





Sustaining Mangrove and Rainforests: Land Rights and Collective Action in Indonesia



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ABSTRACT

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This study explores land right transfer and collective action as strategies for sustaining mangrove and rainforests in Indonesia. Qualitative methods were employed, and 45 informants were interviewed in purposively selected locations. Historical analysis was used to examine forest management, while an Institutional Analysis Development framework was used to assess sustainability. The study found that the land rights regime for mangrove and rainforests has different mechanisms for sustainability. The legal aspects of mangrove forests rely on community awareness and proper management, while rainforest land rights are granted by the government for educational and research purposes. Collective action was identified as a suitable management strategy. Effective control of the situation requires stakeholder cooperation, and effective regulation implementation is necessary for managing the unique forest. Future research should focus on understanding the community's capacity to understand forest characteristics, mapping the interests and powers of forest managers, and applying forest sustainability principles.

1. INTRODUCTION

“Watch the real characteristic of the forest from the mountain to the coastal area and take the sustainability the yields”

The community's dependence on forest resources, which are Common Pool Resources, requires a regulatory mechanism for sustainability. Several studies have shown that each forest condition has different characteristics and has implications for how it should be managed. Dynamic mangrove forests require a management approach, actors and local communities who are involved [1, 2], and rules that are different from other forests [3]. Forest management by involving local communities with an agroforestry system makes people feel safe and comfortable in utilizing the forest resources through a sustainable way according to their forest functions [4, 5].

The diversity of forest formations in Indonesia is a concern in sustainable management. There are six types of classified forest formations, depending on geographical and climatic conditions, there as follows: rainforest, monsoon forest, swamp forest, peat forest, coastal forest, and mangrove forest [6]. It had different kinds of species formation [7]. Each forest formation had distinct resource characteristics, game rules, and actor involvements. The mangrove forests are located along the coastal, forming a unique forest. These forests are adapted to the environment supported by roots projected above the seawater when the trees are submerged. These projected roots are named pneumatophore or respiratory roots. Another formation existing in Indonesia is the rainforest, which it growth at altitudes of 800 meters up to 3,000 meters above sea level [8]. Management of the two types of forests above

requires an approach distinct from those applied to the management of other forest types.

The sustainability of forest resources management in various formations undergoes dynamics driven by time and other influencing factors. Generally, such dynamics were considered solely influenced by the incredible market-demand-prompted pressures to benefit from the forest. However, another frequently overlooked factor, namely land rights regime, constituted part of the non-market aspect. Land rights are the rights of an individual, a community, or a country to manage, extract benefits, transfer, and even cause damage to a resource (asset/endowment) [9]. Land rights to the forest resources constitute an institution as it involves rules concerning the resources' characteristics and the actors engaged.

This clarity of land rights gives the power to the owner or manager to determine how to take advantage of the forest, whether knowing the characteristics that exist in the forest resource or just exploiting it without thinking about its sustainability. Every forest formation has different characteristics that require different approaches to management. However, government regulations assume that sustainable forest management is the same for all forest formations, which may hinder managing forests with different characteristics.

Mangroves along the coastal and rainforests are attractive of their unique characteristics. The mangroves as kajapah and kahayan type and the UB Forest changed the interaction of biophysical and interest to derive benefits from the forests from time to time. A variety of the land right regimes by the transfer of management and land rights alter the behavior of the actors and the managers involved.

Mangroves and rainforests had different conditions and approaches to management. The difference in forest characteristics, behavior of forest parties, regulation, and managers are affected by the transfer of management and land rights regimes from time to time (Evolution). The mangrove was unique due to its position nearby the sea. It is a more dynamic forest than the rainforest. The danger of destruction of forest more damage if it cut to other function or conversion. The current research was still on how to rehabilitation the damage of mangrove forest by community, government, and NGOs participation [10], people agricultural activities around the coastline had declined the biodiversity than climate change [11], how the sustainability of mangrove yield and ecosystem in conservation area [12], the institutional management of mangrove forest was affected by forest characteristic, stakeholder involved and regulation implementation [4]. There is still lack of the information related to the sustainability of mangrove and rainforest management. So, this research aimed to gain a performance picture of the land rights transfer mechanism in the case of two different forest forms (mangrove and rainforest) and the institution of suitable management changed to ensure the management sustainability between the two kinds of formation forests.

