



Conservation agriculture among small scale farmers in semi-arid region of Kenya does improve soil biological quality and soil organic carbon

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The low food production in Sub-Saharan Africa (SSA) has been attributed to declining soil quality. This is due to soil degradation and fertility depletion resulting from unsustainable conventional farming practices such as continuous tillage, crop residue burning and mono cropping. To overcome these challenges, conservation agriculture (CA) is actively promoted. However, little has been done in evaluating the effect of each of the three principles of CA namely: minimum soil disturbance, maximum surface cover and diversified/crop rotation on soil quality in SSA. A study was conducted for three years from 2012 to 2015 in Laikipia East sub county in Kenya to evaluate the effect of tillage, surface cover and intercropping on a wide variety of physical, chemical and biological soil quality indicators, crop parameters and the field-water balance. This abstract reports on soil microbial biomass carbon (SMBC) and soil organic carbon (SOC). The experimental set up was a split plot design with tillage as main treatment (conventional till (CT), no-till (NT) and no-till with herbicide (NTH)), and intercropping and surface cover as sub treatment (intercropping maize with: beans, MB; beans and leucaena, MBL; beans and maize residues at 1.5 Mg ha⁻¹ MBMu, and dolichos, MD). NT had significantly higher SMBC by 66 and 31% compared with CT and NTH respectively. SOC was significantly higher in NTH than CT and NT by 15 and 4%, respectively. Intercropping and mulching had significant effect on SMBC and SOC. MBMu resulted in higher SMBC by 31, 38 and 43%, and SOC by 9, 20 and 22% as compared with MBL, MD and MB, respectively. SMBC and SOC were significantly affected by the interaction between tillage, intercropping and soil cover with NTMBMu and NTHMBMu having the highest SMBC and SOC, respectively. We conclude that indeed tillage, intercropping and mulching substantially affect SMBC and SOC. On the individual components of CA, tillage and surface cover had the highest effect on SMBC and SOC, respectively, but the highest positive effect was realized when all the three principles were applied consecutively. Therefore, CA has the potential to improve biological soil quality among small scale rainfed farmers and thus promote sustainable production.