Abstract

In order to meet the challenges of increasing food production, many agricultural production technologies are being developed and recommended for use by the small- scale fanners who are also the main agricultural producers in sub-Saharan Africa. Whereas some ofthe technologies seem promising in the short-term, their long-term effects on soil productive properties are largely unknown. Soil organic carbon which is closely related to soil productivity has been used to measure the impact caused by the application of external inputs to soils since it is known to respond to such changes. However changes in soil organic carbon caused by the applied inputs are slow, often taking several decades to emerge. Therefore simulation models have been used to predict the likely long¬tenn changes in soil organic carbon, hence soil productivity, as a result to continuous application of external inputs to soils. The work reported here evaluates the applicability of ROTH C-26.3, the current version of the Rothamsted carbon model, to simulate the turnover of soil organic matter in soil under tropical conditions using soil organic carbon concentrations from the Kabete long-term trial measured 22 yrs after the start of the experiments. Measured and Long-term field experiments offer the best modeIled soil organic carbon were closely practical means of monitoring and correlated showing the applicability of the understanding the changes caused by model to simulate soil organic matter different agricultural systems, since these turnover in the tropical soil. The results show changes are slow, often taking many years that even the continuous application of to appear (Powlson et al., 1987; Poulton, inorganic fertilizer alone failed to stop the 1996). The Kabete long-term experiment in decline in soil C. When crop residues were Kenya has now run for long enough to yield returned, decline was slowed. However the useful information on the effects of inorganic only treatments able to stop the decline involved large additions of animal manure. The model predicts a lengthy and difficult amelioration process for degraded soils that have received no organic inputs particularly in the smallholder farms where only small amounts of organic resources are available to restore soil organic matter back to agronomically viable levels. Howeverthe use of Farmyard manure alone or in combination with inorganic fertilizer wi111ead to higher equilibrium C concentrations than the initial amount of soil organic C at the start of the trials.