

Consultant's Report

**Carbon Sequestration, Sustainable Agriculture and Poverty Alleviation -
Results of Workshop and Recommendation for LAC Direction**

By

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Introduction

In August of 2000, a workshop was held at the World Meteorological Organization (WMO) in Geneva, Switzerland to examine the technical synergies and tradeoffs between projects aimed at carbon sequestration and sustainable agriculture. Carbon sequestration projects are those that are designed to take carbon dioxide (CO₂) out of the atmosphere and trap it into the soil or biomass. Sustainable agriculture projects are those that are designed to increase agricultural production in a socially and ecologically sound manner. The general proposition that guided the workshop was that if sustainable agricultural projects sequester carbon through their impact on increased soil organic matter and biomass, then such projects represent an opportunity for the rural poor in developing countries to participate in the proposed "clean development mechanism" and "emissions trading" schemes under the Kyoto Protocol.

The general proposition of the rural poor in developing countries participating in carbon sequestration projects under the Kyoto Protocol has two important implications for USAID and other donors facing budget constraints in their agricultural development assistance programming. First, and in the near term, if the levels of carbon sequestration in sustainable agriculture projects are competitive as compared to other carbon sequestration projects (i.e. land-use change projects and forestry projects), then the development costs associated with sustainable agriculture projects are solid candidates for funding under the clean development mechanism being proposed to implement the Kyoto Protocol. All donors would welcome such additional funding because while it is generally recognized that sustainable agriculture is a key investment to alleviate poverty in rural areas, official development assistance (ODA) allocations for sustainable agriculture continue to decrease. Second, and in the longer term, if sustainable agriculture projects in developing countries appear to be competitive sources of emissions credits in an international market, then private sources of capital for developing country investment in sustainable agriculture will be also become available to supplement the levels of ODA.

Hence, the basic question in the workshop revolved around the issue of the competitiveness of sustainable agriculture projects serving as net carbon sinks and generating carbon emission credits. Given the status of what is known, the emphasis of the workshop was on the technical issues of carbon accounting in sustainable agricultural projects rather than the financial, economic and institutional aspects of projects although, they too, were discussed. The technical aspects of carbon accounting focus on physical measuring and monitoring carbon changes and includes concepts of baselines, additionality, leakages, and permanence of the sequestered carbon. A key socioeconomic issue for the Bureau of Latin America and the Caribbean (LAC) that was discussed in the workshop was the linkage of carbon sequestration projects to small farmers.

This report has two thrusts. First, the report summarizes the results of the workshop and provides an update on subsequent events tied to the Kyoto Protocol that are important considerations in programming development assistance in agriculture. Given the complexity and voluminous literature on the general topic of carbon sequestration, the report makes no effort to discuss the issues in depth but rather directs the interested reader to the relevant sources for current information on the topic on various websites that are discussed below. Second, and more importantly, the report provides recommendations to LAC's Broad-based Economic Growth (BBEG) team in the Office of Regional Sustainable Development (RSD) regarding the role carbon accounting should play in its programming economic growth and agricultural development assistance.

Objective of the Consultancy

This report is submitted in response to Purchase Order 40-3148-0-5723 ¹ under the LAC/RSD/BBEG LACTECH project that calls for a "... special report on the carbon sequestration, sustainable agriculture and poverty alleviation (workshop) sponsored by the World Meteorological Organization ...". The Purchase Order provides for eight days of consultancy to attend the workshop and draft the report. Additional guidance in terms of the assignment and the reporting requirement was provided in a scope of work drafted by LAC/RSD/BBEG and is presented below as background information regarding the objective of this consultancy.

"Work Plan Procedure The contractor will submit two reports to the Team Leader of the LAC/RSD/BBEG. One report will be a written document, which gives the results of the workshop and direction for future use.

At a minimum, it will focus on the following points:

1. U.S. Interests versus NAFTA's interests and, in general, these contrasted to European Interests;
2. Clarify Mexico and Canadian mutual interests;
3. Mercosur's Interest;
4. Caribbean Interest;
5. Andean Interest; and
6. Central American Interests
7. The report should focus on the potential net carbon storage of additional activities under Article 3.4 of the Kyoto Protocol. These are increases in carbon storage that may occur via (a) improved management within a land use, (b) conversion of land use to one with higher carbon stocks, or (c) increased carbon storage in harvested products. The report will emphasize the importance of Latin America and the Caribbean in this process.
8. The different techniques of measuring carbon sequestration additionally;

¹ USDA/FSA/ICD/DRD, *Purchase Order 40-3148-0-5723*, Washington, D.C., August 29, 2000.

In addition, the contractor will provide a PowerPoint presentation that will summarize the above to officials in USAID/Washington. Both the PowerPoint Presentation and the report will be provided to LAC/RSD/BBEG in hard copy and electronic media (Microsoft Office Suite) no later than 30 days after the workshop.”²

The PowerPoint presentation entitled “*Climate Change Mitigation & Sustainable Development in the LAC Region*” was made to the staff of LAC/RSD on November 29, 2000 at the convenience of the LAC/RSD. This written report tracks the findings and recommendations made in the PowerPoint presentation. A copy of the slides of the PowerPoint presentation is included as Appendix 1.

Climate Change Websites and Reports

The literature on climate change and carbon sequestration is substantial and complex. Fortunately, practically all of the relevant program information is available on the Internet. Thus, as background for this report and to assist the interested reader to learn more, several sources of information on climate change and climate change mitigation are presented below. Some of the sites include a glossary of terms for those not familiar with the terms and concepts.

For those readers reviewing this report electronically, it is recommended that you simply click into each of the websites and save/add the site address to your web browser file. This will facilitate periodic access to these sites for those who wish to keep current on the issues and progress in the debate over the implementation of the Kyoto Protocol.

The first site, at <http://www.unfccc.de/>, is the United Nations Framework Convention on Climate Change (UNFCCC) website. It is the source for all official documentation on the climate change negotiations. All documentation and reports of the Conference of Parties (COP), the Subsidiary Body for Implementation (SBI), the Subsidiary Body for Scientific and Technological Advice (SBSTA) as well as the official reports of ad hoc groups are available for review and downloading.

In 1988, the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) established the Intergovernmental Panel on Climate Change (IPCC) to assess the scientific, technical and socio-economic information relevant for the understanding of the risk of human-induced climate change. The work of the IPCC led to setting up the UNFCCC in 1994. The IPCC continues to support the UNFCCC and is an important information source at <http://www.ipcc.ch>. In particular, just prior to the workshop in Geneva it released a special report entitled *Land Use, Land-Use Change, and Forestry*.³ The IPCC report discusses the global carbon cycle and how different land use and forestry activities affect carbon stocks and greenhouse gas

² Ibid

³ Robert T. Watson, et al, editors, *Land Use, Land-Use Change, and Forestry*, Published for the Intergovernmental Panel on Climate Change, Cambridge University Press, 2000.

emissions. The report, available on the IPCC website, is lengthy (377 pages) and very technical. It serves as the baseline document on technical definitions and relationships related to carbon accounting and land-use. A very readable summary of the key findings of report is also available on the IPCC website at <http://www.ipcc.ch/press/sp-lulucf.htm>.

U.S. policy statements and reports on climate change are found at several websites because there are numerous U.S. government agencies involved in the formulation of U.S. policy and implementation of programs related to climate change. Five of the main sites are noted below.

1. The U.S. policy on climate change in the international context is articulated by the U.S. State Department. Climate change policy statements can be found at there website entitled Spotlight: Climate Change at http://www.state.gov/www/global/global_issues/climate/index.html. U.S. domestic policy and programs can also be reviewed at another State Department website at <http://www.usinfo.state.gov/topical/global/environ/climate/main.htm>.
2. The primary site for U.S. climate change background and program information is the Global Warming site of the Environmental Protection Agency at <http://www.epa.gov/globalwarming/index.html>. It is a rich site that includes U.S. position papers on climate change.
3. The principal research website to begin an information search is the U.S. Global Change Research Information Office (USGCRP) at <http://www.gcrio.org/>. The USGCRP is operates under the auspices of the Subcommittee for Global Change Research (SGCR) that includes ten U.S. government agencies participating in global climate change issues. In terms of structure, the SGCR is a subcommittee of the Committee on Environment and Natural Resources that is one of the nine committees of the National Council for Science and Technology (NSTC) that is under the Office of Science and Technology of the White House.
4. The site to search for an agricultural perspective on climate change and provides all the relevant U.S. and several international linkages is the Global Change Program Office website at <http://www.usda.gov/agency/oce/gcpo/> in the Office of the Chief Economist (OCE) of the U.S. Department of Agriculture. The OCE also is responsible for U.S. domestic policy on sustainable development and small farmers and links to information is available at the same website.
5. Also from the perspective of U.S. international development policy and program operations is the USAID Climate Change Initiative that can be reviewed at http://www.usaid.gov/environment/climate_change.html. A cursory review of the Climate Change Initiative clarifies that U.S. development policy to date has focused on helping large developing countries

and regional economies to reduce greenhouse gas emissions through the transfer of clean energy technologies. Climate change activities aimed at carbon sequestration have been limited to large forestry projects.

There are numerous Non-Governmental Organizations (NGO) that monitor climate change. One that has a comprehensive site with good analysis on climate change programs as well as other international programs is the International Institute for Sustainable Development (IISD) in Canada. Their site is at <http://www.iisd.ca/>.

Finally, a U.S. NGO with heavy representation from the U.S. higher education community that follows the climate change debate is the National Council for Science and the Environment (NCSE). Through their National Library for the Environment (NLE) they provide access to the numerous reports completed by the Congressional Research Service on climate change as well as other scientific bodies. Their site is at <http://www.cnie.org>.

Results of Workshop

The workshop was hosted by the WMO in Geneva, Switzerland from August 30 to September 1, 2000. The workshop was co-sponsored by USAID and the International Fund for Agricultural Development (IFAD). The main objective of the workshop was to examine carbon sequestration in relation to climate change mitigation projects and sustainable agriculture projects. The final agenda of the workshop is attached as Appendix 2. Over sixty technical experts (scientists and development practitioners) attended the workshop and the list of participants is attached as Appendix 3.

On the first day, after the opening plenary, the workshop began with several presentations on institutional perspectives of carbon sequestration and sustainable development to set the stage for the workshop deliberations. Next, in plenary, highlights of the IPCC report on Land Use, Land-Use Change and Forestry (LULUCF) were discussed as this report serves as the basic study guiding the implementation of the Kyoto Protocol on these matters. Building on the LULUCF presentation were several other presentations that discussed broad carbon accounting issues in projects. The final session of the first day provided an overview of carbon sequestration project experience by geographic regions. The consultant served as a discussant on the presentations made regarding Latin America experience and briefly shared the LAC Bureau program experience with carbon accounting in smallholder shade coffee systems in Central America.

All the presentations on the first day were excellent but unfortunately hurried as too little time was available to present the topics thoroughly or discuss them adequately. The planners recognized the issue but determined that it was better to put as much information on the table as possible as quickly as possible to set the stage for subsequent

small group discussions. Given the level of expertise of the participants, the determination was the correct one.

On the second day, the plenary session continued for the first half day although presentations in plenary session had been scheduled for the afternoon as well. The morning sessions began the focus on the technical issues of *carbon accounting*, which involves design of prototype methodologies for soil carbon measurement and verification of the soil carbon impact of agricultural activities under a range of land use practices in developing countries. Specifically, presentations were made on topics including: baselines and leakages, measurement and monitoring, and verification systems and permanence. During the second half of the day, the participants were divided into three groups to discuss the issues more in depth and to propose options that could be presented to the plenary as workshops recommendations at the end of the day. The three group discussions included: measurements, baselines and incentives.

The consultant served on the small group that discussed baselines systems. In the workgroup discussions, the consultant's interventions were made that stressed the need for carbon accounting systems that directly linked the project to the individual smallholder's field through the modeling crop specific systems and verifying the models by direct measurement of a sample of participating smallholders. This carbon accounting methodology is referred to as activity-based accounting and is different from land-based accounting that doesn't link directly to the smallholder activity. The two systems have different implications to establishing project baselines and addressing the issue of permanence.

On the third day, the presentations that had been scheduled for the afternoon of the second day were presented first. These presentations dealt with the economic and financial incentives as well as institutional issues. Again, the presentations were all excellent but hurried because of the desire to return to small group discussions which continued to build on the discussions that had started the previous day. At the end of the day, the plenary was reconvened and the reports of the small groups were delivered.

In the closing plenary session, the organizers cited three achievements of the workshop. First, the participants established a strong consensus on the direction of the clean development mechanism of the Kyoto Protocol to address the needs of agriculture and the poor. Second, the participants generated many new ideas and new techniques and a long list of incentives in the design of market-led carbon sequestration projects. And third, the organizers agreed that the participants had established a network of interested scientists and practitioners as a result of the three days of discussions and debate.

Overall the workshop was a success for the organizers as it mobilized two key donors (USAID and IFAD) to address the issue of programming carbon sequestration in their economic growth and agricultural programming. Previously, USAID programming in the Climate Change Initiative, as mentioned above, emphasized the environmental and energy aspects of climate change mitigation programming and not the linkages to sustainable development and poverty alleviation. Now, at least, a programmatic linkage

has been established. The same may be said for IFAD, although it is interesting to note that in IFAD's recently released report entitled *Rural Poverty Report 2001 – The Challenge of Ending Rural Poverty*,⁴ the consultant was not able to identify any references to carbon sequestration projects and programming in report. This suggests that the linkage established between carbon sequestration and sustainable development in IFAD was a new one and likely a direct consequence of the workshop as well.

With this introductory overview on the workshop, below the specific highlights of the workshop from the perspective of the organizers is presented along with some comments. The organizer's report is entitled *Summary Report of the Expert Workshop on "Carbon Sequestration, Sustainable Agriculture and Poverty Alleviation"* and is attached as Appendix 4 to this report. Also below are highlights and comments regarding a concept note that recommends the development of a formal clearinghouse/network that is referred to as a *Global Carbon Sink System (GCSS)*. The GCSS proposal has been drafted under the direction of IFAD and circulated amongst other workshop participants for comments. A copy of the concept note on the proposed GCSS is attached as Appendix 5 to this report. Finally, a short update on the status of the negotiations of the Kyoto Protocol is provided with implications to programming of carbon accounting in economic growth and agriculture projects.

Comments on Summary Report

The organizer's *Summary Report* is presented in four broad parts, a discussion of *context*, a discussion of *content*, a presentation of the *findings* of the three working groups (measurement, baselines and incentives) and a brief note on *next steps*. As mentioned above, the report itself is attached to this report and readers are encouraged to review it. Specific highlights and comments regarding implications to LAC programming follow.

Context – The organizer's report makes the point that the workshop was convened to examine the confluence of three broad themes, new economic opportunities for farmers, increased corporate interest in carbon trading and the state-of-the-art in of carbon accounting systems. These issues apply to both developed and developing countries and better tools are essential for better functioning markets. The experts in the workshop therefore focused on the development of cost effective and reliable methodologies to provide carbon stock baseline information and monitoring changes overtime for small farmers and community involvement. The broad technologies reviewed included indirect approaches of remote sensing and computer simulation modeling as well as direct approaches of field level measurement.

Comment – The overall findings are on the mark for the LAC region where regional economic integration including full participation of smallholder agriculture within the framework of the Free Trade Area of the Americas (FTAA) scheduled for implementation in 2005 continues to be an important foreign assistance objective.

⁴ International Fund for Agricultural Development, *Rural Poverty Report 2001 – The Challenge of Ending Rural Poverty*, Oxford University Press, New York, 2001.

Hence, making available to LAC's smallholder agricultural sector the tools and methodologies that can fully meet global carbon accounting standards for accuracy and reliability at competitive costs would be an excellent program objective consistent with the findings of the Experts Workshop. And because the focus is for direct participation of smallholders in the market, special attention in LAC programming would be on computer simulation modeling and direct field/site monitoring/measurement/verification rather than remote sensing.

