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Assessment of mangrove restoration potential in the North Western province of Sri Lanka for climate change mitigation

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Climate change is a long-term alteration in average weather patterns which now define the world's local, regional, and global climates. The Paris Agreement is an international climate change treaty, and countries will present their climate action plans, referred to as Nationally Determined Contributions (NDCs). Sri Lanka presented NDCs in 2016. Accordingly, the coastal and marine sector has a restoration target of 10,000 hectares of mangroves as a coastal greenbelt with mitigation co-benefits. The identification of potential areas for mangrove restoration is imperative because mangroves cannot be restored where they did not previously exist. The main objective of this research was to identify potential areas for mangrove restoration within the North Western province and thereby contribute to meet Sri Lanka's NDCs on mangrove restoration for climate change adaptation. Most important physicochemical parameters such as salinity, pH, soil organic matter content, and soil water holding capacity of the samples collected from four different sites of mangrove habitats were determined. Samples were collected up to approximately 85 cm in four depths and were triplicated. Salinity and pH were measured using a calibrated multi-meter and soil organic matter content was measured using loss of ignition method. Two-way ANOVA ($p < 0.05$) in MINITAB 14 was conducted to analyse how parameters varied among each depth and sampling sites. The mean of soil salinity, pH, soil organic matter content, and soil water holding capacity ranged between 4.26% to 5.93%, 6.07 to 8.62, 3.40% to 9.31%, and 30.39% to 46.38%, respectively. No significant differences in physicochemical parameters were found among mangrove habitats and an abandoned shrimp farm where previously mangrove plants existed. Hence, abandoned shrimp farms and salterns can be used to restore the mangrove plants. The potential lands for restoring mangroves in North Western Province were identified in Chilaw, Kalpitiya, Mundel, Panirendawa, Puttalam, Vanathawilluwa, and Vennappuwa Divisional Secretariat Divisions. Among them, areas for which historical images in Google Earth Pro were available, were specially chosen to restore the mangroves. This study suggests that the assisted natural regeneration of mangroves in suitable abandoned shrimp farms by facilitating hydrology can be explored as the best option for mangrove restoration.

Keywords: Climate change, nationally determined contributions, North Western province, soil physicochemical parameters, potential lands

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