Impact of climate and land-use change on soil properties and carbon sequestration in West African agro-ecosystems

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Summary

This study was conducted to assess the status of vascular plant species diversity in the different land-use types in Jigawa state. In assessing soil nutrient, emphasis was given on soil physical properties (bulk density, soil texture and particle size); soil macro and micro nutrients (nitrogen, potassium, magnesium, phosphorus and calcium) and soil organic carbon. Biomass assessment was limited to above ground plant biomass. The aim of the study is to provide baseline information that would improve land-use management. The study is be conducted in Nigeria and Ghana. However, the data presented here is a fraction of the research been conducted in Nigeria.
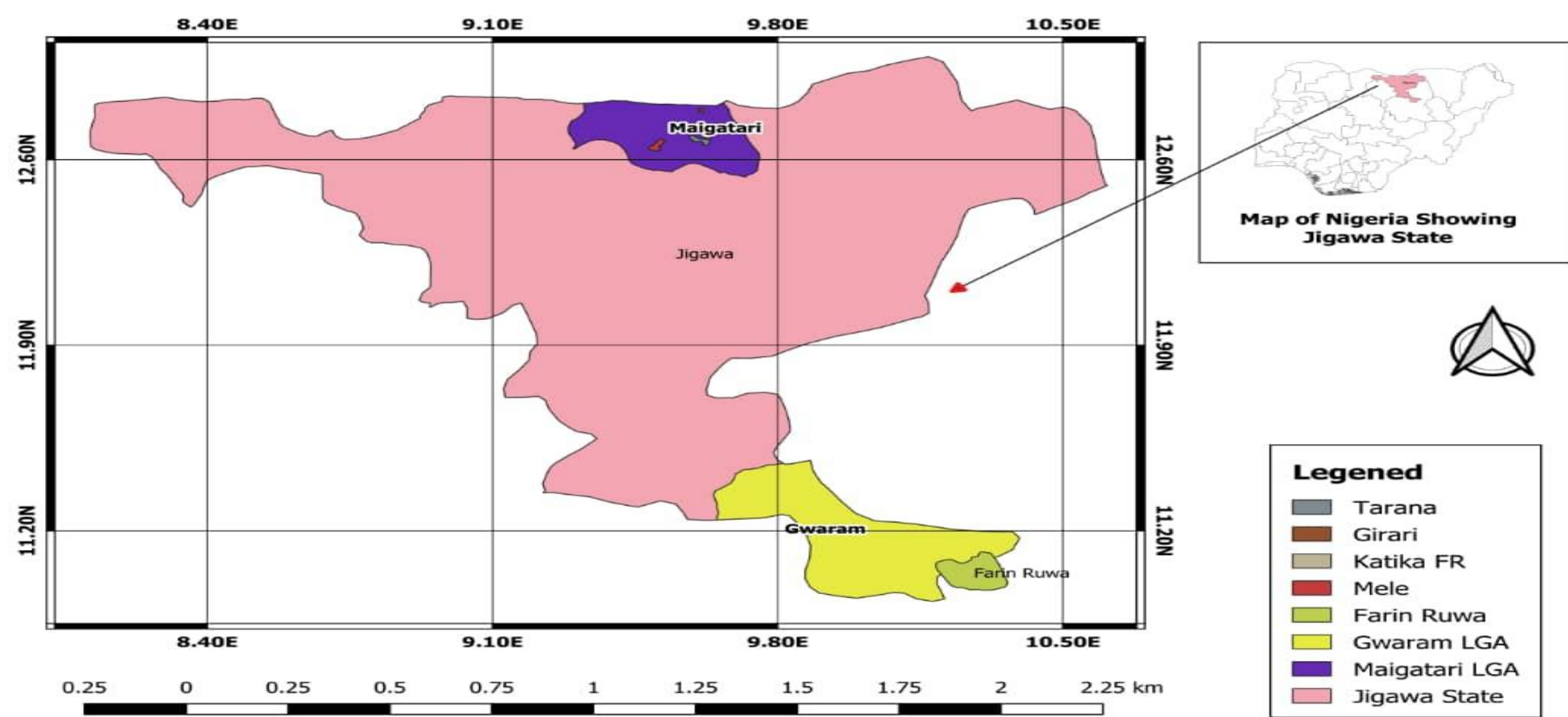
## Introduction

- Human influence on natural environment through land-use change have been observed to contribute majorly to increased CO_2 and greenhouse gasses in the atmosphere.

