« Protéger »
a sustainable soil bioengineering project for riverbank protection in the Caribbean

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LOCAL CONTEXT

- Guadeloupe island is located in **Antilles**, a **biodiversity hotspot** (Myers *et al.*, 2000)
- It harbours a remarkable **native flora** (1700 native species, UICN 2019 ; 450 trees, Rollet 2010) and a **high ecosystemic diversity** (32 types of vegetation, Rousteau *et al.*, 1996)
- More than **50 permanent streams** crossing these ecosystems
- **80% of river streams** managed by local authorities

Conventional practices in riverbank protection use civil engineering techniques based on pure or concrete riprap that have strong negative impacts on ripirian ecosystems and on the ecosystemic associated services. This leads to the **degradation of riparian and aquatic biodiversity**, **ecotones**, **ecological corridors**, etc.

COST EFFECTIVE & SUSTAINABLE → NEW SOLUTIONS

SOIL BIOENGINEERING

Soil bioengineering can be defined as "*The inclusion of vegetation into engineering design to improve and protect hill slopes, embankments and structures from the problems associated with erosion and other types of shallow slope failure*." (Clark & Hellin, 1996)

Soil bioengineering techniques are **nature based solutions** and so, we first need to **understand natural models** and to **identify suitable species**. These species must present **traits compatible with their use in soil bioengineering** (pioneer, heliophilous, easy to propagate...) and **be adapted to riparian conditions** (flood, submersion).

In Guadeloupe, there is a lack of knowledge about riparian ecosystems and the propagation of their species.

Protéger

The « **Protéger** » **project** aims to **develop and promote soil bioengineering for riverbank protection in Guadeloupe**. Its first phase (2016-2018) proposed a **typology of riparian ecosystems and identified species** suitable for soil bioengineering (Gayot *et al.*, 2018). The main objectives of its second phase (2019-2022) are to **define the conditions of establishment of suitable species** and to **study their biological traits**, usefull for limiting riverbank erosion. To do so, the asexual propagation of species, their germination traits and their morphological characteristics are actually in study. A first experiment, concerning the resprout potential of cuttings has already been successfully conducted. This second phase also aims to implement *in situ* soil bioengineering works and to develop a caribbean cooperation network on soil bioengineering.

A PRELIMINARY CUTTINGS PROPAGATION EXPERIMENT

· Aims

Plant propagation by cuttings is an unavoidable basic technique used in soil bioengineering and few bibliographic data are available concerning native caribbean species. We selected a large number of the most promising native species in order to make **a first evaluation of their cutting propagation potential in cost-constrained conditions common for soil bioengineering projects**.

· Method

27 native woody and semi woody riparian species from a large variety of ecological environments occuring in Guadeloupe were sampled during the wet season, in july 2019. **One stem macro cutting** (L 60cm, d>3cm) sampled on **4 individuals trees**, were collected and planted the same day.

· Experimental conditions

Cuttings were planted in 70 L containers
Shade house, 60 % light reduction

Substrate : mix of river sand and natural soil (3/4:1/4)
Irrigation was adapted to precipitation

Cuttings were left **3 months** in pots before excavation.

· Results

Among the 27 species tested, **five** showed the ability to **root from cuttings** with a rate of res-prouting cuttings **from 25% to 100% of the individuals**, depending on species.

The 5 successful species showed a **diversity of ecological features** and belonged to all **Guadeloupean forest ecosystem types** (dry forest, seasonal evergreen forest, rainforest).

· Discussion and perspectives

To date, practitioners were mostly using **exotic species** for **soil bioengineering** such as *Gliricidia sepium* or *Chrysopogon zizanioides*. These practices threaten the **Caribbean rich and endangered flora** and contribute to the **homogenization** of the **biodiversity**.

These experimental results show that the **asexual propagation of native tree species** is compatible with the **typical cost and technical constraints** of soil bioengineering projects.

This brings new opportunities and perspectives for the **use of native Caribbean riparian species for bioengineering in the Caribbean**. Therefore, these results are both innovative and encouraging, both for **practitioners** and **researchers**.

Further investigations concerning both asexual and sexual propagation of riparian species are currently running to **enhance the development of soil bioengineering** with native species in Guadeloupe and in the Caribbean at large.

https://genie-vegetal-caraibe.org

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