



# C-AGG Meeting Summary

## **Meeting Theme: *California Agriculture Leading the Way***

From March 8 – 9, 2017, C-AGG participants met at the Hyatt Regency Sacramento to highlight climate change mitigation progress in California, and specifically, voluntary incentive-based opportunities that will enable the agricultural sector to contribute to GHG emission reduction activities and outcomes.

After an overview and welcome by Debbie Reed, C-AGG Executive Director, the first day of the meeting opened with a keynote from CA Secretary of Agriculture Karen Ross who provided an update on California’s work to advance the California Climate Strategy and the specific agricultural and land use programs that support that work. The keynote was followed by a panel of speakers who highlighted the science, policy, and practice around avoided conversion of farmland in the state, and how this approach can help CA meet its GHG emissions reductions goals. In the afternoon, speakers from the California Department of Food and Agriculture (CDFA) and the CA Air Resources Board (ARB) provided updates on the CA Healthy Soils Program—focusing on how the Healthy Soils Initiative and incentives program will be implemented through projects around the state and quantification methodologies being considered to estimate GHG reductions from those projects. Participants then heard about work to create a CA-specific version of the DNDC model to support statewide analyses, calibration, and validation of N<sub>2</sub>O mitigation from CA soils. Then a representative from ARB described how the Short-Lived Climate Pollutant (SLCP) Reduction Strategy is an important part of CA’s Climate Strategy and laid out CA’s plan to significantly reduce SLCP by 2030. A key piece of this plan is methane reduction at dairy operations—highlighted through the CDFA’s two main dairy methane reduction efforts: The Dairy Digester Research and Development Program and Alternative Manure Management Practices. The first day concluded with a presentation on risk mitigation strategies for carbon offset projects through financial innovation.

Day 2 opened with Reed highlighting C-AGG’s strategy to work with the International Civil Aviation Organization (ICAO) process to develop agricultural offsets and to engage with the UN Framework Convention on Climate Change to highlight the community’s work. Next, a panel of USDA NRCS Conservation Innovation Grant (CIG) recipients discussed their projects and outcomes from that work. They focused on the overlapping and collaborative opportunities with these grants to provide lessons learned on a wide scale. Speakers then provided an update on the recent C-AGG Workshop on COMET Tools which laid out the implementation strategy for these tools to include CA specialty crops this year (among other updates). Another presentation described the March 7 joint C-AGG/National Network on Water Quality Trading Workshop (NNWQT) workshop designed to investigate common quantification methodologies and opportunities for the GHG and water quality (WQ) trading communities to collaborate more closely. The meeting concluded with presentations on international work, first on ICAO’s Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) which proposes to reduce aviation emissions, including through offsets and other market measures. The final presentation provided an update on the Ontario Cap-and-Trade Program’s Offset Protocol Adaptation Process.

## High-level Outcomes

- California is leading the way promoting agricultural GHG reductions in the US, with government leadership and state programs coordinated under the [California Climate Strategy](#) which highlights the state's vision to reduce GHG levels 40% below 1990 levels by 2030. California's scoping plan to assess how to meet the 2030 goals will go to ARB in June 2017.
- The agricultural sector in CA is large and diverse, with about 77,000 farms producing over 400 agricultural commodities, including unique specialty crops that account for \$47 billion in revenue. While CA has some of the most fertile and diverse agricultural soils in the country, the demands of development and urban growth threaten these agricultural lands. To counter this development, the government—from the state to local municipality level—is working with conservation and farming groups to create agricultural land conservation programs. Urban development into agricultural land not only impacts the ability of the state to continue agricultural production, but also to reduce GHG emissions as urban areas generate almost 60 times more GHG per acre than the state's farms.
- CA agricultural crops, ecosystems, and thus farming practices are different than the rest of the country. Many crops are specialty and/or perennial and require tailored tools and policies to support their production, including to help address GHG mitigation. Traditional agricultural tools, practices and support systems have focused on annual corn, soy, and wheat crops; agricultural support systems and resources must be updated and need to address the realities of CA agriculture.
- Funding plays a key role in supporting agricultural innovation. State-level support through the [CA Cap and Trade program](#) funds the [Healthy Soils Initiative](#) in CA; [Conservation Innovation Grants \(CIG\)](#) from the USDA allow for growth, collaboration, and innovation in many areas, including GHG mitigation. Creating opportunities for grantees to collaborate, such as through C-AGG meetings, provides an important forum to share information from many different project types around the country, and to address CA-specific needs as well.
- In the absence of federal policies on climate change mitigation or agricultural offsets, there may be more opportunities for US agriculture to work with other countries, such as in Canada or by participating in international offset programs, such as the [Carbon Offsetting and Reduction Scheme for International Aviation \(CORSIA\)](#) through the International Civil Aviation Organization (ICAO).





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## Wednesday, March 8

### Welcome and Introductions: C-AGG Overview and Background

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Debbie Reed, C-AGG Executive Director, welcomed participants and introduced C-AGG staff and Steering Committee members. C-AGG works to develop and promote the tools and programs needed for market-based incentives and as a multi-stakeholder forum, our success is dependent on building community and success among our participants and stakeholders. Reed encouraged all participants to reach out to C-AGG to continue to identify how we can meet their needs.

The upcoming July C-AGG meeting (July 18 – 20, 2017 in Chicago, IL) will begin with a workshop on the important issue of double counting so that our stakeholders can be proactive about developing systems, communications, and other measures to prevent double counting and/or to flag it with regards to carbon offsets and GHG reduction programs. Field to Market (FTM) is also discussing how to address this issue within FTM projects and programs. Finally, Reed highlighted that the 2018 Sacramento meeting will take place April 4 – 5, 2018—later than our usual March meeting dates.

### Keynote Address: Karen Ross, Secretary of Agriculture, California Department of Food and Agriculture (CDFA)

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Secretary Ross welcomed all the participants to CA and stated that CDFA is looking forward to accomplishing a great deal over the next two years through the [CA Climate Adaptation Strategy \(CAS\)](#) which is a core focus for Governor Jerry Brown. This work has been successful due to strong leadership from the prior administration, clear commitments from many state offices, and continual stakeholder outreach and input. CA is reaching out to other state governments as well as the federal government to further develop this strategy—noting that USDA Secretary Vilsack (under the Obama Administration) helped CA through research and technical assistance.

