

**DIVERSITY, ABUNDANCE AND FUNCTIONAL ROLE  
OF SOIL ORGANISMS IN COCONUT BASED  
MULTIPLE CROPPING SYSTEMS**

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## ABSTRACT

The study addressed; the effect of ecosystem type diversity, abundance and functional role of soil organisms in the coconut monocropping and multiple cropping systems, and building a basic foundation, which is needed for ecosystem payment scheme. Sampling was done in wet and intermediate zones represented by the Walpita and Makandura research centers, respectively. Eleven land use systems were considered for the study; coconut mono culture (CM), bare land (BL) and coconut multiple cropping. Under coconut multiple cropping, nine different intercrops were selected separately for each zones. The treatments were arranged in a randomized complete block design (RCBD) with three replicates ( $n = 3$ ). The experiment was conducted under mature bearing coconut ( $>20$  years) plantation. Soil Macrofauna was sampled using one transect with three replicates at each land use type using quadrat size ( $30 \times 30$ cm) from 0-30 cm depth and visible organisms were handpicked and preserved in 75% alcohol. Dilute plate technique and Spread plate technique was used to determine the soil micro organisms' density. Those techniques were used to cultivate the fungi and bacteria under  $10^{-2}$  and  $10^{-5}$  dilution level respectively.

Research identified 12 classes (Crustacea, Oligochaeta, Hirudinea, Gastropoda, Acarina, Araneida, Scorpionida, Chilapoda, Diplopoda, Amphibia, Reptelia) and 14 orders (Hemiptera, Diptera, Coleoptera, Thysanura, Hymenoptera, Lepidoptera, Orthoptera, Blattaria, Mantodea, Phasmida, Dermaptera, Isoptera, Siphonaptera, Thysanoptera) of soil organisms. Class insecta shows the high diversity with 14 orders. Colony forming unit (CFU) value of bacteria was higher than that of the fungi value. Findings of intermediate and wet zones' studies suggested that coconut multiple cropping systems may have high diversity, abundance and functional role of soil organisms. Both zones studies suggested that coconut multiple cropping systems may increase soil moisture factor, respiration rate, biomass carbon content, organic carbon percentage, total nitrogen content, organic matter content and C:N ratio in 30cm depth other than the bare land and coconut monoculture systems.

Soil organisms' densities and diversities were statistically significant with their functional roles. Cropping systems had greater impact on soil organisms' diversity, abundance as well as their functional role. Overall data of two different zones indicated

a significant positive correlation of soil organism diversity, abundance and their functional role with cropping systems. Those data can be used as a reliable basic bio indicator for payments for ecosystem services (PES). It supports to valorize the economic value of the ecological services returned by soil organisms.

**Keywords:** Soil organisms, diversity, abundance, multiple cropping systems, ecosystem services, payments for ecosystem services