Detecting the short term impact of soil and water conservation practices from incomplete monitoring records - A case study from the Tana sub-basin, Ethiopia

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May 5, 2020

Abstract

Efforts to tackle land degradation worldwide have spurred the adoption of soil and water conservation (SWC) practices intended to reduce surface runoff and erosion. Despite their widespread implementation, missing or incomplete monitoring remains a pervasive problem preventing evaluation of how well SWC practices meet these aims. Key metrics to evaluate SWC efficacy are the production of flow per unit rainfall (runoff ratio), and exported sediment (sediment concentration). We develop a method to assess changes in these metrics in the absence of a flow rating curve, using more complete and reliable measurements of stage (flow depth). We apply these methods to incomplete monitoring datasets collected from five watersheds included in the Tana and Beles Integrated Water Resource Development Project (TBIWRDP) in the Abay (Blue Nile) basin, Ethiopia. Changes in runoff ratio and sediment concentration relative to the first year of treatment varied by season. In the long wet season (Kiremt) that generates most runoff and erosion, reductions in runoff ratio occurred in three watersheds, and reductions in sediment concentration in four watersheds. Reductions in the runoff ratio were directly proportional to the areal density of SWC treatments in the watersheds, suggesting that SWC treatments were effective in controlling runoff and erosion. We suggest that stage and sediment concentration information can be used to assess watershed responses to SWC treatments. Focusing on these relatively robust measurements, may facilitate the design of reliable and affordable monitoring programs, and ultimately facilitate improved financing approaches based on reasonable estimates of likely SWC practice performance.

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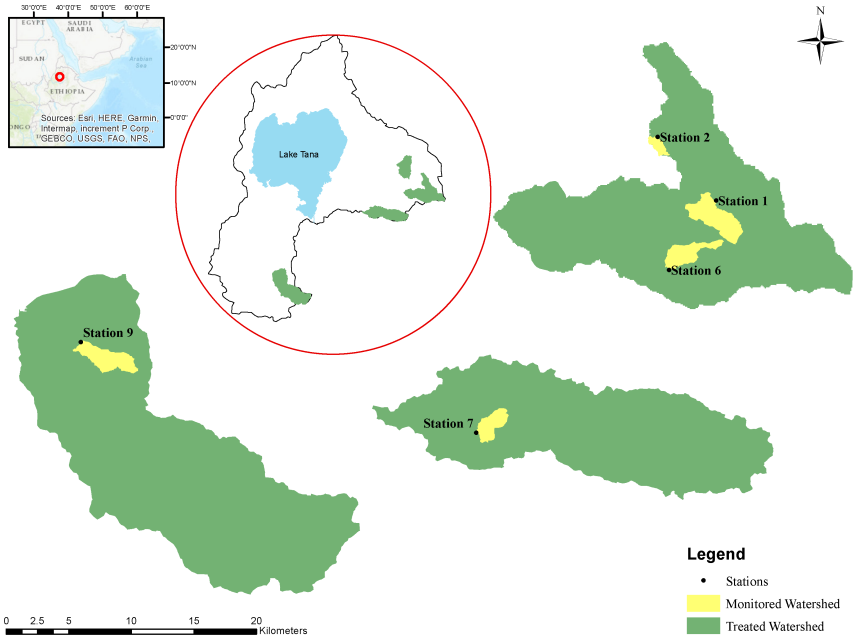

