

Organic matter management for perennial crops in Amazonia

Uguen, Katell ⁽¹⁾; Silva J.P. ⁽²⁾ and Lehmann, J. ⁽³⁾

⁽¹⁾ IRD, Institut de Recherche pour le développement, Bondy, France,

⁽²⁾ EMBRAPA-CPAA, Manaus, AM, Brazil, ⁽³⁾ University of Bayreuth, Germany

Organic inputs are of high importance for soil fertility and crop nutrition in all agro-ecosystems. In a polyculture cropping system with several tree crops, organic inputs are diverse and species can interact by competition or complementarity for nutrients and organic matter. From many parameters of fertility and organic input characteristics, we tried to analyze what are the main components for the restoration of soil fertility and to consider which are the best management practices for good crop production and maintenance of soil fertility.

The agroforestry system studied is located at the EMBRAPA-CPAA research station 29 km northeast of Manaus, in the Amazonas state, Brazil. It is one of the systems of the SHIFT program, « Rehabilitation of Degraded Areas ». The system consists of a mixed cropping of *Bixa orellana* (Urucum), *Bertholletia excelsa* (Castanha), *Theobroma grandiflorum* (Cupuaçu), *Bactris gasipaes* (Pupunha) and *Pueraria phaseoloides* as a cover crop. Two fertilization treatments are tested (30% -without nitrogen- and 100% of the dose recommended for the respective species). In this system biomass balances were done, and organic matter fluxes and contents were measured in aboveground biomass, litterfall, pruning biomass, soil microbial biomass, soil matrix and soil solution.

Litterfall from trees in the polyculture were far lower than in the fallow and primary forest. There were no effects of fertilization level on litterfall (1.42 and 1.56 Mg ha⁻¹ in low and high fertilization treatments, respectively). There were very high differences in litterfall between trees but little differences in soil organic matter. Brazil nut and cupuassu are the trees which had the highest litterfall and also the lowest decomposition rate of the litter. Annatto and peach palm had little litterfall because they were pruned or harvested. Pruning biomass was two times higher than litterfall. There was a positive effect of fertilization on pruning biomass for annatto.

Fertilization of trees showed major effects on the performance of associated pueraria. Pueraria grew only in soil with full fertilization and when established had an irregular development and distribution. Its density also varied beneath the different species: pueraria density was higher beneath peach palm and annatto than under the other two tree crops. When pueraria was well established, living biomass was high during the whole year with a maximum in May, and litterfall was high with little variation throughout the year.

These results showed that pueraria is a key species for maintaining soil fertility and could be managed by fertilization and by spatial association with species which favor or decrease pueraria growth beneath their canopy.