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Mangrove forest utilization policies reconceptualized with a view to improving the regional economy in Aceh Tamiang District, Indonesia

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Abstract. *Natsir M, Ulya Z, Fitriani R. 2022. Mangrove forest utilization policies reconceptualized with a view to improving the regional economy in Aceh Tamiang District, Indonesia. Biodiversitas 23: 6570-6578.* One of the Aceh's (Indonesia) districts with mangrove forests is Aceh Tamiang District. Manyak Payeud, Bendahara, Seureuwey, and Banda Mulia are the four sub-district in the Aceh Tamiang region that have the most potential tourist sites. However, due to the widespread illegal logging of mangroves carried out by the community to suit their daily requirements, the preservation of mangrove forests in the four sub-districts above is seriously damaged. As a result of illegal logging, mangroves are becoming less common in Aceh Tamiang District. Therefore, a unique policy, which can incorporate both community needs and economic development, is needed to manage the mangroves of Aceh Taminga District. The expectation is that mangrove management will enable Aceh Tamiang District to develop tourist attractions in this study. The normative juridical research methodology with SWOT analysis was applied in this study to understand the potential of mangrove management in improving the regional Economy in Aceh Tamiang District. The findings of this study are based on a SWOT analysis of four subdistricts in Aceh Tamiang District. The result suggests that the notion of forestry policy can support both local community interests and regional economic development. Additionally, it can be carried out through the Village Qanun to raise community awareness of the need to maintain and manage mangroves to enable the implementation of regional plans. To harmonize the understanding of the significance of mangroves as one of the regional tourist destinations, institutional coordination between the Aceh Tamiang district government and the provincial and central governments can also be used to realize the development of Aceh Tamiang tourism policies.

Keywords: Mangrove forest, reconceptualization, regional economy

INTRODUCTION

Indonesia is the largest archipelagic country in the world, and Indonesian territorial seas make up about 2/3 of Indonesia's land area and offer a wide variety of biological resources, which are imperative for the sustainability of coastal communities and the country's economic development (Harefa et al. 2020). Mangroves are one of the important biological resources for Indonesia's coastal areas and are present in almost all coastal areas in the Indonesian Archipelago, ranging from Sumatra in the West to Papua Islands in the East. Indonesia alone comprises one-fifth of the global total mangrove area (Leal and Spalding 2022) and has 47 true mangrove species, representing a higher species diversity than any other country in the world (Suwanto et al. 2021).

Mangroves are the second-largest ecosystem service providers for the dependent coastal communities, next only to coral reef ecosystems. Located in a transition zone between marine and terrestrial ecosystems (Balandier et al. 2022), mangroves provide various ecosystem goods and services (Hilmi et al. 2021). Particularly, the scientific community and policymakers highly appreciated mangroves' carbon storage, fishery production, and coastal protection services in the recent decade (Kathiresan 2018; Ragavan et al. 2019; Salminah and Alviya 2019). In addition, recent studies also reveal that mangroves can act as a buffer for Ocean acidification (Sippo et al. 2016), coastal eutrophication (Wang et al. 2021) and act as a sink for micro-plastics (Martin et al. 2020). Despite the significant ecological and economic services, mangrove forests and other coastal woods are disappearing at an alarming rate (Riwayati 2014). Major threats to the loss of mangroves are human encroachment, shrimp farming and other forms of aquaculture, farming, illnesses, catastrophic events and frequent hydrologic changes, rising ocean levels, and insufficient recovery (Khan et al. 2021). As per the recent estimate, mangroves have experienced an annual loss of between 0.16% and 0.39%, globally, because of rapid coastal development (Hamilton and Casey 2016). In South Asia, mangrove forests have been lost at an average rate of 0.18% per year (Richards and Friess 2016). Globally, the area of mangroves decreased by 1.04 million ha between 1990 and 2020 (Leal and Spalding 2022). The rate of loss more than halved over the three decades, from 46,700 ha per year in 1990-2000, to 36,300 ha per year in 2000-2010, to 21,200 ha per year in the most recent decade. There was a substantial increase in the average

annual rate of mangrove loss in Asia, from 1,030 ha in 1990-2000 to 38,200 ha in 2010-2020. The increased loss rate was due mainly to Indonesia, which reported an average annual loss of 6,800 ha in 1990-2000 and 21,100 ha in the most recent decade (Leal and Spalding 2022).

