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Major CO2 losses from degradation of Mauritia flexuosa peat swamp forests in western Amazonia

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Tropical peat swamp forests are major global carbon (C) stores that are particularly vulnerable to human intervention. In the Peruvian Amazonia they have been severely degraded through recurrent cutting of *Mauritia flexuosa* palms for fruit harvesting, and potentially been transformed from a CO_2 sink into a significant source. To estimate emissions associated with degradation, we combined C stock changes in aboveground biomass with peat C losses along a gradient comprising undegraded (Intact), moderately degraded (mDeg) and heavily degraded (hDeg) palm swamps. Temporal and spatial dynamics of the main components of the peat C budget (heterotrophic soil respiration (Rh) and litterfall) were investigated (bi)monthly over three years, while annual site-specific root C inputs and default dissolved organic C exports were taken from the literature. Variables measured at tree or microtopographic level were site-scaled considering forest structural changes from degradation. Site-scale litterfall (Mg C ha^{-1} $year^{-1}$) at the hDeg site (2.3 ± 0.5) was less than half the rate at the Intact and mDeg sites (5.2 ± 0.9 and 6.0 ± 1.6, respectively). Conversely, site-scale Rh (Mg C ha^{-1} $year^{-1}$) was higher at the hDeg site (9.6 ± 0.6) than at the Intact and mDeg sites (7.5 ± 1.1 and 6.1 ± 0.5, respectively). The peat carbon budget (Mg C ha^{-1} $year^{-1}$) indicated that medium degradation reduced the sink capacity of the soil (from -1.8 ± 1.8 at the Intact site to -0.3 ± 0.7 at the mDeg site) while high degradation turned the soil into a high C source (6.0 ± 0.6 at the hDeg site). The large total C stock loss rates of 23.5 ± 14.3 and 57.7 ± 14.3 Mg CO_2 ha^{-1} $year^{-1}$ at the mDeg and hDeg sites, respectively, which originated 94 and 77% from aboveground biomass changes clearly highlight the need for sustainable management of these peatlands.