ERDB MDARRC
FACT SHEET
No. 1 Series of 2017
Ecosystems Research and Development Bureau- Mining and Degraded Areas Rehabilitation Research Center

Improving Survival of Planted Mangrove Seedlings in Exposed Areas Using Bamboo as Wave Attenuators

Alvin Angelo A. Salting[1] & Alma S. Uddin[2]

Background of the Study:

Study Site:
Sitio Cuabo, Barangay Manikling, Municipality of San Isidro, Davao Oriental

- Established in March 2016;
- The study site lies on the Southwestern portion of the Province of Davao Oriental between latitude 126°05'125°10' North and longitude 6°45'-6°50' east. The Municipality of Lupon bound it on the North; the Davao Gulf on the West; the Municipality of Mati on the East; and Governor Generoso on the South.

Figure 1. Panoramic photo of the area before the establishment of the study.

Figure 1. Panoramic photo of the area before the establishment of the study

Significance of the Study:

Mangroves have many important functions such as providing sanctuary for many varieties of aquatic and terrestrial organisms that the Filipinos so much depend upon. Until recent xperiences with the impacts of storm surges brought about by strong winds and typhoons, functions of mangrove and other coastal forests, through coastal protection by trapping sediment and by attenuating waves, have been found to be equally important in saving lives and properties.

Thus, the significance of this research is to develop a cost-effective method of reducing wave energy to provide support to newly planted seedlings to develop a sufficiently strong root system. This in turn, will allow them to withstand wave action thus increasing its survival against identified physical factors.

Materials and Methods:

The following methodologies were undertaken: reconnaissance survey and site selection, site characterization, database development, establishment of the study including planting stock production/ procument of pagatpat seedlings, field planting and data collection.

Figure 3: Construction of bamboo wave attenuators.

The Wave Attenuators were fabricated made of bamboos, (Figure 3). This was established in four designs and two types of lay-outs with three replicates and with a dimension of 10 x 10 meters or a total of 100 sqm per plot, following the minimum required sample size of 10 %. Species used were Pagatpat (Sonneratia alba) planted at a spacing of 1m x 1m. Nursery-raised seedlings from young germinants were used as planting stock (Figure 4).

Figure 4. Pagatpat seedlings preparation

[1]Science Research Assistant, [2]Supervising Science Research Specialist

Figure 5. Actual on-site laying-out of mangrove seedlings.

Figure 6. Bamboo Wave Attenuators protection for planted mangrove seedlings against strong waves.

Spacing between poles was 1m x 1m mirroring the lay-out of planted mangrove seedlings per plot. For every design, a total of 100 poles of 1.5 meter poles are needed for the Quadrat design and 64 poles for the Quincunx design as shown in Figures 5 and 6 .

Significance of the Study:

Mangroves have many important functions such as providing sanctuary for many varieties of aquatic and terrestrial organisms that the Filipinos so much depend upon. Until recent experiences with the impacts of storm surges brought about by strong winds and typhoons, functions of mangrove and other coastal forests, through coastal protection by trapping sediment and by attenuating waves, have been found to be equally important in saving lives and properties.

Thus, the significance of this research is to develop a cost-effective method of reducing wave energy to provide support to newly planted seedlings to develop a sufficiently strong root system. This in turn, will allow them to withstand wave action thus increasing its survival against identified physical factors.

Purpose of the Study:

The study was implemented to improve coastal area planning, specifically in the area of coastal forest management through an effective coastal reforestation using bamboo as wave attenuators.

Furthermore, this study also determine the effectiveness of different models of wave attenuators in improving the survival of newly planted mangrove seedlings; to undertake a cost-effective form of mangrove seedling protection. And to identify other variables that will determine the potential effectiveness of wave attenuators to provide mangrove seedling protection.

Results:

Based on the data gathered over a nine-month period, it was observed that proliferation of filamentous algae affecting the plantation in the months of April until June was high, an inevitable effect of the El Nino phenomenon. During these months there was a general rise in temperature as recorded by PAGASA affecting the planted seedling (Figure 7).

