

C-AGG Meeting Summary

July 20-21, 2011

High-Level Summary

The Coalition on Agricultural Greenhouse Gases (C-AGG) held a meeting in Chicago, IL, on July 20-21, 2011. This document provides a summary of the meeting and its outcomes.

Debbie Reed, C-AGG Executive Director began the meeting by reviewing C-AGG's goals and past and current activities, and initiating a round of introductions among participants. Throughout the course of the meeting, participants heard about and discussed a diverse range of topics, including:

- an update from Marlen Eve on USDA's development of technical guidelines and scientific methods for quantifying on-farm GHG emissions (*page 2*);
- seven of the eight Conservation Innovation Grants (CIG) Greenhouse Gas (GHG) grants recently awarded. The meeting provided a forum for grantees and representatives of USDA to interact with one another. (*page 4*);
- updates from two voluntary registries on the development, approval, and implementation of GHG protocols (*page 8*);
- initial ideas regarding how to identify sources of model uncertainty and some statistical approaches for model evaluation. Bill Salas invited comments on a draft C-AGG white paper as well as expressions of interest in helping to elaborate on sections of the paper that are still to be completed. (*page 10*);
- the Federal Register notice recently released by NOAA on the 2013 National Climate Assessment (*page 11*);
- carbon bundling - an approach that would enable products that use less carbon and build soil carbon to receive premium pricing in the marketplace, similar to the model in place for products certified as organic (*page 12*);
- sustainability initiatives in the livestock sector (*page 13*) and a paper T-AGG is developing focused on livestock and GHG (*page 15*); and
- a summary of a report Peter Weisberg, The Climate Trust, has been developing with funding from EPRI that examines three different methods of aggregating GHG offsets: programmatic, business model-based and sectoral-based methods (*page 17*).

The meeting agenda and PowerPoint presentations from the meeting can be accessed at <http://c-agg.org/resources.html>. For questions about the meeting, or further information on C-AGG, please contact Debbie Reed, C-AGG Executive Director, at: dreed@drdassociates.org.

Update from USDA on Relevant Greenhouse Gas (GHG) Activities

Marlen Eve, Environmental Scientist with the USDA Climate Change Program Office, began the meeting with an update on USDA's progress developing technical guidelines and scientific methods for quantifying on-farm GHG emissions. Eve first briefed C-AGG on this project at the 2010 Chicago meeting.

Eve explained that this project has made a lot of progress since the last C-AGG meeting. The result of the work will be an online tool for land and agricultural managers to assess their current GHG scenarios against "what-if" scenarios related to GHG and changes in management practices. USDA received about 300 comments in response to their 2011 Federal Register notice on this subject and Eve noted that the comments from C-AGG were particularly useful. First drafts of each chapter of the guidelines are now circulating within the author teams. USDA is on track to complete the final public review and release of the report and tool (for beta-testing) in 2013. USDA is working to post their interim documents, as well as interim team reports, and a "Review of the Reviews" report (a meta-analysis completed by Colorado State University) to their website. These steps represent an increase in transparency and access to information that is responsive to stakeholder input, including from C-AGG.

Eve suggested a number of ways that C-AGG could continue to help with this project:

- (1) C-AGG can refer practitioners with technical background and scientific qualifications for the technical peer review in September 2011. USDA is recruiting three sector-based groups for the peer review, including croplands, forestry, and manure management.
- (2) C-AGG can help USDA engage farmers, landowners, commodity groups and other stakeholders in the development of the guidelines and the tool to ensure that both are relevant to a wide group of people, and to demonstrate the use of the tool later in the process.
- (3) C-AGG can provide comments during the public comment period in 2013 and can assist in recruiting others to provide comments; and
- (4) C-AGG can suggest venues for engaging stakeholders in the use of the tool (September 2013).

Eve briefly noted other relevant activities at USDA. The Conservation Innovation Grants (CIG) were announced, in addition to the National Institute of Food and Agriculture's (NIFA) \$56M of climate change grants to academic institutions looking at adaptation and impacts of climate change to the agricultural sector. USDA released its National Inventory of GHG, which is consistent with the EPA National Inventory, but provides more of a deep-dive on agricultural and forestry sources and sinks. USDA also released Departmental regulations on climate change adaptation, requiring the Department to integrate climate

change adaptation into USDA operational plans. Finally, USDA is preparing to play a substantial role in the upcoming 2013 National Climate Assessment.

