THE ROLE OF UNIVERSITAS TERBUKA IN THE PRESERVATION OF MANGROVE FOREST IN TEKOLABBUA VILLAGE, PANGKEP REGENCY FOR FISHERIES RESOURCE CONSERVATION TOWARD SOCIETY 5.0

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Abstract

Similar to other universities, Universitas Terbuka incorporates community service in the principles of *Tri Dharma*. In 2012, Universitas Terbuka engaged in a community-service project in Tekolabua Village, Pangkajene Subdistrict, Pangkajene Regency, South Sulawesi with a goal of planting mangroves in the village. Within the next ten years, the mangrove-planting project has had substantial effects on the surrounding environment. This paper seeks to describe these effects. Results point out that the mangrove restoration project has benefited the spawning ground and nursing grounds for particular species of fish, crabs and shrimps. At the same time, mangroves provide highly viable seed sources for the community particularly Tani Sejahtera, a non-governmental organization with which Universitas Terbuka engaged partnership during the project. The results attest to the strategic roles of higher education institutions most notably Universitas Terbuka in mangrove conservation through *Tri Dharma* enactment to preserve fisheries resources that aim for Society 5.0.

Key words: resources, mangroves, fisheries, Pangkep, Society 5.0

1 INTRODUCTION

Mangrove forests are a forest ecosystem commonly growing along the border area between sea and land, mainly tropical and subtropical areas that are protected. They thrive well around protected river mouths and have mud substrates. They are less dense in environments that have no river mouths. They cannot withstand high waves, and high and steep tidal currents that do not allow mud and sand deposits to be the growth medium. They flourish in coastal areas that have extreme salt levels, saturated water, and less stable and anaerobic substrates [1].

Mangrove ecosystems of Indonesia have a high diversity of vegetation. It is reported that 89 plant species comprising 35 species of trees, 29 species of epiphytes, 9 species of shrubs, 5 species of herbs, and 2 species of parasites are associated with mangrove habitats [2]. In the coastal environments of Surabaya, mangrove vegetation typically consists of 70 plant species comprising 25 true mangroves and 45 associate mangroves [3]. A study in West Bangka found 25 plant species from 19 families [4]. Mangroves are a highly viable ecosystem with various ecological, physical, and socio-economic benefits. It is therefore essential to preserve their sustainability.

Recent years have witnessed the loss of mangrove areas, posing threats to mangrove degradation. In 2021, Indonesia was home to 3.364.076 Ha of mangroves, with a dense category of 3.121.239 Ha (93%), medium 188.363 Ha (5%), and sparse 54.474 Ha (2%) [1]. The area declined by 3.58% from 2015 that spanned 3.489.140,68 Ha [2]. In South Sulawesi, mangroves occupy a mere 12.256,9 Ha [3], of which 60.4 Ha is located in Pangkajene Regency and Pangkep Islands [5]. Mangrove deforestation is primarily due to land conversion for various uses, such as agriculture, pond farming and residential uses. If this persists, mangrove degradation will eventually be detrimental to fish resources.

In line with the preservation of natural resources and environment, the role of Universitas Terbuka (UT) as the 45th state-chartered University

in Indonesia becomes more crucial to the sustainable development of mangrove ecosystems. UT is taking part of environmental conservation programs and at the same time is working toward the principles of *Tri Dharma* (three pillars of higher education), particularly embracing the third pillar that embodies teaching, research, and community service. In 2012, UT engaged in community-based projects in several areas including mangrove restoration in Tekolabbua Village situated in Pangkajene Subdistrict of Pangkajene Regency where 30.000 mangrove seedlings were planted. As the program aims for a rehabilitative purpose, it is essential that a descriptive study be carried out to review the extent to which the planting effort benefits the mangrove ecosystem in the village.

This paper not only highlights the vital role of UT in embracing the third pillar of *Tri Dharma* on which the mangrove-planting initiative is based but also overviews the overall condition of the mangrove plants and its benefits after 10 years since its initial planting.

2 METHODOLOGY

The paper is based on three methods there are, literature reviews that apply studies of scholarly literature typically books, articles, and reports associated with mangrove forests and their benefits; document analysis in which documents pertaining to the community-based project at the study location are interpreted to give meaning around the area of interest; and interviews with a local agricultural community named *Tani Mandiri* with which Universitas Terbuka of Makassar (UPBJJ-UT Makassar) engaged in partnership for the project.

