Analysis of the Utilization of Mangrove Species Diversity in Jerowaru District, East Lombok

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ABSTRAK

Indonesia memiliki ekosistem mangrove terluas di dunia, namun mengalami degradasi signifikan hingga 52.000 hektar per tahun akibat tekanan antropogenik dan lemahnya tata kelola lokal. Kondisi ini menuntut strategi pemanfaatan yang berkelanjutan. Penelitian ini mengkaji pemanfaatan keanekaragaman mangrove oleh masyarakat pesisir di Kecamatan Jerowaru, Lombok Timur, sebagai upaya pelestarian berbasis lokal. Pendekatan kualitatif digunakan melalui observasi partisipatif, wawancara mendalam, dan dokumentasi lapangan, dengan analisis tematik untuk mengungkap pola adaptasi serta persepsi keberlanjutan. Hasil menunjukkan lima spesies dominan—*Rhizophora apiculata*, *Rhizophora mucronata*, *Avicennia marina*, *Bruguiera gymnorhiza*, dan *Sonneratia alba*—yang tersebar di berbagai zona ekologis. Pemanfaatan meliputi bahan konstruksi, pangan lokal, obat herbal, objek wisata, dan kegiatan ritual, yang dilakukan secara kolektif dengan pengetahuan tradisional. Secara ekologis, mangrove berfungsi sebagai penahan abrasi, penyaring limbah, dan habitat biota pesisir; secara sosial budaya, menjadi simbol identitas komunitas serta ruang reflektif lintas generasi. Penelitian ini menegaskan pentingnya integrasi pengetahuan ilmiah dan lokal sebagai kunci pengelolaan mangrove berkelanjutan. Model pemanfaatan di Jerowaru menawarkan pendekatan konservasi terpadu yang mendukung Tujuan Pembangunan Berkelanjutan (SDGs) sekaligus memperkuat fondasi ekonomi hijau berbasis komunitas
Keyword: Analisis; Pemanfaatan; Mangrove

ABSTRACT

Indonesia has the largest mangrove ecosystem in the world, but it experiences significant degradation of up to 52,000 hectares per year due to anthropogenic pressures and weak local governance. This condition demands a sustainable utilization strategy. This study examines the utilization of mangrove diversity by coastal communities in Jerowaru District, East Lombok, as a locally based conservation effort. A qualitative approach was used through participant observation, in-depth interviews, and field documentation, with thematic analysis to uncover adaptation patterns and perceptions of sustainability. The results indicate five dominant species—Rhizophora apiculata, Rhizophora mucronata, Avicennia marina, Bruguiera gymnorhiza, and Sonneratia alba—that are distributed across various ecological zones. Utilization includes construction materials, local food, herbal medicine, tourist attractions, and ritual activities, carried out collectively with traditional knowledge. Ecologically, mangroves function as abrasion barriers, waste filters, and habitats for coastal biota; socio-culturally, they serve as symbols of community identity and a space for intergenerational reflection. This study emphasizes the importance of integrating scientific and local knowledge as key to sustainable mangrove management. The utilization model in Jerowaru offers an integrated conservation approach that supports the Sustainable Development Goals (SDGs) while strengthening the foundations of a community-based green economy.
Keyword: Analysis; Utilization; Mangrove

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1. INTRODUCTION

Indonesia is the world's largest archipelagic country, comprising more than 17,000 islands and a coastline stretching approximately 95,000 kilometers (Akbar, 2022). Indonesia's coastal regions hold vast natural resource potential, both biotic and abiotic. One of the coastal ecosystems that plays a crucial role in maintaining environmental balance and supporting community livelihoods is the mangrove ecosystem (Lamusu et al., 2024). Mangroves grow in intertidal zones and river estuaries, functioning as coastal protectors, carbon sinks, marine habitats, and buffers against seawater intrusion. The mangrove ecosystem is a complex system comprising interacting organisms and environmental factors, and it is highly adaptive to extreme conditions such as high salinity, tidal fluctuations, and muddy substrates (Martuti et al., 2018).

