



C-AGG Meeting Summary

February 29- March 1, 2012

Executive Summary

The Coalition on Agricultural Greenhouse Gases (C-AGG) met in Sacramento, CA, on February 29- March 1, 2012. 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, structure, and past and current activities. Additional meeting topics included:

- The California Department of Conservation's role in agriculture and environmental markets ([page 2](#));
- USDA's development of new tools and other relevant activities ([page 3](#));
- Current activities and future plans at the American Carbon Registry and Climate Action Reserve ([page 5](#));
- Results from a comparison of GHG emission quantification approaches ([page 6](#));
- Approaches to additionality in agricultural offset protocols, as outlined by a C-AGG White Paper Executive Summary, and as discussed by a panel of USDA GHG Conservation Innovation Grant project participants, and related project participants ([page 7](#));
- Challenges and opportunities to using nutrient management protocols, discussed by a panel of USDA GHG Conservation Innovation Grant project participants, and related project participants ([page 9](#));
- A presentation by the Secretary of the California Department of Food and Agriculture ([page 10](#));
- Updates from staff of the California Air Resources Board, regarding the development of a cap-and-trade system, agricultural offset protocol development, and research related to agricultural offset protocols ([page 11](#));
- Identifying core data needs for agricultural GHG measurement ([page 13](#));
- Approaches to capturing uncertainty in biogeochemical process models, as discussed in the latest draft of a C-AGG White Paper and related products ([page 14](#));
- Sources and mitigation opportunities for GHG and nitrogen, as reported by the California Environmental Associates in a draft report ([page 15](#)); and
- Next steps for C-AGG ([page 16](#)).

The agenda and 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.

Pivoting Toward California: Agriculture's Role in Conservation and Environmental Markets

Mark Nechodom, Director of the California Department of Conservation (DOC), presented the group with an overview of the role of agriculture at his Department. He explained that currently the Department provides a property tax break of up to 90% for farmers to keep land in agricultural production under the Williamson Act. Due to budgetary shortfalls, the Act is in danger of being drastically cut, or ended. While Nechodom noted the value of this program, he recognized additional conservation programs are needed, especially in the current fiscal climate. Nechodom advocated for a conservation policy based on payments to farmers for the ecosystem services they can provide. Corporations are already beginning to move in this direction and are setting up the rules for ecosystem services payment systems. Nechodom explained that there is a role for the government, either on the federal or state level, to become involved with and set the rules for these types of programs. However, policy makers need to decide now whether it is in their best interest to become involved. C-AGG, he suggested, could play a valuable role informing this decision-making.

Key points from the questions and discussion included:

- Because of the risk of reversion, law makers are very sensitive to programs focused on the avoided conversion of agriculture lands. It is unlikely that this kind of program will be supported through legislative action. As a result, the Conservation Innovation Grants (CIG) projects are the best source of work on this issue.
- Agriculture has not been persuasive enough to demonstrate that it is a good place to spend auction revenues from the California cap-and-trade program. C-AGG would be a good source of the rigorous information needed to make this argument. However, even with good information, agriculture is unlikely to be high on the crowded priority list.
- Nechodom is not advocating for replacing the Williamson Act; he is suggesting augmenting it with an ecosystem services program. He is participating in a CIG proposal to pilot a water quality trading program in Santa Rosa to test the concept. Support from the Farm Bureau and the agriculture community will be important, even though this has historically been a controversial issue for them.
- Nechodom predicted that, in the next federal Farm Bill, payments for performance will be an increasingly important part of the conservation title.

Update from USDA on Relevant GHG Activities

Marlen Eve, Environmental Scientist in USDA's Climate Change Program Office, began the session by providing an update on the Technical Guidelines and Scientific Methods for Entity Scale Greenhouse Gas Estimation project he has been leading at USDA. This project aims to create a set of tools for a producer to quantify GHG emissions at the farm scale and examine the impact of management changes on the farm's emissions. Eve is leading the development of a web-based, user-friendly tool as well as the underlying guidelines. Accounting for a variety of different systems as a part of a single farm, balancing rigor with ease of use, managing an extensive review process, and maintaining transparency were all cited as key challenges in the process so far. Eve noted that the project just completed an expert workshop on nitrous oxide emissions reduction quantification methods, seeking greater rigorous than the emission factor as prescribed in the Intergovernmental Panel on Climate Change (IPCC) Tier 1 model. Major milestones include the next round of review in April, the final public comment period in July 2013, and final release of the tool and guidelines in the fall of 2013. Eve mentioned that land managers will have the opportunity to review the tools before the final public comment period.