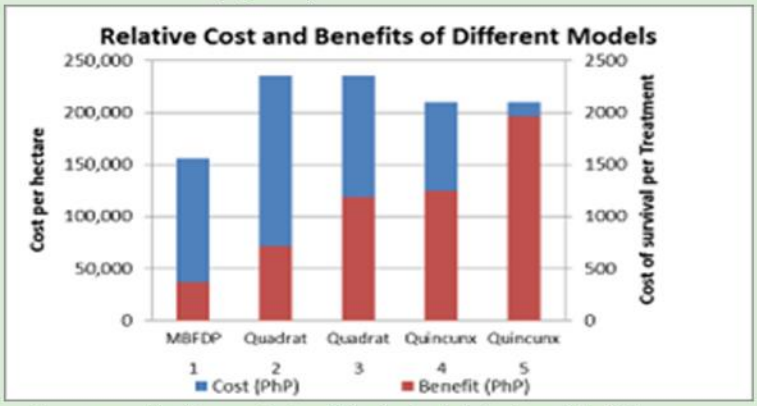
Figure 7. Algal bloom and Die back from extreme heat exposure

The re-channeling of the waterflow (in black arrow) of the nearby river during the rainy season resulted in the shifting of sediments, which encompassed two experimental blocks (in red lines) as shown in the image below. This led to eventual mortality of the seedlings while Block 3 was naturally spared because of its location.

Treatment 5 (Quincunx within the plantation) showed the highest survival with a total of 93 and a mean of 31. This is followed by Treatment 4 (Quincunx fronting the plantation) with 59 survivals and a mean of 19.67. Treatment 2 (Quadrat fronting the plantation) showed the lowest survivals with only 30 and a mean of 10.00 following the control (Treatment 1) with only 23 survivals and a mean of 7.67 (Table 1).

Treatment	Replication			Total	Mean
	I	II	III		
1	0	0	23	**23**	**7.67**
2	0	0	30	**30**	**10.00**
3	0	0	50	**50**	**16.67**
4	0	0	59	**59**	**19.67**
5	0	0	93	**93**	**31.00**
Rep. TOTAL	**0**	**0**	**255**	**255**	**17.00**

Water velocity has affected the survival of the planted seedlings. Water velocity without attenuator is .105 meter per second, data showed that water velocity decreased by .071 meters per second after passing through the wave attenuators (Figure 9).



As per results, the most plausible design is Treatment 5, Quincunx within the plantation, with the highest survival. This also coincides with the Benefit Cost Ratio results, although negative in analysis, but has the higher value closest to 1.

Recommendation and Conclusion:

Additional replication should be conducted as a means to further investigate and maximize the potential of the technology while taking into account extreme climatic events. Appropriate site for the wave attenuators to be replicated should be cautiously assessed. That it must be established far from river mouths and other areas where there is a history of shifting sediment deposition. The quincunx design is a potential attenuator to increase survival of mangroves planted in exposed/ open wave areas. The use of Large Planting Materials (LPM) of more than 1 foot or 40 cm in height in such endeavors of rehabilitation is important to minimize high mortality in areas where there is uncontrolled shifting of sediments such as experienced in the study. Trials using other wave attenuator designs should be pursued in future studies to determine the potential of this technology to ensure high survivals of planted mangrove seedlings.

It is worth noting however, despite these naturally-causing pressures, planted mangroves located in Block 3 thrive well. Otherwise, a massive wipeout of the plots should have occurred. Therefore, the ability of Block 3 to survive amidst effects of climate change merits further study. Community participation, particularly harnessing on the strength of men and women in the project was also valuable in the outcome of the project. Considering that they reside within the study site and the primary beneficiary of the project, their involvement is highly important.

Produced and Packaged by:

Mining and Degraded Areas Rehabilitation Research Center (MDARRC)

Editorial Adviser: Bighani M. Manipula, Ph.D.
Lay-out Artist: Jethrone M. Setenta

Magdum, Tagum City, Davao del Norte
(084) 216 3548 denr_erds11@yahoo.com
www.mdarrcerdb.wordpress.com

Research Station 1
Amas, Kidapawan City, Cotabato
(064) 572 3118 denr_erds12@yahoo.com

Research Station 2
Nabunturan, Compostela Valley
nrs_8800@yahoo.com.ph