

HAFL Master's Thesis Abstract

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English Title: **Carbon sequestration potential of cocoa agroforestry systems in Caldas and Antioquia, Colombia**

English Summary: The aim of this thesis is to assess the carbon stocks, sequestration potential and feasibility for carbon valuation on Hacienda La Tentación, a commercial agroforestry system in Caldas, and 112 cocoa producers in Antioquia. In order to do so, we measured diameter and height of cocoa and shade trees on 45 sample plots on Hacienda La Tentación and estimated aboveground carbon stocks based on allometric models. In Antioquia, we conducted field visits and a questionnaire on carbon sequestration relevant variables such as shade and cocoa tree density, share of non-shaded cocoa, other land uses and interest in carbon offsetting activities. Furthermore, we estimated aboveground carbon stocks based on measurements of representative cocoa and shade trees. The sample plots on Hacienda La Tentación indicated a mean living aboveground carbon stock of 30.82 ± 22.23 t C ha⁻¹ resulting in an accumulation rate of 4.75 t C ha⁻¹ yr⁻¹. 91 % of the living aboveground carbon stock was stored in shade trees and 9 % in cocoa trees. In Antioquia, the estimated mean living aboveground carbon stock was 12.41 ± 25.25 t C ha⁻¹ of which 32 % were stored in cocoa trees and 68 % in shade trees. There was a great variety in carbon stocks in the measured plots on Hacienda La Tentación (0.84 t C ha⁻¹ to 134.24 t C ha⁻¹) as well as with surveyed cocoa producers in Antioquia (1 t C ha⁻¹ to more than 80 t C ha⁻¹). Both the cocoa systems in Antioquia and on Hacienda La Tentación have not reached maturity and will therefore sequester more carbon during their rotation. However, there is potential to further increase carbon sequestration through the introduction of shade trees to non- or less-shaded systems, expansion of cocoa agroforests on pasture, forest plantations on pasture, replanting of unproductive cocoa lots with new cocoa trees and replacement of unproductive cocoa lots with forest plantations. The largest potential for a carbon offset project lies with the



112 cocoa producers in Antioquia which have a total farm area of 1'778 ha including cocoa on 411.5 ha. The cocoa producers in Antioquia were questioned regarding interest in participating in activities enhancing the carbon sequestration potential on their farm. 24 % of farmers have stated interest in restoring degraded forest ecosystems on their farms with native trees, 13 % were interested in expanding the area under cocoa cultivation and 6 % in introducing additional shade trees. In order for carbon offset projects with cocoa producers in Caldas and Antioquia to be feasible, there are multiple recommendations: reduce transaction costs, understand your target market, diversify revenue sources and follow best practice principles. Transaction costs can be reduced through the use of innovative technologies and methodologies, scaling up, exploiting existing synergies and ensuring funding before project development.

Keywords: Cocoa agroforestry, carbon offsetting, Colombia

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