California has ambitious GHG reduction targets through 2030, which includes a focus on managing working and natural landscapes to sequester carbon. The CA government appreciates what farmers and ranchers are doing to meet the multiple expectations of consumers—the highest standards in animal care, employee pay, and environmental stewardship while ensuring low prices. Secretary Ross highlighted programs and practices that have been launched to improve agricultural practices and to support farmers in the state including SWEEP, the Dairy Digester Program, the Healthy Soils Initiative, and the Sustainable Agricultural Lands Conservation Program.

The [State Water Efficiency and Enhancement Program \(SWEEP\)](#) was launched in response to drought; SWEEP covers 100,000 acres and provides financial assistance in the form of grants to implement irrigation systems that reduce GHGs and save water on agricultural operations. CA estimates that 71,000



metric tons of carbon have been reduced so far and every round of applications has been oversubscribed by 300%. A key reason for high farmer and rancher interest and participation across the state has been the targeted outreach through NCRS-funded seminars for growers (targeting small and mid-size farmers, including those who do not speak English as a first language) to help them develop and submit applications. The technical assistance piece has been extremely important to ensure all farmers have access to these programs and tools. The COMET Tools have helped in estimating potential and likely GHG mitigation outcomes associated with the program.

Secretary Ross then highlighted the [Dairy Digester Research and Development Program \(DDRDP\)](#). To create the most innovative program using the best available technology (that was also accessible by many), the state worked with a wide range of communities and farmers. Because of the [Short Lived Climate Pollutants \(SLCP\) legislation](#), CA has more support for both dairy digester technology and alternative manure management technologies. CA is investigating all types of technologies to lower methane reductions from dairies and from food waste, including by producing compost.

Many of the activities also tie into the [Healthy Soils Initiative](#) launched in 2015 which has funding available now; the program aims to build soil carbon and reduce agricultural GHG emissions. Secretary Ross noted that CA is looking to put some of the Healthy Soils money into on-farm improved tillage practices and is looking to fund at least three regional integrated farming systems demonstration projects with various stakeholders to showcase early successes.

In addition to these programs, CA is investing in preserving agricultural land from development by driving smart growth and keeping land in agricultural use which helps to preserve sequestered carbon. The [Sustainable Agricultural Lands Conservation \(SALC\) Program](#) complements investments made in urban areas with the purchase of agricultural conservation easements, development of agricultural land strategy plans, and other mechanisms to reduce GHG and increase agricultural sector resilience.

Thinking strategically about all these programs and their multiple benefits is the most important thing CA can do to make the business case to farmers and ranchers. The key is highlighting case studies from different sectors that show successes at the farm and landscape scale. Regardless of what happens on the federal level, the business community is moving forward with GHG mitigation, and the state needs to ensure that policies support this work and show quantifiable results.

Participants had a full discussion with Secretary Ross. Highlights of the discussion include:

- How to potentially shift farming practices to areas where the ecosystems may better support those farms; for example, moving some large dairies from the dry central valley to the north coast where they can benefit from rain fed agriculture;
- A recommendation that the three projects chosen under the Healthy Soils Initiative should ideally cover different sectoral approaches to maximize learnings and outcomes across program types, and should consider the long-term investments needed to assess benefits and outcomes;
- CDFA is starting to perform an analysis of biochar through their organic review program and is funding research in biochar. However, CA needs to be able to produce the biochar in the state and with the regulatory environment around air emissions, this is difficult. CA has a biomass



issue—there is a lot of waste biomass but there is tension on the best use of that biomass—compost, biochar, mulch, energy generation.

- Governor Brown’s leadership in climate change includes working with more than 170 subnational governments around the world, including provinces, states, and cities to share information on policies, programs, and successes. As a large state, CA can drive policies to address drought, wildfire, and pests that affect everyone.
- The CA Air Resources Board (ARB) is focusing on quantification tools to ensure that investments in GHG mitigation are effective. With the CA Cap and Trade program going through a lawsuit, it is imperative that quantification measures are correct.

## Session 1: Avoided Conversion of Farmland: Helping to Meet CA GHG Goals

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### Avoided Conversion of Farmland—helping meet GHG goals

Edward Thompson Jr of American Farmland Trust (AFT) opened the session by highlighting the loss of farmland in California due to urbanization, water supplies, climate change, and competing environmental benefits. These impacts can be cumulative and so CA needs to address multiple challenges to succeed.

AFT is working at the forefront of farmland conservation to concentrate growth in urban areas. Annually, 40,000 acres are converted to urban use from agricultural use in CA and projections show a continuation of this trend. CA agriculture accounts for 40 billion dollars of annual revenue which underscores the financial value of this land. However, agricultural land also has huge GHG benefits. Urban areas generate almost 60 times more GHG per acre than the state’s farms, and preventing the conversion of farmland can have the single greatest impact on avoided GHG from agriculture. Three speakers will highlight science, policy and practice around avoided conversion of farmland in CA.

### California research on GHG emissions and farmland preservation

Louise Jackson, Emerita Professor and Cooperative Extension Specialist at UC Davis, discussed quantitative estimates of GHG emissions and research questions. UC Davis was studying climate change and agriculture while Yolo County was investigating this connection. Yolo County, a rural agricultural county with strong farmland preservation interests, is close to Sacramento and feels urbanization pressures. UCSD’s study, which examined urban land expansion trends and the rate of change using a Tier 1 approach for GHG emissions per acre in the county, showed that urban lands are responsible for a considerable percentage of overall GHG emissions in Yolo county. Urban land produces 86% of GHG emissions on 4.6% of the land, and the study concluded that preserving agricultural land from development is essential for the county to stabilize and reduce GHG emissions.

A second study examined three distinct urbanization scenarios to look at how the scenarios changed with different growth possibilities. With high density growth/urbanization, the GHG emission scenarios show lowest growth due to high density buildings with better energy efficiency/fewer vehicle miles



traveled, etc. However, if urbanization causes more people to live outside cities and commute, urban GHG emissions increase significantly.

Jackson then discussed topical research questions for further study: Do Business as Usual (BAU) scenarios provide a reasonable projection of urbanization rates? What agricultural areas may be more prone to development? Can public perception be influenced to benefit farmland preservation outcomes? Because farmland is easy to develop, its conservation value is often overlooked. The drought has also been hard on farm families, creating incentives to leave farming and to sell for development.

