

Abstract

Three 10*10 metre quadrat was demarcated within a 50*50 m in early, late season burning and non-burnt plots to assess the influence of different fire regimes on tree diversity and density. A total of 31 species from 8 families with most species from Leguminosae, Combretaceae, Sapotaceae. Shannon Weiner's diversity index showed a higher diversity in early burning plots than in late burning and non-burning plots. Density of tree were higher in unburnt plots than in burnt plots. *Vitellaria paradoxa*, *Terminalia avicennioides*, *Combretum adenogonium* and *Combretum molle* were found most common and abundant. More evenness was observed in least occurring species than common species. These may have implications for climate change mitigation and ecosystems resilience. Higher tree densities in non-burning regimes in the savanna ecosystem could enhance carbon sequestration.

Introduction

The use of fire for conversion of forests and savannas into agricultural and pastoral land is a major land use change in Africa. This is accompanied by large-scale burning of biomass. There is extensive evidence that ecosystems are being degraded at an alarming rate for which bush burning is undeniably one of the major causes resulting in lost of flora and fauna (Hamid *et al.* 2010 ; Asser *et al.* 2005).



The Northern Region of Ghana which covers about 50% of the savanna has recorded higher occurrences of fires (40-80%) than the other 9 regions of Ghana (Kugbe *et al.* 2013).

The reasons for burning include:

- Hunting
- Tapping honey



To save on labor cost and stimulate fresh grass growth



A local belief that it enhances fruiting of *Vitellaria paradoxa* and *Parkia biglobosa*

Fire is purported to be as an indispensable tool for managing savanna ecosystems including grassland and rangeland vegetation quality and monitoring, the influence of fire on plants species density and diversity, is an important subject of discourse in ecosystems management. However not much studies have been conducted on how the time of burning influences richness and evenness in the savanna ecosystem
In tropical savanna, natural fires rarely occur however anthropogenic fires are a major driver of change in vegetation and ecosystem function (Dayamba, et al. 2010). vestigated how the time of burning or non-burning during the dry season influences tree density and diversity in the guinea savanna.

Results:

Species density and diversity

Table 1. Influence of fire on tree in the guinea savanna

Variables	Early Burning	Late Burning	Non-Burning
No of species	12	9	10
Total number trees	41	61	115
Density/ha	1900	2300	3200
Simpson' Diversity Index	0.8077	0.6714	0.5647
Shannon Weiner Index	1.18	1.17	0.94

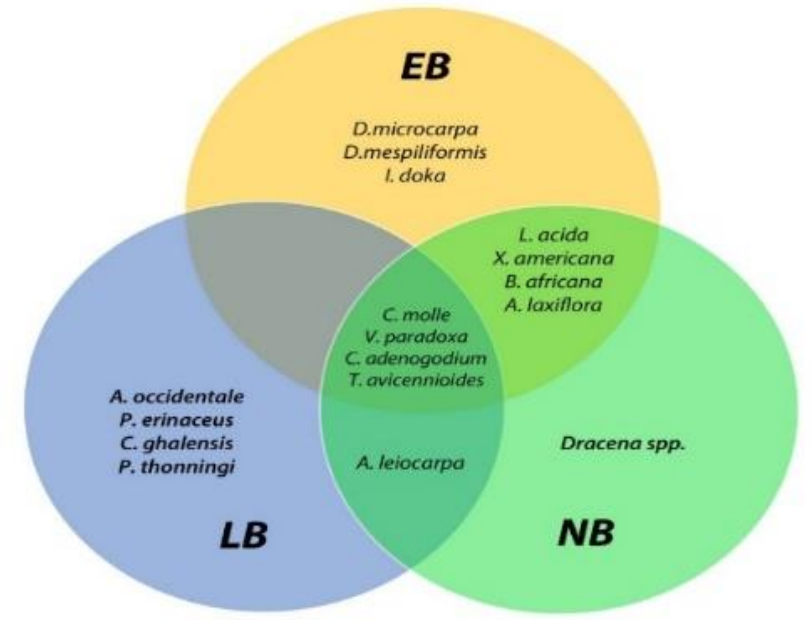


Fig. 3. Common and unique species in early burning (EB), late burning (LB) and non-burning (NB) treatments

