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Nitrogen Fixing Shade Trees in Coffee Agroforestry: Quantification of Nitrogen Transfer to the Coffee Plant.

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Nitrogen-fixing shade trees in coffee agroforestry systems are assumed to provide an alternative nitrogen source for the coffee crop when fertilizer applications are low, but the transfer of nitrogen from shade trees to the coffee crop has not yet been quantified directly. We present a case study for coffee agroforestry systems with *Erythrina poeppigiana* as a shade tree. The transfer of nitrogen from the N₂ fixing tree to coffee plants was measured through a stable isotope pulse and chase experiment.

Shade trees that had been labelled with a ¹⁵N-enriched nitrate solution, were pruned, and the prunings were subsequently laid out below coffee crops under conventional or organic management. Significant fractions of nitrogen ended up in the coffee plants 5 months after the deposition of ¹⁵N labelled prunings on the plantation floor (figure 1). More nitrogen from prunings was found in the soil under organic management than under conventional management. This finding was associated with higher macrofauna abundance, particularly earthworms, in the organic system.

Coppicing of the shade tree and subsequent decomposition of the pruned material was the dominant mechanism for nitrogen transfer to the coffee plant, while other mechanisms only affected coffee plants directly neighbouring the tree.

In conclusion, the pruning of shade trees in coffee agroforestry systems is an important pathway for the transfer of fixed N to the coffee plants and seems to be essential in organic systems.

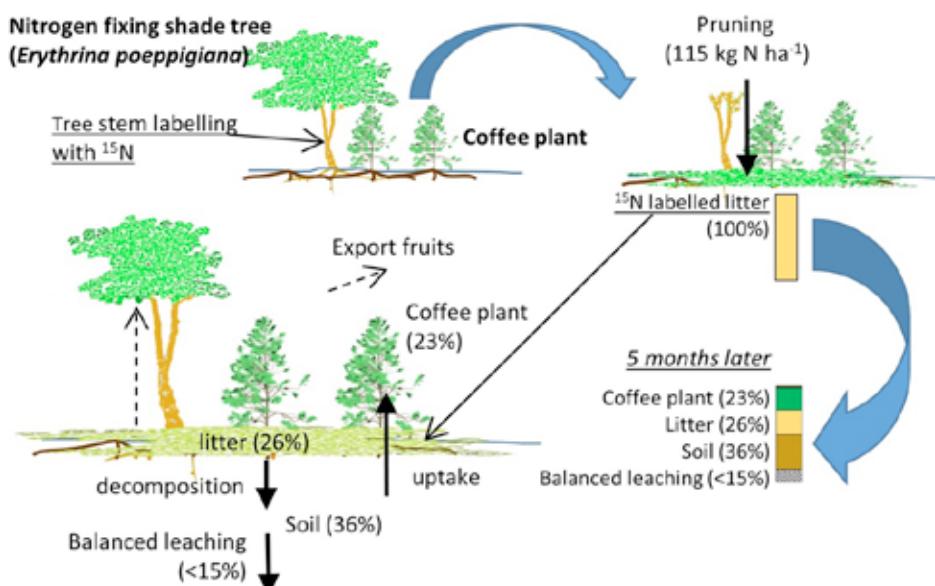


Figure: Fate of nitrogen from ¹⁵N labelled tree prunings: N transfer (% of initial N litter) to the soil and the coffee plant, 5 months after pruning. Data for the organic management.

Keywords: nutrient transfer, facilitation, litter decomposition, nitrogen budget.