Department of Environment and Natural Resources
Ecosystems Research and Development Bureau

NOV 20 2023

MEMORANDUM

TO : The Regional Executive Director
DENR MIMAROPA

THRU : The PENRO, Palawan
The CENRO, Puerto Princesa

FROM : The Director

SUBJECT : **SUBMISSION OF THE REPORT ON THE RESULTS OF THE ASSESSMENT OF THE SUITABILITY OF BEACH FOREST REHABILITATION ON THE REMOTE ISLAND OF PAG-ASA ISLAND, IN KALAYAAN, PALAWAN**

We are pleased to furnish you the report on the results of the Assessment of the Suitability of Beach Forest Rehabilitation on the remote island of Pag-Asa Island, in Kalayaan, Palawan

Attached is the report for your information and reference.

MARIA LOURDES G. FERRER, *CESO III*

College, 4031, Laguna, Philippines
Tel Nos: (6349)5363628; 5362229; 5362269 Fax No. (6349)5362850
E-mail: erdb@denr.gov.ph

ASSESSMENT OF THE SUITABILITY OF BEACH FOREST REHABILITATION ON THE REMOTE ISLAND OF PAG-ASA ISLAND IN KALAYAAN, PALAWAN

Ecosystems Research and Development Bureau
INNOVATING FOR SUSTAINABLE ECOSYSTEMS

TABLE OF CONTENTS

Introduction

The Ecosystems Research and Development Bureau (ERDB) is tasked with assessing the suitability of beach forest rehabilitation on the remote island of Pag-asa in response to the request of Honorable Mayor Roberto M. Del Mundo of the municipality of Kalayaan Group of Islands, Palawan. Pag-Asa Island boasts a unique ecosystem comprising pristine beaches and beach forests, making it of significant environmental importance. However, the island faces challenges related to habitat restoration and revegetation.

According to statements from local officials, the Local Government Unit of Kalayaan has engaged in extensive rehabilitation projects in recent years. These projects included the planting of coconut palm and initiatives focused on mangrove and beach habitat restoration. Unfortunately, despite these diligent efforts, all these undertakings proved unsuccessful, leading to a sense of frustration among the local authorities due to their inability to achieve the desired ecological restoration outcomes.

To address these challenges, the primary objectives of this assessment are as follows:

- To assess site suitability for beach forest and mangrove rehabilitation and recommend appropriate plant species.
- To determine factors contributing to past revegetation failures.

Materials and Methods

Study Site

The study was conducted on Pag-asa Island, located within the municipality of Kalayaan, Palawan, Philippines last May 2-8, 2023. The island is positioned in the West Philippine Sea, with geographical coordinates of 11°3.194' N and 114°17.094' E (Figure 1). Access to Pag-asa Island is possible through both sea and air transportation. It is situated approximately 280 nautical miles away from Puerto Princesa City and around 579 miles from Metro Manila (Gonzales, 2008). The island features a 1.3-kilometer-long airstrip, named after the late General Rancudo, primarily serving military aircraft. Military aircraft can reach the island within 2 hours and 30 minutes from Puerto Princesa Airport, while travel by the municipal-owned wooden motor boat (lansta) takes approximately 72 hours.

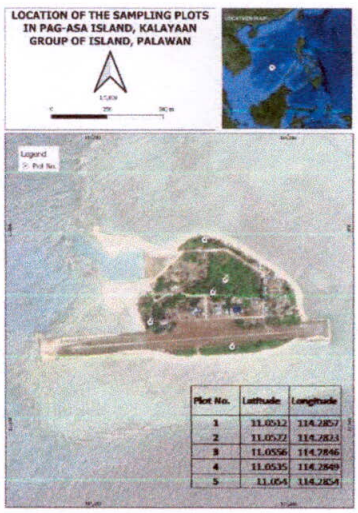

Figure 1. Location map and sampling plots within Pag-asa Island, Palawan.

Field Methods

The team employed a comprehensive approach for assessing the suitability of plant species for Pag-Asa Island, which included vegetation analysis using the quadrat method (Kent and Coker, 1992; Mueller-Dombois and Ellenberg, 1971) and soil analysis. Soil analysis involved the collection of soil samples from the study area, which were then subjected to laboratory testing to determine their composition and suitability to meet the site requirements of the selected plant species.