Content – The report outlines the five broad themes that were reviewed in the presentations in the workshop plenary. They were:

1. State-of-the-art of carbon accounting,
2. Preparatory work guiding the Kyoto Protocol negotiations (notably the LULUCF report),
3. Specific soil carbon issues in agriculture, agroforestry and rangeland land use management systems,
4. Institutional and market issues to reach small farmers and the rural poor in developing countries, and
5. Successful project-based examples in Africa, Asia and Latin America.

Comment – There was good overall balance of the presentations in the workshop as outlined above. However, in subsequent workshop and events related to carbon accounting in sustainable development, greater use should be made of the LULUCF report to define terms and clarify specific workshop objectives and agendas. The subject matter is extremely complex and the LULUCF report does a good job of sorting through what can be described as an almost overwhelming set of issues to review and consider. Furthermore, the report is to serve as the guide for LULUCF activities under the Kyoto Protocol and hence, any sustainable agricultural program or activity related to carbon accounting will need be clear how its definitions and rules relate to the definitions and rules under the Kyoto Protocol.

General Findings – The Organizer's determined there were two general findings.

First, soil types and vegetation types sequester carbon at different rates dependent on climate, soil properties and management systems. More is known about natural systems than managed systems but it is clear that improved land use management systems will result in a higher equilibrium carbon levels. Achieving these higher levels represents not only a potential new global market for farmers in developing countries but also will have positive environmental impacts locally and regionally as well.

Second, the basic tools and methodologies for carbon accounting at various geographic scales are available, are accurate and are reliable and can be employed to measure other benefits such as water quality and biodiversity as well. However, for developing countries, efforts are required to make them more accessible and available at a lower cost.

Comment – Both points are well taken in the LAC context.

Regarding linkages to other benefits, measuring and monitoring systems for carbon accounting will not only complement local and regional environmental program objectives but may also complement *on-farm quality assurance systems* program objectives. A case in point was the LAC project in support for measuring and monitoring systems to both verify shade coffee production standards and also sequestered carbon.

Regarding tools and methodologies, more work is required, particularly in land use management modeling of crop production practice standards (CPPS) and lower cost direct field/site measurement technologies. In the LAC region, perhaps more than other regions, the benefits must directly reach the smallholder. Hence the measuring and monitoring systems need to directly relate to the smallholder participating in the program on an activity-basis rather than as only one of numerous participants under a land-based accounting system.

Findings on Measuring Carbon – The analytical methodologies are available to measure soil carbon and carbon in biomass globally. Measurement at lower levels of geographic scales requires well-designed stratified sampling where the number of samples is dependent on the degree of homogeneity in the particular eco-region being measured. Geo-referenced regional simulation models combined with crop production and biomass models are required and build on soil and biomass inventories that are available. Standard measurement protocols will be developed under the Kyoto Protocol and new measuring techniques will be developed to reduce costs and increase accuracy.

Comment – For the LAC region, research and development activities will certainly be required to improve the carbon accounting systems. Again, because of the importance to direct smallholder participation, emphasis should be directed to crop level and field /site measurement systems and caution related to remote sensing investments in measurement must be exercised. Also, in developing the measuring techniques and measurement standard protocols, sharing and shifting of measurement and monitoring costs is an important consideration if on-farm quality assurance benefits and/or environmental benefits also accrue under the measurement and monitoring activity.

Findings on Project Baselines – In establishing project baselines, it is imperative to clarify the subsystems that are to be impacted on under the project. Levels of stratification, sampling rates and analytical procedures will all vary dependent on the subsystems. Establishing baselines on fragile land areas with widespread soil carbon decapitalization and common property systems is a different challenge than establishing the baseline for U.S. Midwestern agriculture. However, a common element is the geo-referencing of sampled plots and the setting up of control plots. In this context, various international agricultural development organizations have on-going programs that can be built upon. In addition, consideration must be given to the merit of a *systematic land monitoring system* to be proposed by the Food and Agriculture Organization that will

provide simultaneously data on carbon storage, soil quality, biodiversity and state of degradation.

Comment – Networking of spatial data is a good idea and the availability of internet-based geographic information systems (GIS) and hand-held Global Positioning Systems (GPS) receivers with meter level accuracy will dramatically drop the cost of collecting and maintaining such data. The issue of baselines will become more problematic in developing countries as they rectify carbon project baselines with their national inventories.

Findings on Incentives – The organizer’s report suggests that the introduction of a global market for carbon will hopefully force additional incentives favoring reforms and transformations resulting in the participation of poor in carbon markets. Technical constraints to participation by the poor can be overcome but the larger unknown is the socioeconomic issue involving policy reforms, new institutions and technical assistance. In particular, they see three broad areas of concern, *carbon trading by the poor, economic advantages of the smallholders and environmental standards.*

In terms of carbon trading by the poor, the matter of who could serve as an honest broker in the market on behalf of the poor was raised. The position offered by some was that carbon payments would be made to projects and rural associations rather directly to farmers given the higher expected transactions costs for smallholders. Others strongly objected to anyone acting on behalf of the farmers as such approaches would move towards traditional ineffective and inefficient government interventions. All agreed that the development of profiles for investments would be useful and these would include both land use management schemes and carbon-offset schemes.

Economic advantages of the poor include the fact that some soils are heavily degraded and land use management activities could result in large gains in carbon sequestration. Parts of Africa meet this criterion. However, two constraints were also discussed related to participation by the poor. These were the relatively high transactions costs as mentioned above and the issue of common or open property systems that characterize many production systems in developing countries. In the absence of private property rights and clear titles, who owns the sequestered carbon?

Ensuring environmental standards is an issue. The larger issue is one of leakages and additionality that confront all carbon schemes. How do you ensure that activities undertaken to sequester carbon do not modify normal behavior and result in reduced environmental performance of the total system. Also discussed was the more direct issue that efforts to increase carbon sequestration would simultaneously result in environmental degradation. The workshop concluded that the answer was to “develop a menu of “sustainable” agricultural land-use change options that would be considered allowable under carbon sequestration projects”.

Comment – The workshop recommendations are all good ones and the LAC Bureau should carefully examine each to see how they can contribute to expanded smallholder participation in carbon sequestration projects in the region. In particular, the LAC Bureau should focus on investment opportunities that directly relate the smallholder to the market and not through organizations. Also the LAC region should examine the issue of private property rights on carbon.

Next Steps – The *Summary Report* includes a discussion of a single next step. Specifically, the CGIAR's Future Harvest Intercenter Working Group on Climate Change together with USAID's Soil Collaborative Research Support Program (Soil CRSP) and Sustainable Agriculture and Natural Resource Management (SANREM CRSP) would propose to WMO's Global Climate Observing System (GCOS) and FAO's Global Terrestrial Observing System (GTOS), a pilot design for an agricultural carbon measurement and monitoring clearinghouse. Pilot sites for testing their combined measurement approaches will be identified and overseen by IFAD and its host-country counterparts.

Comment – The proposal is a logical next step and a concept note for a clearinghouse has been circulated for comment to other participants in the conference. The concept note is discussed in the next section of this report. It is not clear if the proposal has been generated by the organizations as outlined above but a proposal for an agricultural carbon measurement and monitoring clearinghouse has been developed nonetheless.

Comments on "A Concept Note"

In addition to the USAID internal report on the workshop, selected participants in workshop under the direction of IFAD drafted a concept note recommending the development of a *Global Carbon Sink System (GCSS)* that has been circulated amongst other conference participants for comment. The concept Note is attached as Appendix 5. Highlights of the concept note are discussed below and my comments on the proposed GCSS concept follow the highlights.

Highlights - The Concept Note begins with a review of the workshop general results. The drafters concluded that despite the considerable uncertainty of starting the clean development mechanism under Article 12 of the Kyoto Protocol and the uncertainty facing "emission trading" under Article 17, a more formal structure of cooperation and information exchange related to the issue of linking carbon sequestration projects to smallholder agriculture and the rural poor is necessary. Given the reduced resources by donors being allocated to sustainable development in developing countries and the expected major role the private sector is expected to play in global climate change mitigation activities, the drafters emphasized the importance of private sector participation and funding of the proposed system. In fact, the overall objective of the

proposed "global System and Partnership" is to mobilize private sector investment for carbon sequestration activities by resource poor farmers.

The broad function of the system is to serve as a clearinghouse for information and data dissemination on carbon, socioeconomic and environmental activities related to smallholder/rural poor carbon sequestration projects. The system would have broad thematic nodes as well as broad regional nodes. Operational aspects of the system include a website, perpetual stocktaking exercises, meetings and consultations, joint publications, and reviews and assessments. Organizational aspects of the system include the identification of *Benefactor* organizations and *Endorser* organizations, a *Housing Institution*, a *Secretariat* and *Reviewers/Assessors*. A budget of US\$ 150,000 to fund the design stage involving the development of a series of papers leading to a three-year test period to launch and implement the System is proposed. No estimate of budget for the three-year test period is provided. The Note ends with a brief discussion of a *Road Map* of events involved in the development of the proposal and the identification of the core group designing the System.

Comments – The overall concept of an organized clearinghouse of information on smallholder/rural poor carbon sequestration projects supported by an organized cooperative effort on the part of interested donors, NGO's and corporations is a good one. Regardless of the overall uncertainty facing the Kyoto Protocol in general and Article 3.4 (additional LULUCF activities), Article 12 (clean development mechanism) and Article 17 (emission trading) in particular, what is certain is that if direct efforts are not made regarding participation by smallholders and the rural poor in the climate change mitigation project arena, presumed scale economies will continue to favor large forestry projects. That said, the proposed clearinghouse concept should be modified in several ways.

First, the proposal recognizes that the smallholder/rural poor participation in the carbon sequestration projects will have synergies and tradeoffs with sustainable development and environmental projects but provides no strong organizing theme to address these relationships. The thematic nodes that are proposed are very broad academic disciplinary areas such as: *science, socio-economics, marketing, financing, certification, policy and law*. An alternative is to focus on the issue *carbon accounting* and have sub-themes as in the workshop including: *definitions, measurement, reporting, monitoring, verification, certification and auditing*. These are the topics that were discussed and debated in the workshop and will continue to be the substance of smallholder/rural poor participation in issue of carbon sequestration projects. These same sub themes are increasingly important issues in sustainable development and environmental projects as well and hence, ideal to address synergies and tradeoffs.

Second, the proposal links to the clean development mechanism and emissions trading and refers to "biotic carbon offsets" but does not refer to LULUCF activities. The proposal should be centered on the issue and not the funding mechanisms. For clarification, the proposal should be limited to additional activities (LULUCF activities)

under Article 3.4. for smallholders/rural poor. In this context, the recent IPCC LULUCF report should serve as the baseline document for the design of the proposal.

Third, the proposed title of *Global Carbon Sink System* does not accurately address the smallholder/rural poor focus of the proposal and should be modified accordingly. Something like *Carbon Accounting in Smallholder Projects* would be preferred because the three main ideas of carbon accounting, smallholders and projects are all included in the title and better understood than the term *sink system*.

Fourth, the regional themes listed are Europe, Africa, Asia, and Latin America. These regional aggregations are of marginal value in differentiating operational programs. One alternative is to use the evolving regional economies that are being organized under Free Trade Areas (FTAs). The Kyoto Protocol has very specific guidance for participation of regional economies and the therefore Protocol guidance should figure prominently in the proposal.

Post Workshop Update

The workshop addressed LULUCF activities in the context of sustainable development projects and poverty alleviation within the framework of the Kyoto Protocol that continues to be debated and negotiated. Hence, progress on the design and development of projects for carbon sequestration and sustainable development is dependent on overall progress to implement the Kyoto Protocol as well as resolving two specific issues in Kyoto Protocol. The first issue includes the role of LULUCF (carbon sinks) and involves Article 3.4 (additional activities). The second issue includes the mechanisms and involves Article 12 (clean development mechanism) and article 17 (emission trading). The current status of the Protocol and these specific Articles are discussed next along with some implications.

The sixth Conference of the Parties (COP 6) to the UNFCCC was held at The Hague from November 20 – 25, 2000 to agree on the implementation of the Kyoto Protocol. The U.S. policy⁵ going into COP 6 as stated in the opening statement of the U.S. Head of the Delegation included the following six points.

- Strong, market-based rules for the flexible mechanisms;
- An airtight accounting system;
- Binding legal consequences for failure to meet targets;
- Rules that recognize the role of forest and farmlands in fighting climate change;
- A prompt start to the Clean Development Mechanism, with rules to ensure its workable operation and environmental integrity;

⁵ David B. Sandalow, Assistant Secretary of State for Oceans, Environment and Science, Head of the United States Delegation, Opening Statement to the Sixth Session of the Conference of the Parties to the U.N. Framework Convention on Climate Change, The Hague, The Netherlands, November 13, 2000. <http://www.usemb.nl/pd11113.htm>.

- Help to provide the technology and capacity developing countries need to combat climate change and adapt to its impacts.

In addition to the six points, the Head of the U.S. Delegation also added a strong statement of U.S. support for carbon sequestration and sustainable development in developing countries; "As we did last year in Bonn at COP-5, we will urge a new process among developed and developing countries to explore ways in which all countries can promote strong economic growth and fight poverty while meeting the challenge of climate change."⁶

Unfortunately, the parties could not agree and the talks in November at The Hague were suspended. The talks have been scheduled to resume in Bonn July 16-27, 2001. According to the UNFCCC press release, the three broad stumbling blocks at COP 6 in November included the lack of agreement on the mechanisms (clean development mechanism and emission trading), the rules for counting emission reductions from carbon sinks such as forests, and a compliance regime. Other sources attributed the suspension to the single difference between the EU and US regarding the rules for counting emission reductions from forests. The EU position was that the US must do more to directly reduce its GHG emissions rather than relying on carbon sinks in domestic forests.

The issue of inclusion of additional LULUCF activities was a stumbling block but the President of COP 6 issued a note on November 23, 2000 that outlined a basic agreement that was near at hand. The note suggested that additional Article 3.4 activities may be included in the first commitment period but limited the amounts that a Party could count towards meeting its Article 3 commitments at 3% of its base year emissions. The activities that were listed included grazing land management, cropland management, and forest management all broadly defined and revegetation narrowly defined. The President's note also suggested that LULUCF activities for the second commitment period as well as the rules modalities and guidelines for their accounting would be reviewed later. The note also suggested that the parties agreed that LULUCF activities would be included under the clean development mechanism but placed some restrictions on the implementation of afforestation and reforestation projects.

The President's note also suggested that agreement had been reached on the mechanisms. The composition of the executive Board of the Clean Development Mechanism was defined as well as the eligibility of projects. The Clean Development Mechanism is to give priority to projects that involve renewable energy (small scale hydro) and provide energy efficiency improvements. The note also suggested that there was agreement on emissions trading but concerned that a problem of overselling could arise because of inadequate compliance regimes. Hence, Annex B parties would retain a level of 70 % of their assigned amounts.

All accounts suggest that an agreement amongst the parties to begin implementation of the Kyoto Protocol was very close. The major issue was the amount of carbon sinks that the US could count. Resolving this issue then suggests that the other

⁶ Ibid

issues on LULUCF activities under Article 3.4 and issues related to the clean development mechanism, Article 12 and emissions trading Article 17 would in all likelihood be agreed upon more or less as worked out at The Hague and reported in the President's note.

