



SUSTAINABILITY FROM THE GROUND UP

**Compiled Responses to USDA Federal Register Notice (Vol. 76, No. 34, pp 9534-7)
Submission by the Coalition on Agricultural Greenhouse Gases (C-AGG), the National Association of
Wheat Growers (NAWG), and SureHarvest**

Introduction

C-AGG is a multi-stakeholder policy forum that seeks to mitigate climate change and benefit farmers by advancing the development and adoption of science-based policies, methodologies, protocols, and projects for GHG emissions reductions and carbon sequestration within the agricultural sector. C-AGG participants include agricultural producers, agricultural membership organizations, scientists, GHG quantification experts, carbon investors, policy experts, environmental NGO's, GHG offset programs/registries, and GHG project developers, among others.

We submit these comments in response to the Federal Register Notice published Friday, February 18, 2011, seeking input to USDA for the development of technical guidelines and scientific methods for quantifying GHG emissions and carbon sequestration for agricultural and forestry activities. The response was developed through an open process involving all C-AGG participants, and incorporates the input of multiple, diverse participants, including during an open forum at an in-person meeting of C-AGG during the comment period. This submission is not formally a consensus document. We are joined in this submission by the National Association of Wheat Growers (NAWG) and SureHarvest.

General Comments and Observations

Despite Uncertainties for Future Policy Constructs, Common Needs Should Drive Investments. While understanding and acknowledging that potential mandates and policy constructs governing climate change and GHG mitigation actions at federal and sub-national levels continues to be highly uncertain (with a few notable exceptions, such as California), C-AGG believes that opportunities for agricultural mitigation of GHG are significant and can provide beneficial incentives and outcomes for the agricultural sector as well as for society. Constraints on GHG emissions are already a reality for some in the US, and these constraints impact the agricultural sector, but also offer opportunities to incentivize emissions reductions or increased sequestration in the sector to contribute to the solution set. However, U.S. agriculture eludes simple categorization, and is characterized by a diversity of actors, systems, outputs and practices, as well as varied and variable climates, weather, crops, inputs and demands.

With this in mind, C-AGG urges that USDA investments in technical and infrastructure capacities targeted at enhancing GHG mitigation opportunities continue to be developed with an eye to flexibility in terms of meeting the long-term needs of the sector, and the understanding that a range of opportunities and approaches is likely to best meet the needs and demands of the sector within future policy contexts. Considering the uncertainty regarding future policy, market and program frameworks, flexibility and optionality in the tools USDA develops is likely to be important. USDA can assess the likelihoods of certain outcomes and act to develop the tools and incentives to equip farmers and producers to operate within those scenarios and to do it in a manner that acknowledges the primary role of providing food, feed, fuel and fiber, first and foremost, and solutions to other environmental and societal issues as well. Future scenarios or contexts may range from agricultural offset opportunities that allow the trade and sale of GHG credits in compliance or voluntary markets; to nutrient credits that can be traded or sold on ecosystem or nutrient markets (compliance and/or voluntary); to rewards or incentives that might be available through voluntary, programmatic approaches (e.g., conservation programs), or through various public/private alliances that may emerge interim to or as part of market-based opportunities.

We urge that investments be prioritized to be consistent with these future demands and likely continued fiscal constraints that may narrow the range of investments that might otherwise be made.

Emerging Challenges and Opportunities Should also be Considered. Globalization of markets, including agricultural markets, offers challenges and opportunities, and ensuring the continued viability and strength of US agriculture in the face of global pressures and challenges will also be important. For this, the policy context may require a greater focus on bottom-line business investments for the agricultural sector, and a need to remain relevant as market signals increasingly focus on sustainability of supply chains and metrics to measure sustainability. Intensity-based metrics, for example, can express the efficiencies and related benefits of agricultural systems on a per unit output basis versus traditional area-based metrics (such as bushels per acre), but agriculture could benefit from an assessment and understanding of the trade-offs of these various approaches as they relate specifically to the sector.