3 RESULT AND DISCUSSION

3.1 The Importance of Mangroves

In Indonesian terms, "mangrove" and "*bakau*" (rhizopora) are often used interchangeably when it comes to addressing a type of forest that flourishes in the connective place between the land and the sea. However, they are not necessarily the same thing. While mangrove refers to an assemblage of plants that grow in intertidal areas between

the land and the sea, "bakau" (rhizopora) is defined as one type of plant species that composes the mangrove ecosystem [6]. Taxonomy-wise, rhizopora belongs to plantae (kingdom), viridiplantae (subkingdom), tracheophyta (division), spermatophytina (subdivision), magnolopsida (class), rosanae (superorder), malpighiales (order), rhizophoraceae (family), and rhizhopora (genus). Rhizopora species are generally classified into Oil mangrove (*Rhizophora apiculata*), Black mangrove (*Rirhizophora mucronata*), and *Rhizophora Stylosa* [4].

Mangroves provide essential benefits for humans and their surrounding ecosystems. In terms of ecological importance, mangroves are an ideal place for feeding, spawning, and nursery ground (enlargement area) for several notable's species of juvenile fish and crustaceans, and other sea organisms, as well as viable habitats for various birds, apes and others. In terms of physical importance, mangrove plants mitigate the energy and force of incoming waves and prevent coastal abrasion and seawater intrusion into the land. In terms of economic importance, mangroves have been exploited for fuel-wood consumption, charcoal production and building materials. Mangrove harvesting also contributes to industrial raw materials such as pulp, paper, textiles, food, pharmacy, and cosmetics, in addition to providing grounds for fish and shrimp seeds, and crabs.

3.2 The Role of Universitas Terbuka in Mangrove Preservation

With respect to its critical role in national sustainable development, Universitas Terbuka (UT) reflects on *Tri Dharma* and is working with a goal of environmental sustainability through various activities. In 2012, UT engaged in a community-driven project that empowered mangrove-seed planting in Tekolabbua Village situated in Pangkajene Subdistrict of Pangkajene Regency from 2012 to 2013.

The project is UT's real effort toward one-billion-tree campaign nationwide. The project was carried out in three regional units of Universitas Terbuka (UPBJJ-UT), including UPBJJ-UT Jakarta,

UPBJJ-UT Semarang and UPBJJ-UT Makassar. The objective in UPBJJ-UT Makassar was set to plant approximately 30.000 mangrove seeds in Tekolabbua village to slow the biodiversity loss. The project was established by LPPM UT (Institute for Research and Community Service of Universitas Terbuka) and was headed and implemented by a group of lecturers of UPBJJ-UT Makassar.

To achieve its objective, the project was conducted in typical steps involving activities that include: First, location survey that aimed to evaluate land availability and suitability for mangrove plants. The second is implementation that called for the participation of local stakeholders including the government of Pangkep Regency, students across all levels (from elementary to secondary), approximately 150 members of Masjid Youth Groups, LPPM UT, the Head and lecturers of UPBJJ UT Makassar, and the surrounding community. The third is monitoring and evaluating; monitoring was conducted three times, allowing any updates about the ongoing development or progress of the mangrove plants. The first monitoring was carried out within 40 days of planting, the second within 80 days, and the third within 120 days which also marks the handover of mangrove land to *Tani Nelayan Mandiri* delegated by its chief Ir. Hamsah. ***Figure. 2*** shows the monitoring and maintenance of mangrove plants, and the handover of mangrove land to *Tani Nelayan Mandiri.*

Figure 1*. Participants prior to seedling planting in Tekolabbua Village in Pangkep Regency.*

Figure 2. *Monitoring and handover of mangrove planting location after 120 days of planting to Tani Nelayan Mandiri in Tekolabbua Village, Pangkep Regency.*

To foster the survival and growth of the mangrove plants, the lecturer team of UPBJJ-UT Makassar conducted replantation twice in the location in 2014, both September 16 and December 21, as presented in ***Figure. 3***.