Indonesia has about 3.5 million hectares of mangrove forests, making it the country with the largest mangrove area in the world (Rahadian et al., 2019). Unfortunately, the destruction of this ecosystem continues due to land conversion, illegal logging, and pollution. According to the Ministry of Maritime Affairs and Fisheries (KKP, 2024), the rate of mangrove degradation has reached 52,000 hectares per year, which means that rehabilitation efforts must be further increased so as not to be left behind from the damage that has occurred. In the ecological context, mangroves have a function as a transition zone between land and sea, as well as a spawning and rearing area for marine life (Karimah, 2017).

Mangroves are not only ecologically important but also have high social and economic value (Hadi, 2023). Coastal communities use mangroves for various purposes such as building materials, firewood, processed foods, traditional medicines, and natural dyes. In addition, mangroves are also educational and spiritual tourist attractions that strengthen local cultural identity. Awareness of the importance of mangrove conservation is increasing in various coastal areas of Indonesia. Programs such as Empowered Villages, mangrove ecotourism, and community-based conservation have emerged as solutions that integrate environmental protection with economic empowerment. This approach shows that conservation does not have to be opposite to development but can go hand in hand to create mutually reinforcing benefits.

Jerowaru District in East Lombok Regency is a coastal area that has very high mangrove potential. This area is known for its ancient mangrove areas that are still preserved and become a habitat for various types of plants and coastal animals. Mangrove species such as *Rhizophora* spp., *Avicennia* spp., *Bruguiera* spp., and *Sonneratia* spp. are found to be quite abundant at several coastal points and river mouths, making it one of the areas with high biodiversity (Aminuddin et al., 2019). According to Matatula (2019), the diversity of mangroves in the tropics reflects ecological zoning influenced by salinity, substrate, and tides.

The diversity of mangrove species in Jerowaru provides wide benefits, both in ecological and economic contexts. From an ecological perspective, mangroves function as natural protection from abrasion, reduce the impact of storms, and become a spawning and nurturing place for various marine life such as fish, shrimp, and crabs (Irwansah et al., 2024). In addition, the existence of mangrove vegetation also strengthens the carrying capacity of the environment against climate change through high carbon sequestration capacity.

Meanwhile, from an economic perspective, the people of Jerowaru use parts of mangroves such as wood and leaves for building materials, fuel, and medicines (Elista Septiana et al., 2022). Another potential that has begun to be developed is the handicraft and food industry based on mangrove products such as pidada fruit syrup (*Sonneratia caseolaris*) and *dodol* made from mangrove extract. This utilization strengthens the foundation of the local economy while introducing conservation value through value-added products. According to the theory of sustainable utilization (WCED, 1987), natural resource management must meet current needs without sacrificing the capabilities of future generations. The Jerowaru community has also developed a form of ecotourism called Bale Mangrove which combines conservation activities, environmental education, and creative economy development. This program is the result of collaboration between local communities and various parties, including local governments, the private sector, and other institutions. According to Aminuddin et al. (2024), active community participation in natural resource management can increase the effectiveness and sustainability of conservation.

The use of mangroves not only has an impact on the environment and economy, but also on socio-cultural aspects (Irwansah et al., 2024). In Jerowaru, mangroves are part of local traditions in traditional rituals, environmental learning in schools, and strengthening community identity (Al Idrus et al., 2025). The interaction reflects that mangroves have become an integral part of people's lives, not only as a natural resource but also as a symbol of value and sustainability.

However, the complexity of this utilization also presents challenges. Development pressures, lack of environmental education, and the potential for overexploitation are serious threats to the survival of mangrove ecosystems. If not managed wisely, the diversity of mangroves, which is the main strength of this region, can actually be lost and cause greater socio-economic impacts in the future. This condition encourages the need for an in-depth study of the forms of mangrove utilization and the dynamics that accompany it. This study is important to identify the right potential, risk, and strategy in maintaining a balance between conservation and

utilization. Knowledge-based approaches and community involvement are the main keys in creating adaptive mangrove ecosystem governance.