Through the quadrat method, the team assessed the relative abundance and importance of each species by counting individuals within the quadrat, providing insights into species composition and community structure. The assessment utilized nested quadrats, including a 20m x 20m quadrat (main plot) for larger trees with a diameter-at-breast-height (DBH) of $\geq$10 cm, a 10m x 10m quadrat (subplot) for pole-sized plants with a DBH of <10 cm but $\leq$ 5 cm, and a 2m x 2m quadrat (subplot) for regenerating plants with a DBH of < 5 cm and below (including seedlings, wildlings, and saplings). Species were identified following the guidelines of Palis et al. (2013) and Primavera et al. (2016). Uncommon beach forest plant species were photographed and sampled in detail as herbarium specimens. Branch tips with leaves and fruits were clipped, mounted in newsprint, and preserved with available alcohol inside resealable plastic bags. In total, 5 quadrats measuring 20m x 20m were established within the study site.

Simultaneously, soil analysis involved the collection of soil samples, which were sent to the ERDB laboratory for detailed testing. The laboratory analysis aimed to determine the soil's composition, texture, and nutrient content, ensuring that it matched the specific site requirements of the selected plant species. This dual approach of vegetation analysis and soil analysis provided a holistic understanding of the suitability of plant species for rehabilitation efforts on Pag-Asa Island.

To identify factors contributing to past rehabilitation failures, we conducted Key Informant Interviews (KII) and Focus Group Discussions (FGD) with local communities and decision-makers, analyzed historical rehabilitation projects, and examined factors such as soil quality, climate conditions, and human activities that affected previous efforts.

Results and Discussion

Suitable species for rehabilitation

Based on the results of both the vegetation survey and soil analysis, it is evident that Pag-Asa Island's beach forest vegetation is predominantly characterized by the Beach Strand Type, a common coastal vegetation type along the West Philippine Sea. Among the species identified (Table 1), *Barringtonia asiatica* (Botong), *Terminalia catappa* (Talisay), *and Calophyllum inophyllum* (Bitaog) emerged as the dominant species, with *Barringtonia asiatica* exhibiting the highest importance value (IV) of 114.42, followed by *Calophyllum inophyllum* (IV: 61.21) and *Terminalia catappa* (IV: 30.18). These species, with their high importance values, not only represent the dominant components of the beach forest ecosystem but also align well with the soil characteristics recorded during the soil analysis.

Table 1. Overall Structural Characteristics of Beach Forest Species in Pag-asa Island, Kalayaan, Palawan

Species	Relative Frequency	Relative Density	Relative Dominance	Importance Value
Premna serratifolia L.	13.33	16.36	0.48	30.18
Morinda citrifolia L.	6.67	1.82	0.15	8.63
Calophyllum inophyllum L.	20.00	18.18	23.03	61.21
Barringtonia asiatica (L.) Kurz	13.33	29.09	72.00	114.42
Leucaena leucocephala (Lam) de Wit.	6.67	1.82	0.04	8.53
Cocos nucifera L.	6.67	1.82	0.51	8.99
Heliotropium foertherianum Diane & Hilger	6.67	1.82	0.34	8.83
Guettarda speciosa L.	13.33	16.36	1.73	31.43
Terminalia catappa L.	13.33	12.73	1.72	27.78
TOTAL	**100**	**100**	**100**	**300**

The soil analysis data indicates that the island's soil varies between sandy and sandy loam textures (Table 2), with pH levels ranging between 7.14 and 8.39. Importantly, these species, particularly *Barringtoniaasiatica*, *Terminalia catappa* (Talisay), and *Calophylluminophyllum* (Bitaog) are well-suited to the soil conditions present on Pag-Asa Island, making them the recommended species for rehabilitation efforts. Their high importance values signify their ecological significance and their capacity to thrive in the given environmental conditions, ensuring their successful growth and contribution to the restoration of the beach forest ecosystem.

