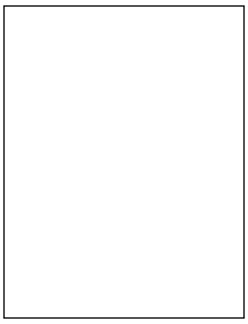

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# Impact of Land-use Change on Soil Microbial Community Composition and Organic Carbon Content in the Dry Tropics of India

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ABSTRACT

The impact of land-use change (LUC) from natural forest (NF) to degraded forest (DF), and then to either *Jatropha curcas* plantation (JP) or agroecosystem (AG) in the dry tropics of Uttar Pradesh, India was studied on soil microbial community composition in terms of Phospholipid fatty acid (PLFA) biomarkers and soil organic carbon (SOC) content. The trend of total bacterial PLFAs across all the land-use types was in the order: NF > JP > DF > AG. In NF, there was dominance of Gram-negative ($G^-$) over the Gram-positive ($G^+$) counterpart PLFAs. The levels of $G^-$ differed significantly in AG and JP from that of DF, whereas, that of $G^+$ in the three land-use types were almost similar. Fungal PLFAs, however, followed a different trend, i.e. NF > JP > DF = AG. Total PLFAs, fungal: bacterial (F/B) ratio and SOC content followed the trend similar to that of total bacterial PLFAs. Across all the land use types, there was a strong positive relationship among the SOC content and $G^-$ , total bacteria, fungal, total PLFAs and F/B ratio. The fungal compared to bacterial PLFAs seemed more sensitive to LUC. The changes in F/B ratio, fungal and bacterial PLFAs reflected 91%, 94% and 73% variability in SOC content, respectively. Increased F/B ratio in JP favoured more soil C storage leading to faster ecosystem recovery compared to either AG or DF. PLFA of F/B ratio may be used as the early indicator of ecosystem recovery in response to disturbances, especially related to LUC.

*Key Words:* Dry tropics; F/B ratio; PLFAs; soil organic carbon

Land-use change (LUC) and excessive resource extraction resulted in ~0.6% loss of forest cover per year worldwide (Hansen *et al.* 2010). Restoration of forests poses a major challenge globally and especially in the tropics as these are more vulnerable to LUC. Soil microbial community responds more readily to soil disturbances in any ecosystem, relative to chemical or physical soil properties (Jackson *et al*., 2007). Any change in microbial community composition, could be used as the sensitive index of soil disturbance. Several studies have shown LUC to have significant impact on microbial community especially in the temperate regions (Zhang *et al*., 2005; Six *et al*., 2006; Gracia-Orens *et*

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