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Desrita *et.al*. Mangrove seeding technology application

Mangrove seeding technology application for rehabilitation and optimization program of coastal area to be an ecotourism area in Belawan Sicanang

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Abstract

Most of the mangrove ecosystems in North Sumatera have changed the statue into the lands of business which is ignoring environmental aspects. Such as pond clearing, conversion of land into plantations and agriculture, etc. The most ironic happens on Belawan Sicanang, Medan Belawan, Medan City. This has caused fundamental changes for mangrove ecosystem Belawan Sicanang is the only one subdistrict in Medan City which has the widest mangrove ecosystems, i.e. 895.24 ha. However, in recent years has been both quality and quantity declines in mangrove ecosystems due to land conversion into the industry, habitation, ponds, and palm plantation. This mangrove ecosystem has an important function as a buffer zone of Medan city from tidal floods, abrasion, strong waves, and tsunami. Moreover, mangrove ecosystems also functionate as a place for the reproduction of seawater biota which is the source of small fisherman livelihood living in the coastal area. The application of mangrove wood-seeding technology is a solution for wood-mangrove regeneration and rehabilitation which is very useful for mangrove habitat. Inventory of mangrove seedlings is important for mangrove rehabilitation activity. Seedling sources used are comes from the local area so that is expected for facilitating in seed collection and makes the living percentage of mangrove seeds higher. Through a dedication activity, enthusiasm appeared and a citizen or partner group interested in participating in dedication activity so that is expected to foster enthusiasm in protecting the coastal environment by conducting seedings and rehabilitation of mangrove forests. Then, the mangrove condition caring community of Belawan Sicanang, Medan Belawan, Medan City formatted, so that the target to make coastal area became ecotourism area optimized.

Keyword: Mangrove seedings; Rehabilitation; Coastal Area; Ecotourism

1. INTRODUCTION

Most of the mangrove ecosystem in North Sumatera have changed the statue into the lands of business which is ignoring environmental aspects. Such as shrimp pond, conversion of land into plantations and agriculture, etc. The most ironic happens on Belawan Sicanang, Medan Belawan, Medan City. Which has caused fundamental changes for mangrove ecosystem.

Belawan Sicanang is the only one subdistrict in Medan City which have the widest mangrove ecosystems, i.e. 895.24 ha. However, in recent years has been both quality and quantity declines in mangrove ecosystems due to land conversion into the industry, habitation, ponds, and palm plantation. This mangrove ecosystem has an important function as a buffer zone of Medan city from tidal floods, abrasion, strong waves, and tsunami. Moreover, mangrove ecosystems also functionate as a place for the reproduction of aquatic biota which is the source of small fisherman livelihood living in the coastal area.