Eve also announced the release of two new reports based on the farm-scale quantification project. The first, *Greenhouse Gas Emissions from U.S. Agriculture and Forestry: A Review of Emission Sources, Controlling Factors, and Mitigation Potential*, is a meta-analysis of all the reviews in the literature of GHG emissions from agriculture. The second, *Report of Greenhouse Gas Accounting Tools for Agriculture and Forestry Sectors*, is a snapshot of the various tools, models, calculators, and protocols dealing with agricultural GHG emissions. Research for the second report was done in-house, rather than reaching out to each tool's developer individually. Additionally, Eve noted a new partnership at USDA focused on wildlife conservation efforts and ecosystem markets, as well as a new round of CIG funding for water quality trading programs.

Next, Greg Johnson, Team Leader for the USDA-NRCS Air Quality & Atmospheric Change Team, gave an overview of GHG-related work at USDA-NRCS. Johnson noted that, while NRCS tries to approach its work as holistically as possible, it entered into the climate change space through air quality issues. NRCS has two streams of funding that allot a portion of their grants to climate change projects – the Environmental Quality Incentives Program (EQIP) and CIG funding. Particularly noteworthy are the recent GHG CIG projects and the associated EQIP funding for producer engagement. Johnson also mentioned that within USDA, his office provides training to other NRCS staff, and leads the Climate Change Coordination Team at USDA.

Adam Chambers, Physical Scientist at USDA-NRCS, continued the session with an update on the development of the COMET-Farm tool for reducing GHG emissions from field operations, livestock, and energy use on a farm or ranch. Chambers noted that the Quick

Energy Tool for measurement of on-farm energy use has just been released and COMET-Farm as a whole is currently undergoing stakeholder and expert review. The public beta test is scheduled to begin this spring followed by the release of the first public version this summer. Chambers stressed the importance of feedback on the tool from groups such as C-AGG and hoped C-AGG participants would continue to provide input throughout development of the tool. Chambers also noted that the development team is examining making the soil data exportable, so that once entered, farmers could export this data to other tools (a benefit previously discussed at C-AGG).

Lucinda Roth, Climate Change Specialist at USDA-NRCS California, finished the USDA presentations with a brief overview of the USDA-NRCS California state office. The California office is the only state office with its own climate change specialist. Roth explained that the office is tracking the carbon market, offset opportunities, and the development of state policy. It has led several workshops with farmers on NRCS, its practice standards, and the impact of those standards on GHG emissions. Additionally, Roth noted that it is funding its own CIG projects examining GHG emissions reductions.

Key points from the questions and discussion included:

- Neither COMET-Farm nor Eve's project on farm-scale emissions directly address uncertainty. COMET-Farm currently assumes that models have perfect foresight, but the development team is aware this is incorrect. Eve sees the farm-scale emissions tool as a way to drive some of the research on quantifying and reducing uncertainty, rather than a way to quantify the uncertainty itself.
- Chambers would like feedback on which data, once entered in COMET-Farm, should be easily exportable for use in other models or tools. Chambers currently plans to provide any user-entered data as a spreadsheet export. COMET-Farm will not, however, build a connector to every other tool available. Johnson noted that this issue needs to be approached carefully, since USDA cannot send a user's data to anyone else; the user must do this him or herself.
- Currently, remote sensing is not being incorporated into COMET-Farm.
- While Chambers expressed a desire to better coordinate between the Nutrient Tracking Tool (NTT) and COMET-Farm, he noted that coordination between these tools is not a high priority under the Conservation Delivery Streamlining Initiative. The tools do, however, share a common user interface and COMET-Farm can export data to the NTT.
- While Johnson's office is producing great training tools, there can still be some resistance to climate change, even from within NRCS. To deal with this, the training tools emphasize resiliency and sensitivity to climate fluctuation, rather than climate change. Additionally, they emphasize win-win solutions and the climate-energy connection. It was also noted that education and information access help people feel more comfortable in the climate change space.