- The tendency to significantly reduce the pace of global temperature in the long run is limited especially in the sub-Saharan Africa due to population pressure and poverty.

Methods

- A sample plot measuring 100m x 100m with three replicates was randomly established in five land use types across three ecological zones (Wetland ecosystem, Sahel and Sudan Savannas) totaling 45ha. Within each of the 100m×100m sample plots, all vascular tree species with diameter at stump height (DSH) ≥ 5.0cm were identified to species level, measured for height and counted.

- The DSH was measured at 30cm from ground level. Soil samples were collected at three different depth along the soil gradient and tested for some selected soil micro and macro properties.

- Indirect estimation method was used to quantify the above ground plant biomass from the five identified land use types across the ecological zones.

LAYOUT OF THE STUDY LOCATION
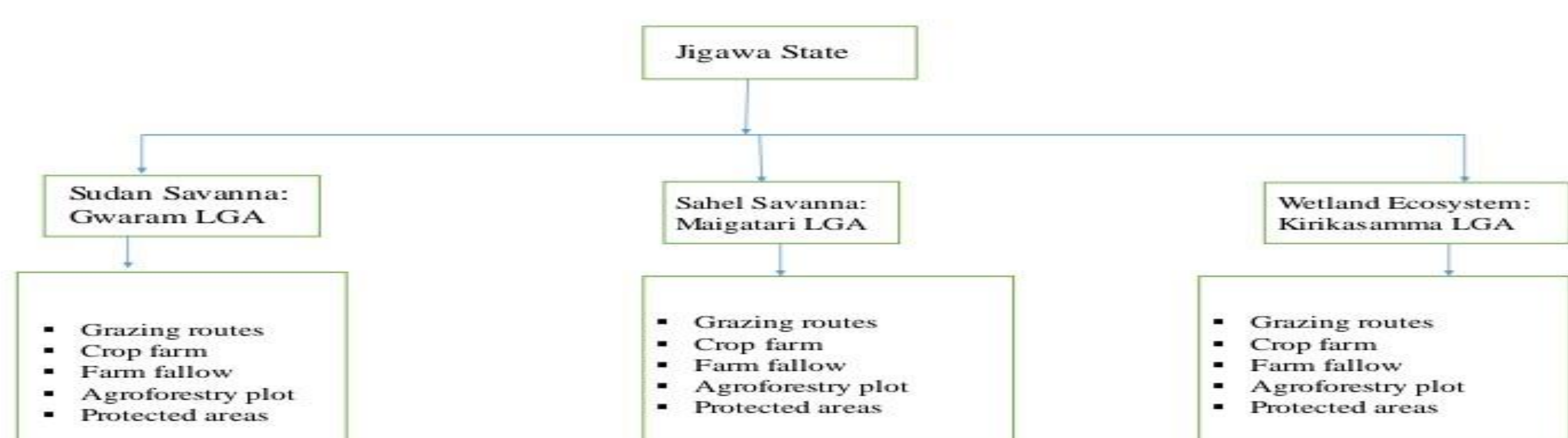
Results

- A total of 399 tree species in 79 genera and 51 species were encountered from which; forest reserve, under the wetland ecosystem had the highest number of species (16). Sahel savanna had the least species richness; diversity and species evenness decreasing from forest reserve, crop farm, agroforestry plots, cattle rout to fallow land (D= 21.84-8.38), (H^i =6.54-4.05), (Ha=0.15-0.01).