The new U.S. administration will be making a basic decision if it can support the Kyoto Protocol and if it does, it is unlikely that it will try to renegotiate positions except at the margins. Hence, the implication would be that LULUCF activities will be included in the first commitment period and can be included in the clean development mechanism and emission trading. However, if the new administration is unable to support the Kyoto Protocol, that is, it is not willing to accept the commitment to reduce Green House Gas (GHG) levels 5 percent below the 1990 level in first commitment period 2008 – 2012, then the implication for LULUCF activities in the Kyoto Protocol is unclear as the U.S. has been a major supporter of including carbon sinks in the negotiations. Other developed countries and regions, particularly the European Union, have emphasized the need to reduce emissions to meet the targeted amounts. Notwithstanding the Kyoto Protocol, one could argue that given the relative importance of LULUCF activities to the U. S. in addressing the issue offsetting GHG, continued efforts by the LAC Bureau to ensure smallholder participation in carbon sequestration projects are warranted.

Recommendation on LAC Direction

The specific proposals regarding a recommended direction for the LAC Bureau to take is discussed below in the section titled *Proposed Actions*. However, before presenting the proposed actions, brief comments are provided with regard to the questions raised in the LAC/RSD/BBEG "work plan procedure". Those questions to be focused on in the report include: *interests in the region, potential net carbon storage of additional activities, and different techniques of measuring carbon sequestration*. Each is discussed below. In responding to the questions, extensive quotes from the summary of the IPCC LULUCF report *A Report on the Key Findings from the IPCC Special Report on Land-Use, Land-Use Change and Forestry*⁷ are introduced, as the issues and terminology are complex.

Interests in the Region

Interests in the region are discussed with three questions in mind. First, what are the overall carbon sequestration versus emissions reduction interests of particular LAC regions? Second what are the LULUCF interests in the regions (i.e. Article 3.3 versus

⁷ Robert T. Watson, Chair of the IPCC, *A Report on the Key Findings from the IPCC Special Report on Land-Use, Land-Use Change and Forestry*, 12th Session of SBSTA, Bonn, Germany, June 13, 2000, <http://www.ipcc.ch/press/sp-lulucf.htm>

Article 3.4)? And third, of the additional activities under Article 3.4, what are the broadly defined versus narrowly defined interests in the regions?

Interests in Carbon Sequestration vs. Emissions Reductions – U.S. interests in the Kyoto Protocol are overall energy driven and a major issue is how much the U.S. can offset GHG emissions in its assigned amount with domestic carbon sequestration credits and internationally traded credits. These same interests are shared with its NAFTA partners that also have significant domestic options to sequester carbon through LULUCF activities. These interests, however, are in sharp contrast with EU interests where carbon sequestration is much less of an option. This led to the major difference in COP 6 where the EU wanted to see the U.S. focus much more on reducing its emissions leading to the lack of agreement and suspension of the talks. Given the U.S. administration recognition that it needs a comprehensive energy policy, the issue of carbon sequestration will have to be considered. In this context, it is interesting to note that the President has suggested that given the economic integration of NAFTA and the importance of energy to economic health of all the partners, the new energy policy should be a North American energy policy. This suggests that the U.S. positions regarding the implementation of the Kyoto Protocol will likely be coordinated more closely with Canada and Mexico.

The balance of interests between carbon sequestration and emissions reductions differs in the other LAC regions depending on the industrialization of the region and the availability of non-fossil fuel based energy sources. Interests to acquire clean technologies to address emission reductions are greatest for Mercosur and the Andean regions but both regions also have extensive areas where carbon sequestration projects will play an important role. The CACM region is also interested in both but does not have vast areas for carbon sequestration projects as with Mercosur and the Andean regions. The Caribbean interests, because they are island states or states with extensive coastal areas, are particularly interested the issue of how to cope with the consequences of climate change. Carbon sequestration and emissions reductions in the Caribbean will have little affect in the aggregate and hence, of lower interest.

Interests in LULUCF Activities – The IPPC LULUCF report made the following conclusion.

“A basic conclusion of the report is that LULUCF activities provide an opportunity to reduce greenhouse gases emissions into the atmosphere by avoiding deforestation, and to increase the uptake of carbon from the atmosphere into the terrestrial biosphere through afforestation, reforestation and improved forest, cropland and range-land management activities. However, it will be critical to develop an internally consistent set of definitions and accounting procedures, coupled with a measuring and monitoring system, if governments want a system which accurately reflects the exchanges of carbon between the terrestrial biosphere and the atmosphere from applicable LULUCF activities. Well designed LULUCF activities also have the potential of contributing to sustainable development goals.”⁸

⁸ Ibid

However, an important distinction has to be made between ARD activities and other additional activities within the overall LULUCF activities. Article 3.3 provides for ARD activities that are included in the first commitment period and they have been addressed on a priority basis by energy and environmental interests through the U.S. Joint Implementation (JI) program that is covered Article 6 of the Kyoto Protocol. As noted above, these ARD activities contribute to sustainable development but not necessarily poverty alleviation. From a regional perspective, those areas which have vast areas in forests are more interested in ARD than additional activities that involve more intensive design and monitoring. Those areas include Mexico, Mercosur, the Andean region and to lesser extent CACM.

Article 3.4 provides for all other additional LULUCF activities. If approved for implementation in the Kyoto Protocol, such LULUCF projects can be supported by the Clean Development Mechanism Article 12 and participate in the emissions trading under Article 17. Because these additional LULUCF activities include agricultural activities and agroforestry activities, they have much greater direct impact on poverty alleviation than the ARD activities in Article 3.3. All LAC regions are interested in project activities and investment resources that can assist them in alleviating poverty in their regions. Hence, it is fair to suggest that all regions including the Caribbean are interested in Article 3.4 additional LULUCF activities. An important further distinction between these activities is discussed next.

Interests in Broadly Defined Versus Narrowly Defined LULUCF Activities –
 Within the category of Article 3.4 LULUCF additional activities, there are two types as discussed in the summary of the LULUCF report below.

“Additional activities under Article 3.4 can be defined broadly or narrowly and can involve improved management practices or land-use change. Additional activities under Article 3.4 can be defined broadly (e.g., forest, cropland or range-land management) or narrowly (e.g., changes in tillage method, irrigation water management, fertilization or crop selection). Both are consistent with a land-based, activity-based or combined accounting system. However, because broad-based activities are land- or area-based, they are most suited to a land-based accounting system, where-as narrowly-based activities are most suited to activity-based accounting. It should be noted that when broad-based activities are associated with land-use changes it may be difficult to separate the human-induced changes in carbon stock from those occurring naturally or in response to indirect human activities.”⁹

From the combined perspective of carbon sequestration, sustainable agriculture and poverty alleviation, the more important area of interest is in narrowly defined, activity-based carbon sequestration projects. Such projects begin with the individual smallholder at the field level. This is in contrast to the broadly defined, land-based projects that begin at the top and where some benefits may trickle down to the smallholders that live and work within the project's broadly defined land-base area.

⁹ Ibid

Bottom-up activities begin at the field level and modify the production practices. All regions are interested in the bottom-up approach but not because it will lead to major energy related impacts in the short run but rather that such activities incorporate the smallholder/rural poor sector into the carbon accounting regime where the benefits that will accrue include first the potential for added income, second local environmental benefits and third contribute to climate change mitigation.

Potential Net Carbon Storage of Additional Activities

The scope of work specifically directed the consultancy to address the question of potential net increases in carbon storage that may occur via (a) improved management within a land use, (b) conversion of land use to one with higher carbon stocks, or (c) increased carbon storage in harvested products. To respond to this question, the aggregate potentials of both Article 3.3 ARD activities and Article 3.4 activities that are discussed in the LULUCF summary report are presented. Annex 1 countries are developed countries that have agreed to accept firm commitments to reduce GHG emissions and have established national levels. Non-annex 1 countries are developing regions that often have not yet completed their national inventories and hence, specific estimates of aggregate potentials are not available.

“Article 3.3 activities have the potential to reduce greenhouse gases emissions into the atmosphere by avoiding deforestation and by increasing the uptake of carbon from the atmosphere into the terrestrial biosphere through afforestation and reforestation. However, ARD activities are likely to result in accounted net emissions from Annex I Parties during the first commitment period because the debits due to deforestation are likely to outweigh the credits due to afforestation and reforestation, even though the total forested lands in Annex I countries are likely to be a net sink: Using IPCC definitions of AR and D, continuation of the current rates of A/R and D activities in Annex I countries would result in annual accounted changes in carbon stocks of 7 to 46 Mt C (A/R) and -90 Mt C (D) during the first commitment period, hence an overall accounted debit of -44 to -83 Mt C annually. If hypothetically, the rates of A/R are increased by 20%, and the rates of D are decreased by 20%, this would result in an increased uptake of 0 to 3 Mt C (A/R) and a decreased emission of 18 Mt C (D), hence an overall accounted debit of -23 to -62 Mt C annually. These accounted changes in carbon reflect the net exchange of carbon between the atmosphere and terrestrial biosphere on lands accounted under Article 3.3, which are only a small fraction of the total forested lands within Annex I countries. Using FAO definitions of AR and D, coupled with three different accounting systems (land-based I and II and activity-based), results in either large credits or debits being accounted. Only in the case of land-based I does the accounted carbon approximately reflect the net exchange of carbon between the atmosphere and terrestrial biosphere on lands accounted under Article 3.3. However, the large debits (-333 to -849 Mt C per year) reflect the fact that much of the managed forest estates, which are in carbon equilibrium, are not accounted for. Significant opportunities

exist for reducing emissions through avoided deforestation and enhancing uptake through reforestation and afforestation in non-Annex I countries.”¹⁰

Article 3.4 activities have the potential to uptake carbon by up to 250Mt C annually within Annex I countries during the first commitment period: Activities which could potentially fall under Article 3.4 include forest management other than that covered by Art 3.3 (ARD), changes in management practices which do not lead to a change in cover type, e.g., conservation tillage, and changes in land management which lead to a change in land cover type, e.g., conversion of cropland to grassland. There are three broad categories of management activities in Annex I countries that have the potential to uptake carbon dioxide by up to 250 Mt C annually during the first commitment period, i.e., forest, cropland and range-land management. In addition, there is the potential to increase the uptake of carbon in non- Annex I countries through the same three management activities and by converting degraded agricultural lands into agroforestry.¹¹

Clearly, the issue of avoiding or slowing the rate deforestation is the key activity under Article 3.3 activities. However, the aggregate magnitude of Article 3.4 additional LULUCF activities is substantially greater than the levels expected from afforestation and reforestation activities. On a per hectare basis, some activities and approximate net annual rate of change in carbon stocks based on global estimates from the LULUCF¹² report are as follow.

Improved Management within a Land Use

Forest Management	0.4 t C ha/yr
Cropland Management	0.3 t C ha/yr
Grazing Land Management	0.7 t C ha/yr
Rice Paddies	0.1 t C ha/yr
Agroforestry	0.3 t C ha/yr

Land-Use Change

Agroforestry	3.1 t C ha/yr
Conversion of Cropland to Grassland	0.8 t C ha/yr
Wetland Restoration	0.4 t C ha/yr
Restoring Severely Degraded Land	0.3 t C ha/yr

¹⁰ Ibid

¹¹ Ibid

¹² Robert T. Watson, et al, editors, *Land Use, Land-Use Change, and Forestry*, Published for the Intergovernmental Panel on Climate Change, Cambridge University Press, 2000.

The potential for meaningful carbon sequestration impacts for narrowly defined activity-based projects under Article 3.4 additional LULUCF activities is significant. The costs of these types of projects are higher of course and are discussed next.

Techniques of Measuring Carbon Sequestration

Regarding specific LULUCF interests, broadly defined activities in Article 3.3 ARD have been emphasized because the relationship between national accounting of assigned levels and large scale anthropogenic activities are easier to measure as they involve changes in land cover and changes in biomass. Hence, remote-sensing techniques coupled with large area ecosystems modeling and extensive sampling are measurement techniques of choice for effectiveness and efficiency. But the techniques are well understood for both systems as the summary LULUCF report concludes.

“Methods for measuring and estimating changes in carbon stocks exist to meet the needs of the Kyoto Protocol: Technical methods that may be deemed to be sensitive enough to serve the requirements of the Protocol exist for above ground carbon stocks and probably for below ground carbon stocks. However, while Annex 1 Parties generally have the technologies available, few currently apply them routinely for monitoring, hence operational systems will have to be developed. In contrast, Non Annex 1 Parties may require assistance to develop the necessary capacities. Improved methods and research results are likely to be highly transferable from Annex I to non-Annex I Parties.”¹³

“Accounting systems can be either land-based, activity-based or a combination of both and should be transparent, consistent, comparable, complete, accurate, verifiable and efficient. The sequence of steps for a land-based system is: (i) definition of applicable activities referring to specific land areas; (ii) estimate of land units per activity, (iii) estimate of changes in carbon stocks per unit land area/time period, and (iv) sum over land units and the commitment period. If the land-based approach is used it may be difficult to factor out natural and indirect human-induced effects when there are changes in land-use. The sequence of steps for an activity-based system is: (i) definition of applicable activities; (ii) estimate of changes in carbon stocks per activity/unit of area/time period, (iii) estimate of land area per activity, and (iv) sum over activities and commitment period. If the activity-based approach is used, and if there are multiple activities taking place at some locations, the effects may not be additive and accounting errors could occur.”¹⁴

“The key issues of concern for project-based activities, i.e., baselines, additionality, leakage, monitoring, verification, and permanence are, with the exception of permanence, not unique to LULUCF activities: Experience is being gained to address these issues through about thirty Activities Implemented Jointly (AIJ) and other LULUCF projects that are under initial stages of implementation in nineteen countries.

¹³ Robert T. Watson, Chair of the IPCC, *A Report on the Key Findings from the IPCC Special Report on Land-Use, Land-Use Change and Forestry*, 12th Session of SBSTA, Bonn, Germany, June 13, 2000, <http://www.ipcc.ch/press/sp-lulucf.htm>

¹⁴ Ibid

To date this experience is constrained by a number of factors including the small number, the limited range of project types, the short period of field operations and the lack of internationally agreed guidelines and methods to establish baselines and quantify emissions and uptake. Key issues include, *inter-alia*:

- *baselines*: project or regional/national sectoral baselines, and fixed or adjustable
- *additionality*: environmental, financial, technological and institutional
- *leakage*: national and transboundary – quantification could be addressed through monitoring key indicators and using standard risk coefficients, and reduction through project design by offering alternative livelihoods and access to land, food, fuel and timber resources
- *monitoring and verification*: techniques and tools exist to measure carbon stocks in project areas relatively precisely depending on the carbon pool. Qualified independent third-party verification could play an essential role in ensuring unbiased monitoring.
- *permanence*: could be addressed by projects that run in perpetuity, debits for all releases, project replacement, or delayed/partial credit initially (tonne year accounting). It could also be addressed through various internal and external risk reduction approaches including good practice management systems, project diversification, self-insurance reserves, standard insurance services, involvement of local stakeholders and regional carbon pools.”¹⁵

Based on the potential interest of LAC regions to introduce Article 3.4 carbon sequestration projects as described above and the issue of transferring techniques of measurement and monitoring, several proposed actions for LAC/RSD/BEG are recommended.

Proposed Actions

The activities that are proposed below will be considered during a period when U.S. foreign assistance and USAID programs are both under review. The activities that are being proposed are believed to be consistent with the direction that development assistance is headed but for the sake of clarity, a broad programming backdrop is perhaps useful. Three background themes are presented. They are: a shift in U. S. foreign assistance goals, Science and Technology (S&T) access and governance as a key strategic programming objective, and renewed interests in program assistance alliances.

The first consideration is that USAID’s economic growth and agricultural programming objectives are being reconsidered as part of the new administration’s review of U. S. foreign assistance. One option in terms of economic growth goal revision is to shift USAID’s focus from helping countries to achieve *self-sustaining economic growth* and *alleviating poverty* to a goal of helping countries to integrate into an *open and equitable international system* while enhancing *individual civil and economic rights*. These latter goals are consistent with the U.S. Foreign Assistance Act of 1961 as

¹⁵ Ibid

amended and are important objectives in the "globalization debate". Given the Free Trade Area of the Americas' potential impact on all countries and individuals in the LAC region, such a shift in the LAC Bureau's strategic program merits consideration.

