

Effects of selected soil and water conservation technologies on nutrient losses and maize yields in the central highlands of Kenya

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ABSTRACT

Mitigating nutrient loss is a prerequisite of sustainable agriculture in the tropics. We evaluated three soil and water conservation technologies (mulching, minimum tillage and tied ridging) for two cropping seasons (long rains 2011, short rains 2011) at two sites in the central highlands of Kenya. The objectives were: to determine effects of the technologies on runoff, sediment yield and nutrient loads in sediment, and to assess influence of the technologies on maize yields. Experimental design was a randomized complete block with 3 treatments replicated thrice. At the beginning of experiment, soil was sampled at 0–15 cm depth and analyzed for pH, N, P, K, C, Ca and Mg. Mulch was applied at a rate of 5 t ha⁻¹. Runoff was sampled, sediments extracted by drying in oven at 105 °C, and analyzed for NPK and C loads. Data were subjected to analysis of variance using SAS 9.1.3 and means separated using Fishers' LSD at 5% level of significance. Results showed reduced nutrient losses with the technologies. In Meru South, sediment yield was reduced by 41 and 7% during long rains 2011 ($p = 0.03$), and by 71 and 68% during short rains 2011 ($p = 0.01$) under mulching and minimum tillage, respectively. Runoff and maize yields were positively influenced by mulching. In Mbeere South, sediment yield was lower under soil and water conservation technologies. Runoff was reduced by 52 and 49% during long rains 2011 and by 51 and 30% during short rains 2011 under tied ridging and mulching respectively, compared with control. Total crop failure occurred during long rains 2011 due to erratic rains. During short rains 2011 tied ridging and mulching increased maize yield by 94 and 75%, respectively, compared with control. This study highlights the importance of analyzing soil and water conservation technologies within rain-fed farming systems perspective in response to declining food production and supports a focus on tied ridging and mulching.