

Abstract

A study to determine the effects of tillage and cropping systems on; soil surface roughness, moisture storage and sorghum, and cowpea yield was conducted in the semi-arid Makueni County, Kenya during the long (LRS) and short rains seasons (SRS) of 2010 and 2011. Three tillage systems; tied-ridging (TR), oxen-plough (OP) and sub-soiling and ripping (SR) and, three cropping systems; sole sorghum with and without manure application, sorghum-cowpea rotation and sorghum/cowpea intercropping, were investigated. Surface roughness recorded immediately after tillage was 75, 30 and 25% for TR, SR and OP, respectively. Moisture content below the 60 cm soil depth varied significantly ($p < 0.05$) in the tillage-cropping system and cropping season. Plots where manure was applied exhibited higher moisture content irrespective of tillage or cropping system. Maximum and minimum sorghum grain yields of 1.96 and 0.36 t ha⁻¹ were achieved under TR and OP during the SRS and LRS, respectively. Differences in sorghum grain yield with and without manure application were 78%, 57% and 24% and 28, 43% and 48% under TR, OP and SR during the SRS and LRS respectively. Intercropping significantly reduced (>50%) in cowpea (OP and SR) and sorghum (OP) yields during the SRS. In the LRS reductions were minimal (<25%) across the tillage systems of both crops. The SRS favoured sorghum production whereas cowpea performed better in the LRS. TR showed the least reduction in yields across cropping systems. The TR systems could be boosted by manure application and thus support sustainable production of sorghum in the semi-arid areas.