

Evaluating the Terrace Benefits of Erosion in a Terraced-Agricultural Watershed for Sustainable Soil and Water Conservation

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Abstract : Terracing is a conservation practice to reduce erosion and widely used for soil and water conservation throughout the world but is relatively expensive. A modification of the Soil and Water Assessment Tool (called SWAT-Terrace or SWAT-T) explicitly aims to improve the simulation of the hydrological process of erosion from the terraces. SWAT-T simulates erosion from the terraces by separating terraces into three segments instead of evaluating the entire terrace. The objective of this work is to evaluate the terrace benefits on erosion from the Goodwater Creek Experimental Watershed (GCEW) at watershed and Hydrologic Response Unit (HRU) scales using SWAT-T. The HRU is the smallest spatial unit of the model, which lumps all similar land uses, soils, and slopes within a sub-basin. The SWAT-T model was parameterized for slope length, steepness and the empirical Universal Soil Erosion Equation support practice factor for three terrace segments. Data from 1993-2010 measured at the watershed outlet were used to evaluate the models for calibration and validation. Results of SWAT-T calibration showed good performance between measured and simulated erosion for the monthly time step, but poor performance for SWAT-T validation. This is probably because of large storms in spring 2002 that prevented planting, causing poorly simulated scheduling of actual field operations. To estimate terrace benefits on erosion, models were compared with and without terraces. Results showed that SWAT-T showed significant ~3% reduction in erosion ($Pr < 0.01$) at the watershed scale and ~12% reduction in erosion at the HRU scale. Studies using the SWAT-T model indicated that the terraces have advantages to reduce erosion from terraced-agricultural watersheds. SWAT-T can be used in the evaluation of erosion to sustainably conserve the soil and water.

Keywords : Erosion, Modeling, Terraces, SWAT

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