MONITORING, COMPLIANCE AND ENFORCEMENT

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Earlier this month, Sen. Jeff Bingaman (D-NM), Chair of the Senate Committee on Energy and Natural Resources, proposed a set of 10 principles for climate legislation. One of the principles that he put forward dealt with the institutions that would be needed to deal with climate change and in particular the development of carbon markets. He presents a caution to policy makers: "An institution that exists only in concept may look better than the flawed institutions that exist in real life. But there is a significant time and opportunity cost associated with starting a new institution from scratch." When we examine salient issues regarding agriculture's role in carbon sequestration with a focus on monitoring, compliance and enforcement, we need to see what we can learn from recent conservation policies so we put in place viable and effective institutions.

In the development of carbon markets, which include the sequestration of carbon in soils through agricultural practices, the suite of market implementation challenges related to monitoring, compliance and enforcement are frequently referred to in the literature as verification. As a goal, landowners, farmers, aggregators and the other participants in carbon markets need confidence in the monitoring and verification processes; the processes need to be accurate, replicable, enforceable and cost effective.

An initial question deals with whether agriculture and crop farmers in particular, are going to be under an emissions cap like other sectors of the economy, or whether they are they going to be outside of the cap. The answer to this question directly impacts the extent to which the sequestration of carbon in soils through agricultural practices will result in credits that farmers will be able to sell. Or, if the sequestered carbon will be available to offset other parts of the farm operation. If climatic mitigation is taken seriously, agriculture might well be under the cap. This being the case, the need to establish baselines arises and a focus on recommended management practices (RMPs) as a way to determine carbon credits becomes more problematic. While the following assumes farmers are in the position of selling carbon credits, most of the same issues hold if farmers are under a carbon cap and are using C-sequestration as an offset for their other GHG producing activities—monitoring, verification and enforcement are still required.

Issues and Alternatives

One of the first challenges is what entity or entities are going to be given the responsibility to verify whether or not participants in carbon markets, either as individual contact holders or as part of aggregated pools, are meeting their contractual obligations. A corollary is whether these entities will have the institutional capacity to carry out legitimate and creditable verification procedures from the perspectives of each of the participants in the market. There are a number of possible alternatives that could be used.

(1) Currently, the CCX has a mixture of private businesses and quasi-public agencies, such as state associations of soil and water conservation districts, listed as project verifiers. However, of the seven organizations listed that work in the United States, only three mention the verification of C-sequestration on their websites—these are the private businesses. How these entities actually accomplished this verification is not specified.

(2) An alternative would be for a USDA agency to get involved in providing verification services. Both NRCS and FSA come to mind as possible agencies for this role. NRCS has an extensive background in soil and land management

along with the development of COMET-VR incorporating CENTURY. Their District Conservationists (DCs) have years of experience developing soil conservation plans for farms and working alongside producers as they adopt soil conservation practices. However, as we learned dealing with Conservation Compliance, the culture of the agency is not disposed towards active monitoring and enforcement of required practices specified in management plans. FSA has experience running a variety of commodity and conservation programs. Furthermore, given many of FSA's programs, it has an agency culture "more comfortable" with monitoring and enforcement. While there has been some office consolidation, both agencies still have an extensive presence in most agricultural regions of the country. If there is USDA agency involvement, thought will have to be given to the nature of the relationship among agency personnel, aggregators of contracts and the exchanges or programs creating the markets so that conflicts of interest are avoided. Finally, there is the challenge of resources. If a USDA agency is going to provide verification services, then personnel and financial resources will be necessary. Two of the lessons of Conservation Compliance were that the added workload for DCs resulted in high levels of burn out among DCs and shifted financial resources away from other programs.

(3) A third alternative is to build capacity for the provisioning of verification services through the development of Technical Service Providers (TSP) as has been done in other areas of conservation programming. The challenge here is who is going to provide the training and then certify that the TSPs have the requisite level of skills.

(4) A fourth alternative is use of self-certification of compliance with contractual requirements. Some aggregators currently require their clients to mail in a post card periodically on which they self-certify their compliance with their contractual obligations. Other participants in the market might question if this is adequate.

With the exception of the fourth alternative, all the alternatives require a mechanism to pay for the verification services. A straight-forward approach would be to charge a fee based on a percentage of the value of the carbon contract. The size of the fee would reflect the type of verification services provided and the frequency with which each contract is monitored for compliance with its obligations. Currently, the contract language for at least one of the aggregators on the CCX regarding verification costs for their participants is rather vague. How verification costs are determined and assessed are areas that need to be discussed, agreed upon and communicated with transparency.