Transparency and Access are Important. Additionally, it is important that all data, databases, and systems established and utilized pursuant to this effort – which will hopefully incorporate existing data, databases, and systems previously developed through public investments – be transparent and accessible and available to the stakeholder community at large. This includes the agricultural community as well as the research community and all additional stakeholders. Publicly available information should also include information on climate change and its impacts, rates of GHG emissions and uptake from agricultural practices and systems, and opportunities and incentives to adopt management practices and systems. As soon as appropriate the data and SharePoint site being used by the expert/author teams organized by USDA should also be made publicly available for all stakeholders.

Goals, Objectives and Outcomes Should be Clear, Specified. While acknowledging the complexities faced by USDA in undertaking this task, one general observation expressed by many within C-AGG is that a better understanding of the desired goals, objectives and outcomes of this exercise and of the investments to be made would be desirable. Stating the scenarios and opportunities and desired outcomes can help identify priority investments with broader or cross-cutting application, particularly in the face of budget constraints. Additionally, identification of the desired outcomes can help ensure that investments made will meet the stated needs. A focus on enhancing the bottom line for agricultural producers within a carbon-constrained

future, which has a distinct bottom-line, business-based connotation, might result in very different investments than one targeted at maximizing the mitigation of greenhouse gases from agriculture, which might be more programmatic. Also, the total impacts to the sector, in the aggregate, might vary with these approaches.

A Move to Refine and Consolidate Tools and Metrics Should be a Key Outcome. To the extent possible, multiple approaches that can support future policy constructs should be included and considered for further investment, particularly where measurement of outcomes is part of the approach. It would be beneficial in this respect for USDA to evaluate existing approaches, methods and metrics to determine which have utility across the broadest range of agricultural systems. With burgeoning sustainable supply chain initiatives directed at agricultural production, and the proliferation of tools and metrics that has accompanied these, it would be particularly helpful to the agricultural sector if USDA could help to identify which of these offers the most utility and is most effective, and if necessary, identify a common system or approach that could reduce the duplication of data collection requests that is beginning to be experienced by agricultural producers, and which is likely to increase over time.

Evaluate Existing Tools First. Relevant to the development of market-based offset protocols, USDA should build on the excellent work of others, rather than starting anew. There are many private groups already developing protocols (e.g. the Climate Action Reserve, American Carbon Registry, Verified Carbon Standard, Alberta Offset System, and others), including some that have already been developed and approved by those programs and are in use. These should be cataloged, considered, evaluated, and where appropriate, utilized to the extent practical.

Similarly, the USDA has invested resources over the years into the development of the CENTURY and DAYCENT models and their spinoffs, and many of these models work well to estimate how different management practices and cropping systems will impact erosion, yield and soil organic carbon (SOC) sequestration, and even on-farm energy use. The Wind Erosion Protection System (WEPS) can show how SOC is affected as well as erosion. These tools should be considered and evaluated against desired outcomes.

COMET-VR and its enhanced versions (e.g. COMET-Farm) are in use and online at USDA, and the use of these tools might meet many of the needs identified in this Notice. COMET-Farm can be utilized and is (largely) operational now, or could be in the very near term, rather than in three years as envisioned by this exercise. It could be that investments in these tools to enhance their application over the broad geographic range of the US and to incorporate all aspects of production as included herein would be the most appropriate investment of resources, particularly when resources are constrained. The target audience(s) for tools needs to be well defined since in many cases, tools have been developed for researchers and advisors and not for producers.

Include Practitioners in the Development Phase. We urgently suggest that USDA include agricultural practitioners/producers in the expert and author panels from the start of this exercise, rather than only later in the process. This will ensure the practicality of efforts and identify pitfalls that producers might foresee which scientists and policymakers might not. We believe that farmers/practitioners/producers are the best experts when it comes to identifying the needs and demands of the sector, and the utility of tools and guidelines being developed for their benefit.

Scale. While this (seemingly) is beyond the original scope of the project, work should be done during the front-end development of this tool (if a tool is the desired outcome, or one desired outcome) to make it compatible with project-level work. Ultimately, tools should be developed with an eye to future needs, which should include the ability to work or operate at all scales, including from the project level through to the national inventory level.

