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Potential of Biofilm Biofertilizer Application in Paddy Soil Carbon Sequestration in Sri Lanka: An Economic Feasibility Analysis

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Anthropogenic emissions of carbon (C) to the atmosphere at higher rates have led to global warming and climate change. Soil carbon sequestration (SCS) has been recognized as the process that stores atmospheric C for a long period without escaping back to the atmosphere. Globally, expanding agricultural lands has come to play a major role in SCS in the phase of degradation of natural ecosystems like forests by deforestation, fire, etc. The objective of this study was to evaluate the potential of Biofilm biofertilizer (BFBF) application in SCS under rice cultivation. Soil stable C was estimated as sequestered soil C by using organic carbon (Walkley-Black) and oxidizable carbon in the BFBF application and the farmers' chemical fertilizer (CF) alone application. Soil samples were collected from paddy fields in 25 representative locations in several districts of Sri Lanka in three consecutive seasons: *Yala* 2018, *Maha* 2018/19, and *Yala* 2019. The results showed that the SCS was significantly (p<0.05) higher in the BFBF practice in every season. This is due to increased microbial C assimilation in the root zone of soil. The BFBF practice sequestered 19 t C ha^{-1} $year^{-1}$ over farmers' CF practice, showing an enormous potential to gain income through soil C trading. There was also an increasing trend in the paddy grain yield up to ca. 30% under the same practice. Thus, during the next five years, if the BFBF practice would be implemented island wide, the potential income from trading C will be ca. 190 billion rupees. In conclusion, the BFBF practice can be considered as an eco-friendly and economically viable method to replace the farmers' current practice of CF alone application.

Keywords: Biofilm biofertilizer, Carbon trading, Rice cultivation, Soil carbon sequestration