Key points from the questions and discussion included:

- USDA will not be releasing individual responses to the 2011 Federal Register Notice comments, but all comments were categorized and provided to the working groups, the comments will be published with the draft review, and USDA will address generally how comments were handled
- USDA NRCS is working to develop a network between the CIG projects and the project author teams so that they can collaborate and leverage each other's work. Hopefully the CIG grantees will be able to use the online measurement tool being developed by USDA as part of their projects, and provide real-time feedback to USDA.
- USDA wants to engage stakeholders in a needs assessment for the tool and the user interface, an idea that C-AGG has promoted and can perhaps help implement, to ensure maximum utility of the tool for producers.
- COMET-Farm has gone a long way towards developing a user-friendly interface for producers, and it is likely that the tool under development now will have a similar interface, though different underlying mechanics.
- While this project is focused solely on GHGs and climate change, other parts of the Climate Change Office will look at environmental markets and weave in other environmental impacts. For example, the Office of Environmental Markets is developing a Nutrient Tracking Tool (NTT) to look at implications of various agricultural practices on water quality. This tool is being evaluated in the Chesapeake Bay right now. USDA hopes to develop a common interface for the GHG tool and the NTT to allow for a single set of data inputs from producers; they are also interested in and welcome input on what other environmental factors to look at – quantitative and qualitative. Participants expressed hope that USDA can think holistically about soil quality. USDA offered to brief C-AGG on the NTT model at a future meeting

Eve also took advantage of the opportunity to ask C-AGG several questions in response to its Federal Register Notice comments. Eve thanked the group for all the useful technical resources and information sources they provided and for other valuable input. He noted that while the current guidelines are not focused on quantifying on-farm energy use, hopefully, through an interagency technical advisory group that includes the U.S. Department of Energy and the White House Council on Environmental Quality (CEQ), this can be included in a later draft. More information was requested on methane oxidation as a result of land conversion and participants referred Eve to the chapter in *Soil Carbon Management* on this issue. (Note: After the meeting, Phil Robertson of Michigan State University clarified the comment and provided the attached resource materials for further

consideration: [Robertson 2004 N2O Methane Abatement Global Carbon Cycle & Suwanwaree & Robertson SSSAJ 2005](#)

When asked for clarification on developing a common accounting system for all producers to utilize, participants responded that this comment was directed towards the convergence between carbon accounting for multiple systems, e.g., for carbon markets (whether voluntary or compliance) and for sustainable supply chain initiatives. Common accounting systems will allow for consistency of measures across multiple life-cycle analyses and will avoid the danger of double counting. Additionally, the incorporation of other activities, such as nutrient management, into a common accounting system will allow for greater efficiencies and better understanding of and tracking of systems approaches.

USDA Conservation Innovation Grant (CIG) GHG Project Awardees

A panel presentation from seven of the eight CIG agricultural GHG project awardees was divided into three sections: nitrous oxide projects, livestock projects, and land use conversion and cropland projects. Presenters for the nitrous oxide projects included:

- Ryan Anderson, Delta Institute, on *Bringing Greenhouse Gas Benefits to Market: Nutrient Management for Nitrous Oxide Reductions*
- Lara Moody, the Fertilizer Institute, on the *Smart Nitrogen Application Program (SNAP) Demonstration Project*

Ryan Anderson began by explaining that the project, *Bringing Greenhouse Gas Benefits to Market: Nutrient Management for Nitrous Oxide Reductions*, is designed fill the gap created when the Chicago Climate Exchange (CCX) stopped issuing soil carbon credits to farmers. Per acre credit rates are very low for nutrient management practices, so scale and aggregation are important aspects of this project. The project will also look at innovative management practices to see if they have higher credit rates; and will investigate whether credits can be stacked and bundled with nutrient trading water quality markets. Building on the aggregation model that the Delta Institute developed working with CCX, this project is using the American Carbon Registry's (ACR) nutrient management protocol to produce offsets which EKO Asset Management Partners has already contracted to buy. This project, working with farmers in Illinois, Michigan, and Oklahoma, provides the opportunity to test and refine the ACR's protocol, and to compare it with other protocols, and compare modeling results across the DeNitrification-DeComposition (DNDC) model, COMET, and others. Anderson noted that the project has already begun farmer outreach and will begin aggregation in the spring of 2012.

Lara Moody continued the panel with a discussion of the 4R approach to nutrient management and the *Smart Nitrogen Application Program (SNAP) Demonstration Project*. The 4R approach emphasizes using the right fertilizer at the right rate, place, and time. Using this approach, the project is developing a SNAP website and Nitrogen Desktop tool to assist

farmers in making nutrient management decisions and implementing best management practices, and will allow for web-enabled data energy and measurement, reporting and verification. The project will utilize all three N₂O protocols, and will evaluate each of the three for value derived. In addition, it will identify benefits and challenges associated with each, and may result in the modification of protocols as necessary to enhance implementation, and possibly, the synthesis of a different, improved protocol for future use. The project will enroll producers in a nutrient management protocol in order to credit and monetize the GHG reduction, and will involve agronomists, NRCS, fertilizer retailers and growers, including the National Corn Growers Association (NCGA), which is a project partner. Participants saw the potential for this project to interface with the USDA's on-farm GHG accounting project and provide a comparative case study for the DNDC model.

Both presenters recognized the challenge of farmer participation, and skepticism about climate change. Moody indicated that there is a need to unify the agricultural sector around a common message to drive nutrient stewardship as an alternative to mandatory regulation of nutrients. The "real deal" is economics, efficiency, productivity, and increased profits and yields via nutrient stewardship. Carbon markets and water quality are secondary messages. Participants suggested ensuring that financial incentives are in place from the beginning of the project, as well as framing the project for farmers around soil health and getting ahead of regulation of nonpoint sources of pollution. Anderson also suggested that projects collaborate on administrative tasks and infrastructure development to allow for efficient use of resources and data compatibility.