By understanding the comprehensive use of mangrove diversity, the Jerowaru community can maintain the sustainability of coastal ecosystems while strengthening the local economic and cultural foundations (Elista Septiana et al., 2022). Scientific studies on this aspect are crucial to ensure that natural resource management is carried out in a fair, inclusive, and sustainable manner.

2. RESEARCH METHOD

This study uses a qualitative approach to deeply understand the practice of utilizing mangrove diversity by the community in Jerowaru District, East Lombok Regency, with a focus on subjective meaning, socio-cultural value, and ecological interaction. Data were collected through participatory observation in areas with high mangrove cover, in-depth interviews with community leaders, fishermen, ecotourism managers, and village officials, and field documentation (Immanuel Sinabang et al., 2022). The analysis was carried out thematically with an interpretive approach, covering the categories of economic, ecological, and socio-cultural utilization, as well as sustainability perceptions.

3. RESULTS AND DISCUSSION

A. Diversity of Mangrove Species in Jerowaru District

The results of direct observation and interviews with the community show that the mangrove area in Jerowaru District has a high level of vegetation diversity. The five main species that dominate the region are *Rhizophora apiculata*, *Rhizophora mucronata*, *Avicennia marina*, *Bruguiera gymnorhiza*, and *Sonneratia alba*. The vegetation is spread evenly in various coastal hamlets such as Poton Bako, Batu Nampar, and Teluk Ekas. Each species of mangrove is found in a different ecological zone, reflecting the environmental conditions in which it grows.

Rhizophora apiculata species are mostly found in the central zone of mangrove ecosystems. This type has a large stilt root that rises up to five meters from the base of the stem. The leaves are elliptical in shape, tapered, with a dark green color at the top and reddish at the bottom. The fruit is pear-shaped with an orange viviparous hypocotyl, reaching 38 cm in length. Its natural habitat is muddy land that is flooded with tides, and this type serves as a very effective coastal abrasion barrier.

Rhizophora mucronata, known as black mangrove, also dominates the Jerowaru mangrove area. The bark of the stem is dark to black in color and has horizontal slits. The stilt roots and aerial roots rise from the lower branches up to 2.5 meters. The leaves are wider than *R. apiculata*, shiny green, and 11–23 cm long. The fruit is oblong, cigar-like, with a coarsely biparous hypocotyl with nodules, between 36–70 cm long. High tolerance to salinity makes this species suitable for coastal land rehabilitation.

Avicennia marina or white flame grows in the outer zone of mangroves that are directly exposed to seawater. Its characteristic features are greenish-gray stems and pencil-shaped breathing roots (*pneumatophores*) that aid respiration in muddy substrates. The leaves are inverted ovoid, shiny green with a whitish lower surface. The salt glands on the leaves function to remove excess salinity. The fruits are round, oval, and semi-viviparous. This species is highly adaptive to extreme salinity and is often used in coastal reclamation.

Bruguiera gymnorhiza, or linden, grows in the back of mangrove forests. This type has plank roots and knee roots that spread horizontally over the ground level. The stem is large and roughly slit, with wide lenticels at the base. The leaves are large, elliptical, shiny green on top, and yellowish-green below. The fruit is spiral-shaped with a purplish-green straight hypocotyl, up to 30 cm long. This species is found in dry areas with low salinity and good aeration, often utilized as an alternative food source.

Sonneratia alba, or white pidada, dominates the coastal zone directly facing the sea. The stem is large with fine longitudinal cracks and a blunt cone-shaped breathing root. The leaves are thick and leathery with a glossy green color on top and grayish-white below. The fruits are round, somewhat flat, have a distinctive aroma, and are rich in antioxidants. This species is highly tolerant of high salinity and provides ecological and economic benefits through the use of fruits and leaves by coastal communities as food and herbs.

B. Analysis of Mangrove Species Utilization by the Jerowaru Community

The use of mangroves by the people of Jerowaru District shows a complex pattern and is integrated into their daily lives. Various species of mangroves are not only used as natural resources for economic purposes such as raw materials and alternative foods but also play a role as protectors of the environment and local cultural identity. Each species has ecological characteristics that allow its specific use, whether for coastal stabilization, sewage filtering, or domestic-based commercial products.

