

The Effect of Soil and Water Conservation Treatments on Rainfall-Runoff Response and Soil Losses in the Northern Ethiopian Highlands: The case of May Leiba Catchment

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In the Ethiopian highlands soil erosion by water is not only an important agent of land degradation but also results in the losses of valuable water resources as surface runoff. In addition to massive SWC activities in Tigray, water harvesting schemes (reservoirs) have been launched to reduce the risk of crop failure to water stress. The water harvesting schemes were not successful due to losses of water through seepage and evaporation from reservoirs and due to SWC structures on the catchment. The aim of this study is to determine the effect of SWC structures on hydrological responses of May Leiba catchment. The study site is located in the Northern Ethiopian highlands. Field-sized runoff plots (60x10m to 100x10m) were established before the rainy season in 2010 on the major land use types (cropland and rangeland) and three slope categories or sites (gentle, middle and steep). Each site consists of three plots treated with different SWC structures (stone bund, trench and stone bund with trench) on rangelands and two (stone bund and stone bund with trench) on cropland. Control plots were also installed for each site and slopes for comparison. Runoff generated from plots was collected in the water collecting trenches installed at the lower end of each plot. Runoff in these trenches was measured and removed daily. The result shows that there are significant differences among the SWC treatments ($p < 0.000$) in terms of runoff responses and soil loss reduction. The runoff was extremely high for the rangelands ($p < 0.000$) compared to croplands. Several studies also reported high runoff from rangelands in relation to grazing intensity. The effect of slope on runoff response was not significant ($p < 0.620$) due to increased stone cover with slope on both land uses. On rangelands, runoff reduction was 85%, 62% and 17% for stone bund with trench, trench and stone bund compared to control plots. While on cropland runoff reduction was only 61% and 11% for stone bund with trench and stone bund respectively. In conclusion it can be stated that SWC structures resulted in radical reduction of runoff delivery to water harvesting structures.

Keywords: Soil and water conservation, land degradation, runoff, runoff plots, soil erosion, hydrological responses, Ethiopian highlands

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