Effect of Assisted Natural Regeneration on Tree Diversity and Carbon Regulation

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Assisted Natural Regeneration (ANR) is one of the popular techniques to restore an ecosystem. This study aimed to assess the effect of ANR on biodiversity and carbon regulation in young plantations at reforestation units of the Kilinochchi premises, University of Jaffna (80° 24 E' 61° 6 N'). A total of 63 plots (2.52 ha) were laid with a dimension of 20 m × 20 m. The sampling plots were categorized into mixed plantation (MP) and unmixed plantation (UMP). Tree height (TH) and diameter at breast height (DBH) were measured. Shannon-Weiner Index (SWI), species richness, evenness and Important Value Index (IVI) were estimated. Allometric equations were used to estimate the carbon stock. A total of 931 individual trees comprising 27 species, 24 genus and 14 families, were identified. MP had a significantly ($p<0.0001$) high SWI with a mean value of 1.34±0.07 compared to UMP (0.45±0.05). Similarly, species richness and evenness were significantly high in MP (5.09±0.34, 0.86±0.02) than UMP (2.17±0.14, 0.43±0.05), respectively. These results represented that tree species were evenly distributed with high species diversity and richness in MP than UMP. The IVI revealed that most dominant species was *Terminalia arjuna* (Maruthu/Kumbuk) (124.45) next to *Khaya senegalensis* (Khaya) (53.84), *Mangifera indica* (Mango) (41.51), *Gliricidia sepium* (41.4), *Albizia lebbeck* (Vakai/Mara) (30.54), and *Syzygium cumini* (Naval/Danba) (27.76). The species Naval, Maruthu, Vakai, Khaya, *Madhuca longifolia* (Iluppai/Mee), *Pongamia pinnata* (Pungai/Karanda) had more than 90 % of survival percentage ($p<0.001$). Mean DBH and TH were 10.82±0.22 and 6.34±0.11, respectively and were not significantly differed ($p=0.645$, $p=0.186$) among the plantation category. Mean tree density and basal area were 364.44±40.37 stemsha^{-1} and 2.996± 0.46 m^{2}ha^{-1}, respectively and were not significantly differed ($p=0.213$, $p= 0.259$). Diameter increment was high in *Albizia saman* (Pare mara) (4.07±1.55 cmyear^{-1}) next to *Khaya* (3.83±0.43 cmyear^{-1}). Mean biomass and carbon stock were 11.74 ±2.35 and 5.63±1.13, respectively and were not significantly differed ($p=0.378$). A total of 14.2 MgC was accumulated whereas 52.06 Mg CO2 was sequestered. Mean carbon stock was 5.63±1.13 MgCha^{-1} whereas 20.66±4.13 MgCha^{-1} mean CO_2 was sequestered. This study highlighted the importance of promoting multiple tree species to increase biodiversity and their careful selection in carbon regulation.

Keywords: ANR, Carbon Sequestration, Dry zone, Tree biodiversity, Tropics