The second consideration is the growing recognition that Science and Technology (S&T) programming is an important instrument in achieving the foreign assistance goals, particularly the goals of global and regional economic integration where market access is increasingly tied to product and process standards unattainable without substantial investments in new technologies. Technology access by individuals is also an important issue in a globally integrated knowledge-based economy; the difference between haves and have-nots is access to knowledge and technologies and is becoming increasingly clear with the digital divide. In another paper for USAID, the consultant has argued that an option for a new USAID S&T programming policy is *to advance S&T access and governance in regional developing economies*.¹⁶

The third consideration is USAID's renewed interest in designing and implementing its programs through alliances with the private sector and non-governmental organizations (NGO's). USAID has long recognized the merit of such cooperation but in some areas of programming, USAID program relevance is now dependent upon such alliances. Agricultural programming is a case in point.

USAID agricultural staff and budget resources have been dwindling over the years to a point where they are at best marginal to the global scale of the issues. Access to, and governance of, agricultural science and technology is the key to addressing global challenges in food and economic prosperity for the rural poor and advancing strategic alliances is the only way that USAID can do better. The alliance includes private sector provision of both the access of technology through both intellectual property licensing and risk capital consistent with sound and viable investments. The alliance includes the NGO's with the field presence and knowledge of the local cultural reality that is critical to sound investments. And finally, the alliance includes the U.S. Higher Education community to augment USAID's technical cadre. Certainly USAID can and should increase its technical ranks but given the accelerating rate of scientific discovery and technological advances, any attempts to remain current requires USAID to form new relationships with the U.S. Higher Education community to assure that its programs are technically sound.

Assuming the programming themes discussed above will be involved in making LAC program choices coupled with the results of the *Experts Workshops on Carbon Sequestration, Sustainable Agriculture and Poverty Alleviation* plus the uncertain status of the negotiations of the Kyoto Protocol, two sequential efforts should be undertaken. First, LAC/RSD/BBEG should complete three surveys/studies. Based on the results of the studies, they should be prepared to co-fund three to five alliance designed and

¹⁶ John A. Becker, Consultant, *Advancing Science and Technology (S&T) Access and Governance in Regional Developing Economies - A Policy Option Brief*, USAID/PPC/PDC, January 2001.

implemented smallholder *on-farm quality assurance* demonstration programs that each include sequestered carbon as a joint product. The studies and the demonstration programs are discussed more in depth below.

Surveys/Studies

A Survey of U.S. Agricultural Trade Associations should be undertaken to identify interests in the development of smallholder on-farm quality assurance programs in cooperating regions of LAC. For example, the producers of a particular high-value vegetable crop in the U.S. may wish to work with the growers of the same crop imported into the U.S. market in the off season to establish crop production process standards that advance the collective interests of the specific commodity industry. The assumption here is that U.S. agricultural producer and trade interests struggling with market integration recognize the value of cooperative relationships with producers in other countries and would welcome the opportunity to work through an alliance to advance collective self-interests. Such a survey was developed but shelved by LAC/RSD/BBEG for lack of funding in 1998. That proposed survey could serve as the starting point to design a new study.

A Survey of U.S. NGO Involvement and Interest in Smallholder On-Farm Quality Assurance and Carbon Sequestration Programs should be undertaken to identify programs, interest and awareness. The survey would include a desk review on the Internet and telephone contacts to compile the initial listing of active NGO's and would be followed up by workshop to clarify programmatic issues and interests in forming alliances. The assumption is that the NGO's have operational programs and would welcome the opportunity to share their experience and comment on future needs.

A Survey of U.S. Domestic Certification Programs for On-Farm Quality Assurance and Carbon Sequestration should be undertaken to identify the current state of the art in terms of measurement, monitoring as below in Table 1. The issue for LAC is smallholder agriculture and this means that narrowly defined activity-based accounting is required to track carbon sequestration gains to the farmer. Also, while the smallholder will benefit from carbon sequestration projects, their participation in such projects will depend on the extent that the measuring and monitoring costs can be shared by the measuring and monitoring costs incurred to gain market access. It is recommended that LAC/RSD/BBEG establish an ad hoc task force to examine the programming implications of recent developments in carbon accounting systems and on-farm quality assurance systems in the development agriculture sector. More specifically, it is recommended that LAC/RSD focus on the costs of carbon accounting projects and the costs of on farm quality assurance systems. Those cost include the following.

- Costs of project design, implementation and evaluation.
- Cost of carbon sequestration practices (incurred by the grower).
- Cost of verification.
- Cost of marketing credits.

<u>Procedures Involved</u>	<u>Carbon Accounting</u>	<u>On-Farm Quality Assurance</u>
Nature of the Problem	Measure Net Change in a Carbon Overtime	Verify Production Process and Link to Harvested Product to Establish Basis for Identity Preserved Marketing
<u>Planning</u>		
1. Set Standards	Specify Land Use Standard	Crop Production Process Standard (CPPS) or Site Specific Crop Management (SSCM)
2. Model Process	Carbon Accounting Modeling such as the GORCAM	Plant/Crop Modeling such as the DSSAT (optional)
<u>Implementation</u>		
3. Inventory Natural Resource Base	Field Characterization with GPS/GIS	Field/Border/Landscape Characterization with GPS/GIS
4. Verify Process Events	Event Documentation by GPS/GIS	CPPS Event Documentation by GPS/GIS
<u>Certification</u>		
5. Performance	Estimate Field Carbon Sequestration Performance with Event (independent variables) Values	Product Linkage at Harvest to Field Gate with GPS/GIS Results in IP Commodity
<u>Audit</u>		
6. Compliance Review	Sample to Refine Model Estimates	Sample to Verify Grower Participation (3 rd Party)

Table 1. Planning, Implementation, Certification, Audit

Demonstrations Programs

Upon completion of the three studies described above, the partners in the carbon accounting alliance will have a good understanding of the synergies and trade offs between narrowly defined activity-based carbon accounting projects and on-farm quality assurance certification programs. Based on this information and assuming the studies support proceeding further, it is recommended that LAC/RSD/BBEG initiate one or two alliance demonstration projects in each of the regions. The purpose of the demonstration projects would be to determine the complementarities between carbon accounting and on-farm quality assurance programs to assist the smallholder sector in the LAC region to participate in global markets for identity preserved (IP) commodities and carbon sequestration services (carbon sinks).

List of Appendixes

Appendix 1: Climate Change Mitigation & Sustainable Development in the LAC Region; Presentation by John A. Becker

Appendix 2: Agenda – Expert Workshop on “Carbon Sequestration, Sustainable Development and Poverty Alleviation”

Appendix 3: List of Participants – Expert Workshop on “Carbon Sequestration, Sustainable Development and Poverty Alleviation”

Appendix 4: Summary Report of the Expert Workshop on “Carbon Sequestration, Sustainable Development and Poverty Alleviation”

Appendix 5: Global Carbon Sink System For Rural Poverty Alleviation (A Concept Note - draft)

Appendix 1

**Climate Change Mitigation &
Sustainable Development in the LAC Region**

Presentation by John A. Becker

Climate Change Mitigation & Sustainable Development in the LAC Region

Presentation by
John A. Becker
Greenbury Shaw Associates

Presentation Overview

- ✧ Background on UNFCCC & Kyoto Protocol
- ✧ The Issues at COP 6 -- The Hague
- ✧ Latin American and Caribbean Participation
- ✧ Implications to LAC Programming
- ✧ Implications to IR 3

United Nations Framework Convention on Climate Change

- ✧ Established in New York on May 9, 1992
- ✧ Ratified by 186 countries
- ✧ Ratified by the U.S. (fourth country) on October 15, 1992
- ✧ Builds on Plan of Action to Combat Desertification of 1989
- ✧ Builds on Montreal Protocol to protect Ozone Layer of 1987

Framework Convention on Climate Change

- ✧ Definitions
- ✧ Objective
- ✧ Principles
- ✧ Commitments
- ✧ Structure
- ✧ Overview of the Process

Some Key Definitions

- ✧ Climate Change -- anthropogenic attribution
- ✧ Climate System -- all spheres and interaction
- ✧ Emissions (release of greenhouse gases)
- ✧ Greenhouse Gases (6) (3) (1)
- ✧ Regional economic integration organization
- ✧ Reservoir -- forests, oceans, soil
- ✧ Sink (process that removes greenhouse gas)
- ✧ Source (process that releases greenhouse gas)

The Objective

- ✧ "...stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a timeframe sufficient to allow ecosystems to adapt naturally to climate change..."

The Principles

- 1. Protect the climate system on the basis of equity where developed country parties lead.
- 2. Needs and circumstances of developing country parties are given full consideration.
- 3. Lack of full scientific certainty should not postpone precautionary measures which should be cost effective and can be carried out cooperatively amongst parties.

The Principles "continued"

- 4. Climate change mitigation policies and measures should be integrated with national sustainable development programs.
- 5. Climate change mitigation measures taken should not restrict trade.

Key Commitments by All Parties

- Provide national inventories of anthropogenic emissions by sources and removals by sinks.
- Undertake national and regional programs containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks.

Key Commitments by All Parties "continued"

- Promote transfer of technology to mitigate climate change by reducing or preventing anthropogenic emissions in all sectors.
- Promote sustainable management and enhancement of sinks and reservoirs of greenhouse gases.
- Cooperate on plans to adapt to the impacts of climate change, e.g. coastal zone management, water resources and agriculture.

Key Commitments by Developed Country Parties

- Adopt policies and take corresponding measures to limit anthropogenic emissions and to enhance sinks and reservoirs to return by the end of the decade to earlier levels of anthropogenic emissions of CO₂. {Article 4.1 (a)}
- Provide policies and measures with projected emissions by sources and removals by sinks to return to 1990 levels. {Article 4.2 (b)}

Key Commitments by Developed Country Parties "continued"

- Provide new and additional financial resources to assist developing country parties to meet their national communications obligations (inventories).
- Provide financial resources for transfer of technology.
- Support endogenous capacities in developing countries (capacity building).

UNFCCC - Structure

- Conference of Parties
 - Annex I Countries
 - Annex II Countries
 - Non Annex I Countries
- Secretariat
- Subsidiary Body for Implementation
- Subsidiary Body for Scientific and Technical Advice

Intergovernmental Panel on Climate Change (IPCC)

- Established in 1988
- Established by WMO & the UNEP

Global Environmental Facility (GEF)

- In the IBRD
- Mechanism used for Technology transfer

UNFCCC Conference of Parties

- COP 1 - Berlin (Berlin Mandate)
- COP 2 - Geneva
- COP 3 - Kyoto (Kyoto Protocol)
- COP 4 - Buenos Aires (BA Plan of Action)
- COP 5 - Bonn
- COP 6 - The Hague

The Berlin Mandate

"Review of the adequacy of Article 4, paragraph 2 (a) and (b), of the Convention, including proposals related to a protocol and decisions on follow-up."

Kyoto Protocol- Some Highlights

- Meeting of the Parties to the Protocol
- Reduction Commitment Period 2008- 2012
- Annex I Target 5 % Reduction of 1990 GHG levels by the 2008-2012
- Annex I Country Progress by 2005
- Need 35 Countries to Ratify
- Need 55 Percent of the 1990 CO₂ Emissions

Koyoto Protocol- Main Issue

The Koyoto Protocol Established Binding Targets and Agreed upon Mechanisms but It Did Not Define the Implementation Procedures to Guide the Parties to the Protocol.

The Buenos Aires Plan of Action

The BA Plan of Action (COP 4 Decision 1) charged the UNFCCC Structures and the IPCC to Develop the Guidelines, Rules and Regulations to Implement the Kyoto Protocol.

Some Key Terms

- × Capacity-building (Article 4.5 of the Convention)
- × EST (Environmentally Sound Technologies)
- × Flexible Mechanisms
 - Emissions Trading
 - Joint Implementation
 - Clean Development Mechanism
- × AOSIS (Alliance of Small Island States)
- × LULUCF

LULUCF

- Land Use
- × Land-Use Change
- × Forestry

The Issues COP 6 – The Hague

- Implementation of the Convention
 - + 17 issues
- × Preparations for the Implementation of the Koyoto Protocol
 - + 7 issues
- × Institutional Issues
 - + 1 issue

Some Convention Issues

- × National Communications – Annex 1
- × National Communications – non Annex 1
- Consultative Process on Technology Transfer
- Capacity-building in Developing Countries
- Cooperation with International Organizations
- × Adequacy of Article 4, paragraph 2 (a) & (b)

Some Kyoto Protocol Issues

- ✦ Decisions on LULUCF
 - ✦ Definition AR5 (Article 3.3)
 - ✦ Additional Emission-induced Activities (Article 3.4)
- ✦ Decisions on Rules and Guidelines of the Three Flexibility Mechanisms
 - ✦ Joint Implementation
 - ✦ Clean Development Mechanism
 - ✦ Emissions Trading

The Institutional Issue

- ✦ Lagging payments to the four trust funds that support the Convention
- ✦ Year 2000 budget \$14,363,000

Results of COP 6 -- The Hague

- ✦ 182 Countries Participated
- ✦ 39 International Organizations Participated
- ✦ 260 NGOs Participated
- ✦ Progress on All Boxes
- ✦ U.S. and E.U. Unable to Agree on Role of LULUCF to Serve as Sinks
- ✦ COP 6 Session Suspended - May/June 2003

Latin American and Caribbean Participation

- ✦ Annex I -- no LAC countries
- ✦ Annex II -- no LAC countries
- ✦ Non-Annex I -- all LAC countries
- ✦ AOSIS (Alliance of Small Island States)

Financial and Technical Support to LAC Countries

- ✦ 32 LAC Countries have received CIEP funding and UNEP support to assist them in meeting their reporting commitments.
- ✦ The World Bank is supporting CARICOM in a Planning for Adaptation to Climate Change project.
- ✦ UNEP is providing support to five LAC countries for Climate Change assessments

Status of National Communications in LAC

- ✦ CARICOM -- none
- ✦ CACM -- Costa Rica, Honduras, and El Salvador
- ✦ Andean Pact -- none
- ✦ Mercosur -- Argentina and Chile
- ✦ Mexico

LAC Proposed Projects Under Article 12.4 of the Convention

- Only three LAC countries (Chile, El Salvador and Mexico) have proposed financial and technical support projects in their national communications.
- Only two (Chile and Mexico) proposed LULUCF projects (all forestry).

