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Land use change and carbon stock dynamics in Sub-Saharan Africa - Case study of Western Africa – Ghana

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Among different regions of the world, Africa and particularly sub-Saharan Africa (SSA) has contributed less than any other to the greenhouse gas emissions, but it is also the region most vulnerable and the least well equipped to the consequences. In SSA the role of land use change in controlling CO_2 emissions may be more critical than in any other regions and perhaps the most uncertain component of the global carbon cycle. The most typical example of incomplete estimates will arise from the lack of reliable data for carbon pools. Three factors account for much of the rest of the uncertainty: (1) initial stocks of carbon in ecosystems affected by land-use change, (2) per hectare changes in carbon stocks in response to different types of land-use change, and (3) legacy effects; that is, the time it takes for carbon stocks to equilibrate following a change in land use. Considering the source of uncertainty and the lack of field data for SSA, the study has been located in Ghana (Jomoro district, Western Region) where forest is the only source of wood for domestic uses and deforestation annual rate was 2.2% for the period 2005-2010. This study analyze the above mentioned gaps by assessing: 1) initial carbon stocks (tropical rain forest), 2) per hectare changes in carbon stocks as consequence of deforestation followed by six different main land uses [tree plantations (rubber, coconut, cocoa, oil palm, mixed plantations) and a secondary forest], 3) dynamics of soil carbon stocks through the time considering chronosequences. When accounting changes in carbon stocks in the UNFCCC framework, it is required to consider 5 carbon pools that are: aboveground biomass, belowground biomass, litter, dead wood and soil. Within REDD+ mechanism it is clear that only aboveground pool has to be always considered, belowground biomass is recommended and the others are facultative. Evidence from official UNFCCC reports suggests that only a very small fraction of developing countries currently reports data on soil carbon, although emissions from soils following deforestation are likely to be significant in many cases. Despite the common understanding about the effects of deforestation on different compartments in terms of carbon stocks (e.g. disappearance of biomass) variations in soil carbon are much less perceptible, even after a radical change in land use . This study brings in the spotlight the soil reaction to radical land use change in the long run demonstrating that it is not so trifle as commonly believed. Importance of considering soil carbon stock for accounting land use change dynamics is not properly recognized in the international deforestation policies and its influence in mitigating climate change is nowadays neglected but it is really not negligible.