development—more local specificity, more real time information

## 3. Communication and coordination among ourselves, among industry, among broader public, trust, reporting, policymakers, who is reaching out to the producers and who carries the message?

- Some producers are forward looking, but at the conservation district level there is ambiguity about how researchers and other regional agencies can support and contribute to conversation about new practices and new approaches needed in agriculture (Leslie Michel: Needs to know who is interested, who has time and knowledge specific to their concerns)

### **Cross-cutting Themes:**

1. Considering the next generation of agriculture, research, technology, scientists and farmers and decision-makers
2. Quantification of C footprints—getting a better handle on what we know and don't know about opportunities for interaction
3. Knowledge that is customizable, right scale, actionable

### **Discussion:**

- We need better knowledge of what is going on, what researchers are doing what, what producers are doing what. Being able to have dialogue to integrate those groups.
- How do we build this network of integrated people? We need a conduit for information sharing—conservation district, ag professional side and research community. Would love to walk out of here with concrete ideas of building the network. Keep and maintain conversations.
- Heads conservation district science and planning office—highlight technical expertise. Districts had little respect at university level. Job is to up recognition with certifications and training and to create a singular plug in the get information back to districts. Challenge because interests are so specific to different regions in state, types of producers, connections back to university are unique. Some partnerships with extension, but districts are filling the vacuum left by leaving extension personnel. Need strategic plans and accountability. Developing legitimacy and structure of conservation district role.
- Discussion of creation of a database. For example, African professionals in diaspora—wanting to give back to Africa, approached Gates foundation—support for a database of expertise—searchable—find people with relevant skills and commitment to project. Network for partnerships. Conservation district.
- Tribes: Missions is to incorporate this knowledge and translate information to tribes. A lot of tribal focus is on cultural value of climate change—seeking to focus efforts on helping tribes.

**Would it be helpful to identify some resources that already exist for communication, coordination and collaboration? Could we list networks and databases?**

- WSU has a database that says what people do but its out of date—Need to revisit information and seek buy in and involvement from people
- Conservation district database
- Climate science center and Oregon Climate science institute
- Kathy Lind UofO
- AgClimate.net (via CSANR in part) is evolving to fulfill some of this need—people want opportunity for a conversation
- Fellow and coordinator from Climate Hubs to support this effort (coordinator and fellow)
- Climate science center and Oregon Climate science institute has a list
- REACCH social network analysis- Map who is involved and how they connect

### **Projects and program with Research Agenda:**

REACCH

LTER

BioEarth

WISDM

Animal Ag and Climate Change

NSF FireEarth

OCCRI

...and so on

Very heterogeneous industry groups in the region. That difference means we have to treat each type of production system differently

### **User groups:**

Producers: individuals. On-farm-research

Ag Commodity meetings

Sales consultants advisors

Lobbying groups

4H/FFA—curriculum content absorbers—interns, conservation districts, NRCS, practice standards

EPA

USDA

Policymakers: including local/county/state government

Tribes

Consumers, food suppliers

Citizen Science Groups

University and University extension

Experiment Stations

University Department

LCCs Landscape Conservation cooperatives

Soil Health Committees—WA and OR

NOAA and NWS

Corps of Engineers

State agencies: WDFW, Forestry, DEQ

**Sources of NEWS:** google, radio, peer-to-peer communication

Agbizlogic.com

- Think about social network analysis and systems mapping—establish levels of networks from regional to local networks
- Advantage of an initial big map that tries to defined all of this, we can help define a strategic path through networks.
- Sonia: we want to define a road map forward—looking for commitment to join the conversation.
- Volunteering to be part of the group that thinks about how these efforts fit together and how to move forward with a database, social network analysis: Sonia, Brooke, Nichole, Mark, Dominique, Robert, Dan, Sonia, Nichole, Dominique, Liz, Bea. Seems appropriate to send the ask to participate in this back to the larger group
- 2 sources of funding to support this workshop: Hub funding and NIFA finding—report due at end of month