2. METHODS

2.1 Time and place

This study was conducted in two types of forest in different locations. Research in kajapah & kahayan mangrove forest in Margasari Village, Labuhan Maringgai District Lampung Province and in the University of Brawijaya Forest (UB Forest) as tropical rainforest, Malang Regency, East Java, Indonesia was conducted in July-November 2020.

2.2 Data collection

This research took a qualitative approach as a case study focusing on the institutional aspects of right regime Land rights by mechanism transfer with primary and secondary data. The primary data were from in-depth interviews with the respondents, while secondary data were collected through literature studies, Landsat mapping, village monographs, and national and international journals. Respondents were selected by purposive sampling [13], consisting of relevant stakeholders, followed by a non-probability sampling technique called snowball sampling [14].

2.3 Informants sources

Information on forest management related to aspects of land right transfer, bundles of right, forest characteristics, stakeholder involvement, and management rules was obtained from informants who were selected purposively, while information related to the history of forest management and sustainability performance was obtained from informants who were selected by snowball sampling. The number informants and categories are detailed in Table 1.

Table 1. Informants and categories

No.	Type of Respondents	Number/ Techniques	Types of Datas
Mangrove Forest			
1	Public Figure in community	12/snowball	History mangrove management (land right transfer, bundles of right, forest characteristic, the actor involve, forest yields utilization, regulation implementation)
	Mangrove Management	11/purposive	Management aspects of mangrove, forest characteristic, the actor involve, forest yields utilization, regulation implementation
	NGOs	2/purposive	Community fasilitator on mangrove utilization by community
	District Official	2/purposive	Forest management
Rainforest/UB Forest			
2.	Public Figure in community	15/snowball	History forest management (land right transfer, bundles of right, forest yields utilization, forest characteristic, the actor involve, regulation implementation)
	UB Forest Management	1/purposive	Management aspects of forest, cultivation of trees and horticultural products, community management
	State Forest Company (SFC)	2/purposive	Primary Forest management (land right transfer, bundles of right, forest yields utilization, forest characteristic, the actor involve, regulation implementation)
	Forest Service	2/purposive	Activities on forest program

2.4 Data analysis

Information related to the transfer process land rights regimes in forest management and the various driving factors involved and the resulting performance is analyzed using historical path dependence analysis. This analysis focused on the path (path dependence) on the history of changes in forest management regarding regime changes, various driving factors, and the resulting management performance based on years of management. This analysis did not describe matters that have nothing to do with forest management.

Meanwhile, the relationship between characteristics of forest resources, rules of the game, and actors' roles was analyzed using the Institutional Analysis Design framework (IAD framework) [15].

3. RESULTS AND DISCUSSIONS

The market's role influenced forest management changes in forest products. The actors' behavior in deriving benefits from the forest was based on the strata and types of land rights regimes attached to the forest resources. Institutional arrangement of Land regime may take a variety of forms, namely (1) private right, (2) state right, (3) communal Land, (4) public Land, (5) user rights, and (6) open-access right or nobodies' right. In addition, there are four types of ownership, namely open-access right, communal right, state right, and private right, while also any strata of rights were (1) tradable, (2) transferable, (3) excludable, and (4) enforceable [16].

The existence of these types and strata of rights is proven to affect the sustainability of forest management. Actors' interaction with forest resources was influenced by the types and strata of these rights. In the mangrove forest in kajapah type, there has been a change in ownership rights through 1976-2015 (39 years) and produces different performances. Private management of mangrove forests with the kajapah type causes forest damage with abrasion and loss of prawn ponds, even though the community was very dependent on the mangrove forest. 80% of the community's life revolved around the mangrove forest in the Amazon, and Brazil also depends on the mangrove forest [12]. Therefore, to ensure the sustainability of ecological, social, and economic management, an integrated management approach in a multidisciplinary manner has been carried out through an approach with policymakers and involved parties.

Meanwhile, the management of UB Forest also showed performance by involving various parties in achieving management goals. As an educational forest with a grant status by the Ministry of Environment and Forestry, UB Forest is used as an area of research, education, and community service for the academic community. The devolution of forest areas that SFC previously managed as a center for industrial timber has since changed its main functions and duties, depending on the parties in charge of management.

3.1 Path dependence in the historical analysis of mangrove and UB Forest

3.1.1 Historical analysis of mangroves forest (Kajapah & Kahayan)

In addition to market factors, the performance of mangrove forest management turned out to also be significantly influenced by land rights. Kajapah type mangrove forests have historically seen changes in management and Land rights with the involvement of numerous different actors.

