

Comparison of SWAT and GeoWEPP model in predicting the impact of stone bunds on runoff and erosion processes in the Northern Ethiopian Highlands

Nigus Demelash (1,2), Jared Flagler (3), Chris Renschler (3), Stefan Strohmeier (4), Hubert Holzmann (1), Ziadat Feras (5), Hailu Addis (2), Claudio Zucca (4), Wondimu Bayu (2), and Andreas Klik (1)

(1) Universität für Bodenkultur Wien, Department of Water, Atmosphere & Environment, Vienna, Austria (andreas.klik@boku.ac.at), (2) Amhara Regional Agricultural Research Institute (ARARI), Bahir Dar, Ethiopia, (3) University of Buffalo, NY, USA, Department of Geography, (4) International Center for Agricultural Research in the Dry Areas (ICARDA), Amman, Jordan, (5) UN. Food and Agriculture Organization (FAO), Rome, Italy

Soil degradation is a major issue in the Ethiopian highlands which are most suitable for agriculture and, therefore, support a major part of human population and livestock. Heavy rainstorms during the rainy season in summer create soil erosion and runoff processes which affect soil fertility and food security. In the last years programs for soil conservation and afforestation were initiated by the Ethiopian government to reduce erosion risk, retain water in the landscape and improve crop yields.

The study was done in two adjacent watersheds in the Northwestern highlands of Ethiopia. One of the watersheds is developed by soil and water conservation structures (stone bunds) in 2011 and the other one is without soil and water conservation structures. Spatial distribution of soil textures and other soil properties were determined in the field and in the laboratory and a soil map was derived. A land use map was evaluated based on satellite images and ground truth data. A Digital Elevation Model of the watershed was developed based on conventional terrestrial surveying using a total station. At the outlet of the watersheds weirs with cameras were installed to measure surface runoff. During each event runoff samples were collected and sediment concentration was analyzed.

The objective of this study is 1) to assess the impact of stone bunds on runoff and erosion processes by using simulation models, and 2) to compare the performance of two soil erosion models in predicting the measurements. The selected erosion models were the Soil and Water Assessment Tool (SWAT) and the Geospatial Interface to the Water Erosion Prediction Project (GeoWEPP). The simulation models were calibrated/verified for the 2011-2013 periods and validated with 2014-2015 data. Results of this comparison will be presented.