### **Moving into the “WHAT”**

1. What motivates us?
2. Finding ways to connect science to on the ground decisions

### **Possibility of identifying 3-4 operational questions:**

1. Decisions on irrigation management—has been a challenge getting abstract research to something we can implement. The process of getting to what are the critical actionable questions has been a struggle. How big do we build a dairy lagoon? Does climate change play a role in these decisions (precipitation). This is a big cost
  2. irrigation scheduling—demand for using climate information to solve local problems
  3. water stress and heat stress management – varieties. Climate related plant stress—management options
  4. update models using climate change scenarios. Wine grape growers need to know about heat spikes a few days in advance to manage (AgWeather.net, Clark Seavert ready to do applied economic workshops for specific ag. groups like wine grapes—opportunity to develop that network of growers)
  5. work with existing decision support tools to add the decision part of it. If we have irrigation management information it can be tailored to specific systems—customizing widgets so the model works for tree fruit or grapes or whatever.
- Wine grape industry planning a workshop to ask producers about management strategies, e.g. “How did you deal with heat stress in 2012?”
  - Need to review practice standards so that recommendations to producers are viable for specific actions. NRCS standards are what needs to be reviewed. They review standards every 5 years and create new ones—they are national and state specific standards.

- For many specialty crops there are no standards—this is where Clark’s work fits beautifully. Need to work with crop consultants—can’t stop with public sector entities and take recommendations to crop consultants
- NRCS typically does updates in a vacuum—assemble a group to provide input back to them—need to provide that input to NRCS that for example on GHG emissions, there is a group that can address them. Need to link tools like the irrigation scheduler with the conservation districts. Knowing about these tools and getting them to producers is very important.
- Reaching out to NRCS about standards and available tools—with researchers, conservation districts, NRCS people: Nichole, Laurie, Amanda (Leslie: This goes back to communication about tools with Extension and LCCs. Conservation districts have an annual training every year). Mike Strobel is that NRCS connection person. Private sector perspectives.
- We may need to talk about time sensitive widgets in a separate conversation from other non-time sensitive resources about carbon storage for example. With a lot of widgets people are giving input in different ways.
- would like to see a system for information sharing involving producers themselves—e.g. warm winters leading to new disease. Farmers using their phones and sharing pictures about what is happening in different places
- Summary handbook connecting resources and information for groups—for example dryland wheat. This takes commitment but would be really strong as a tool for end users.

Sign ups:

- This is something that we can think about as AgClimate.net. Hearing that it needs to have a lot of selectivity for different people interested in one part of the system can easily access the information applicable to their systems. Building a strategic planning—Dianne, Chad, Sonia, Brooke, Chad, Bea, Stephen, Laurie
- Widget planning: Vincent and Chad, Katherine Heggewich UI, Kirti Rajagopalan, Jim McPherson.
- People coming together to talk about connecting with producers: Amanda, Sonia, Dianne, Brooke, Mark, Mary Harrington ??, Stephen

## Take Aways

- Go back to the statement of hope—we are the hope working together
- Its nice to know there is a bigger world of research happening out there—soil health—good to know there is a bigger world out there
- Hope that there is more support for conservation community work moving forward
- Knowing that network exists
- Happy to see some action items
- Learned more about science and climate change—can do better in talking to producers in a way that addresses these challenges in a better way
- Happy about process—also overwhelmed with all of the ideas
- A real sense of unity of purpose
- Great to meet people, bringing away a lot of perspective and information and good connections. Afraid that all of this motivation will sit in a white paper. But we have to move to action
- Talking about the bigger picture and integrated experiences—helps inform information sharing

- Closer connections
- This is a very complex issue, there is not simple approach to solve mitigation and adaptation cross the board. Federal research relies on mandates—need political participation. Tired of 10 minute sound bites
- National model for collaboration across institutions – document what exists and make it relevant and accessible
- Northwest agriculture—good introduction to what exists
- Brought us closer to moving toward accessible tools