



Tropentag, September 14-16, 2022, hybrid conference

“Can agroecological farming feed the world?
Farmers’ and academia’s views”

Effects of land use on tree species diversity in different agro-ecological zones of Ghana

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Abstract

The understanding of changes in plant species’ responses to the interactive effect of land use and climate is not only an important area of research, but could also inform on the effect of such interactions on the composition and structure of future plant biodiversity. We hypothesize that rainfall and land use affect the composition and diversity of tree species and soil fertility attributes. We investigated the effects of land use along an aridity gradient on the population structure and diversity of woody vegetation and on soil fertility attributes in Ghana. The study was performed in: i) the wet evergreen forest zone, ii) the moist semi deciduous forest zone and iii) the dry semi deciduous zone, following a gradient of increasing aridity. In each zone, we compared protected forest areas with the surrounding non-protected agriculturally used areas. Ten survey plots of 50 m × 20 m (0.1 ha) were randomly selected in each of the six site (60 observation plots in total). In each plot, composite soil samples from top soil (0-20 cm) were taken for physico-chemical analyses.

Species richness and Shannon-Wiener diversity index were calculated based on species identities and relative abundance in a vegetation layer. Soil fertility attributes was measured for the different land use types in all the ecological zones.

Tukey multiple comparisons of means at 95% confidence level among different land use types showed significant difference in species richness and Shannon Wiener diversity index between land use types (protected forest and croplands) in each ecological zone. We observed tree species diversity increased in a gradient of decreasing aridity / increasing rainfall regimes. Protected forest areas showed highest levels of tree taxonomic diversity with varying degree among aridity gradients. Soil attributes (pH and C:N ratio) were observed to be significantly different and more homogeneous in dry and moist semi deciduous ecological zones in both land use types compared to Wet evergreen zones. The outcomes of this study depict the rapid reduction of tree species diversity as a result of agriculture. Hence, the development of agricultural systems where more trees are incorporated on croplands is highly suggested.

Keywords: Agriculture, climate change, diversification, ecosystem service, forestry, nutrient cycle, system shift