CACAO SEEDLINGS PRODUCTION FOR AGROFORESTRY REFORESTATION PROGRAMME

1- INTRODUCTION

The proposed Reforestation Programme aims to protect the native forests of the Sierra Madre in the Palanan Region by strategically planting cacao trees within an agroforestry system. This approach is designed to create buffering zones around the threatened areas, effectively halting their expansion into the native ecosystem. Once planted, the cacao trees change the legal status of the land, and the deforestation process can be severally punishable by the Philippines Environmental Laws.

It is important to emphasize that the design and implementation of this program were carried out in direct coordination with the Agta Palanan Organization (Indigenous group of Sierra Madre in Isabela). This initiative aims to directly benefit the Agta by establishing cacao tree plantations, which will generate income through the plantation of the seedlings and later by the cacao seed by-products. Additionally, the program seeks to prevent encroachment on their Ancestral Domain and promote environmental conservation efforts in the region. This comprehensive approach not only supports economic development for the Agta people but also fosters the preservation of their cultural heritage and the surrounding ecosystem.

Cacao trees are increasingly recognized as a vital component of agroforestry and reforestation efforts due to their adaptability and environmental benefits *(i).* Their ability to thrive in shaded environments allows them to flourish beneath the canopy of taller trees, making them a perfect fit for layered agroforestry systems that aim to replicate natural forest dynamics.

This multi-layered approach enhances biodiversity, providing habitats for various birds, insects, and wildlife, which is crucial for ecosystem health and resilience *(ii).*

Moreover, the presence of cacao trees in agroforestry systems contributes to improved soil health by promoting nutrient cycling and enhancing soil structure, preventing erosion, and supporting water retention in the landscape. This, in turn, plays a significant role in regulating local water cycles and reducing the impacts of extreme weather events *(iii).*

For the last years ISU (Isabela State University) developed the technologies to produce and process cacao seeds in Cagayan Valley – In land face of Sierra Madre. These efforts resulted in the creation of a Cacao Producers Association which currently process XXXX tons of cacao seeds every year. Although this expertise, to start up a similar programme in Palanan region – Coastal face of Sierra Madre, requires the analyses of the best cacao species to be used.

2- PROJECT PROPOSAL

The proposed project aims to analyse the adaptation of different cacao seedlings to the Palanan Region environment. The research findings can serve as a source to define the best cacao species to be used in the proposed Reforestation programme.

3- METHODOLOGY

When exploring the adaptation of seedlings to their environment, several parameters can be assessed to understand how well they are coping with various conditions.

The experiments will be conducted in a Tree Nursery (ISU New Campus), using three different cacao species (already used in “In Land Areas” by ISU), having XX repetitions of each one. This project will analyse the following parameters:

3.1- Growth Metrics: Using precision scale

3.1.1- Height: Measuring the growth in height. Every 15 days, using Digital Calliper

3.1.2- Leaf Area: Measuring the leaf area can indicate how well the plant is photosynthesizing. In two different stages (XX and XX days). Using LeafByte app.

3.1.3- Biomass: Weighing the above-ground and below-ground biomass. After drying the sample, using Precision Scale.

3.2- Root Development:

3.2.1- Root Length and Density: Assessing root development can indicate nutrient acquisition capacity. When cropped measuring the length of the main root, using Digital Calliper, and After drying, counting the number of axis, using Magnifying Lenses.

3.3- Stress Tolerance:

3.3.1- Drought Resistance: Testing seedlings under controlled drought conditions to assess their resilience.

3.3.2- Salinity Tolerance: Evaluating growth in saline conditions. Based on the soils analyses, we can simulate the same conditions the seedlings will face when planted

3.4- Environmental Factors:

3.4.1- Soil Characteristics: Evaluating pH, texture, and organic matter content to determine suitability for seedlings.

3.4.2- Light Availability: Quantifying the amount of light received can help understand its impact on seedling growth.

3.4.3- Temperature and Humidity Conditions: Monitoring these environmental factors can elucidate their effects on seedling adaptation.

4- BUDGET

Category	Item	Use	Costs
Equipment	Plastic Bags	All experiment	500 PHP
	Soil substract	All experiment	200 PHP
	02 Precision Calipers (depth and regular)	Final Measuring seedlings porpotions	3000 PHP
	02 Magnifyer lenses	Final counting of root axis	4000 PHP
	02 Soil PH tester	Monthly readings	2500 PHP
	02 Luminosity Tester	Monthly readings	1500 PHP
	02 Soil Humidity Teste	Monthly readings	1400 PHP
	01 Precision Scale	All experiment	6500 PHP
Human Resources	02 students	All experiment (4 months)	8000 PHP
	01 Coordinator		1500 PHP

TOTAL	29100 PHP

5- REFERENCES

(i) Pagnussat, G. C., & Rojas, C. (2017). The Role of Agroforestry in Cocoa Production: A Review. In Agroforestry Systems, this paper discusses the integration of cacao into agroforestry systems and the benefits related to biodiversity conservation and sustainable land use.

(ii) Schroth, G., & Mendelsohn, R. (2016). The Role of Trees in Sustainable Cocoa Production: A Review. In Tree Physiology, this review highlights the ecological advantages of integrating cacao with tree-based systems, emphasizing the importance of shade trees for productivity and resilience.

(iii) Cocoa & Forests Initiative (CFI). Various reports from this initiative provide insights into cacao farming's sustainability and ways to improve cacao production while conserving forests and biodiversity.