The panel continued with presentations on the livestock grants including:

- Matt Sutton-Vermeulen, Unison Resource Company, on *Bovine Innovative Greenhouse Gas Solutions (BIGGS)*
- Erin Fitzgerald, Innovation Center for U.S. Dairy, on the *Dairy Farm Stewardship Toolkit*

Matt Sutton-Vermeulen emphasized that the BIGGS project places high priority on communicating success stories, and will adapt and streamline four protocols currently used in Alberta for U.S. dairy and beef production. Producers enrolled in this project will implement best practices and leverage already robust data collection and management systems. The project has three goals: designing scalable approaches for scalable production; closing knowledge gaps (tracking how farmers' perceptions change as they move through this process; and streamlining data collection and data sources. A BIGGS desktop tool with a user-friendly interface will be developed. Sutton-Vermeulen suggested that, because of current market dynamics, the producers will be inclined to participate.

Erin Fitzgerald presented the *Dairy Farm Stewardship Toolkit* and explained how this project fits within the Innovation Center for U.S. Dairy's ongoing sustainability work. The project aims to create a tool that will measure the sustainability of dairy farm operations and recommend best management practices that farmers can undertake to improve their

operations. This tool will utilize a Standard Accounting Procedure, allowing a GHG protocol to be layered on top. Communication, training, and support are critical components of the project. The project, by piloting the tool in 12 states, hopes to lay the groundwork for larger scale deployment in the future. The theory behind the tool is that good stewardship and environmental enhancements make sense competitively and from a bottom-line perspective. The project will test, reiterate, and test and reiterate over time.

The last three presentations from the panel focused on land use conversion and cropland grants including:

- Steven Apfelbaum, Applied Ecological Services, on *Agricultural Soil Carbon in the Palouse Region: Developing a Large-scale Agricultural Soil Carbon Transaction in the Palouse Region*
- Randal Dell, Ducks Unlimited, on the *Avoided Grassland Conversion Carbon Project*
- Belinda Morris, Environmental Defense Fund, on *Demonstrating Greenhouse Gas Emissions Reductions in California and Midsouth Rice Production*

Steve Apfelbaum explained that the *Agricultural Soil Carbon in the Palouse Region: Developing a Large-scale Agricultural Soil Carbon Transaction in the Palouse Region* project selected one ecosystem to demonstrate how soil carbon can be brought to the market place. The project aims to bring a soil carbon crediting scheme to the scale of an entire ecosystem – the Palouse Grasslands -- from both a legal and a scientific perspective, leading to aggregation and crediting. The two-phase project is built around the issue of scaling, and seeks to develop, test, document, and refine a low-cost aggregation model; and look at the predictability of carbon dynamics on the landscape, in order to address certainty for carbon markets. All of the measurement for this project will be completed through remote sensing using high-resolution aerial photography. Quantification will employ the TEP Soil Carbon Quantification Method, which is just finishing the validation process through the Voluntary Carbon Standard (VCS). Apfelbaum noted that one of the critical challenges will be firming up the legal contract(s) for the large number of operators in the region as the basis for a large-scale aggregation model. An identified data/knowledge gap is that state-of-the-art modeling does not align with on-the-ground carbon measurements, and there are policy issues associated with soil depth and carbon concentrations below typical testing depths.

Randal Dell presented the *Avoided Grassland Conversion Carbon Project*, a collaboration of Ducks Unlimited, the Climate Trust, and the Nature Conservatory. This project, focused on the prairie pothole region, is beginning by completing an aerial survey to serve as the baseline for the project. Then it will apply the DNDC model to protocol development under VCS and bring land through this protocol.

Belinda Morris concluded the panel with an overview of the *Demonstrating Greenhouse Gas Emissions Reductions in California and Midsouth Rice Production* project, which builds off the work of the Environmental Defense Fund in California and Winrock International in Arkansas. This project plans to implement a protocol developed for rice production, based

on the DNDC model, focused on three practice changes: reducing winter flooding, removing straw after harvest, and dry seeding. A project goal is to develop a user-friendly technology to combine performance-based and practice-based approaches. The project will also analyze the potential to replicate this project and apply it elsewhere. While this project focuses on reducing methane emissions, the primary GHG produced in rice production, the accounting surrounding GHG reductions will measure changes in all GHGs.

