

Seasonal CO₂ Flux Dynamics in Tropical Constructed Lakes: Comparative Insights from Wet and Dry Zones of Sri Lanka

G.D.D.J Bandara*, N.D.K. Dayawansa¹, R.P. De Silva¹ and M. I. M. Mowjood¹

Postgraduate Institute of Agriculture
University of Peradeniya
Sri Lanka

Tropical man-made freshwater systems are increasingly recognized as significant yet understudied contributors to atmospheric carbon dioxide (CO₂) emissions. It is hypothesized that CO₂ fluxes in reservoirs located in different climatic zones of Sri Lanka would exhibit distinct seasonal patterns due to contrasting environmental drivers. This study examined seasonal CO₂ flux dynamics in *Thalangama* Tank (wet zone) and *Huruluwawa* Tank (dry zone). Monthly six-hour CO₂ flux measurements were conducted for six months using automated floating chambers. Simultaneously, monitoring of water quality and meteorological parameters performed. In *Thalangama* Tank, CO₂ flux remained consistently positive. Turbidity shows the strongest positive correlation ($r = +0.53$), indicating sediment resuspension, reduced solar radiation for aquatic photosynthesis and organic matter decomposition as dominant processes. One-way ANOVA revealed marginal seasonal variation ($F = 2.42$, $p = 0.052$), suggesting stable CO₂ emissions across months. In contrast, *Huruluwawa* Tank exhibited a significant seasonal shift from net CO₂ emission to uptake ($F = 3.90$, $p = 0.008$). Negative correlations were observed between CO₂ flux and wind speed ($r = -0.56$), turbidity ($r = -0.53$), and dissolved organic carbon ($r = -0.35$), implying enhanced mixing and primary productivity promoted CO₂ sequestration. These findings highlight distinct CO₂ flux patterns across climatic zones and highlight the necessity of zone-specific carbon assessments. Further, detailed investigations are essential to accurately identify the environmental controls governing CO₂ fluxes in tropical freshwater reservoirs, particularly in the context of climate change mitigation and ecosystem management.

Keywords: CO₂ Flux, Tropical Freshwater Systems, Irrigation Tanks

*Corresponding author: dilandileepa@gmail.com; ORCID: 0000-0002-0960-2038

¹Department of Agricultural Engineering, Faculty of Agriculture, University of Peradeniya