Plot	Textural Class	Clay	Sand	Slit	pH	OM	N	Available P	Available K
Seaward	Sand	2	92	6	8.39	5.85	0.29	15.57	0.06
Middleward	Sand	0	100	0	7.57	14.02	0.7	14.72	0.18
Landward	Sandy Loan	8	70	22	7.14	16.43	0.82	16.12	0.15

Table 2. Soil Analysis Results for Various Plots on Pag-asa Island, Kalayaan, Palawan

Factors contributing to the failure of past rehabilitation efforts

Several key factors contributing to the failure of past rehabilitation efforts on Pag-Asa Island have been identified through a combination of Key Informant Interviews (KII) and Focus Group Discussions (FGD) involving local leaders and the island's community. First and foremost, despite the good intentions and efforts put forth, the rehabilitation initiatives faced logistical challenges. The seedlings of appropriate species like Bitaog and Talisay were indeed selected, but they lacked proper handling and conditioning prior to planting. This issue was exacerbated by the fact that the seedlings had to be transported from the main island, resulting in a delay of almost three days before reaching Pag-Asa Island. Such delays can have a detrimental impact on the vitality and survival rates of seedlings, particularly in the context of beach forest and mangrove restoration.

Another part of the rehabilitation efforts involved the planting of coconut, but unfortunately, this attempt was met with failure as well. The seedlings used for coconut planting were already stressed and wilted due to evapotranspiration suffered during the hauling process. The coconut seedlings were

prone to the rhinoceros beetle (*Sinodendron cylindricum*) infestation present on the island, which significantly hindered their growth and survival. The adult rhinoceros beetle feeds on the sap, fruits, shoots, leaves, and nectar of coconuts for its survival (Figure 2&3). This setback underscores the importance of not only selecting the right species but also ensuring the health and vitality of the seedlings chosen for reforestation projects.

Furthermore, it became apparent that mangrove rehabilitation failures were observed. The absence of a naturally sourced brackish water supply and sediments loading, such as a river, on Pag-Asa Island proved to be a critical limitation. Mangroves thrive in brackish water environments, and the lack of this essential ecological component on the island makes it unsuitable for mangrove growth. Additionally, the absence of an in-situ nursery for plant propagation further hindered the rehabilitation efforts, as it limited the availability of well-conditioned seedlings ready for transplantation. These factors collectively underscore the need for a more holistic and site-specific approach in future rehabilitation endeavors on Pag-Asa Island.

Other factors that may indirectly lead to the failure of past rehabilitation efforts were extreme weather conditions, coastal development, poor waste management and limited transportation. The passing of Typhoon Odette uprooted several beach vegetation and trees (Figure 4&5). Constructed structures for nursery were toppled down. Hence, seedlings were difficult to produce for propagation and rehabilitation purposes.

Coastal development had led to obliteration portions of the beach forests especially during the establishment of the air strip, sea port (Figure 6&7) and circumferential road. The on-going construction for the expansion the sea port area brought construction materials and equipment that trampledbeach vegetation. Thus, the construction did not just introduce foreign aggregates but also created barriers for beach forests.

Poor waste management were evident as plastics, broken bottles, as well as construction debris were seen on the ground even within the locally proposed beach forest reserve. Based on interview, sewerage system was still on planning stage. Without proper waste management and sewerage system, potential pollution could add to the harsh condition for beach forest to thrive.

Lastly, transport of planting materials to Pag-asa Island was limited through a wooden hulled boat that can navigate the West Philippine Sea only during the dry season and calmer period. During these times, plants were subjected to extreme heat from the sunlight and sudden rain pour in the afternoon. In addition, frequency of travelswas also limited due to the presence of Chinese coast guard and other intimidating huge vessels(Figure 8) surrounding the waters of Pag-asa Island. Thus, survival of seedlings was minimal due to less optimal conditions during said period.

Conclusion

The assessment of Pag-Asa Island's beach forest and mangrove rehabilitation potential has shed light on critical factors that must be addressed for successful ecological restoration. The island's unique ecosystem, characterized by beach strand vegetation dominated by species like *Barringtonia asiatica*, *Terminalia catappa*, and *Calophyllum inophyllum*, presents a valuable opportunity for habitat rehabilitation. However, past rehabilitation efforts have faced significant challenges, including logistical hurdles in transporting seedlings, inappropriate handling of selected species, and the mismatch between the chosen species and the island's ecological conditions.

