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## Do Planting Regimes Affect the Growth Performance of Native Timber Species in Pasture-Afforestation Systems Aiming at Improving Small-scale Farmers' Livelihood?

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### Abstract

Afforestation and reforestation may be considered in a new mechanism being developed under the United Nations Framework Convention on Climate Change known as REDD+ (reducing emissions from deforestation and forest degradation in developing countries). Tropical timber tree plantations established on former pasture might serve as long-term livelihood for livestock farmers providing valuable timber. Compared to exotic trees, native timber tree species may be more adapted to the local environment and show more positive effects on local biodiversity and ecosystem processes, but their successful establishment is often impeded by insect herbivores causing dramatic loss of seedlings in afforestation/reforestation. However, only little information exists on the selection of suitable species for productive performance, related key herbivore insects and their impact on the timber tree species as well as successful sustainable management strategies in reforestations.

Our study focuses on the effects of different planting regimes on establishment and performance of three native Central American timber species. Growth, survival and economical potential of *Anacardium excelsum* (Anacardiaceae), *Cedrela odorata* (Meliaceae) and *Tabebuia rosea* (Bignoniaceae) were quantified for the planting regimes ‘monoculture’, ‘3-species-mixture’ and ‘control’ (mixture plots protected by insecticides), established in an experimental plantation in Central Panama. Furthermore, leaf damage by insect herbivores was assessed two years after planting.

Best performance was observed for *Tabebuia* in all planting regimes. *Cedrela* showed highest mortality, possibly due to high susceptibility to drought and unfavorable local conditions. Height- and diameter-growth were similar for *Anacardium* and *Cedrela*. Growth of all timber species was highest in the insecticide-protected control plots, indicating a relevant impact of insect herbivores on plant performance. This finding was supported by leaf damage patterns, which significantly differed between the planting regimes. Lowest damage, along with best tree performance, was found in insecticide-protected plots, indicating that pest control may be a major issue in reforestation of former pastures.

**Keywords:** *Anacardium excelsum*, *Cedrela odorata*, insect herbivory, pasture reforestation, *Tabebuia rosea*, timber tree performance, REDD