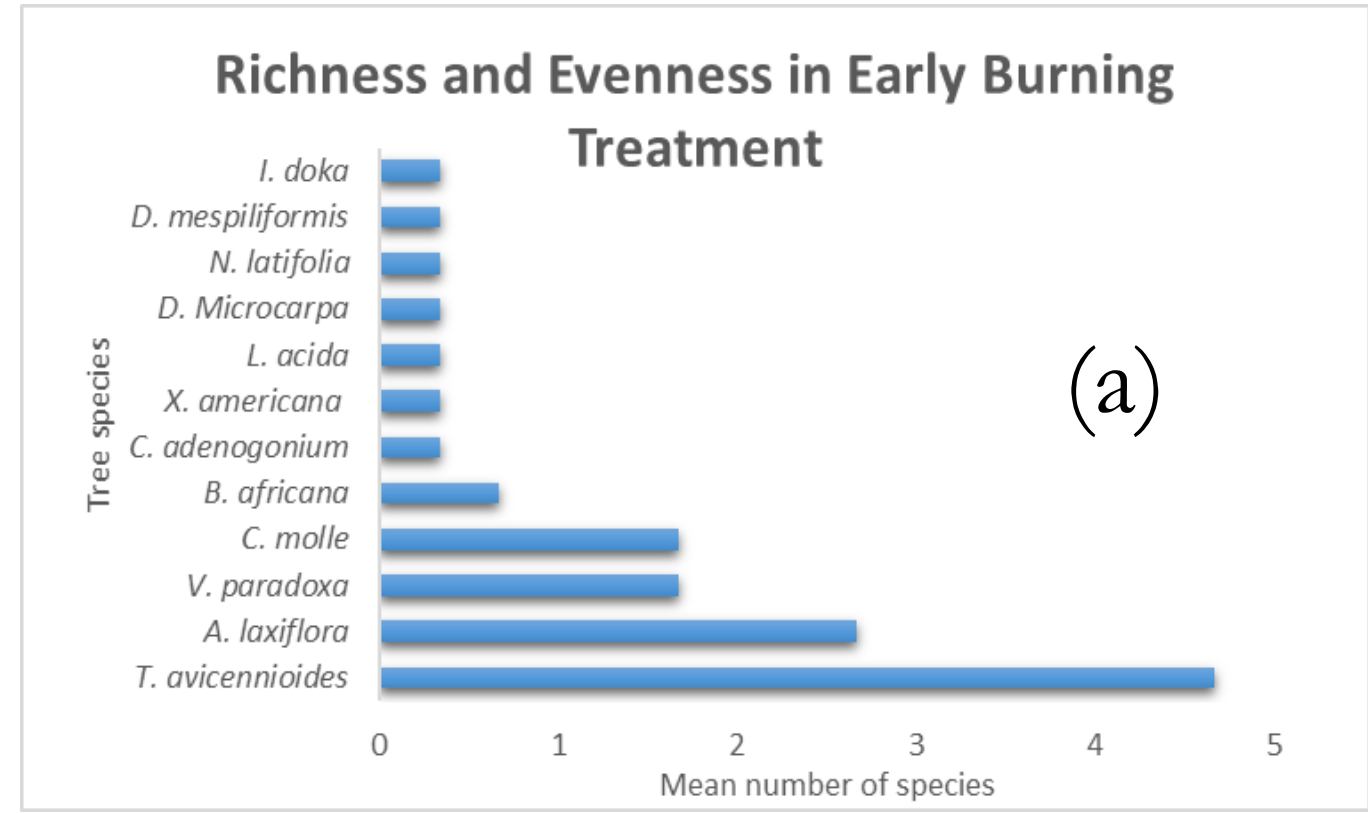


Fig. 3 Richness and in Early burning (a), Late burning (b), Non-burning (c)

