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## Leaf Area and Biomass Dynamics of a Thorn-Shrub Savannah Ecosystem in the Borana Zone, Ethiopia

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### Abstract

Many uncertainties exist concerning the quantification of the carbon sequestration potential in savannah ecosystems. Biomass and carbon pools are highly variable within the different vegetation types of this zonal ecosystem, and very often most basic and sufficient accurate information related to biomass dynamics are not available.

Here we present a methodological non-destructive approach to determine high-resolution data of leaf area index (LAI) and above-ground biomass (AGB) from a thorn-shrub savannah ecosystem in southern Ethiopia, representative for the African Sahel-Zone with bimodal rainfall distribution.

Optical and destructive LAI measurements were taken from 5 dominant shrub and tree species in weekly intervals during one rainy season. We correlated the results of multiple biomass harvestings with the non-destructive optical method. Multiple optical LAI measurements performed in different horizontal vegetation layers at a 5 m grid allowed us to upscale LAI and biomass information collected at the species to the plot level of the shrub-tree formations. Established allometric equations for above-ground biomass estimations of dominant shrub and tree species were additionally used to validate our method.

We discuss our results towards the option to use this optical method for estimating above-ground net primary production (ANPP) and, thus, the carbon sequestration potential for shrub-tree dominated savannah ecosystems. The results indicated that spatial and temporal biomass heterogeneity at species and plot level resulting from the system's high natural variability will be the main methodological challenge to cope with.

Consequently, optical biomass monitoring will be a key-method to determine the spatial and temporal variability of ANPP from tree and shrub dominated savannah ecosystems and should therefore be subjected to a scientific discussion as promising approach to estimate the carbon sequestration potential of this major tropical ecosystem.

**Keywords:** ANPP, biomass, carbon sequestration, destructive, LAI, non-destructive, Sahel