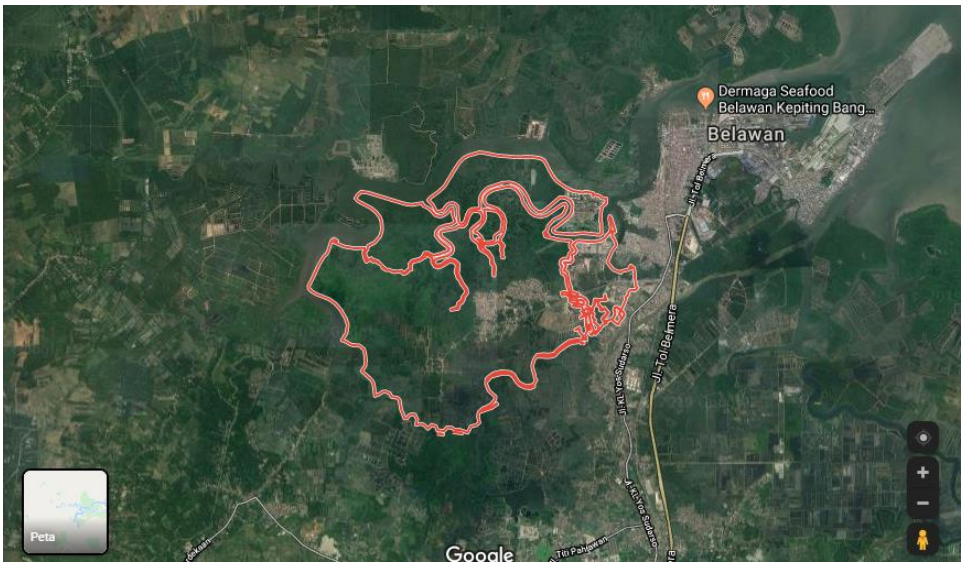

Figure 1.1. Belawan Sicanang Map

1.1 Partner problems

Common problems occurred such as the declines of mangrove ecosystems quality and quantity in Belawan Sicanang as a result of various utilization activities such as land conversion for habitation, fish farming, agriculture, and illegal logging, takes special attention from all parties. Moreover, the other problem is the lack of public awareness in mangrove ecosystems important and mangrove ecosystems unmanagement as an ecotourism area. The responsibility in managing this area not only from government but also from all society participation especially from the local society around the mangrove ecosystems which is actively involved in management and utilization of mangrove, so that in the end the mangrove ecosystem sustainability can be maintained and sustainable.

1.2 Target and Solution

The high damage of mangrove forests, especially in the coastal areas of Belawan Sicanang Village due to human activities, greatly affects the sustainability of mangrove ecosystem life. Application of mangrove wood nursery technology is one of the solutions carried out for the regeneration and rehabilitation of mangrove wood species that are very useful for mangrove habitat improvement. The supply of mangrove seedlings is important for mangrove rehabilitation activities. The source of seed used comes from a local location so that it is expected to facilitate seed collection and the percentage of live seedlings of mangrove wood species planted will be high. The target of community service activities in the mono community this year is, after the implementation of this activity the community groups that are partners of this community service have a place and mastered good mangrove nursery techniques to produce mangrove seeds to regenerate and rehabilitate mangrove ecosystems in Belawan village. Sicanang is expected to be a motivation for other villages surrounding individuals and groups about the rehabilitation of coastal areas and their long-term benefits for improving the community's economy and environment, and how mangrove ecosystem management becomes an ecotourism area. Also, it is expected to increase public awareness and understanding, especially in Belawan Sicanang Kelurahan, on the importance of protecting and preserving the mangrove forest area to preserve the preservation of coastal ecosystems.

2. METHODS

The implementation method of community service activities is carried out through an approach with several methods, such as the formation of an implementation committee team carried out

through a method of discussion approach to the way of family, in educational activities carried out by teaching methods and demonstration dedication, in the nursery and planting activities and maintenance carried out with practice and demonstration with directly in the field. The results of the Community Service activities are expected to be the basic capital for partners and community members in the Belawan area of Sicanang Island, to manage the coastal area sustainably. The existence of the community's ability to make good seedlings, it is hoped that this area can be used as a center for seedlings for the North Sumatra region and its surroundings, especially in Belawan. The emergence of public awareness of the benefits of mangroves, it is expected that the community will participate in protecting the coastal area by planting mangroves in areas that have damaged mangroves, also, it is expected to provide benefits to the community and can increase revenue from the ecotourism sector by utilizing the mangrove ecosystem. Practical learning phase

2.1 Tools and materials preparation

The tools and materials needed for mangrove seedings are polybags, various types of mangrove seeds, mud, molds and raised beds.

2.2 Seedlings house production

The place that will be used for the seedling nursery is chosen as a field that is flat and flat. The distance to the location of the planting is as close as possible to be more effective in transporting the seeds. Land used for breeding must be submerged during high tide with a frequency of approximately 20-40 times/month, so that it does not require watering.

