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A Nine-Year Study on the Benefits and Risks of Soil and Water Conservation Practices in the Humid Highlands of Ethiopia: The Debre Mawi Watershed

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Abstract

A nine-year (2010–2018) field study in the Debre Mawi watershed was conducted to understand the effect of governmentally-imposed and farmer-initiated conservation practices. The watershed is in the sub-humid Ethiopian Highlands which experience high and increasing erosion rates despite years of conservation efforts. Consequently, reservoirs are filling up with sediment and soil degradation is enhanced, calling for the evaluation of conservation practices currently in use. The few past long-term experimental studies on structural practices are inconclusive. In addition, only anecdotal information is available for stream flow and sediment loss. Precipitation, stream discharge, and suspended sediment concentrations were recorded manually in the Debre Mawi watershed during the nine-year period. Groundwater depth and total saturated area measurements were taken for selected periods. From 2012 to 2014, government-mandated conservation practices were constructed, which consisted of 50-cm-deep infiltration furrows with bunds downslope. These furrows were filled in with sediment by 2018. At the same time, the acreage of eucalyptus trees planted by farmers on the most vulnerable lands tripled to 5% of the total area with most trees fully grown in 2018. Runoff coefficients and sediment concentrations decreased steadily throughout the nine years. In the saturated bottomlands, the observations suggested that government-sponsored infiltration furrows in the saturated bottomlands were ineffective and may concentrate flows and enhance gully erosion, while eucalyptus trees appear effective. The results of this observational study point to both the potential benefits of conservation practices in this sub-humid tropical highland region and to emerging long-term risks. If structural conservation is to be pursued in watersheds like Debre Mawi, due attention must be given to the safe removal of excess water from the

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valley bottoms. The vegetative farmer-initiated practice of planting eucalyptus trees effectively reduced stream flow and erosion, but at the same time, might dry up wells during the dry monsoon phase which should be investigated further. The implication of this research is that the implementation of large scale SWCPs in the Blue Nile basin should be context appropriate to minimize the risks of reservoir siltation including GERD.

Keywords: Soil erosion, Soil degradation, Soil and water conservation practices, Runoff