## The Smart Growth Case for Farmland Conservation

Julie Alvis, Deputy Assistant Secretary, California Natural Resources Agency provided an overview of the California Climate Strategy which highlights the state's vision to reduce GHG levels 40% below 1990 levels by 2030. California is currently developing a scoping plan to look at how to meet the 2030 goals, and the plan will go to the ARB in June 2017.

Part of the process for drafting the scoping plan includes developing strategies for sustainable land use plans. [Vibrant Communities and Landscapes](#) is the result of the California Strategic Growth Council (SGC) collaborating with many state agencies to provide grant funds to incentivize low income housing, sustainable transportation (to reduce vehicle miles traveled), and protect agricultural lands at risk of urbanization. The SGC is made up of representatives from six agencies which work to implement [CA SB 375](#) supporting CA goals to establish targets for GHG reductions.

Agricultural Conservation Easements (ACE) are state grants to permanently protect important agricultural land under threat of conversion. Candidates for funding must show that the property is at risk of development—if there is a proposed change in zoning, there is development nearby, etc. Projects also must result in quantifiable GHG reductions through avoided increases in GHG emissions from vehicle trips associated with the development potential of the property. This methodology assesses the risk of conversion on agricultural lands based on patterns of development in the vicinity. Alvis concluded her presentation by highlighting recent CA ACE projects noting that this program has been an opportunity for CA to protect agricultural lands from conversion through a dedicated funding source.

## Farmland Preservation in Monterey County

Marc Del Piero of the Ag Land Trust of Monterey County noted that Monterey county produces 10% of CA's agricultural output on 1% of the state's irrigated farmland. This is due to innovation, soils, climate, and infrastructure (along with the availability of water and land to farm).

A railway line that was built straight up the Salinas Valley through prime agricultural land in Monterey County has led to urbanization and development of agricultural land. The Ag Land Trust of Monterey County was formed in 1984 to better preserve this land, and worked with the County Board of Supervisors to direct municipality growth into areas that are the least prime for agriculture. As an example of unplanned growth, in 1953 Los Angeles County was the most productive agricultural county in the US, and it is now almost entirely developed.



Preservation efforts by Monterey County include a general plan focusing on city-centered growth policies, agriculture preservation policies, and agriculture buffer policies; an Agricultural Land Mitigation Program funded by a SALC grant; city-county Memorandums of Agreement to establish principles for annexation and growth; the Williamson Act (a.k.a. the California Land Conservation Act of 1965) which enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural use; and conservation easements and fee purchases. The County works closely with the Local Agency Formation Commission (LAFCO) of Monterey County, created to discourage urban sprawl.

Del Piero noted that King City is their greatest success story of agricultural land preservation through use of agricultural buffer easements and conservation easements to direct city growth on the least agriculturally productive land. The Ag Land Trust has successfully shown farmers how to use conservation programs and work with cities to require agricultural buffer easement zones (creating an enforceable boundary). As infrastructure development revitalizes urban areas of the country, Del Piero suggested that a portion of the revitalization budget go towards ‘fixing’ city boundaries to help preserve farmland.

Discussion focused on the following points:

- Development restrictions in one area do not necessarily mean that the level of (potentially less desirable) development will move somewhere else but that development restrictions can incentivize development to areas that are more suited to growth.
- Sometimes preservation of land runs counter to landowner desires. Landowners may own farmland that they purchased as such, and if society decides farmland is a natural resource worthy of protection for public health and safety, that use may assume a higher value than a landowner’s preferred use.
- Many Monterey County farms grow three crops a year which makes carbon sequestration in soils through farming practices difficult. Once farmland is converted to irrigated agriculture, the likelihood of enhanced soil carbon decreases even further. Many of the practices that apply to Midwestern agriculture don’t apply to CA specialty crops and other agricultural systems, so GHG emission reductions through N<sub>2</sub>O emission reductions are most feasible.
- While GHG emissions from urban land are much higher than agricultural lands, there are also more opportunities for GHG emissions reductions in urban areas (e.g., energy efficiency, renewable energy, electric cars, mass transit, etc.). It is important to note that emissions factors being used now for agricultural vs. urban lands may need to change with innovations.
- In cities residents live in urban, dense environments and preserved land outside the urban boundaries can serve as many people’s “backyards”; it is important to provide strong ties to agricultural land (such as Farm to Fork programs, etc.).

## Session 2: CA Healthy Soils Program

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### Healthy Soils Initiative and Incentives Program

Geetika Joshi, Senior Environmental Scientist Supervisor at CDFA, presented updates to the Healthy Soils Initiative, which establishes five actions to protect and improve CA's soils. The state is working with USDA-NRCS on these actions which include:

1. Protect and restore soil organic matter in California's soils.
2. Identify sustainable and integrated financing opportunities to facilitate healthy soils.
3. Provide for research, education and technical support to facilitate healthy soils.
4. Increase governmental efficiencies to enhance soil health on public and private lands.
5. Promote interagency coordination and collaboration to support soils and related state goals.

The Healthy Soils Program is one tool to implement the Healthy Soils Initiative, focusing on incentives to build soil carbon and reduce agricultural GHG emissions. The program is funded through the Greenhouse Gas Reduction Fund (GGRF); CDFA received \$7.5 million to administer the program this fiscal year. Incentive funds (50% of the funds) will be provided to CA farmers and ranchers to increase soil organic matter; demonstration projects (40% of the funds) will showcase practices and increase adoption of sustainable practices on specific farms. The remaining 10% of funds will cover CDFA administrative costs. CDFA has not decided on whether to require matching funds but does prefer projects to come with a match.

The proposed funding for incentive projects is \$25,000 per project—targeting 150 different projects. These projects must result in GHG reductions from agricultural practices for a specified time (quantifiable using a method determined by ARB) and utilize conservation practices identified by NCRS. The timeline to apply and implement projects is short—with project implementation beginning in October 2017.

Demonstration projects will have up to \$250,000 per project (estimated funding for 12 projects) and have a field/on-farm component with quantifiable GHG emission reductions. The projects will need to partner with different groups such as industry, academia, non-profits, and include an outreach and education component such as a Field Day.