The following responses are to specific questions posed by USDA:

1.1 How may USDA best improve upon existing greenhouse gas estimation guidelines for the agriculture and forestry sectors, while at the same time simplifying input requirements and enhancing the ease of use for individuals and entities?

- 1) It would be best if the guidelines were not so simplified that science is lost. In particular, process models if used must be properly parameterized, field tested, calibrated and validated in order to perform well at predicting GHG fluxes. Investments in improving the accuracy and utility of these models may be desirable.
- 2) There will be the temptation to reward specific practices without regard to countervailing practices that may offset benefits of the new practice adopted. No till, for example, sequesters soil carbon but also uses more herbicide (which has environmental co-effects) and may emit more N₂O. Counting the sequestration benefit of no-till without decrementing for offsetting effects will overestimate its benefit (for example). The point is that it is essential to provide a systems approach to the guidelines: farmers utilize and adopt systems, and it is the net GHG impacts of systems that we are interested in.
- 3) USDA needs to be explicit about definitions and about boundaries. The farm gate should be the farm-level entity, but in applications where the focus is on life-cycle emissions or supply chain sustainability, it is also important to have the input supply chain that leads to the farm gate included as part of the farm gate tally – i.e. to include the CO_{2e} costs of agronomic inputs in the farm entity.
- 4) There may be value to tallying co-benefits, e.g. GHG mitigation practices that also provide nitrate or phosphorus pollution abatement. In the event two practices have the same GHG mitigation potential, if one has a known co-benefit that should be noted and promoted, as appropriate.
- 5) It would be helpful for USDA to provide as much detail as possible on the uncertainties associated with each of the quantification approaches, in particular guidance on how users of the methods can improve the accuracy of estimates. For example, explaining which input variables have the biggest influence on uncertainty intervals and how/if accuracy may change depending on the scale of application. This type of detail will likely be most helpful for third parties (e.g., registries) to tailor tools appropriately to specific applications.
- 6) USDA should provide multiple interfaces and embed guidance within the decision support tool to improve utility, portability and connectivity to databases. It will be helpful if the tools and guidance can be accessible both when the farmer is online and when he/she is not, for example. If growers can

run scenarios as they perform estimations they may find the exercise more useful. Alternatively, provide an opportunity for a farmer to visit an extension office for a one-two hour consultation, during which an estimate of GHG emissions and suggested options for practice change could be made.

- 7) USDA should develop systems and interfaces that are workable for agricultural producers and that do not create such burdensome demands that uptake is limited by lack of utility or time and resource constraints that are greater than the real or perceived benefits. In many cases, the same data inputs for GHG models can be used for other metrics such as on-farm energy and nutrient usage. Having multiple outputs from the same data set will benefit the producer and the ultimate impacts.
- 8) USDA should provide ways to get default values for less critical data input elements and provide complete transparency with respect to the use of algorithms, calculations and sources for default values. Guidance should be provided to users on the sensitivity of the underlying model(s) to the various data inputs, to indicate which inputs really matter, which are of secondary importance, and what the factors that influence these sensitivities are.
- 9) Life-cycle analysis is a helpful way to do base analysis; complete guidelines on developing LCAs, and the boundaries of LCAs, would be beneficial.
- 10) We understand that this project does not consider carbon markets. However, if this project will eventually develop the capacity to tie into carbon markets, or if the investments from this exercise are to be applicable for future carbon markets, ensure that guidelines consider carbon market needs, including issues of performance standards, additionality, leakage, and gaming.

1.2 USDA intends to develop a standard set of methods for practice-, process-, farm- and entity-scale inventories which could provide a technical basis for improved methods for current voluntary State and regional systems. Are there specific areas where a USDA guideline would be most useful to current State and regional systems? Are there limitations to using the proposed quantification tools in the context of State and regional systems?

