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Mangrove Nursery as Environmental Recovery Efforts in Aquaculture Pond Area, Utan Sub-District, Sumbawa

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ABSTRACT
Geographically, the Utan sub-district is located in the coastal region of Sumbawa Regency, with abundant fisheries and marine potential. One of the potentials in the Utan sub-district is shrimp farming. Meanwhile, the management of natural resources in coastal forest areas so far tends to be less improved; this is due to various reasons, such as the lack of public awareness of the importance of coastal greenery and maintenance of existing coastal forests. Through the mangrove nursery program as an effort to restore the environment in the pond cultivation area, in Utan District, Sumbawa, it is hoped that it can raise awareness and the community's active role in the importance of a healthy environment. The results show that his community service succeeded in forming mangrove farmer groups, fostering mangrove farmer groups by conducting periodic education, and building mangrove nurseries. This mangrove nursery is managed directly by a group of mangrove farmers and has succeeded in producing 2,500-4,000 mangrove seedlings and successfully marketing them. In conclusion, this community service activity was successfully carried out and proved to improve farmers' welfare around the ponds. In addition, with this mangrove nursery, the community can contribute to the planting process so that a lot of carbon is absorbed in the atmosphere so that the air quality in the Sumbawa environment is of high quality. This means that the economy, society, and environment will be sustainable.

Keyword: Aquaculture Pond Area, Environmental Recovery, Coastal Area, Mangrove Nursery

1. Introduction

The coastal area is an area that is widely used by the community to carry out various activities such as fishing, aquaculture, tourism, transportation and other activities [1] Various kinds of activities found in coastal areas make the carrying capacity of the environment decrease. One form of ecosystem that plays an important role in the coastal area is the mangrove ecosystem. Mangrove ecosystems with their uniqueness have various functions, both from an ecological and economic point of view [2][3].

A few decades, the development of the times and technology as well as the increasing population has resulted in an increase in basic needs, both directly and indirectly. The development process, on one hand, is experiencing problems and on the one hand, it is demanded to increase the necessities of life, on the other hand, natural resources are very limited, so that the social order of life is increasingly lacking in terms of prosperity, both economic welfare and a healthy environment [4].

Utan is one of the sub-districts in Sumbawa Regency. Geographically, Utan sub-district is located in the Coastal region of Sumbawa Regency, with abundant fishery and marine potential. One of the potentials in Utan sub-district is shrimp farming. Meanwhile, the management of natural resources in coastal areas of the forest has so far tended to be less improved, due to many reasons, for example, the lack of public awareness of the importance of coastal greenery and maintenance of existing coastal forests.

As a result of this phenomenon, it causes damage to the ecosystem and ecological order both on land and at sea, such as abrasion everywhere and environmental pollution that is beyond the threshold, due to protected forest area ecosystems both on land and at sea which function as open spaces. or, other hardwood shade trees for water catchment areas and Mangrove Forest areas as greenbelts and filters to prevent abrasion and absorb sources of pollutant substances, both those that are hundreds of years old and those that have just been planted, are currently being cut down and destroyed for temporary economic interests, it is caused due to the absence of supervision from the government, lack of outreach and guidance among coastal communities about beach greening [5][6].

Strengthening community groups and learning productive businesses, for example how to cultivate aquaculture and fishermen by caring for mangroves and coastal forests, sometimes due to unsupportive Human Resources factors, so that community awareness is needed for the success of all programs , public awareness will grow, if their welfare is considered.

Through the mangrove nursery as environmental recovery efforts program in aquaculture pond, Utan, Sumbawa, it is hoped that this will create growing awareness and an active role for the community on the importance of a healthy environment. Based on these problems, the proposing team seeks to provide assistance in an effort to preserve the mangrove ecosystem from destructive activities. With this mentoring activity it is hoped that the community will be able to understanding the important role of mangrove ecosystems in efforts to preserve the environment, developing a mangrove nursery business (mangrove nursery). carry out mangrove conservation activities in an integrated and effective manner in maintaining and protecting the sustainability of coastal ecosystems.

2. Methods

2.1. Project Location

The implementation of mangrove nursery activity as environtmental efforts in aquaculture Pond area, located in Penyengar hamlet, Stowe Brang village, Utan sub-district, Sumbawa regency, West Nusa Tenggara province. The map of the proposed project location is below.