Throughout the process of creating these programs CDFA has held many public forums for stakeholder feedback and is looking to continue that outreach throughout the process. Discussion and feedback covered the following:

- It is important to use metrics that growers value and can measure. For example, the Almond Board funded research on carbon improvement in soils and found that enhanced soil carbon can take a lot of time—particularly with perennial crops and the broad spectrum of soils. CDFA recognizes the high time requirement—especially when working to build soil organic carbon—and are thus working with the restriction that each dollar in funding must be tied to quantified carbon reductions.



- The Maryland Department of Agriculture has an unfunded bill modeled on CA's Healthy Soils Program. They are looking at using existing funds to reward farmers who reduce GHG emissions but acknowledge changes in soil carbon occur over years and are difficult to measure over short time periods.
- One concern raised with the CA program is potential impacts to biodiversity such as to CA grasslands which have high native plant diversity. Nutrients added to these ecosystems through compost applications may encourage non-native species. CDFA is tracking compost projects to ensure they do not negatively affect native species and is using conservative estimates for nutrient additions to certain areas to ensure native species are not harmed. There is a white paper on this on the CDFA website.

## Quantification Methodology Development

Bonnie Soriano of the ARB described the process of dedicating proceeds from implementation of the CA Cap-and-Trade auction to fund CDFA's Healthy Soils Program and provided updates on ARB's review of quantification methodology (QM) for the Greenhouse Gas Reduction Fund (GGRF) and the Healthy Soils Program.

Through California Climate Investments, the state has raised over \$4 billion since 2012 which has been deposited into the GGRF and is available for appropriation to State agencies. The money is to fund projects and programs to reduce GHG; maximize economic, environmental, and public health benefits; and invest in disadvantaged/low-income communities. Currently, \$1.7 billion has been awarded to projects with an estimated reduction of over 14 million MTCO<sub>2</sub>e.

Soriano discussed the quantification methodology that ARB is developing to provide a mechanism to estimate the net GHG benefits from the Healthy Soils Program. Net GHG reductions from soils are achieved through carbon sequestration as well as N<sub>2</sub>O and methane emissions reductions. This is the first year of the program and the quantification methodology will be updated as new tools and systems become available. Design principles for the QM must include CA land use management practices, must align with USDA/NRCS incentives and management practices, must be available across CA cropping systems, and must balance analytical rigor with ease-of-use.

ARB is currently identifying and evaluating quantification methodology resources (using the USDA "Blue Book" [Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory](#)) and assessing the following tools: DNDC, COMET-Farm, and COMET-Planner. Each of these has strengths and limitations and ARB is evaluating two approaches: QM Option 1: USDA Quantitative Methods (plus compost) + DNDC and QM Option 2: COMET-Planner 2017 Update. QM Option 1 develops a site-specific, Tier 2 level of complexity methodology where model runs provide a lookup table by practice, county, and crop category and outputs are stored in lookup tables. QM Option 2 is consistent with USDA Quantitative Methods, uses COMET-Farm functionality, is based on DAYCENT modeling, and is updated to CA to include Major Land Resource Area (MLRA), soil types, and climate. The latter work is ongoing. Next steps include a beta-test on the COMET-Planner update, finalization of



the draft QM, taking public comments in coordination with CDFA, and providing status updates on QM development to CDFA's Science Advisory Panel. Discussion points included the following:

- The program is an incentive program and not a market based program (no awarding of credits), but the quantification tools will have some of the same functionality as market QMs.
- CDFA is considering permanence requirements for the program, especially with the possibilities of conventional tilling after no-till leading to lost carbon. Even if reversals occur outside the Program grant period, CDFA is interested in longer-term tracking of impacts.
- This is the first year of the program and ARB and CDFA have developed a limited set of practices for inclusion. A scientific subcommittee vetted the use of compost as a technology in 2015 even though it is not an approved NRCS conservation practice. This is the first time that funds are available through voluntary incentives to improve soil health and reduce GHGs, and quantification of outcomes is important to back the incentive payments. CA is looking for more funding to include new practices that might be accepted in the future, such as the use of biochar and other carbon sequestration options.

## Session 3: DNDC Modeling to Quantify Potential N<sub>2</sub>O Mitigation from CA Soils

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William Salas of Applied GeoSolutions (AGS) presented on the DeNitrification-DeComposition (DNDC) model, a mechanistic process model built to predict N<sub>2</sub>O emissions. ARB is funding a research project to create a regional version of the model to support statewide analyses, calibration, and validation. The project team performed a model analysis of CA N<sub>2</sub>O emissions from 2000 – 2015 and assessed the mitigation potential of changes in tillage, cover cropping, nitrification inhibitors, and irrigation systems. To run the analysis, the team used data from many sources to consider the broad variety of ecosystems, crop types, irrigation systems (using Department of Water Resources survey data), and weather across the state. The updates required more complex model improvements for regional N<sub>2</sub>O modeling under irrigation methods and baseline simulations so the team modified the regional DNDC version to conduct irrigation-event based simulations, built the database to parameterize irrigation practices for different irrigation methods, and conducted simulations under different irrigation methods to calculate baseline N<sub>2</sub>O.

When the DNDC simulated emissions and ARB reported N<sub>2</sub>O emissions, the project team found that the N<sub>2</sub>O emissions estimated by these two methodologies are generally comparable. N<sub>2</sub>O fluctuates throughout the year and from year to year, but overall emissions show a decreasing trend since 2000. The emissions reductions are driven by changes in total agricultural areas, crop type, and precipitation and irrigation demand (change from flood to drip systems). The team has detailed spatial databases for N<sub>2</sub>O emissions by county and finds that the soil types drive model variability. The work is wrapping up and the research team will submit a draft report to ARB in May.

Salas also provided a brief follow up on the OpTis work in Indiana where his team used remote sensing analysis from satellites to map agriculture practices throughout the state over the last decade. A benefit



of this method is satellite data can be compared to model estimates. This approach used information on soils, crops, watershed conditions, etc. to build models, but the team still needs to conduct a QA/QC process. They have set up a field data campaign to improve understanding of satellite data performance. As an example, satellite estimates of crop residues provide good data for current farming practices, and modelers can also look back in time with available imagery. Cover cropping and no-till is determined through satellite data from the European Sentinel. AGS has a goal to map the entire US with OpTis over the next three years.