Key points from the questions and discussion included:

- These projects will be a key catalyst for future work in this sector, an important practical activity, and a vote of confidence for the industry.
- USDA selected these CIG grants in order to keep momentum on evaluating carbon markets. There is some redundancy between projects by design.
- Participants agreed that engagement with each other and USDA throughout the life of the grant will be very important. USDA and the grantees had a chance to meet informally at the meeting and it was suggested that an engagement plan for further collaboration between the CIG grantees, USDA and C-AGG could be presented at the November C-AGG meeting.
- Whether there will be another round of CIG funding for agricultural GHG work is still undecided. However, the response to this round of funding demonstrates the huge demand for this type of grant.
 - USDA was urged to provide more of a lead time to develop and submit grants in the future, in order to allow grantees to identify and confirm collaborators and matching funds.
 - C-AGG will make recommendations to USDA for future CIG project areas, perhaps including GHG mitigation (again), water quality crediting, wetland banking, and other areas of interest.
 - USDA was urged to bring EPA into the process, since some participants said EPA is out of touch with conservation and GHG mitigation work on the ground on farms. A suggestion was made to involve 2 high-level EPA career staff to participate in the CIG-GHG process at USDA on a 'permanent' basis. Engaging EPA more in C-AGG was also suggested.
- It was noted that USDA has used the Century and DAYCENT models extensively (e.g., in COMET-VR), while the majority of these grants are using the DNDC model. USDA noted that they hope to foster collaborative, rather than competitive, use of these models. While USDA does not think these models can be easily integrated, it hopes these grants will illuminate some of the strengths and weaknesses between models, and that the CIG projects might provide a platform for integration. USDA was clear that a model has not yet been selected for their technical guidelines currently under development.
- Participants noted the need for collaboration between all of the research arms of USDA and beyond, such as ARS, NIFA, NRCS, and EPA, in order to fill the data

gaps in this space. USDA pointed to a few collaborative projects already underway, including the Global Research Alliance on Agricultural Greenhouse Gases¹ and links between the CIG grants and ARS.

Agricultural Protocol Development: Updates from Voluntary GHG Registries

An update on the process of agriculture GHG protocol development, approval, and implementation was presented by:

- John Kadyszewski, Winrock International and Nick Martin, American Carbon Registry
- Kathryn Goldman, Climate Action Reserve

John Kadyszewski began by providing a brief history of Winrock International, the parent company to the American Carbon Registry (ACR). Winrock has a long history working with livestock and their methane emissions. Nick Martin continued the presentation by providing an overview of ACR's process and a few of its protocols. Martin explained that most of ACR's protocols are developed by an external author for ACR verification, which includes internal review, public comment, and peer review. This process takes four to eight months and generally costs \$20,000 to \$40,000. All documents are posted for transparency.

Martin provided an overview of 4 of ACR's protocols: nitrous oxide from fertilizer rate reduction, nitrous oxide from fertilizer management, rice emissions reductions, and adapting the Alberta SGER beef and dairy protocols. The first two protocols both deal with nitrous oxide release as a result of fertilizer management. The first, developed by Michigan State University (MSU) and the Electric Power Research Institute (EPRI), is focused solely on the annual reduction in the rate of fertilizer used, as measured against a baseline. The other protocol, based off the DNDC model, addresses changes in any of the 4Rs of fertilizer use in 48 crops or cultivars. This protocol is used in three of the CIG grants (Delta Institute, the Fertilizer Institute, and the Chesapeake Bay Foundation). The other two protocols are used by CIG grants as well. The rice protocol, also based off the DNDC model, is being used for the Environmental Defense Fund's grant. The beef and dairy protocol, based off a protocol developed for Alberta, is being used for Unison Resource Company's grant. This final protocol has undergone extensive work by a science panel in order to adapt it for the U.S.

Kathryn Goldman continued the panel with an overview of the Climate Action Reserve (CAR) and an update on three of their agricultural protocols under development. CAR develops protocols for GHG offsets, manages third-party verification, and operates a transparent registry of offsets. It has registered over 15 million tons of offsets and has

¹ <http://www.globalresearchalliance.org/>

already had four of their protocols approved by the California Air Resources Board (CARB). Goldman provided an update on the development since the last C-AGG meeting of three of CAR's protocols: the Rice Cultivation Project Protocol, the Nutrient Management Project Protocol, and the Cropland Management Project Protocol. The rice protocol is the furthest along of the three and will be out for public comment in the fall. The nutrient management protocol has required extensive background research and, as a result, is being drafted now. This protocol has a sub-committee specifically examining stacking and the protocol will be very specific about additionality. The cropland management protocol has been more challenging and is currently on hold. There is a quickly changing baseline for cropland management that has made developing performance thresholds difficult. Fortunately, there is a lot of synergy between this protocol and the nutrient management protocol.

