

Modeling of Improvement Potential of Homegardens in Manikhinna Area of Kandy District

H.J.C. Jayasooriya¹, D.K.N.G. Pushpakumara¹ and H.M.S. Heenkenda²

¹ Department of Crop Science, University of Peradeniya, Sri Lanka

² HORDI Unit II, Department of Agriculture, Gannoruwa, Sri Lanka

Kandyan homegardens are identified as an economically viable, highly adapted and environmentally sound agroforestry system in Sri Lanka which is having diverse mixture of plants in a close association with each other. Nearly 15% of lands in the country are under this system, which has enormous potential to provide its services to the society. The objective of this study was to identify an agroforestry model to improve the potential of homegarden system. Randomly selected 25 homegardens in Manikhinna GN Division belongs to mid country intermediate zone, were investigated for the study. Household and vegetation surveys were conducted to obtain information about owners' interest towards the improvement of homegarden and assessment of plant species and existing tree volume of each homegarden, respectively.

Four improvement strategies, namely (i) increasing the number of trees in a given species; (ii) replacement of species; (iii) substitute species; (iv) managing species to achieve optimum productivity were used to develop the agroforestry model.

About 80% of homegardens in Manikhinna area were under 0.1-0.4 ha category indicating the high degree of fragmentation. Species-area curve indicated that covering of 90% of plant species require to assess at least 2 ha of cumulative land area. Vegetation survey revealed that the occurrence of 151 species from 125 genera and 58 families with 5 endemic species. Diversity of homegardens was higher in 0.1-0.2 ha category compared to <0.1 ha and 0.2-0.4 ha categories. *Cocos nucifera*, *Mangifera indica*, *Artocarpus heterophyllus*, *Swietenia macrophylla*, *Michelia champaca* and *Filicium decipiens* were selected as model timber species. Agroforestry model was developed by specifying number of trees need to introduce, pattern of tree introducing and arrange of different components in the garden for two different size classes separately. For 0.1-0.2 ha class it gives nearly 100% predicted volume increment compared to the existing volume at 20 years time by applying the model whereas 0.2-0.4 ha size class shows 50% volume increment. Further, productive food/fruit trees will account for better yield throughout the year, thereby safeguarding the food and nutritional security of family members. However, the contribution from animal food products gain from the system is at a low value in this area due to various reasons.

Land fragmentation, labour scarcity and soil management, were identified as major limitations for improve the condition of homegardens. Introduction of new improved fruit varieties with quality planting materials and replacement of less productive trees by high productive varieties were identified as major improvement potentials. Proper mechanism of transmitting information relevant to homegarden management towards farmers is identified as a major service that people need to ensure the improvement of the homegarden system in the studied area.

Influence of Soil Salinity on Carbon Mineralization in a Plant Residue-Amended Soil

B. C. Walpola¹, S. H. R. Piyadharshani¹ and K.K.I.U. Arunakumara²

¹Department of Soil Science, University of Ruhuna, Sri Lanka

²Department of Crop Science, University of Ruhuna, Sri Lanka

The interaction of salinity stress and the quality of plant residue on carbon mineralization in soil is yet to be elaborated. Therefore, this study was conducted to assess the effect of salinity stress on carbon mineralization in a soil amended with different types of plant residues. A factorial combination of two soil types (saline and non-saline) with three types of plant residues (i.e. leaves of *Sesbania*, *Caliandra* and *Gliricidia*) was used in the laboratory incubation. Soil without being amended with any type of plant residue was served as the control. Carbon mineralization was determined at 3, 7, 14, 21, 28, 35, 42, 49, 56 and 70 days after the treatments. The experiment was replicated four times and data were statistically analyzed using SAS package.