Implications to LAC Programming

- Policy Formulation
- Strategy Formulation
- Activity Design and Implementations

USAID Global Climate Change Initiative

- December 1997 "Presidential Initiative"
- Underlying Principle of USAID's Role of Helping Developing Countries Achieve Sustainable Development is that Efforts to Reduce
 - Greenhouse Gas Emissions and
 - Vulnerability to Climate Change
- USAID lead is GRENVOCC -- Global Climate Change Team
- Special Objective for Global Climate Change

Climate Change Initiative - Special Objective

- Five Year -- \$1 Billion program FY 1998-2002
- 12 Countries and Regions, 40 USAID OUs
- Activities Supported:
 - Treaty Participation
 - Energy and Industry
 - Urban Areas
 - Forestry and Land Use
 - Vulnerability and Adaptation

Climate Change Initiative -- Geographic Foci

- Key Countries and Regions:
 - LAC: Brazil, Central America, & Mexico
 - AFR: Central Africa & South Africa
 - ESE: Central Asia, Pakistan, Russia & Ukraine
 - AOE: India, Indonesia, & the Philippines
- Other LAC Participation -- Bolivia, Ecuador, Guatemala, Honduras, Jamaica, LACRESI, Nicaragua, Panama, Paraguay & Peru

LAC Programming -- Broad Options

- OUs Must Work with CCI Team if Climate Mitigation is the Primary Objective (note Environmental Climate Change is Special Emphasis Secondary Code)
- OUs Can Work within BDEG Framework if Economic Growth and Agricultural Development is the Primary Objective and CCI Emphasis is Secondary

LAC Programming - Broad Options

- Private Markets
- Agriculture and Food Security
- Expanded Access and Opportunity

Private Markets

- Look at Trade-led Adjustments where Critical Markets Could be Expanded and Strengthened that are Consistent with Emissions Reduction or Reduced Vulnerability
- No Recommendations

Agriculture and Food Security

- Look at Activities that Enhance Agriculture Development and/or Encourage Food Security and are Consistent with Emissions Reduction or Reduced Vulnerability
- No Recommendations

Expanded Access and Opportunity

- Look at Activities that Expand Economic Opportunities for Rural and Urban Poor and are Consistent with Emissions Reduction or Reduced Vulnerability
- Use DAC Guidelines on Poverty Reduction and Policy Coherence
- Recommended Direction for LACRSD/BBEG

Agricultural Market Certification Challenge

- Rethinking Agricultural Grades and Standards
- MSU Work on Importance of Shift from "Outcome" G&S to "Process" G&S
- Significant Implications to Participation by Smallholder Agriculture

Implications to IR 3

- Access to Product Markets
- SPN Agreement Implications to US Market Access in Agricultural Markets
- Biosafety Protocol Related Implications to Market Access in Agricultural Markets
- Organic Market Access

Biogeochemical Cycles

- * Carbon Cycle
- * Nutrient Cycle
- * Hydrological Cycle

Methodological Issues

- * Rules
- * Approaches
- * Verification

Knollenberg Amendment on Kyoto Protocol

"None of the funds appropriated by this Act shall be used to propose or issue rules, regulations, decrees, or orders for the purpose of implementation, or in preparation for implementation, of the Kyoto Protocol."

From the FY 2000 Foreign Operations, Export Financing and Related Programs Appropriation Act

Practice

- * An action or set of actions that affect the land, the stocks of pools associated with it or otherwise affect the exchange of greenhouse gases with the atmosphere.

Land Use Versus Land Cover

- * Land Use - The total of arrangements, activities, and inputs undertaken to a certain land cover type (a set of human actions). Or The social and economic purposes for which land is managed (e.g. grazing, timber extraction, conservation).
- * Land Cover - The observed physical and biological cover of the Earth's land as vegetation or man-made structures.

Carbon Accounting- IPCC Definition

"... a carbon accounting system records, summarizes and reports the quantity of carbon emissions by sources and removals by sinks through applicable IPCC activities for a specific period of time."

Carbon Accounting – Core Objectives

- Transparency
- Consistency
- Comparability
- Completeness
- Accuracy
- Verifiability
- Efficiency

Carbon Accounting – Basic Approaches

- Land-based Accounting
- Activity-based Accounting

Carbon Accounting – Some Issues

- Natural versus Human-Induced
- Baselines
- System Boundaries (leakages)
- Timing
 - Full Credit and Ongoing Liability
 - Equivalence Time and Ten-years
- Uncertainty (measurement and baselines)

Carbon Accounting – Some Methods

- Vegetative Inventory
- Soil Inventory
- Eddy-Flux
- Flask Measurements
- Remote Sensing (satellite)
- Ecosystem Modeling
- Biome Models

Carbon Accounting – Some Models

- Bookkeeping Models
- Process-based Models
 - DNAT
 - Simulation

Synergy and Trade-Off Modeling

- Linking Process-based Models with Bookkeeping Models
- Linking Carbon Accounting Models with Sustainable Development Models (water)
- Linking Carbon Accounting Modeling with Crop Production Practice Standard (CPPS) Modeling for Organics, Food Safety, SPS, and Biotechnology

Digital Verification
Systems of Crop
Production Practice
Standards

By Greenbury Shaw

Appendix 2

**Agenda –
Expert Workshop on “Carbon Sequestration,
Sustainable Development and Poverty Alleviation”**

**EXPERT WORKSHOP ON "CARBON SEQUESTRATION,
SUSTAINABLE AGRICULTURE AND POVERTY ALLEVIATION"**

**WORLD METEOROLOGICAL ORGANIZATION
GENEVA**

30 AUGUST – 1 SEPTEMBER 2000

Background: Large areas of agricultural lands have been seriously degraded by the loss of nutrient and carbon stocks. Nearly a billion people live in poverty on degraded lands. However, these lands have a huge potential to store carbon, which could also lead to a significant improvement in soil productivity and hence poverty reduction. Poor farmers would be paid to use agricultural practices that increase soil carbon stocks, thereby improving soil quality while at the same time removing CO₂ from the atmosphere. If such means can be put in place, then activities that sequester carbon have the potential to combat poverty and thereby to increase political and financial stability in poorer countries. Such a carbon budgeting system would require cost-effective and practical means to measure the level of carbon in soil as well as changes over time.

Workshop Sponsors: An Expert Workshop on "Carbon Sequestration, Sustainable Agriculture and Poverty Alleviation" will be held at the World Meteorological Organization (WMO) in Geneva, Switzerland from Wednesday, August 30th through Friday, September 1st, 2000. The Workshop is being organized through the collaborative efforts of the World Meteorological Organization (WMO), the United Nations Food and Agricultural Organization (FAO), U.S. Agency for International Development's Office of Agriculture and Food Security (USAID/AFS), and the International Fund for Agricultural Development (IFAD).

Primary Objectives: The overall goal of the workshop is to discuss carbon sequestration in relation to climate change and sustainable agriculture, but the **specific focus** will be on **design of prototype methodologies for soil carbon measurement and verification** of the soil carbon impact of agricultural activities under a range of land use practices, particularly in developing countries. Participants will consider drylands, rangelands, pastures, croplands, and agroforestry lands. Researchers would use the data obtained by these methods to quantify how agricultural practices can increase long term soil carbon reserves. If the proposed measurement methods prove to be acceptable, private sector, governments, and non-governmental organizations (NGOs) could use carbon reserve data in establishing and monitoring carbon sequestration initiatives aimed at promoting sustainable agriculture and rural poverty alleviation.

Small working groups will focus on **key measurement and verification issues** including:

1. baseline and additionality;
2. measurability and monitoring uncertainties;
3. leakages and permanence;
4. accounting and verification; and
5. financial and institutional mechanisms.

The workshop's formal presentation sessions and small group discussions are designed to pool expertise on these new measurement techniques so that interested stakeholders can (1) expedite further research and testing, and (2) factor this prospect of affordable and reliable measurement devices into carbon budgeting discussions in other fora.

In addition, the workshop will (1) propose ways to integrate these new technologies into ongoing carbon measurement actions, and (2) make recommendations on design approaches, old and new, that could increase scientific and project-level confidence in longer term understanding of carbon flux levels and how best to influence them, and, (3) the workshop will begin to make recommendations on capacity-building and policy changes needed to implement these measurement systems in developing countries at the project level.

In sum, the workshop aims to:

1. share recent technical, scientific, political, and socio-economic developments in the emergence of soil carbon sequestration as a vehicle for fostering rehabilitation of degraded lands in developing countries through the practice of sustainable agriculture;
2. identify potential barriers, constraints, and opportunities to developing countries in Africa, Asia, and Latin America in the implementation of carbon sequestration projects and activities that promote poverty alleviation and restoration of degraded agricultural lands;
3. identify unresolved technical issues and potential opportunities in soil carbon sequestration science, monitoring, and implementation for developing countries;
4. share lessons learned from current pilot projects focused on capacity-building, assessing technical and financial feasibility, and measurement/verification of carbon sequestration in agricultural soils;

5. design prototype methodologies for soil carbon measurement and verification of the soil carbon impact of agricultural activities under a range of land use practices, particularly in developing countries; and
6. create a functioning network of experts who can facilitate a process that will help design, test, and implement feasible pilot projects that promote carbon sequestration on degraded lands in developing countries.

Workshop Plan/Organization: The first part of the workshop (August 30 and August 31) will consist of a series of short presentations and open discussions to assist the participants in better understanding the current status of technologies, measurement issues, and approaches to designing and implementing carbon sequestration projects for developing countries. These initial sessions will also provide opportunity for networking and establishing links between individuals and organizations that have capacity to assist in the design and implementation of projects.

The second part of the workshop (September 1) will be for small group activity, in which participants will help actively to: identify reliable prototype methodologies for soil carbon measurement, verification, and monitoring, make recommendations for capacity-building and suggest approaches to dealing with a variety of technical, policy and institutional issues facing implementation of carbon sequestration projects. Each group will help produce specific documents and other products that can feed into a longer-term process of capacity-building and implementation of measurement and verification systems in developing countries.

AGENDA - Wednesday - August 30

TIME	SESSION THEME	PRESENTERS	OBJECTIVES
9:00-9:30	INTRODUCTION OF PARTICIPANTS AND EXPLANATION OF AGENDA	Mike Coughlan (WMO) John Lewis (USAID/G/EGAD/AFS) Parviz Koohafkan (FAO) Bahman Mansuri (IFAD)	-Revise Agenda -Set Goals/Objectives
SESSION I 9:30-10:30	RECENT DEVELOPMENTS -- SETTING THE STAGE	CHAIR: Mike Coughlan (WMO)	
	INSTITUTIONAL PERSPECTIVES ON CARBON SEQUESTRATION AND SUSTAINABLE AGRICULTURE	Per Ryden (Global Mechanism of CCD/Rome) M. V. K. Sivakumar (WMO) Parviz Koohafkan (FAO) Bahman Mansuri (IFAD) Goro Uehara (University of Hawaii/USA) Discussants: --Ed Kanemasu (University of Georgia/USA)	1. Share recent technical, scientific, political and socio-economic developments in the emergence of soil carbon sequestration as a vehicle for fostering rehabilitation of degraded lands in developing countries through practice of sustainable agriculture. 2. How do specific institutions view the issue and how might they assist the process of design and implementation of carbon projects?

	<p>LESSONS LEARNED FROM LULUCF/IPCC DOCUMENT AND OTHER UNFCCC POLICY GUIDANCE</p>	<p>John Flynn (Winrock International/USA)</p> <p>Lin Erda (Agrometeorology Institute/China)</p> <p>Jens Mackensen (UNEP-Nairobi)</p> <p>Pedro Sanchez (ICRAF-Nairobi)</p> <p>Discussant: --Adele Morris, US Department of State</p>	<p>1. What should be understood about the LULUCF document and the process that created it, in the design of carbon projects?</p> <p>2. Overview of recommendations made and how it can help in this current effort.</p>
<p>10:30-10:45 10:45-11:00</p>	<p>SESSION I GENERAL DISCUSSION BREAK</p>		
<p>SESSION II 11:00-12:30</p>	<p>SPECIFIC CARBON SINK ISSUES AND PERSPECTIVES</p>	<p>CHAIR: John Lewis (USAID)</p>	
	<p>SOILS AND SOIL SCIENCE</p>	<p>L.R. Oldeman (ISRIC/Netherlands)</p> <p>Hari Eswaran (USDA/NRCS)</p> <p>Discussants: --Charles Sloger (USAID/USDA) --John Kadyszewski (Winrock International/USA)</p>	
	<p>SUSTAINABLE AGRICULTURE AND AGROFORESTRY</p>	<p>Lou Verchot, (ICRAF-Nairobi)</p> <p>N. Dieye (INSAH/Mali)</p> <p>Discussant: --Robin Reid (ILRI-Nairobi)</p>	

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	<p>RANGELANDS</p>	<p>Tagir Gilmanov (South Dakota State University/USA)</p> <p>Myles Fisher (CIAT-Cali, Columbia)</p> <p>Discussants: --Robert Ford (USAID/USDA) --Mike Bertelsen (Virginia Tech/USA)</p>	
<p>12:30-14:00 14:00-14:30 SESSION III</p>	<p>LUNCH SESSION II GENERAL DISCUSSION</p>		
<p>14:30-16:45</p>	<p>IMPORTANCE OF CARBON SEQUESTRATION TO DEVELOPING COUNTRIES: TRENDS, FACTS, & ISSUES</p>	<p>CHAIR: Bahman Mansuri (IFAD)</p>	
	<p>AFRICAN CONTEXT</p>	<p>Moses Tenywa (Makerere University/Uganda)</p> <p>Lennart Olsson (Lund University/Sweden)</p> <p>Larry Tieszen (USGS/EROS)</p> <p>Discussants: --Aminata Badianne (National Agriculture Research Institute/Senegal) --Oladapo Afolabi (Federal Environmental Protection Agency/Nigeria) --Paul Desanker (Malawi)</p>	<ol style="list-style-type: none"> 1. Identify potential barriers, constraints, and opportunities to developing countries in Africa in the implementation of carbon sequestration projects. 2. How to design projects and activities that promote poverty alleviation and restoration of degraded agricultural lands
<p>15:30-15:45</p>	<p>BREAK</p>		

15-

16:45-17:30	<p>ASIAN CONTEXT</p>	<p>Li Yu'e (Agrometeorology Institute/China)</p> <p>John Ryan (ICARDA-Aleppo, Syria)</p> <p>Discussant: --Goro Uehara (University of Hawaii/USA)</p>	<ol style="list-style-type: none"> 1. Identify potential barriers, constraints, and opportunities to developing countries in Asia in the implementation of carbon sequestration projects. 2. How to design projects and activities that promote poverty alleviation and restoration of degraded agricultural lands
	<p>LATIN AMERICAN CONTEXT</p>	<p>John Kadyszewski (Winrock International/USA)</p> <p>Cesar Izaurralde (Argentina)</p> <p>Discussant: --John Becker (USAID/LAC Consultant)</p>	<ol style="list-style-type: none"> 1. Identify potential barriers, constraints, and opportunities to developing countries in Latin America in the implementation of carbon sequestration projects. 2. How to design projects and activities that promote poverty alleviation and restoration of degraded agricultural lands
<p>SESSION III GENERAL DISCUSSION</p>			

AGENDA - Thursday - August 31

TIME	SESSION THEME	PRESENTERS	OBJECTIVES
SESSION IV 9:00-12:30	SYNTHESIS OF CURRENT SCIENCE AND TECHNOLOGY ISSUES IN PROJECT-BASED ACTIVITIES	CHAIR: Pedro Sanchez, CGIAR Intercenter Working Group on Climate Change	
	SETTING BASELINES AND LEAKAGE ISSUES	<p>Jeff Herrick (USDA/ARS/New Mexico)</p> <p>John Ingram (NERC-Centre for Ecology and Hydrology/UK)</p> <p>Discussant: Carrie Stokes (USAID/Climate Change Team)</p>	<ol style="list-style-type: none"> 1. Identify unresolved technical issues and potential opportunities in carbon sequestration science, monitoring, and implementation for developing countries. 2. Address/debate options on setting baselines and dealing with leakage in carbon sequestration projects in developing countries
10:15-10:30	MEASUREMENT AND MONITORING: IN-GROUND CARBON METHODS	<p>Gregg McCarty (USDA/ARS)</p> <p>Tim Arkebauer (University of Nebraska/USA)</p> <p>Forest Hall (NASA, Goddard—Earth Sciences/USA)</p> <p>Cheryl Palm (Tropical Soil Biology and Fertility Program-Nairobi)</p> <p>Discussant: --L.R. Oldeman (ISRIC/Netherlands)</p>	<ol style="list-style-type: none"> 1. Propose and debate workable methodologies for carbon measurement, monitoring, and verifications systems. 2. Identify unresolved technical issues and potential opportunities in carbon sequestration measurement, monitoring, and implementation.
10:15-10:30	BREAK		