Subak (2000) posed the question: are carbon payments going to be coupled to carbon accounting monitored or verified at the farm level or decoupled and based on the use of farmer recommended management practices (RMPs) which will be tied through research to changes in C-levels? An important corollary is whether the focus is exclusively on carbon or if other GHG related to agricultural field operations such as N2O are going to be included as well. The literature suggests that the use of RMPs might be more cost-effective than developing more elaborate site-specific systems of carbon accounting. However, if RMPs are used, the question arises what are the suites of RMPs that are acceptable for C-sequestration and how rapidly do they vary geographically to account for differences in soils and climate? Simulation research using the CENTURY model by Yadev et al (under review) shows that soil organic carbon migrates fairly rapidly in a downhill direction within watersheds, with hill slopes and interfluves losing sequestered

carbon through the erosion process and flatter bottomlands accumulating carbon through deposition. This result raises the issue of whether credit for carbon sequestration should be given to the often downhill landowner on whose land the carbon is directly measured or the uphill farmer whose activities initially sequestered the carbon from the atmosphere through photosynthesis. If the later is more appropriate, then credits should be based on practices known through modeling and empirical investigation to sequester carbon rather than on expensive-to-obtain direct field measurements.

Similarly, are more practices acceptable than just those which have been outlined by CCX? A number of researchers suggest that the suites of practices should be more extensive and "complex" than just conservation tillage as spelled out by CCX. Do we follow the suggestion of Lal (2008) and others to include practices such as a broader array of soil and water conservation practices, cover cropping, complex rotations, integrated nutrient management including manure and other forms of nutrient recycling? What becomes problematic is the linkage between the suites of practices adopted by a farmer through his/her carbon contract and the confidence that the market participants have that a certain number of tonnes of CO_2 are sequestered per year. This is an area of on-going research (see *Soil and Tillage Research* 83 (1), Gal et al. 2007). All the participants are going to need confidence in how these rates are established as well as an appreciation for why they might or might not vary.

There is an important policy design question here: to what extent will empirical data be used to determine a relatively large number of different combinations of RMPs, soil type, location, crops and C-sequestration rates versus a small number of combinations to accommodate the ease of market function, ease of verification, uncertainty and minimize costs related to monitoring C-sequestration. Given the volume of research on the dynamics of C-sequestration in agricultural soils, this aspect of policy design is very important and calls for a thorough discussion.

If the decision is made to go forward with the use of RMPs in the development of contracts for carbon sequestration, what is the potential role for models like CENTURY? This is particularly relevant if contracts are developed for a combination of RMPs, soil type, location and crops. Do the developers of carbon markets have sufficient confidence in carbon cycle-based models like CENTURY to use them as estimators for C-sequestration rates much like USLE or RUSLE2 have been used in soil and water conservation planning? Can this be done for geographic units relevant for producers and landowners? A similar question presents itself regarding the use of a planning tool like The Voluntary Reporting of Greenhouse Gases-Carbon Management Evaluation Tool (COMET-VR), a decision support tool for agricultural producers, land managers, soil scientists and other agricultural interests (http://www.cometvr.colostate.edu/) that can be used to help farmers evaluate the economics of carbon sequestration contracts. COMET-VR provides an interface to a database containing land use data from the Carbon Sequestration Rural Appraisal (CSRA) and calculates in real time the annual carbon flux using a dynamic CENTURY model simulation.

When considering monitoring and verification, relevant questions are how will it be done and how often? If contracts are going to be for multiple years based on some combination of RMPs, the technology appears to be available to use remote sensing to carry out part of the verification. However, the use of remote sensing (Landsat Enhanced Thematic Mapper Plus–ETM+ (Bricklemyer et al. 2006, 2007)) for the

presence or absence of RMPs brings up the issue that plagued some of the compliance considerations in the late 1980's–"the spy in the sky" being used to track producer behavior and report producer missteps. Is it now politically acceptable to use this kind of verification technology? If remote sensing is going to be used, the infrastructure needs to be in place to ensure that the images are acquired during the right times of the year to track tillage operations and crops for verification purposes. This might well mean images from more than one time period. The ideal timing of such images will most likely vary based on the region of the country in question. A considerable amount of on-going validation might be necessary of the remote sensing technology in order to maintain its credibility among market participants. Given the technical feasibility of verification based on remote sensing, will it still be relevant to have on-site inspections of land under C-sequestration contracts? Part of the answer depends on how complex the RMPs are which make up the prescribed practices for the particular contracts. As these become more complex, the need for more frequent on-site verification might increase. On the other hand, direct use of remote sensing data has not been developed to the point where accurate assessments of changes in soil organic carbon content can be made.

Furthermore, one of the results we found regarding Conservation Compliance which might be particularly relevant here was that producers were very sensitive to the frequency and density of compliance monitoring. When NRCS shifted from compliance monitoring based on a 5 percent county sample to a 2 percent state sample, producers' expectations of being found out of compliance fell dramatically as did their expectations of being penalized. Demonstrated verification visits might be very useful in terms of maintaining the integrity of the suite of RMPs necessary to attain the desired level of C-sequestration. This could be particularly relevant during periods of time when the costs of employing RMPs increase; if there are associated yield penalties for high valued crops; or if crops change in relative value to low C-payments. These situations could be incentives for producers not to follow the contracted RMPs. Verification needs to be reliable enough to identify the instances in which producers are no longer meeting their contractual obligations. The institutions doing the verification need to be robust enough and have sufficient legitimacy to enforce market rules. Given that in many instances farmers will be looking at multiple year contracts and the recent increased volatility in the commodity and input markets, contract holders might be encouraged to participate in a revenue insurance program so as to minimize perverse incentives not to follow their contracts.