- Following the previous C-AGG meeting, Chambers researched NRCS's policy on credit stacking. He noted that NRCS asserts no direct or indirect interest in credits that may come from EQIP-funded practice change.

Agricultural Protocol Development: Updates from Voluntary GHG Registries

An update from the voluntary registries included Nick Martin, Chief Technical Officer at the American Carbon Registry (ACR), and Derik Broekhoff, Vice President for Policy at the Climate Action Reserve (CAR). Martin began the session by providing an overview of the agriculture protocols currently under development at ACR, which fall in the areas of nitrous oxide from fertilizer, rice, livestock, and New England region specific. Across all of these protocols, Martin cited a number of challenges from standardized additionality and baseline setting. He suggested that, while standardized approaches are often beneficial, the idea of project-specific tests should not be eliminated for cases where a standardized approach may be too difficult. Martin noted that there are still several unresolved issues on this topic, including the right threshold for common practice, the feasibility of output-based intensity metrics, and a method to reward early adopters while also incentivizing laggards to change practices. He stressed that additionality and baseline-setting is not necessarily the same; protocols should not exclude the stacking of multiple revenue streams; appropriate intervals for adoption and crediting must be set in order to be successful, and temporal flexibility is also important. Finally, Martin noted that the delay in creation of offset protocols as a part of a cap-and-trade program in California is creating uncertainty in the market which is depressing the price of offsets. The California Air Resources Board (ARB) needs to provide clear guidance to project developers and farmers as soon as possible to ensure enough offsets in the market and incentivize farmers to participate.

Next, Broekhoff presented an update on CAR's agriculture work since the last C-AGG meeting. Broekhoff reminded the group that CAR has been working to complete the Rice Cultivation Project Protocol and the Nitrogen Management Project Protocol. The rice protocol for dry seeding in California was completed in December, though CAR is interested in expanding this protocol in the future. The nitrogen protocol is still under development, though CAR hopes to have it complete by June. While CAR is still deciding on the use of standardized approaches and which practice changes to include, Broekhoff noted that a performance standard for nitrogen application rate reduction will definitely be included and aggregation will play a central role in the protocol. Broekhoff discussed the soil carbon protocol, of which CAR has suspended development. Within the next few weeks, CAR will release a Request for Proposals to examine the potential GHG emissions reductions, the use of performance standards, and possible quantification methods for land-use change, and also plans to develop two issue papers on this topic to inform their decision making on the feasibility of a soil carbon protocol.

Key points from the questions and discussion included:

- There is currently not enough data on precision agriculture for CAR to develop a protocol on it. However, it is unlikely that there will be enough data before precision agriculture becomes common practice.
- Both Martin and Broekhoff said it is unlikely their registries will develop soil carbon sequestration protocols.

Comparison on Quantification Approaches

During lunch, Steven De Gryze, Managing Director at Terra Global Capital, LLC, and Dana Gunders, Project Scientist at the Natural Resources Defense Council (NRDC), presented the outcomes from an uncertainty comparison of different types of models for agricultural GHG emissions, completed by Terra Global Capital on behalf of NRDC. Gunders explained that the goals of this project were to make uncertainty more accessible to a non-technical audience, compare model uncertainty using examples with actual values, and inform decisions about how rigorous a model needs to be for various uses, such as the offset market and supply chain initiatives. De Gryze presented the results of several different models for tomatoes in Yolo, California; potatoes in the Upper Midwest; corn in central Illinois; and camelina in Montana. He noted the variability between the observed and modeled GHG emissions reduction for each crop and asked whether participants thought that the correct crops and models were chosen.

Key points from the questions and discussion included:

- Many participants noted the wide variability between different model results and between the modeled and actual field measurements. Participants also noted that the comparisons were not “apples to apples”.
- One participant suggested calculating the difference between observed and modeled values for each crop. Another participant suggested that an interpretative paragraph for each example would be helpful.
- When using models such as the Cool Farm Tool for this project, De Gryze isolated the biogeochemical portion of the model.
- The low yield data suggests that the corn data set may not be the best data to use for this crop, particularly when assuming there is no yield impact from practice change.
- There are a number of different options to expand on this project, including choosing an example where field measurements were taken in two different studies; expanding the number of models tested, and gathering data specifically for use in this study. For this last option, the expense of building a new data set was noted a particularly tough challenge.

