Application of N-rich tree biomass to crop fields in agroforestry associations can cause build-up of mineral-N in the top soil in excess of crop demand during early stages of crop growth. It is therefore important to monitor movement of such mineral-N in the soil, so that management questions to minimize its potential loss via leaching could be designed. A randomized complete block experiment to investigate mineral-N movement down a soil profile in an agroforestry system was conducted in an Ultisol in the central highlands of Kenya during the long and short rains of 1998 cropping seasons. The study was a follow-up to previous work undertaken in the region between 1992 and 1997 that had indicated substantial build-up of mineral-N in the top soil layer in excess of crop (Zea mays) demand during the first six weeks of a cropping season following application of tree biomass into the soil. It was hypothesized that the accumulated mineral-N may be lost from the system through various processes (such as leaching). The objective of the current study was therefore to quantify mineral-N movement in the soil and to propose ways of managing the mineralized N from the soil-applied organic amendments to minimize its losses and thereby maximize its (N) economy in the cropping systems. The results indicate that the bulk of mineral-N in these soils was in the form of nitrate-N with ammonium-nitrate comprising less than 10%.

During the first season with plenty of rain, mineral-N progressively moved down the soil profile as the season progressed accumulating in the deeper soil horizons in stark contrast with the second dry season where mineral-N accumulated in the top soil layers. Treatments that received tree leafy-biomass but had no trees fertilizer and the inorganic fertilizer treatment recorded higher amounts of mineral-N in the 100 to 300 cm depth averaging 15 to 30 mg N kg⁻¹. On the other hand, soils in treatments with Leueaena leucocephala and Calliandra calothyrsus tree hedges recorded an average of 1 to 3 mg N kg⁻¹ in the same depth indicating that trees are capable of intercepting and recapturing the crop-inaccessible nutrients, below the roots of the annual crops by the action of their deep roots. Indeed, results on the Iota! root length indicated that only less than 5% of all the maize roots were located below the 90 cm soil depth while 75% leucaena and 40% calliandra roots were found below the same depth. The study indicates that trees are effective in capturing subsoil mineral-N that accumulates below the rooting depth of most annual. It is therefore recommended that farmers in the central highlands of Kenya be encouraged to incorporate fast-growing trees that may offer other benefits (such as
fodder for livestock or soil erosion control) in their farming systems. The trees will assist in capturing the leached nutrients that would otherwise be lost from the system. The captured nutrients may be recycled back into the system through leaf litter or when the trees are pruned and the prunings incorporated into the soil or feed to livestock and the resulting manure returned to the soil. Key words: calliandra, leucaena, leaching, nitrate, rooting depth, subsoil.