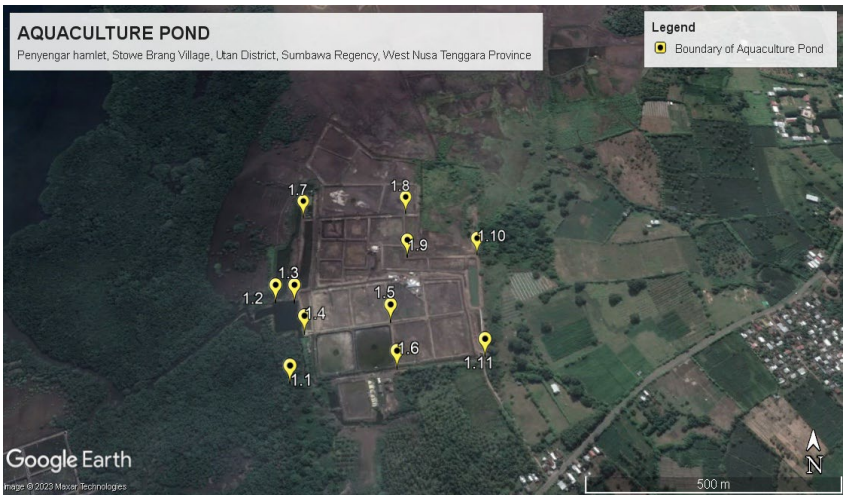

Figure 1. Maps of mangrove nursery project

This project was only carried out in Penyengar hamlet, Stowe Brang village, Utan sub-district, Sumbawa, this project was carried out in the context of PT SMM's concern for the environment around the ponds, both from an economic, social and ecological perspective. PT SMM is committed to maintaining environmental sustainability around its pond business location. Therefore this activity needs to be carried out to provide education to the community regarding the importance of mangroves for the coastal environment, and provide training to the community in Pengengar hamlet to be able to carry out mangrove cultivation so that it will have

a positive impact on increasing welfare through selling seeds and also participating in conserving environment by taking part in planting mangroves.

2.2. Stage of Mangrove Nursery

This project implementation methods offered to address partners' issues in this activity include: (1) Preliminary survey, (2) Coordination with related parties, (3) Socialization of activities, (4) Implementation of activities, and (5) Monitoring and evaluation of activities. The stages of mangrove conservation activities include: (1) Mangrove nursery training to the community in Stowe brang village & Program outreach (2) Construction of mangrove seedling house (3) Making nursery beds (4) Procurement of seeds and organic fertilizers (5) Planting mangrove seedlings (6) Creation of protection of nursery areas (7) Monitoring and maintenance of mangrove seedlings (8) Mangrove seedlings are ready to be planted in coastal areas. (Figure 2).

