

## ABSTRACT

Conversion of wetlands to agricultural land affects the quantity and quality of soil organic matter (SOM), thereby influencing carbon (C) and nitrogen (N) dynamics. This study examined the impact of land-use and soil depth on soil C and N concentrations, their stable isotopes ( $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ ), thermal stability, and chemical composition in 14 permanently and seasonally flooded wetlands and adjacent maize, vegetable, and sugarcane farms. Results showed that soil depth had a significant impact on soil C ( $P < 0.0001$ ) and N ( $P < 0.0001$ ) contents, while land-use alone did not affect C ( $P = 0.6095$ ) and N ( $P = 0.5276$ ). However, land-use  $\times$  depth interactions for both C ( $P = 0.0457$ ) and N ( $P = 0.0203$ ) were significant, indicating depth-dependent land-use impacts. Significant depth ( $P = 0.013$ ) and land-use ( $P < 0.0001$ ) impacts on  $\delta^{13}\text{C}$  were revealed by stable isotope analyses, with sugarcane and permanently flooded wetlands showing depleted values, while  $\delta^{15}\text{N}$  increased steadily with depth regardless of land use. Low-thermally stable C (LTSC) predominated in all systems, accounting for 71%, 82%, 75%, 78% and 78% of the total C in permanently flooded wetland (PFW), seasonally flooded wetland (SFW), sugarcane, maize, and Vegetable farms, respectively. Low-thermally stable N (LTSN) dominated in the SFW (64%), sugarcane farms (60%), and vegetable farms (56%). In PFW, high-thermally stable N (HTSN) dominated, whereas in maize farms, LTSN and HTSN were roughly equal. This suggests considerable organic matter lability, especially in SFW. In the solid-state  $^{13}\text{C}$  NMR analysis, O-alkyl C was the predominant functional group across land uses, followed by alkyl C. Depth-dependent changes in alkyl:O-alkyl ratios indicated the gradual breakdown of SOM. Overall, hydrological regime and soil depth emerged as primary factors influencing the dynamics of SOM in the studied ecosystems, while land-use effects were reflected in the interaction term.