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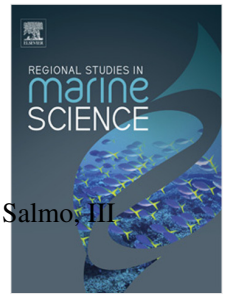

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Tree biomass quantity, carbon stock and canopy correlates in mangrove forest and land uses that replaced mangroves in Honda Bay, Philippines

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Abstract

Mangrove forests are important carbon (C) sinks in the tropics that are threatened by tropical deforestation and land use conversion, especially in Southeast Asia. Yet quantitative estimates are limited on the biomass (i.e. aboveground, belowground, downed woody debris) and tree C stocks of primary, secondary, and converted mangroves in Southeast Asia. While some related studies have been conducted in Latin America and Central Asia, there is a need to assess different geographical areas and regional ecosystems, as well as to consider the impacts of mangrove conversion to other land use types. In this study, tree biomass and tree biomass C stocks of secondary mangrove forests and four types of land uses that replaced intact mangrove forests (abandoned aquaculture pond, abandoned salt pond, coconut plantation, and cleared mangroves) in the coast of Honda Bay, Philippines were quantified. Their relationships with selected canopy variables were evaluated. Our measurements revealed that mean biomass (±SE) of intact mangroves ranged from 22.4 ± 9.0 to 178.1 ± 32.0 Mg ha^{-1}, which store 10 - 80 MgC ha^{-1} (mean: 47.9±5.1 MgC ha^{-1}). Leaf Area Index correlated with mangrove tree biomass C stock ($r = 0.67$, $p < 0.05$). In contrast, the biomass and tree C stock of the replacement land uses ranged from 0.1 ± 0 Mg ha^{-1} and 0.12±0.1 MgC ha^{-1}, respectively, in the abandoned aquaculture ponds to 12.0 ± 4.0 Mg ha^{-1} and 5.7±1.5 MgC ha^{-1} in coconut plantation. Our results indicate the importance of mangroves in storing considerable amounts of C in tree biomass in the coastal