



## **Do stone bunds affect soil physical properties? - A case study in northern Ethiopia**

Christoph Schürz, Andreas Schwen, Stefan Strohmeier, and Andreas Klik

Institute of Hydraulics and Rural Water Management, Boku, Vienna, Austria (christoph.schuerz@boku.ac.at)

Central issue of rain fed agriculture systems in the Ethiopian highlands is to store rain water in the soil during the rainy season (June to September). The aim is to maximize plant available water and to reduce surface runoff and soil erosion. Stone bunds are a common practice for soil and water conservation, influencing the translation processes of surface runoff. However, changes in surface hydrology affect the temporal and spatial properties of soil physical parameters.

The objective of this research is to find a relationship between the spatial distribution of soil properties and the location of the stone bunds, but also to monitor the temporal behavior of those soil parameters, to better understand the impact of stone bunds on soil water movement. The research area is located in the Gumara Watershed, Maksegnit in Northern Ethiopia. There two representative transects were selected: One transect crosses three fields with conservation measures applied perpendicular to the stone bunds at a length of approximately 71 m. The second transect crosses a similar hill slope without conservation structures at a length of 55 m. During the rainy season in 2012 soil physical properties were monitored in specific spatial and temporal intervals. The measurements included bulk density, soil texture and volumetric water content. Tension infiltrometer tests were conducted to determine saturated and near saturated hydraulic conductivity for areas near stone bunds and the center of the fields on one hand, but also to derive van Genuchten parameters for those points inversely with Hydrus 2D. Slope steepness and stone cover along the transects were assessed, using survey and photogrammetric analysis.

Preliminary results show an increase in the water content of topsoils within a range of approximately 2 m above the stone bunds but only random fluctuations in the field without conservation measures. At depths greater than 20 cm no significant differences in water content were found. Bulk density shows lower values in the areas above the stone bunds where sedimentation takes place. Slope steepness and stone cover also decrease in a range of a few meters above the stone bunds that also indicates sedimentation processes.

Further analysis with consideration of the spatial and temporal distribution of the measurements may show influences on soil physical properties but also relationships between soil parameters (cross correlation). Showing a cyclic behavior of soil physical properties at the same spatial scale as the conservation measurements are placed may indicate a relationship between soil conditions and man-made conservation structures. Significant temporal changes of specific soil physical properties over the rainy season may allow a deeper insight in the impact of conservative measures on soil water balance.