

Enhancing Soil Physical and Hydraulic Properties on Humic Nitisols Using Residue Mulch and Tillage in Kirege, Tharaka-Nithi

Omenda Jane Akoth

A105/10683/2013

March, 2017

Abstract

Tillage and residue mulch alter the structure and composition of soil consequently influencing important soil physical and hydraulic processes such as soil water content and nutrient availability. This study therefore aimed to investigate long term effect of residue mulch and tillage practices on soil physical and hydraulic properties in a long-term on-station field experiment in Kirege Primary School in Chuka. Meru South Sub-county Tharaka-Nithi County. The experiment was laid out in a randomized Complete Block design arranged in split plots and repeated thrice. The parameters of interest were: bulk density and hydraulic conductivity. Tillage was the main factor treatment while mulching the sub factor treatment. Using soil sampling Pf rings undisturbed samples were collected at the depth of Seem for bulk density and hydraulic conductivity determinations. Hydraulic conductivity determined using constant head method and bulk density determined using equation 11 in the laboratory. Data were subjected to analysis of variance (ANOVA) in SAS version 9.2 and mean separation done using LSD at ($p < 0.05$). The results obtained indicated that tillage and residue mulch had no significant effects on the bulk density and the hydraulic conductivity. The means for bulk density ranged from 0.93023 to 0.83016. Mean separation indicated that bulk density increased in the order $CtWf < CtW < MIR < CtR < MtW < MtWf < MtRf < CtRf$. The hydraulic conductivity of the depth 5cm for different treatments ranged from 38.304 to 2.00 and mean separation indicated that the hydraulic conductivity increased in order $CtR < CtW < MtW < MtR < MtRf < CtRf < MtWf < CtWf$ so that 38.3 was the highest and significant while 2.00 was the least. While tillage and residue mulch had no significant difference on bulk density and hydraulic conductivity on short term. These treatments show the potential of affecting these soil physical properties on long term basis based on the differences observed in the means of the treatments. Use of residue can thus be recommended in reducing soil bulk density and enhancing hydraulic conductivity. Similarly, minimum tillage can enhance hydraulic conductivity while increase soil bulk density. The findings from the study will be used in recommending use of appropriate soil management technologies towards enhancing ideal soil physical properties in the humid Nitisols of Kirege and similar agro-ecological zones.