- (1) What is needed is development of a farm scale system that can be aggregated up to larger areas (as opposed to top-down system development). The farm scale is where the work to reduce GHGs and increase SOC will take place, so systems will need to capture this data at the farm scale. State and regional systems should be built around this ability, or should build in the capacity to utilize data that is captured and summarized from the farm scale, and not vice versa.
- (2) It should be noted that in many supply chain product-oriented data collection scenarios, field-level data will be required (a farm may be comprised of multiple fields). Flexibility to capture data at the field level should also be considered.
- (3) Aggregation and scale are important to consider when designing and developing this system, so guidance to state and regional systems that will guide and allow aggregation from the farm scale to regional scales, to state level inventories, and ultimately, national inventories, should be considered and provided.

- (4) Integration of tools and methodologies that allow for systems-based approaches to be measured, reported, and verified, rather than practice-by-practice, or gas-by-gas tools, will enhance utility and outcomes.
- (5) It is noted that the northeastern US does not have baseline measurements of soil carbon.

2. Objectives. The guidelines will result in a methodology for an integrated emissions inventory at the entity scale for all agricultural (crop and livestock) and forest management activities, including (but not limited to) those listed below:

- (1) The definition of 'entity' and 'farm' must be made clear.
- (2) It is neither apparent nor specified where rangeland fits in, but rangeland should be included.
- (3) Impacts outside the borders of the entity must be considered. For example, effects of entity-level activities on downstream water bodies and air pollution and even ground water need to be considered.
- (4) The integrated emissions inventory should establish a Scope 1, 2 and 3 framework that is understood by all participants and conforms to the Greenhouse Gas Protocol Initiative.

2.1.2 Rice cultivation practices and technologies to reduce methane emissions, including improved water table management, cultivation and fertilizer management.

- (1) As a crop, rice should be covered in item 2.1.1. There is an implication that in rice the only problem is methane, but this is not the case. A full analysis of GHG impacts from rice cropping systems is necessary.

2.1.3 Are there specialty crops where specific changes in management can greatly reduce GHG emissions or increase carbon sequestration that should be considered to enhance completeness and comprehensiveness of the guidelines, estimation and reporting tools? (Refer to 2.1.1 and 2.1.2)

- (1) There is no mention in this list of forage crops or crops that are likely to become major cellulosic biofuel feedstocks – switchgrass, for example. There is a need to consider the effects of converting both cropland and marginal lands not now used for crops to growing perennial grasses for biofuels.
- (2) Whether short-rotation woody biomass would be considered a cropping system or a forestry practice is not indicated, but it is important that the same guidelines will apply in either case.
- (3) It will be important to document changes in methane oxidation on land conversion – when rotating out of forests or long-term CRP or marginal lands, for example, methane oxidation is likely to decrease.
- (4) Specialty crops should be further defined as this is a question with broad implications; additionally, since any particular county in OR or CA may be growing over 200 different crops it will be important to decide how these will be assessed, and according to what criteria or priorities. We suggest at least breaking this down into specialty crop categories such as perennial vs. annual, treeing crops vs. vine crops, etc. to allow grouping specialty crops with similar management practices.

2.1.4 Are there additional cropland activities, management practices or technologies to be accounted for to enhance completeness and comprehensiveness of the guidelines, estimation and reporting tools? (Refer to 2.1.1 and 2.1.2)

