

Decomposition of coarse woody debris produced through land conversion from a forest to an oil palm plantation

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Tropical peatlands are widely distributed in Indonesia and Malaysia and have accumulated a huge amount of biomass and soil carbon as peat, coexisting with swamp forest. Recently, however, the huge carbon pool has been threatened by deforestation and peat decomposition through land conversion to oil palm plantations. The land conversion produces a large amount of coarse woody debris (CWD). The CWD is usually piled high in a row (stacking rows) in plantations and would become a large CO₂ source through decomposition, though quantitative information on CO₂ emission is still lacking. Thus, we conducted a field experiment to quantify how much CO₂ is emitted through CWD decomposition.

The study was conducted in a newly developed oil palm plantation from a tropical peat swamp forest in Sarawak, Malaysia. After land preparation, CWD was piled up at the center of each subrow (0.3 ha). We measured the effective volume of a 90-m-long stacking row four times between November 2011 and May 2020, assuming that the shape of a cross section is a triangle. In addition, we determined the moisture and carbon content of CWD samples taken from the stacking row.

The width and height of the stacking row had decreased gradually. The mean cross-sectional areas of the first three measurements were 4.9, 4.1 and 3.5 m², respectively. The total amount of carbon in the stacking row was estimated at 19.0 t in November 2018 and 9.0 t in May 2019 from the effective volume and carbon content. The carbon amount was converted to 56.8 and 30.1 t C ha⁻¹, respectively, which indicates that 26.7 t C ha⁻¹ (= 16.1 g C m⁻² d⁻¹) was lost between the two measurement dates for 166 days.

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