Impact of Community-Based Mangrove Cultivation on Carbon Sequestration Function of Mangrove Ecosystems in Negombo Estuary, Sri Lanka: A Paradigm for Sustainable Livelihood - Ecosystem Interaction

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Mangrove ecosystems perform a range of ecological functions and provide a range of services to humanity, both locally and regionally. Contribution to ecological services by afforested mangrove areas, is understudied. Therefore, the present study is focused on the traditional mangrove cultivation and management practices, and it especially aims to quantify the carbon sequestration capacity of a community-based managed mangrove area at Negombo estuary. Kadolkele was selected to represent the natural and relatively undisturbed mangrove stands, while Wedikanda represented the man-made/ cultivated mangrove stands at Negombo estuary, Sri Lanka. Above and below ground biomass of mangrove trees were determined by allometric method. Average annual biomass increment was determined with five-year data of same study plots at two study areas. Mean annual biomass increments and their percentages were recorded as 13.54±0.47 Mg $ha^{-1}y^{-1}$ (9.24%) and 12.02±0.14 Mg $ha^{-1}y^{-1}$ (8.98%) for Kadolkele and Wedikanda, respectively. Average annual total organic carbon (TOC) accumulation rates were found to be 7.19 ±0.25 Mg $ha^{-1}y^{-1}$ and 6.56 ±0.07 Mg $ha^{-1}y^{-1}$ for Kadolkele and Wedikanda, respectively. Generally, the highest biomass and TOC increments were observed near the estuarine shoreline, with a decline trend towards the landward area. Based on the five-year total woody growth, the annual carbon sequestration capacities were calculated as 7.71 ±1.29 Mg C ha^{-1} y^{-1} and 6.90 ±1.18 Mg C ha^{-1} y^{-1} for Kadolkele and Wedikanda, respectively. No statistically significant difference was observed ($p > 0.05$) between the data on biomass and TOC increments of two study areas. Results revealed that carbon sequestration capacity of mangrove areas managed with traditional ecological knowledge is comparable to that of natural mangroves. Cultivated mangrove stands therefore are comparable in primary production to natural stands, thus manifesting the positive contribution of mangrove cultivation to overall productivity and carbon assimilation function of the estuary. This also provides testimony to the efficacy of indigenous methods adopted for mangrove cultivation and management.

Keywords: *Carbon sequestration capacity, Community-based management, Mangroves*