2.3 Nursery beds production

The beds are made of strong bamboo. The size of the beds is adjusted to the needs. Generally measuring 1 × 5 m or 1 × 10 m with a height of 1.5-2 m. The beds were given light shade from palm leaves/coconut/palm/palm/ thatch / Alang-Alang or the like. Media (basic) beds are mud soil in the surrounding area. On top of the media (base) is covered with thick plastic to prevent the roots from penetrating the soil. If more than one bed is made, one bed with the other beds is given a distance of 0.5 meters, which is used as a working path. To make the road easier, a bridge has been built around the beds. 1 × 5 m beds can accommodate seedlings in 10 × 50 cm polybags or 1200 ml of used drinking water bottles or as many as 2250 units for 1 × 10 m beds.

2.4 Seedlings

1) *Rhizophora spp*

The fruit used for breeding should be selected from mangrove trees over 10 years old. Good fruit, characterized by the almost hypocotyl release from the fruit. Ripe fruit from *Rhizophora spp*, characterized by the color of dark green or brownish fruit, with cotyledons (rings), are yellow or red. The fruits are planted 1 piece each in each polybag. The fruit is embedded in approximately one-third of its total length (± 7 cm). Every 6-10 seeds, tied together so as not to fall easily, the bond is opened after the first leaf comes out. The first leaf will come out after 1 month, the third leaf will come out after 3 months.

2) *Bruguiera spp*

The fruit is chosen from trees that are between 5-10 years old. The selected fruit that is ripe is characterized by almost loose fruit stems from the tuber and hypocotyl color reddish-brown or reddish-green. The collected fruit does not need to be washed with water but only needs to be wiped clean with a fresh, healthy, free pest and disease-free fruit, not rooted and hypocotyls in length 10-20 cm. Do not pull the fruit petals or be released by force because they can damage the fruit. The media used for breeding is the same as *Rhizophora spp*. All work is always done in the shade (does not get direct sunlight) so that the fruit does not dry out. Before sowing, polybags are left inundated by tides. Seeding is done at the beginning of the full moon, where the stagnant reaches the seed hypocotyl. *Bruguiera spp* seeding as in *Rhizophora spp* but does not need to be tied.

3) *Ceriops spp*

Fruit maturity characteristics are yellow cotyledons with 1 cm or more cotyledon length and brownish-green hypocotyls. The collected fruit is washed clean and the fruit released. Then, seeds that are hypocotyls in length are 20 cm or more. The media preparation for *Ceriops spp* is the same as the preparation of *Rhizophora spp*. *Ceriops spp* seeding is the same as *Bruguiera spp* seeding.

4) *Avicennia* spp

Characteristics of fruit maturity are the color of the skin of a yellowish fruit, and sometimes the skin of the fruit is slightly open. The ripe fruit is easily separated from the petals. The fruit is removed from the petals and the seeds are free of pests and weigh about ≥1.5 grams. After the petals are removed, the fruit is soaked in water for 1 day to peel off the skin. Fruit that has not been peeled off, can be peeled off by hand. Then, the fruit is transferred to a bucket of clean brackish water. The preparation of *Avicennia spp* seedlings was not different from *Rhizophora spp*. The polybags were watered until it was quite wet, then the nursery was done. The seeds are planted each one fruit in one polybag, by being implanted approximately 1/3 the length of the seed into the soil/media.

2.5 Seeds cultivation inside a polybag

1) The nursery stage is carried out after the seedling treatment stage is complete. Seedings are carried out as follows:
2) The media used for seedings are sediments from embankment embankments or sediments that are appropriate to the characteristics of the parent tree. The media is left for approximately 24 hours so as not too soft. The planting media that have been provided are put into a black plastic bag (polybag) measuring 12 cm wide and 20 cm high, which has been given small holes of approximately 10 pieces.Take a poly bag, then fill with mud around the beds.
3) Fill the polybags with sediments, but not too full just ¾ of the polybag contents.
4) After being filled with mud, fold the top of the polybag to the outside with the aim at low tide and dry weather, salt water crystals do not get trapped inside the polybag that can inhibit the growth of mangrove seeds.
5) Next, plant selected mangrove seeds that are well-conditioned into sediments with sufficient depth.
6) Don't forget to plant *Ceriops spp*, *Sonneratia spp* and *Avicennia spp* into small polybags and *Rhizopora spp* and *Bruguiera spp* seeds into large polybags.
7) After that, insert one polybag one by one already filled with the mangrove seeds into the beds. It should be endeavored that one bed can be used for only one type of mangrove, in order to facilitate distribution at the time of collection at the mangrove planting stage.
8) Maintenance is carried out routinely including: watering, weeding, and spraying

