

**Summary of the January 2010 Forum
Center for BioEnergy Sustainability (CEBS)
Bioenergy and Changes in Carbon Stocks
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The Kyoto protocol says, “The net changes in greenhouse gas emissions by sources and removals by sinks resulting from direct human-induced land-use change and forestry activities, limited to afforestation, reforestation, and deforestation since 1990, measured as verifiable changes in stocks in each commitment period, shall be used to meet the commitments” The important point for our discussion today is that these emissions and removals are measured as changes in stocks while emissions from fossil fuels and most other sources are measured as flows to the atmosphere. The distinction is that emissions and flows in the biosphere are perceived to be in a sense reversible.

Marland and Schlamadinger had been running simulations of forest management strategies with the Graz/Oak Ridge Carbon Accounting Model (GORCAM): which focuses on forests and forest products, their diverse fates, and the effects on carbon stocks; and played a role in the accounting strategy adopted at Kyoto. GORCAM is a spreadsheet model that estimates cumulative carbon change over time, accounting for many variables. It works on the scale of years. GORCAM has been run for scenarios of land use that are being discussed with respect to use of biofuels today.

It is often assumed that the regrowth of the crop following harvest of biomass will offset all of the carbon released from the harvesting and use of the biomass. This might be true if there were no loss of soil carbon and if the regrown biomass contained the same amount of carbon as the harvested biomass. In any case, there will be a time interval between when the biomass emissions are incurred and when CO₂ is taken up by growth. This interval may be a matter of months for annual crops, years for short-rotation woody crops, or decades if the biomass is from traditional harvesting of trees. Marland and Marland (1992) had earlier concluded that “the most effective strategy for using forest land to minimize increases in atmospheric CO₂ will depend on the current status of the land, the productivity that can be expected, the efficiency with which the forest harvest is used to substitute for fossil fuels, and the time perspective of the analysis.”

GORCAM results published in the middle 1990s are consistent with the observations published recently by Searchinger et al (2009) but not with the solutions suggested by Searchinger et al. The problem is not with accounting for stock changes but with looking at incomplete systems when carbon accounting does not include all parties or all times. That is, the accounting for carbon is not complete when biomass fuels are burned in a country that does report emissions regularly but are produced in countries that do not report regularly. The temporal problem is a real concern in circumstances with short commitment periods, thresholds, or emissions trading. The result is that biofuels may not be “carbon neutral” when accounting systems do not capture the full affected system.

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