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## Linking Stocks and Flows: New Emission Factors for Managed Tropical Histosols

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### Abstract

Quantifying greenhouse gas (GHG) emissions from managed tropical histosols was one of the major gaps in the 2006 revision of the IPCC National Greenhouse Gas Inventory Guidelines. Since the Guidelines were published, several studies suggested that emissions from these soils were high when they were drained and converted to agriculture. In 2011 IPCC began an effort to provide better guidance for the inclusion of these lands in national GHG inventories. Estimates of these emissions remain controversial because of methodological limitations and incompleteness of many studies. For most types of tropical agriculture emission factors were based chamber measurements, but data availability remained a major constraint. Tropical agricultural emissions ranged from of 1.5 to 14 Mg C ha<sup>-1</sup> y<sup>-1</sup> for different types of croplands. Developing the emission factor for oil palm and short rotation forestry posed a challenge as data were available for both chamber and subsidence measurements. For short rotation plantations, data were available from a limited geographic range (22.1 and 17.7 Mg C ha<sup>-1</sup> y<sup>-1</sup> for subsidence and flux approaches, respectively). For oil palm, the two methods produced results that were not significantly different (8.9 and 12.2, respectively). Results of the two approaches were averaged to produce the final emission factors of 20 and 11 Mg ha<sup>-1</sup> y<sup>-1</sup> for short rotation plantations and oil palm, respectively. Since the publication of these results, new data has confirmed the emission factors. New emission factors were also produced for non-CO<sub>2</sub> GHGs. Soil N<sub>2</sub>O emissions between 0 and 5 kg N<sub>2</sub>O-N ha<sup>-1</sup> y<sup>-1</sup>, but these factors are also based on few data. New data suggests that emissions may be considerably higher than these values, particularly in highly fertilised oil palm plantations. Emissions of CH<sub>4</sub> are also high in several types of production systems, ranging from 0 to 140 kg CH<sub>4</sub> ha<sup>-1</sup> y<sup>-1</sup>, and they are extremely high from drainage ditches (>2500 kg CH<sub>4</sub> ha<sup>-1</sup> y<sup>-1</sup>). We conclude with some recommendations for improving measurement efforts to better constrain emissions from managed tropical histosols.

**Keywords:** Greenhouse gas emissions, IPCC, palm oil plantation, tropical soils