In Aceh province (Indonesia), the extent of mangrove covers 26,960.94 ha, of which 33,054.17 ha are in forested areas, and 6,093.23 ha are outside of forested areas, according to data gathered by the Ministry of Marine Affairs and Fisheries through One Map Mangrove. It is pertinent to note that about 3,700.95 ha of mangroves in this region are critically damaged (Prasojo 2021). Following are the major mangroves areas along the Aceh Province, East Aceh District (80.45 ha), Langsa City (5,253.15 ha), Aceh Tamiang (15,447.91 ha), North Aceh (959.11 ha), Lhokseumawe (88.34 ha), and Bireuen (25.57 ha). A district in Aceh Province with the largest mangrove area is identified as Aceh Tamiang District (Hanafiah 2022). However, 75% of the mangroves in the Aceh Tamiang District are in a severely damaged state, according to a report by Antaranews. Unrestricted land conversion and unlawful logging are the main causes of mangrove degradation/loss in Aceh Tamiang District. At the national and provincial levels, there are several policies relating to mangrove management, both in the form of legislation and programs. However, mangrove management strategies have a number of problems, such as conflict and ambiguous policy objectives, a lack of cooperation between authorities, and challenges in putting policies into practice on the ground (Swastika et al. 2017; Salminah and Alviya 2019).

In the view above, in the present study, the Aceh Tamiang District has been selected as the study area and it has been conceptualized that regional development through efficient utilization of mangroves, particularly in the coastal region of Aceh Tamiang, would prevent the mangrove loss/degradation and ensure the sustainability of mangroves.

The main objectives of the present study are: (i) How are the best practices for mangrove management and use related to local policies aimed at boosting the local economy? (ii) What more steps should be taken to enable mangroves to develop into an agrotourism industry that can boost the local economy?

MATERIALS AND METHODS

This study employs the normative juridical research methodology (Soren 2021), which is the study of laws that are conceptualized and developed by the doctrines established by the drafter and/or developer (Kothari 2004). The research location is Aceh Tamiang District, Aceh Province, Indonesia (Figure 1).

The method used to analyze the issues raised by this study is qualitative (Natsir et al. 2019), and involves looking at several laws about the preservation of mangroves, enhancing the local economy, and investigating community culture. Further, the Aceh Tamiang mangrove buffer area's management strategy was developed using the SWOT analysis (Rozemond 2018). This approach aims to discover distinct internal and external influences methodically. The source of information gained is secondary information, which is made up of primary, secondary, and tertiary legal sources (Angkasa et al. 2019).

