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Climate Action and Human Generated Mangrove Systems in Fiji

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Figure 1: *Assessing the Votua Natural Mangrove stand with children from Natutu village (one of the 3 villages surrounding the Votua Mangrove Natural stand).*

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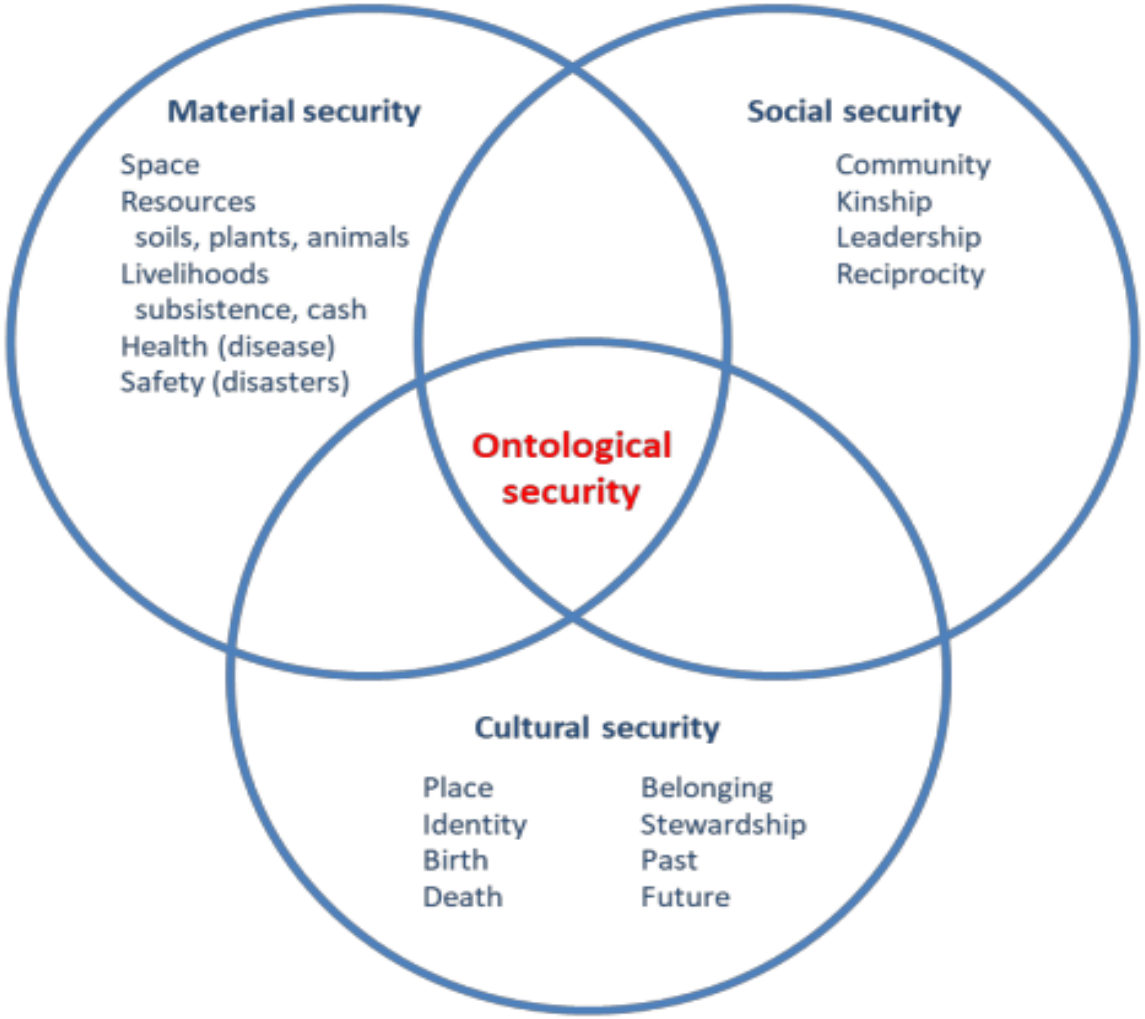
University of the South Pacific



Introduction

- The *"vanua concept",* the changing climate, and initiating mangrove restoration programs in the hope to protect the *"vanua" or* "*... in Cook Islands Maori, "enua" means "land, country, territory, afterbirth" (*Pond, 1997: page 2).
- Mangrove restoration programs directly supports SDG's.
- 90% of Fiji's mangrove systems are situated at the two main islands situated of the 3 main deltas; Ba, Rewa and Labasa.
- 2019 Planting Initiative passed by the government "4 Million Tress in 4 years" and what transpired later on.

