

IMPACT OF DEFORESTATION ON SOIL EROSION AND SLOPE STABILITY IN DEKINA LGA, KOGI STATE, NIGERIA

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Abstract

The conversion of forested areas to clearings alters topsoil characteristics, disrupts water movement patterns, and reduces slope stability, contributing to increased soil erosion and streamflow while degrading land quality. This study aimed to assess the impact of deforestation on soil detachment, drainage capacity, and slope stability in Dekina LGA, Kogi State, Nigeria. A total of 60 soil samples were collected, evenly distributed between forested and deforested sites, with 30 samples from each category. Soil degradation was assessed using a double-ring infiltrometer system to measure infiltration rates, while the Revised Universal Soil Loss Equation (RUSLE) was applied to estimate soil erosion rates. The results showed that deforested land experienced a soil loss rate of 42.6 t/ha/year, significantly higher than the 16.8 t/ha/year recorded in forested areas. Runoff transmission was 68% higher in deforested sites, with a runoff coefficient of 0.72 compared to 0.43 in forested sites. Deforestation led to a reduction in soil organic matter from 3.8% to 1.6% and an increase in bulk density from 1.24 g/cm³ to 1.69 g/cm³, indicating compaction and reduced permeability. Slope stability analysis revealed an 18% reduction in shear strength cohesion values and a 26% decrease in shear strength angle values in deforested sites, increasing landslide susceptibility. Statistical analysis using T-test indicated significant differences ($p < 0.05$) between forested and deforested sites concerning soil properties, runoff, and soil erosion rates. These findings corroborate previous studies that highlight the adverse effects of deforestation on land degradation and slope stability. Based on these outcomes, the study recommends afforestation programs, land conservation measures, and environmentally sustainable land management practices to mitigate the negative impacts of forest clearance in the study area.

Keywords: Deforestation, Soil Erosion, Runoff, Slope Stability, Soil Properties