MANAGING ECOSYSTEMS TO MITIGATE CLIMATE CHANGE: ITS NOT JUST THE ON-SITE CARBON STOCKS

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Among the strategies under consideration for mitigation of global climate change is to increase the carbon stored on-site in terrestrial ecosystems. The logic is that carbon sequestered in the ecosystem is carbon not in the atmosphere. However, if our intent is to mitigate climate change it is important to ask the net impact of a mitigation strategy on greenhouse gas emissions and on the radiative balance of the Earth. If the carbon content of the biosphere is to be purposefully managed; what are the costs in terms of fossil-fuel use, the opportunities for using the land in alternate ways, and the emissions of other greenhouse gases? And, in the context of this meeting, what is the direct, physical impact on the climate system? In essence a complete consideration needs to include the chemical, physical, and economic systems of which the ecosystem is a part. This presentation sets a framework for examining the full greenhouse gas implications of managing the carbon in forest ecosystems or agricultural soils. It is this net impact on greenhouse gas emissions from the chemical and economic systems, not just the on-site stocks of carbon, that needs to be incorporated with the physical role of ecosystems in the climate system. We show, with illustrations from changes in forest and agricultural management, that the net impact on greenhouse gas emissions can be far different than the change in on-site carbon stocks once the flow of products and the energy needs of management are brought into consideration. An additional challenge is that we are entering a regime where it is not just carbon, but it is "your carbon" and "my carbon"; and this creates challenges in reaching optimal solutions