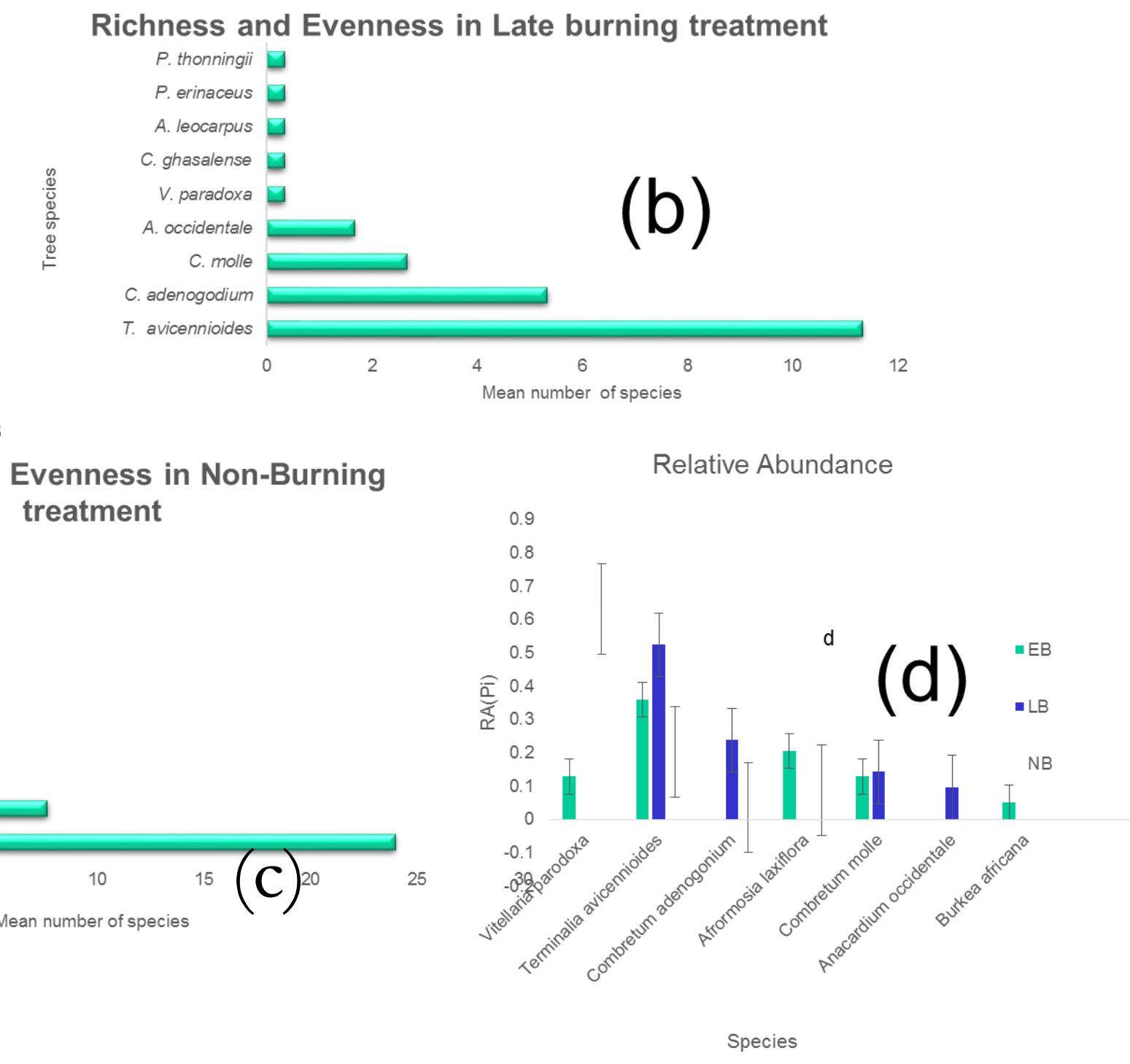


Fig. 4. Relative of abundance (d)

