

Session title: Carbon sequestration in Agroforestry (#19)

Session leader: Dr. B Mohan Kumar, Kerala Agricultural University, India

Rapporteur: Dr. TK Kunhamu, Kerala Agricultural University, India

Date: 24 August 2009

Time: 17:00 to 18:30

Venue: Room No. 14

There were eight speakers in this session dealing with a range of subjects on carbon sequestration potential of agroforestry systems—ranging from biophysical to socioeconomic and policy aspects. Titles of presentations and the speakers' affiliations are given below, which is followed by a brief report on the salient points of discussion.

Session 19 (C2) Carbon sequestration in Agroforestry

Sl. No	Title	Authors	Affiliation of the principal author
1	Carbon sequestration of smallholder tree farms and agroforestry farms in the Philippines	Rodel D. Lasco and Florencia B. Pulhin	World Agroforestry Centre (ICRAF) Laguna, Philippines
2	Carbon Storage in Soil Aggregate-size Fractions under Agroforestry Systems	Vimala D. Nair and P.K. Ramachandran Nair	Soil and Water Science Department, University of Florida, Gainesville, FL 32611-0510, USA
3	Forest carbon, land tenure, and carbon revenue distribution	André Rodrigues Aquino and André Aasrud	The World Bank, Carbon Finance Unit
4	Charismatic carbon - Inpang community agroforestry carbon bank, northeast Thailand	Jay H. Samek, David L. Skole, Usa Klinhom, Chetpong Butthep	Department of Forestry, Michigan State University, East Lansing, USA
5	Carbon Sequestration Potential of Agroforestry; Policies, Issues and Barriers	Vivek Saxena	Ministry of Environment & Forests, Government of India, New Delhi, India
6	Balance between soil N ₂ O emissions and aboveground CO ₂ uptakes in coffee monocultures and agroforestry plantations in Costa Rica	Hergoualc'h Kristell, Harmand Jean-Michel Ute Skiba	Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), Montpellier, France
7	Does tree management affect aboveground and soil C-sequestration in Acacia mangium Willd. stand in the humid tropics of India?	T.K. Kunhamu, B.M. Kumar and S. Samuel	College of Forestry, Kerala Agricultural University (PO), Thrissur, Kerala, India
8	Estimating the carbon sequestration potential of short rotation coppice on marginal sites - a model approach	Ansgar Quinkenstein	Brandenburg University of Technology Chair of Soil Protection and Recultivation Konrad-Wachsmann-Allee 603046 Cottbus, Germany

A brief summary of the presentations and the salient recommendations of each presentations are given below.

1. Dr. R. Lasco: Presented 10 years data on the potential of smallholder tree farms and agroforestry systems in the Philippines to sequester carbon. Carbon sequestration potentials as high as $9.9 \text{ Mg ha}^{-1} \text{ yr}^{-1}$ was reported. Also presented case studies of emerging C markets.
2. Dr. Vimala Nair: Examined the role of tree roots in sequestering C in the deeper soil layers in AFSs under different agroecological conditions: subtropical silvopasture in Florida, USA; parkland and fodderbank systems in Mali in the semiarid-to-arid West African Sahel; homegardens in the humid lowlands of Kerala, India; cacao AFS in Bahia, Brazil and in the dehesa AFS of Spain. Data on soil organic carbon pools in relation to different soil aggregate-size fractions in soil layers up to one meter depth under the various AFSs. Results suggest that tree-based AFSs have greater potential for C sequestration compared with treeless systems.
3. Dr. André Rodrigues Aquino analyzed the relation between land tenure and the design and success of community-based forestry carbon finance projects and the carbon revenue distribution mechanisms based on a comparative study of four forestry carbon sequestration projects in sub-Saharan Africa. He discussed the changes in land tenure situation and how it impacted project design and the carbon revenue distribution and provided some generalizations on the links between land tenure, the design of forest carbon projects, and the carbon revenue distribution mechanism adopted.
4. Dr. Jay H. Samek: Presented a case study involving members of the Inpang Community Network, Thailand. The paper highlighted the lessons learned in developing the Inpang Community Agroforestry Carbon Bank, which represents a socially and environmentally valuable form of carbon offset as opposed to single-species reforestation plantations. Ecological and social benefits of AFS vs. large plantations highlighted. A CSP of 10 t C/ha/year was projected for the smallholder farms of the participants.
5. Mr. Vivek Saxena: Analyzed the existing policies, guidelines and tools related to CDM, A& R projects and REDD. The policy issues and key barriers for realizing the carbon sequestration potential of agroforestry were discussed. Policy options for promotion of Agroforestry in realizing C-sequestration potential of agroforestry have been suggested and the constraints in AR CDM projects discussed.
6. Dr. Hergoual'h Kristell: Soil N_2O emissions and C storage in coffee monocultures and coffee agroforestry systems (AFS) with N_2 fixing shade trees, under two agricultural managements were compared. For both types of agricultural management, annual N_2O emissions were higher in the AFS than in monocultures. The balance between cumulated N_2O emissions and CO_2 uptakes over the lifetime of the plantations was negative in monocultures but positive in AFS with a greater contribution to mitigate climate change of the organic management ($37.3 \text{ Mg CO}_2\text{-eq ha}^{-1} \text{ 32 y}^{-1}$) than of the conventional one ($14.9 \text{ Mg CO}_2\text{-eq ha}^{-1} \text{ 32 y}^{-1}$).
7. Dr. T.K. Kunhamu: Explained the changes in aboveground and soil (0-15 cm) carbon pools of six-and-half-year-old *Acacia mangium* trees as influenced by stand management practices such as planting density regulation and tree pruning. Treeless control plots registered the lowest soil C stock (24.7 Mg ha^{-1} for the 0 to 15 cm layer) while the stand with $2500 \text{ stems ha}^{-1}$ showed the highest soil C content, implying some negative effects of very high stand densities (e.g., $5000 \text{ stems ha}^{-1}$) on the soil C pools.

8. Ansgar Quinkenstein: The role of short rotation coppice (SRC) of poplar or black locust as an approach for sustainable production of biomass and fixation of carbon with positive effects on soil humus and general fertility of marginal agricultural sites were discussed. The results of a simulation study demonstrated that SRC can form an effective carbon sink. If the effect of replacing fossil energy fuels by regrowing biomass is taken into account, SRC can be considered to be a permanent carbon sink and may provide a promising alternative for future land use in the temperate zone.