

Efficacy of traditional practice of mangrove cultivation in Negombo estuary

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Abstract

Mangroves are cultivated traditionally to produce twigs and branches for “Brush Park” fishery in Negombo estuary, Sri Lanka. Objective of the present study is to determine the efficacy of this practice in terms of its impact on overall mangrove primary productivity and mangrove carbon sequestration of the estuary. Net primary productivity (NPP) was determined by annual litterfall and biomass increment of mangroves at Kadolkele (7° 11' 42" N; 79° 50' 32" E), a natural, nevertheless a secondary stand that had been harvested for “Brush Park” construction twenty years ago and now being protected and Wedikanda (7° 11' 18" N; 79° 50' 04" E), a stand that has been cultivated and maintained by fishermen to extract twigs and branches for “Brush Park” construction. As indicated by complexity index scores, (42.33 at Kadolkele and 22.48 at Wedikanda), the natural stand is structurally superior to cultivated stand. Selection of species for cultivation, periodic harvesting of branches appears to reduce structural complexity of cultivated stand. Difference of net primary productivity of Kadolkele ($2401.29 \pm 18.46 \text{ g m}^{-2} \text{ y}^{-1}$) and Wedikanda ($2122.56 \pm 16.44 \text{ g m}^{-2} \text{ y}^{-1}$) however, is not statistically significant ($p < 0.05$), which indicates the traditional wisdom in mangrove cultivation methods. With respect to carbon sink-function, out of $1232.17 \pm 9.23 \text{ g}$ of carbon accumulated in mangroves at Kadolkele per m^2 per year, 55% in wood ($682.80 \pm 7.51 \text{ g m}^{-2} \text{ y}^{-1}$), $152.91 \pm 1.94 \text{ g m}^{-2} \text{ y}^{-1}$ in roots, and thus 67% in sequestered form. At Wedikanda, $602.88 \pm 6.93 \text{ g m}^{-2}$ out of $1116.51 \pm 12.63 \text{ g m}^{-2}$ of carbon included annually in the plants is in woody stems and $131.62 \pm 2.03 \text{ g m}^{-2}$ in roots, thus 65% of carbon in sequestered form. Annually, the secondary mangrove stands at Kadolkele (13.5 ha) is capable of sequestering 166.34 t y^{-1} at a rate of $12.32 \text{ t ha}^{-1} \text{ y}^{-1}$ while cultivated mangroves at Wedikanda (9.5 ha) 106.06 t y^{-1} at a rate of $11.16 \text{ t ha}^{-1} \text{ y}^{-1}$ and the difference is not statistically significant ($p < 0.05$). Cultivated mangrove stands therefore are as productive as the natural stands and their carbon sequestration capacities are comparable, thus manifesting the positive contribution of mangrove cultivation to overall mangrove productivity and carbon sinks. The average annual carbon sequestration by Negombo estuarine mangroves is $11.74 \text{ t ha}^{-1} \text{ y}^{-1}$ and this is equivalent to the amount of carbon emitted as CO_2 by combustion of 19,209 liters of diesel or 22,043 liters of gasoline by motor vehicles.

Keywords

mangrove cultivation, carbon sequestration, vegetation structure