Assessment of residue decomposition and soil carbon dynamics under a range of legume cropping systems in Kenya

M.Sc. Thesis

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6 Abstract

Legume residues can be an important component in organic matter management. The success of applying legume residues to stabilize or increase organic matter depends on the legumes biomass production and the decomposition dynamics, which vary among legume types and are regulated by the biophysical factors of the environment.

The objective of the present study was to assess the impacts of four different legume types with contrasting biochemical quality under different management systems on soil organic carbon dynamics in Western Kenya. Decomposition dynamics of *Mucuna pruriens*, *Arachis hypogaea, Phaseolus vulgaris* and *Calliandra calothyrsus* residues in different environments were monitored by following up weight loss and examining residue pools by mid-infrared spectroscopy (MIRS) as well as with classic laboratory analysis. Different soil organic carbon and nitrogen pools after residue application were examined as well. As cultivation on slopy area is common in the study area carbon loss via erosion was taken into account as well. At the end, a partial carbon balance was created to keep track of the in- and outputs in the carbon cycle.

Unlike hypothesized none of the fertilizer treatments had a significant impact on the decomposition. Only significant differences were measured between the decomposition of the legume types. Groundnut residues decomposed was most rapid, followed by mucuna and common bean, whereas calliandra residues decomposed slowest.

Plant chemical traits could only party explain differences in decomposition processes whereas peak areas of the mid-infrared spectra showed differences between the legumes that could be related to weight loss.

Concerning the overall carbon balance its was concluded calliandra to be the legume with most potential affect soil organic matter contents.