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Effect of microtopography on rill incision at field scale using Close Range Photogrammetry at Angereb watershed in Ethiopia

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In Ethiopia rill erosion is widely observed on every parcel of agricultural lands, particularly in the Northern part. However, there is lack of information on the spatial formation of rills along the slope that can be used for the planning and design of erosion control measures. The presented investigation was carried out to determine critical rill incision on sandy loam and clay loam soil textures using topographic and soil surface roughness properties. The experiment was conducted from June to August 2007 on 3.5 m wide and 13.5 m long freshly tilled, bare plot at Angereb watershed located in the NE of Tana basin, Ethiopia. The plots have an average slope of 17 % and slope orientation was SW. The total amount of rainfall in July and August was 660 mm.

Digital Elevation Models (DEM) of the plots were compiled with the method of close range photogrammetry (CRP) using a calibrated digital single lens reflex camera with a wide angle lens. To investigate the effect of topographic and microtopographic changes on rill incision upon successive initial rainfall events, DEMs were generated before and after rainfall events.

Rill incision was computed for each sampled rill using grid cell values of mean slope gradient (S_{cr}, m m^{-1}), contributing area (A_c, m^2) and the random roughness before the rain (RR, m) at the start of the rill. Non-linear regression between slope gradient and rill contributing area has given weak inverse relation (-0.09 and -0.08 for sandy loam and clay loam). Significant improvements were obtained by considering the random roughness. Critical rill erosion occurred when $S_{cr} * A_c^{0.08} * RR^{-0.25} > 0.55$ (R^2=0.51) and $S_{cr} * A_c^{0.03} * RR^{-0.31} > 0.74$ (R^2=0.54) for the sandy loam and clay loam texture, respectively.