ABOVE - GROUND CARBON STOCKS ALONG A SUCCESSIONAL GRADIENT IN A TROPICAL DRY FOREST: COMMUNITY STRUCTURE AND ECOSYSTEM FUNCTION

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INTRODUÇÃO

Human alteration on natural ecosystems has been substantial and is still growing. Forest ecosystems, for instance, have been drastically converted by half of its historical extension, with a high transformation rate for tropical forests up to 13 million hectares per year (Laurance 2010). Tropical dry forests have been struck particularly hard with a reduction of 48.5% at global level (Hoekstra *et al.*, 2005) and 66% in Latin America (Portillo - Quintero and Sánchez - Azofeifa 2010). Declining of species as a result of habitat alteration has raised concern due to the potential consequences of biodiversity loss for ecosystem functioning and the provision of ecosystem services (Naeem *et al.*, 2009).
Tropical dry forests (TDFs) are considered among the most endangered ecosystem in the tropics due to habitat transformation and subsequent biodiversity loss (Hoekstra *et al.*, 2005). Due to this transformation, current extension of TDFs is represented by a landscape complex consisting of a matrix of agricultural fields and patches of secondary forest succession (Portillo - Quintero and Sánchez - Azofeifa 2010). Forest succession has significantly influenced patterns of species diversity and composition in TDFs (Madeira *et al.*, 2009, Quesada *et al.*, 2009). How changes on biodiversity during succession affect the functioning of TDFs, however, is not yet understood (Quesada *et al.*, 2009).

OBJETIVOS

The general purpose of this study was to estimate carbon stocks in a tropical dry forest. Specifically, we evaluated how changes on community structure along successional stages influences above - ground carbon stocks.

MATERIAL E MÉTODOS

The study area, Parque Estadual da Mata Seca (10,281 ha), is located in the state of Minas Gerais. The area has an extension of 10,281 ha. The area is represented in three successional stages: 1) early (11 years) with a single stratum and a canopy up to 4 m, 2) intermediate (31 years) with two strata and canopy up to 15 m, and 3) late (50 years) with two strata and canopy up to 20 m (see Madeira *et al.*, 2009 for a complete description). In 18 plots (0.1 ha, 6 plots/stage) we identified and measured the diameter at breast height (DBH) of all woody stems with DBH ¿ 5 cm. To estimate carbon stocks, we calculated the above - ground biomass (AGB) for individual trees using an allometric equation for dry forests (Chave *et al.*, 2005). This equation depends on tree DBH values and wood density. We converted these biomass data to carbon stocks using a carbon value of 47% (Hughes *et al.*, 1999). We used community attributes (evenness, dominance) to evaluate the relative contribution among species to carbon stocks, as well as the effects of succession on the total magnitude of carbon following an approach by Balva-

nera *et al.*, (2005).

RESULTADOS

We registered 94 tree species in the study area. However, carbon stocks were estimated from 72 species, because we did not have wood density data for 22 species. Total carbon storage estimated was 11.4 ± 9.7 Mg C/ha in early successional stages, 44.6 ± 18.3 Mg C/ha in intermediate, and 98.4 ± 17.0 Mg C/ha in late stages. Community attributes indicated that early stages had a lower species richness (F=15.37, P¡0.01) and higher species dominance compared to intermediate and late stages. Species richness and dominance was not different between intermediate and late stages. As a result, functional contribution of species to carbon stocks was highly uneven in early stages (F=44.8, P¡0.01). This uneven pattern is due to the dominant species *Myracrodruon urundeuva,* which accounted for more than 80% of carbon stocks in early stages. Intermediate and late stages, in contrast, showed a more even community structure related to carbon stocks.

Carbon stocks in our study reflect patterns in other tropical dry forests with higher amounts of carbon in old - growth forests compared to earlier stages of succession. The community structure of few dominant species frequently observed in early stages of succession has been also registered in other tropical forests (Balvanera *et al.*, 2005). Relative species contribution to carbon stocks was mainly influenced by species abundance in early stages. In intermediate and late stages where similar relative abundances were similar, however, differences in species contribution to carbon stocks may be more important due to other characteristics such life histories and differential rates of biomasss accumulation.

CONCLUSÃO

Although the intermediate stage in our study area has approximately 31 years, it stores about 45% of the carbon stored in late stages. This highlights the importance of secondary forests as carbon sink, given that currently secondary forests occupy 40% of the total forest area (Brown and Lugo 1990) and will likely become the dominant ecosystem in tropical regions (Laurance 2010).

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