Participants discussed possible tradeoffs between N<sub>2</sub>O and carbon sequestration given the interactions between soil organic matter and N<sub>2</sub>O production; organic matter in soil supports the microbes that produce N<sub>2</sub>O.

NRCS soil surveys, which are a combination of in-situ surveys and spatial analyses, provide data on model variables. The challenge is how to reduce soil sampling costs and time and resource requirements and improve accuracy. Systems that can be pulled behind tractors to test soils only provide field scale data, and the overall data gap is at the larger scale.

## Session 4: Short-Lived Climate Pollutant Reduction Strategy

Edie Chang of the ARB provided an update on the Short-Lived Climate Pollutant (SLCP) Reduction Strategy, which is a key part of CA's Climate Strategy. SLCP include black carbon (BC), methane, and hydrofluorocarbons (HFCs) which are both powerful climate forcers and harmful air pollutants. SLCP and CO<sub>2</sub> make up a majority of the Global Warming Potential (GWP) in the state. BC levels are 90% lower now than in the 1960s, and will be cut in half again by 2020. However, BC emissions from wildfire are the largest source of BC emissions in CA and are not included in the State's reduction strategy. Methane emissions have been regulated through landfill regulation and Cap-and-Trade offset protocols, and there are current oil and gas rules under development. HFC emissions have been increasing over time, but early actions under AB 32 will cut emissions 25% below expected levels in 2020.

As required by CA Senate Bill 1383 (SB 1383), and as one of Governor Brown's "pillars" to meet 2030 GHG goals, ARB is developing the SLCP Reduction Strategy with 2030 emissions reductions targets (from 2013 levels) of 50% for BC (non-forest), 40% methane, and 40% HFCs. SB 1383 requires implementation on January 1, 2018. The Strategy focuses on anthropogenic sources of BC, provides specific direction on methane reductions from dairy/livestock and landfills, and encourages policies for the production and use of renewable natural gas. BC emissions will mainly be covered through incentive programs to replace wood-burning stoves. Methane is covered through several measures including establishment of a dairy workgroup and development of regulations to reduce manure methane emissions from the dairy and livestock sector after January 1, 2024.

The State is pairing these targets with financial incentives including Cap-and-Trade offset credits, California Climate Investments with Cap-and-Trade auction proceeds, Low Carbon Fuel Standard Credits, and Renewable Energy Credits. After Board consideration in March 2017, the final Strategy will be integrated into the 2030 Target Scoping Plan Update. Participants discussed the following points:



- The addition of carbon sequestration to the Scoping Plan has been discussed, but ARB does not have enough data on sequestration potential, so the focus has been more on energy-related activities.
- The best available control technology requirements for NO<sub>x</sub> continue to limit siting of technologies due to NO<sub>x</sub> attainment standards. Trading diesel from trucks to renewable natural gas injected into a pipeline from dairy digesters in the Central Valley can have significant benefits. Biomass to energy poses challenges due to regional district rules and regulations.

## Session 5: CDFA Dairy Digester and Alternative Manure Management Practices (AMMP) Programs

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Casey Walsh Cady summarized the CDFA Dairy Digester and AMMP programs funded by the CA Climate Investments Program (CCIP). California is the largest dairy producer in the US with 1,438 dairies of many different sizes, with an average herd size of 1,215.

Given the size of its dairy industry, CA has a relatively low number of anaerobic dairy digesters, with just 17 operational and four more under construction. Most dairies currently dispose of manure with flush systems, but digesters can significantly reduce methane. In 2011, CDFA created a dairy working group to address key barriers to dairy digester use, including permitting, finances etc. with the goal of developing more. In 2014 CDFA began a process to help fund more digesters, and a competitive solicitation funded six digester projects. The largest covered lagoon funded through this process is in Kings County and the farm is now runs on 60 – 100% renewable natural gas generated from the digester. A second solicitation which will be announced mid-March 2017 with applications due May 2017. Once awards are announced in August 2017, a project will have just two years to build a digester—an aggressive timeframe for construction. Funded projects must use the ARB GHG Emission Reduction Calculator Tool to report total GHG emission reductions, total project GHG emission reductions per unit of energy-corrected milk production, and total project GHG emission reductions per dollar of GGRF funds requested.

The AMMP is a new program being developed by CDFA to focus on non-digester dairy management practices that can reduce GHG's and provide other benefits. Identification of practices and funding is underway, but may include switching to scrape and composting, solid separation, and pasture based management. Practices and technologies are required to show quantifiable GHG emission reductions.

CDFA is funding a research project to evaluate the use of a hydrodynamic technology capable of converting large amounts of manure into a more stable sterile soil amendment with a predictable nitrogen mineralization response that reduces greenhouse gas (GHG) emissions. The research is just getting started and targets a 25% GHG reduction in overall CO<sub>2</sub> equivalent emission rates from manure and subsequent amended soils.

CDFA will also be working with the ARB SLCP program to support near-term actions to reduce manure methane as ARB will begin regulating GHG from California dairies beginning in 2018.



Cady described a hub and spoke model for Dairy Biogas Clusters where groups of co-located dairies can contribute manure to a central digester, making 90% methane reductions possible. The consolidation of the industry under this model can improve air quality and reduce GHG emissions.

Participants asked about any enteric emission reduction programs and Cady noted that ARB is funding a CA-specific diet program to look at reducing enteric emissions; the department needs more information on potentially studying the addition of biochar to fields for enteric emission reductions.

## Session 6: Environmental Price Assurance Facility (EPAF)

Sheldon Zakreski of The Climate Trust (TCT) discussed risk mitigation strategies through financial innovation for carbon offset projects. He noted that although there has been innovation in terms of protocol development over the last 8 – 9 years, these protocols still do not show positive financial viability overall and landowners are thus unwilling to enroll in projects where there is revenue uncertainty. The Environmental Price Assurance Facility (EPAF) could help mitigate the revenue risk for carbon offset projects by auctioning off put options that can serve as a guaranteed price floor for new projects. A put option contract gives the owner the right, but not the obligation, to sell credits and may help a project get up and running. It is a method for the market to settle on what premium it would pay for credits. This has not yet been used in US carbon markets, but has been successfully tested by the World Bank through their Pilot Auction Facility to test the value of European carbon credits.