From 1977 to 1980, the kajapah functioned as a greenbelt. This mangrove forest is an open resource for anyone who wants to benefit from it, which can be categorized as an open-access Land. Open-access rights damaged resources because it is difficult to enforce their right. The Land rights institution should be defined to arrange the relation between the resource users [17]. Then, historically kajapah underwent changes in management and Land rights with the involvement of various actors, from open access to private status.

The status changes begin with the development of shrimp cultivation in the Kajapah area, which has traditionally led to the logging of mangrove forests. This activity does not consider the formal legal aspects in the clearing stage (oral approval from the regional head) [1, 2]. With the passage of time and the increasing economic benefits of prawn farming,

it is claimed under private rights. The inaction of the village government also influences the shift in the status of land rights in giving informal permits to traditional shrimp farming actors [1, 2].

The permit for the opening of the pond has turned the mangrove forest into a pond area. Traditional giant prawn cultivation in the Kajapah area had been successful for 10 years, from 1980 to 1990. Starting in 1991, this kind of mangrove forest management attracted the attention of the government and the community, especially related to the abrasion disaster. Mangrove forest degradation is generally due to economic reasons, even though the protection and environmental functions [18].

Several efforts to rehabilitate traditional shrimp ponds were carried out through the ABRI Entering the Village (AMD) program initiated by the TNI in collaboration with the Lampung Provincial Forestry Service and non-governmental organizations. After the rehabilitation process was successful, the community surroundings Kajapah took the initiative to hand it over to the University of Lampung. They have done it because they were traumatized due to abrasion in 1990 (Figure 1).

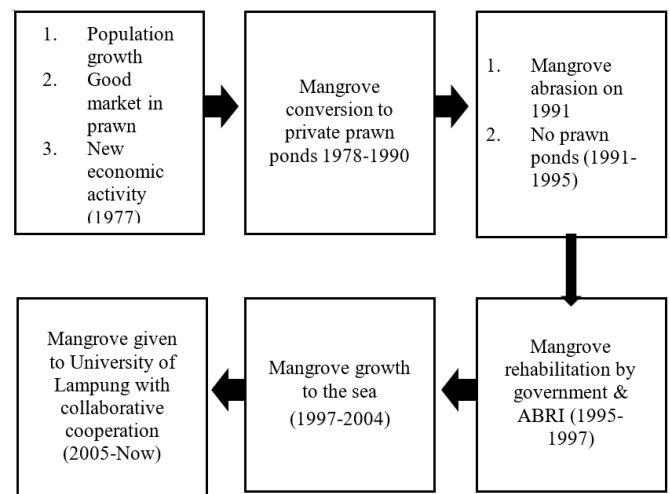


Figure 1. The transfer of the land rights on mangrove forest management with land emerged

The transfer of the mangrove forest management into the hands of the University of Lampung was conducted administratively and subsequently managed collaboratively with local people [2, 4, 19-22]. Community awareness to maintain mangrove forests occurred after the abrasion in 1990, and they realized that they did not have to clear mangrove forests in taking forest benefits.

“Collaborative action was suitable for mangrove forest management which it located along the coastal and could not fence. Why we give the management to University of Lampung, we believed that university didn't use it as a commercial land, but it could manage with involved the other stakeholder which it the same interest in mangrove forest development (community said)”

There are four important points for the sustainability of natural resources: 1) community-based conservation should be checks and balances among various parties-local groups, government actors, NGOs, and aid agencies; 2) empowerment of the local group; 3) implement the reasonable processes of

decision-making, and 4) local groups have access to adequate funds for implementing the rules they create [3]. The horizontal and vertical stakeholder involvement in forest management provides a degree of certainty as to sustainability. This collaboration on mangrove rehabilitation among the actors showed the success of mangrove growing to the sea (Figure 2).



Figure 2. Land cover of mangrove forest
Source: Citra Landsat Sentinel 2 tile number MSIL1C (2022)

On the other side, in Kahayan type (other types in mangrove forest), from 1996 to 2005 was the year of large-scale shrimp farming by private companies. However, private companies feel the need to pay attention to preserving the mangrove forest as a coastal green line. In this case, the rights used are still the same as the Kajapah, namely the rights of access & withdrawal, management, and exclusion rights. A large amount of prawn ponds-added land in Kahayan reduces the benefits derived from the mangrove forest. However, the ownership rights to manage these prawn ponds cannot be privately owned because they are in a protected area along the coast [19]. The granting of private rights to the Kahayan type is possible if the owner still pays attention to mangroves as a greenbelt. If the corporate implemented the good interaction between characteristics mangrove resources, government/facilitator, and regulation, it would achieve sustainable mangrove management [23].

