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Effect of climate and land-use change on the structure and diversity of woody vegetation – lessons from West Africa's woodlands

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Abstract

In this scientific article, we investigated the effect of climate and land-use change on the structure and diversity of woody vegetation in West Africa's woodlands, drawing important lessons from empirical studies and research findings. Land-use change in terrestrial ecosystems plays a vital role in many global change processes and consequently, has a significant effect on biodiversity and ecosystems. In addition to changes in how land is being used, human-induced climate change in the last century has exacerbated the impact of these pressures. We examined the complex interactions between climate change, land-use change, and woody vegetation dynamics, by asking the following research questions: i. Are effects similar or do they differ across different land-use types? ii. Are effects similar or do they differ across different climatic zones?

Sampling was done from March to June 2022 (3 months) in random plots established in Forests, Fallows, and Croplands (representing different gradients of anthropogenic changes in Land-use) and in two major ecological zones of Ghana: Moist Semi-deciduous and Dry Guinea Savannah zones (representing a steep climatic gradient). We established a total of 60 plots, with each plot measuring 50×50 sq. m, and collected data on all woody species found within them (dbh, height, taxonomic identification, and other parameters to measure their functional traits). We used size-class distributions (SCDs) and a range of diversity measures to analyse the structural composition, taxonomic and functional diversity of each land-use type.

Our synthesis of current knowledge provides important insights for policymakers, conservation practitioners, and field researchers working on ecological and environmental challenges. Furthermore, it contributes to our understanding of how these ecosystems may respond to future environmental changes and inform strategies for their sustainable management and conservation

Keywords: Climate change, land-use change, West Africa, woody vegetation

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