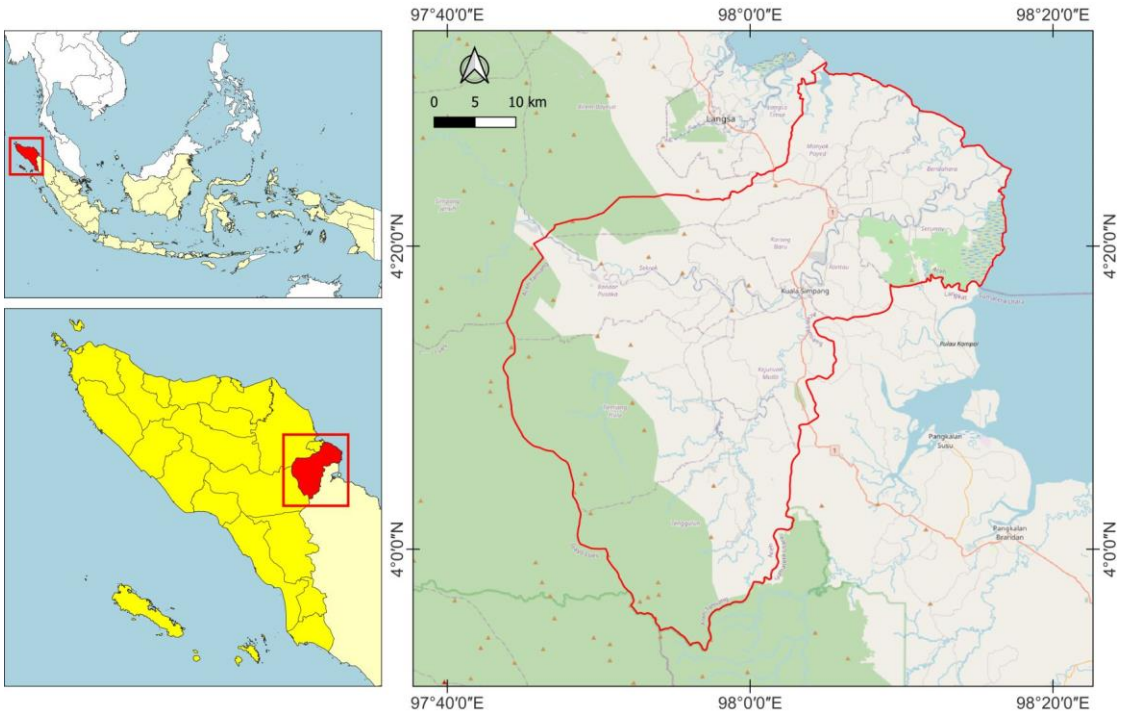

Figure 1. Location of sampling sites in Aceh Tamiang District, Aceh Province, Indonesia

RESULTS AND DISCUSSION

The ideal concept of mangrove management and utilization is linked to regional policies to improve community economy

On the east coast of Aceh Province, the Aceh Tamiang District is home to the largest mangrove forest, which supports several protected ecosystems and wild animals (Ely et al. 2021; Guo et al. 2022; Yunianto and Kurniawan 2022). Even though they are currently in poor shape as a result of mangrove land being converted to fulfill the demands of the neighborhood, all kinds of natural resources in the mangrove area generally provide advantages for the community (Osorio et al. 2017; Firdaus et al. 2021; Adnan et al. 2022).

However, the loss of mangroves as legally required protected forests is undoubtedly a result of the increase in land conservation that goes hand in hand with population growth. It is well recognized that one of the consequences of the population boom is a rise in land acquisition for habitation and development, which in turn results in ecological losses (Kiolol et al. 2017). It is also underlined that the community's transfer of advantages to fulfill needs for daily living in business and personal interests is also a contributing factor in the harm to the mangrove ecosystem (Reyes-Perez et al. 2021). Conversion, particularly clearing land for aquaculture and agriculture, transforms primary and secondary mangrove forests into non-mangrove forests.

An overview of mangrove disturbance is provided by several recent studies and scientific reviews (Hamilton and Casey 2016). Mangrove loss can result in natural calamities like coastal erosion (Goldberg et al. 2020). Additionally, the loss of mangroves is the first step in the degradation of biodiversity, both in terms of quality and quantity, which substantially impacts coastal economies (Shah and Ramesh 2022). Mangrove degradation results in the loss of a significant ecological niche where fish, marine animals, and migratory species can feed, reproduce, and hatch. Because many coastal residents depend on marine resources and the fishing sector, the loss of mangroves also has a hugely detrimental impact on the coastal Economy (Hakim et al. 2017).

Of course, the government must create policies to address the above issues as part of its concern for the environment (Nugroho et al. 2008). Mangrove management policies must be founded on the community's economics, local knowledge, and the resilience of the mangrove ecosystem (Figure 2). One suitable approach that can be used in mangrove management and protection strategies is the idea of Agroforestry. Mangrove forests and their priceless services may disappear in some locations if proactive policies that aim to halt the negative trend and protect this system are not implemented effectively. Mangrove forests are also among the most delicate ecosystems in the world, and during the past 50 years, they have dramatically declined due to significant coastal development (Nguyen et al. 2020).

The "Agroforestry idea," which combines forestry and agricultural operations in one land management unit, is an optimal and sustainable land use management method and aims to boost community incomes, employment possibilities, and forest product output (Miswadi et al. 2015). Any land-use strategy, technique, or technology that integrates woody perennials with crops and animals in the same land management unit, in some spatial arrangement or temporal sequence, is called Agroforestry (Widyati et al. 2022).

Recently, particular focus has been placed on managing model agroforestry practices that serve economic and ecological purposes (Boinot et al. 2022). There have been several invasions by miners, fires, plantations, residential areas, and unchecked harvesting of forest products in forest areas. The necessities of human existence are significantly impacted by agroforestry, which serves as a water buffer zone, a watershed protection against erosion, an animal habitat and food source, as well as a primary source of animal feed and wood products (Jose 2019). Management of forests outside protected areas that become zone buffers should be carried out with integrated and synergistic activities.

