Quantifying Ecosystem Service Benefits on Working and Natural Lands

A joint workshop between the Coalition for Agricultural Greenhouse Gases (C-AGG) and the National Network on Water Quality Trading (NNWQT)

March 7, 2017 - 1:00 pm to 5:00 pm, Hyatt Regency Hotel Sacramento, CA

Final Workshop Summary of Outcomes

Dialogue Objectives

A key component of programs targeting the payment of ecosystem services from working lands is the ability to quantify outcomes. While often necessary, the use of models and estimation tools bring with them issues such as uncertainty, limited applicability (e.g. geographically), high data burdens, and high transaction costs. At scale, however, models can significantly reduce costs and may provide greater accuracy. This workshop explored quantification methods and tools in the arenas of greenhouse gas (GHG) mitigation and water quality trading (WQT). As ecosystem service programs, such as trading markets, payment for success, and other incentivized, targeted conservation efforts develop there is continued demand for rigorous yet cost-effective and scalable quantification methods to measure outcomes of on-farm practices. This workshop sought to identify opportunities to share resources and lessons learned, and to integrate markets. The workshop had the following objectives:

1. Share ecosystem market and carbon market quantification tools and experiences to highlight challenges, exchange lessons learned, and identify whether common tools exist.
2. Identify opportunities to broaden dialogue to include a variety of ecosystem service programs and determine whether quantification tools extend to those programs.
3. Define a research agenda of next steps to harmonize and refine quantification approaches and to identify or develop common tools and methodologies.

Key Questions

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?

HIGH LEVEL OUTCOMES

- Carbon market metrics and rules are more universally agreed upon than those for water quality trading markets. Carbon markets show significant stakeholder agreement regarding methodologies and protocols, modeling tools, and quantification approaches.
    - The United Nations Framework Convention on Climate Change (UNFCCC) international rules have largely driven carbon offset market development and methodology and protocol development.
    - Quantification methodologies in use in carbon markets are quite rigorous; high data requirements boost costs and complexity which reduces cost-effectiveness and scaling.
- Water quality market metrics and rules are less certain than those for carbon markets, making a drive towards common methodologies and quantification approaches elusive.
    - Water quality markets are typically localized and driven by significant local regulatory or stakeholder priorities.
    - US Environmental Protection Agency (EPA) has not yet provided necessary guidance on water quality market metrics and rules; such guidance would help inform or establish common quantification methodologies and market rules.
- Common tools are not being utilized by carbon and water quality trading markets, but with many similar drivers and many shared outcomes, there may be an opportunity to increase market integration if the quantification tools from each individual market were to reside under a common platform. Development of simple, shared platforms with appropriate levels of quantification rigor or models with reduced data needs could potentially meet common market needs.
    - Potential enhancements or adjustments to existing tools to make them more cost-effective and scalable include enhancements to the COMET suite of tools and/or reduced data needs for the DNDC model.
- Carbon markets are more globalized and credits more transferable (spatially and temporally) than water quality trading markets.
    - Carbon credits can be traded across programs with common requirements, and across time with vintage year assignments.
    - Water quality credits are tied to specific water basins or water bodies and time-limited hydrologic dynamics. Therefore, in most cases, water quality credits do not carry vintage year assignments that would allow them to be carried from year-to-year.
- Credit stacking or bundling for ecosystem service markets is desirable and supported by the carbon market and water quality market communities, but proof of concept is needed to demonstrate how this would work.
    - Identification of a pilot project(s) to test proof of concept and demand for ecosystem credits is a possible next step for the communities.

- The stacking or bundling of water quality credits with associated carbon credits is being tested in the Ohio River Basin Water Quality Trading Program.
- Metrics and quantification tools for the broad suite of ecosystem service impacts (e.g. biodiversity, wildlife habitat, pollinator health, etc. as well as carbon and water quality) are necessary to quantify and monetize these impacts. Consistency across markets could enable greater integration, which could in turn potentially unlock new conservation and restoration opportunities.

INTRODUCTION AND FRAMING THE ISSUE

Debbie Reed of C-AGG and **Neil Crescenti of NNWQT** welcomed participants, reviewed the workshop objectives, and presented a short history of carbon markets for agricultural GHG mitigation and water quality trading markets. In both markets, point sources of nutrients or GHG are traditional targets for emissions and nutrient reductions. In both markets, changes in land use or agricultural management practices (which represent non-point sources of emissions or nutrient reductions) are more difficult to quantify than point sources. Identification of quantification tools that balance the rigor of quantification for market-based credits with necessary simplicity, cost-effectiveness, and scalability is a common challenge.