6.8

	<p>ABOVE-GROUND METHODS INCLUDING REMOTE SENSING</p>	<p>Peter Grace (CIMMYT/Mexico) Paul Doraiswamy (USDA/ARS) Ed Sheffner (NASA, Applications Division/USA) Markus Walsch (ICRAF-Nairobi)</p> <p>Discussant: --Lynnette Wood (Associates in Rural Development/USA)</p>	<ol style="list-style-type: none"> 1. Propose and debate workable methodologies for carbon measurement, monitoring, and verifications systems. 2. Identify unresolved technical issues and potential opportunities in carbon sequestration measurement, monitoring, and implementation.
	<p>GENERAL DISCUSSION</p> <p>MODELS AND SCALE-UP ISSUES AND PROBLEMS</p>	<p>Ponce M. Hernandez (Trent University/Canada)</p> <p>Keith H. Paustian (Colorado State University/USA)</p> <p>Dennis Ojima (Colorado State University/USA)</p> <p>Jim Jones (University of Florida/ICASA/USA)</p> <p>Discussants: --Lennart Olsson (Lund University/Sweden)</p> <p>--Mike Bertelsen (Virginia Tech/USA)</p>	<ol style="list-style-type: none"> 1. Propose and debate workable methodologies for carbon measurement, monitoring, and verifications systems. 2. Identify unresolved technical issues and potential opportunities in carbon sequestration science, monitoring, and implementation for developing countries.
<p>12:30-14:00</p> <p>14:00-14:30</p>	<p>LUNCH</p> <p>SESSION IV GENERAL DISCUSSION</p>		

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SESSION V 14:30-16:15	ECONOMIC DEVELOPMENT: INCENTIVES AND INSTITUTIONAL ISSUES	CHAIR: Parviz Koohafkan (FAO)	
15:15-15:30	ECONOMIC AND FINANCIAL INCENTIVES	John Antle (Montana State University/USA) Tom Tomich (ICRAF-Nairobi) Bruce McCarl (Texas A&M University/USA) Discussant: --Barbara Cooney (FAO)	<ol style="list-style-type: none"> 1. Propose and debate workable methodologies for dealing with economic/financial incentives in carbon measurement, monitoring, and verifications systems. 2. Identify unresolved technical and analytical issues needing resolution for design and implementation of carbon projects in developing countries.
16:15-16:45	BREAK INSTITUTIONAL ISSUES: CAPACITY-BUILDING, PARTNERSHIPS, AND OTHER ISSUES	Allen Keiser (FAO/IFAD Consultant) Diouf Madeleine (Ministre de Environment/Senegal) Birama Diara (Direction Nationale de la Meteorologie/Mali) Paul Bartel (USAID/AFR/SD) Discussant: --Carrie Stokes (USAID/Climate Change Team)	<ol style="list-style-type: none"> 1. Propose and debate workable methodologies for dealing with policy and institutional issues in carbon measurement, monitoring, and verifications systems. 2. Identify unresolved technical and analytical issues needing resolution for design and implementation of carbon projects in developing countries. 3. What capacity-building needs will be required to make carbon projects work effectively and efficiently? What options are most feasible?
16:15-16:45	SESSION V GENERAL DISCUSSION		

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SESSION VI
16:45-17:30

ORGANIZING SMALL GROUPS

CHAIR: Christine Bergmark

- 1. Design/recommend prototype methodologies for soil carbon measurement and verification systems for carbon projects.**
- 2. Make recommendations for future climate negotiations, i.e. Lyon that will facilitate agricultural soil carbon sequestration activities in developing countries.**

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AGENDA – Friday – September 1

SESSION I 8:30-12:00	8:30-10:30	Session I Working Groups	Focus on choosing reliable options for measurement, verification, and monitoring
	10:30-10:45 10:45-12:00	Break Session I Plenary Chair: Pedro Sanchez (CGIAR)	Presentations by Working Groups and discussion/synthesis of recommendations
SESSION II 13:30-17:00	12:00-13:30 13:30-15:30	Lunch Session II Working Groups	Focus on policy, capacity-building, and poverty issues
	15:30-15:45 15:45-17:00	Break Session II Plenary Chair: Bahman Mansuri (IFAD)	Presentations of Working Groups and discussion/synthesis of recommendations
		Chair: John Lewis (USAID)	Conclusion of Workshop and Follow-Up Activities
Session III 17:00-17:30			

Appendix 3

**List of Participants –
Expert Workshop on “Carbon Sequestration,
Sustainable Development and Poverty Alleviation”**

**WORKSHOP ON "CARBON SEQUESTRATION,
SUSTAINABLE AGRICULTURE AND POVERTY ALLEVIATION**
Geneva, 30 August - 1. September 2000

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Appendix 4

**Summary Report of the
Expert Workshop on “Carbon Sequestration,
Sustainable Development and Poverty Alleviation”**

Summary Report of the Expert Workshop on “Carbon Sequestration, Sustainable Agriculture and Poverty Alleviation”

Context

This report is a summary of the results of an international workshop on “Carbon Sequestration, Sustainable Agriculture and Poverty Alleviation.” An assembly of eminent scientific experts explored the importance of carbon in agriculture and land use, as well as new avenues to reduce poverty among the rural poor in developing countries and enhance their food security. Over 60 scientists and development practitioners joined in Geneva from 30 August to 1 September to examine these issues and look to the way forward.

The participants from developing and developed countries came from research institutions, universities, agricultural and meteorological services, non-governmental and development assistance organizations. Participants discussed innovative and promising examples of small farmer initiatives in projects promoting carbon storage in soil and plants. Discussions covered the most recent methodology and model development in carbon cycle and carbon sequestration and available technologies and techniques, ranging from satellite spectrometry and computer modeling to the most effective forms of direct participation of rural communities.

The meeting was convened in response to the emergence of greater economic opportunities for farmers, rapid increases in corporate interest in carbon trading and concern about the lack of a state-of-the-art system for carbon measurement. Trade in carbon is steadily rising and the emerging possibilities are exciting for the future. However, better tools are essential for reliable assessment as the basis for a better functioning marketplace. The experts therefore proposed cost effective and reliable methodologies for furnishing baseline information and monitoring.

A series of presentations covered the biophysical, social and economic dimensions of carbon sequestration and stockage. The participants focused on the reliability of measurement, scale and variability, contemporary technical innovations, the emergence of mechanisms for valuation and marketing, and approaches and models for small farmer and community involvement.

Content

The sessions covered the following themes:

- The implications of recent work in science and technology on carbon sequestration in order to set baselines and assess leakage, measure and monitor trends on the ground and through remote sensing, and build relevant models for various geographic and ecosystem scales.
- The lessons learned from the preparatory work already completed to inform the negotiations and future policy for the Framework Convention on Climate Change (notably the IPCC Special Report on “Land Use, Land-Use Change and Forestry” published earlier this year).
- A review of carbon sink issues and perspectives regarding soils, agriculture, agroforestry and rangelands.

- Institutional and market perspectives on carbon sequestration and sustainable agriculture, covering economic and financial incentives, capacity-building and appropriate forms of partnership to reach small farmers and the rural poor in developing countries.
- Project-based examples of win-win options for preventing land degradation, enhancing land productivity, carbon sequestration, and poverty alleviation, drawing on experiences in Africa, Asia and Latin America.

Findings

Participants noted that different soil types sequester carbon at different rates and with different degrees of stability (carbon residency) and that these differences are known for natural systems, while data are still incomplete for managed systems. Different vegetation types sequester differing amounts and types of carbon in their biomass and the sources of these variations are also understood. Soils and ecosystems that have lost carbon in the process of their degradation and carbon-limited soils, including degraded soils, will come to a higher equilibrium of carbon stock under improved land use and management systems. There can be a significant amount of carbon sequestration depending on climate, the type of the management system and the inherent properties of the soil. This knowledge has attractive implications for policy makers to initiate and implement programs to assist farmers particularly in developing countries to move towards improved land management practices for environmentally friendly sustainable development.

There was a general consensus that available information on new techniques and methodologies create opportunities for reliable measurement and verification that is cost effective, efficient, and relevant. The available tools and models can apply to the geographic scales appropriate for aggregate measurement and as a basis for evaluation of quantities, values and permanence. Participants also emphasised the need to consider both the potential returns on carbon sequestration for farmers and other benefits and services of improved soil quality, agriculture, natural resources productivity and other economic activities. However, there is a need to further perfect methods and tools to make them more accessible and adaptable to developing countries at low cost. And, the benefits concerning increases in biodiversity and land protection from erosion or desertification have to be better estimated.

The conclusions and recommendations from the Working Group discussions fall into three general areas: 1) measurement, 2) baselines, and 3) incentives. The overall conclusions of the three working groups and the plenary discussions follow below.

1) Measuring Carbon Stocks in Agricultural Systems

Working Group One considered the question of measurement of carbon stocks in agricultural systems. They noted that the existing analytical methodology is adequate to measure carbon in biomass and soil globally. The Group also noted that some ecoregions are relatively homogeneous in their soil types and land use while other ecoregions are much more heterogeneous. Cost-effective ways to assess and monitor carbon stocks and sequestration potentials in the latter requires more sampling in well-designed stratified sampling protocols to achieve any given level of precision. The protocols will be refined and improved as experience is gained in pilot projects.

In addressing these issues, the Group started by asking what do we know, progressed to consider assessment and monitoring protocols, and finally discussed research and development needs.

1a) What do we know?

Extensive information exists about soils, including soil maps and soil classification by properties. In particular, knowledge exists about soil carbon values in undisturbed ecosystems in the world's major ecoregions. Starting with these baseline data, sequestration potential at any particular location can be projected using geo-referenced data and simulation models such as Century or Roth C, combined with the DSSAT and other biomass and crop production models.

1b) Assessment and Monitoring Protocol

Assessment and monitoring protocols should be developed and broadly disseminated. Standard protocols are important to assure replicability of results and comparability of data across sites. Current methods for analyzing carbon content are high accurate. However, carbon is distributed non-uniformly in soils. Statistical sampling design can be effectively used to minimize sampling and interpolation errors. There will be trade-offs between the potential amount of carbon sequestered, the system complexity and the precision of measurement required.

The Group identified two factors that can improve cost effectiveness of the sampling protocol.

- Geostatistics can be used to optimize sampling frequency for any given landscape.
- Soil and vegetation maps and other base-line information can be used as available in project areas to improve sampling efficiency.

Carbon content in soil systems can be measured to different levels of precision. The level of precision that can be obtained depends primarily on the amount of expected change in soil carbon compared to the normal level of variability. Adding sampling points will increase precision but also increase costs. The Group recommended monitoring of control (no-project) plots in parallel with the project to permit more precise estimation of the baseline during the life of the project, and, hence, more precise estimates of actual carbon benefit of the project.

1c) Research and Development

The underlying science is well understood and appropriate technologies are available for assessment of carbon sequestration in soil at any required level of precision. Additional research and development can develop new equipment and techniques to make existing methodologies more cost efficient in light of the current market value of sequestered carbon of US\$3-5 per ton. Many exciting techniques were identified with substantial potential to increase the precision of measurement and decrease the cost of sampling.

- Combinations of remote sensing of normalized differential vegetation index (NDVI), eddy-covariance techniques (e.g., Bowen ratio), and modeling are emerging as prospective methods of carbon sequestration estimation.

- Progress is being made in more sophisticated options for assessment and monitoring at acceptable precision. Examples are remote sensing techniques, including non-destructive analysis using near-infrared and mid-infrared spectrometry.
- Remote sensing by satellite (e.g., Landsat 7, MODIS) to monitor land cover and changes in land management offers the possibility to use these techniques to estimate carbon accumulation approach instead of direct carbon measurement.

All these new methodologies have to be referenced by in situ measurements.

Finally, there was no discussion about the kind of carbon that will be stored and we need data on carbon compartments and their residence time (from one to more than one thousand years).

2) Project Baselines

Working Group Two emphasized the special relevance and multiple advantages of sequestration activities in developing countries. Furthermore, the Group discussed the inherent challenge of undertaking intervention and development activities on large scales for the most vulnerable regions and people. In many developing country locations, carbon content of soils is decreasing. For these locations, baselines can often be constructed using contemporaneous measurements from multiple sites with differing degrees of degradation in combination with available historical data. The stratification, sampling, and analytical means to attain successful implementation are at hand and can be applied.

2a) *What do we know?*

Working Group Two understood the special relevance and multiple advantages of sequestration activities in developing countries. Furthermore, the Group appreciates the inherent challenge of undertaking intervention and development activities on large scales for the most vulnerable regions and people. Win-win options exist and need to be promoted particularly for the benefit of small farmers and to reduce poverty in fragile areas and in common property zones. International institutions and the CGIAR Intercenter Working Group on Climate Change can identify these options and assist in the preparation of carbon sequestration projects.

2b) *Baseline Protocol*

Baselines for complex landscape projects must represent appropriate selections of the important systems in which sequestration is planned as well as other landscape units that might be impacted. The selection of physical sites should be based on an appropriate stratification of the landscape units that is best determined by experts in sampling and research design in association with local experts. When setting baselines, consideration will need to be given to stratification of social and cultural systems, topography, soils, land cover, land use, and other important features which structure the landscape pattern. Each of these stratified units then will need to be sampled to define a project baseline and to determine the sampling intensity required. Sampling intensity during the project lifetime can be minimized where management practices leading to carbon sequestration can be systematically applied and monitored across management units. Specific plots must be geo-referenced, described in detail, documented with respect to current status and past history of land use and inputs, and reserved as "reference" cases or control plots. The baselines exist as real landscape units through the project period and in this sense are dynamic. Objective criteria for assuring

environmental and development benefits can be established for these systems units (~1-100 ha) or landscape units (10^2 - 10^3 squared kilometers) so that competent institutions and private entities can certify and verify that the criteria have been achieved. Economic and policy assumptions should be discussed for baselines in each project.

Appropriate credits will be determined from measurements within stratified landscape units in the context of monitored land management practices. Additional credits or debits may result from changes in management practices (e.g., more efficient food production, reduced livestock methane emissions, sustainable firewood production).

2c) Research and Development

It is clear that the development of carbon sequestration projects, including the project design and baseline, are important for participation by the most impoverished regions and vulnerable people. International institutions such as WMO, FAO, IFAD, CGIAR, UNEP, UNDP, and the WB, for example, can assist in providing and generating data, information, baseline studies, guidelines, and models to identify options, areas, and systems for carbon sequestration projects. National and international development and research organizations can make substantial contributions to the reduction of risks through the development of information systems that can help to quantify the expected benefits from changes in management practices. We have to consider what will be the place of a systematic land monitoring system, which will be proposed by the FAO, that can furnish simultaneously referenced data on carbon storage and information on the benefits concerning soil quality, biodiversity and the state of degradation.

3) Incentives

While the mechanisms for the measurement and verification of carbon sequestration produced by agricultural activities are feasible and increasingly affordable, the institutional mechanisms for ensuring the success of carbon sequestration projects will require contractual discipline on the part of the buyer, the seller, and each of their governments. Hopefully, the development of a global carbon market will underwrite the bottom line incentives for such new discipline. Working Group Three's discussions focused on the social, economic and political activities necessary to ensure successful initiatives that result in both increased carbon sequestration and poverty alleviation. There was wide recognition of the potential for carbon sequestration projects to provide benefits to the poor, but, at the same time, policy reforms, institution-building, and technical assistance will be needed if this goal is to be achieved. Hopefully, the force of a new global market for carbon will provide additional incentives favoring implementation of these reforms and transformations. Participants noted that both market and non-market mechanisms would be necessary to take into account the diversity among countries, regions and communities to ensure that poor farmers are also the beneficiaries of agricultural carbon sequestration activities. Discussions fell into three broad categories: carbon trading for the poor, economic advantages of smallholders, and environmental standards.

