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Estimation of soil erosion and sediment yield in Wadi El Hachem watershed (Algeria) using the RUSLE-SDR approach.

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Abstract : One of the most common types of soil degradation is water erosion. It reduces soil quality at the erosion site and may cause sedimentation issues at the deposition site. This phenomenon is estimated using a variety of models. The Revised Universal Soil Loss Equation (RUSLE) model is the most often used, due to its consistence and low data requirement. It is useful for estimating annual soil loss at the watershed scale. To investigate the relationship between soil erosion and sediment deposition, the combined RUSLE and Sediment Delivery Ratio (SDR) models are used. The Wadi El Hachem watershed is a coastal and mountainous Mediterranean basin with rugged topography and high degree of climatic aggressiveness. Both of these characteristics can have an immediate effect on soil erosion and sediment yield. This research includes estimating the Average Annual Soil Loss (A) and Sediment Yield (SY) in the Wadi El Hachem watershed, mapping different RUSLE factors as well as A and SY, and studying the influence of rainfall erosivity (R) on A and SY in dry and rainy years. The A results vary from 0 to 410 $t \cdot ha^{-1} \cdot yr^{-1}$ with an annual average of 52 $t \cdot ha^{-1} \cdot yr^{-1}$. The Renfro's SDR model was selected as the best model for estimating SY, with standard error, standard deviation, coefficient of variation, and Nash-Sutcliffe efficiency (NSE) values of 0.38%, 0.02, 0.07%, and 1.00, respectively. The average SY throughout the whole watershed is around 27 $t \cdot ha^{-1} \cdot yr^{-1}$. The SY map for the entire Wadi El Hachem watershed revealed that sediment production zones are mainly concentrated in the Northeast of the basin, at the basin's outlet, and in the tributaries of the dam. The simulation results of soil loss and sediment yield in dry and rainy years revealed that R is one of the main factors affecting soil erosion and sediment deposition in the Wadi El Hachem watershed. The mean difference in R factor between dry year and rainy year is 671 $MJ \cdot mm \cdot ha^{-1} \cdot h^{-1} \cdot yr^{-1}$. As a result of this fluctuation, the soil loss and sediment yield have increased by 15 and 8 $t \cdot ha^{-1} \cdot yr^{-1}$, respectively. The results of this research can be used to provide scientific and technical support for conservation and management strategies of the Wadi El Hachem watershed.

Key words : Soil erosion ; Sediment yield ; Wadi El Hachem watershed (Algeria) ; RUSLE-SDR

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