The importance of aligning rehabilitation species with site-specific ecological factors cannot be overstated. Soil analysis results revealed variations in soil textures and pH levels, reinforcing the suitability of dominant species like *Barringtonia asiatica* for planting. Recognizing the absence of a natural source of brackish water for mangrove growth, it is evident that mangrove rehabilitation may not be feasible on the island without innovative solutions. Moving forward, a comprehensive

approach that incorporates proper handling, local nursery development, and a meticulous species selection process must be undertaken to ensure the success of beach forest and mangrove rehabilitation on Pag-Asa Island. By learning from past mistakes and adapting strategies to the island's unique conditions, we can effectively contribute to the restoration and preservation of this ecologically significant and remote island in the West Philippine Sea.

Recommendation

Based on the assessment and analysis conducted, several recommendations emerge for the LGU of the Kalayaan Group of Islands in the preservation and sustainable management of Pag-Asa Island's natural resources, particularly its beach forest ecosystem, for the long-term benefit of the coastal community.

1. Rehabilitation and Resource Protection:

- Collaborate with relevant agencies such as DENR, DA-BFAR, PCA, PCSD, and DOT to develop and implement a comprehensive plan for the rehabilitation and protection of Pag-Asa Island's natural resources, particularly its beach forest ecosystem.
- Cease the planting of coconut seedlings until the rhinoceros beetle infestation on the island has been completely eradicated.
- Initiate salvage cutting of standing dead trees to eliminate host plants and ensure the destruction of rhinoceros beetle eggs and larvae.
- Regularly clean and remove debris on the island to minimize the spread of the rhinoceros beetle infestation.

2. Seedling Management and Transport:

- Establish an in-situ nursery within the area to facilitate easy transportation and enhance the survival rate of planted seedlings.
- Implement quarantine measures for transporting seedlings, lumber, and timbers, with preference given to treated or kiln-dried lumber and timber to mitigate the risk of termite infestation.

3. Planning and Sustainability:

- Conduct a carrying capacity and coastal vulnerability study at this early stage of development to inform future resource management decisions.
- Develop an updated Comprehensive Land Use Plan (CLUP) before initiating large-scale rehabilitation efforts, ensuring sustainable land use practices.

4. Infrastructure and Environmental Protection:

- Prioritize the construction and installation of a sewage treatment Facility (STP) on the island to protect its natural resources and environment.

These recommendations collectively aim to promote responsible and sustainable resource management on Pag-Asa Island, considering both environmental conservation and the well-being of the coastal dwellers.

Figure 2. The arrows show the hole made by rhinoceros beetle on the thrunk of young planted coconut

Figure 3. Dead and top pruned coconut devasted by Super Typhoon Odette in 2021

Figure 4. Devastated Infrastructure in Pag-asa Island made by super typhoon Odette.

Figure 5. Uprooted trees in Pag-asa Island due to Super typhoon Odette.

Figure 6. Pier rehabilitation

Figure7. Airport in Pag-asa Island

Figure 8. Images of huge Chinese coast guard and unidentified vessels visible using binoculars.

Prepared by:

November A. Romena
Supervising Science Research Specialist

Alvin S. Gestiada
Senior Science Research Specialist

References:

Gonzales, B. (2008). Pag-asa Island and Adjacent Reef Resources Assessment, Kalayaan Island Group, Kalayaan, Palawan. Western Philippines University. 10.13140/RG.2.1.3124.8081.

Primavera, JH, RB Sadaba, MJHL Lebata, & JP Altamirano (2016). Mangroves and Beach Forest Species in the Philippines. Ecosystems Research and Development Bureau – Department of Environment and Natural Resources. College, Laguna, Philippines, 238 pp.

Primavera, JH & RB Sadaba (2012). Beach Forest Species and Mangrove Associates in the Philippines. SEAFDEC Aquaculture Department, 154 pp.