Greenhouse gas emissions reduction credits in the form of carbon offsets have been traded in domestic and international voluntary and compliance markets for some time. Buyers for carbon offset credits can include any number of interested parties, whether they are regulated entities required to reduce emissions with support of a trading scheme or simply participants in a voluntary effort to reduce and/or offset GHG emissions. Due to the global nature of GHG emissions and the need for global emissions reductions, carbon trading programs can allow for the purchase of credits from almost anywhere, or within defined jurisdictions with similar program requirements and rules, as long as the credits are supported by an approved, methodologically valid approach.

Water quality trading—sometimes referred to as nutrient trading—is an innovative, market-based approach that provides pollution dischargers an alternative to installing onsite technology to meet regulatory obligations as established under the Clean Water Act (CWA), by working with off-site sources to generate equal or greater pollutant reductions. Generally, WQT transactions involve point sources—those with a definitive location of discharge such as municipal wastewater facilities, utilities, and factories—and nonpoint sources—those for which it is difficult to identify direct levels or contributions of pollution such as agricultural production, livestock grazing, and forestlands. Due to the nature of nonpoint sources, the ability to quantify pollution reductions is key to water quality trading.

Many of the factors that impact GHG emissions reductions in agriculture have water quality impacts as well, but there are some key differences in the markets. WQT markets may not have to address permanence the same way that carbon markets do, and while most WQT markets are regulatory, carbon markets are mainly voluntary (but can be regulatory as well, as is the case in California). WQT programs

are often regulatory and pollution dependent, linked to CWA elements such as Total Maximum Daily Loads (TMDL), and the National Pollutant Discharge Elimination System (NPDES).

The spatial scales between the two markets also exhibit some differences and commonalities. Watersheds, like agricultural operations, are dynamic, different sizes, and often unique, making one-size fits all mitigation approaches and quantification approaches challenging. The target markets also exhibit different scales. While WQT is often conducted on a local or regional level and has more elements reflecting local community needs and engagement, the fungibility of carbon credits (credits must be 'countable' and have identical replacement value within different systems) and the global nature of climate change means they can be bought and sold into international markets regardless of where emissions reductions occur.

SESSION 1: STATE OF QUANTIFICATION APPROACHES

The field of ecosystem service quantification methods continues to evolve as market and program needs change. Program managers, model developers, and practitioners shared their knowledge on the current state of quantification in GHG and WQT markets.

Mindy Selman, USDA Office of Environmental Markets provided a high-level overview of some tools currently used in WQT programs, noting that there are no common tools in use, and that the complexity of tools depends somewhat on the watershed scale. There is no common approach compared to the carbon markets where the quantification approaches and tools are largely the same or similar.

Selman described some field scale tools such as STEPL which is a spreadsheet tool used in the Ohio River Basin WQT program and the Nutrient Tracking Tool (NTT) used in the Chesapeake Bay[1].

The EPA and the US Department of Agriculture (USDA) are planning to publish a paper within the next 12 months that will describe all tools currently being used for WQT programs.

Keith Paustian, Colorado State University (CSU) described the NTT which was developed by the USDA Natural Resources Conservation Service (NRCS) for water quality quantification and is designed to estimate nutrient and sediment losses from agricultural systems and additions to surface water. It uses the APEX model to estimate N and P in surface run-off, leaching, and sediment loss (erosion) and was designed to predict nutrient movement to the edge of field.

For potential future applications, CSU has begun to add NTT functionality to the COMET-Farm platform, with the intent to allow users to track how water moves through fields at the farm level. CSU plans to add a hydrography dataset and a watershed boundary dataset to the COMET-Farm platform, with the goal of creating an integrated GHG and WQ tool that will be called the Conservation Management Evaluation Tool (COMET) rather than the Carbon Management Evaluation Tool (COMET). The team hopes to have the work completed and ready for testing by Summer 2017.

