PROTEGER: AN INNOVATIVE ECOLOGICAL ENGINEERING PROJECT FOR RIVERBANK PROTECTION IN GUADELOUPE

Mira E.[1], Evette A.[2], Labbouz L.[3], Robert M.[3], Rousteau A.[4], Tournebize R.[1]

1. INRA Antilles Guyane, domaine de Duclos 97170 Petit-Bourg Guadeloupe FWI +59(0)690197153 eleonore.mira@inra.fr, regis.tournebize@inra.fr

2. Univ. Grenoble Alpes, Irstea, UR LESSEM, rue de la Papeterie BP 76 38402 Saint Martin d'Hères Cedex, France +33 (0)4 76 76 27 06 +33 (0)6 38 21 12 45 andre.evette@irstea.fr

3. Parc National de Guadeloupe Habitation Beausoleil, Montéran 97120 Saint Claude +59(0)590415575 lucie.labbouz@guadeloupe-parcnational.fr ; marie.robert@guadeloupe-parcnational.fr

4. UMR Ecofog, laboratoire de biologie et de physiologie végétales Université des Antilles et de la Guyane, Campus de Fouillole +59(0)590483054 alain.rousteau@univ-antilles.fr

Tropical areas are particularly subject to erosion. In the Caribbean, precipitation regimes, associated to frequent hurricanes, are characterized by high rainfall events. On steep slopes and along riverbanks, even minor disturbances can lead to erosion and landslides. To guarantee the safety of property and people, Guadeloupe local authorities must carry out work to protect the banks of watercourses and gullies. In most cases, these constructions are made of pure or concrete riprap. Although these civil engineering techniques are well managed and sometimes indispensable, they have a strong negative impact on the functioning of riparian ecosystems [1]. In relation to civil engineering, soil bioengineering represents a softer and more respectful option, from an environmental and landscape perspective, and is also generally less expensive. Soil bioengineering is both an old and innovative solution based on nature: its implementation imitates effective natural models to control and prevent erosion.

In the West Indies, the natural flora of riverine network system has hardly been studied and local species are still not used extensively in the work of protecting watercourse. The lack of knowledge of riparian ecosystems in Guadeloupe led to the emergence of the “Proteger” project in 2015 to promote soil bioengineering techniques on riverbank of this territory.

As soil bioengineering techniques aim to copy natural model, the first phase of this project (2016-2018) aimed to identify the thirty local species most suited to maintain riverbanks. Trees, shrubs, ferns and herbs owning to different riparian ecosystems were therefore selected on their biotechnical traits relevant for soil bioengineering. [2]

The second phase of the project (2019-2022) consists in controlling the multiplication of these species, in order to feed bioengineering works.

Three different interconnected experimentations concerning germination ability, stem cuttings propagation, growth and development of seedlings of the selected species have been designed on a complex conceptual framework.

Vegetative propagation is widely used for bioengineering works as it represents a low cost, fast and effective way to obtain plant material [3] [4]., and allow the construction of specific bioengineering techniques such as fascines or brush mattresses [5]. Then, we conducted a first *ex-situ* experiment aiming to evaluate the vegetative propagation potential of cuttings from thirty-two herbs, shrubs and tree native species.

Experimental conditions were representative from those compatibles with soil bioengineering works settlement (low cost) (Figure 1).

Figure 1: first experiment conducted on vegetative propagation

Our results indicate that some Caribbean native riparian species can be easily propagated. Among the selected species, propagation of three trees (*Citharexylon spinosum, Chimarrhis cymosa, Homalium racemosum*) four shrubs (*Clidemia hirta, Ludwigia hyssopifolia, Piper dilatatum, Piper dussii*) and three herbs (*Dieffenbachia seguine, Hymenachne amplexicaulis*, *Thelipteris reticulata*) species can be controlled in low tech conditions, allowing the development of soil bioengineering techniques in Guadeloupe and in the Caribbean.

The next step will be to control the germination of species that can not resprout from cuttings. The final aim of the Proteger project is to mainstream riverbank soil bioengineering techniques in the Caribbean.

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