TCT has a proposal to USDA to test this through the EPAF, whereby the EPAF provides put options to investors, project developers, and landowners which guarantee a minimum value for environmental credits. The worst-case outcome is that environmental markets end and if the put options are exercised, verified environmental credits are retired on behalf of EPAF's funders. The anticipated outcome is that environmental markets continue and if the put options are not exercised, the original funding revolves into new financial risk mitigation. This proposal requests that a \$2 million investment by TCT be matched by \$2 million through a USDA CIG. Zakreski asked a series of questions to stimulate discussion:

- What should TCT auction—the premium or the price?
- Tradability—should put option holders be able to sell the contract?
- Markets—Compliance and/or voluntary? With voluntary projects struggling with the lack of buyer certainty it would be helpful to focus on the voluntary space.
- Term—2 years? 5 years? 10 years? The 10-year timeframe would provide more certainty.

Participants asked if TCT has concerns that they have created a security that could be regulated by the Securities and Exchange Commission; TCT highlighted research on environmental commodities and ensuring market transparency. The group also asked if TCT foresees obstacles in the bankability of projects where the projects must show credit worthiness of the put options. Zakreski noted projects could take this put option agreement to the lender to show that the put option is already in place. TCT is open to any projects or protocols to test the concept.



# Thursday, March 9, 2017

## Session 7: C-AGG Updates

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Reed opened Day 2 of the meeting by introducing two new Steering Committee members—Nicholas Goeser of the National Corn Growers Association (NCGA) and Gabriele Ludwig of the Almond Board of California—and noting that Rich Conant of Colorado State University will be stepping down after a run of several years on the Steering Committee. She then highlighted some key initiatives of C-AGG, including working to interest the International Civil Aviation Organization (ICAO) process to develop agricultural offsets and engaging with the UN Framework Convention on Climate Change to highlight the community's work with agriculture and GHG mitigation. C-AGG applied for UNFCCC observer status nearly a year ago and is looking forward to creating a new platform for stakeholder engagement at the international level. Reed is traveling to Bonn in May for the UNFCCC Intersessional meetings.

In terms of the US government and the 2018 Farm Bill, C-AGG held meetings in Fall 2016, including a briefing for Senate Agriculture staff. Ideas discussed for policy support included:

- Aligning crop insurance provisions to increase participation in conservation programs, and environmental market-based opportunities that increase resilience and improve conservation outcomes.
- Opportunities to improve federal data sharing across agencies and between farmers and ranchers to make data collection and data entry seamless for market-based approaches.
- Specific support for credit stacking and quantification of environmental benefits as well as the development of a strong business case and value proposition for landowners to prevent the conversion of agricultural land to urban development.

## Session 8: USDA NRCS Conservation Innovation Grant (CIG) Updates

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Kari Cohen, USDA NRCS Environmental Markets & Conservation Finance, opened the session and gave an overview of CIG grants, noting that NRCS is currently reviewing 2016 CIG proposals and hopes to announce awards late April/early May 2017. USDA funded nine GHG CIG projects in 2011 and an additional nine in 2015; at that time, NRCS added an Innovative Conservation Finance CIG category. A panel of CIG participants shared project outcomes and status.

### **Robert Parkhurst, Environmental Defense Fund (EDF)**

Parkhurst noted that EDF is working on a number of CIG projects; he highlighted their work on a [Nitrogen Fertilizer Management CIG](#) with the objective of creating an infrastructure for a fertilizer protocol that can work across crops and then implementing that protocol. The project includes many collaborators such as the Almond Board of California; ACR; Applied GeoSolutions; Carbon Credit



Solutions; CAR; C-AGG; Delta Institute; K-Coe Isom; United Suppliers; UC Davis; and Viresco Solutions. The project will create an umbrella protocol that begins with a crop, geography, and practice; the protocol will be adaptable and expandable to many types of crops. This has grown into a larger effort to look at how to get data needed to meet supply chain goals. There will be a project listed shortly with a multi-grower corn project in the Midwest to highlight this work, and there is already a buyer for those project credits.

Participants asked how the CIG found producers willing to engage with the work and Parkhurst noted that the project had a multi-pronged outreach strategy. EDF has 8 – 9 grower advisors across the US, and they also worked with CIG collaborators such as United Suppliers, K-Coe Isom and the National Corn Growers Association.

To balance farmer privacy while having access to farmer data, the project is mapping data networks for farmers—meaning that they are looking at who farmers give their data to and which are the most trusted relationships. They are also looking at how to map data across GHG protocols, sustainable supply chain initiatives, and other initiatives to see what data is needed.

Parkhurst also highlighted a Grasslands Protocol CIG which is being led by CAR. Currently, CAR is updating the protocol to include irrigation and change some of the start dates. They now have two projects listed under the protocol and expect to have a third in December 2017.

#### **Beth McGee, Chesapeake Bay Foundation**

The [\*Promoting Rotational Grazing in the Chesapeake Bay Watershed\*](#) CIG is developing a robust regional network of grazers in Maryland, Pennsylvania, and Virginia, quantifying the environmental and economic benefits of converting from grain-based systems to a rotational grazing system, exploring related market-based opportunities for grazers (i.e., carbon and nutrient trading programs), and sharing the information via the grazers network. The CIG is using available tools such as COMET-Farm to compare outputs and quantify benefits from the different field sites. Although the project is also looking at water quality benefits, this CIG is under the GHG umbrella rather than water quality because the project wanted to work with the C-AGG network. With the current discussion on soil health, the project has been collecting soil samples and sending them to Cornell's soil lab to analyze any changes in soil parameters.

Participants asked if the CIG has run into challenges convincing farmers to move to rotational grazing; McGee noted the CIG is leveraging connections in Maryland, Pennsylvania, and Virginia to provide farmers more resources and information. They are also building on the Maryland Grazing Network to create better farmer to farmer networks and discussion forums. They find that farmers are testing rotational grazing field by field and are converting gradually.

McGee stated that the project will not try to bring GHG credits to market. They tried to do this in 2011 but found it was too much work due to lack of confidence in the historical data and high verification costs.