[1] For more information, see the *Background Document for Joint C-AGG/NNWQT Workshop 7 March 2017* available at http://www.c-agg.org/cm_vault/files/docs/JointWorkshop_Background_Final3-1-2017.pdf

Speakers then provided high-level overviews of tools used in carbon markets today (and one under development for possible future use). Paustian highlighted the COMET tools—COMET-Farm and COMET-Planner. COMET tools are not currently used in carbon markets, but CSU hopes to incorporate enhancements to those tools that would potentially make them rigorous enough for use in carbon markets. COMET-Farm is a platform that uses empirical and dynamic models to estimate farm-scale full GHG accounting within "farm-gate." COMET-Farm implements the USDA 2014 entity scale GHG methods[2].

William Salas, Applied Geosolutions provided an overview of the De-Nitrification De-Composition (DNDC) model, a research tool that has been adapted for and is being used in carbon markets. DNDC is a soil biogeochemical process model that quantifies soil nutrient cycling, GHG emissions, and water quality impacts from agricultural practices. DNDC applications include field level research, GHG mitigation studies, and regional and national scale GHG inventories. DNDC is also used in many market-based GHG offset protocols. The DNDC model developers have adapted the model for market uses by appropriately assessing uncertainty, bias, validation and calibration for specific applications.

Debbie Reed, C-AGG briefly described two additional tools developed for GHG accounting—the EPRI/MSU N_2O carbon offset methodology and the TFI/IPNI N_2O tool (not yet in use). The Electric Power Research Institute (EPRI) and Michigan State University (MSU) N_2O offset methodology applies to N rate reductions from organic and synthetic fertilizer and has been approved for use by the three voluntary carbon market registries: American Carbon Registry (ACR), the Climate Action Reserve (CAR), and the Verified Carbon Standard (VCS). The methodology quantification is based on a non-linear N_2O response equation developed for the US North Central Region (NCR) and has Tier 2 custom emission factors for NCR corn row-crop systems in the US and Tier 1 defaults for the contiguous US outside the NCR.

The second tool has recently been developed by The Fertilizer Institute (TFI) and the International Plant Nutrition Institute (IPNI) and is being proposed for use by Field to Market (FTM) in its Field Print Calculator (FPC). The TFI/IPNI N_2O tool is a Meta Model which provides a Tier 2 metric for N_2O emissions reductions associated with certain 'best management' practices for certain crops in certain regions. IPNI and TFI worked with scientists to estimate N_2O emissions based on crop type, region of the country (NRCS Land Resource Region), and soil texture; the model is sensitive to N applied from all sources (cover crops, synthetic and organic N) and emissions reductions factors are applied for the latter 2 of 3 categories of practices (basic, intermediate, advanced).

Participants discussed APEX validation and noted that APEX has been used at many local and regional levels mainly for water quality, sediments, and nutrients. The presenters highlighted that many of the models discussed have users around the world and there have been many validations leading to

[2] Eve, M., D. Pape, M. Flugge, R. Steele, D. Man, M. Riley-Gilbert, and S. Biggar, (Eds), 2014. *Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory*. Technical Bulletin Number 1939. Office of the Chief Economist, U.S. Department of Agriculture, Washington, DC. 606 pages. July 2014; https://www.usda.gov/oce/climate_change/Quantifying_GHG/USDATB1939_07072014.pdf

improvements over time. Models are important, but model validation is the best way to improve them as long as uncertainty can be calculated/captured.

SESSION 2: MARKET-BASED QUANTIFICATION APPROACHES: LESSONS LEARNED, CHALLENGES, PROGRAM CROSS-OVER

A panel of speakers discussed how to make linkages between WQT and GHG programs based on individual experiences. Key points from the session included:

- For WQT, local community/social issues often form the basis for agreement that WQT is beneficial for conservation, bridging groups that that may otherwise value either practicality or certainty.
- In some states, e.g. Maryland, site-specific farm-scale assessment tools are used in water quality trading and the state's Agricultural Certainty Program[3].
- GHG market approaches are more universal.
- Fungibility is a critical difference in GHG markets—and poses unique challenges to balancing accuracy and rigor with aggregation, which is critical to scaling.
- Quantification methodologies for point sources of pollutants can achieve low uncertainty, but biological systems are by their nature highly complex and variable and have higher associated uncertainty, which is a constant conundrum and source of angst for policymakers.
- Questions considered for future investigation included how to balance spatial differences between what is happening in the field vs. what the models might report? Apart from locational uncertainties, how to account for variations in impacts from one year to the next? Are these issues the same for both markets?