Additionality Panel: Presentation of C-AGG Additionality Executive Summary and Roundtable Discussion on Additionality

Debbie Reed began the panel by reviewing the C-AGG Additionality White Paper Executive Summary. This document summarizes the additionality white paper, which has been presented at the last two C-AGG meetings, and incorporates additional input from the C-AGG working group on additionality. Reed explained that the document is targeted specifically at policy makers and focuses on four key concepts:

- Standardized methods and approaches should be utilized when possible,
- Experts in agricultural science and practice must be involved in defining agricultural additionality,
- Barriers to practice change are a hallmark criterion of additionality, and
- Project developers and aggregators are recognized agents of change.

Following Reed's presentation, Ricardo Bayon, Partner at EKO Asset Management Partners, moderated a roundtable discussion on additionality in the GHG CIG projects featuring:

- Eliav Bitan, Agriculture Advisor, National Wildlife Federation
- Garth Boyd, Senior Partner, the Prasino Group
- Steven De Gryze, Managing Director, Terra Global Capital, LLC
- Randall Dell, Regional Biologist for Environmental Markets, Ducks Unlimited
- John Kadyszewski, Director, Winrock International
- Matt Sutton-Vermeulen, President, Unisom Resource
- Frederik Vroom, Forest Analyst, The Earth Partners

The bulk of the roundtable discussion focused on the challenge of rewarding early adopters while also maintaining environmental integrity. Agriculture, more than other sectors requires early adopters of a practice change to serve as a model and an educator for their peers. Additionally, these early adopters are responsible for making large reductions in GHG emissions on their farms, rather than the incremental reductions of later adopters. As a result, it is important to incentivize early adopters, even though they do not meet a strict test of additionality. There was no clear answer from the group how to solve this problem. Panelists suggested that proportional additionality or uncertainty deductions could be used, if early adopters and offset generating producers are aggregated together either by an aggregator or by the protocol itself. Participants noted that while this approach provides flexibility, it reduces the price of offsets that are already relatively low in price. One participant proposed that allowances could be either be taken out of circulation to account for the non-additional offsets from early adopters or could be awarded to early adopters rather than awarding offsets for the practice change. Other participants suggested that the carbon market might not be the right place to reward early adopters. It might be better to compensate these producers for spreading their practice change to other producers.

Participants recognized that all of the solutions suggested were policy decisions that will be decided by the crediting entity, rather than a group like C-AGG.

Panelists also discussed the challenges of using standardized approaches to additionality in agriculture. In order to maintain environmental integrity, standardized approaches may set a low performance threshold – the percent of farmers, often 5-10%, that need to adopt a practice before it is considered common. However, panelists noted that this type of additionality test leaves out a large number of producers who might change practices once the threshold is reached. Standardized approaches also ignore the risk of reversal – the risk that a farmer might return to the old practice in the next growing season. Since the ultimate goal is widespread adoption of these practice changes, participants suggested that the focus should be placed on all producers, not just the first 5%. Additionally, one panelist noted that thresholds create a public relations problem for project developers, since it makes these issues difficult to understand for producers and a non-technical audience. Other participants defended the utility of thresholds and standardized approaches. Because individual entities are so small in agriculture compared to point source pollution, it can be very resource intensive to determine additionality on an individual scale. Baselines in agriculture are also dynamic, which means that a set threshold is needed to measure additionality, rather than drawing a baseline at the adoption level that exists today. Participants cautioned that, while related, additionality and baselines should not be confused.

Performance-based rather than practice-based offsets were also considered by the panel. One panelist noted that a performance-based system would provide robust data with a high confidence level. The results presented during the lunch session, he suggested, do not meet this criteria. Whether to allow a producer to generate offsets from reduced GHG emissions per unit of output, while increasing both the total yield and the total GHG emissions, was a controversial topic. Some panelists recognized that global agricultural yields need to increase in order to meet future demand, so capping production isn't feasible. Other participants wondered about the integrity of awarding offsets when there has been no net reduction in GHGs in the atmosphere. Producers, they note, could receive credits even if there is an increase in GHG emissions from their farms. One panelist suggested that this issue could be resolved by the market itself. If buyers don't believe that performance-based offsets have integrity, they will not be purchased.