3a) Harnessing the Gains from Carbon Trading for the Poor

The Group noted that reducing transactions costs through group investments, creating a system of honest brokerage, and clarifying property rights are important means of harnessing gains from carbon sequestration projects for the poor. There was a general consensus among the Group that some sort of broker between buyer and seller would be required to facilitate these carbon transactions. Suggestions for the identity of such a broker ranged from an NGO

to government to private traders. All agreed that it would be important to avoid creating a system which bestows monopoly power over transactions to the broker, as this could lead to the exploitation of either the buyers or the sellers. Instead there should be a market of several brokers who compete in making carbon trades.

Another suggestion was to use the carbon payments for projects or public goods investments that would benefit rural associations rather than pay farmers directly. Examples discussed included subsidizing farm inputs or health and education programs. Objections were raised to this scheme as it essentially results in a move away from market mechanisms to more traditional government interventions. It was noted that market mechanisms offer new ways of reaching poor people that may be more effective in increasing incomes and alleviating poverty.

Institution-building at a national level in order to facilitate market transactions was considered to be an important aspect of generating carbon sequestration project benefits for the poor. This is important both to improve the decision-making capacity of participants at various project levels and to facilitate the capacity to develop a market that includes the participation of the rural poor. The role that GEF could play in such a process was discussed and the potential for training and capacity-building under this mechanism as well as under the auspices of other international organizations was noted.

The Group reached a general consensus that it would be useful to develop profiles of investment opportunities that results in competitively priced carbon credits as well as poverty alleviation and make a catalogue of such opportunities available to potential buyers. The CGIAR's Intercenter Working Group on Climate Change as well as international and national institutions should play an important (if not lead) role in developing and disseminating such a catalogue.

The Group also discussed the importance of considering not only measures to generate carbon sinks, but also programs to generate offsets (e.g., adoption of biofuel) and source reduction (e.g., limiting methane, preventing deforestation). The appropriateness of multiple strategies will be determined by the degree of heterogeneity of socioeconomic and production conditions. By addressing this diversity, a mixed strategy would result in reduced mitigation costs as well as a higher distribution of benefits.

Addressing the barriers to technology adoption among poor farmers, about which we already have considerable knowledge and experience, is another important mechanism for harnessing the benefits of carbon sequestration projects for the poor. These benefits include reducing exposure to risk, increasing the capacity to provide insurance against risk for the poor, structuring payments to help address investment constraints and the need for a rapid return at the farm level, and institutional development in the area of property rights and education.

3b) Promoting the Economic Advantages of Smallholders

The market for carbon credits will be driven by demand, rather than supply. Therefore a critical issue is the extent to which smallholders and the poor will provide attractive investment opportunities to potential buyers of credits. The discussion noted that some of the rural poor are located in degraded areas with good carbon sequestration potential. These farmers could become more attractive to investors than the rest of the rural poor. Assessment of the marginal cost of attaining carbon sequestration on such lands will determine the competitiveness of each carbon sequestration project. The poor on marginal lands with less absorptive capacity must also be worked into this process. It is possible that poor farmers and

other land-users on marginal lands will not necessarily be the least cost producers of carbon credits. It could be necessary to provide either some sort of intervention to improve their competitiveness or incentives to investors will be necessary in order for the rural poor to benefit from carbon sequestration activities. During discussions, two constraints to their competitiveness were identified:

- The potential high transaction costs in identifying and dealing with smallholders and the poor.
- Poor farmers and smallholders frequently operate under common property or open access property rights regimes and often there are more than one system of resource ownership operating on the same parcel of land. (For example, there may be different rights to land, water, and trees, or there may be more than one landowner for a given parcel of land.) While tried and true best practices are available for increasing land tenure security for the land improver (reclaimer), policy support for such practices has been uneven. Perhaps pressure from a new soil carbon market will help to solidify the necessary policy enabling conditions for this crucial institutional change.

Several strategies for overcoming these constraints were discussed. The Group agreed that to lower overall transaction costs it would most likely be necessary to reduce carbon market transaction costs. This can be done by working with groupings of smallholders, utilizing local-level organizations that are already in place, such as farmers' associations and watershed management coalitions, or by developing new organizations, such as carbon credit unions.

3c) Ensuring Environmental Standards

The Working Group considered two issues raised by groups concerned with ensuring environmental standards and identified different solutions appropriate in each case. The first was how to ensure that carbon easement sales do not result inadvertently in an increase in carbon or other greenhouse gas emissions. In regard to carbon, this concern can be dealt with by establishing baselines. Carbon sequestration projects should also take into account the potential for leakages and designed to avoid creating incentives to generate leakages. Some tricky issues arose in this discussion, such as the need to pay farmers who have already adopted carbon sequestering land use practices such as no-till prior to the implementation of carbon sequestration projects. Excluding these early adopters, while making payments to others who are newly adopting, would cause serious opposition, and, perhaps, reversion to carbon emitting practices among the early adopters, so they could adopt again and receive payment. Paying these early adopters, however, would result in problems of additionality. To resolve this dilemma, it may be necessary to consider a government subsidy payment for the earlier adopters. Further baselines guidance on this issue from the IPCC as soon as possible would be useful. There was also extensive discussion on the need to consider the impact of changing farm practices on the emission of other greenhouse gases, such as methane and nitrous oxide (e.g., the net effect on greenhouse gas emissions of increasing nitrogen fertilizer use). It was agreed that carbon sequestration projects need to take these emissions into account when calculating net returns from carbon sequestration activities.

The second issue was how to reduce environmental problems associated with practices adopted to sequester carbon. One example discussed was the implications of increased farm chemical usage (e.g., fertilizer and herbicides) on water quality. The Group was divided on how these issues could and should be dealt with. To the extent that negative environmental impacts are private costs born by the farmer, it was felt that no intervention would be necessary, as the farmers themselves should have the right to make their own decisions on

what was appropriate. The right to make these decisions assumes that the farmer is adequately informed of the real costs and benefits accrued by his/her decisions. However, where negative environmental impacts result in externalities, e.g., costs that are born by others in local, regional or global communities, some sort of intervention is necessary. There was a general consensus that one way of addressing these issues would be to develop a menu of "sustainable" agricultural land-use change options that would be considered allowable under carbon sequestration projects. Such a list of practices could be developed by the CGIAR's Intercenter Working Group on Climate Change and other international and national institutions and would be screened for their potential impacts on non-greenhouse gas related environmental impacts.

Next Steps

The Future Harvest Intercenter Working Group on Climate Change of the CGIAR (Consultative Group on International Agricultural Research) will convene with USAID's Collaborative Research Support Programs (CRSPs), Soils CRSP, led by University of Hawaii, and Sustainable Agriculture and Natural Resource Management (SANREM) CRSP, led by the University of Georgia, to propose to WMO's Global Climate Observing System (GCOS) and FAO's Global Terrestrial Observing System (GTOS), a pilot design for an agricultural carbon measurement and monitoring clearing house addressing the above concerns and findings. Pilot sites for testing their combined measurement approaches will be identified and overseen by IFAD and its host-country counterparts.

Concluding Note

The International Fund for Agricultural Development (IFAD), with support from the Food and Agriculture Organization of the United Nations (FAO) and the United States Agency for International Development (USAID), sponsored this workshop at the headquarters of the World Meteorological Organization (WMO) in Geneva. Carbon sequestration can contribute to achieving the objectives of the global environmental conventions. In addition, it offers a promising way to attain sustainable development and increase incomes in developing countries. The consultation in Geneva has produced this provisional set of technical and institutional recommendations to create an integrated monitoring system for accounting and quality control. The expert consultation on verification organized by FAO for the end of September will permit further reflection on these guidelines. The challenges and opportunities for the world's rural poor are important, immediate, and a priority for the donor community.

Appendix 5

**Global Carbon Sink System
For Rural Poverty Alleviation**

(A Concept Note - draft)

GLOBAL CARBON SINK SYSTEM FOR RURAL POVERTY ALLEVIATION

(A Concept Note - draft)

I. Introduction

1. Despite political differences between various groups of the Parties to the UNFCCC and the uncertainties surrounding the start up of the Clean Development Mechanism (CDM), there is growing consensus that "biotic carbon offsets" are important and desirable tools to be employed in the global efforts to address problems associated with Greenhouse Gas (GHGs) emissions. Accompanying this consensus is an increasing recognition and appreciation of corollary benefits that carbon sequestration has on conservation and the ability to make a livelihood. Generally, if farmers are paid for activities leading to carbon storage they can better afford to adopt more environmentally friendly management practices. Moreover, the potential of carbon sequestration activities contributing to an increase in the flow of resources from the private sector to rural areas for poverty alleviation makes carbon sequestration a particularly attractive proposition.

2. As the overall level of ODA has been declining during the last decade, the process of globalization has directed a substantial amount of private resources to the developing countries. However, the increase in private net capital flow has benefited primarily 10-12 countries, of which only two or three are low income countries. Moreover, the share to sub-Saharan African countries from private resources has been a small fraction of the total, primarily benefiting two countries, i.e., the Republic of South Africa and Nigeria. Carbon sequestration, already entered in the market, is one possible option to influence the direction of additional resources towards resource poor farmers. This Concept Note advances a proposal for establishing a global System and Network partnership dedicated to this objective. The System, by virtue of its global structure and a holistic participatory approach involving major stakeholders (scientists, practitioners, certification experts, policy makers, investors, and local population), is also expected to contribute to the resolution of issues which are presently posing major barriers to a vibrant and effective market for carbon sequestration and the other GHGs, namely methane and N₂O.¹

3. The identification of the need for such a system is the outgrowth of a workshop, under the sponsorship of the International Fund for Agricultural Development (IFAD), the United States Agency for International Development (USAID), World Meteorological Association (WMO), and supported by the Food and Agricultural Organization of the United Nations (FAO), held in Geneva at the end of August 2000 on "Carbon Sequestration, Sustainable Agriculture and Poverty Alleviation." The meeting convened to respond to growing economic opportunities for farmers, interest by corporations in carbon trading and problems with a state-of-the-art system for measuring carbon. A group of policy advisors, university

¹ While the actual volume of methane (CH₄) emitted is much smaller than carbon dioxide (CO₂) emissions, methane has a Global Warming Potential (GWP) of 21. Nitrous oxide, N₂O, is an even more powerful gas than methane, with a GWP of 310.

professors, representatives of Non- Governmental Organizations and International Governmental Organizations, scientists and others addressed the issue of how to use carbon sequestration, as contemplated in the Kyoto Protocol and its Clean Development Mechanism, for the economic benefit of and to alleviate the food insecurity in developing nations.

4. The workshop took note that large areas of agricultural lands have been seriously degraded through loss of nutrients and carbon stocks. Nearly a billion people live in poverty on degraded lands. These lands have a huge potential to store carbon, which could also lead to a significant improvement in soil productivity and hence poverty reduction. Poor farmers would be paid to use agricultural practices that increase soil carbon stocks, improve soil quality while at the same time removing CO₂ from the atmosphere. If means can be implemented, then activities that sequester carbon have the potential to combat poverty and increase political and financial stability in poorer countries. Such a carbon budgeting system would require cost-effective and practical means to measure the level of carbon in soil as well as the changes in carbon over time. The workshop concluded that concerted efforts are required at the global level to address these issues and also to tilt the market in favour of smallholders and the rural poor. (See Annex III).

II. Kyoto Protocol, Emissions Reduction and Carbon Sequestration

5. Article 12 of the Kyoto Protocol defines the CDM. Its first stated purpose is to assist developing country Parties in both achieving sustainable development and contributing to the ultimate objective of the UNFCCC, i.e., stabilization of GHG concentrations in the atmosphere at a level that would prevent anthropogenic interference with the climate system. A second purpose is to assist developed country Parties in achieving their targeted reductions of GHG emissions by obtaining certified emissions reductions to apply to their targeted reduction commitments from projects in developing countries that result in emission reductions. The CDM is the only "flexibility" mechanism in the Kyoto Protocol that directly affords an opportunity to developing country Parties to contribute to reduction of GHGs cooperatively and in a way advantageous to them. Moreover, while the dominant focus of the UNFCCC and its Protocol is on reduction of emissions by developed country Parties, it is arguable that the CDM integrates the five guiding principles of the UNFCCC better than any of the other flexibility mechanisms. The first principle concludes that the developed country Parties should take the lead in combating climate change and its adverse effects but it first recognizes that all Parties are to protect the climate system for present and future generations based on equity and in accord with their common but differentiated responsibilities and respective capabilities. The second principle states that the specific needs and special circumstances of developing country Parties should be given full consideration including those Parties particularly vulnerable to the adverse effects of climate change and those that would have to bear a disproportionate or abnormal burden under the Convention. The third principle is the precautionary principle. The fourth states that the Parties have a right to and should promote sustainable development. The last urges cooperation to support an open international economic system that would lead to sustainable economic growth and development in all Parties.

6. If carbon sequestration is to be included under the CDM then it will do so because the Parties will assert it. Moreover, it will need to be approved specifically for the agricultural sector for application during the first commitment period since Article 3.3 of the KP bounds application of carbon sequestration type activities to "direct human-induced land-use change

and forestry activities, limited to afforestation, reforestation and deforestation since 1990.” Nevertheless, the potential for carbon sequestration being an effective tool in mitigating GHG emissions, even if not applicable to the first commitment period but to the second and following commitment periods, is great. The IPCC has estimated that it may be possible to remove 40 to 80 Pg of carbon by sequestering it in cropland soils over the next 50 to 100 years.

7. The “biotic carbon offsets” involving smallholders and dwellers on common property can take place within:

- Forests by increasing carbon storage in the soils and biomass through reforestation and improved forest management.
- Crop lands by increasing carbon storage in the soils through improved management, leading to higher yields with less chemical inputs.
- Rangelands by increasing carbon storage in soils by controlling and improving grazing management.

III. Present Market for Carbon and Prospects for its Growth

8. A recent study done by MIT for the World Bank indicates that a global market in emissions could be in the tens of billion dollars annually if there is full and free trading with the developing countries. Carbon sequestration could secure a commensurate size (some billion dollars a year) of such a market. The potential for a carbon “credits” market for the US agricultural sector alone is estimated to be in the order of USD 1-5 billion per year for the next 30-40 years.² Carbon markets are emerging in various parts of the world. Several million hectares of forests world wide are currently under forest management regimes related to GHG mitigation funding. To date, more than 25 forestry projects have been funded through joint implementation mechanisms in more than 15 countries³ (see Annex IV). More projects are being pursued by both the public and private sectors. Another example is the recent contracts by Canadian and American utilities to purchase 6 million metric tones of sequestered carbon from Iowa farmers.⁴ However, full realization of such a market will be conditioned on the resolution of a host of issues related to carbon trading, the most important among them being accurate quantification and verification methods and tools to assess the impact of policies and economic factors on both the sequestration rate and the farm economy.

9. Within the above context and despite the sharp differences of opinions and perspectives demonstrated in international negotiation fora, vigorous efforts are being made in the form of research, experimentation, consultation and policy analysis. These efforts are world wide and represent expectations for exciting market opportunities in the future. Of particular significance are the initiatives undertaken recently by European countries in spite of the impression that they had left at COP-6 as anti-carbon sequestration. For example, the EC is sponsoring an important workshop aimed at bridging the gap between implementation and certification experts (Amsterdam, March 2001). Two major conferences on carbon economy are also planned by Environmental Finance magazine (London, 15-16 February 2001 and New York, 27-28 February 2001). Moreover, a large number of web sites have been already

² CASMGS.

³ IFAD/ICRAF.

⁴ CASMGS.

created on this subject. In brief, even in the absence of a reasonable consensus on CDM and its governance in the future, the elements of a market in transition for carbon sequestration are presently at work.