Figure 2: *Conceptualizing Pacific Land as Security. (Source: Kempf (2004))*

What is a "*Human Generated Mangrove System?*"

How it all began…

Issue: No proper M&E tool developed to monitor success rates, growth rates, etc.).
Study Gap: To study the regeneration of human generated mangrove systems in Suva, Fiji.
Importance: Development of a proper M&E for human generated mangrove systems.

Figure 3 (L-R): *Featuring the planting sites for the PaCE-SD Graduate Students Association, eventually becoming the study sites of this research.*

Objectives

1. To monitor the regeneration process of human generated mangrove systems at the Nasese and the Lami foreshore (planting sites for the PaCE-SD Graduate Students Association).

2. To develop a proper M&E datasheet for a human generated mangrove system.

3. To provide recommendations from the experiences gained during the planting initiatives.

Figure 4: *Crossing the Natutu village river to access the Votua Natural Mangrove Stand.*

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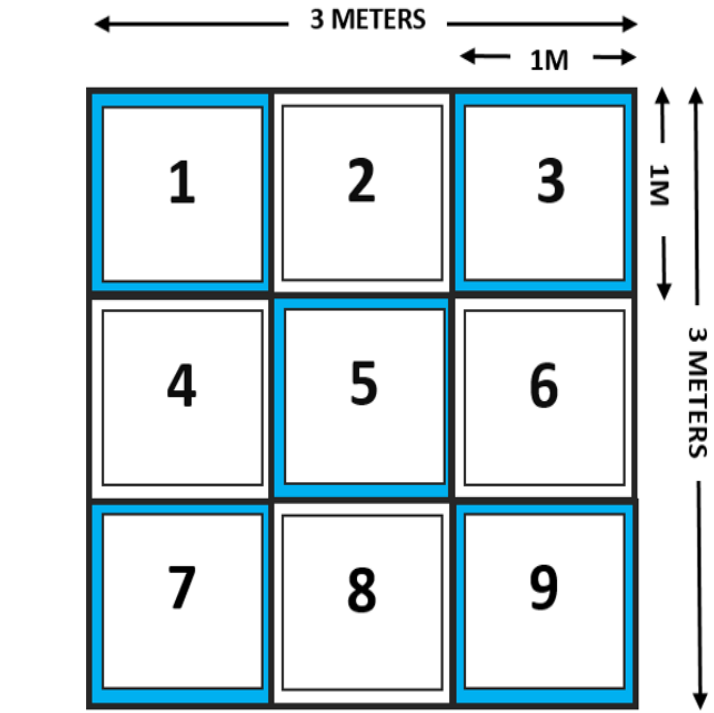
Methodology

- Desktop Research
- Installing a 3x3m Quadrant (GPS location and the use of cloth to tie and mark the specific plant of study/ color coded)
- Data analysis – R-software and Excel (bar graphs)



			KEY:		None of the Lami plants have reached 2 years of age only Nasese												
			P1/P2/P3		Plant numbers 1, 2 and 3 that were sampled in each quadrant												
			Y/N		Yes/No												
	Quadrant 1						Quadrant 2						Quadrant 3				
		Height of Plant (cm)						Height of Plant (cm)						Height of Plant (cm)			
		P1	P2	P3				P1	P2	P3				P1	P2	P3	
	Nasese	109	121	108			Nasese	125	105	124			Nasese	110	130	116	
	Lami						Lami						Lami				
		Number of Leaves (Yes/No)						Number of Leaves (Yes/No)						Number of Leaves (Yes/No)			
		P1	P2	P3				P1	P2	P3				P1	P2	P3	
	Nasese	109	121	108			Nasese	125	105	124			Nasese	155	130	96	
	Lami						Lami						Lami				
		Number of Branches						Number of Branches						Number of Branches			
		P1	P2	P3				P1	P2	P3				P1	P2	P3	
	Nasese	9	8	4			Nasese	13	11	12			Nasese	10	11	9	
	Lami						Lami						Lami				
		Presence of Parasites (Yes/No)						Presence of Parasites (Yes/No)						Presence of Parasites (Yes/No)			
		P1	P2	P3				P1	P2	P3				P1	P2	P3	
	Nasese	Y	Y	Y			Nasese	Y	Y	Y			Nasese	Y	Y	Y	
	Lami						Lami						Lami				
		Number of Aerial Roots						Number of Aerial Roots						Number of Aerial Roots			
		P1	P2	P3				P1	P2	P3				P1	P2	P3	
	Nasese	6	5	7			Nasese	7	8	5			Nasese	6	8	7	
	Lami						Lami						Lami				
		Height to 1st Branch (cm)						Height to 1st Branch (cm)						Height to 1st Branch (cm)			
		P1	P2	P3				P1	P2	P3				P1	P2	P3	
	Nasese	50	51	48			Nasese	62	49	53			Nasese	56	52	64	
	Lami						Lami						Lami				

