Abstract

Temperature sensitivity of decomposition is key in determining terrestrial carbon responses to global change though differences between recalcitrant and labile carbon pools have not been demonstrated. The objective of the study was to evaluate the effect of organic matter quality on temperature sensitivity of soil organic matter (SOM) decomposition under three temperature levels and two soil moisture levels. A chronosequence approach was used to obtain organic matter with varying quality attributes across a cultivation chronosequence in which land-use history ranged from a recently converted primary forest to 80 years of continuous cropping in the highlands of Western Kenya. From each conversion time, soil was sampled to a 10 cm depth in three replicates in January 2009 and incubated for carbon dioxide (CO2) evolution at three temperature levels (10oC, 25oC and 33oC) and two soil water content levels (50% and 100% water holding capacity - WHC). Total carbon (C) and nitrogen (N) were analyzed using dry combustion method while SOM quality was characterized using Mid-Infrared spectroscopy.
C and N loss in 80 years of cultivation ranged between 60 and 70% with decomposition rates increasing ($R2 = 0.99$; $P<0.001$) with temperature. Rates of CO2 emissions were highest at 50% WHC. Recalcitrant carbon pools increased with cultivation period and were found to influence ($P<0.05$) temperature sensitivity. Sensitivity was similar at 100% WHC for forest and cultivated soils. Study indicates that SOM quality affects sensitivity of soil organic matter decomposition to temperature. Incorporation of these factors into carbon cycle models will help in predicting effect of climate change on SOC storage. It will also help in managing SOC in various landscapes through improved land management that mitigate C release.