Panelist offered several final comments for incorporation into the White Paper Executive Summary:

- Simpler, regional performance standards are needed.
- A 5% threshold for common practice does not work because it excludes too many producers from receiving offsets for a practice change.
- Flexibility between standardized and non-standardized approaches is important. There is not one solution for every producer who might use a protocol.

- Testing additionality is a good idea, but it is important to understand what that means. The last sentence of the Executive Summary should be edited to reflect this.
- The solution to rewarding early adopters without compromising additionality needs to be found within the current offset protocol framework, not something completely new.
- The principles should be edited so they are more specific to the topic of additionality. Currently, some of them are generally applicable to agricultural GHG mitigation.
- Increased efficiency in agricultural production should be rewarded, even if yields increase.
- Uniform data, particularly USDA data sets, are an important component of additionality.
- Explain both the distinctions between additionality and baselines as well as how they are related.

Roundtable Discussion on Nutrient Management Protocols

Ricardo Bayon, Partner at EKO Asset Management Partners, moderated a second roundtable discussion on nutrient management in the GHG CIG projects featuring:

- Ryan Anderson, Director, Delta Institute
- Allen Dusault, Farm Smart Program Manager, Innovation Center for U.S. Dairy
- Belinda Morris, Regional Director, Center for Conservation Incentives, Environmental Defense Fund
- Bruce Ringrose, VP Business Development, ClimateCHECK
- Frederik Vroom, Forest Analyst, The Earth Partners

Panelists discussed at length the challenges facing producers participating in a nutrient management project. The represented CIG projects all require large amounts of data from producers for their protocols. Many producers often do not currently collect the data needed for nutrient management protocols or they collect it in the wrong format for these protocols. One panelist noted the risk that, while producers might keep the necessary data now, they may not for the entire crediting period, thus rendering them ineligible for credits at the end of the period. In order to help address this challenge, the CIG projects have been focusing on making data collection efforts web-based, quick, and easy to complete. One panelist mentioned that COMET-Farm does this particularly well already and his project may use this tool rather than developing another. Another panelist explained the value of leveraging professionals who already help producers with data collection. Panelists recognized the need to coordinate across various tools and efforts and commended the work of the C-AGG Core Data Needs Workgroup in this regard.

Panelists also discussed some of the challenges posed by protocols and models to the project developers themselves. One panelist noted the challenge of using highly complex models, such as the DeNitrification-DeComposition (DNDC) model outside of an academic setting where there is a much more robust computer processing system. Currently, meeting the protocol requirement for model runs can take hours on a standard computer. Bill Salas, it was mentioned, is already working on a solution to reduce the through-put time by 80-90% by eliminating the graphics in the model. Another panelist pointed out the limitations of protocols. For example, he explained, the highest impact practice changes on a farm may be beyond the scope of a protocol, because they are beyond the geographic scope of a project area.

Panelists were divided on the reactions they will receive from farmers when projects of this type are rolled out on a broad scale. Some panelists recognized that they are only working with progressive farmers right now and they expect significant push-back from the broader community. Panelists also noted that producers are getting disillusioned following the collapse of national cap-and-trade legislation. Framing the discussion around increasing market access, improved efficiency, and other co-benefits will be important to counter this situation. Producing offsets for the private sector's voluntary corporate social responsibility efforts could also create opportunities for farmers. Some panelists were less worried about the reaction from the broader farming community. Once an agricultural offset market is bringing in more revenue for producers, additional recruitment should be relatively easy. These panelists noted the importance of basic education for farmers on these agricultural GHG-related issues. While C-AGG may not be the best group to take on this task, it could develop the educational materials for farmers.

Overview of Agricultural Offsets, Opportunities in California

Karen Ross, California Secretary of Food and Agriculture, provided an overview of her department's work and the role of collaboration. While she has faced a number of challenges as Secretary, including limited statutory authority and a shrinking budget, collaboration with diverse stakeholders and other areas of government has greatly expanded the reach and impact of the Department of Food and Agriculture. Ross noted a number of areas of interest to C-AGG where the Department is directing significant attention, including expanding the use of nutrient management plans on farms, creating sustainability programs for specialty crops, increasing the use of dairy digesters, examining ways to monetize ecosystem services in order to lower regulatory costs, establishing a roundtable effort to discuss agricultural GHG offsets, and continuing research funding. Additionally, Ross recognized that agriculture is going to be critical to figuring out how to meet out carbon and nutrient management goals.