- (1) Importantly, there is no mention of energy use in this tally – i.e. fuel used for farm machinery, the carbon/energy costs of agronomic inputs such as pesticides and fertilizers, nor electricity used for irrigation or for drying grain. In a GHG-mitigation scenario that does not cap such GHG emissions upstream of the farm, these emissions need to be considered in a comprehensive integrated program that reports net global warming impact at the farm or entity level. USDA needs to avoid adopting guidelines that address some but not other impacts (of material consequence); an incomplete system can be counterproductive and encourage gaming. In other applications, such as in protocols for market-based offsets, excluding certain carbon pools or emission sources from project accounting, either because these are considered *de minimis* or because exclusion is conservative, may be entirely appropriate. Thus “life cycle” (upstream and downstream) emissions should be addressed in some applications USDA is targeting here, and possibly not in others.
- (2) Since it is unclear what is included in 2.1.1 this is difficult to answer, but most certainly the answer should be yes. There are many activities, practices, and technologies not currently included in existing USDA tools, for instance, that would enhance the effectiveness and completeness of any tools or guidelines. This underscores the need to identify desired outcomes and impacts, since it would help to evaluate and assess prioritization.
- (3) Regarding items under 2.1.2, Rice Cultivation, the role of rice residue management was not included. Rice residue removal practices, in lieu of anaerobic decomposition of residues in flooded rice fields, is another potential way to reduce methane emissions. However, this has fertilizer implications, since the incorporation of rice straw versus burning has shown that incorporation of straw results in about 30 kg N/ha less fertilizer needed – so a full assessment is necessary. Consider including the GHG impacts of rice residue management within this scope, including also the GHG impacts of alternative uses of rice residues.
- (4) Minor sources of on-farm emissions should be included in the system if, in the aggregate, they materially impact the national inventory. Assessing the relative impacts of each to the national inventory might aid in prioritization, as well. Otherwise, there will continue to be gaps in emissions and inventories at any scale.

2.2.3 Manure management practices and technologies to reduce methane and nitrous oxide emissions, including digesters, lagoon management, land application practices, and composting.

- (1) Be certain a systems approach is used; e.g., an anaerobic lagoon covered to capture methane will also reduce N₂O emissions by inhibiting nitrification (providing a synergistic effect). Conversely, aerating a lagoon to reduce methane generation will increase N₂O emissions (providing a tradeoff effect). Likewise, land application of manure will reduce methane generation but stimulate soil N₂O emissions. Be certain manure management guidelines are compatible with cropland guidelines.
- (2) Manure management needs to consider whether the practices is purposely decreasing the N fertility of the manure; a lot of fertilizer N can be needed to replace all the N denitrified in some of these systems,

so nutrient conservation needs should be considered as well, particularly since it takes a lot of energy to convert into plant useable forms.

2.2.4 Are there additional grazing land and animal agriculture activities, management practices or technologies to be accounted for to enhance completeness and comprehensiveness of the guidelines, estimation and reporting tools? (Refer to 2.2.1, 2.2.2 and 2.2.3)

- (1) Yes; the use of nitrogen and nitrification inhibitors, for instance, or feed supplements that reduce animal greenhouse gas emissions.

2.3.6 Are there additional forest activities, management practices, equipment or technologies to be considered to enhance completeness and comprehensiveness of the guidelines, estimation and reporting tools? (Refer to 2.3.1 - 2.3.5)

- (1) Fertilization must include the energy / CO₂ costs embedded in the fertilizer itself. As for cropland management, all management inputs (fertilizers, pesticides, fuel use) must be included in the accounting guidelines. There is no sense in crediting individual practices without assurances that offsetting practices have not been inadvertently promoted. Additional thinning for biomass feedstock removal will require fuel use, may stimulate soil respiration, and may slow soil carbon accretion.
- (2) Genetic modifications to existing species and plant breeding -- not just species selection.
- (3) Controlled burning is a very useful management practice, which may release CO₂ in the short-term but in the longer term may reduce net GHG emissions and help to improve SOC. Full LCA's of controlled burning as part of systems should be completed. Fire is used in many forests in the south to improve the stands, control undesirable species and to prevent uncontrolled wild fires. A light burn may be better than no burn, in terms of net GHG impacts to the system.
- (4) Not sure what is meant by wood products. Burning waste wood at mills is used to generate steam to run mills or produce electricity. Again, use of fire should be considered.
- (5) Reforestation is not listed or mentioned.
- (6) Short-rotation woody biomass grown for fiber and/or energy should likely be identified as a specific category.

2.4 Are there sources of information relevant to the objectives of this project which can be made available to the author teams? If so, please provide this information or the name and contact details for the correspondent.

