The effectiveness of soil conservation measures at landscape scale in the West Usambara highlands, Tanzania

Geert Sterk[a], Juma Wickama[b], Rens Masselink[c]

a Department of Physical Geography, Utrecht University, Utrecht, The Netherlands
b Agricultural Research Institute-Mlingano, Box 5088 Tanga, Tanzania
c Soil Physics and Land Management Group, Wageningen University, Wageningen, The Netherlands

Abstract

The adoption of soil and water conservation (SWC) technologies among small holder farmers in the East African highlands is an area which poses many challenges. When adoption occurs across a vast landscape, the locations and effectiveness of the adopted measures is often not adequately known. Potentially, remote sensing could be used for locating SWC structures, while modelling can help in estimating the effectiveness of the implemented measures. The objectives of this study were 1) to locate SWC structures in two highland areas, and 2) to determine the effectiveness of the implemented measures in reducing soil erosion at landscape scale. The study was conducted in the West Usambara highlands of north-eastern Tanzania in two blocks of 100 km^2 each. The object-based image analysis (OBIA) remote sensing technique was used to detect SWC measures. Soil losses were modelled using the Universal Soil Loss Equation (USLE). The OBIA-technique was effective in identifying, classifying and mapping of the adopted SWC technologies (grass strips and bench terraces). The percentage of agricultural area that contained SWC measures ranged from 2.6% to 19.7% for the two 100 km^2 areas. The estimated reductions in soil losses caused by the installed SWC measures ranged from 1.3% to 7.6% in the two blocks. It is concluded that, despite the SWC programs in the area, the rate of adoption of promoted measures has been low, and the reduction in erosion was minimal in the two blocks we monitored.