Carbon sequestration by secondary forests at small farms along the Transamazon highway

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Secondary tropical forest regrowth in abandoned agricultural areas is becoming a key element in the mitigation of global and regional climate change. In this study we focus on estimating the total aboveground biomass stored in secondary forests of distinct successional stages, following traditional cultivation by smallholders settled along the Transamazon highway, in Pará, Brazil. The study site is one of the several areas in the Amazon region assisted by the Brazilian government program called "Proambiente". Different actions have been developed by Proambiente with the overall objective of conserving natural resources while enhancing sustainable production systems. In this study, ten small farms were investigated. Each area was georeferenced and land cover was classified based on Landsat TM images. Land use histories were obtained from interviews with the farmers. Eleven secondary forest patches with areas larger than 5ha were classified as initial or advanced stages, according to their structural attributes. A mature forest site was also studied for comparison. Three nested plots were established for each sampled area (i.e., squares of 10 x 10m, 3 x 3m, and 1 x 1m). Aboveground biomass was estimated by a general model for the 573 stems measured in diameter and height. Although general models may present limitations, they can be useful as a first approximation in the broad perspective of our study. Mean aboveground biomass was estimated as 45Mg ha-1 (SD=27) for forests in the initial successional stage and 100Mg ha-1 (SD=60) for forests in the advanced successional stage. Simulations for hypothetical farms with total area of 100ha showed a potential carbon sequestration varying from 937 tons of carbon (12.5% of the area with forests in the initial and 12.5% in the advanced stage) to 125 tons of carbon (5% of the area with successional forest in the initial stage). More than creating expectations towards a successful scenario of a global carbon market, these results can contribute to an assessment of environmental services provided by secondary forests in the Brazilian Amazon.