Development of Growth and Volume Yield Model for *Melia volkensii* (Guerke) Tree Species used in Afforestation and reforestation Programs in the Drylands of Kenya

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Abstract

Site index is the most commonly used measure used in forestry to determine the potential site productivity and provides key information for forest management practices and planning. It is determined using species-specific site index models that take into account climatic and edaphic factors. *Melia volkensii* (Guerke) is a fast growing indigenous multipurpose tree species in the family Meliacease and is endemic to the drylands of eastern Africa. In Kenya, the species has been over-exploited because of its high quality timber and non-timber products. Melia is currently being promoted for growing by smallholders and private companies like Better Globe Forestry Ltd and KOMAZA for timber production and carbon credits. The species has a relatively shorter short rotation of 12–18 years. . Although Melia trees have been planted actively in recent years, there is little information on the growth and yield of Melia to guide future afforestation and reforestation programs. The purpose of this study was to prepare a comprehensive Melia growth and tree volume yield model for Melia plantation that can be used to predict growth and yield and support forest planning and decision-making. Tree height, diameter at breast height and bole height data was collected from 109 temporary sample plots of 9 trees each spaced at 4m x 4m from plantations ranging in age from 3 to 20 years. There were 19, 51, 28 and 11 plots in Kiambere, Kitui, Kibwezi and Nyangoro respectively. The highest site index was for Kiambere (9.1M) and lowest for Nyangoro (7.7m). The results showed that there was difference in height growth (p=0.01), tree basal area (p=0.03), tree volume (p=0.02) and above ground biomass (p= 0.02which corresponded to annual rainfall of growth site. Diameter growth of the low tree density was larger than that of the high tree density and great in the case of high site index. Additional site variables such as edaphic factors are recommended to be taken into account in future when developing the Melia growth curves. The developed Melia growth

curve were useful in determining Melia plantation productivity and guiding investment in commercial Melia growing and planning forest restoration programs.

350 words (text: max 350 words)