- (1) T-AGG <http://nicholasinstitute.duke.edu/ecosystem/t-agg/t-agg-reports>
- (2) M-AGG review of existing quantification protocols at http://sustainablefoodlab.org/index.php?option=com_content&view=article&id=104:ag-carbon-markets&catid=9&Itemid=27.
- (3) Similar work and sustainability efforts are underway at EPA and USGS and at other Federal agencies, so this work should be closely coordinated to prevent redundancy and ensure collaboration and coordination.
- (4) Regarding 2.3.2 Forest management practices and technologies to reduce GHG emissions or increase carbon sequestration, including stand thinning, restoration, fertilization, and species selection, the Climate Action Reserve recently published four white papers that explore issues with relevance to

forest carbon accounting and forest management practices. The white papers cover the following topics:

- Accounting for carbon in soils affected by forest carbon projects;
- Accounting for carbon in lying dead wood;
- Effects on forest carbon of even-aged management and alternative silvicultural activities; and
- Evaluation of sustainable forestry certification programs and criteria.

The papers can be downloaded from the Climate Action Reserve's website at:

<http://www.climateactionreserve.org/how/protocols/adopted/forest/forest-protocol-white-papers/>

- (5) Regarding forest management, reducing nitrous oxide emissions through modified fertilizer management, and other areas, see the American Carbon Registry protocols available at <http://www.americancarbonregistry.org/carbon-accounting/carbon-accounting>.
- (6) Regarding 2.3, Forests and Afforestation, Winrock International has conducted analyses and developed tools over the last 15 years, including for USDA, U.S. EPA, the Department of Energy and others, for measuring, monitoring and reporting forest carbon pools and GHG emissions. Examples include:
 - Sourcebook for Land Use, Land-Use Change and Forestry Projects. See http://www.winrock.org/Ecosystems/files/Winrock-BioCarbon_Fund_Sourcebook-compressed.pdf.
 - Measurement Guidelines for the Sequestration of Forest carbon. US Forest Service General Technical Report NRS-18. See <http://www.treesearch.fs.fed.us/pubs/13292>.
 - Measuring, Monitoring and Verification of Carbon Benefits of Forest-Based Projects. See [http://www.winrock.org/ecosystems/files/Measuring%20monitoring%20and%20verification%20of%20carbon%20benefits%20for%20forest-based%20projects%20\(2002\).pdf](http://www.winrock.org/ecosystems/files/Measuring%20monitoring%20and%20verification%20of%20carbon%20benefits%20for%20forest-based%20projects%20(2002).pdf).
 - Guidelines for Inventorying and Monitoring Carbon Offsets in Forest-based Projects. See http://www.winrock.org/ecosystems/files/Guidelines_for_Inventorying_and_Monitoring.pdf.
 - A Guide to Monitoring Carbon Storage in Forestry and Agroforestry Projects. See <http://www.winrock.org/ecosystems/files/carbon.pdf>.

2.5 Are there opportunities to reduce GHG emissions and increase carbon sequestration in the agriculture and forestry sectors that should be reflected in the methods?

- (1) This is unclear; is this asking what protocols exist and are under development? If so, M-AGG has compiled a comprehensive summary of what is available and in development.
- (2) Biochar and the impacts of biochar should be included.

2.6 USDA intends to rely on engineering calculations, models, and observations as primary methodological approaches. How can USDA balance rigor while maintaining broad applicability, national consistency, and user friendliness?

- (1) Ensure that reference sites are available for verifying model output. Ensure that models are self-consistent. Be sure to specify the crop/grazing/forestry systems and practices for which the models are not sufficiently tested – uncertainty analysis will help, but strict sideboards might be more straightforward (e.g., don't include in the model crops or practices for which there is now too little information, but make allowances for including later – i.e. make the models scalable).

- (2) A greater understanding of the levels of uncertainty associated with various models and tools, the robustness of those uncertainty estimates, and a determination of what are minimally acceptable for various uses would be beneficial.
- (3) The USDA-ARS GraceNET protocols can be utilized to maintain national consistency for soil sampling.

2.7 What models and tools currently exist for farm- or entity- scale GHG inventory and reporting, and how might they be useful to the current project objectives? For each model noted, provide a source citation for information on the model.