The Ministry of Environment and Forestry (KLHK) has been implementing the Social Forestry program since 2016, and one of the systems is included in Agroforestry. Agroforestry is thought to be capable of improving the welfare of communities surrounding forest areas as well as bolstering the food security system during a pandemic.

The diagram that can be used to design policy for the management and preservation of mangroves is as follows:

Several government-set public policies are illustrated in the sketch above. However, the management of mangrove areas also results in expanding the mangrove area to relieve pressure on the existing mangrove forests while continuing to meet community demands for mangrove wood, particularly for cerocok wood and wood for raw material in the production of charcoal, if the policy can strike a balance between economic growth and environmental needs.

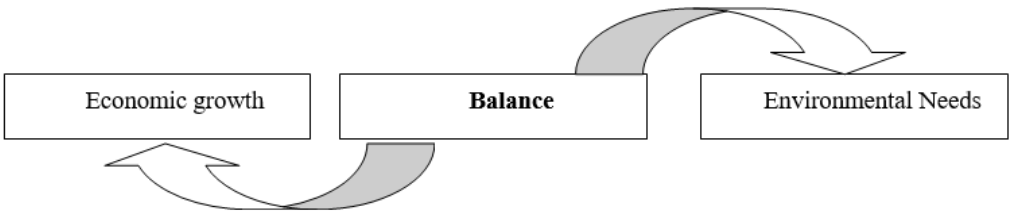

Figure 2. Design policies for the management and preservation of mangroves

A SWOT analysis can be applied, with stages comprising inventory, evaluation, and strategy development against internal and external elements, in Aceh, particularly Aceh Tamiang District, to investigate the context of balance in the selection of mangrove protection and management policies.

Strengths

In light of Aceh Tamiang District's natural surroundings, which include 4 coastal sub-districts rich in mangroves, it should have been able to draw both local and outside communities as tourism destinations. It can be advantageous for tours of the mangrove region if fishermen in medium-sized boats always travel along the path of the mangrove area. Biodiversity is abundant, and if it can be protected, it will undoubtedly encourage the development of fishing boats, increasing the appeal of mangrove ecotourism. Larsen believes that the tourism experience is the function of a personal psychological process, including expectation, perception and memory, and the quality of experience will leave a different degree of recollection in the hearts of tourists (Li and Zhao 2021).

Learning about visitor satisfaction is interesting because it's always a key factor in building tourism destinations. Agrotourism and nature tourism are two forms of travel that consistently draw visitors of all ages (Shevchuk et al. 2022). Agrotourism is the idea of using natural resources, with the major draw being stunning natural landscapes and nuances of beauty (Kinasih et al. 2020). The actual site of Tanjung Kramat Village and Alur Nunang Village is in Bandar Mulia, one of Aceh Tamiang's four (four) coastal districts. Pulau Rukui Beach in Alur Nunang Village, which is renowned for being sustainable, also supports this (Mufti 2019).

When there is a high tide, the nearby land will be submerged and appears to be splitting from the unstable estuary. Additionally, the shoreline is frequently altered by the occurrence of water currents. The neighborhood has long been aware of this distinction. Based on the recreational and tourism conditions present in Aceh Tamiang, it can be said that this region has a lot of potential for use as a recreation and tourism destination because it has unique natural phenomena and potential conservation areas that are parallel to and accessible from popular tourist destinations.

The Tamiang coastal biodiversity is protected, and several other subdistricts, including Manyak Payeud District, have sea tuntung (*Batagur borneonsis*) and Windu Shrimp (*Penaeus monodon*). Aceh Tamiang's seas are one of the places where high-quality tiger prawns are produced (*P. monodon*). Tiger shrimp are a high-value fishery commodity due to the strong market demand for their production. Tiger shrimp production from cultivation operations needs a plentiful supply of seeds from top-notch tiger prawns to be successful. Conservation efforts must be made to protect tiger shrimp broodstock from overfishing, disease risks, and genetic preservation to ensure its sustainability and availability (Anonimous 2020).

