ABSTRACT

Plantations are inextricably tied to the soil, water, and atmosphere. The conversion of natural ecosystems to farming has intensified in recent decades. The planted watersheds differ from urban and crop-covered watersheds. Tree plantations can modify soil properties and rainfall incident above plantations. This research aims to study influence of plantations on soil and rainfall partitioning parameters for the watersheds covered with nine types of selected plantation (i.e., Mango, Cashew, Guava, Sapota, Litchi, Coconut, Banana, Eucalyptus, and Tea) grown under similar soil and climatic conditions. The variations observed in soil properties at different depths and under different plantations are evidence of plantations' influence on micro-watershed soil properties. The saturated hydraulic conductivity of soil (Ks) is strongly correlated with the physico-chemical properties of soil. The temporal changes in soil properties were observed when compared with 1971-year data which indicated that plantations have influenced various soil properties. Using *in-situ* Ks measurements, Rosetta models were applied to test their applicability. Model 3 matched well for sandy loam and loam soil, whereas Model 1 matched well for sandy clay loam soil. Throughfall was the most significant variable among various rainfall partitioning parameters (RPPs), namely throughfall (TF), stemflow (SF), net rainfall (RN), and interception (IC). The multi-location sampling with a positioning design of TF receptacles was developed to minimize TF variation under an individual plant canopy. The proposed multi-sampling (TF_p) resulted in consistent low variability values compared to the conventional randomly measured values under a tree canopy. The sampling locations at the middle of the canopy radius obtained the lowest RMSE_RD. The RPPs varied from 54 to 83% (TF), 1.1 to 7.7% (SF), and 16 to 42% (IC) of incident rainfall under various plantations. RPPs' relationship with rainfall characteristics indicated a strong linear relationship with rainfall depth and a weak linear fit with rainfall intensity. The models of relative proportions of TF, SF, IC, and RN against the rainfall depth values showed an exponential relationship with rainfall depth. Model performance parameters for fitted models showed a good fit for Sapota and Tea plantations.

Keywords: Plantations, soil properties, rainfall partitioning, throughfall, stemflow, interception.