Methodology

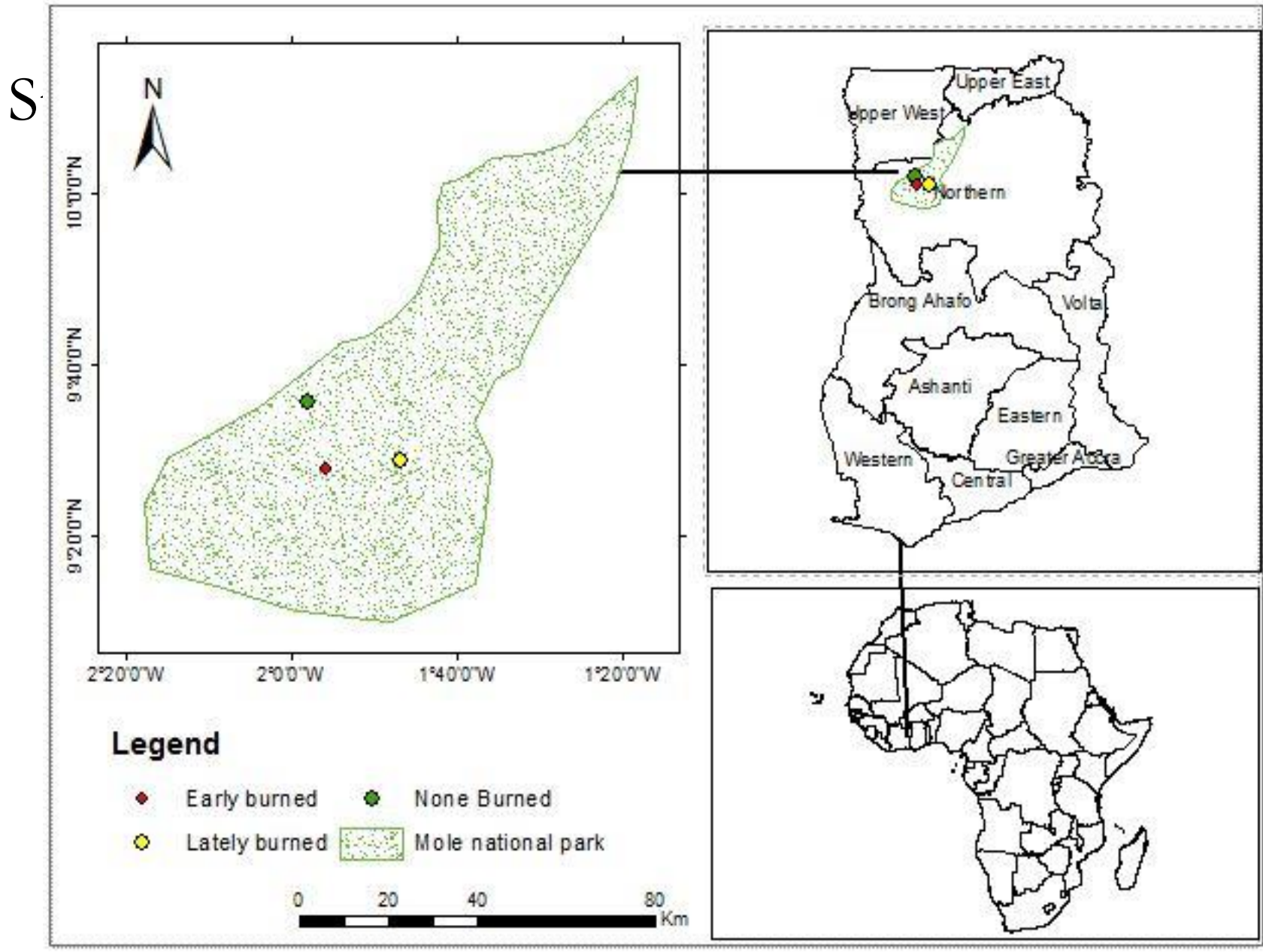


Fig. 1. Maps showing Africa (lower right), Ghana (upper right) and Mole National Park (left).

Rainfall: about 1100 mm per annum
Usually dry from November to May which facilitates vegetation burning
Vegetation: Guinea savanna gradually transforming into Sudan savanna woodland toward the south
Characterized by drought-resistant trees such as *Grewia mollis*, *Adansonia digitata*, *Combretum molle* grasses; *Andropogon gayanus* and *Sporobolus pyramidalis*

