Using legume trees for soil bioengineering in the Caribbean: ways for conservation and restoration of riparian forest

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Soil bioengineering is an important restoration tool to control erosion along slopes and river-banks which are increasingly threatened by human use. It can be efficient to trigger successional trajectories and to reestablish local riparian plant communities. Legumes are particularlly relevant in soil bio-engineering because of their ability to improve soil quality through nitrogen inputs and their high ecological tolerance, especially in flood-prone areas. Among the territory of the Caribbean Islands hotspot, Guadeloupe shows a remarkable biodiversity and almost 20 native legume tree species are harbored in 34 different ecosystems. In the context of global change and erosion of biodiversity, species conservation and ecosystem restoration are priorities, particularly in places under anthropogenic pressure such as riparian areas. The breadth of indigenous legume tree species richness carries the promise of finding suitable species to contribute to the development of soil bioengineering in Guadeloupe.

In order to provide practical tools for the use of Caribbean legume tree species in soil bioengineering, we assessed the germination, growth, morphological traits and herbivory of 5 candidate restoration native legume species during the first stage of development.

Five native legume tree species (*Inga ingoides* (*Rich.) Willd., Inga laurina (Sw.) Willd., Lonchocarpus heptaphyllus (Poir.) DC., Lonchocarpus roseus (Mill.) DC., Pterocarpus officinalis Jacq.*) adapted to riverine environments of different ecosystems (Swamp forest, Seasonal evergreen forest, Rainforest) were selected. Thirty seeds per species were sown in nursery. Germination rate, number of herbivory injuries, survival rate, stem length, taproot length and diameter, shoot and root biomass were measured on 3-month-old seedlings.

All the species showed high germination and survival rate, but distinct performance and traits were observed. *Lonchocarpus heptaphyllus* appeared to be the most sensitive species to herbivory and also showed the lower growth rate with the less developed root system. *L. roseus*, a critical endangered species, had the lower shoot and root biomasses, and shoot root ratio. *Inga ingoides* and *Inga laurina* showed high shoot and root growth rates. *Pterocarpus officinalis* had the highest shoot and root growth rates.

Despite of the differences observed between species, native legume tree species present a high potential for a use in soil bioengineering in Guadeloupe and in the Caribbean at large.