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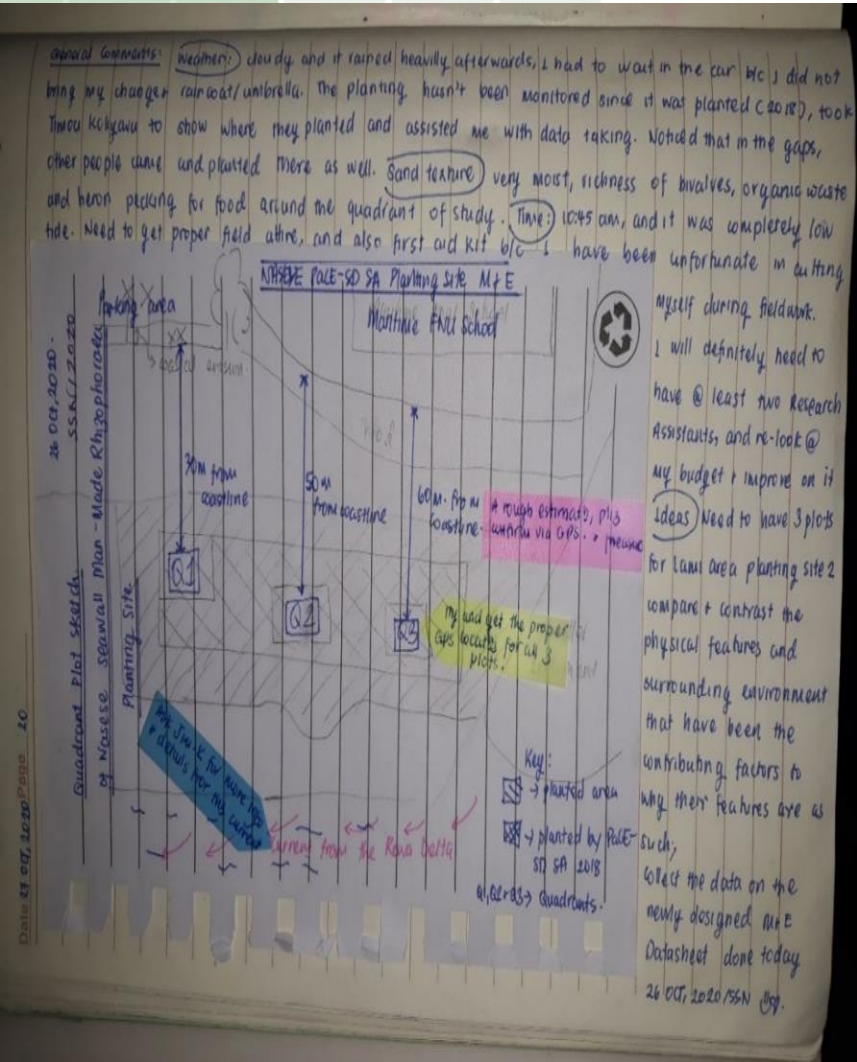
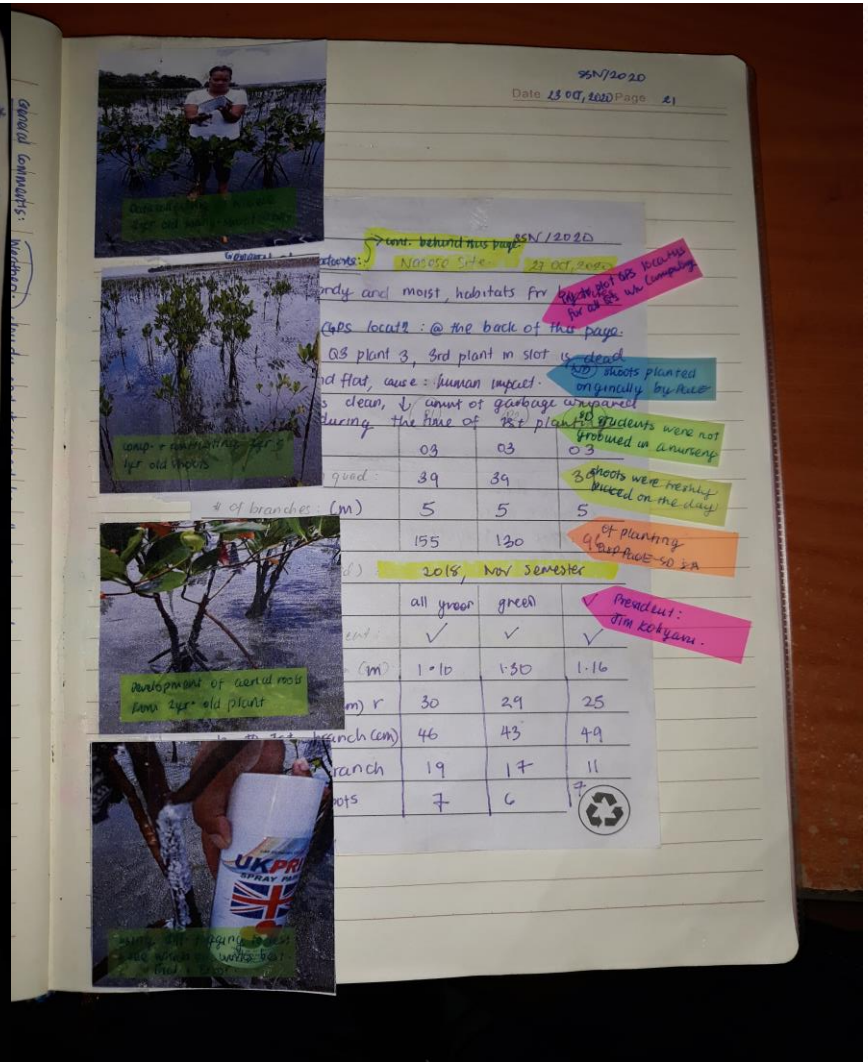
Development of an M&E Datasheet for Human Generated Mangrove Systems