Weaknesses

Managing mangroves in Aceh Tamiang District has several things that could be improved, particularly in several coastal areas. For instance, mangrove forest educational tourism witnessed major drawbacks due to governments instituting mobility restrictions and business closures during the Covid-19 pandemic (Hu et al. 2021). As a result, the ecosystem needs to be more effectively controlled and tourism becomes less environmentally friendly due to a lack of care in Pulau Ruku Beach, Alur Nunang Village, and Banda Mulia District. Additionally, a 7 km stretch of road leading to a place that can only be reached on foot has also been damaged. Covid 19 pandemic has paralyzed the economy of each region, so the government's role is needed in establishing specific policies to improve the community's economic sector (Bustami et al. 2021).

Mangrove forests in numerous sub-districts, including Banda Mulia, Manyak Payeud, and Seureuwey, are also degraded as a result of illegal logging by both local communities and individuals living outside the village to support their daily requirements. In addition, public facilities that should be used to boost the economy, like Fish Auction Places (TPI), are continually ignored. As indicated below, this lies in the vicinity of Tanjung Kramat Village in the Banda Mulia District (Figure 3).

Additionally, there are a lot of land conversion efforts that are deemed ineffective. For example, the mangrove forest in Seruway District suffers from an imbalance (damage), loss, and reduction of the ecosystem as a result of this transfer of function, and as a result, the livelihood of the local community (traditional fishermen) has decreased and biological wealth as an important value is threatened. Feared to go extinct, beneficial for tourism, education, and medicine.

Sharks, rays, dolphins, groupers, and other commercial fish are among the fish lost in and around these seas. The types of crabs, shrimp, and shellfish become quite hard to find in addition to the type of fish. Additionally, the ecosystem of mangrove forests is impacted by the diminution or even extinction of several forest species, including birds. Numerous birds and animals have either never been seen or completely vanished.

Figure 3. The situation of Fish Port Facilities (TPI) in Tanjung Kramat Village, Aceh Tamiang, Aceh, Indonesia

Opportunities

There are many options that the Government of Aceh Tamiang can use mangroves to expand the coastline tourism industry. The biodiversity and byproducts of mangrove forests have huge advantages over the current tourism destinations.

Nurlina et al. (2022) have highlighted that "having a tourist destination on Rukui Island can boost economic activity and create jobs for the local population." Additionally, there is a chance to draw investors through the expansion of the Rukui Island tourism destination. The last chance is the desire of the local community to be personally involved in the development of Rukui Island attractions in the very high category. This is in addition to the intensity of the number of tourists who wish to visit Rukui Island attractions (Nurlina et al. 2022).

In the meantime, if the mangroves' are preserved/ managed appropriately, their biological outcomes also have significant economic worth. Being a coastal region well known for producing Windu Shrimp, Aceh Tamiang Region can improve its economic standing, particularly in increasing regional income. The products of the mangrove forest resources are then primarily used to make syrup, crackers, and other delicacies, which, if packaged properly, will obviously become a lucrative local industry.

Threats

Some facilities and infrastructure that should offer significant benefits have been ignored due to the community's low legal awareness about protecting natural resources. Large-scale logging is widespread because of this and because the population still has a significant need for mangroves. This extensive logging depletes the biological diversity of mangroves, making several animal species scarce. Tourist attractions that should be kept up become slums because people don't care about the environment as much as they should.

Access roads to places deemed damaged or even cut off the need to be considered a threat. For example, it will be challenging for people to get to coastal mangrove areas without simple access.

Referring to the SWOT analysis as a whole, the following scheme can be used to create policies that are reasonable and consistent with the idea of agroforestry (Figure 4):

The formulation mentioned above can be deemed appropriate given that shifting the function of coastal conservation activities will significantly impact the environment. Therefore, to maintain a balance between human needs and locally based economic development, agroforestry is, of course, the best option available. The government can implement these measures without worrying about conflicts with other or more stringent rules. With the help of this regulation, all coastal resources can be effectively controlled and maintained.

The community jointly administers and safeguards forest lands through agroforestry operations as part of the social forestry program. Agroforestry activities can also protect forest areas from the possibility of unilateral land conversion. For further development, it is necessary to understand how local communities feel about ecotourism locations. This is founded on the idea that ecotourism requires community participation in the management process (planning, monitoring and evaluation). The neighborhood's interest in managing attractions was nonexistent when it first started. However, in every meeting with traditional leaders and the local communities, management provides the most recent information on developments and plans (Harianto et al. 2020).