- Soil bulk density, OC, N, P, and K differs across the land use types except for soil pH and Ca that showed less significant differences across the land use types (p=0.05).

- Sudan savanna ecoregion had the highest average record of above ground plant biomass accumulation (50kg/ha). Fallow land being the best land use type with the highest above ground plant biomass records of 80kg/ha.
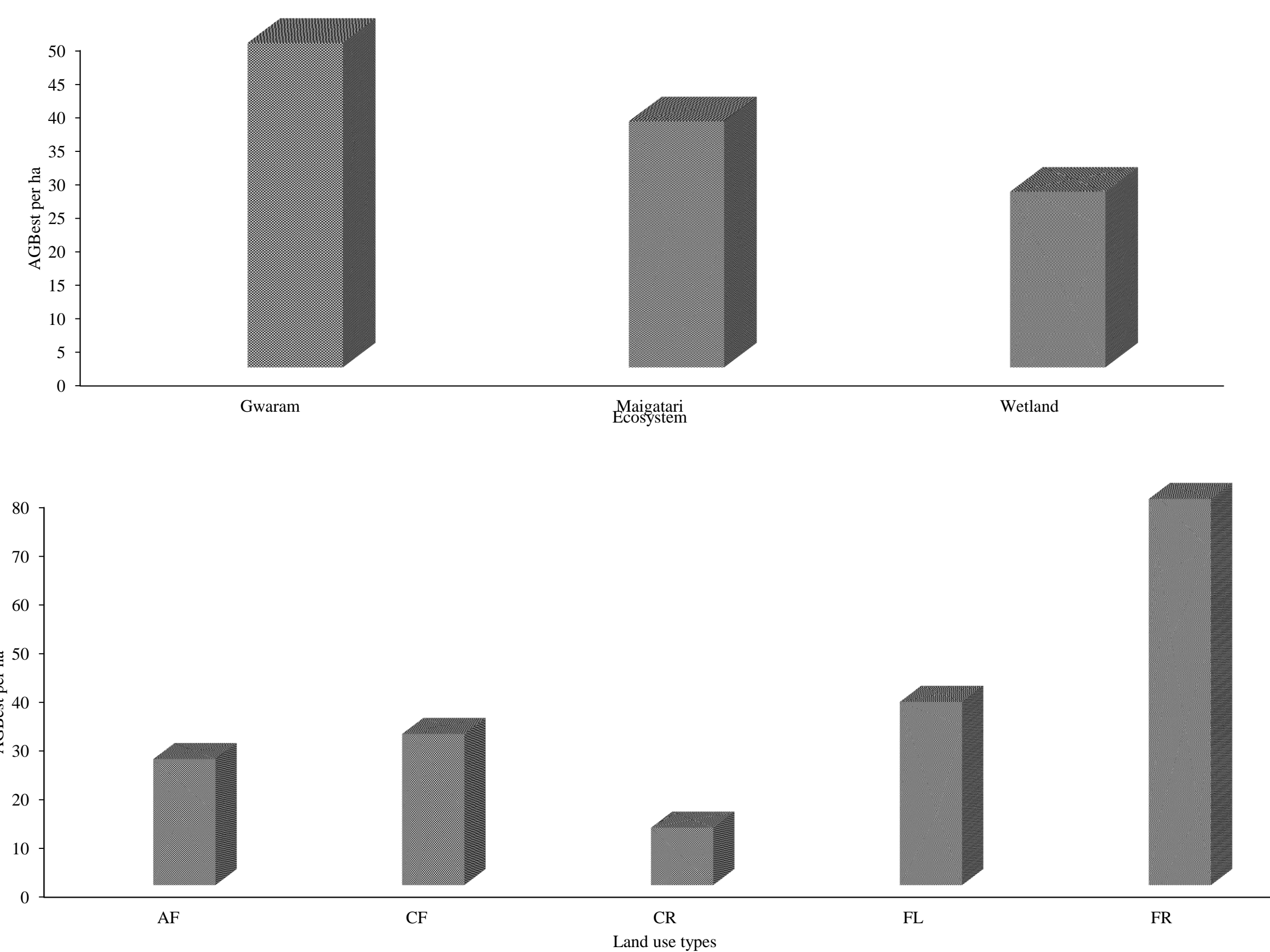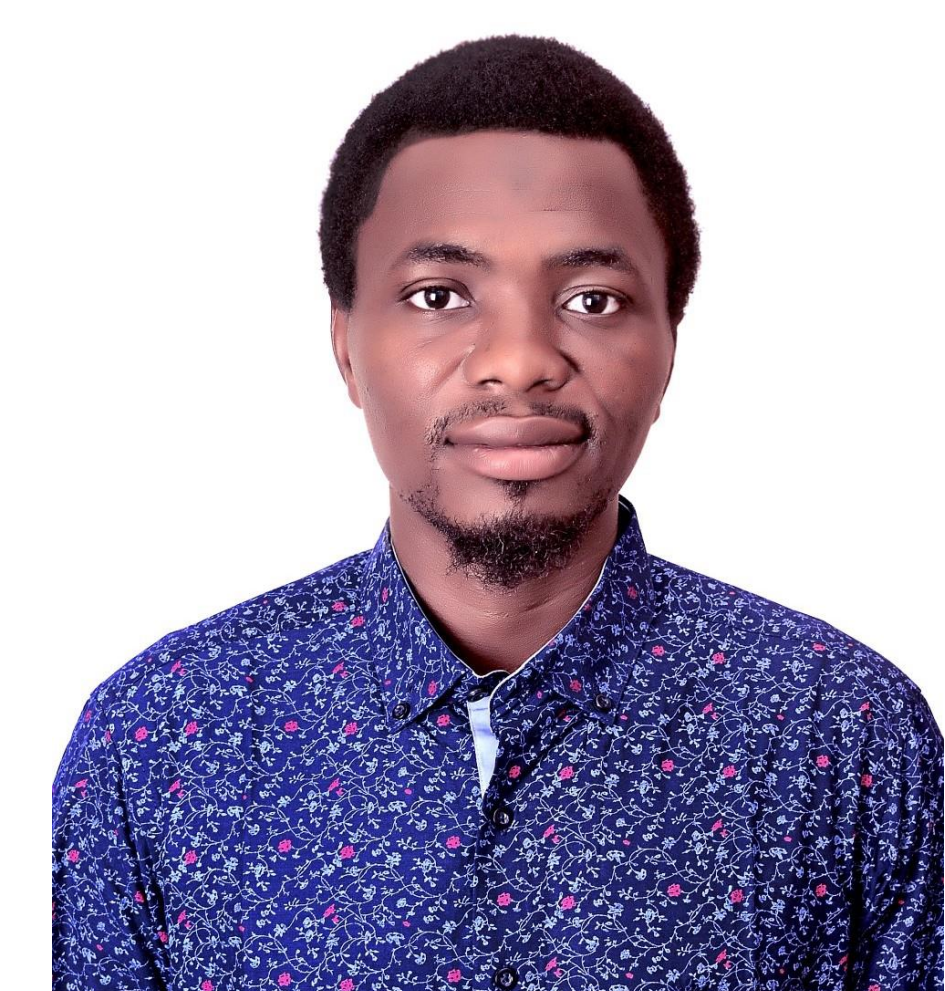

Conclusion

- It was concluded that land use types had negative impacts on plant diversity, soil properties and plant biomass accumulation.

- Therefore, there is the need for mitigation measures (agroforestry and sensitizations) to conserve the current biodiversity to ensure resilience to anthropogenic disturbances.

Acknowledgement

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