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Enhancing ecosystem services in the upper Blue Nile Basin, Ethiopia through soil and water conservation implementation

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Soil and water conservation (SWC) are implemented in the highlands of Ethiopia to restore degraded agricultural soils. This study evaluates the effectiveness of the recent SWC campaign to enhance ecosystem services. Two selected watersheds: treated (180 ha) and untreated (130 ha) are similar in soil type, agro-ecology, elevation, agricultural practices, and cropping patterns. Physical and biological SWC measures were implemented in the treated watershed. Rainfall, infiltration rate, discharge, sediment concentration, and sediment associated soil nutrients data were collected in 2015. The results indicate that about 1266 mm of rainfall was measured from June to November, 2015. Observed infiltration rates were twice in the treated compared with untreated watersheds (72, 36 mm hr⁻¹, respectively). The total storm runoff depth and sediment concentration were less in the treated watershed (21 mm, 10 g/l) than in the untreated watershed (39 mm, 16 g/l). The sediment yield in the treated and untreated watersheds was estimated at be a modest 2.6 and 7.7 Mg ha⁻¹, respectively. The loss of sediment associated soil nutrients from the treated and untreated watersheds were 2.5 and 8.2 kg ha⁻¹ N, 0.03 and 0.05 kg ha⁻¹ P. The depth of dry season discharge differed (9.7 and 2.6 mm for treated and untreated watersheds) over the period from December, 2015 to May, 2016. However, in both watersheds, the measured runoff sediment losses were considerably less than in other watersheds that our group was monitoring. This could be attributed to high rate of infiltration and subsurface leaving the watersheds. Thus, the experimental results suggest that although SWC measures contributed to enhancing ecosystem services including increasing base flow that nationally priority should be given to watersheds that have greater losses of sediment and nutrients and small amounts of base.

Keywords: Soil nutrients, erosion, ecosystem, Ethiopia