Panel speakers:

Susan Payne of the Maryland Department of Agriculture highlighted a Maryland-specific assessment tool that meets the needs of both WQ and GHG projects, and discussed the challenges of developing a tool to address multiple programs. The online, site-specific, farm-scale assessment Maryland Nutrient Tracking/Trading Tool (MNTT) is used for both WQT and the Agricultural Certainty Program. The Certainty Program certifies that farms which have met the more stringent of either the 2025 Bay or State Total Maximum Daily Load (TMDL) for N, P, and total suspended solids (TSS) receive a 10-year exemption from new environmental regulations and pre-qualify to participate in the trading program.

The Greenhouse Gas Emissions Reduction Act of 2009 charges the Maryland Department of Agriculture with stacking carbon credits on the nutrient/sediment marketplace. Because Maryland does not have an active WQT program at present, it is not currently participating in credit stacking. The Healthy Soils bill now in the legislature is modeled on the California legislation (minus a dedicated funding source). Both

[3] In 2013, the Maryland General Assembly passed legislation to establish a voluntary Agricultural Certainty Program that will give Maryland farmers a 10-year exemption from new environmental laws and regulations in return for installing best management practices to meet local or Chesapeake Bay TMDL goals ahead of schedule. More information: http://mda.maryland.gov/resource_conservation/counties/AgCertainty.pdf

the MD and CA Healthy Soils programs focus on education about, and promotion of, practices that sequester carbon.

On the WQT side, many of the Best Management Practices (BMPs) that improve WQT also improve carbon sequestration. Maryland is working with neighboring states Pennsylvania and Virginia to develop a regional tool based on the NTT called the Chesapeake Bay Nutrient Trading and Tracking (CBNTT) tool, in addition to their state-specific version. There is interest from the private sector in these tools, with many people ready to serve as project developers and aggregators, but Maryland has not yet created a consolidated rules document needed to support this work.

Margaret Williams, American Carbon Registry discussed lessons learned on quantification tools which are specific to carbon and those which cover ecosystem services. Carbon market protocols have unique challenges to balance accuracy and rigor: credits must be fungible across systems. This makes it difficult to simplify accuracy and rigor through project aggregation, although aggregation is necessary to cost-effectively scale projects.

Experience has shown the carbon market community that there are many lessons learned the first time protocols and methodologies are used in the field, and many of those projects in the field now are first generation. One lesson learned working with agriculture methodologies that incorporate research tools such as the DNDC and APEX models is that they require expertise to run. Projects can also experience issues with model versions—a protocol may require a certain version of a model, but models may be updated and tracking updates can be difficult (one of the discussion points at C-AGG's February 2017 COMET Tools workshop was how to track and communicate model updates for the user community).

Carrie Sanneman, Willamette Partnership discussed some of the challenges she has seen in data collection and project monitoring for WQT and her views on the level of rigor associated with different programs.

The Willamette Partnership is active as a project administrator for WQT in the Northwest and WQT has been a part of the National Network on Water Quality trading since its inception. Sanneman noted that unlike carbon, WQT does not have clear guidance from international markets, and thus each program attempts to balance efficiency and certainty to meet developing market needs.

Sanneman described WQT as both a social and a technical process. From the social side, WQT is based on a shared community willingness to tolerate risk, and a common understanding of the watershed and the goals that the project is trying to achieve. Where a common understanding exists that WQT is a good route for natural resource conservation, groups that may value either practicality or certainty can coalesce around agreed outcomes. Projects should also use adaptive management procedures—is there something in place that is "OK" for now, and that will allow a (more) technical methodology to be approved in the future? A common approach for WQT programs to address project tradeoffs is to address local social issues first, then identify existing technical approaches that work, and finally, adapt or develop more accurate technical approaches over time.

Teresa Lang, Climate Action Reserve described and compared three criteria for quantification tools for carbon markets: cost-effectiveness, user-friendliness, and data needs/data burdens, and discussed their relative importance. While all the issues matter, accuracy and uncertainty are those highlighted by regulatory markets. For example, point source GHG emissions projects often have low uncertainty (e.g., capping oil refineries produces very accurate emission reductions quantification), and regulators like low uncertainty. Many agricultural offset projects calculate uncertainty differently, and it is challenging to identify which issues are most important to achieving certainty. Scale helps reduce uncertainty by the law of numbers, so there is a debate about whether to allow projects under a certain number of acres, and if they are allowed in, how does this affect uncertainty? Aggregation is a key to getting agricultural offset projects to work; some of the planned improvements to the COMET tools which were described at the C-AGG COMET workshop (e.g., allowing batch uploads of project data) may help with ease of use.

