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"Reconcile land system changes
with planetary health"

Does plant diversity or dendrometric characteristics enhance carbon storage in West African savannah?

Moussa Ganame[1], Martin Wiehle[2], Adjima Thiombiano[3]

[1] *University Centre of Banfora/University Nazi BONI, Agricultural Sciences and Agrifood Engineering, Burkina Faso*

[2] *University of Kassel, Tropenzentrum / Organic Plant Production and Agroecosyst. Res. in the Tropics and Subtropics (OPATS), Germany*

[3] *University Joseph KI-ZERBO, Plant Biology and Ecology, Burkina Faso*

Abstract

West African savannah ecosystems greatly contribute to climate change mitigation through carbon sequestration. However, these ecosystems undergo disturbance which can change the composition and structure of vegetation and subsequently cause a significant change in CO_2 absorption and emission rates between the bio-and the atmosphere. This change raises a fundamental question as "Will the composition, structure of vegetation change or human disturbance alter ecosystem carbon storage?" and thus in how far West African countries can contribute to an increased CO_2 sequestration. The study aimed to understand the drivers of aboveground carbon stocks variation in savannah ecosystems. Specifically, we (i) assessed the impact of woody species diversity and stand structure on carbon stock variation in savannah ecosystems, (ii) evaluated how dominant species influence carbon sequestration on savannah ecosystems, and (iii) how do protected forest categories drive carbon stock variation on savannah ecosystems. Vegetation data were collected according to two forest categories (Boulon-Koflandé Classified forest belong to the category IV and Tapoa-Boopo Reserve belongs to the category VI of the International Union for Conservation of Nature nomenclature) and vegetation types of savannahs ecosystems in Burkina Faso. Plant structural parameters such as diameter at breast height, tree height, and basal area were assessed and richness counted and diversity metrics (shannon diversity index, evenness) were computed. Biomass was assessed using mixed species allometric equation developed by the first author. Structural equation modelling and multiple linear regression were performed to relate diversity indices and structural parameters to carbon density. A total of 4226 trees composing of 98 species, 67 genera, and 26 families were inventoried in the both sites. Stocked forests with high basal area, large trees characterised by high diameter at breast and high height are the primary drivers of savannah ecosystem AGC stock. However, richness and diversity indices did not influence directly AGC. These findings constitute a baseline for monitoring forest ecosystems in order to increase carbon stocks within the REDD + framework in Burkina Faso.

Keywords: Carbon sequestration, climate change, functional diversity, human disturbance

Contact Address: Moussa Ganame, University Centre of Banfora/University Nazi BONI, Agricultural Sciences and Agrifood Engineering, 21.21, 1091 Bobo-dioulasso, Burkina Faso, e-mail: emanagassoum@yahoo.com