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Understorey vegetation drives surface runoff and soil loss in teak plantation-based system of Northern Laos

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Humid tropical mountainous area experiences serious soil erosion due to rapid changes in landuse, sometimes implying erosion prone management practices. In this study, we hypothesized that keeping understorey in teak tree plantation would protect soil and avoid soil erosion. We assessed the effects of 4 management practices in teak tree plantation area on water and soil losses using 6 replicated 1-m^2 microplots in four plantations situated in Northern Laos during the wet season of 2017. The landuses in the four plantations were teak without understorey (TNU), teak with low density of understorey (TLU), teak with high density of understorey (THU), and teak with broom grass, *Thysanolaena latifolia* (TBG). During the wet season of 2017, we monitored surface runoff and soil loss for 22 rainfall events. We also measured some of the teak tree and understorey characteristics (i.e. height and percentage of cover) and the percentage areas of soil surface features (i.e. litter, free aggregates, crusting, etc.). Relationships among these variables was estimated through multiple statistics and regression analyses. We found that runoff coefficient and soil loss were the smallest for THU and TBG: runoff coefficient was 23% for both treatments, and soil losses were 465 and 381 g m^{-2}, respectively. Runoff coefficient and soil loss for TLU were 35% and 1115 g m^{-2}, respectively. We observed the highest runoff coefficient and soil loss under TNU (60%, 5455 g m^{-2}) associated to the highest crusting rate (82%). High runoff coefficient and soil loss under TNU was explained by the kinetic energy of rain drops falling from the broad leaves of the tall teak trees down to bare soil, devoid of plant residues, thus leading to severe soil surface crusting and detachment. Overall, promoting understorey such as broom grass in teak tree plantations would (1) limit surface runoff and improve soil infiltrability, thus increase the soil water stock available for both root absorption and groundwater recharge, and (2) mitigate soil loss and favour soil fertility conservation.