Follow-ups must be made in the mangrove empowerment project so that it can develop into an agrotourism industry that can boost the local economy

Researchers are interested in studying the issue of mangrove conservation in several facets. Numerous policies and programs have been implemented to safeguard and keep mangroves as one of the protected ecosystems (Armawi et al. 2022). However, several challenges to protecting mangroves are faced because of communal endeavors based on sustaining life.

The best option for preserving the mangrove ecosystem and all of its natural resources can be seen as agroforestry, where the satisfaction of demands and economic growth coexist so that it is believed that it won't interfere with or be in conflict with higher restrictions.

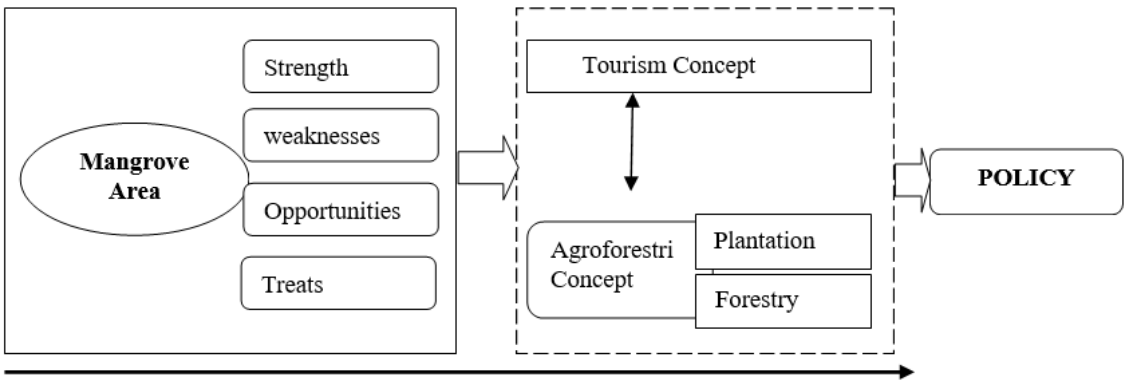

Figure 4. SWOT analysis plan for creating policies for mangrove areas

Each component that makes up agroforestry is a mixture of others yet can function alone. Agriculture, forestry, animal husbandry, fisheries, and beekeeping are the elements of agroforestry (Mason et al. 2022). Agroforestry is divided into many categories based on viewpoints and interests. Agroforestry is categorized in several ways, including according to its constituent parts, the technical terms employed, the development period, the agroecological zones, the economic orientation, and the scope of management (Wulandari et al. 2020).

This agroforestry and intercropping system aim to raise the standard of living in the village communities surrounding the forest by giving smallholder farmers or rural residents the chance to cultivate food crops. In addition, villagers close to the forest are required to actively participate in efforts to preserve and stop forest and land destruction in this way (Mayrowani and Ashari 2011; Tamga et al. 2022).

Overall, the advantages of managing forests through the concept of agroforestry are: (i) increased food production, farmers' income, job opportunities, and improved quality of community nutrition to achieve the welfare of farmers around the forest; (ii) increased knowledge and skills of farmers in the hope that an agricultural intensification system can be developed on dry lands in rural areas, which means increased productivity of dry agricultural land.

Mangrove forest restoration and rehabilitation is a crucial and ambitious task. It is vital to map the distribution and area of mangrove forests and the type and density of their level of life if they serve additional purposes (Girolami et al. 2023). Mangrove forests are in diminishing condition because coastal areas are frequently exploited as multifunctional land due to different human activities that take place there, both in harmony and against competing interests (Melana et al. 2000; Dwi et al. 2021).

Mangrove coastal areas are utilized not just for ecotourism but also for the growth of the agrotourism industry. The potential of productive sources is also developed by turning mangroves into an agrotourism destination. Naturally, if successful, small-town economic development will continue on its own and may even help raise regional income. Agrotourism is all tourism-related activities that educate visitors about the agriculture industry's production methods and turn rural areas into destinations where they may directly consume agricultural products (Hoose et al. 2021). In addition, local farmers may have the opportunity to boost their revenue and improve their living conditions with the growth of agrotourism (Swastika et al. 2017). Therefore, it goes without saying that to preserve mangroves, real efforts must be made to halt any activity that could harm them. With the help of various cutting-edge models, the notion of usage, initially utilized for the demands of life and the economy, may be improved so that people who depend on mangroves can survive and boost their economies simultaneously. This is seen in Figure 5.