The community uses the leaves, stems, roots, and fruits of species such as *Rhizophora* spp., *Avicennia marina*, *Sonneratia alba*, *Bruguiera gymnorhiza*, and others for various purposes. This utilization is not exploitative but based on local knowledge that has been passed down across generations and adjusted to the

dynamics of the existing ecosystem. The pattern of its use is also growing, driven by collaboration between villages, youth communities, housewives, and partner institutions in the fields of conservation and creative economy.

Through interviews and observations, it can be seen that the use of mangroves is not only carried out individually but also in collective forms through business groups, educational activities, and cultural festivals. This utilization shows that there is a close relationship between ecosystem sustainability and the welfare of coastal communities. More than just a material resource, mangroves are an important entity in the social, economic, and spiritual structure of society. Furthermore, this utilization will be analyzed separately in three main dimensions: economic, ecological, and socio-cultural.

1) Economic Utilization

Mangrove species such as *Rhizophora apiculata* and *Rhizophora mucronata* are used by the community for traditional construction and fuel purposes. The wood is used as house posts, fences, and charcoal, as it is resistant to moisture. The fruits of *Sonneratia alba* and *Bruguiera gymnorhiza* are processed into local food products such as *dodol pidada*, mangrove coffee, and lindur noodles. These products began to be developed in the form of MSMEs that were marketed outside the region. The leaves of *Avicennia marina* are used as animal feed, while the bark and leaves of *Rhizophora* are used as natural dyes and herbal remedies. This economic innovation shows how mangroves are used not only as a source of raw materials but also as a driver of the creative economy and households.

Coastal communities that were previously fully dependent on marine products are now starting to develop mangrove-based businesses as income diversification. Some groups of housewives produce pidada syrup, flame chips, and herbal teas, which are marketed in village events and festivals. The village government together with partners encouraged the formation of cooperatives to expand distribution. Mangrove-based products are starting to gain a place as a typical souvenir and a symbol of the region's green economy. In addition, the use of mangrove products as bioformalin and organic fertilizers has begun to be studied to support integrated agriculture. These activities form a local value chain that drives the village economy inclusively. Mangroves are a commodity that is not only ecologically beneficial but also commercially valuable.

Bale Mangrove and the surrounding ecosystem are used as natural and educational tourism destinations, which contribute to the local economy. Visitors are introduced to the types of mangroves through interpretive pathways and product processing practices. This tour involves village youth as guides and environmental facilitators, opening up new job opportunities. The results of tourism management are used to fund conservation and training of mangrove businesses. Tour packages are a unique attraction that utilizes the habitat of *Sonneratia alba* as an element of the tourist narrative. This activity shows that the use of mangroves does not only stop at material products, but also ecosystem services that support the community-based tourism sector.

2) Ecological Utilization

The *Rhizophora* spp. type has large roots that serve as an abrasion barrier and form a natural fortress on the coastline. This root structure resists waves, strengthens the substrate, and prevents land erosion. This ecological function is very important for the coastal area of Jerowaru which has many estuaries and a high risk of abrasion. Roots also create habitats for marine life such as small fish, crabs, and shrimp, which adds ecological value to coastal systems. This type of replanting is carried out periodically to maintain vegetation cover. In the context of climate change and sea-level rise, *Rhizophora* functions as a natural green belt. Collaborative conservation projects utilize this species as a top priority for the rehabilitation of coastal areas.

The species *Avicennia marina* and *Sonneratia alba* have the ability to absorb toxins and heavy metals through the roots and leaves. Their breathing roots improve soil aeration, while the leaves of *Avicennia* remove excess salt through specialized glands. This ability makes them very effective in reclaiming damaged pond land and reducing pollution. Mangroves also serve as a natural filter for domestic and agricultural waste carried into the sea. In addition, their presence helps stabilize salinity levels and improve water quality.