Key points from the questions and discussion included:

- Agriculture research is critical to ensuring that we can meet future demand. Ross would like to see more money at the federal level put into competitive grants.
- ARB is very excited to see engagement from the agriculture sector. Ross has been working to bring production agriculture to the table so they will worry less about the impact of climate policy on their energy use. Offsets need to prioritize the highest impact strategies for expanding the number of acres involved.
- Farmers are difficult to engage and there is not a single solution for getting their attention. The extension model is still the most effective engagement model.
- Non-point source regulation is not efficiently managed right now. Regulation needs to be systematic and look across silos in order to avoid conflict and duplication. Consolidated permit review at the EPA is a tool Ross hopes to apply to agriculture.
- Looking ahead to the federal Farm Bill, Ross would like to see more conservation funding but thinks this is unlikely. Because of the current rhetoric about small farms on the national level, farmers feel threatened when people ask questions about their operations. In order to move forward on conservation issues, the agriculture sector needs to start discussion with the assumption that environmental gains already made will not be lost.

Overview of AB32 and the California Cap-and-Trade Program

Edie Chang, Air Pollution Specialist at the California Air Resources Board (ARB), began a series of sessions from ARB by providing an overview of California's cap-and-trade legislation – AB32. This legislation, which aims to reduce California's GHG emissions to the 1990 level by 2020, calls for the completion of a scoping plan, identification of voluntary measures for emissions reductions, and the establishment of a cap-and-trade system. While agriculture is not a capped sector under the cap-and-trade program, agriculture can generate offsets for use by capped sectors. Up to 8% of a covered entity's obligation can be met with offsets rather than allowances. The use of offsets is designed to contain costs and provide investment in projects not under the cap. Chang noted there is a real concern that there will not be enough offsets in the market; as a result, ARB is working to examine additional protocols for approval. Looking forward, ARB plans to begin their next scoping plan (in the fall of 2012), increase harmonization with partners such as the Western Climate Initiative (WCI), and continue to seek new GHG emissions reduction opportunities.

Key points from the questions and discussion included:

- Projects from anywhere in North America can generate offsets under AB32; however the currently approved protocols are limited to the U.S. A technical working group is examining the potential for sector-based reductions from international REDD projects, though these are not technically offsets.
- ARB is examining the potential to link offsets in California and Quebec.

- As the cap-and-trade program is established, ARB will give away most allowances to covered entities. Over time, however, these allowances will be increasingly auctioned. The auction revenue must be appropriated by the state legislature and it must further the goals of AB32.
- Chang hopes C-AGG can help to examine some of the technical issues, such as how to reward early adopters while maintaining additionality.

Agricultural Protocol Development: Process, Research Activities Underway

Brienne Aguila, Lead Staff for Offsets at ARB, continued the discussion of AB32 with an overview of California's compliance offset program. She explained that offsets under the program must be real, additional, quantifiable, permanent, verifiable, and enforceable. Offsets must be generated through an ARB-approved protocol, which goes through a regulatory process including public comment, environmental review, and ARB Board approval. In order to reduce the administrative burden, ARB has decided to approve only one protocol for each project type, though they will revise and expand protocols once approved. ARB approves registries to complete much of the offset generation work on its behalf in order to reduce the administrative burden as well. Currently, all project developers must use an approved registry.

Mike FitzGibbon, Air Pollution Specialist at ARB, followed this presentation with an overview on ARB's research division and its current work. FitzGibbon explained that two-thirds of California's agricultural GHG emissions are nitrous oxide and, as a result, this has been the focus of ARB's agricultural research. The first phase of work calls for a baseline emission inventory and model, including crop and site specific GHG emissions factors and calibrating and validating the DNDC model for California crops. Then in the second phase of work, mitigation options will be examined. FitzGibbon noted a nitrous oxide working group has been formed to shape the research agenda.

Key points from the questions and discussion included:

- ARB is discovering a lot of variability in GHG emission factors. This is largely due to weather variability, particularly water.
- ARB does not have a specific timeframe for when they will be bringing another protocol through the approval process, but it will not be in the next year.
- Rather than creating many different protocols for the same project type, ARB is trying to create protocols that are widely applicable and expandable over time.
- ARB has chosen to use standardized approaches since it is significantly easier to manage.
- While the current research at ARB is California-focused, protocols developed do not need to be limited to California only. California producers bear the cost of AB32 so the political incentive is to focus on California crops.