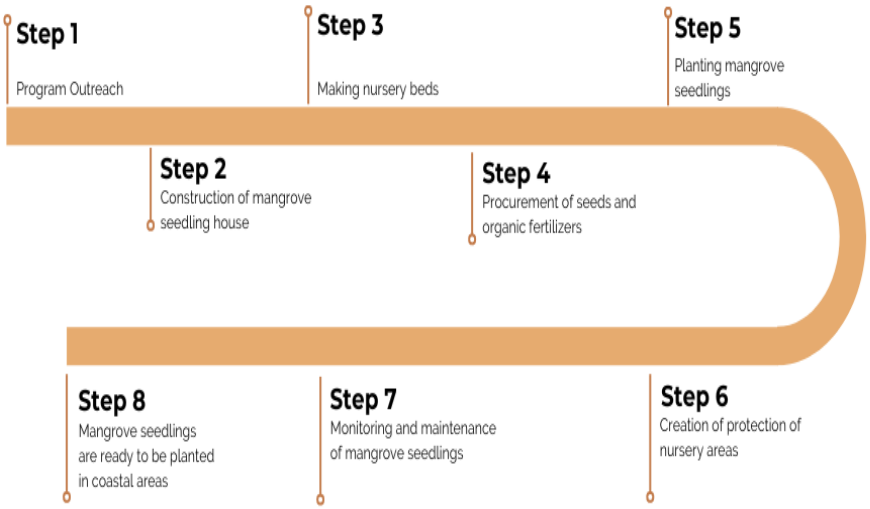

Figure 2. Stage of Mangrove Nursery

3. Result and Discussion

3.1. Understanding The Important Role of Mangrove Ecosystems

Various biological and human systems depend on mangrove ecosystems, which have a vital and varied role to play in protecting the environment [7]. Tropical and subtropical climates are home to these distinctive coastal habitats, which are frequently found along intertidal zones where land and sea converge [8]. According to [9] here are some crucial details emphasizing the value of mangrove ecosystems: biodiversity, carbon sequestration, coastal protection, economic value, water quality and etc. To implement it, we need support and cooperation from various parties, such as the Environment Agency and the Sumbawa Regency Maritime and Fisheries Service. The following figure is a socialization activity for mangrove nurseries to several local government agencies in Sumbawa Regency.

Figure 3. Outreach thr program to the Fisheries and Maritime Service (DKP) and the Environment Agency (DLH), Sumbawa Regency

Figure 3 shows outreach to the Department of Fisheries and Maritime Affairs (DKP) and the Environment Agency (DLH), Sumbawa Regency related to the mangrove nursery program. DKP fully supports mangrove nursery activities in Utan sub-district, they recommend several mangrove species for breeding, at least Rhizophora and Sonneratia and DKP also will try to help find consumers. DLH fully supports also for mangrove nursery activities in Utan sub-district and is ready to collaborate, according to DLH Every pond industry in Sumbawa is required to carry out a greenbelt, one of which is planting mangroves, so DLH can recommend each pond industry to buy mangrove seedlings in nursery land in Utan sub-district.

Figure 4. Outreach the program to Stowe Barang Village apparatus

Figure 4 shows outreach the program to the Stowe Barang Village Apparatus, related to the mangrove nursery program. Village apparatus and the Stowe Brang Community are ready to participate in the mangrove nursery activities for 6 months,and then the Stowe Brang Village has provided 1 are of land for a nursery.

Figure 5. Conducted socialization of mangrove nursery program

The purpose of this socialization (Figure6) is to increase the knowledge of the mangrove farming community in Stowe Brang village related to mangrove nursery techniques, This activity was attended by 30 mangrove farmers, 14 UTS Teams, 2 representatives from PT SMM and 14 people from the Stowe Brang Village Officials, With this socialization, the knowledge of the farming community in Stowe Brang regarding mangrove nurseries has increased so that the community is very enthusiastic about participating in this activity.

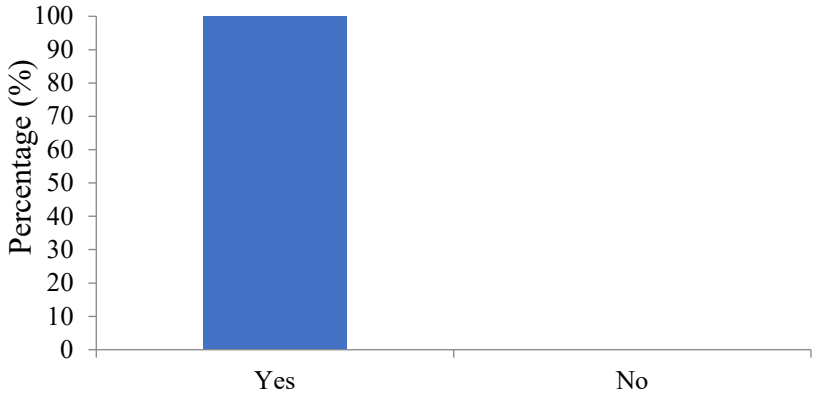

Figure 6. Farmer knowledge on Mangrove Nusery Technique

Figure 6 illustrates the extent of knowledge among mangrove farmers in Stowe Brang Village concerning the mangrove nursery technique, subsequent to the implementation of socialization activities. The evidence undeniably showcases that these concerted efforts in socialization have yielded substantial results, elevating the comprehension of mangrove farmers in relation to the intricacies of the mangrove nursery technique. Astonishingly, a comprehensive analysis reveals that 100% of the participating mangrove farmers have acquired a profound understanding of the procedures involved in executing mangrove nursery techniques.

This substantial surge in knowledge acquisition can be attributed directly to the well-structured and carefully executed socialization initiatives that were meticulously designed to cater to the specific needs and learning capacities of the local farming community. The workshops, interactive sessions, and information dissemination events orchestrated by a team of experts in collaboration with the local community have demonstrated their unparalleled effectiveness [10][11].

