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Determination of biomass production and carbon sequestration capacity of selected vegetation type in Yagirala forest reserve

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All natural forest ecosystems sequester Carbon in phytomass, forest floor litter and soil. Phytomass includes all above and below ground biomass (total biomass) of the vegetation. In this study Carbon sequestration capacity of vegetation was estimated in moderately exploited natural forest area in Yagirala Forest Reserve(YFR), which is tropical lowland rain forest selectively logged by State Timber Cooperation in late 70's. In this study, we used new approach, based on the basic physiology of biomass production process. Photosynthesis is the primary physiological process responsible for biomass production of all higher plants, and it involves capture of incoming radiation by the canopy of forest and its conversion into biomass using primarily, atmospheric CO_2 and water. Monteith (1972 & 1977) showed that the rate of biomass production is directly proportional to the amount of radiation intercepted by the foliage canopy. The above relationship can be given as:

$$W = e R_I$$

Where, W is the amount of total biomass (above and belowground biomass) produced and R_I is the amount of radiation intercepted by canopy. The proportionality constant, e is termed as Radiation Use Efficiency (RUE). Canopy radiation interceptions were estimated using hemispherical photographs acquired in the 25 sampling points and HemiView 2.1 Canopy Analysis Software, Hemispherical photographs were taken using Nikon Coolpix 990 digital camera with Nikon FC – E8 fisheye converter mounted on Delta - T self levelling mount at each sampling point at a height of 1m above the ground between 08:00 and 16:00 hrs, when, no direct sunlight is visible., and maximum and minimum RUE values for the forest were assigned assuming that the dominant forest vegetation is having C3 photosynthetic pathway, using available literature on previous studies [Monteith (1977), Evens (1993), De Costa & Jayaweera (1996)] to calculate biomass production. A vegetation survey was carried out in 6 plots (6 x 0.5 ha) to identify dominant species in the study area.

Average annual biomass production rate was calculated as ~51.3 tons $ha^{-1}yr^{-1}$ and average atmospheric CO_2 fixation rate for the moderately exploited natural forest area was calculated as ~95.05 tons ha^{-1} yr^{-1}. According to the Important Value Index (IVI) which is the expression of the dominance of particular species (IVI = Relative density + Relative basal area + Relative frequency), *Myristica dactyloides* is the most dominant tree species and Myristicaceae is the most prominent family that contribute more for the carbon sequestration in moderately exploited natural forest in YFR.