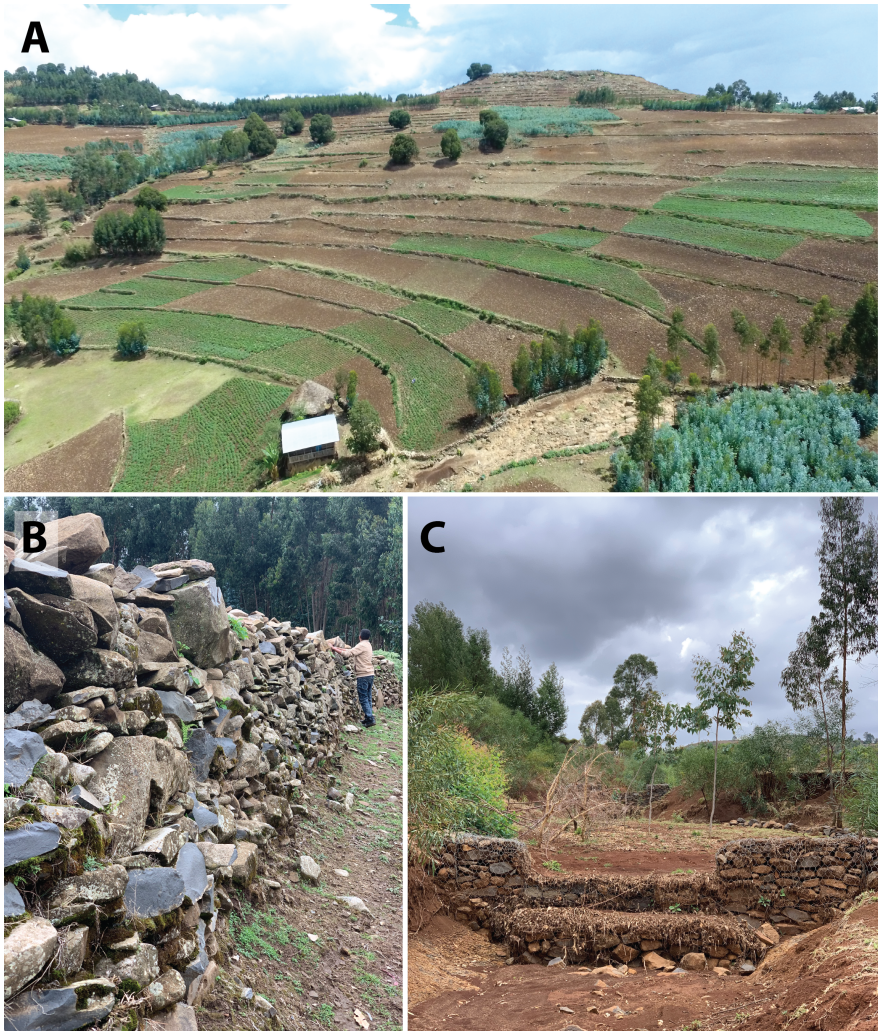

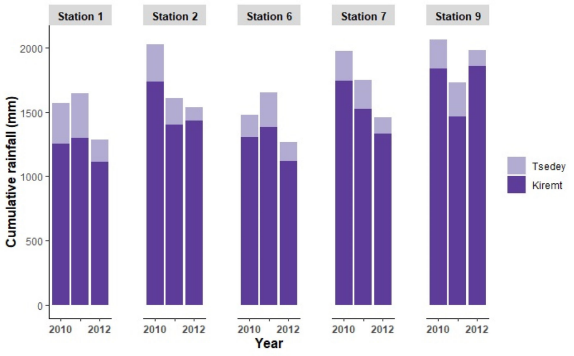

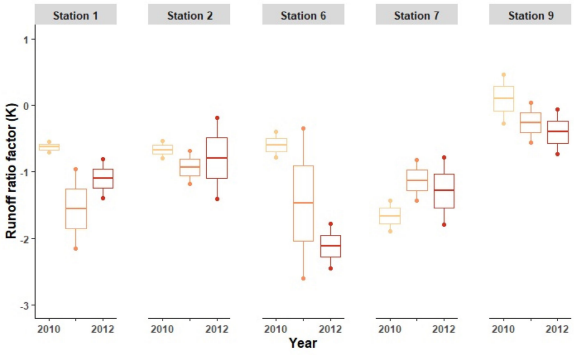

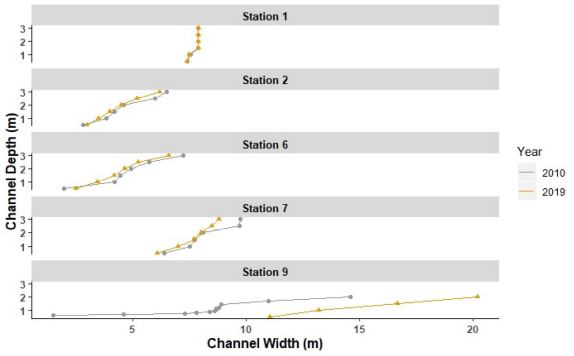

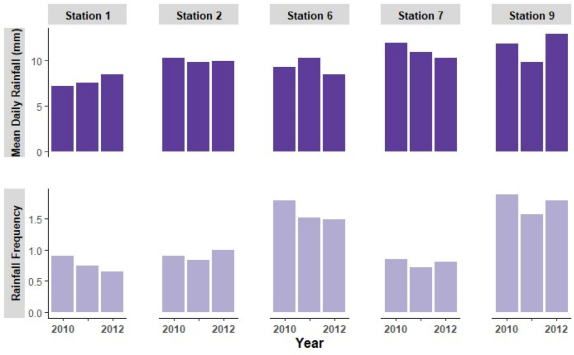

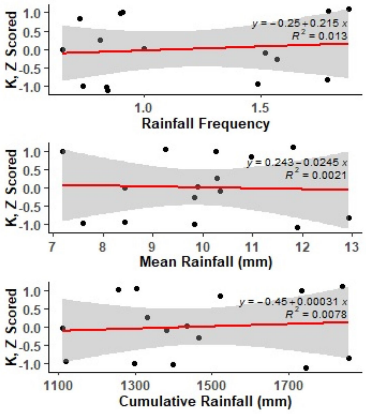

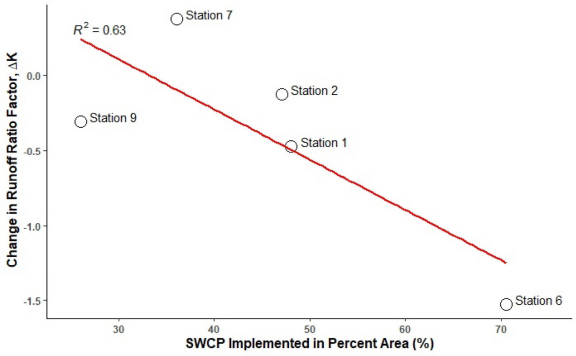

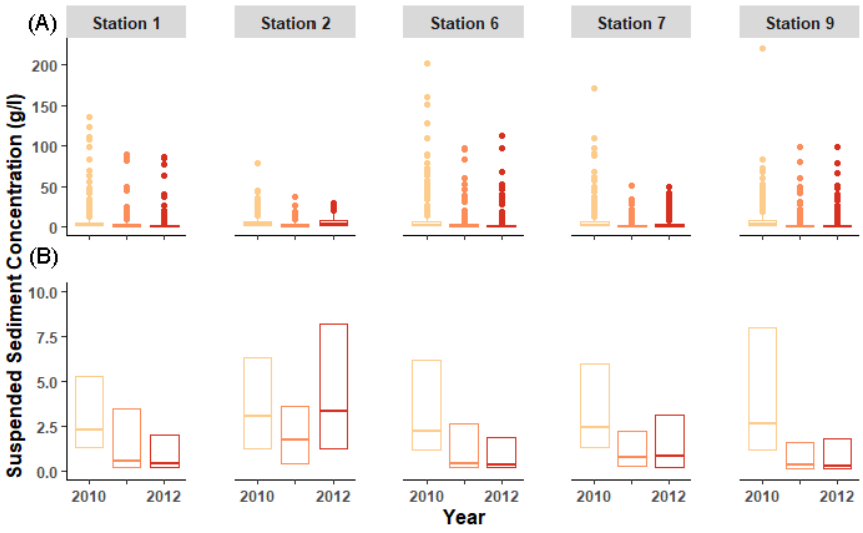

