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## Vegetation Restoration in Area Closures: The Case of Douga Tembein, Central Tigray, Ethiopia

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### Abstract

Since 1991, communities in Tigray region have started to establish area closures (exclosures) to deal with shortage of biomass and land degradation. Although the need of scientific information is clear, studies made to assess vegetation restoration in area closures are very limited. This study assesses the population structure and biomass of two dominant woody species: *Acacia etbaica* and *Euclea racemosa* subsp. *schimperi* and compare with communities fuel wood demand. For this study contrasting age of exclosures (5 and 10) were selected. Vegetation assessment was done using systematic line plot sampling in an area of 3600 m<sup>2</sup>. One way analysis of variance and regression analyses were used to analyze the data. A strong relationship was not found between the diameter and height of the two woody species in both exclosures. However, with the increase in year of protection, the relationship for *A. etbaica* gets better ( $R^2 = 15.4 - 22.8\%$ ). This shows the improvement of sites with an increase in age of protection. The frequency distribution of woody species showed almost an inverted J-shape with few or no individuals at higher diameter classes. This could be due to selective removal of bigger woody species for fuel wood and construction. Mean density of the two woody species within treatments varied between 194 and 1078 trees ha<sup>-1</sup>; basal area 1.74 and 8.7 m<sup>2</sup> ha<sup>-1</sup>; volume 1.98 - 13.98 m<sup>3</sup> ha<sup>-1</sup>; live above ground biomass 3014.40 - 5268.30 kg ha<sup>-1</sup>; and dry above ground biomass 359.98 - 462 kg ha<sup>-1</sup>. The result showed that there is a significant difference ( $P < 0.05$ ) in vegetation parameters investigated between the two wood species within treatments. The result also indicated that from the total of 114.6 ha of exclosures investigated, 51 tons of dry above ground biomass could be harvested. Given the current firewood consumption of 1 to 1.2 t hh<sup>-1</sup> yr<sup>-1</sup> and taking the number of households (200), the amount of dry above ground biomass produced would cover around 25% of their yearly consumption. Thus, exclosures have considerable contribution in solving shortage of biomass for fuel. Vegetation management such as pruning could help to increase vegetation growth and biomass produced.

**Keywords:** Biomass, Ethiopia, area exclosures, fuel wood, population structure, Tigray