

Modeling Soil Erosion and Sediment Yield in Geba Catchment, Ethiopia

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Abstract : Soil erosion is a major threat to the sustainability of land and water resources in the catchment and there is a need to identify critical areas of erosion so that suitable conservation measures may be adopted. The present study was taken up to understand the temporal and spatial distribution of soil erosion and daily sediment yield in Geba catchment (5137 km²) located in the Northern Highlands of Ethiopia. Soil and Water Assessment Tool (SWAT) was applied to the Geba catchment using data pertaining to rainfall, climate, soils, topography and land use/land cover (LU/LC) for the historical period 2000-2013. LU/LC distribution in the catchment was characterized using LANDSAT satellite imagery and the GIS-based ArcSWAT version of the model. The model was calibrated and validated using sediment concentration measurements made at the catchment outlet. The catchment was divided into 13 sub-basins and based on estimated soil erosion, these were prioritized on the basis of susceptibility to soil erosion. Model results indicated that the average sediment yield estimated of the catchment was 12.23 tons/ha/yr. The generated soil loss map indicated that a large portion of the catchment has high erosion rates resulting in significantly large sediment yield at the outlet. Steep and unstable terrain, the occurrence of highly erodible soils and low vegetation cover appeared to favor high soil erosion. Results obtained from this study prove useful in adopting in targeted soil and water conservation measures and promote sustainable management of natural resources in the Geba and similar catchments in the region.

Keywords : Ethiopia, Geba catchment, MUSLE, sediment yield, SWAT Model

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