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Effects of Three Different Logging Regimes on the Stand Structure of *Isoberlinia doka* (Caesalpinaceae) and Local Forestry Income in Central Benin (West Africa)

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Abstract

Selective logging is the most frequent form of timber wood exploitation in the woodland-savannah mosaic in central Benin. The intensity of the selective logging activities has increased considerably in recent years though knowledge of the impact of selective logging on the woodland-savannah mosaic is sparse. In the presented study a modelling approach was chosen in order to test for effects of three different logging regimes on stand structure and local forestry income of *Isoberlinia doka* (Caesalpinaceae) and local forestry income. The model was applied for woodlands with a high density of *I. doka* that are characteristic elements throughout the Guinea and Sudanian domain in West Africa. The three logging regimes correspond to three scenarios developed in the IMPETUS-project (Integrated Approach for Efficient and Sustainable Use of Fresh Water in West Africa). The three scenarios reflect (A) economic growth and implementation of the decentralisation, (B) “business as usual”, and (C) economic stagnation and institutional uncertainty. For scenario A the stand structure developed towards a higher number of fertile individuals of *I. doka*. In scenario B stand structure stayed stable but showed a low number of fertile individuals of *I. doka*. Scenario C revealed the absence of fertile individuals and a strong decrease even for *I. doka* individuals of medium size. Total local forestry income within the modelling period of 20 years was highest in scenario C (354 USD ha⁻¹) followed by scenario B (230 USD ha⁻¹) and lowest in scenario A (130 USD ha⁻¹). However, in the last year of the modelling period (2025) local forestry income was high for scenario A (16 USD ha⁻¹) and scenario B (15 USD ha⁻¹), but extremely low in scenario C (3 USD ha⁻¹). The study shows that only scenario A represents an economically and ecologically optimised management that guarantees both a long-term economic benefit and a potential for natural regeneration of *I. doka* due to a sufficient number of fertile individuals.

Keywords: Africa, conservation, forest management, forest-savannah mosaic, modelling, tree-ring analysis