

ABSTRACT

Background: Terraces are structures consisting of ditches and embankments used to control erosion and increase land productivity. There is, however, little emphasis on the effects of the ditch dimensions on soil moisture and nutrient dynamics. **Objective:** To determine the effect of varying ditch depths on soil moisture and nutrient quantities and their variability within the terrace slope on hard-setting soils. **Methodology:** Soil samples were collected seasonally in 2014 and 2015 from terraces with different ditch depths (60, 30, and 0 [control] cm) for the determination of soil moisture content (SMC). The samples were collected from the upper, middle and lower slope positions of each terrace. Soil from the three slope positions of each terrace was also sampled at the end of the study and analyzed for total nitrogen (%TN), available phosphorous (Av. P), exchangeable potassium (K⁺) and % organic carbon (OC) contents. Data were subjected to a two-way analysis of variance and differences in means determined at a 95% level of confidence. **Results:** Significant interactions ($P < 0.001$) in SMC were observed between seasons, ditch depths and slope positions. Higher SMC was found in treatments with 30 and 60 cm ditch depths in all the slope positions and seasons compared to the control. Soil moisture contents in the lower and upper slope positions were significantly different between the terraces with 30 and 60 cm ditch depths when rainfall was high and evenly distributed, but non-significant in poorly distributed rainfall seasons. Significant differences ($P \leq 0.05$) in contents of total nitrogen and available phosphorous were found between the upper and lower slope positions of the terraces with ditches. **Implications:** The effect of ditch depths on moisture, total nitrogen and available phosphorous contents and their variability within the slope depended on the amount and distribution of rainfall. **Conclusion:** Construction of terraces with shallow ditch depths (of 30 cm) is recommended to conserve soil moisture and nutrients nitrogen and phosphorous on hard-setting soils in the marginal areas of semi-arid Eastern Kenya.