2.6 Seeds cultivation and maintenance

For planting the seeds used tools and materials needed are: bamboo tips, rope mining, machete (hole maker) from wood, shovel, paddleboard (Tongkat), meter stage of planting activities. Activities related to planting are: marking installation, making planting holes, planting and backfilling of plant holes.

Ajir is a piece of bamboo or wood, as high as 1 m, with a diameter of approximately 1-2 cm. Ajir is used to make the planting distance and determine the planting point so that before planting has been installed in advance according to the desired planting distance. The installation of the stake is assisted by using a rope or meter so that a straight and regular planting distance is obtained.

In the maintenance activities, Tools and materials used for the first stage of weeding and weeding are plant seeds for replanting, Seedling and planting equipment, Weed and garbage transport, Parang, Talley growth monitoring sheets.

This activity aims to ensure the seedlings planted grow well. After 10 days of planting it is necessary to check the plants, dead plants need to be embroidered (replanting) (Figure 11a), in this

case planting 2 to 3 seedlings per hole reduces the risk of replanting. Likewise, weeding is started for weeding, weeds, rubbish or other objects that get stuck or interfere with growth. Also, it should be noted other factors that affect the growth of puppies both human factors and natural factors (waves, pests, and diseases).

2.7 Data observation and analysis

1) Observation of seed conditions is done every week until the seeds are ready for planting.
2) Measurement of seedling growth is done before the seedlings are planted in the field, this is done to find out growth information of each identity based on the location of the population.
3) The parameters measured in this study are the percentage of seedling life (%) from seeding to planting, height (cm) and diameter (cm) of seeds to determine the quality of seedling (diameter / height of seedlings).
4) Data processing and analysis are carried out only in the scope of the calculation of the amount of genetic material (seeds) that become plant seeds (percentage of life) and average seedling growth (diameter and height) based on each type and location of natural forest populations.
5) Formula used in calculating the percentage of live seeds that grow into seeds

3. RESULT AND DISCUSSION

From the planned service activities that have been prepared and the plan to run the mangrove nursery technology application for the rehabilitation and optimization of the coastal area to become an ecotourism area in Belawan Sicanang Village, Medan Belawan District, Medan city, the results and outcomes achieved are as follows:

3.1 Activity preparation

Preparation of community service activities Application of mangrove wood nursery technology in Belawan Sicanang village, which starts with coordination and outreach with the Sicanang Care Young Generation Communication Forum and Sicanang Mangrove Ecotourism Group as Sicanang Island Mangrove Group as a group of community service partners so that the formation of the implementation team and participants of the socialization activities will be carried out. the importance of mangroves on the environment and economy of rural communities. It also described the functions of mangroves such as physical, ecological and economic functions. Not only that in the socialization, but there was also a discussion and discussion on how to choose fruit and propagules for seeds and good seeding methods.

3.2 Survey of mangrove seeding location

Mangrove nursery sites are carried out in Belawan Sicanang Sub-District, where the nursery is selected that is fielded and flat. The distance to the location of the planting is as close as possible to be more effective in transporting the seeds. The land used for breeding is exposed to seawater during high tides with a frequency of approximately 20-40 times/month, so it does not require watering.