Figure 3. *Mangrove restoration in Tekolabbua Village, Pangkep Regency, 2014.*

The project was represented by a team of lecturers from 4 faculties, i.e., Faculty of Mathematics and Natural Science (now Faculty of Science and Technology), Faculty of Teacher Training and Education, Faculty of Social and Political Sciences (now Faculty of Law, Social Sciences and Political Sciences), and Faculty of Economics. ***Figure. 4*** showed the condition of mangrove trees within 10 years.

Figure 4. *10-year-old mangrove trees in Tekolabbua Village, Pangkep Regency.*

Mangrove rehabilitation through the replantation of mangrove ecosystems in areas where they have previously existed is part of ecosystem restoration agenda across coastal environments. At its heart, the project is coherent with the Sustainable Development Goals (SDGs), i.e., a shared blueprint to promote new development that nurtures changes toward sustainable development, including environmental development. In an explicit sense, mangrove development is defined in the 14th goal concerning the oceans and marine resources, and the 15th goal concerning land ecosystem (life on land) [7]. According to Bappenas (National Development Planning), the objective of sustainable development refers to the fourth pillar, i.e., environmental development [8].

Mangrove forest is a transitional ecosystem between the land and the sea, inundated during high tide and dry during low tide. Given this circumstance, the 15th objective of SDGs is integral to mangrove conservation schemes, i.e., the preservation of land ecosystems in a sustainable manner and the rehabilitation of degraded forests. Mangrove rehabilitation seeks to preserve mainland ecosystems and maintain mangrove sustainability and biodiversity that includes land organisms.

The embrace of *Tri Dharma* of Higher Education, particularly when it comes to the core value of community service, promulgates a landmark decision by Universitas Terbuka to contribute to environmental development through its commitment to advocating government's one-billion-tree scheme as previously shown from ***Figure. 1*** to ***Figure. 3*** This commitment is also visible in UT Go Green, an environmentally friendly concept that also incorporates mangrove restoration efforts. These efforts are not only about restocking trees, but also about nurturing their growth into viable ecosystems to ensure that the associated organisms thrive well in the ecosystem. The commitment is firmly instilled in Universitas Terbuka, particularly in UPBJJ UT Makassar, which manifests in the implementation of community-based mangrove planting project in 2012 followed by the independent mangrove replantation in 2014.

3.3 The Importance of Mangrove Plantation Program in The Sustainable Conservation of Fisheries Resources in Tekolabbua Village

Within the next ten years, the mangrove-planting project has had substantial effects on the ecosystem. Interview results with the chief of *Tani Nelayan Mandiri,* Ir. Hamzah (2020), provide evidence of how successful the effort has been and what benefits it has yielded.

3.3.1 Ecological Benefits

There are various indicators that identify more fish species in the location. The planting area has become a viable ecosystem that supports the survival of various marine species in the waters around the mangroves where nursery, spawning and feeding occur. This finding is consistent with several prior studies. A study in Badung River Mangrove Park found 14 fish species from 14 families and 7 orders [9]. 9 families including Ambasidae, Riidae, Mugilidae, Tetraodontidae, Phallostethidae, Drepanidae, Gobiidae, Aplocheilidae and Syngnatidae were found based on a study in Sayung Demak located in Bedoro Village [10]. A study in the waters of Sajoanging Subdistrict in Wajo Regency identified 7 families. i.e., Adrianichyntidae, Carangidae, Clupidae, Engraulidae, Gerreidae,

Gobidae, and Megalopidae [11]. These findings attest to mangrove ecosystem sustainability and its importance in fisheries resources.

3.3.2 The Benefits of Conservation

The conservation area of mangrove forests can be a source of mangrove seedlings that can be distributed in the surrounding areas. The potential of mangrove regeneration becomes higher when seedling sources come from the surrounding area, given that the inventory of mangrove seedlings is fundamental to make the living percentage of mangrove seeds higher, and in turn to provide benefits in a wider extent for the ecosystem.

4 CONCLUSION

Higher education institutions are the apex bodies in education system that play a pivotal role in the sustainable development of fisheries resources. The mangrove-planting project through community-driven program to advocate nationwide one-billion-tree scheme in Pangkep Regency has contributed positive outcomes to the sustainability of natural resources, particularly fisheries resources, which is aligned with SDGs programs by 2030 to usher in Society 5.0.

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