

Above ground biomass-carbon partitioning, storage and sequestration in a rehabilitated forest, Bintulu, Sarawak, Malaysia

ABSTRACT

Forest degradation and deforestation are some of the major global concerns as it can reduce forest carbon storage and sequestration capacity. Forest rehabilitation on degraded forest areas has the potential to improve carbon stock, hence mitigate greenhouse gases emission. However, the carbon storage and sequestration potential in a rehabilitated tropical forest remains unclear due to the lack of information. This paper reports an initiative to estimate biomass-carbon partitioning, storage and sequestration in a rehabilitated forest. The study site was at the UPM-Mitsubishi Corporation Forest Rehabilitation Project, UPM Bintulu Sarawak Campus, Bintulu, Sarawak. A plot of 20 × 20 m² was established each in site 1991 (Plot 1991), 1999 (Plot 1999) and 2008 (Plot 2008). An adjacent natural regenerating secondary forest plot (Plot NF) was also established for comparison purposes. The results showed that the contribution of tree component biomass/carbon to total biomass/carbon was in the order of main stem > branch > leaf. As most of the trees were concentrated in diameter size class ≤ 10 cm for younger rehabilitated forests, the total above ground biomass/carbon was from this class. These observations suggest that the forests are in the early successional stage. The total above ground biomass obtained for the rehabilitated forest ranged from 4.3 to 4,192.3 kg compared to natural regenerating secondary forest of 3,942.3 kg while total above ground carbon ranged from 1.9 to 1,927.9 kg and 1,820.4 kg, respectively. The mean total above ground biomass accumulated ranged from 1.3 × 10⁻² to 20.5 kg/0.04 ha and mean total carbon storage ranged from 5.9 × 10⁻³ to 9.4 kg/0.04 ha. The total CO₂ sequestered in rehabilitated forest ranged from 6.9 to 7,069.1 kg CO₂/0.04 ha. After 19 years, the rehabilitated forest had total above ground biomass and carbon storage comparable to the natural regeneration secondary forest. The forest rehabilitated activities have the potential to increase carbon stock through tree planting. Therefore, forest rehabilitation has shown the potential role as a carbon sink that helps to reduce emissions of greenhouse gases and mitigate climate change.

Keyword: Biomass partitioning; Carbon sequestration; Forest biomass; Forest carbon; Natural regenerating secondary forest; Rehabilitated forest