The beds are made of strong bamboo. The size of the beds is adjusted to the needs. Beds measuring 1 × 5 m. The beds are 5 beds. The beds were given light shade in the form of para-para. Media (basic) beds are mud soil in the surrounding area. On top of the media (base) is covered with thick plastic to prevent the roots from penetrating the soil. Single beds with other beds are spaced 0.5 meters apart, which are used as work roads. 1 × 5 m beds can accommodate 1000 × 10 cm seedlings in polybags of 10 × 50 cm.

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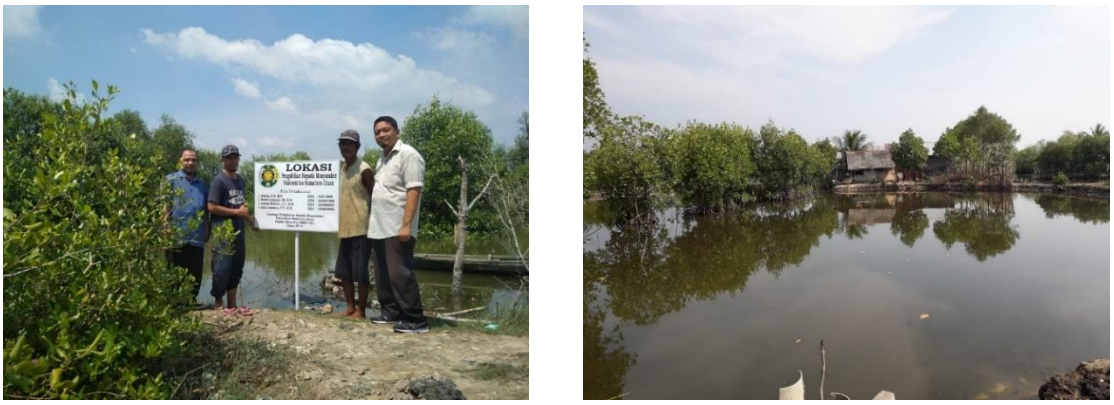

Figure3.2.1Survey of Mangrove seedings location

3.3 Parent tree survey which is become the seeds source

The survey was carried out jointly with the implementation team of the Sicanang Care Young Generation Communication Forum service and the Sicanang Mangrove Ecotourism Group. The parent trees used as seed sources are from Bruguiera spp, Avicennia spp, Ceriops spp, and Rhizophora spp. The tree surveyed is located not far from the seeding location, making it easier to bring fruit or propagules that will be used as seedlings later.

Mangrove seedlings are taken from mangrove trees which are located not far from the nursery location, the parent tree which is used as the source of seed is selected for fruiting mangrove trees and then the old fruit is selected for further seeding. Mangrove seeds are taken directly from the tree. Mangroves of the Rhizophora and Avicennia species, located varying at different heights. Rhizophora fruit taken is ripe fruit, which is marked by the yellow ring in the propagule section. For propagules whose yellow rings have not yet appeared, they are not taken because they cannot be planted yet.

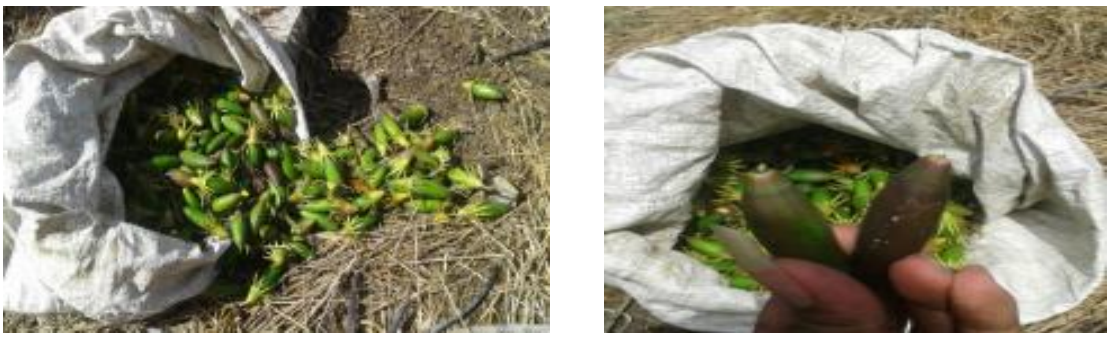

Figure3.2.1Mangrove which will be used as seeds

3.4 Maangrove seedbed

The seedlings are carried out in the following manner in collaboration with various institutions and field experiences owned by the partner groups in seedings and mangrove planting.