### **John Nickerson, Climate Action Reserve (CAR)**

The [Standardized Inventory Methodology, Analytical and Reporting Tools for Forest Carbon Projects](#) CIG is working to:

- Develop an inventory methodology to reduce development and implementation costs and lower barriers to entry to carbon markets for small to mid-size forest and range landowners. A proof of concept pilot will test the approach with collaborating organizations.
- Develop analytical and reporting tools to standardize and streamline verification to reduce verification costs. These tools will also be road-tested in the pilot.
- Demonstrate the efficacy and cost reduction of the new methodology and tools through application via pilot testing.

This project has successfully created projects around the country that are generating a lot of credits. However, Nickerson noted that he sees the trend of increased verification costs across the board and with this trend, projects are less likely to participate (fees can exceed \$50,000 every 6 years for landowners). The high costs are due to scrutiny by regulatory organizations such as ARB that require more rigorous, and thus expensive, verification approaches. To reduce verification costs, the CIG project is working develop a standardized inventory methodology to help landowners calculate their own carbon inventory that is linking to US Forest Service growth and yield models. Hopefully the tools will reduce verification costs and bring the barriers to entry down from 5,000 to 2,000 acre parcels to encourage smaller landowner participation.

### **Sheldon Zakreski, The Climate Trust**

The [Working Lands Carbon Fund](#) CIG project is working with the Packard Foundation to develop a working lands carbon facility to merge private capital with impact investment and carbon markets. The project team has identified market barriers from traditional lenders who may not value carbon credits due to the uncertain future of carbon markets. The CIG aims to overcome market barriers by setting a price floor so the project recipient receives upfront funds and TCT can recover the investment over a longer timeframe. Any additional money earned from the project's offset sales will be split with the project developer and the investor. USDA funding will help set up the facility, set up liability companies, and find investors. The CIG targets 80% of the projects in the CA regulatory market and 20% in the voluntary market; it is about to sign the first contract with a forestry project in Connecticut for the CA regulatory market. TCT has engaged with impact investors on this project and would consider it a success if they could get investment from larger investor groups such as CALPERS.

TCT is a true believer in the carbon markets and is taking the long view; they see this as a decades-long project. Many other organizations and countries (such as Quebec and Ontario in Canada) are putting time and resources into advancing carbon market development.

### **Nick Goeser, National Corn Growers Association (NCGA)**

Goeser reported on two CIG projects to educate farmers on soil health through the Soil Health Partnership. In 2014, NCGA received their first CIG to bring on communication staff and on-field support to promote soil health; the second CIG proposal involves a partnership with other organizations to



develop a corporate carbon in-setting framework (this project is called *Scalable On Farm Greenhouse Gas Reductions and Water- Quality Improvements: Development and Implementation of an Economical and Verifiable Insetting and Accounting Framework*). Goeser highlighted that the project is working closely with Monsanto and Monsanto's goals of carbon neutrality has provided project credibility for the work.

The program works with farmers who are looking to de-risk their engagement in more extensive on-farm conservation practices and has 100 farmers enrolled in the program a year ahead of schedule. Some farmers are skeptical about climate change, but all have been interested in soil health and in opportunities to increase funding while reducing risk. Additionally, with the extensive nature of data collection and data quantification around offset projects, farmers recognize the value of their data.

Participants asked who will pay the growers and Goeser noted that buyers such as Monsanto are interested in purchasing credits. The conversation touched on the Farm Bill; by tying conservation measures to subsidies and insurance—and mainly to those measures applicable to annual Midwestern crops—farmers that grow crops that are CA-specific and/or perennial are disadvantaged. Although it is unclear what might happen in the 2018 Farm Bill, there are many rural agricultural voters who want conservation practices disconnected from insurance while others want those linkages to continue and even to increase.

#### **Shahira Esmail, Terra Global Capital**

This CIG, *Creating Value for Producers and Impact Investors through Marketable GHG/Environmental Credits on Range/Pasture Lands*, works with farmers and ranchers to implement NRCS practices in six Western States including California, Oregon, Washington, Texas, Hawai'i and Colorado. It is also helping to create access to GHG markets and stacked credits such as water quality—and will implement a credit stacking demonstration. The real focus is how to bring value to farmers, attract new capital to their operations, and better engage farmers. The CIG has engaged farmers and ranchers from the start of protocol development to ensure that data collection and monitoring requirements are feasible for their operations. The project is currently reviewing protocols; CAR is looking to begin protocol development shortly. The other piece of this work is engagement with multi-national exchanges to spread the word on carbon markets.

## **Session 9: C-AGG & CSU Workshop on COMET Tools: Summary of Workshop Outcomes & Next Steps**

Debbie Reed of C-AGG and Keith Paustian of CSU discussed outcomes from the C-AGG [COMET Tools workshop held February 2017 in Fort Collins, CO](#). The recent workshop was a follow up to a [2016 COMET Tools workshop](#) when participants generated a list of suggested improvements to COMET-Farm that might enable its use in carbon markets. The summary of outcomes from the 2017 workshop includes updates on COMET-Farm, COMET-Planner, and the DNDC model. Reed and Paustian led a review of the workshop's main points as highlighted below:



#### COMET-Farm:

- API planned for public release June 2017 is working well in test phase
- API will support applications desired by C-AGG participants, e.g., ability to batch upload and process multiple fields through COMET-Farm

#### COMET-Planner:

- Estimates GHG impacts of NRCS conservation practices
- Allows regional specificity (at MLRA) rather than simply state-wide averages of GHG estimations
- Implementation options for NRCS Conservation Practice Standards have been added
- Provides aggregated GHG emissions by region, but cannot provide field-specific data
- Aligned with COMET-Farm & USDA entity-scale GHG inventory methods for greater consistency
- Validated to regional scales, but CA is one area where validation is weakest
- Beta version for CA is ready for roll-out; goal is to release version for entire US by late 2017 (but this work is not yet authorized by USDA)

#### DNDC model update/rewrite:

- Focus to date has been on rewriting the science code, and the result is a reduction in the number of lines of science code by ~50% which has improved model performance and reduced model execution time by ~90%
- Next steps: rewrite GUI's, modernize remainder of code-base, develop user interfaces

#### Additional suggestions from C-AGG participants at the workshop included the following:

- The ability to quantify reversals of emissions reductions or sequestration would be helpful for projects
- Issue of double counting—how to ensure no double counting that would allow a landowner, operator or project(s) to claim credit for an activity more than once, including in different markets or venues
- CSU owns the IP for the COMET tools and the underlying DayCent model
- How to quantify soil health; this is an open question in the scientific community
- Quantification support for ecosystem service markets, e.g., water quality, nutrient leaching, erosion, etc. would be helpful
- How to quantify climate resilience and whether that can be done by tracking conservation practices
- The possible addition of a life cycle extension to COMET-Farm
- How improved reporting and flexible baselines affect how carbon markets look at baselines—for example, are more tailored baselines possible?

