ABSTRACT

Tropical Savannas are extensive biomes recognized for conserving considerable biodiversity while sustaining livelihoods. Several and sometimes competing land use systems exist side by side in tropical savannas with each engendering particular management approaches. Savannas are believed to hold about 13% of global terrestrial carbon. However, unlike forest ecosystems, carbon quantification studies have been quite limited despite savannas being the most extensive biome in the tropics. Given their wide spread spatial coverage, it is becoming increasingly important to understand the linkages between competing land uses within savanna systems and their importance for biodiversity and carbon sequestration if we are to better inform the design of ecosystem management strategies in savannas. This study examines linkages between land use systems, biodiversity, carbon stocks and grazing intensity at the frontier of Lake Mburo National Park (LMNP) and surrounding ranchlands. Applying a split plot design, four sites of 1060m along the East border of Lake Mburo National Park (LMNP) and adjacent ranchlands, spaced 1000m apart, spread over 7km length were assessed for species composition, richness and dominance; and grazing intensity. A total of 72 plots located at progressive distances of 300, 420 and 540m away from the border into LMNP and in the opposite direction into the ranchlands were demarcated for this study.

Supplemented by secondary data, field data were used to develop species-specific and multispecies allometric biomass models used for computation of carbon stocks for small trees and shrubs and carbon stocks in different carbon pools thus Above Ground Biomass (AGB), Below Ground Biomass (BGB) and Soil Organic Carbon (SOC). Results show a difference in the composition of herbs and mammals between the LMNP and adjacent ranchlands, there is a higher wild mammal abundance in ranchlands than in the LMNP. The differences in plants and mammals is related to grazing intensity between the LMNP and ranchlands. The study developed species-specific and multispecies allometric biomass models for estimations of Above Ground Biomass (AGB). The developed models were applied with other models to estimate carbon stocks in various carbon pools. The association between species richness and dominance with carbon storage was observed to vary between land use types. Whereas in LMNP no significant associations between species richness, dominance and carbon stored in different carbon pools was observed, in ranchlands, above-ground and below-ground biomass carbon increased with woody species richness and decreased with dominance. For Soil Organic Carbon (SOC) no significant associations were observed at all levels. Results further reveal associations between species richness, dominance and Total Ecosystem Carbon (TEC).

Conclusively, biodiversity as represented by species composition, richness and relative abundance does differ between the two land uses. Though not fenced, the border appears to have an effect on species composition of herbaceous and mammal species composition and richness thus differentiating biodiversity in the two adjacent land uses. On carbon pools, the study affirms the view that savannas hold considerable carbon stocks though relationships between the different pools (AGB, BGB and SOC) are influenced by land use systems. This study shows that unfenced borders of the protected area can be effective in conserving vegetation and mammals in the park. Therefore, Collaborative Management exploiting the existing unfenced border is recommended for future park planning.