- (1) Prior investments in these/any tools should be leveraged to the extent possible by utilizing them in development of the current exercise, rather than using them solely as a reference. For example, the 1605(b) guidelines should be utilized as may be appropriate.
- (2) The compiled list of tools should be shared with the general public and with all stakeholders.
- (3) The Cool Farm Tool (growingforthefuture.com) is an open source, publicly available, transparent, globally-oriented tool with increasing uptake in the private sector product-level GHG reporting arena.

3.8 Are these appropriate criteria by which to formulate GHG estimation and reporting guidelines, methods and tools? Are there other criteria that should also be considered? (Refer to 3.1 - 3.7)

- (1) Different metrics should be considered and evaluated from the agricultural perspective. It should be noted that GHG intensity metrics – i.e. the GHG produced per unit production can allow for absolute increases in GHG emissions. Carbon markets are concerned about absolute reductions – not reductions per bushel of corn or pound of milk. So long as a practice does not increase intensity – which would be counted as leakage by the markets – there is no credit available for reducing intensity per se (i.e. for increasing yield without also decreasing absolute GHG flux). Put another way, most markets do not currently credit “positive leakage.” That said, increasing efficiencies can be an effective means to avoid future emissions, so a calculator that notes intensity in addition to absolute CO₂e credits would be a useful educational and accounting feature. For an alternate perspective, see Murray and Baker, 2011, *An Output-based Intensity Approach for Crediting Greenhouse Gas Mitigation in Agriculture: Explanation and Policy Implications*, at <http://nicholasinstitute.duke.edu/ecosystem/t-agg/t-agg-reports>.
- (2) It is important to recognize the challenges of measurement and verification within agricultural systems, and to seek to reduce uncertainty. One of the major input problems is use of monthly or even daily time step climate data in models. How does one account for a late frost, or a hard rain event where most of the water becomes runoff and does not infiltrate the soil, but where the model may account for it as if it was available to crops. Climate is the biggest driver in crop production and it is the area with the most ‘holes’, in terms of our ability to measure it and account for it.
- (3) One common system should ultimately be developed and utilized by all agricultural producers to prevent gaps in accounting, or double-counting, etc.
- (4) The difference between accuracy and precision must be considered, and they should not be confused, as they are not the same.
- (5) Transaction costs must be considered as part of system development (we note that cost effectiveness is included in your list), and cannot be greater than the benefits for the system to be effective.
- (6) The Climate Action Reserve notes the importance of the criteria listed (Transparency, Consistency, Comparability, Completeness, Accuracy, Cost-effectiveness, and Ease of Use) and would suggest the

addition of two more criteria: Relevance and Conservativeness. Sample definitions of these criteria are provided below:

- a. **Conservativeness:** Conservative assumptions, values, and procedures should be used to ensure that GHG emissions are not underestimated (for inventories) or GHG reductions are not over-estimated (for offsets).
- b. **Relevance:** Data, methods, criteria, assumptions and accounting boundaries should be chosen based on their “intended use.”

3.9 To the extent that there are tradeoffs, which criteria are more important than others in ensuring the usefulness of the project products for entity-scale estimation and reporting? (Refer to 3.1 - 3.7)

- (1) There will be tradeoffs. Pay attention to what the market needs – accurate, verifiable quantification of GHG emissions and sequestration, and net changes in these.
- (2) The basic thing that is needed in soils is to increase or maintain the existing SOC levels in order to retain the primary and ancillary benefits of SOC. USDA should consider also all the other environmental and societal benefiterers of SOC management.
- (3) As to trading carbon credits, the financial rewards will likely be small for most individual farmers, ranchers, and foresters, but on the whole/in aggregate, the impact can be very large.
- (4) This question begs the question: what is the purpose of the project/tools? There is no mention of a basic education and awareness campaign to help producers understand basic GHG concepts, how their farming operation and broad practice areas/inputs affect the amount of GHG emissions, short- and long-term strategies to manage emissions, and the crop recordkeeping data required by GHG emission calculation tools. These are foundational elements of farm-level continuous improvement programs that mesh well with NRCS programs such as EQIP and CSP.