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Comparative Analysis of Tree Growth in Yagirala Man-Made Forest and Sinharaja Natural Forest in Sri Lanka, and Implications for Sustainable Forestry Management

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Abstract

Determination of tree growth is an important aspect of sustainable forestry practices. In Sri Lanka, much research has been carried out to determine the tree growth in different forests. However, the comparison between natural and human-planted forests is not comprehensively studied. Therefore, this study aims to compare tree growth between the *Yagirala* man-made forest in Kalutara district and the *Sinharaja* natural rainforest in Rathnapura district, Sri Lanka, while focusing on assessing sustainable forestry practices and ecological adaptation. The parameters of tree height, Diameter at Breast Height (DBH), and the basal area of the trees were measured using the Clinometer method, DBH tape, and the standard formula for the basal area [$\pi\times$ (DBH / 2)^2], respectively. To measure these parameters, tree species of *Artocarpus nobilis, Alstonia macrophylla,* and *Dipterocarpus zeylanicus* were selected, and the total sample size for the study was 50 trees per study area (1 km^2) with measurements taken in both the *Yagirala* man-made forest and the *Sinharaja* natural rainforest. To minimize the effects of variables like tree age and site conditions, standardized sampling was implemented by selecting trees of similar age and species and controlling for environmental factors. The one-way ANOVA method was applied to evaluate the differences in the growth performance across these two forest types. Results indicate that, for tree height and DBH, there were no statistically significant differences *($p>0.05$)* between the *Yagirala* and *Sinharaja* forests, with mean heights of 14.70 m and 18.75 m, and mean DBH of 0.183 m and 0.325 m, respectively. However, the basal area reported a significant statistical difference *($p<0.05$)*, suggesting that the *Yagirala* forest's mean basal area (0.039 m^2) was considerably lower than that of the *Sinharaja* forest (0.118 m^2). The mean height and DBH of trees in the *Yagirala* man-made forest are comparatively closer to those in the *Sinharaja* natural rainforest, indicating that these trees have adapted well to the growing conditions. Although the basal area of trees in the *Yagirala* forest is significantly lower than that in the *Sinharaja* forest, this gap does not diminish the potential of man-made forests. The observed differences may be linked to factors like age, species composition, and applied management practices. With ongoing management practices and time, the *Yagirala* forest's basal area will improve, further enhancing its ecological value. In conclusion, these results demonstrate how well artificial forests can adjust to environmental factors that support tree development and ecological function.

Keywords: *Man-made forests, Tree growth measurements, Yagirala, Sinharaja, Sri Lanka*