Key points from the questions and discussion included:

- ACR's nitrous oxide protocol developed by MSU and EPRI is intentionally more limited than the other nitrous oxide protocols. Farmers have said that different models could be better for different farm types. CAR has decided to require both a fertilizer rate reduction as well as reduction in one of the other "R"s to ensure that farms are going beyond common practice.
- Participants noted the differences between performance-based approaches and practice-based approaches to protocol development. One participant cautioned that prescribing practice change does not ensure performance enhancement and, and said that instead protocols should be prescribing performance targets. A performance-based approach promotes innovation, rather than just compliance, and leads to greater efficiencies. Another participant noted, however, that while innovation should be safeguarded, real-time measurement can be difficult, especially for nitrogen fluxes. Modeling eases that difficulty and provides some certainty to the results, which is valued by farmers.
- Winrock and the American Farmland Trust are cosponsoring an event (happening concurrently with this meeting) on converting USDA conservation programs from a practice to a performance basis. There could be lessons for markets there as well.
- Only one of the protocols presented measured emissions per unit of crop produced, or intensity, as opposed to the total emissions for the farm or area enrolled. Since production will be increasing in the future, this should be reflected in the protocols. One participant recognized, however, that rewarding decreased intensity, if total on-farm emissions are increasing, is perceived negatively. ACR expressed interest in protocol developers bringing more protocols utilizing intensity-based metrics.
- The technical guidelines under development by USDA are neutral on intensity. While they can be used for intensity-based metrics, it is not necessary. USDA does

address this issue in other ways, both through conservation programs and the Global Research Alliance on Agricultural Greenhouse Gases².

- Participants said that when examining issues such as intensity, inputs, and absolute reductions, agriculture needs to be treated differently than other sectors since it behaves differently, and is not at all homogenous.
- A more holistic, integrated approach needs to be taken towards measuring both macro- and micro-nutrients and integrated nutrient management, since one nutrient can be a limiting factor or have other impacts. For example, decreased nitrogen can cause an increased use of phosphorous.
- Annual crop yield increases are the trend currently, so holding inputs steady represents increased efficiency and reduced inputs. Models such as DNDC don't take this into account since they are calibrated with historical yield data, even though they take into account the actual weather events. Some protocols could be designed to use projected yields rather than historical yield, or could revisit baselines periodically to address some of this challenge.

C-AGG White Paper: The Role of Biogeochemical Process Models for Agricultural Offset Projects: An Approach for Capturing Uncertainty

William Salas, Applied Geosolutions, LLC, presented a white paper he has begun developing with Steven DeGryze, Mark Ducey, and Johan Six. The objectives of the white paper (which Salas noted is still a very rough draft) are to: (1) initiate discussions on how to assess uncertainty in applications of biogeochemical process models for agricultural GHG offset projects; (2) identify sources of model uncertainty; (3) present some statistical approaches for model evaluation, since there is no single approach or right set of criteria; and (4) create a living document on this issue that improves over time. On the third objective, Salas discussed several methods for accounting for uncertainty, including discounting the modeled GHG reductions and aggregation. He also discussed the interactions between model structural uncertainty and how uncertainty in input parameters propagates to model uncertainty, as well as methods for accounting for this. In presenting the white paper at this meeting, Salas hoped to elicit feedback from C-AGG on content and direction for the paper. Moving forward, the authors plan to refine a set of questions for assessing model uncertainty for agricultural offset projects, add more examples of calculations, examine the effects of extrapolating a model to a new region, and expand the discussion in annotated outline sections of the paper. Salas asked anyone who is interested in working on writing a section to contact him directly.

Key points from the questions and discussion included:

² <http://www.globalresearchalliance.org/>

- The white paper touches on both technical questions and management and policy questions. C-AGG is a good group to tackle the latter. When beginning to evaluate and weigh in on these issues, it is important to determine whether these questions are important from a decision support perspective. Also, with regards to determining certainty/uncertainty, there is no need to determine a threshold level of either; what is important is that the level of uncertainty is or will be known, and markets can determine whether any given level is too much, or sufficient.
- Data still poses substantial challenges. There are still many gaps, though different participants identified different priority gaps to fill. While there is little data on specialty crops, research on row crops, as a result of their prevalence, could be a higher impact use of limited resources. In either case, when setting data collection priorities, it is important to examine data already published in the peer reviewed literature.
- Variability in field data collection and quality is a continuing challenge for independent validation of process models. Even though there are some statistical work-arounds, comparing historical, current, and ongoing field data sets is a problem. Fortunately, procedures for collecting field data are becoming more standardized as time goes on and models are improving as they are calibrated with a growing set of high quality field data.
- There is a distinction between a model, as a part of a protocol, used as a decision support tool for farmers and as a decision support tool for the market. When the market uses the model, the market is allowed to determine the level of uncertainty it will tolerate. On the other hand, if the tool is used by farmers, the protocol decides the uncertainty level and corresponding deduction.
- C-AGG could keep a list of other issues and questions, beyond the scope of this white paper, for future development.
- Identifying and forming consensus around key questions could drive research in the future.

Federal Register Notice on the 2013 National Climate Assessment

NOAA has released a Federal Register Notice soliciting technical input into the National Climate Assessment, a comprehensive report on the projected impacts of climate change on the U.S., released every four years. The final Assessment will be written by a Federal Advisory Committee which includes two agricultural representatives: Rattan Lal and Dave Gustafson. Agriculture, land resources, water resources, and biodiversity are four of the six elements within USDA's jurisdiction that must be examined. USDA will lead the federal assessment in six areas, three of which will be undertaken in 2012: agriculture, forests, and a regional assessment of the U.S. Midwest. In 2014, USDA will lead on three applied assessment reports: one on the interface between land, water, and bioenergy, and competition for these resources; one on food security; and one on rural communities and

how climate change will impact people in these communities. One participant expressed interest in the rural communities report and the effects of the regulatory approach to agriculture. While USDA has been envisioning this report to be framed around economic viability and social fabric, USDA staff was interested in this idea as well, though they noted the need to link everything in the report back to climate change impacts. Another participant noted the importance of energy and the pressures that farmers are facing to use their crops for both energy and food production. USDA staff noted that they have been engaged in the energy section of this report precisely for this reason. USDA also urged C-AGG to be as involved as possible in the Assessment (providing expertise, reviewing drafts, and providing input) and mindful of the deadlines released in the Notice.