- ARB plans to use the work others have done already as much as possible in protocol development.
- While ARB will take environmental co-benefits into account during a protocol's required environmental review, they do not have the ability to quantify these as part of an offset.
- ARB is developing a priority list of protocols for development as a part of the WCI. These priorities will then be divided and developed by different WCI members.
- Farmers are looking to minimize the expense of fertilizer on the farm and discussion of rate change as a part of a protocol makes them uncomfortable.
- Currently, ARB is not conducting research to examine grasslands.
- Generating offsets can be an expensive task for a producer, particularly due to verification costs. While it is important to ensure that an agricultural offset has the same validity as any other offset, it is also important to improve the value proposition for a producer. Pilot projects can be particularly valuable for this.
- Coordination between agencies is needed in order to meet everyone's goals for nitrous oxide and groundwater impacts. Quantifying tradeoffs is also particularly important.
- Site specific GHG emissions factors, while an easy way to compare, will not be used in an inventory for ARB.

Presentation and Discussion of C-AGG Workgroup Activity: Identifying Core Data Needs for Agricultural GHG Measurement

Debbie Reed, C-AGG Executive Director, and Marlen Eve, Environmental Scientist in USDA's Climate Change Program Office, provided the group with a report on the current status of the Core Data Needs Workgroup. This Workgroup aims to scan the information and data points required by various models, tools and initiatives seeking to measure agricultural greenhouse gas (GHG) emissions and reductions, in order to see if it can identify 'information hot spots' for GHG measures or some density of data points that are common across programs. With data point overlays devised for the various tools, including sensitivity analyses conducted by some of the programs to identify their most critical data inputs, it may be possible to begin to narrow or at least better identify common data needs, and the most critical data needs for various outcomes, whether carbon market projects or supply chain initiatives. Also, the workgroup is seeking to identify when measured or actual data is required, versus the use of look-up or default values. The results can lead to better harmonization across various efforts, initiatives, tools, and models, help reduce 'audit fatigue' among producers, potentially narrow data collection needs to essential elements, and increase accuracy of data collected.

The Workgroup has been building a spreadsheet based on Eve's work at USDA which catalogues all of the tools used in this space. Reed and Eve proposed several potential future

activities for the Workgroup, including adding sustainable supply chain initiatives to the spreadsheet and creating a Microsoft Access database with additional information on each tool. Reed and Eve suggested that before creating the database, it might be useful to try case studies, to populate the data for four tools, in order to better understand issues of data granularity, to develop specification sheets for the ACCESS database, and to ensure that the database will meet the goals of the group. Reed noted that there is a lot of interest from other external groups in this particular C-AGG work product.

Reed and Eve concluded the presentation by requesting feedback from the group. Reactions included:

- The list of tools should be expanded to encompass all of the data we are asking for from farmers, not just climate-related data.
- Producer groups need to be engaged early in the process; there is a great deal of sensitivity around activities such as this. While it adds a lot of complexity, this is an argument for including supply chain initiatives as well.
- It seems like this project is enabling multiple tools, rather than advocating for fewer tools. Fewer tools would go a long way towards simplifying things for farmers. This project aims to ultimately create common interfaces and identify unnecessary data, rather than seeking to narrow the number of tools.
- While there are distinctions, the difference between tools, models, protocol, etc. is confusing. Refining these categories and creating a Microsoft Access database, where different tools, models, and protocols could relate to one another, would help clarify this.
- NRCS has an effort to create a uniform data interface for conservation programs. They should be included in this project since they will be a major driver in this space.
- Adding the Nutrient Tracking Tool or the Stewardship Index to the list of test cases would help evaluate the complexity of adding non-carbon tools.
- The Workgroup needs to be very specific about what the input metrics are for each tool. Even the difference between measurement units, for example, can make a big difference for producers.
- C-AGG participants already have much of the information to complete the four identified case studies.
- Better collaboration is needed between the workgroups.