Participants asked whether CSU can quantify the issue of weak validation of the COMET-Planner tool; Paustian noted that for any given conservation practice within a region there are sample farms that use the USDA bluebook methods to quantify impacts, but the methods in the bluebook are “weaker” for



some of the specialty crops than they are for corn, soy, and wheat. The new COMET-Farm drag and drop function will help with more complicated crop types and rotations.

There was also discussion on how projects can prepare offset projects for success by identifying up front any specific data requirements, even before projects are initiated.

## Session 10: Joint C-AGG & National Network on Water Quality Trading Workshop (NNWQT): Summary of Workshop Outcomes & Next Steps

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Thayer Tomlinson of C-AGG provided an overview of the March 7<sup>th</sup> workshop, [Quantifying Ecosystem Service Benefits on Working and Natural Lands](#), and discussed outcomes and next steps. The workshop, organized by C-AGG and NNWQT, explored quantification methods and tools for GHG mitigation and water quality trading (WQT) markets. Participants from both communities shared information on quantification tools and experiences; through this, participants highlighted common and distinct challenges, exchanged lessons learned, and sought to identify common tools used in both markets. Participants also discussed possible opportunities to broaden collaboration and dialogue and worked to define a near-term research agenda to harmonize and refine quantification approaches and identify or develop common tools and methodologies. Key questions presented at the start of the event were:

1. What are commonalities and differences between quantification approaches and quantification tools for GHG and water quality, and are there lessons to share that can inform future efforts to combine market approaches?
2. What opportunities are there to integrate (harmonize) quantification strategies, approaches, and/or standards and tools?
3. What are the broader implications for ecosystem service programs?

Key takeaways from the workshop included:

**Continued collaboration:** Participants recommended continued collaboration between the two communities through future joint workshops and engagement with other organizations such as sustainable supply chain initiatives (e.g., FTM) to highlight existing tools within the communities. It is important to keep the research community closely engaged to ensure that developing quantification approaches meet the community's needs on the ground and in the marketplace.

**Stronger engagement of the farming community:** A key takeaways was the need to more fully engage the agricultural sector (e.g., farm groups, grower groups, and farmers and ranchers) and ensure that market-based approaches work for them and their operations. Besides direct engagement, one potential avenue is to work with sustainable supply chain initiatives such as Field to Market. It is important to connect benefits to farmers and ranchers to meet their needs, while achieving beneficial ecosystem impacts.



**Who else should be at the table?** Participants were divided as to whether to keep initial collaboration between the two communities or to immediately bring in other ecosystem services communities such as habitat, wildlife, biodiversity, etc. Some participants felt strongly that it is useful to first create strong collaboration between WQ and GHG and then bring in other communities, while others felt that communities such as innovative finance and social science are important to include in continued efforts to harmonize experiences. Participants suggested undertaking a mapping exercise to look at where the community sees itself in 3 – 5 years, and decide based on the outcomes of that exercise.

**Continued harmonization between GHG and WQ:** While synergies are important, the sustainability and ecosystem services space is becoming quite crowded, and collaboration is required to help avoid or prevent the double counting of outcomes in multiple markets or programs. Despite incongruent approaches, the two communities are both seeking ecological enhancements through market-based approaches and collaboration can help address issues of demand/buyers to help develop these markets and scale these approaches.

**Proof of concept:** Participants suggested the development of projects that stack or quantify WQ and carbon benefits and testing them in markets is a key next step.

## Session 11: The International Civil Aviation Organization (ICAO) Carbon Offsetting and Reduction Scheme for International Aviation (CORSI A)

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Arjun Patney from the American Carbon Registry (ACR) provided an overview of the ICAO CORSIA program. Aviation emissions account for 2% of global CO<sub>2</sub> emissions and are growing. These emissions are exempted from the Kyoto Protocol, but in 2010, ICAO (a UN agency) set a goal of carbon neutral growth starting in 2020. ICAO proposes to reduce emissions through market-based measures (MBMs), including sustainable alternative fuels, offsets, aircraft technology improvements, and operational improvements. The largest opportunity for reductions comes from alternative fuels and offsets.

With the large amount of credits required, a CORSIA MRV system will be implemented, and is being developed through the ICAO Standards and Recommended Practices (SARPs) group, which is also working on criteria for the emissions units. At this time, it has been agreed that all programs that generate offset credits should have clear methodologies and protocols; validation and verification procedures; and avoidance of double counting. Offset credits should be additional, based on a realistic and credible baseline, and represent permanent emissions reductions.

Participants asked how a carrier might choose which credits to use with all the varying countries' market prices on carbon and Patney responded that ICAO will likely not require airlines to purchase credits from their home country, but this requirement could come from governments—for example, the US State Department could require US-based carriers to purchase only US-based credits.



## Session 12: Ontario Cap-&-Trade Program: Update on Ontario Offset Protocol Adaptation Process

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Teresa Lang of the Climate Action Reserve (CAR) provided an update on the [Ontario Offset Protocol Adaptation Process](#). CAR is the lead group in the process of developing 13 protocols to facilitate the creation of high quality offsets for use in the GHG cap and trade programs that have been or may be implemented in Ontario, Québec, and other Canadian provinces. They are adapting new protocols from existing protocols and are bringing information in from US protocols.

The first three priority protocols being adapted are: landfill gas capture and destruction, ozone depleting substances capture and destruction, and mine methane capture and destruction due to their applicability in the provinces. Additionally, CAR will be adapting GHG offset protocols for N<sub>2</sub>O reductions from fertilizer management in agriculture, livestock, organic waste digestion, organic waste management, forestry, afforestation, urban forestry, grasslands, conservation cropping, and refrigeration systems.

Participants highlighted that the risk of invalidation is huge for project developers and pointed to ARB having invalidated some projects which made the markets slow considerably. It is important to track invalidation and the risk of invalidation moving forward.