Sustainable Supply Chain Initiatives: Prospects for Carbon Bundling and How to Increase Farmer Profitability

Jason Clay, World Wildlife Fund (WWF), presented the work he has been leading on carbon bundling. Clay explained that carbon is one of the key leverage points in agriculture when looking to reduce the impact of food production on the natural environment. He is working to create a market for creditable carbon – to bundle the cost of the carbon used to produce a commodity into that commodity’s price through the entire supply chain. This credible carbon includes carbon sequestered in the commodity itself, carbon in non-commodity production (such as carbon in buffers along the edges of fields), reduced carbon emissions in the production of a product, avoided emissions in commodity production, and avoided downstream carbon emissions (such as effluent). The idea is that products that use less carbon and ultimately build soil carbon will carry a premium price tag. Currently Clay and his team are working on selecting the first five or six target commodities for carbon bundling and identifying partners and companies in the supply chain to work with them. Since there are only a few processing companies in many of the target supply chains, working with processors can be easier and more effective than engaging small farmers directly. Clay claimed that carbon is treated as a loss leader, since the price difference in question is not seen as significant.

Bob Langert, McDonalds, offered a response to Clay’s presentation from the food industry perspective. Langert explained that McDonalds has a history of demanding high quality products and engaging with their suppliers on upstream impacts. For example, following a campaign by Greenpeace on the tropical deforestation impacts of soy production in Brazil, McDonalds engaged their soy suppliers and worked to fix the problem. McDonalds has examined their own carbon footprint and found that the majority is attributed to beef. As a result they are working with WWF to assess the carbon footprint of the beef supply chain and start a beef roundtable process. Langert explained that McDonalds adds a lot of value as a convener to these types of multi-stakeholder groups. Langert did disagree with Clay on two points. First, Langert noted that top quality standards should not cost more. They should fall into the pre-competitive space. Secondly, Langert disagreed that carbon is a loss

leader. McDonald's faces a lot of competition and even costs as small as Clay envisions for carbon make a material difference.

Key points from the questions and discussion included:

- Development and implementation of the carbon bundling system that WWF envisions needs to be developed so as not to preclude entire classes of producers or technology. Innovations such as the book and claim system³ used in energy markets can ensure that small producers are not disproportionately affected.
- The potential for agricultural intensification creates even greater opportunities for carbon efficiency in many countries. However, there are still gains to be made in already intensively managed countries such as the U.S.
- One participant noted that the growers she is working with are monitoring water and nutrient management per yield, but haven't found a way to monetize reductions in carbon yet. These producers are looking for engagement from companies such as McDonalds, which Langert noted is coming. It was suggested that paying a producer for the quantity of product they are producing rather than the commodity (french fries by serving v. potatoes by weight) could encourage innovation in resource use on farm.
- While McDonalds utilizes common standards and a scorecard approach for all its producers, there is leeway built into the system for how the data is interpreted. This allows farmers to be measured relative to their specific context, and to help support continuous improvement in each place.
- One participant expressed concern that the supply chain will send market signals to producers without incentivizing changes in the methods of production, or bringing value back to producers. Langert noted that McDonalds is paying for sustainability in their supply chain, even though they negotiate this pre-competitively.
- Food waste was suggested as a use of carbon to be incorporated into WWF's carbon measurement.

Sustainability Initiatives within the Livestock Sector

A panel discussing sustainability initiatives within the livestock sector included:

- Matthew Welch, Innovation Center for U.S. Dairy
- Randy Spronk, National Pork Board
- Karen Haugen-Kozyra, KHK Consulting

³ Example of the 'book and claim system': in green energy markets, customers pay a premium for green energy, though they don't actually 'get' green energy – but they do get bragging rights.

Matthew Welch began the panel by providing an overview of the Innovation Center for U.S. Dairy's approach towards sustainability and the Center's programs. He explained that the Center's approach, which began with carbon and is now focused on water, includes working with producers and the entire value chain to improve the sustainability of the dairy industry. The Center has a Sustainability Council, made up of industry leaders, who set the goals, including a 25% reduction in GHG emissions by 2020. Several programs have been developed to achieve this goal, including the Dairy Farm Smart Project, the Farm Energy Efficiency Project, the Cow of the Future Project, the Dairy Power Project, the Dairy Fleet Smart Project, and the Sustainability Awards Program. Moving forward, the Center is working to complete their comprehensive life-cycle analyses of milk and cheese, expanding the Sustainability Council, and securing more support and additional stakeholder engagement in their projects.