Participants asked about creating an uncertainty ratio for carbon projects and Lang stated that to develop this, a project would have to have a lot of data published by the government or in a reputable peer-reviewed journal.

Temporal uncertainty is difficult to account for when projects are also accounting for year to year variation. This can depend on the model used—for example, the DNDC model pulls (automatically downloads) actual weather data for the period to model within a project scenario, creating weather-normalized data. The challenge is how to balance what is happening in the field vs. the models. If a quantification tool is using the weather for a particular year, there is uncertainly on how this compares to the baseline when looking into the future. WQ and carbon markets deal with this issue differently. In WQ, NTT is a daily model but it runs 50 years of historical data and looks at averages; credits are based on an annual average and not a specific year to account for uncertainty. For carbon, credits are sold per vintage years to look at specific outcomes from specific years.

In terms of project shortages, all carbon credits are conservatively estimated and some markets have buffer pools to ensure there is an added margin of safety. Adding buffer pools to agricultural projects, like those used for forestry projects, could be an obvious step to develop greater certainty for agricultural offset projects, but forestry projects generate a lot more credits than agricultural projects and we need to find a way to ensure that agricultural markets can succeed.

Beth McGee, Chesapeake Bay Foundation (CBF) noted that CBF has experience in both carbon and WQT markets. The Chesapeake Bay region is more focused on WQ, but has realized there are GHG emission reductions also occurring due to reduced or enhanced nitrogen utilization from WQ projects. CBF is looking at an on-farm tool to quantify how rotational grazing can impact carbon and WQ. While CBF sees a lot of overlap between WQ and carbon, both require data intensive reporting, and it would benefit these markets to simplify data collection requirements to collect only that data necessary for quantification; it would also be respectful of farmer's time. If we are focusing on N_2O, farmers need to know their fertilizer rates or the models can't report outcomes accurately enough to generate credits cost-effectively.

Between the two markets, carbon is considerably more data intensive and projects are more difficult to take to market. The voluntary space is easier than regulatory markets because the latter require specific inputs rather than more universal default inputs.

SESSION 3: QUANTIFICATION OF ECOSYSTEM SERVICES: FITTING IT ALL TOGETHER

The challenges and lessons for impact quantification are not limited to GHG and WQ markets. Panelists discussed bigger picture lessons for ecosystem service programs, where future opportunities exist, and identified trends and needs for program development. Key takeaways included:

- Stacked quantification is happening in the sustainable supply chain world, but unfortunately there is not a lot of money there for farmers, and quantification is often not rigorous enough to support verification, or thus market applications.
- Buyers in carbon and WQT markets seem to be interested in buying either WQ or carbon credits but not both.
- EPRI has projects that are bringing carbon credits forward from projects that are funded for WQT programs.
- Stacking is a great opportunity but can also be a challenge; VCS is seeing an opportunity in bundling eco-system service values.
- Can better quantification lead to 'blended ecosystem service credits' that have greater financial value than just a GHG credit or just a WQ credit? If so, how much rigor is required, and what incremental price or value can be achieved, if any?

Panel speakers:

Kari Cohen, USDA NRCS indicated that the supply chain sector is looking at multiple ecosystem impacts, and thus may be the best future option for credit stacking, but at this time, there is not much money available for farmers. Others noted that quantification efforts to date in these programs are not rigorous enough to support tradeable credits in even voluntary markets.

Jessica Fox, Electric Power Research Institute (EPRI) discussed EPRI's efforts to develop carbon credits from projects that are funded for WQ trading programs. EPRI has a CIG project that is developing forestry carbon credits for tree planting as a BMP. EPRI also has an RFP out to landowners for project proposals that include N, P, and C benefits. EPRI tested many models to create a dynamic model that is specific to forestry and tree planting. When reporting on progress in a project, EPRI will often showcase before and after photos of projects for transparency and documentation.

