

IMPACT OF CLEAR-CUTTING ON RUNOFF PATTERNS: A CASE STUDY IN A PINE PLANTATION IN TROPICAL LOWLANDS, SRI LANKA

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Forest plantations play a crucial role in regulating hydrological processes, including the control of surface runoff, which occurs when rainfall exceeds the soil's infiltration rate. The felling of forest plantations, through clear-cutting, can significantly impact hydrological processes by increasing surface runoff, leading to reduced ground water recharge, soil erosion, water pollution and floods. However, limited research has been conducted on the specific effects of clear-cutting on surface runoff in pine plantations. This study investigated the impact of clear-cutting on surface runoff patterns in a *Pinus caribaea* plantation in the tropical lowlands of Sri Lanka. Three 10 m × 3 m surface runoff plots were established on hill slopes within the pine plantation to represent overall site characteristics. The pre-clear-cutting period was considered the control, while the post-clear-cutting period was the treatment. Slope, canopy cover, ground vegetation cover, and litter thickness within each plot were measured. Rainfall and surface runoff were recorded for individual storm events from July to November 2023, covering the southwest monsoon and second inter-monsoon periods. After data screening, data from 28 storm events were used for the analysis. The average surface runoff was 0.43 mm and 1.04 mm before and after clear-cutting, respectively. The results indicated a significant difference ($p < 0.05$) in surface runoff between pre- and post-clear-cutting periods. Positive correlations were observed between rainfall and surface runoff in both periods. Average surface runoff was negatively correlated with the canopy cover and positively correlated with the slope and litter thickness. Clear-cutting increased surface runoff by 141.9%. The findings suggest that surface runoff increased during the post-clear-cutting period due to the loss of canopy interception and soil compaction, highlighting the need for forest management practices to control surface runoff in pine plantations in the tropical lowlands of Sri Lanka.

Keywords: Clear-cutting, Forest plantation management, *Pinus caribaea*, Surface runoff