Randy Spronk presented the pork industry's sustainability program. Similar to the dairy industry, the pork industry began its sustainability work with a field-to-fork carbon footprint evaluation. To complement this life-cycle analysis, the National Pork Board has developed a Carbon Footprint Calculator, which allows farmers to determine their own footprint and run scenarios based on changes in inputs and operations. Spronk has used this Calculator for his own farm and found that his biggest source of carbon emissions is feed. In addition to the carbon footprint, the pork industry has already begun to develop a water footprint and has air and land footprints planned for the future.

Karen Haugen-Kozyra, presenting on behalf of Garth Boyd, CAMCO Global, provided an overview of the Global Roundtable on Sustainable Beef. The Roundtable, made up of stakeholders from across the supply chain internationally, met for the first time in 2010 in Denver, CO to define sustainability in a way that is appropriate for beef, build trust with stakeholders and producers, and establish a commitment to a multi-stakeholder process. The Roundtable has established a life-cycle analysis working group and identified a few key issues in the areas of air, biodiversity, energy, land, water, and people and animals. The Roundtable is currently in the process of establishing a formal governance structure, led by a steering committee, and a work plan, as well as holding regional roundtables that reflect the diversity of regional production systems.

Key points from the questions and discussion included:

- There are many operational changes in the pork industry that can result in reduced GHG emissions. Changing the components of the feed, including adding synthetics, and the way the feed is used can reduce emissions, as well as using a deep pit instead of a lagoon for manure.
- The Carbon Footprint Calculator for pork is not sensitive enough to take into account integrated systems such as manure used to fertilize feed crops. It was noted that nitrogen is not the same as (and should not be equated with) nitrous oxide emissions, so there may be no difference when using an integrated system.

- The accounting method for life-cycle analyses should match the purpose of the analysis. For example, some of the emissions from feed could be allocated to the feed producer rather than the livestock producer. While livestock industries want to take responsibility for the emissions in their feedstuffs, there are advantages to attributing these emissions to feed producers as well.
- In the pork industry, the absolute level of GHG emissions has leveled off, while the intensity of emissions has decreased.
- Genomics plays a role in reducing GHG emissions, but there is still a lot more information needed. Genomics are only one part of a larger system.
- Decisions about sustainable practices based on ethics are inherently difficult since ethics vary from one person to another. Consensus on sustainable practices would be useful for regulation and legislation.
- There is inherent danger in only looking at one metric of sustainability such as carbon. There are no metrics that cross the three 'pillars of sustainability' (environment, economics, and ethics).
- Pork has a smaller carbon footprint than beef, and chicken has a smaller carbon footprint than either, but there are other reasons to still eat pork and beef. When measuring sustainability, it is important to benchmark against the same commodity.
- The Carbon Footprint Calculator developed for the pork industry does not collect and aggregate data from multiple producers. While better data is important, tracking is a sensitive issue with producers. One way around this might be to create an open source database where a producer can enter data (anonymously) in order to see others' data in the aggregate, and determine how they match up (in the aggregate).
- Life-cycle analysis only provides a snapshot and a benchmark. Once this is complete, one has to find ways to improve on current performance and practices and provide support tools for producers.
- There are a lot of metrics that can be measured in these supply chains. Consensus on the critical metrics for measurement will be very important.
- Carbon footprinting and related exercises can lead to unintended consequences if the information is not used properly. For example, these footprints do not take into account the comparative advantage of different types of land use.
- Producers are much more trusting of initiatives driven by the sector itself (or segments of the sector) rather than one driven by stakeholders.

T-AGG Livestock Project

Lydia Olander, T-AGG, moderated a panel on the livestock paper that T-AGG is just beginning to work on. The panel included:

- Shawn Archibeque, Department of Animal Science, Colorado State University

- Juan Tricarico, Innovation Center for U.S. Dairy
- Allan Stokes, National Pork Board

Olander began the panel by providing an overview of the project. She explained that livestock was too large a topic to cover in the previous T-AGG work, so it is now being covered in its own report. There are multiple anticipated users of the report, including: private or voluntary GHG markets; sustainable supply chain initiatives; and policy makers. The paper will cover GHG mitigation potential per pound of product for practice changes in the cattle, sheep, goat, and swine sectors; quantification methods; and implementation considerations. Olander hoped to begin answering the following questions with this panel:

- Is this report, as designed now, useful to the anticipated users?
- Are there unanswered questions?
- What are the critical science gaps?
- What are the practice changes possible?
- How well do the sectors track these practices?
- What are the barriers to practice implementation?

Shawn Archibeque presented the findings for cattle from the recent *Carbon Sequestration and Greenhouse Gas Fluxes in US Agriculture: Challenges and Opportunities* report published by the Council on Agricultural Science and Technology (CAST). This report examined the main areas of enteric emissions, including diet, additives, and genetics; and manure emissions, including manure management systems and methane capture. Archibeque sees several challenges and limitations still remaining for understanding GHG emissions reductions from beef, including the units used for measurement, system-wide implications of practice change, deleterious side effects of some practices/practice changes, compartmentalization of emissions within one step in the production process, difficulty identifying a baseline, and implementation barriers, such as market approval abroad. On measurement methodologies, Archibeque noted that different models are better for different production systems. He also noted that new estimates and default values for methane emission from cattle should be released soon by the Intergovernmental Panel on Climate Change (IPCC).

