Modeling Carbon Sequestration in Mbola, Tanzania

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The pressing need to reduce greenhouse gas emissions and temper the effects of climate change is unequivocal. One abatement option is Reducing Emissions from Deforestation and forest Degradation (REDD), which seeks to naturally sequester carbon in biomass and soil. Using the carbon sequestration model in an ArcGIS toolset, Integrated Valuation of Ecosystem Services Tradeoffs (InVEST), the importance of land cover map resolution and carbon stock accuracy was evaluated. In three consecutive runs, soil carbon, biomass carbon, and land cover datasets of increasing sophistication and expense were used to model sequestration over a 20 year interval. It was found that including dynamic soil carbon data drawn from other models was crucial. By incorporating the effects on soil carbon changes from land cover changes, the accuracy of the model increases significantly. Also, using a high-resolution land cover map along with biomass carbon stocks from a forest inventory significantly improved model accuracy. Literature biomass carbon values for each land cover classification were found to be too variable, with a huge disparity between high, medium, and low estimates. At the current market value of carbon on the Chicago Climate Exchange (CCX), InVEST valued carbon sequestration from rotational woodlots at $22.95 per villager over 20 years. With revenue just over a dollar each year, carbon contracts would not be effective in encouraging more sustainable land management.