

Volume Estimation of Trees: An Exploratory Study on Rosewood Logging Within Forest Transition and Savannah Ecological Zones of Ghana

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Abstract : One of the endemic forest species of the savannah transition zones enlisted by the Convention of International Treaty for Endangered Species (CITES) in Appendix II is the Rosewood, also known as *Pterocarpus erinaceus* or Krayie. Its economic viability has made it increasingly popular and in high demand. Ghana's forest resource management regime for these ecozones is mainly on conservation and very little on resource utilization. Consequently, commercial logging management standards are at teething stage and not fully developed, leading to a deficiency in the monitoring of logging operations and quantification of harvested trees volumes. Tree information form (TIF); a volume estimation and tracking regime, has proven to be an effective sustainable management tool for regulating timber resource extraction in the high forest zones of the country. This work aims to generate TIF that can track and capture requisite parameters to accurately estimate the volume of harvested rosewood within forest savannah transition zones. Tree information forms were created on three scenarios of individual billets, stacked billets and conveying vessel basis. The study was limited by the usage of regulators assigned volume as benchmark and also fraught with potential volume measurement error in the stacked billet scenario due to the existence of spaces within packed billets. These TIFs were field-tested to deduce the most viable option for the tracking and estimation of harvested volumes of rosewood using the smallian and cubic volume estimation formula. Overall, four districts were covered with individual billets, stacked billets and conveying vessel scenarios registering mean volumes of 25.83m³, 45.08m³ and 32.6m³, respectively. These adduced volumes were validated by benchmarking to assigned volumes of the Forestry Commission of Ghana and known standard volumes of conveying vessels. The results did indicate an underestimation of extracted volumes under the quotas regime, a situation that could lead to unintended overexploitation of the species. The research revealed conveying vessels route is the most viable volume estimation and tracking regime for the sustainable management of the *Pterocarpus erinaceus* species as it provided a more practical volume estimate and data extraction protocol.

Keywords : cubic volume formula, smallian volume formula, *pterocarpus erinaceus*, tree information form, forest transition and savannah zones, harvested tree volume

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