Juan Tricarico, continuing the panel, noted that the Innovation Center for U.S. Dairy has identified many of the same practices as T-AGG as potential GHG mitigation opportunities. A lot of these practices, he noted, have been researched for some time in the context of increasing efficiency in general. Tricarico stressed the importance of examining enabling technology and investing in new practices now. He cautioned that livestock needs to be examined from a systemic view. Water is an important issue in addition to carbon and, therefore, carbon should not be viewed in a vacuum. The benefits of one animal versus another as a whole should be measured rather than one characteristic (like grass-fed) versus another (like corn-fed).

Allan Stokes offered several observations based on his experience with the pork industry's sustainability initiative. He stressed that, in developing an LCA, defining the proper scope, boundaries, and methodologies are critical. For example, establishing baselines can be difficult since there are enormous regional variations. This suggests that regional as well as industry-wide baselines are necessary. On methodologies, Stokes suggested that the T-AGG report go beyond the exercise of just surveying what is out there to develop a consensus on a common set of methodologies and boundaries that can be achieved, so that apples can be compared to apples. Regarding baselines, he cautioned that geographic locales can have huge impacts on GHG baselines for manure, but also for energy use (e.g. fans needed to cool animals in hot regions; heat needed to warm animals in cool regions). One national aggregated baseline number can be established, but it is also important to look at regional differences and baselines, and where tools and guidelines are developed, adapt them by region. Finally, Stokes noted that the increased time or costs of a practice on producers are critical concerns and should be evaluated as part of this analysis.

Key points from the questions and discussion included:

- Even though the T-AGG report will approach practices from a science basis, it is important to think about the time, risk, and cost implications for the actual implementers of these practices.
- Compartmentalization is important in order to begin to evaluate cost. There will be significant research investment needed for this in the future, particularly in the beef sector.
- Energy use will be much more important in this report than in the report on cropping.
- A section on future research needs should be included.
- When thinking about what to include in the report and how to prioritize all of the suggestions received, the end users and their priorities is an important frame.

Evaluating Approaches to Aggregating GHG Offsets

In the final session, Peter Weisberg, The Climate Trust, presented a summary of a report he has been developing with funding from EPRI entitled *Evaluating Approaches to Aggregating GHG Offsets*. This paper examines three different methods of aggregating GHG offsets: programmatic, business model-based and sectoral-based methods. This analysis has produced several important lessons learned. Weisberg found that, when considered upfront, aggregation can change the way that a crediting system works. Aggregation enables proportional additionality and can raise the confidence in modeling results. Aggregation can also significantly reduce the performance risk for producers, by rewarding producers for practice-based changes, while simultaneously rewarding aggregators for performance-based results. Moving forward, Weisberg recommends that registries should develop programmatic aggregation rules for U.S. projects, including temporal flexibility and

additionality rules. Pilot design for a sectoral-based system in the U.S. should also be examined. Weisberg noted that EPRI still has yet to decide if the report will be made public. However, it will be the focus of a spring workshop next year.

Weisberg offered questions for small group consideration. Key points from the group report-outs included:

- Since an aggregation system works in a similar way to crop insurance, farmers are already comfortable with this type of system. Also, it is clear that aggregation is the only way to bring agricultural credits to offset markets. Aggregation allows farmers through scale to address important policy considerations (e.g. performance-based baselines) and to bring in participants while reducing risks for all sides.
- Early pioneers should be rewarded for taking on risk; aggregation can achieve this by establishing sectoral baselines.
- The difference between projects, aggregates, and participants is unclear and this paper should build out definitions for these terms.
- The statistical benefits of aggregation should be explicitly identified.
- Someone in the system will need to invest in model development and verification for aggregation.
- In the lessons learned, the paper could discuss how risk management and an insurance approach affect aggregation.
- Assessing model certainty and applying an uncertainty discount across a range of project types still requires more investigation. Do different project types and regional differences call for different uncertainty deductions?
- The more that aggregation is written into protocols, the more likely it is to end up in offset program rules. In the case of California, if aggregation is going to be included in the rules, the CARB will have to address this.
- Yield insurance could be a valuable service provided by an aggregator, since producers really fear yield loss, and this is a hindrance for participation.
- Identified gaps: how will the aggregation evaluation and development component be paid for? In CCX, all aggregators learned through on-the-job training, and nothing was documented. With funding, consideration could have been given to how to develop aggregation models.
 - It was suggested that aggregation be considered from the product certification standpoint, and internalized into certification/labeling approaches.
 - Cooperatives (e.g. Land O'Lakes) handle product identity at the end-point, although their product comes from many places.
 - Book and claim system is another option suggested.

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