IV. The Proposed Global Carbon Sink System (GCSS)

A. Rationale

10. The Geneva Workshop demonstrated that prospects are promising for finding win-win solutions to harness carbon sequestration options in favour of smallholders, pastoralists and dwellers on common property. However, many disciplines have bits of the puzzle and, often, different glossaries. Moreover, the proliferation of information, duplication of efforts and lack of consensus on recommended approaches and solutions have contributed to misconceptions and doubts regarding the potential of carbon sequestration. Consequently, in the aftermath of the workshop a group of participants considered the need for a "System" with a global outreach through which information seekers from various disciplines (e.g., research, implementation, investment and certification) can fruitfully concentrate their time and efforts when searching for needed information. Such a system should also facilitate the exchange and consolidation of information and promote the convergence of direction among major stakeholders concerned with climate change, sustainable agriculture and poverty alleviation. In this context, carbon sequestration through soil would be an important challenge for the System. The major characteristics of the System, distinguishing it from other initiatives, would be: (i) its exclusive focus on smallholders and poverty alleviation; and (ii) the extension of its outreach to the grassroots level, encompassing local and traditional knowledge (paragraph 14). Given the crucial role of the private sector the "System" should focus its endeavours to ensure active participation of this sector as a main stakeholder. In fact, the CDM is expected to generate financing primarily from the private sector rather than government sources.

B. The objectives

11. The ultimate objective of the GCSS is to contribute effectively to a process through which larger amounts of private resources are allocated to carbon sequestration activities through smallholders and dwellers on common property resources, the main stewards of the natural resources. In this context, the System is expected to further activate the present market in transition and influence the market once CDM is established. More specifically, GCSS, working primarily as a clearing house, would aim at:

- Accumulation, compilation, synthesis and dissemination of information and data on carbon activities ranging from problem identification to research (scientific, socio-economic, finance, implementation strategies and approaches).
- Assessment and peer-review of data, methods, and information for relevance, cost-effectiveness, sustainability and potential for application among smallholders in developing country projects.
- Dissemination of and facilitation of the exchange of information.
- Encouragement of further research, policy and financial analysis in favor of carbon sequestration activities targeted at smallholders and the poor in developing countries.

- Facilitate and promote the development of a functioning carbon market that is accessible to and targeted toward participation by the smallholder sector in developing countries.
- Assist in promoting donor coordination and policy coherence between the various environmental conventions so that environmental integrity as well as poverty alleviation for the poor smallholder is achieved in a sustainable manner.

12. With such a range of objectives, the System would also acquire the capacity for advocacy, directly or through other partners including its Housing Institution. A further benefit contemplated is identification of the gaps in knowledge and a resultant promotion to fill those gaps. The necessity of capacity building in order to assure that investments are secure and identifying technology transfer needs and opportunities should also be understood to be within the context of advocacy. Also, this storehouse of knowledge should be available to and shared with policy makers located in International Governmental Organizations and national agencies, and with humanitarian organizations and corporations.

V. Description of the System

13. The System in essence will be a “Network of Knowledge” and a “Platform” for exchanging knowledge. Its operation and the program work would be directed at bringing consensus on major issues ranging from technical to implementation strategies and enabling policy frameworks. To this end, GCSS would bring together various “*Thematic Nodes*” representing major disciplines involved, e.g., science, socio-economics, marketing, financing—both public and private, certification, policy and law. It will store received information from various disciplines thereafter to place the information, under appropriately designated headings, at the disposal of users thus allowing them to access the information they need to benefit their work. The System would also secure participation of “*Regional Nodes*”, e.g., Europe, Africa, Asia, Latin America, etc.

14. The scope of the work of the System will not be confined to the formal arenas (science, research, policy, etc.), but will encompass local and traditional knowledge, the know how of farmers and the rest of civil society. One of the main challenges facing the System would be to avoid the duplication of the work of the existing networks and initiatives, while at the same time establishing a linkage with other relevant and active sites. Finally, there must be reports on implementation.

VI. Operational Tools

- Web Site
- Stock Taking Exercises on a continuous basis
- Meetings and Consultations
- Joint Publications
- Review and Assessment

(To be assessed and elaborated)

VII. Organizational Framework

15. The organizational structure of the System will consist primarily of:

- A. Sponsoring and Co-sponsoring Organizations;*
- B. The Housing Institution;*
- C. The Secretariat and the Central Node;*
- D. Thematic Nodes;*
- E. Regional Nodes; and*
- F. Reviewers/Assessors.*

A. Sponsoring and Co-sponsoring Organizations

16. Sponsoring and co-sponsoring organizations will be identified on the basis of their roles as Benefactors. Being a Benefactor should ordinarily be based on a gift of money. However, it could also encompass allowance to open up the Benefactor's database thereby making its papers available to those reviewing/assessing in order to determine whether the papers are relevant to the goals of the System and, if so, thereafter to include the relevant papers in the System. On the other hand, allowing use of a database may be seen as an endorsement and an organization merely opening its database could be an Endorser, another role to be considered for inclusion in the framework of the Organization.

B. The Housing Institution

17. The System is to be housed by an existing non-governmental institution with international coverage, strong environmental credentials and an adequate pool of expertise. Selection of an appropriate institution will come out of the forthcoming planning process that includes a "brainstorming/planning" meeting between potential partners in the process.

C. The Secretariat

18. The System would be served by a Secretariat located in the Housing Institution. It is here where the Central Node of the "Network" will be also located. The duties of the Secretariat will be to maintain the partnership with the Housing Institution, maintain an orderly internet site, organize the Node headings, promote the Network, and assure the quality of Reviewers/Assessors. Details will need to be worked out for development of an internet web site. Other details to be addressed will include the sharing of administrative personnel and sharing of space in the Housing Institution. Finally, it will be important to address the copyrights of the organizations that will supply the papers. Publishing some of those papers through the Housing Institution web site is likely to require permission of the organization (and possibly the author) through which the paper was originally published.

D. Thematic Nodes

19. The Thematic Nodes (TNs) represent major disciplines involved in the carbon economy with a focus on poverty alleviation. They need to be carefully selected to ensure that first, the most crucial disciplines are included and second, the System would not be overcrowded by too many disciplines. During the design phase, including the brainstorming session (paragraph 24), an initial attempt for the selection of TNs would be undertaken. The

list could be re-examined and modified during the implementation period. Moreover, the categorical headings of TNs and their subheadings need elaboration and clarification. If, for example, one merely dubs a Thematic Node "Science," this may prove insufficient since there are many subcategories of science which will be relied upon. Organizing the System and the web site so as to assure intralinks between the TNs and Regional Nodes (RNs) will be important. Further, given the varied mixtures of politics, economics and cultural backgrounds of the Member States of the UN, there will likely be different solutions for situations which otherwise share similar food security and poverty problems. But, since the IPCC uses a broad definition of "socio-economics" for purposes of evaluating National Assessments under the UNFCCC, perhaps the heading "Socio-Economic Policy," relying on the IPCC's definition, could serve as the heading as well as the guiding principle. This will contribute to assuring the pluralism that is contemplated. Nevertheless, the advancement of carbon measurement techniques should be a category in and of itself since this System revolves around application within the CDM of the Kyoto Protocol. "Investment" could be another heading under which available and/or proposed financing could be included. The Kyoto Protocol's Adaptation Fund, the World Bank's Prototype Carbon Fund, the Global Environment Facility's funding, and the various efforts being made in the private sector—e.g., General Electric Capital, Philip Morris, AT&T—could all prove to be useful funding sources for carbon sequestration projects and will need monitoring. "Trade" may also be a useful category since trade and investment go hand in hand and technology transfer is tied to trade. Finally, updates and changes in applicable laws would also be an appropriate heading.

E. Regional Nodes

20. The System with its intended global coverage would require active participation by stakeholders from various regions: North America, Europe, Japan, developing countries, etc. The identification and assurance of the participation of Regional Nodes (RNs) would be undertaken during the design phase and initial stages of implementation. [To be elaborated]

F. Reviewers/Assessors

21. It will be important to employ the efforts of qualified Reviewers/Assessors in order to assure the integrity of the information made available in the System. Having removed "validation" as a role should not allow us to miss the point that some threshold needs to be reached for inclusion in the System; otherwise it risks becoming a "Junk" network. It is also possible that a disclaimer will be necessary in order to notify users that the solutions made available in the papers have not been validated by the Reviewers/Assessors, but have merely been reviewed for relevance and the readers' consideration. For those who are picked to be Reviewers/Assessors, it may be sufficient recompense that they can add this role to their resume. Otherwise, an honorarium of some type may need to be arranged. If the Reviewers/Assessors are already employees of the Housing Institution or an Endorsing or Sponsoring organization, that organization could add this role to the applicable job description. University professors could be considered for these roles but they are often seeking more tangible remuneration than the mere addition of even a meaningful role to their resumes. Finally, Reviewers/Assessors should come from a broader range of backgrounds than the US in order to provide a sense of confidence to developing countries that their situations are understood; at the same time this should assure meeting the goal of pluralism.

VIII. Cost and Financing

22. The cost for launching and implementation of the System for a test period of 3 years will be estimated during the design stage. The estimated cost for the design stage as described in paragraph 24 below would be about USD 150,000 as follows:

- a. Consultancy requirement for the preparation of white paper, USD 10,000 (The white paper will be prepared by B. Mansuri at no cost).
- b. Brainstorming session and its preparation, USD 30,000.
- c. Consultancy for finalizing the paper from white to green and gray cover including the preparation of a business plan, USD 90,000, covering the cost of principal author and collaborating authors.
- d. Side Event in Montreal, USD 20,000.

23. Given the crucial role expected from the private sector it is important that the cost of the design stage be covered from sources within this sector. However, seed money, to the tune of 30% of the total cost, could be mobilized from public sector resources such as IFAD, GM/CCD and USAID. Fund raising for the design stage will start once the Concept Note has been finalized on the basis of comments provided by the Core Group.

IX. The Road Map

24. The road map for achieving the organization of this venture has begun with a conceptualization based on an earlier version of this document and will move next to a brainstorming session in February 2001, out of which a white paper will be developed. Further refinements will come soon thereafter leading to a green paper and ultimately, in the Spring, to a presentation of the System at a Side Event during COP-6, bis, in Montreal. On the basis of the outcome of the Side Event and the comments received, a final paper will be prepared as a basis for mobilization of resources from the private sector. Through the whole process, sponsored by WRI, a "Principal Author" would work closely with a "Core Group of Collaborating Authors," representing various regions, relevant disciplines and partner institutions. The selection of participants in a brainstorming session will be done in consultation with the Core Group.

25. As the principal author, Bahman Mansuri (IFAD) started drafting the white paper. The initial members of the "Core Group of Collaborating Authors" consists of the following: (a) Robert Ford (USAID); (b) Robert Wolcott (WRI); (c) Cesar Izaurralde (Battelle-Pacific Northwest National Laboratory); (d) John Kadyszewski (Winrock International); (e) Edwin Sheffner (NASA); (f) Goro Uehara (University of Hawaii); (g) Edward Kanemasu (University of Georgia/SANREM); and (h) Allen Keiser (Consultant). The group would be expanded to include experts from Europe, Japan and developing countries.

Annex I: Outline of the Design Paper

[Under preparation]

Annex II: List and brief description of Initial Nodes participating at the design stage

[To be decided on the basis of consultation with the Core Group]

Annex III: Report of Geneva Workshop

[Available on separate file]

Annex IV: Examples of Carbon Sequestration projects already funded

Although the CDM is not yet operational, since the late 1980s, a number of forestry-based carbon sequestration project investments have been made in the developing world, as part of a pilot phase designed to build experience and establish best practice. Some of these projects are outlined in the table below. Those which have been reported to closely involve local communities are marked with an asterisk.

Examples of forestry-based carbon offset projects to date

Project name	Start date	Carbon offset (10 ³ tC)	Area (ha)	Host country	Investor country	Project description
AES-Care	1990	10,500	186,000	Guatemala	USA	Agroforestry*
ICSB-NEP I	1992	56	1,400	Malaysia	USA	Reduced Impact Logging
AES-Oxfam-Coica	1992	15,000	1,500,000	South America	USA	Forest protection*
AES-Nature Conservancy	1992	15,380	58,000	Paraguay	USA	Forest protection*
Face-Profafor	1993	9,660	75,000	Ecuador	Netherlands	Small farmers plantation forestry*
Rio Bravo	1994	1,300	87,000	Belize	USA	Forest protection and management
Carfix	1994	2,000	91,000	Costa Rica	USA	Forest protection and management*
Noel Kempff M.	1996	14,000	1,000,000	Bolivia	UK/USA	Forest conservation and management
Burkina Faso	1997	67	300,000	Burkina Faso	Denmark	Firewood community forestry*
Scolec-Té	1997	15	13,000	Mexico	UK/France	Community forestry*
PAP OCIC	1997	18,000	570,000	Costa Rica	Norway, USA	Forest conservation*
NSW + Pacific Power + Delta Electricity	1998	69	1,041	Australia	Australia	Reforestation
World Bank Prototype Carbon Fund	1998	n.a.	n.a.	International	International	Renewable energy and forestry

* indicates reportedly close involvement with local communities

Thus far, total investments in forestry-based carbon offsets have tracked the signals emerging from the policy process, rising sharply from an annual US\$4.5 million to US\$347 million following the Kyoto Protocol's legally-binding GHG emission targets.

Source: "A Regional Environmental Services Facility for the Benefit of the Upland Poor in Asia," IFAD, January 2000.

Annex V:

**A Report of Preliminary Findings Regarding United States'
State Laws That Address the Kyoto Protocol Climate Change Issues**

by Allen Keiser

As part of the preparation studies for the design paper, a review of US State laws that address the Kyoto Protocol has been undertaken. Below is a summary of the review's preliminary findings.

Several states have taken actions which are encouraging. Only a few states can be said to have made some kind of tax credit available, but such credits are not fully on point with carbon sequestration. Other state legislatures have denied their governments' ability to take the Kyoto Protocol climate change issues into account. The three paragraphs below follow the above outline. The search terms used were first, "carbon" limited by "tax," second, "greenhouse gas," third, "climate change," and fourth, "carbon sequestration."

California has created a Climate Action Registry where entities voluntarily report their early emissions reductions, including reductions which occur at the entity's facilities outside the state. The California Registry requires third-party verification but there is recognition that reliable baseline (and other) measurements are a problem. Both New Hampshire and Wisconsin have also established voluntary, early reporting Registries. Hawaii, in planning for its facility systems regarding energy, has as one of its objectives "[t]he reduction, avoidance, or sequestration of greenhouse gas emissions from energy supply or use." Nebraska, a mid-western farming state and home to the recently retired Senator Bob Kerrey, has recognized that "[i]mproved agricultural production methods, soil conservation practices, and other methods of stewardship of soil resources have great potential to increase carbon sequestration on agricultural lands and help offset carbon dioxide emissions from other sectors of the economy." The Nebraska legislature thus created a Carbon Sequestration Advisory Committee to quantify and verify carbon sequestration on agricultural land, and "to recommend policies or programs to enhance the ability of Nebraska agricultural landowners to participate in systems of carbon trading." Tennessee recognized that "the development of biobased products, agricultural biomass, bast fiber crops and industrial utilization would reduce dependence on foreign oil imports; enhance energy security; reduce environmental emissions of harmful pollutants; decrease greenhouse gas emissions; increase profitability for agricultural biomass commercial activities; revitalize rural areas with new markets and revenue streams; and would provide greater consumer choices for power, fuel and commercial products."

Only three states have some kind of carbon or green tax credit. New York provides a green building tax credit if certain construction conditions are met. Maryland gives tax credits to businesses that provide commuter benefits to their employees, one of the goals of which is to reduce carbon monoxide (not a greenhouse gas) levels. Closer to being on point, Connecticut provides a tax credit to donors of open space that could have the effect of absorbing significant amounts of carbon dioxide.

Six states have generally rejected any efforts to reduce greenhouse gas emissions: Alabama, Illinois, Kentucky, Oklahoma (an oil and gas producing state), West Virginia

(home of Senator Robert Byrd—author of the Byrd Resolution, a poor state that relies heavily on coal production for income), and Wyoming, home of the incoming Vice President Richard Cheney, an oil and gas producing state.