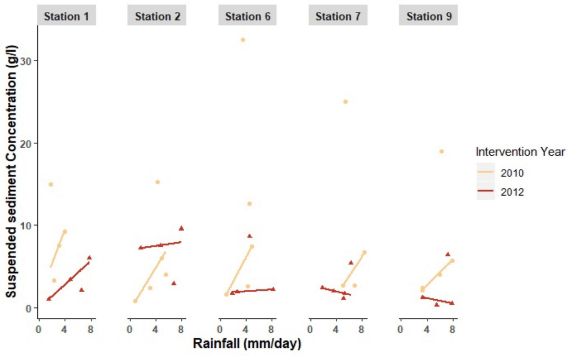

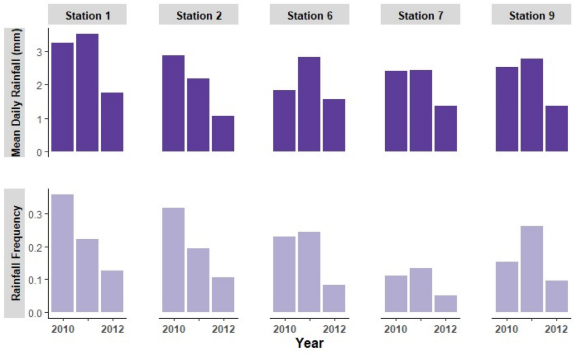

Statistical Parameter (n=13)	Coarse Sand	Medium Sand	Fine Sand	Silt + Clay	Ksat (cm/sec)
Range:	22.3	12.5	17.0	44.6	3.4E-05
Mean:	3.6	5.3	10.4	80.7	1.3E-05
Standard deviation:	5.9	3.7	6.0	12.2	9.8E-06
Standard error:	1.6	1.0	1.7	3.4	2.7E-06