Combretum-Terminalia vegetation accumulates more carbon stocks in the soil than the biomass along the elevation ranges of dryland ecosystem in Southern Ethiopia.

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Introduction

Ethiopia has diverse woodlands and dry forests particularly in Northwestern and southern part of the county (WBISPP, 2005). The dry lands cover approximately 71.5% of the landmass (Mulugeta and Demel, 2004). Of which the woodland ecosystem covers 25.8%, which accounts for sequestering 1263.1 million tons of carbon (WBISPP, 2005 ;Yitebitu, 2010). However, there is **scarcity** of reliable estimates of **biomass and soil carbon variation along** elevation (Houghton, 2007; Saatchi *et al.*, 2007; Houghton *et al.*, 2009).

Objective

The overall objective of this study is to investigate biomass and soil carbon stocks along the elevation gradients, thereby contributing to account the roles of woodland ecosystem for climate change mitigation in southern Ethiopia

Methodology

Study area and data collection

A total of 60 plots were surveyed (10 plots x 2 replications x 3 elevation gradients) (Tefera et al., 2005).

Conclusion

The studied woodland carbon stocks potential was estimated 76.5-135.5 Mg/ha along elevations. This showed that the woodland has been high potential on climate change mitigation. Soil carbon stocks contributed around 67% of the total ecosystem carbon stocks. This implies the conversion of woodland ecosystem into agriculture in the study sites would contribute to increase emission and reduction of carbon sinks.

Data analysis

Aboveground Biomass: Used already developed allometric equation of Chave (2014).

Belowground Biomass: Conversion factor i.e. 26% of the above ground biomass Cairns *et al.* (1997).

Litter Biomass: Using Allen (1986) and Pearson *et al.* (2005)

Soil analysis: Soil organic carbon analysis followed Walkley and Black methods (Walkley and Black,1934).

Bulk density Calculated

- After oven drying 105⁰c (ratio of dry mass to volume).
- Soil Texture, pH, N analysis was followed standard method.

Statistical Analysis: SAS 9.0 ,One-way ANOVA , Arc view GIS 9.3 , Sigma plot , Microsoft excel

RESULT AND DISCUSSION

Biomass Carbon Stocks along Elevation Gradients

Table 1: Mean total woodland ecosystem carbon stocks ($\pm$ SD, Mg ha⁻¹) along the elevation gradients (n = 20 plots each)

Carbon pool	Elevation			F	P
	Lower	Middle	Higher		
Standing biomass Carbon	25.1 $\pm$ 8.4 ^a	15.1 $\pm$ 6.9 ^b	14.1 $\pm$ 6.3 ^b	14.13	0.0001
Litter carbon	0.19 $\pm$ 0.08 ^b	0.36 $\pm$ 0.08 ^a	0.21 $\pm$ 0.0099 ^b	36.65	0.0001
SOC (0-30 cm)	51.2 $\pm$ 21.31 ^c	120 $\pm$ 17.2 ^a	91.1 $\pm$ 43.21 ^b	23.37	0.0001
Total woodland carbon stock	76.51 $\pm$ 25.8 ^c	135.5 $\pm$ 22.8 ^a	105.4 $\pm$ 43.7 ^b	16.84	0.0001

Thus, conservation and management of this wood land ecosystem is vital to ensure climate change mitigation and benefit from the prospective carbon financing.

Recommendation

- Future studies should focus in developing **site and species specific equations** at country’s level to accurately estimate the actual biomass carbon stocks.
- Further research is also needed focusing on **carbon flux** capacity of woodland ecosystem.
- Carbon emission reduction policy strategies such as **REDD+** and Clean Development Mechanism (**CDM**) should recognize the potential woodland ecosystems particularly in the tropics.