

Impact of Land-use Change on Vertical Soil Bacterial Communities in Sabah

ABSTRACT

Decline in forest productivity due to forest conversion is defining the Bornean landscape. Responses of bacterial communities due to land-use changes are vital and could define our understanding of ecosystem functions. This study reports the changes in bacterial community structure in organic soil (0–5 cm; O-Horizon) and organic-mineral soil (5– 15 cm; A-Horizon) across Maliau Basin Conservation Area old growth forest (MBOG), Fragment E logged forest (FELF) located in Kalabakan Forest Reserve to Benta Wawasan oil palm plantation (BWOP) using two-step PCR amplicon analysis of bacteria DNA on Illumina Miseq next generation sequencing. A total of 30 soil samples yielded 893,752-OTU reads at $\geq 97\%$ similarity from 5,446,512 good quality sequences. Soil from BWOP plantation showed highest unshared OTUs for organic (49.2%) and organic-mineral (50.9%) soil. MBOG soil showed a drop in unshared OTUs between organic (48.6%) and organic-mineral (33.9%). At phylum level, Proteobacteria dominated MBOG but shifted to Actinobacteria in logged and plantation soil. Present findings also indicated that only FELF exhibited change in bacterial communities along the soil depth, moving from the organic to the organic-mineral layer. Both layers of BWOP plantation soils deviated from other forests' soil in β -diversity analysis. To our knowledge, this is the first report on transitions of bacterial community structures with different soil horizons in the tropical rainforest including Borneo, Sabah. Borneo tropical soils form a large reservoir for soil bacteria and future exploration is needed for fully understanding the diversity structure and their bacterial functional properties.