# Researchers make greenhouse gas emissions from tropical peat soils with higher accuracy

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Tropical peatlands store lots of carbon and have an important role in the global carbon cycles. Tropical peatlands account for about 5 to 10% of global soil carbon.

Peatland C stocks have been significantly depleted due to climate change and human disturbances. Clearing of forests and draining of peatlands have accelerated the emission of $CO_2$ from peats. This has been the major talking point at numerous international forums aiming to combat climate change. Recently, FAO published a report on peatland mapping and monitoring in which one of the recommendations is to update the IPCC emission factors of greenhouse gas (GHG) emissions for peatlands.

While there is an agreement that tropical peat land emits large amounts of $CO_2$, there is uncertainty around the estimates. Researchers commonly measure $CO_2$ emissions at a site and then extrapolate the value from that site to all tropical peat regions. Such estimates are highly uncertain.

To answer this challenge, a group of researchers from Australia, Indonesia and Malaysia has provided the first comprehensive analysis of tropical peatland GHG fluxes from studies conducted over the past 20 years. The study published in *Global Change Biology* documents studies in tropical peatlands that measure $CO_2$, $N_2O$, and $CH_4$ fluxes in soil from land with various uses, groundwater levels and other environmental conditions. In addition, the researchers separate total $CO_2$ respiration from heterotrophic respiration (respiration from microbes decomposing organic matter).

Their results reveal that measurements of GHG emissions in tropical peat soils are highly variable. The data also stress the importance of correct interpretation of soil respiration data, as using total $CO_2$ respiration alone can lead to misinformation. A forest may have a similar total $CO_2$ emission as a plantation, however, the groundwater levels and heterotrophic respiration were different.

The researchers found that groundwater level had a stronger influence than land use on $CO_2$ emissions in tropical peat soils. For shallower groundwater (less than 0.5 m from ground surface), the total $CO_2$ emissions had a median value of 41 tons per ha per year, and 66% of it was due to heterotrophic respiration. For lower groundwater level (deeper than 0.5 m), the median is 66 tons $CO_2$ per ha per year, and 84% of it comprises of heterotrophic respiration. Deeper groundwater levels due to drainage also caused a substantial increase in nitrous oxide ($N_2O$) emissions. Nitrous oxide is known to have a more significant effect on global warming potential (GWP), estimated to be 298 times more potent than $CO_2$. Thus, in terms of GWP, $N_2O$ emissions were about 15% of total $CO_2$ emissions under deep groundwater levels.

Surprisingly, the research found that the total $CO_2$ emissions from tropical peatlands have the same magnitude as forest mineral soils.

Maintaining a shallow groundwater level appears to be the only viable option for reducing GHG emission in the fragile ecosystem, as deeper groundwater levels (?0.5 m) induced an average of 25 ton $CO_2$ per ha per year larger emission and 35 ton $CO_2$ larger warming potential.

The increase in methane when the groundwater level is raised is substantially smaller compared to the other two GHGs. Excessive drainage of peatlands can create significant negative impacts on the climate and people living in tropical regions. However, as peatlands are also a source of income

supporting the local economy, more practical solutions are needed to create environmentally balanced yet economically viable opportunities. Restoring peatland hydrological function can help decrease GHG emissions, prevent floods, and avoid adverse drought effects.

**More information:** Jeremy Aditya Prananto et al. Drainage increases CO 2 and N 2 O emissions from tropical peat soils, *Global Change Biology* (2020). onlinelibrary.wiley.com/doi/10.1111/gcb.15147

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