Looking at the below scheme, it is clear that the mangrove management policy utilizes the concept of agroforestry if applied in Aceh Tamiang. At the very least, it can be calculated that the development of the mangrove area will result in areas that are not just used for ecotourism but also for agrotourism. All of the mangrove's natural components, including the stems, leaves, roots, and others, may be processed and made into goods like paints, syrups, medications, and other affordable things and, of course, assist the community with the growth of agrotourism. In addition, the regional income will greatly increase if the community's economic income sector grows.

As a result, the strategic planning for the growth of mangrove tourism in Aceh Tamiang takes into account the potential for developing eco-green product innovations alongside mangrove agro-tourism by maximizing the potential for the existence of Micro, Small, and Medium-Sized Enterprises (MSMEs) as proponents of tourism development because it might potentially become Aceh Tamiang's first agrotourism destination if the MSME sector and mangrove tourist work together.

The strategy mentioned above's design can, of course, be considered in regional policies so that it has legal validity and must be implemented by the community. The policy also gathers information on how to control product development tactics to develop the potential for mangrove agro-tourism, which must prioritize the development of current products, mangrove tourism, and MSME products.

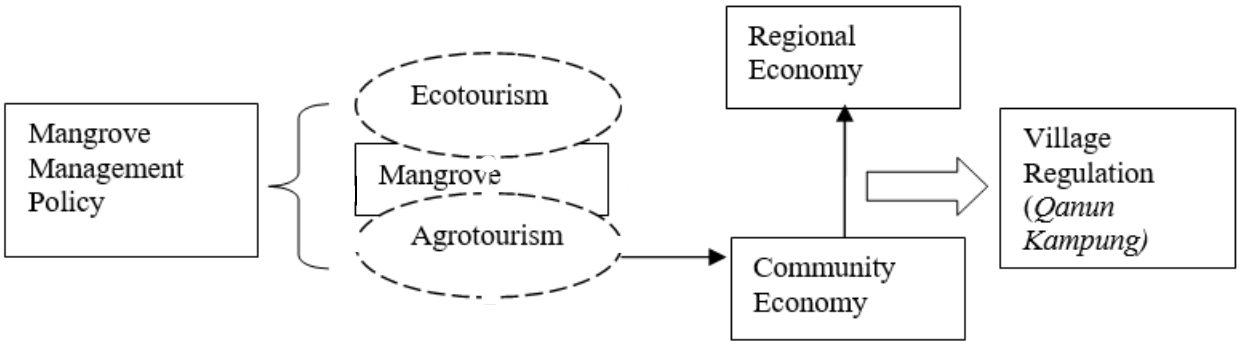

Figure 5. Mangrove management policy scheme

There is no policy that determines the course of Aceh Tamiang's tourism development, according to all of the current laws in the region. Therefore, the policy's scope can be implemented at the lowest level, such as village rules (Qanun Kampung). The Aceh Tamiang Regent Regulation Number 32 of 2018 about the List of Village Authorities Based on Origin Rights and Village-Scale Local Authorities serves as the justification for creating a village qanun level policy (Azaki and Lutfi 2022).

In Aceh Tamiang, the implementation of legislation for mangrove management at the village level is at least capable of fostering the growth of community forests and social forestry enterprises. Involving the neighborhood that surrounds the forest can also be used to lead it toward appropriate planning and governance. It is hoped that establishing this village rule would also contribute to the growth of institutions and group entrepreneurial capacity that will impact the rural economy, help to utilize and exploit state forests, generate employment opportunities, and enhance community welfare.

Discussion

The agroforestry system is expected to optimize land productivity so that people can continuously harvest the results, depending on how much variety of species is combined in one field and the management system. Therefore, the choice of plant species composition and how to manage them is very important in determining the success of this agroforestry system. But on the other hand, agroforestry has enormous promise for the success of the farming community's greening movement.

