Geophysical Research Abstracts
Vol. 19, EGU2017-2847, 2017
EGU General Assembly 2017

Determining RUSLE P-factors for stonebunds and trenches in rangeland and cropland, Northern Ethiopia

Gebeyehu Taye (1,2), Jean Poesen (2), Matthias Vanmaercke (3), Bas Van Wesemael (4), Samuel Tesfay (1,5), Daniel Teka (1,4), Jan Nyssen (6), Jozef Deckers (2), and Nigussie Haregeweyn (7)

(1) Department of Land Resources Management and Environmental Protection, Mekelle University, P. O. Box 231, Mekelle, Ethiopia , (2) KU Leuven, Department of Earth and Environmental Sciences, Celestijnenlaan 200E, 3001 Heverlee, Belgium, (3) Université de Liège, Département de Géographie, Clos Mercator 3, 4000 Liège, (4) Georges Lemaitre Center for Earth and Climate Research, Earth and Life Institute Universite Catholique de Louvain, Belgium, (5) Soil Physics and Land Management Group, Wageningen University, The Netherlands, (6) Department of Geography, Ghent University, Ghent, Belgium, (7) Arid Land Research Center, Tottori University, Japan

The implementation of soil and water conservation (SWC) measures in the Ethiopian highlands is a top priority to reduce soil erosion rates and to enhance the sustainability of agroecosystem. Nonetheless, the effectiveness of many of these measures for different hillslope and land use conditions remains currently poorly understood. As a result, the overall effects of these measures at regional or catchment scale remain hard to quantify. This study addresses this knowledge gap by determining the cover-management (C) and support practice (P) factors of the Revised Universal Soil Loss Equation (RUSLE), for commonly used SWC measures in semi-arid environments (i.e. stone bunds, trenches and a combination of both). Calculations were based on soil loss data collected with runoff plots in Tigray, northern Ethiopia (i.e. 21 runoff plots of 600 to 1000 m^2, monitored during 2010, 2011 and 2012). The runoff plots were installed in rangeland and cropland sites corresponding to a gentle (5%), medium (12%) and steep (16%) slope gradients. The C and P factors of the RUSLE were calculated following the recommended standard procedures. Results show that the C-factor for rangeland ranges from 0.31 to 0.98 and from 0.06 to 0.39 for cropland. For rangeland, this large variability is due to variations in vegetation cover caused by grazing. In cropland, C-factors vary with tillage practices and crop types. The calculated P-factors ranged from 0.32 to 0.74 for stone bunds, from 0.07 to 0.65 for trenches and from 0.03 to 0.22 for a combination of both stone bunds and trenches. This variability is partly due to variations in the density of the implemented measures in relation to land use (cropland vs rangeland) and slope angles. However, also annual variations in P factor values are highly significant. Especially trenches showed a very significant decline of effectiveness over time, which is attributable to their reduced static storage capacity as a result of sediment deposition (e.g. for trenches in rangeland: 0.07-0.13 in 2010 to 0.37-0.65 in 2012). Hence, the results of this work may not only help in better modelling and quantifying the average long-term impacts of SWC measures over larger areas, but also show the importance of considering temporal variations of the effectiveness of SWC measures.