As indicated by the data presented in Figure 8, the pre-socialization knowledge levels stood at a diverse range, reflecting the variations in prior exposure and familiarity with advanced mangrove nursery techniques. However, post-socialization assessments exhibit a dramatic shift toward uniformity, with every single participant expressing a clear and confident understanding of the intricate steps required for successful mangrove nursery management.

The positive implications of this achievement extend beyond the realm of mere statistics. The newfound expertise held by these mangrove farmers promises not only enhanced livelihoods through improved agricultural practices but also reinforces the sustainability of the fragile coastal ecosystem. This outcome validates the undeniable potential of targeted and well-executed socialization efforts in effecting transformative change within local communities.

Figure 6 stands as an emblem of success, portraying the power of collective knowledge enhancement through strategic socialization. It serves as an inspiring example for similar initiatives across the globe, highlighting the capacity of education and community engagement to bridge gaps and elevate societies toward a more sustainable and ecologically conscious future.

3.2. Developing a Mangrove Nursery Business

The world's coastal ecosystems are facing unprecedented threats due to urbanization, climate change, and habitat degradation. In this context, the establishment of a mangrove nursery business presents a compelling opportunity to address these challenges while fostering sustainable livelihoods for coastal communities [12]. Mangroves, often referred to as "rainforests by the sea," are critical ecosystems that provide a range of ecosystem services. They act as natural barriers against coastal erosion, safeguarding communities and infrastructure from the ravages of storms and sea-level rise. Mangroves also offer vital breeding and nursery grounds for marine life, contributing to biodiversity and fisheries productivity. By developing a mangrove nursery business, we embark on a path to restore and conserve these precious ecosystems [13].

The symbiosis between environmental conservation and sustainable livelihoods is at the heart of a mangrove nursery business. For coastal communities, whose livelihoods depend on coastal resources, the business

provides an alternative source of income. By producing and selling mangrove seedlings, nursery operators not only contribute to ecosystem restoration but also create employment opportunities for locals. This duality of purpose aligns with the principles of sustainable development, fostering economic growth without compromising ecological integrity [14][15].

Developing a mangrove nursery business is not without challenges. Ensuring seedling survival, maintaining water quality, and building a market demand can be complex. However, these challenges come with opportunities to innovate, collaborate, and learn from experiences. By incorporating sustainable practices, utilizing social media for marketing and engaging with stakeholders, these challenges can be overcome.

The development of a mangrove nursery business transcends beyond economic gains; it embodies a harmonious relationship between environmental conservation and community development. By nurturing and restoring mangroves, we contribute to the overall health of our planet's coastal ecosystems. Simultaneously, we empower communities with sustainable livelihoods, creating a blueprint for enterprises that balance ecological well-being and economic progress. As we forge ahead with this venture, we demonstrate the profound impact that innovative business models can have in addressing pressing environmental concerns while fostering prosperity.

Figure 7. Establishment of a farming group

Figure 7 shows the activity of forming a mangrove farmer group in Stowe Brang Village, as one of the efforts to develop a mangrove nursery business. The formation of mangrove farmer groups and the development of mangrove businesses has a number of strong reasons related to environmental sustainability, community empowerment and local economic development.

Mangroves are vital coastal ecosystems. They help mitigate the impact of waves and winds, protect shorelines from erosion, and serve as breeding grounds for various marine species. The formation of sustainable mangrove farmer groups and mangrove businesses will aid in the effort to restore and preserve mangrove ecosystems, which are increasingly threatened by climate change and human activities. By establishing mangrove farmer groups, farmers can collaborate in the management of these ecosystems. This enables them to share knowledge, experiences, and resources, thereby enhancing the effectiveness of management and conservation efforts. The presence of such groups also simplifies coordination in terms of planning, implementation, and monitoring of activities.

Forming mangrove farmer groups provides an opportunity to empower the local community. By developing knowledge and skills in mangrove propagation and maintenance techniques, group members can take an active role in conserving their own environment. This also enhances their sense of ownership and responsibility towards their surroundings. The establishment of a mangrove business can offer an additional source of income for the local community. Planting and selling mangrove seedlings can create a sustainable income stream. Moreover, this business can help alleviate pressure on natural ecosystems by reducing the need for firewood and unsustainable mangrove logging.

