

Woody Carbon Stock Potentials and Factor Affecting Their Storage in Munessa Forest, Southern Ethiopia

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Abstract : The tropical forest is considered the most important forest ecosystem for mitigating climate change by sequestering a high amount of carbon. The potential carbon stock of the forest can be influenced by many factors. Therefore, studying these factors is crucial for understanding the determinants that affect the potential for woody carbon storage in the forest. This study was conducted to evaluate the potential for woody carbon stock and how it varies based on plant community types, as well as along altitudinal, slope, and aspect gradients in the Munessa dry Afromontane forest. Vegetation data was collected using systematic sampling. Five line transects were established at 100 m intervals along the altitudinal gradient between two consecutive transect lines. On each transect, 10 quadrats (20 x 20 m), separated by 200 m, were established. The woody carbon was estimated using an appropriate allometric equation formulated for tropical forests. The data was analyzed using one-way ANOVA in R software. The results showed that the total woody carbon stock of the Munessa forest was 210.43 ton/ha. The analysis of variance revealed that woody carbon density varied significantly based on environmental factors, while community types had no significant effect. The highest mean carbon stock was found at middle altitudes (2367-2533 m.a.s.l), lower slopes (0-13%), and west-facing aspects. The *Podocarpus falcatus*-*Croton macrostachyus* community type also contributed a higher woody carbon stock, as larger tree size classes and older trees dominated it. Overall, the potential for woody carbon sequestration in this study was strongly associated with environmental variables. Additionally, the uneven distribution of species with larger diameter at breast height (DBH) in the study area might be linked to anthropogenic factors, as the current forest growth indicates characteristics of a secondary forest. Therefore, our study suggests that the development and implementation of a sustainable forest management plan is necessary to increase the carbon sequestration potential of this forest and mitigate climate change.

Keywords : munessa forest, woody carbon stock, environmental factors, climate mitigation

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