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Identification of soil erosion prone areas in Matale district in Sri Lanka using RUSLE model and bare soil index

J. M. P. M. Jayasekara [1]*, C. C. D. Mendis[1], K. V. N. T. De Silva[1], K. N. Kodikara[1] and V. P. A. Weerasinghe[1]

[1]Department of Zoology and Environmental Management, University of Kelaniya, Dalugama, Sri Lanka
jayaseka-em18026@stu.kln.ac.lk*

The Matale District is situated in the Central Province of Sri Lanka. It is roughly 1,993 km^2 in size and is in the foothills of the central mountain range. Matale District is vulnerable to soil erosion, which causes serious problems for the local environment and agricultural activities. Soil erosion in Matale District is primarily caused by several factors, including rainfall, land use, slope, soil type and conservation practices. This study aims to assess the soil erosion vulnerability in Matale District, Sri Lanka, utilizing the Revised Universal Soil Loss Equation (RUSLE) model and Bare Soil Index (BSI). RUSLE Model, a Digital Elevation Model (15 * 15m), rainfall data, land use and land cover, soil maps, and cropping parameters were used to evaluate the severity of erosion throughout the Matale district. The RUSLE model was calibrated and utilized to determine the rates of soil erosion considering rainfall erosivity, soil erodibility, slope length and steepness, cover management, and conservation practices. Furthermore, the BSI was calculated using remote sensing techniques. The results of the study indicated that soil erosion vulnerability in Matale District varied significantly. The estimated annual average soil loss varied from 0 to 731.71t ha^{-1} yr^{-1}. Improved land management practices and forest cover were associated with lower rates of soil erosion, whereas steep slopes, poor vegetation cover, and intense land use practices were associated with higher rates. The BSI map further explains the soil erosion risk map. When comparing the BSI map with the soil erosion risk map, most of the areas with bare soil are prone to erosion. Paddy-cultivated areas, scrub lands, chena and other cultivated areas are prone to experience high levels of soil erosion when considering a land use map. The Red Yellow podzolic soil, Reddish Brown Earths, immature Brown Loams, Erosional remnants steep rock land, and various lithosols soil types are found in areas with severe soil erosion when comparing the soil and Soil Erosion Risk Maps. When comparing a slope map to a soil erosion risk map, areas with a high percentage of slope indicate high soil erosion. Areas with a low percentage of slope on a soil erosion risk map indicate less erosion. Based on the results, recommendations for soil conservation and sustainable land management strategies in the identified vulnerable areas in the Matale district include measures such as afforestation, contour farming, terracing, conservation agriculture practices, and education and awareness programs. This study contributes to understanding soil erosion vulnerability in Matale District and provides a foundation for further research and initiatives focused on sustainable land management and environmental conservation. Proper soil conservation practices should be implemented to safeguard natural resources, improve agricultural productivity, and assure long-term sustainability.

Keywords: Soil Erosion, RUSLE, Bare Soil Index, Matale district