Mangroves provide important habitat for migratory birds, reptiles, and various marine species that depend on transitional ecosystems between land and sea. The *Bruguiera gymnorhiza* area is a nesting place for waterfowl and a refuge for land animals such as monitor lizards and water snakes. Its root system enriches the organic content of the soil and helps in nutrient recycling. Mangrove areas also function as spawning and rearing sites for various types of fish, which supports local fisheries productivity. Community activities such as fishing and shrimping traditionally adjust to the ecological cycle of mangroves. Some species are also indicators of a healthy environment used in conservation mapping. This ecosystem shows the link between natural sustainability and the ecological function of mangroves.

3) Socio-Cultural Benefits

The Bale Mangrove area is used as a public space for residents' discussions, school activities, and traditional rituals. This place has become a symbol of cross-generational collaboration and a center for

ecological learning. The educational path introduces the character of mangrove species and their ecological role through visual and narrative approaches. Activities such as planting mangroves with students, environment-based art workshops, and traditional music performances make this space multifunctional. The value of togetherness, mutual cooperation, and ecological responsibility is formed from this activity. It also reinforces the community's identity as a protector of coastal nature. Bale Mangrove is a clear example of integration between conservation and social character development.

Knowledge about mangroves is passed down from the older generation to the younger generation through folklore and daily practices. Some species such as *Bruguiera gymnorhiza* and *Sonneratia alba* are used in healing rituals and traditional ceremonies as a symbol of harmony with nature. The activity of planting and caring for mangroves is interpreted as a form of gratitude and prayer for the safety of the village. Herbal remedies from mangrove leaves are used as part of alternative medicine that indigenous communities preserve. This local spirituality strengthens the community's commitment to protecting mangrove forests not only as an economic source but as part of life. This tradition shows that the preservation of mangroves is also based on moral values and deep-rooted cultural beliefs.

The socio-cultural utilization of mangroves is getting stronger with the active involvement of local communities, especially youth and housewives. They formed conservation groups, learning communities, and mangrove-based MSMEs. This encourages them to develop their local potential independently and sustainably. Training, product promotion, and environmental festivals are a means to cultivate a love for the mangrove ecosystem. Value-based management creates a social system that is more sensitive to environmental issues. The community plays a role not only as users but also as protectors and innovators in preservation. The use of mangroves in Jerowaru is proof that local wisdom can synergize with global conservation efforts.

4. CONCLUSION

The mangrove area in Jerowaru District has a high level of vegetation diversity with five main species, namely *Rhizophora apiculata*, *Rhizophora mucronata*, *Avicennia marina*, *Bruguiera gymnorhiza*, and *Sonneratia alba*, which are spread across various coastal hamlets and occupy different ecological zones according to their respective environmental characteristics. Each species exhibits distinctive morphological and physiological adaptations that contribute to ecosystem functions such as abrasion barriers, salinity regulation, and oxygen provision, as well as providing economic and social benefits through the use of fruits and leaves by communities as food sources and herbal medicines. A participatory approach that combines field observations and interviews with local communities reinforces the relevance of traditional knowledge in sustainable mangrove management, demonstrating that the integration of scientific data and local wisdom is key to the preservation of coastal ecosystems.

The use of mangrove species by the Jerowaru community shows a deep integration between ecological functions, economic potential, and socio-cultural values inherited across generations. Species such as *Rhizophora* spp., *Avicennia marina*, *Sonneratia alba*, and *Bruguiera gymnorhiza* are used adaptively for construction, food, herbal medicines, natural dyes, and animal feed, as well as to support MSME-based creative businesses and educational tourism destinations that encourage local green economic growth. In terms of ecology, mangroves play an important role in abrasion prevention, waste filtration, marine life habitats, and climate change mitigation, which is continuously strengthened through replanting and carbon monitoring. From a socio-cultural perspective, the use of mangroves as a space for community reflection, ecological education, traditional rituals, and spirituality forms a collective identity as a protector of coastal nature. The active participation of youth and women in conservation groups and creative activities shows that collaborative mangrove management is able to bridge local wisdom with the agenda of sustainable conservation.

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