Sampling Procedure

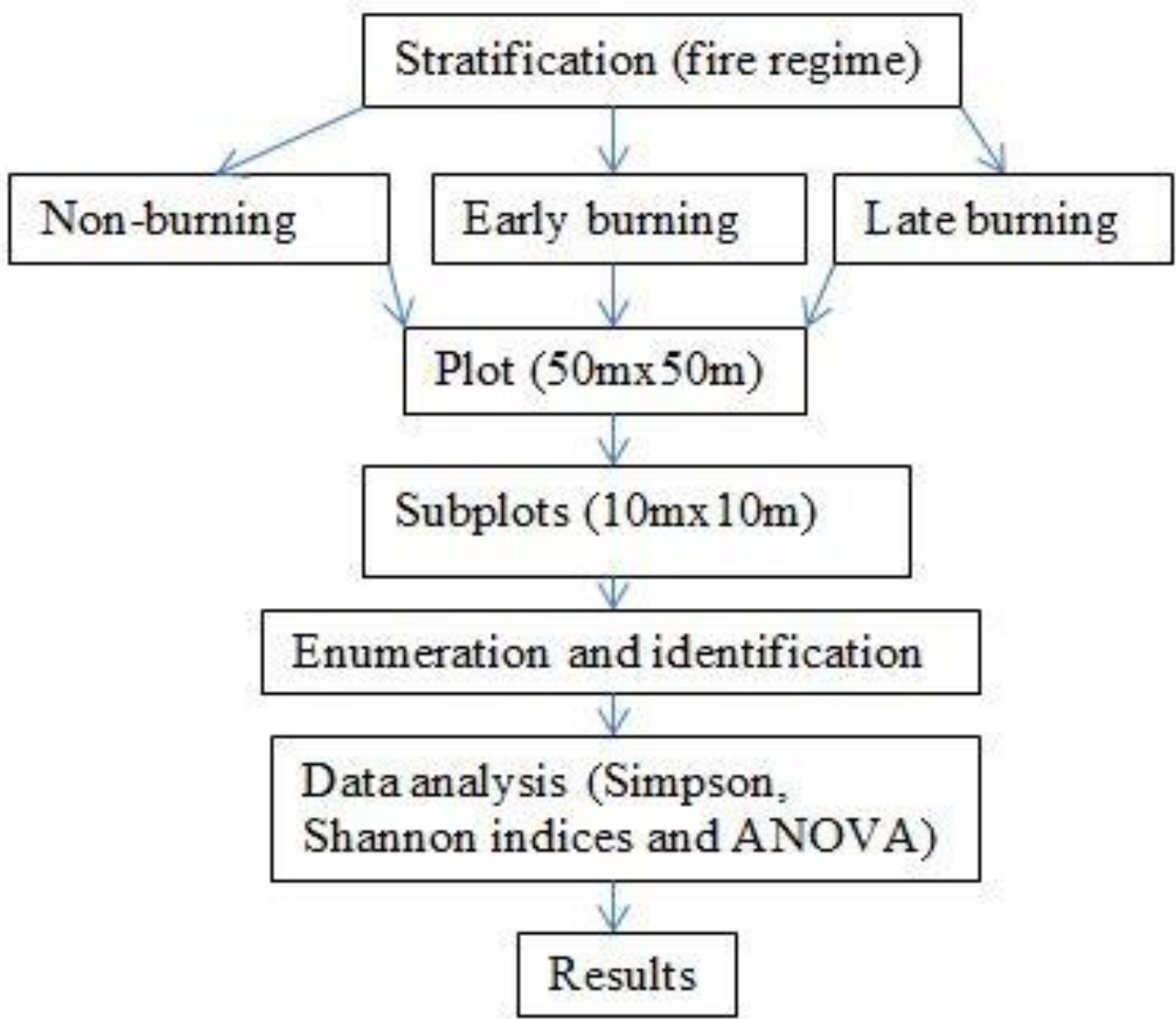


Fig. 2. Summary of Methods

Conclusions

With the exception of *Anacardium occidentale*, all the species are native to the guinea savanna. *Anacardium* might have been brought in by some animal or some other agents of dispersal from surrounding communities. Tree species density estimated for the different burning treatment is an indication that the period time of burning has influence on tree density (Table 1).This confirms the knowledge that the savanna are not a climax vegetation, when disturbance is minimized can gradually transform into a wood land or forest. It was observed that most species identified in the non-burning treatment were present in both early season burning and late season burning (Fig. 2). Burning promoted the growth of *Terminalia Avicennioides* and *Combretum spp.* The study revealed that no burning is a desirable condition for *Vitellaria paradoxa* (Sapotaceae) which is an important economic species in the guinea savanna ecosystem. The studies revealed that non-burning would increase productivity of a few tree species but not diversity. Burning treatments however had higher species richness and evenness. These could have implications for climate change mitigation and ecosystems resilience. Higher tree densities in non-burning regimes in the savanna ecosystem would enhance carbon sequestration. Diversity of tree species can is better for ecosystems resilience. Fire management regime plays a very a significant but indirect role in ecosystems management.

for
Forest Conservation in Ghana's Coastal
Savannas: Assessing Ecological and Social
Dimensions Singapore Journal of Tropical
Geography, 26(2), 151-169

Kugbe J. X. (2013). Spatio-temporal
Dynamics of Bushfire Nutrient Losses and
Atmospheric Depositional Gains across the
Northern Savanna Region of Ghana.
Ecology and Development Series. No 90.

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