After being taken from the source, the mangrove fruit is then placed in a protected place. Mangroves can be placed temporarily in raised beds or broodstock trees. Mangrove seedlings are then treated in such a way that when planted they can achieve maximum survival.

1. The media used for seedings are sediments from embankment embankments or sediments that are appropriate to the characteristics of the parent tree. The media is left for approximately 24 hours so as not too soft. The planting media that have been provided are put into a black plastic bag (polybag) measuring 12 cm wide and 20 cm high, which has been given small holes of approximately 10 pieces.
2. Take a polybag, then fill with mud that is around the beds.
3. Fill the polybags with sediments, but not too full but ¾ of the polybag contents.

4. After being filled with mud, fold the top of the polybag to the outside with the aim at low tide and dry weather, salt water crystals do not get trapped inside the polybag that can inhibit the growth of mangrove seeds.
5. Next, plant fruit / mangrove propagules that have been selected and in good condition into the sediment with sufficient depth.
6. For *Ceriops spp*, *Avicennia spp* and *Bruguiera spp* planted are fruit while *Rhizophora spp* is propagul.
7. After that, enter one by one polybag that has been filled with mangrove seeds into the beds.
   The mangrove nursery process that can be carried out in this service can be seen in bellow.

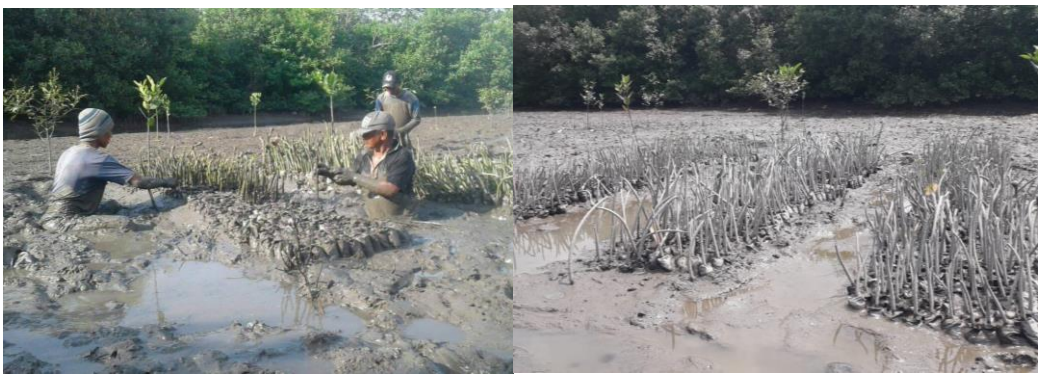

Figure3.2.2 Mangrove seedlings process

3.5 Monitoring the Success of Mangrove Seedings

After the seedlings and seedlings are planted, then monitoring, safeguarding, and maintaining is carried out to increase the success of the nursery process. Furthermore, to guard the breaking waves. This is done to protect the mangrove seeds that have been planted at the planting site. It needs to be recognized that mangroves can only be used as abrasion barriers, after being approved for less than five years when the roots have succeeded in increasing the power of the waves.

After one month of the nursery process, the seedlings will grow with two leaves appearing, this in the community is called the seedlings will start to break up and two leaves come out, and then the next one will reappear two more leaves and so on.

