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Enriching Forest Plantations with Understory Crops: An Interdisciplinary Approach Towards Reforestation, Food Security and Resilient Production Systems

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Abstract

Deforestation in the Central American Republic of Panama is continuing at a rate of 13,000 ha per year. Politicians and scientists therefore widely acknowledge the need for reforestation in order to restore environmental services such as the regulation of hydrological regimes, the maintenance of biodiversity, and the storage of carbon. In this context tropical timber plantations are considered as a sustainable and economically feasible way to foster reforestation of degraded lands. However, the greatest obstacle to the implementation of timber plantations for small as well as large-scale reforestation is the long time period of up to 10 years until the first returns out of wood harvesting can be expected.

The present study presents an approach to overcome this obstacle by introducing four different crop rotations into high value timber plantations of six exotic and native tree species in an agroforestry trial in Eastern Panama. The aim of the trial was to identify optimal tree-crop combinations as well as optimal tree planting distances and light regimes to allow first returns out of wood plantations during the establishment phase. Initial tree growth and mortality has been evaluated in the different agroforestry systems in comparison to tree monocultures. Socioeconomic methods were used to evaluate the suitability and feasibility of this agroforestry system using participatory interviews with local farmers and methods of investment appraisal including risk analysis.

Results show that the enrichment of forest plantations with *Cajanus cajan* even improved tree performance of some species. Combining reforestation with crop production can help to overcome the frequent criticism - observed in the interviews - of forest plantations reducing the area available for food production. These agroforestry systems can improve food security in rural areas, while the agroforestry systems tend to have higher net present values on a long time view of 25 years.

Keywords: Agroforestry, Panama, reforestation, taungya, tropical forest plantations

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