The mangrove business not only has an impact on the environment, but also opens up new economic opportunities for the community. This can help reduce dependence on certain sectors, such as fishing or

agriculture, and mitigate the economic risks associated with price and demand fluctuations. The formation of mangrove groups and businesses also plays an important role in raising public awareness about the importance of mangrove conservation. Through direct interaction with group members and through education conducted by businesses, the community will better understand the benefits and important role of mangroves in maintaining the balance of coastal ecosystems.

By integrating environmental conservation, community empowerment, and local economic development, the formation of mangrove farmer groups and mangrove businesses is a comprehensive and long-term impact strategy. This ensures that ecological sustainability and human well-being can support each other in a fragile coastal environment

3.3. Maintenance of Mangrove Nursery

Mangrove conservation activities play a pivotal role in maintaining and protecting the sustainability of coastal ecosystems. These activities need to be integrated and effective to address the complex ecological, social, and economic factors that impact mangrove habitats.

Figure 8. Maintenance of mangrove seedlings

Figure 8 shows mangrove seedling maintenance activities by mangrove farmer groups in Stowe Brang Village, the maintenance of mangrove seedlings is crucial to ensure their healthy growth and successful establishment in their natural habitat. Proper care during the early stages of growth helps increase their chances of survival and contributes to the overall success of mangrove restoration efforts.

Maintain an appropriate water level within the planting area. Mangroves are adapted to fluctuating water levels, so ensure that the soil remains moist but not waterlogged. Regular irrigation might be necessary, especially in areas with insufficient rainfall. Monitor and manage salinity levels to mimic natural conditions. For certain species, it might be necessary to provide freshwater inputs to prevent excessive salt buildup. Use appropriate soil types similar to the natural habitat. Mangroves prefer well-draining, nutrient-rich soils. Amending the soil with organic matter can improve its fertility and structure. Mangroves require adequate sunlight for photosynthesis. Ensure that they receive the right amount of light by choosing suitable planting locations and managing vegetation shading.

Monitor seedlings for pests and diseases and take preventive measures. Regularly inspect the seedlings' leaves and stems for signs of damage or infestation. Prune and shape seedlings as needed to encourage healthy growth and prevent overcrowding. Removing dead or diseased branches helps maintain plant vitality. Provide appropriate fertilization based on the specific needs of mangroves. Nitrogen, phosphorus, and potassium are key nutrients required for growth. In areas with herbivores like crabs or goats, protect young seedlings with barriers or enclosures to prevent grazing. Address soil erosion around the seedlings by using techniques like mulching or installing protective barriers to stabilize the soil. Regularly monitor the health and growth of seedlings. Adjust maintenance practices based on observations and changing environmental conditions. Control invasive plant species that might compete with or harm the growth of mangrove seedlings.

Involve local communities in the maintenance process. Engaging residents can foster a sense of ownership and responsibility for the seedlings' survival. Keep records of maintenance activities, growth rates, and any challenges faced. This data can inform future restoration projects. Periodically evaluate the effectiveness of maintenance practices and make adjustments if necessary. By providing proper maintenance, we can contribute to the long-term success of mangrove restoration efforts, helping these vital ecosystems regain their health and functionality.

4. Conclusion

The conclusion of this community services is had succeeded in forming a mangrove farmer group chaired by Mrs. Rusnawati, then succeeded in fostering a mangrove farmer group by conducting periodic education and building a mangrove nursery. The mangrove nursery house was directly managed by a group of mangrove farmers and managed to produce 1,500 mangrove seedlings and successfully market them. This mangrove nursery activity is a crucial step in efforts to preserve and restore coastal ecosystems. Through good nursery efforts, mangrove seedlings can grow healthy and strong, ready to be planted in their natural habitat. Mangrove nursery activities are not only about growing seedlings, but are also an integral part of efforts to preserve the wider coastal ecosystem. With a planned and sustainable approach, we can realize the restoration and preservation of mangrove ecosystems for a better future.

This community services have been carried out successfully and has been proven to be able to improve the welfare of farmers around the ponds. In addition, with this mangrove nursery, the community will contribute to the planting process so that a lot of carbon in the atmosphere will be absorbed, so that the air quality in the Sumbawa environment will be of high quality. meaning that the economy, social and environment will be sustainable.

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