

Impact of Different Cover Crop Management Systems on Soil Properties

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Rubber (*Hevea brasiliensis*) is a vital plantation crop in Sri Lanka, contributing significantly to the agricultural sector. However, continuous rubber cultivation causes a decline in soil fertility, negatively impacting long-term productivity. The study aimed to characterize the soil chemical properties in immature rubber lands under different cover crop management practices. Eighteen soil samples were collected from 0 - 0.15 m depths in three different immature rubber lands (Blocks) situated within the Boralu soil series at Clyde estate. Each site represented a different cover crop condition (treatment): Fully Established Cover Crop, 12 months (FCC), Partially Established Cover Crop, 6 months (PCC), and Natural Vegetation Cover (NVC). *Mucuna bracteata* was utilized as a cover crop, and a consistent fertilizer application was employed across all sites. The collected soil samples were analyzed for key chemical properties, including soil pH, soil organic carbon (SOC), exchangeable potassium (Ex. K), exchangeable magnesium (Ex. Mg), total nitrogen (TN), and available phosphorus (Av. P). The study employed a Randomized Completely Block Design (RCBD), with data analyzed using analysis of variance (ANOVA) followed by mean separation using the Least Significant Difference (LSD) test. The experimental setup included three treatments (FCC, PCC, and NVC), with three sites considered as blocks. The results indicated that SOC ($1.3 \pm 0.09\%$), Av. P ($20.17 \pm 0.19 \text{ mg kg}^{-1}$), Ex. K (59.3 mg kg^{-1}), and Ex. Mg ($24.25 \pm 8.28 \text{ mg kg}^{-1}$) was significantly highest under FCC, while TN ($2.4 \pm 0.19 \text{ mg kg}^{-1}$) was highest under NVC. All measured soil chemical parameters exceeded the existing soil nutrient conditions in the Boralu soil, SOC (0.9–1.3%), Av. P (20–35 mg kg^{-1}), Ex. K (40–60 mg kg^{-1}), Ex. Mg (20–30 mg kg^{-1}), and TN (0.09–0.13%). However, soil pH did not significantly differ among the three cover crop management practices. Overall, the FCC significantly improved most soil chemical parameters, except TN. These findings emphasize the potential benefits of cover crop management in enhancing soil chemical properties in immature rubber plantations in Sri Lanka.

Keywords: Boralu soil series, Cover crop management, Fertility, Soil erosion