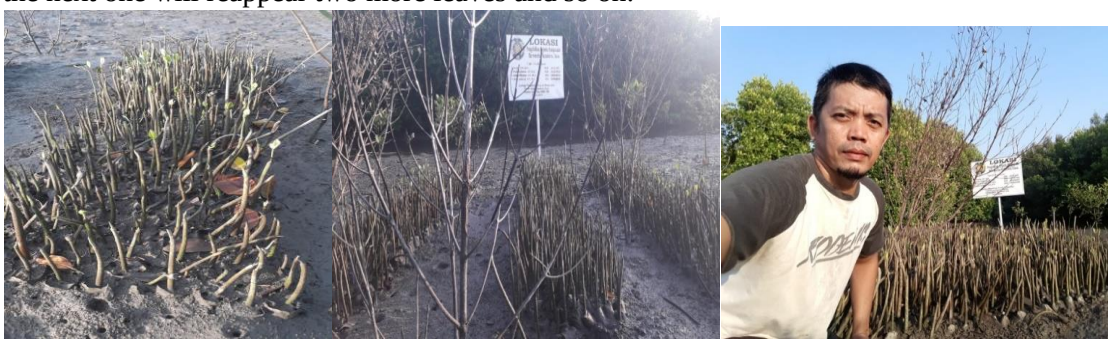

Figure3.2.3 Mangrove Seedling Monitoring and Maintenance Process

From the nursery activities as shown in Figure 3.2.3, 1500 mangrove seedlings were obtained with a success rate of up to 85% that were ready to be planted at the specified location, then mangrove seeds that had reached the age of two months with a sign that they already had four leaves planted at planting location.

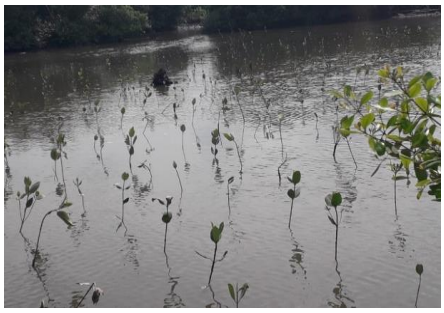

Figure3.2.4 Location of Mangrove Wood Seed Planting

3.6 Success Evaluation of Service Program

Based on the results of the activities that have been carried out, it is obtained that in general, the community service activities run smoothly. In the extension activities, the community was very enthusiastic about receiving knowledge delivered in the form of theory. In this activity the question and answer session with the community lasted quite a long time, the community could understand and motivation arose. This shows that the community still needs guidance and additional insight related to environmental sustainability. Moreover, they are made aware that the impact of environmental damage will directly cause harm to the community, both directly in the form of fishermen's catches, and indirectly in the form of long-term adverse effects of environmental damage.

Increasing public awareness and the application of science and technology is considered very appropriate to open public insight on the importance of environmental conservation both ecologically and economocally. This is because the community still thinks that what has been done, so far has not had a bad impact on them. The information dissemination and counseling are given seem to have a positive impact on changes in community paradigm to motivate the replanting of mangrove ecosystem on degraded lands.

Also, the preservation of mangrove ecosystem in Belawan Sicanang are expected to make and optimize coastal area into ecotourism areas and mangrove ecosystem tours, to improve the lives of the surrounding communities.

4. CONCLUSION

Public/partner enthusiasm and interest appeared in following the dedication activity so that is expected can foster enthuasiasm in protecting coastal environment by seedlings and rehabilitation of mangrove forest. Carring and protecting mangrove forest condition society group in Belawan Sicanang Medan Belawang Medan City has formated and continously rehabilitate the mangrove.

5. ACKNOWLEDGMENTS

In carrying out this activity, the research team received a lot of help from various groups, so that this community service activity could be carried out well. In this regard, the implementation team would like to thank USU's LPPM for financing this activity through USU's Non PNBP funds with the Letter of Agreement for Community Service Assignment Number: 327 / UN5.2.3.2.1 / PPM / 2019, May 20 2019. The team also thanked the Sicanang Island Youth Care Communication Forum and the Sicanang Island Mangrove Ecotourism Group for participating in Community Service activities.

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