Date:
Name of Researcher:
Case Study Site:
Age of Mangrove Shoot:
GPS Location:
Quadrant Number:
Total Number of Plot:
Number of Plants in Plot:
Plot Size (cm/m):
Number of shoots in the planted slot:
Height of Plant:
Height of Plant to 1st branch:
Radius of Plant:
Number of main Branches:
Number of sub-Branches:
Number of leaves:
Color of leaves
Condition of Plant:
General Observations:
Plot Sketch of Study Area and Locations of Plots:

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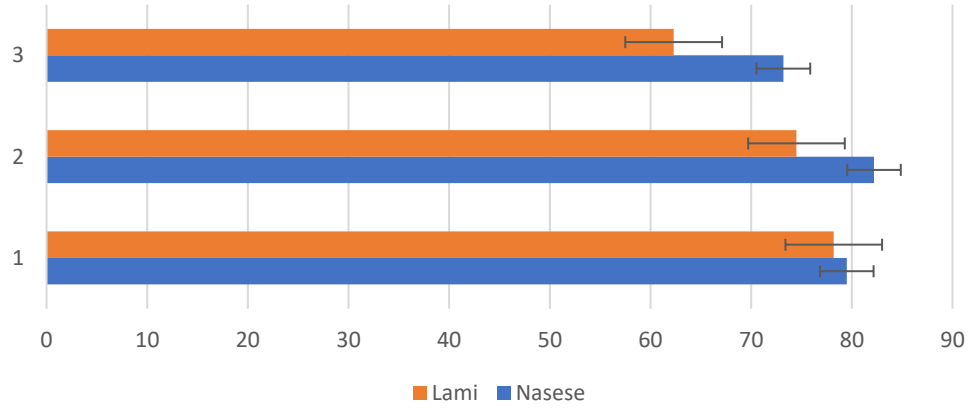
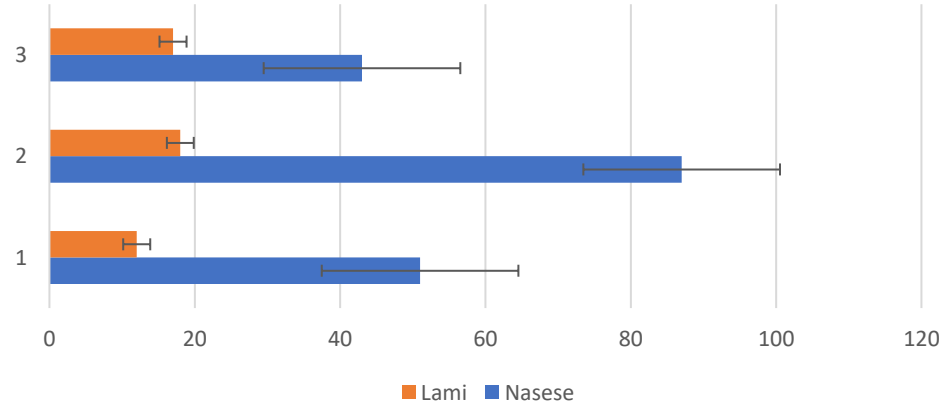
Results & Data Analysis

	Population Distribution Test			Population Variance Test			Variable Variation Test between samples		
Tested Variables	Test	p-value	Hypothesis Conclusion	Test	p-value	Hypothesis Conclusion	Test	p-value	Hypothesis Conclusion
