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Comparison of Soil Quality in Mono-culture Forest (*Pinus caribaea*), Natural Forest and Analog Forest Ecosystems: A Study in Mirahawaththa Sri Lanka

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Abstract

Soil quality is a reflection of the ability of a soil body to perform functions which are essential to people and the environment. Soil quality definitions emphasise several features, chemical, physical and biological. However, the concept of soil quality is based on the premise that any of these features can be used to evaluate the degradation or improvement of soil ecosystem functions. Some soil quality concepts (soil structure, organic matter content (OM) and microbial as well as microbial activity) are commonly used to evaluate sustainable land management in agroecosystems. This study examined the soil quality of the three different ecosystems (Analog forest (AF), Natural forest (NF), and Monoculture forest (MF)). The study was undertaken in Belipola, Mirahawaththa, Welimada. Six soil samples were collected for each soil test (The samples were collected in zig-zag across the site). Apparent density, soil pH, soil organic matter (Walkley and Black Method), and microbial diversity (Dilution method) was evaluated. Six plots (unit area 1 m^2) of each ecosystem was measured to detect the Earthworm presence indicators and observed the earthworm casts and counting. The result by apparent density in NF show the lowest value (1.09) and the highest value (1.34) in MF. The AF apparent density value was 1.22. soil pH resulted in AF-6.5, NF-6.2, and MF-5.9. Also, the result of Organic matter content in NF-3.9%, AF-3.1, and MF-1.2 was detected. Analysis of soil microbial diversity of three ecosystems was shown AF (range 137 to 296), NF (range 130 to 335), and MF (range 12 to 21) numbers of colonies in Petri dishes. Numbers of earthworm casts per square meters in AF (range 5 to 13), MF (0), and NF (range 10 to 15) were recorded. In conclusion, the soil quality of AF most close to the NF ecosystem compares with the MF system. We have revealed that there is a large potential to restore the soil into becoming more analogous to the natural forest to enhance the soil quality through AF technology.

Keywords: Analog forest, Microbial diversity, Monoculture forest, Natural forest