For the current Conservation Innovation Grant (CIG) project, landowners decide which lands will be converted to forest; EPRI wants the project to work well for landowners so those landowners maintain the lands into the future. Because farmers are signing 20 year contracts with no permanent easements, the permanence of sequestered carbon is not assured. EPRI is partnering with organizations that support protected species such as the American Chestnut Foundation (working to conserve the warbler).

EPRI held a credit auction with students at the University of CT and found that students paid 34% more for credits that were bundled with carbon rather than those bundled with pollinators.

Brian Brandt, American Farmland Trust (AFT) discussed the Conservation Marketplace Midwest (CMM), which has partnered with other organizations working on a supply chain sustainability project called Field Stewards which rewards farmers for protecting water quality, helps food companies address water quality risks in their supply chains, and provides consumers the opportunity to support cleaner water with their purchases. CMM has a CIG project in Michigan that is creating pollinator habitat at farms using long term easements. AFT's role in the project is farmer outreach and they see a strong environmental ethic driving the work with farmers and landowners.

Toby Janson-Smith, Verified Carbon Standard (VCS) sees credit stacking as both an opportunity and a challenge: the opportunity is in bundling eco-system services values. In voluntary markets, a corporation or other buyer may capture other values for biodiversity credits in a bundled credit rather than specifically seeking to purchase stacked credits. Charismatic offsets with bundled ecosystem attributes are trading at a premium even if there are fewer actual credits compared to some of the more 'industrial' offsets.

Panel and Participant Discussion

Ecosystem service markets represent just a slice of existing markets and one of many opportunities to incentivize sustainable land management. When looking at the spectrum of potential outcomes including water, biodiversity, health, etc., there are many benefits that can support sustainable agricultural production and it is important to convey to the agricultural sector which options are financially viable and sustainable.

The rigor that is required in markets and the need to quantify uncertainty creates an ongoing tension between accuracy and simplicity. Farmers and project developers in the field need simplified tools. High complexity means missed transactions. Ideally, a more user-friendly tool like COMET-Planner would be useful, but it must be rigorous enough to meet the needs of the market. On the WQ side, the Water Quality Index (WQI) for water quality measurements is very easy to use and gives a very basic water quality measurement. The tool can consider a whole farm system to give users a starting point to understand water quality impacts, though as a quantification tool it is not robust enough for market-based trading.

The questions we need to address are how do we get to scale, and how do we attract investment (demand) in this space? We need to approach the space through the lens of investors who are seeking assurance of real impacts, and through the lens of the public to ensure there is defensible rigor. Before and after images can help the public and investors to see and understand actual benefits.

DISCUSSION AND NEXT STEPS: WHERE TO GO FROM HERE?

Based on the dialogue and information shared in the workshop, what are next steps? Workshop participants brainstormed to identify research and development needs, determine whether others should be engaged in the conversation in the future, and how C-AGG and NNWQT can continue to advance the field of ecosystem service markets. Key takeaways 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 further explore common tools used within the communities. We lose opportunities, synergies, and valuable resources if we just go our separate ways. It is also important to keep the research community closely engaged to ensure that quantification approaches being developed meet project marketplace needs.
- **Stronger engagement of the farming community**: We need to more fully engage with the agricultural sector (e.g., farm groups, grower groups, and farmers and ranchers) and ensure that market-based approaches work for them. Besides direct engagement, one potential avenue is by working with sustainable supply chain initiatives such as FTM. We need to directly connect benefits to farmers and ranchers to meet their needs while achieving beneficial ecosystem impacts.
- **Who else should be at the table**? Participant 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 across different communities and different ecosystems. Participants suggested undertaking a mapping exercise to look at where we want to be 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 will be 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 scale these approaches. We need to be innovative and identify a broader range of incentives or tools that can drive action on the farm. What might work best in Iowa may not be an ideal solution in Maryland. How do we begin to harmonize the types of approaches that are used while retaining enough flexibility to address local needs and still be able to scale? One idea is to learn from projects that have worked. Though we see markets and credit trading as a driver, innovation is starting to infiltrate other areas such as sustainable supply chain initiatives.

- **Proof of concept**: We should develop projects that stack or quantify WQ and carbon benefits, and take them through the market process. Demand and incentives must be identified, whether regulatory or voluntary or CSR. We have learned a lot in our respective markets, and come a long way. We need to not let perfect be enemy of good as we move forward. To the extent that we can quantify impacts and outcomes, we can help to inform future market-based opportunities, including how they are implemented.