The release of CO₂-C was increased at the initial stage of the incubation for all the treatments followed by a gradual reduction as incubation proceeds. The highest CO₂-C content was observed in the soil amended with *Caliandra* leaves followed by *Sesbania* and *Gliricidia*. The CO₂-C evolved under saline condition was ranged from 313 to 905 CO₂-C mg/kg (respectively in the control and *Caliandra* residue-amended soils). Salinization reduced the rates of CO₂

evolution by 18.7, 6.2 and 5.2 % respectively in *Caliandra*, *Sesbania* and *Gliricidia* residue amended soils. The greater amounts of CO₂ produced in *Caliandra* residue treated soils can be attributed to the higher biodegradability of *Caliandra* leaves induced by higher C content compared to other residues. This suggests that the readily decomposable fractions of organic C in *Caliandra* are greater than those in *Sesbania* and *Gliricidia*. We concluded that the response pattern of C mineralization to salinity stress is dependent upon the type of plant residue and the incubation period.

Key words: plant residues, carbon mineralization, incubation

113

**Investigation of the Effect of Growth Rate on the Quality of Teak
(*Tectona grandis* L.f.) Wood**

D.N. Jayawardana and H.S. Amarasekera

Department of Forestry and Environmental Science, University of Sri Jayewardenepura, Sri Lanka

Teak was established as a plantation species since 1680 in Sri Lanka. Recently several private sector companies have got involved in planting teak with shorter rotation. This study was designed to study how wood quality of teak varies with fast growth rates.

Based on diameter at breast height and total tree height, three different crown classes namely, suppressed, co-dominant and dominant were selected from a 45-year-old state plantation at Melsiripura, Kurunegala. Three trees from each crown class were studied. Sample disks were extracted at breast height from each tree, in order to measure ring width and specific gravity of each ring. Percentage heartwood was also measured.

The mean ring width values obtained for suppressed (2.65 mm), co-dominant (3.54 mm) and dominant (4.67 mm) crown classes were significantly different. Ring width values indicate the growth rate. Mean specific gravity values obtained for these classes (0.6231, 0.6473 and 0.6346) were not significantly different. Specific gravity is a measure of wood quality. Regression coefficients between ring width and specific gravity were very low: in suppressed R² = 2.1%, in co-dominant R² = 0.0% and in dominant R² = 0.0%. These results show that the differences in specific gravity in the crown classes cannot be explained by the differences in growth rate, indicating that there is no relationship between growth rate and specific gravity. Based on these results it can be concluded that ring width is a property that depends on the growth rate but specific gravity seems to be an inherent property independent of growth rate variation. Hence, fast growth rates with shorter rotations are not likely to reduce specific gravity in teak.

Wood property patterns were found to be similar between the crown classes, indicating that these trends are inherent in teak. Ring width fluctuates close to the pith, and then decreases forming almost a constant value towards the bark; specific gravity remains almost a constant value from pith to bark.

114

Growth, Morphological, Anatomical, and Physiological Responses of Canopy Species to Varied Light Environments.

S.H. Bandumala¹, B.M.P. Singhakumara² and P.M.S Ashton³

¹Forest Department, Sri Lanka ²Department of Forestry and Environmental Science,
University of Sri Jayewardenepura, Sri Lanka

³ School of Forestry and Environmental Studies, Yale University, USA

Growth, morphological, anatomical, and physiological characteristics of seedlings of three canopy species; *Artocarpus nobilis* Thw., *Litsea gardneri* Thw. and *Myristica dactyloides* Gaertn. were compared with variation to the light regimes in lowland tropical rain forest, southwest Sri Lanka. Seedlings were grown under four stimulated light environments; deep shade (50 μmol m⁻² s⁻¹), medium shade (350 μmol m⁻² s⁻¹), partial shade (800 μmol m⁻² s⁻¹), and full sun (1200 μmol m⁻² s⁻¹) found in Sinharaja rain forest. Seedling height and mortality were recorded at three months intervals. After one and half years of seedling growth, leaf photosynthesis and stomatal conductance were measured and leaf cross sections taken for anatomical measurements. Digital photomicrographs of leaf sections were taken for leaf morphology measurements. After two years of growth, seedlings were uprooted and dried at 80°C and dry mass recorded for root, stem, and leaves. Mass ratios were calculated for leaves, roots, and stem.