Agroforestry may combine agricultural and forestry technology to create more efficient, lucrative, and environmentally sound land-use systems. Agroforestry, which combines the forestry and agricultural sectors, is a form of ecologically dynamic resource management that may boost biodiversity and sustainable output. Alternative solutions for managing sustainable output include agroforestry systems. These systems include trees that draw nutrients from the soil's deeper layers and leaf litter to boost the soil's quality. In addition, the agroforestry system is a closed ecosystem that best supports soil nutrient retention, so crops may benefit from it (Widyati et al. 2022).

Because of the potential for biodiversity and its effects on other ecosystems, particularly the coastal ecology, which is one of the mainstays of tourism in the area, the usage of the forest by the local people is crucial (Sánchez et al. 2021). To maintain forest sustainability and improve the efficiency of implementing forest sustainability management policies for target communities, it is important to understand the factors influencing communities surrounding the forest in how it is exploited. The present study results indicate that, despite the district's well-known abundance of natural resources, Aceh Tamiang District currently lacks a tourism development strategy and the mangrove forests of Aceh Tamiang District can be used for ecotourism, which will benefit the local economy.

However, the possibility for Aceh Tamiang to expand the tourism industry in its mangrove forests appears to be diminished by the existence of centrally administered legislation due to the management controversy around the protection of mangrove ecosystems (Sulaksana et al. 2021). Therefore, it is necessary to redirect utilization sources to create opportunities for the restoration of existing mangrove forests, including through the creation of community forests in the form of mangrove plantations, to take alternative actions to reduce the quantity and quality of mangrove forests from the direct use of mangrove wood.

Additionally, logging mangroves in coastal areas by local communities, which harms both forest areas and other biological resources of mangrove ecosystems, has worsened the condition. Thus, Natsir and Rachmad (2018) have claimed that "any environmental activity generally has the potential to cause environmental contamination in its development." When natural or human-made processes alter the environment's natural order to the point where its quality falls below a specific threshold, the environment becomes polluted and ceases to function as it should (Natsir and Rachmad 2018).

The idea of agroforestry is to boost people's income, employment prospects, and the output of forest products. The expansion of the mangrove area is indirectly possible by transferring useful sources to the land beyond the area. In terms of ecology, the expansion will impact Aceh Tamiang's mangrove forests. In a limited sense, this open space is referred to as a mangrove buffer region.

Planning for tourism at the local level requires competent administration, community involvement, and empowerment. This includes initiatives such as (a) building governance to achieve a positive experience and well-being, (b) developing infrastructure to meet environmental conservation, (c) integrating the promotion of tourism through product development and market segmentation, and (d) interpreting to provide the education of cultural and environmental conservation (Lestari et al. 2021).

Because the development and adoption of tools to prevent pollution and/or environmental damage as well as law enforcement, necessitates the integration of aspects of transparency, participation, accountability, and justice. The legislation regulates the existence of support for the principles of environmental protection and management based on good governance. It is not simple to manage mangrove forests as a protected area next to the land used by residents. The challenge is finding a balance between community livelihood and mangrove forest preservation. The use of mangrove forests by locals to boost their income is common, but they have little awareness of the wetland life cycle in the mangrove environment (Situmorang 2018).

Mangroves provide enormous benefits to people's lives, necessitating a unique policy idea that can balance their requirements and the government's ambition to boost the economy by using mangroves as tourist sites (Afifah et al. 2021). In Aceh Tamiang, policies that strike a balance between addressing community needs and regional economic needs can be implemented without running afoul of stricter rules. However, an agro-tourism must get assistance through promotions during its development to be publicized, draw in more tourists, educate them, and boost managers' incomes (Esti et al. 2020).

The advantages of mangrove ecosystems in terms of physical functions include disaster mitigation, coastal protection from abrasion, tidal waves (rob), tsunamis, mudguards and sediment traps transported by surface air currents, preventing the intrusion of seawater into the land, as well as being able to penetrate waters to a certain extent (Utomo et al. 2018). On the other hand, mangroves are harmed by at least three main factors, including excessive logging, conversion of mangrove forests without consideration for environmental issues, and pollution (Sambu et al. 2018).

With the help of this strategy, it is hoped that the needs of coastal people may be met and that mangroves in Aceh Tamiang can continue to exist and be exploited as tourist attractions. The variety of biological resources found in mangrove forests, which may be utilized to make food, furniture, and medicines, and which are, of course, able to be traded, lends support to this.

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