Number of Leaves	Shapiro. Wilk	2.20E-16	Sample not normally distributed	Bartlett	0.0538	Sample variance is not significantly different	Kruskal-Wallis	0.02129	Significant difference in the # of leaves between samples
Plant height	Shapiro. Wilk	0.6725	Sample are normally distributed	Bartlett	0.9184	Sample variance is not significantly different	ANOVA	0.226	No significant difference in tree height between samples
Plant diameter	Shapiro. Wilk	2.20E-16	Sample not normally distributed	Bartlett	0.747	Sample variance is not significantly different	Kruskal-Wallis	0.02348	Significant difference in plant diameter between samples
Height of Barnacle	Shapiro. Wilk	0.3914	Sample are normally distributed	Bartlett	0.4328	Sample variance is not significantly different	Post Hoc	0.003686	Significant difference in barnacle height between NHG & LHG

1 Year Old Human Generated Stands Average Height (cm)



1 Year Old Average Number of Leaves of Human Generated Stands



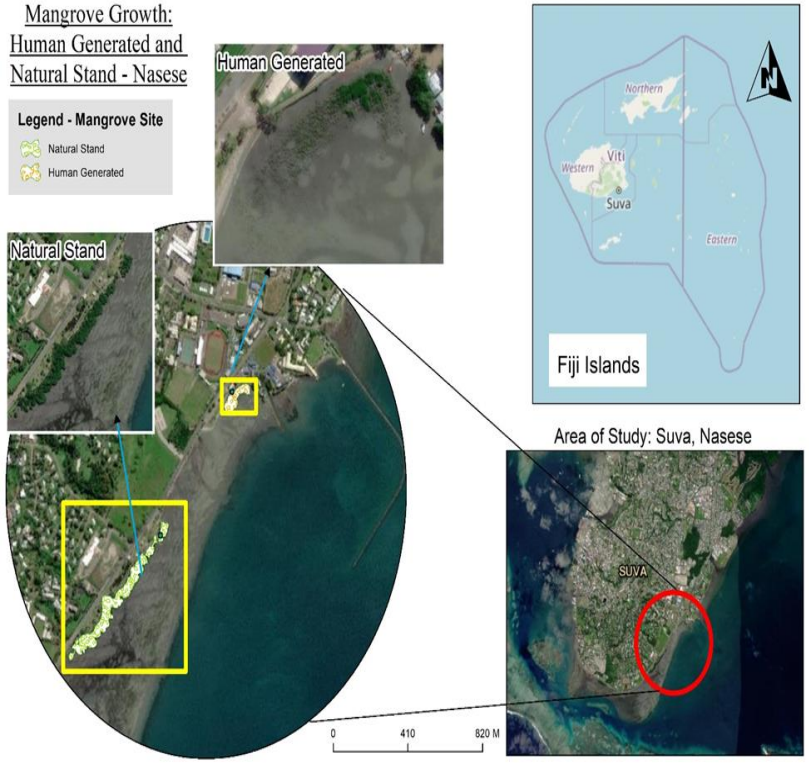
Comparative Study:

