



Tropentag, September 15-17, 2021, hybrid conference

“Towards shifting paradigms in agriculture
for a healthy and sustainable future”

Agriculture Is the Main Tropical Deforestation Driver, Responsible for Carbon Emissions and Ecosystem Service Losses

TOBIAS SEYDEWITZ¹, DAVID LANDHOLM², PRAJAL PRADHAN³

¹*Potsdam Institute for Climate Impact Research, Rdi: Climate Resilience, Germany*

²*Potsdam Institute for Climate Impact Research, Rdi: Climate Resilience,*

³*Potsdam Institute for Climate Impact Research, Rdi: Climate Resilience,*

Abstract

Globally, deforestation results in a large amount of anthropogenic greenhouse gas (GHG) emissions, contributing to climate change substantially. Forest cover changes also have large impacts on ecosystem services. Deforestation is the dominant cause of land cover change in the tropical region. This land cover change relates to distinct causes recognised as direct deforestation drivers. Understanding these drivers requires a significant effort. The current studies on these drivers are mostly limited to coarse resolution. Further, GHG emissions due to deforestation are quantified only in biomass removal, while linking emissions from soil organic carbon (SOC) loss to deforestation is lacking. Additionally, deforestation impacts on ecosystem services are only assessed regarding loss without a closer picture of ecosystem service changes. Therefore, we analyse for 2001–2010: (1) the magnitudes of deforestation drivers, (2) the related carbon loss resulting from the removal of biomass and change in SOC, and (3) the ecosystem service value (ESV) change due to tropical deforestation. On the global scale, agriculture (90.3%) is the primary deforestation driver, where the expansion of grassland contributed the most (37.5%). The deforestation drivers differ in magnitude and spatial distribution on the continental scale. During our study period, the total carbon loss by biomass removal and SOC loss accounted for 8,797.32 Mt C and 1,185.16 Mt C, respectively. Furthermore, tropical deforestation caused a gross ESV loss of 408.6 billion Int.\$/yr, while the net loss represented 63.2 billion Int.\$/yr. Our findings highlight that agriculture represents a substantial contribution to global carbon loss and ecosystem service loss due to deforestation. Additionally, we show that the drivers differ in magnitude and distribution for different continents. Further, we highlight the underlying danger of putting the monetary value of nature by presenting estimates on the ESV gain through land cover change, together with the ESV loss.

Keywords: Carbon emissions, deforestation, drivers, ecosystem services