The effectiveness of tree-leaf biomass as a source of N to crops in agroforestry systems depends on the rate at which crops can obtain N from the biomass. A study was conducted to determine the fate of $^{15}$N labeled, soil-applied biomass of two hedgerow species, *Calliandra calothyrsus* Meissner (calliandra) and *Leucaena leucocephala* (Lam.) de Wit (leucaena), in the subhumid highlands of Kenya. Labeled biomass obtained from $^{15}$N fertilized trees was applied to microplots in an alley cropping field and maize planted. N uptake and recovery by maize and hedgerow trees was periodically determined over a 20-week period during the short rain (1995) and the long rain (1996) growing seasons. In maize crop from treatments that received leucaena biomass, higher N uptake and recovery were recorded than in maize from the plots that received calliandra biomass. However, N uptake and recovery were higher in calliandra tree hedges than in leucaena hedges, indicating differences in N uptake by the two tree species. The largest fraction (55–69%) of N in the applied tree biomass was left in the soil N pool, 8–13% recovered by maize, 2–3% by tree hedges, and 20–30% could not be accounted for. Some of the unaccounted for N may have been left in the wood and root portions of the tree hedges and in the bulk soil below the 20-cm depth. The study shows that only a small fraction of the N contained in the N-rich biomass that is applied to the soil is taken up by the current season's crop, suggesting that a major benefit may be in the build-up of the soil N store.