

Decomposition- and nitrogen-release patterns of biomass from three agroforestry multipurpose trees (*Calliandra calothyrsus*, *Cordia africana* and *Grevillea robusta*) were investigated in four contrasting environments (microregions) in the Kenyan tropical highlands during two cropping seasons. Dried leafy biomass was placed in 2-mm litter bags, buried at 15-cm depth and recovered after 2, 4, 7, 10, 15 and 20 weeks. Decomposition patterns were best described by first-order exponential decline curves. The decomposition rate constants ranged from 2.1 to 8.2  $\text{yr}^{-1}$ , and the rates of decomposition among the species were in the order: *calliandra*  $\geq$  *cordia* > *grevillea*. There was a species-by-environment interaction during both seasons, but the nitrogen released did not follow such a pattern. Among the three tree species, *calliandra* released the highest amount of cumulative N, followed by *cordia* and *grevillea*. Using multiple regression techniques, decomposition pattern was described as a function of three groups of factors: biomass quality (N, C, lignin and polyphenol), climate (soil temperature and rainfall), and soil conditions (pH, soil organic C, total N and P). For all the species and factors combined, the adjusted  $R^2$  values were 0.88 and 0.91 for seasons 1 and 2, respectively. Among the three groups of factors, climate and biomass quality had the most influence on decomposition rates. Climatic factors accounted for 75% of the total rate of decomposition in season 1 ('irregular' season with less rainfall and more soil temperature fluctuations), whereas biomass quality factors were more influential in season 2 ('regular' season), accounting for 65% of the total variability.