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En **transition** vers
un **monde viable**

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Assessing legume tree and shrub impacts on nitrogen cycling in banana cropping systems

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Trees in cropping systems provide a wide range of services such as soil carbon storage, erosion regulation, or promotion of soil biodiversity and microbial symbioses. However, modalities and consequences of tree or shrub species introduction into banana cropping systems have seldom been studied. In order to improve the general knowledge on tree management in these systems, the BANABIO research program relied on a participatory approach for designing bio-diversified exportation banana cropping systems with local farmers. A banana-based agroforestry system was set up in 2018 in comparison with both conventional and organic management systems in a CIRAD experimental research station located in Martinique. The agroforestry system associated several legume tree and shrub species (600 individuals.ha⁻¹ *Cajanus cajan*, and 360 trees.ha⁻¹ *Inga ingoides* and *Indigofera zollingeriana*) that were interplanted with banana (1200 individuals.ha⁻¹) at the beginning of 2019. At the end of 2019, *Cajanus cajan* were replaced by *Theobroma cacao* (600 trees.ha⁻¹) used as a complementary crop to bananas. Since 2019, plant growth and species performance have been followed through height and circumference measurements, biomass restitution through pruning, residues N content and N₂ fixation estimated by $\delta^{15}\text{N}$ natural abundance. Tree management led to an increase of pruning biomass restitution through the production cycles, i.e. from 2 t DM.ha⁻¹ of *Cajanus cajan* residues in 2019 to 5 t DM.ha⁻¹ of *Inga* and *Indigofera* residues mixture in 2021, leading to a global restitution of about 80 kg N.ha⁻¹ in 2021. Further analysis of $\delta^{15}\text{N}$ values in *Inga* and *Indigofera*, in parallel to those of banana and other non-N₂-fixing reference species, will allow to determine the proportion of N restituted from biologically fixed N. Soil C and N increases since the plantation suggest a positive impact of legume tree and shrub introduction on soil fertility, and their good compatibility with banana cropping systems.