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Applied nucleation affects soil restoration of degraded grasslands in the Knuckles conservation forest, Sri Lanka

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Sub-montane forests in the Knuckles conservation region in Sri Lanka had been cleared for cash crop cultivation during the colonial era. Those lands were abandoned due to low yield and subsequently, they developed into barren grasslands. Previous research found that the grassland soils had a lower nutrient content than the neighbouring forest soil. In the present study, we tested the hypothesis that the establishment of native tree islands with the presence of *Gliricidia sepium* as a shade plant, and with the application of Biofilmed Biofertilizer (BFBF) positively affects the soil nutrients status of the degraded land through soil restoration processes. The research design consisted of four blocks and each block consisted of two sets of an experimental plot with three different sizes of the island (2 m^2, 4 m^2, 8 m^2). Inside the islands, four native plants (*Macaranga indica*, *Bhesa ceylanica*, *Symplocos cochinchinensis,* and *Eugenia bracteata*) were randomly established under four treatments [(+G+B), (-G+B), (+G-B) and (-G-B)], with and without *G. sepium* (+G and -G) as shade plant and with and without the application of BFBF (+B and -B). Soil Organic Carbon (SOC), Ammonium, Nitrate, Phosphate, and Cation Exchange Capacity (CEC) were determined in soil collected from islands of different sizes and the nearby grassland at the initiation of the field experiment as well as after two years. The treatment +G+B in the large island (8 m^2) showed significantly higher ($p<0.05$) SOC, and ammonium than that of the initial soil samples and the grassland soil. Nitrogen, CEC, and phosphate levels were significantly ($p<0.05$) higher in the larger islands than in other island sizes. Higher Relative Growth Rates (RGR_h) and the survival of native plants were observed in the large islands. Microorganisms in the BFBF-treated islands helped to accelerate the decomposition of organic matter and release nutrients that soil receives from the native plants and *G. sepium*. The presence of *G. sepium* as a nurse plant and the application of BFBF (G+B+) improved soil nutrients in the large islands compared to medium and small islands.

Keywords: Biofilmed Biofertilizer (BFBF), *Gliricidia sepium*, native plants, Restoration

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