If, as a consequence of monitoring and verification, a question arises as to whether or not a producer is meeting his/her contractual obligations, how will it be dealt with? If one of the USDA's agencies is involved, will the landowner have the option to request mediation as is the case with most, if not all, USDA programs? Assuming for the moment that (s)he does, what can we learn from past mediations of conservation issues that might be helpful here? Analysis of 407 mediation cases in Illinois from 1997-2008 indicate that monitoring agencies will need flexibility in dealing with participants found out of compliance or in violation with contractual obligations. Presently, the personnel of agencies like FSA and NRCS in mediations dealing with conservation issues have virtually no leeway in designing an "alternative" solution for the out of compliance situation; the regulations give the agency personnel no "room to move" as it were. As a consequence, conflicts are not resolved efficiently—low-cost, win-win solutions cannot be arrived at. Alternatively, personnel from agencies like Risk Management Agency and Rural Development, seem to have greater flexibility in arriving at a solution to a dispute beyond just the "regulations." If monitoring and verification are going to work, it would

seem there needs to be a discussion regarding how out-of-compliance or contract violation situations are dealt with and resolved. USDA's own mediation experience within its own programs suggests there are a number of different models. Extending long periods to producers to come into compliance, almost a USDA standard practice in the past, will not be acceptable in most markets. Given that we are dealing with a market and contractual relationships, everyone needs to have confidence that all participants will meet their contractual obligations in a timely manner.

While the focus here has been on C-sequestration in agricultural soils, a number of researchers have pointed out that increasing soil organic carbon is highly correlated to a number of valuable ecosystem services (see Lal 2008). For example, the use of RMPs that have a high correlation for C-sequestration also have a high benefit for water quality. This permits "double dipping" in terms of the environmental benefits. This might be particularly relevant during a period in which land might be leaving the CRP and Conservation Compliance is weakened. While C-sequestered in and of itself is very important, its association with other valuable ecosystem services (improving water quality, reducing nonpoint source pollution and hypoxia, advancing global food security, increasing biodiversity, and controlling desertification (Lal 2008)) related to soil profile has value beyond that related to global climate change. As markets develop for carbon, we need to explore the potential for using them as an opportunity to shift some of the forms of farm income support away from their traditional commodity base to an ecosystem service base. This could be used as an additional payment to that which would be received for the sequestered carbon.

In conclusion, we have tried to present a number of the important issues related to the compliance monitoring of C-sequestration contracts related to agricultural soils. Dealing with these issues will help develop an institutional structure that will help ensure the effectiveness of emerging carbon markets without sustaining high transaction costs.

References

Baker, J., T. Ochsner, R. Ventera, and T. Griffis. 2007. "Tillage and soil carbon sequestration—What do we really know?" *Agriculture Ecosystems and Environment* 118: 1-5.

Bingaman, Jeff. 2008. "Finding the Path Forward on Climate Legislation" accessed at http://energy.senate.gov/public/index.cfm?FuseAction=PressReleases.Detail&PressRelease_id=7bd43a6f-f03a-453d-8f4f-1ed6cfc84056&Month=7&Year=2008&Party=0 22 July 2008.

Bricklemyer, R., R. Lawrence, P. Miller, and N. Battogtokh. 2007. "Monitoring and verifying agricultural practices related to soil carbon sequestration with satellite." *Agriculture, Ecosystems & Environment* 118:201-210.

Bricklemyer, R., R. Lawrence, P. Miller, and N. Battogtokh. 2006. "Predicting tillage practices and agricultural soil disturbance in north central Montana with Landsat imagery." *Agriculture, Ecosystems & Environment* 114:210-216.

Lal, R. 2001. “Soil carbon dynamics in cropland and rangeland.” *Environmental Pollution* 116: 353-362.

Lal, R. 2007. “Farming carbon.” *Soil and Tillage Research* 96: 1-5.

Lal, R. 2008. “Promise and limitations of soils to minimize climate change.” *Journal of Soil and Water Conservation* 63: 113A-118A.

Logar, N. and R. Conant. 2007. “Reconciling the supply of and demand for carbon cycle science in the U.S. agricultural sector.” *Environmental Science and Policy* 10: 75-84.

Post, W., R. Izaurralde, J. Jastrow, B. McCarl, J. Amonette, V. Bailey, P. Jardine, T. West, and J. Zhou. 2004. “Enhancement of carbon sequestration in US soils.” *BioScience* 54: 895-908.

Subak, S. 2000. “Agricultural soil carbon accumulation in North America: considerations for climate policy.” *Global Environmental Change* 10:185-195.

Willey, Z. and B. Chameides (eds). 2007. *Harnessing farms and forest in the low-carbon economy: how to create, Measure, and verify greenhouse gas offsets.* Durham, NC: Duke University Press.

Yadav, V., G. Malanson, E. Bekele, and C. Lant. In review. “Modeling Watershed-scale sequestration of soil organic carbon for carbon credit programs.” *Environmental Management.*

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