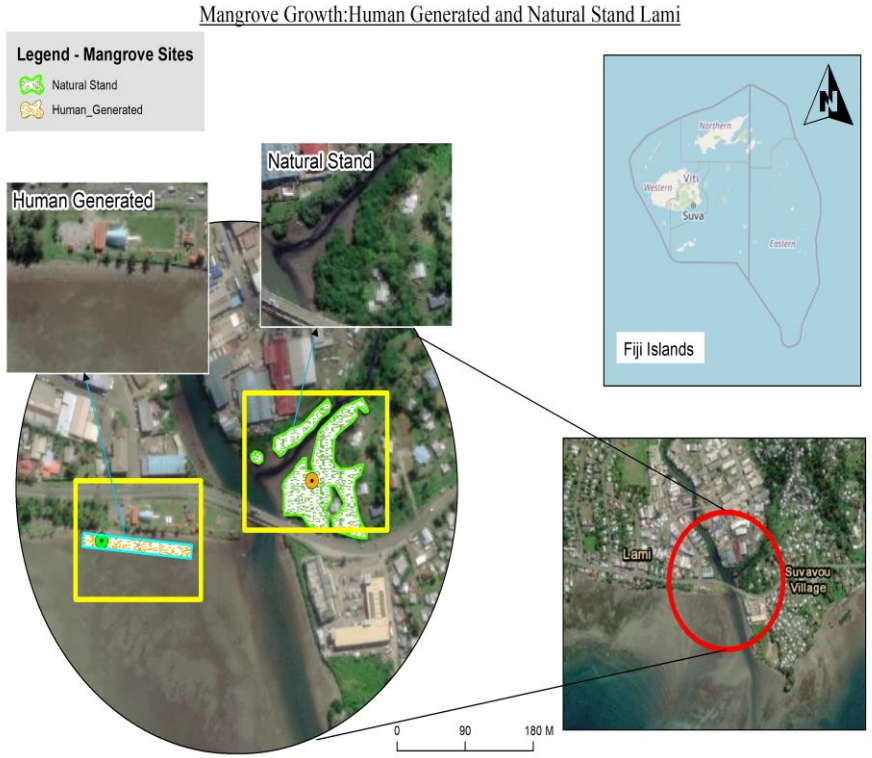
Nasese Site:

- 6-7% survival rate after 2 years M&E
- Factors affecting survival rates:
  * species of propagules
  * location of planting
  * community support and awareness
  * popular planting site
- **Both the sites** – there is always a clean-up at the planting area of interest before the planting of propagules take place

Lami Site:

- 0% survival rate after 2 years of M&E
- Factors affecting survival rates:
  * human induced factors (not supported by the surrounding communities)
  * not so favorable condition (surrounded by informal settlements and industrialized area)
  * exposed to high wave action
  * highly polluted area





Recommendations

* It is highly recommended to plant seedlings picked from nearby natural stand close to the desired planting site.

* The need to have a proper M&E after a planting initiative to ensure high succession rate.

* The need to consider the already existing ecosystems at the desired planting site. Take for instance, at the Nasese human generated planting site, replanting of mangroves had to be put to a halt because mangrove replanting was evading the mudflats and tidal shore where migratory birds normally rest before they continue with their migration.

* Planting site needs to be probed and determined by experts because not all areas are suitable for mangrove planting or re-planting activities.

* Have an awareness program for the surrounding communities at least several times before a planting initiative is carried out, as mentioned in this study/chapter, one of the major contributing factor to the unsuccessful rate of human mangroves regeneration process are humans. This is greatly evident in the Lami site.

* Have the seedlings already planted in a nursery (preferably at the nearest natural stand of the site of planting interest) before a replanting activity for at least 6 months to increase compatibility and survival rate.

- When planting, plant 2-3 seedling per plot to increase survival rate.
- Mangrove Reforestation and Mangrove Afforestation.

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Thank You for Listening ☺

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