Presentation and Discussion of C-AGG Executive Summary: Uncertainty in Empirical and Biogeochemical Process Models for Agricultural Offset Protocols: An Approach for Capturing Uncertainty

Steven De Gryze, Managing Director at Terra Global Capital, LLC, and Debbie Reed, C-AGG Executive Director, presented an update on the current status of the C-AGG White Paper:

Uncertainty in Empirical and Biogeochemical Process Models for Agricultural Offset Protocols: An Approach for Capturing Uncertainty; the Executive Summary; and the Uncertainty Workgroup. De Gryze explained that the initial White Paper was trying to cover too many different levels of complexity and target too many different audiences. As a result, the paper didn't work for any one audience. The Workgroup has decided to develop instead three different products:

- A white paper that examines model evaluation without the theoretical science;
- A scientific paper for publication that delves into the statistical foundations and assumptions being used; and
- An executive summary that explains to policymakers the key concepts of evaluating uncertainty for any model, and key concepts related to model selection.

Additionally, Bill Salas has provided a simplified version of the DNDC model that can be used as a consistent example throughout all the products.

De Gryze and Reed concluded the presentation by requesting feedback from the group. Reactions included:

- People tend to be hesitant to share their data with others, which makes it harder to do the type of analysis of interest to this Workgroup. Any data that GHG CIG projects want to provide publically would make a huge difference.
- Uncertainty, while important, is not always a particularly engaging topic. However, discussing whether or not an offset credit is real is a much more engaging, but related, issue.
- The author group for these products could be expanded to a wider group of experts.
- The DNDC model does not account for uncertainty associated with inputs, such as field measurements.
- It would be interesting to examine uncertainty across models or types of models, though this would be a very labor intensive process.
- The developers of COMET-Farm are still trying to figure out the best way to report uncertainty.

GHG and Nitrogen: Sources, Scenarios and Mitigation

Amy Dickie, Senior Associate at California Environmental Associates (CEA), presented preliminary findings from a Packard Foundation-commissioned project examining the sources, costs, and mitigation potential of GHG emissions and nitrogen. She found that the largest sources of GHG emissions are from soil management and enteric emissions from livestock. The geographic distribution of GHG emissions is very important to consider, since one quarter of all of the U.S. GHG emissions from agriculture occur in Texas, California, and Iowa. Dickie noted that this suggests state level policy may be a more important driver to

reduce GHG emissions than the federal Farm Bill. For mitigation potential, Dickie explained that soil carbon management practice changes are the most promising opportunities. Dickie noted that this conclusion is consistent the Technical Working Group on Agricultural Greenhouse Gases (T-AGG) reports, which CEA's analysis relied upon heavily.

Key points from the questions and discussion included:

- Some crops and livestock systems require greater inputs because they yield a higher output – either in quantity or caloric content. Data on outputs would be helpful to accompany this project's research.
- Changing cropping patterns or switching from an annual to perennial crop is difficult to credit, since there are concerns about additionality. Practice change is the easiest GHG emission mitigation opportunity to credit.
- Data collection on practices is still critically needed.
- The project examined mitigation opportunities from a research perspective. Cover crops are the best "shovel-ready" practice change.
- Several of the mitigation opportunities identified by this project, such as improved feed for livestock to reduce enteric fermentation, may not be possible without new research to improve technology.
- The T-AGG livestock assessment and the California Nitrogen Project are both currently underway and will be very valuable for informing this space.

Wrap-up and Conclusions

Reed concluded the meeting with a brief summary of next steps.

- The Executive Summaries of white papers presented at this meeting will be revised and additional input for those drafts is welcome.
- Reed will also reach out to schedule follow-up meetings with ARB to continue discussions and share important C-AGG work.
- At the next C-AGG meeting in Sacramento, Reed would like to arrange for a day of site and project visits and she would welcome ideas for locations.

Additional opportunities for C-AGG that emerged from the discussion included:

- Informing discussion at federal and state levels regarding the structure and rules for ecosystem services payment programs;
- Providing California policymakers with rigorous information that makes the case that agriculture should receive allowance auction revenues for incubation projects to develop agricultural protocols and offsets;
- Offering feedback on COMET-Farm as it develops, including which data inputs should be easily exportable to other tools;

- Aiding coordination across various nutrient management models, tools, and protocols;
- Working with Bill Salas as he reduces the through-put time in the DNDC model, and ensuring greater accessibility to aggregators and project developers seeking to test project development plans and outcomes;
- Developing basic educational materials to help farmers understand GHG emissions and mitigation opportunities; and
- Helping to resolving the technical issues around early adopters and additionality for ARB.