Mangrove forest management with two types, that is, Kajapah and Kahayan, have differences in institution of management. The mechanism of the right regime on mangrove forests has changed depending on the mangrove forest characteristics. Direct and indirect users interactions were different in mangrove forest utilization. On mangrove forests with land emerged (Kajapah), the direct user utilized the mangrove for non-modern prawn cultivation [2]. While mangroves without land emerged (Kahayan), the direct user opened the mangrove for modern prawn ponds utilization [19].

So, sustainable management of mangrove forests cannot be carried out in the same way. Still, we must pay attention to whether the management rules applied to mangrove forests are Kajapah or Kahayan types. This will affect the different

performance among the management actors, regulations, and the characteristics of the mangrove forest resources.

3.1.2 Historical analysis of UB forest

Based on the interview with the key informants, land rights regime changes also took place in managing a forest in Karangploso District, Malang Regency, and East Java. First, the management of this forest began in the pre-independence Dutch colonial era by Jawatan Kehutanan. In this period, this forest management was profit-oriented. The trees grown were of the species *Paraserianthes falcataria* (Figure 3).

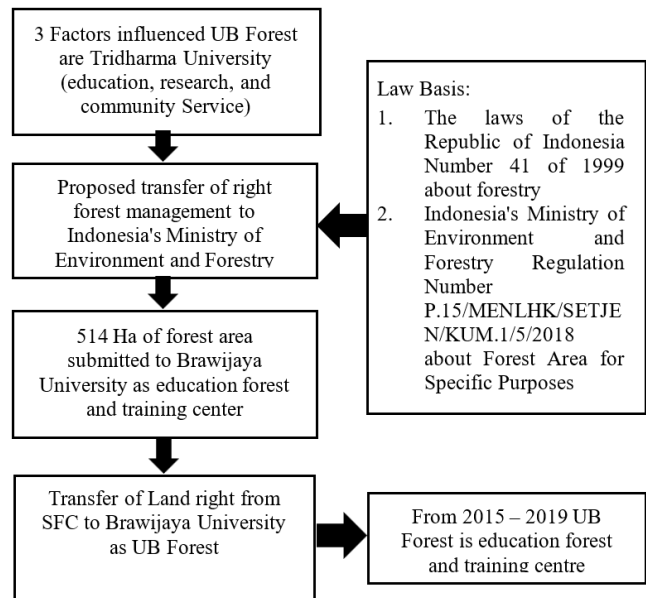


Figure 3. Transfer of land rights of forest management from sfc to Brawijaya University in Karangploso District, Malang Regency

The second-period management of this forest was run by the state-owned company SFC post-Independence Day (the years after 1945). The then-fledgling company established in 1951 started its operation in Malang Regency of East Java in 1960. This company's business purpose was to increase the state revenue. In its first days, it cultivated acacias. The third period was based on the issuance of the Decision Letter of the Minister of Environment and Forestry No. 196/MenLHK-PTKL/KUH/Pla.2/1/2020 on January, 2020 about the land forest rights designation to the 544.74 hectare forest Karangploso District, Malang Regency, were transferred from SFC to Brawijaya University. This rights transfer had implications for the different management's vision and mission. SFC, the previous manager, was corporate-oriented, while Brawijaya University strived for the visions and missions aligned with research, education, and community empowerment.

“Forest stand at the UB Forest and the community in and around it needed as field laboratory for the students to extend from the class. It could be clear how the forest and community living and their interactions. The practice of forest management could be shown at that forest. So, in the future the competence of the forest students could achieve”

The transfer of that right implied of the changed of obligation the community around forest in SFC and UB Forest

period was seen at Table 1. It was little different of the kinds of right as it could be seen on Table 2.

Table 2. The obligation of community around forest in SFC and UB Forest Period

Obligation of farmers	Kinds of Obligations of Farmer	
	SFC	UB Forest
Maintaining of forest	Farmer supposed to take care of standing stock and works at the land with their agriculture plantation	Farmer supposed to take care of standing stock and works at the land with their agriculture plantation
Tap of Pine resin	Farmer supposed to tap pine resin in works land with priced Rp 3000.00,-/Kg	Do not have to tap pine sap
Coffee Tax	Delivering coffee beans (green and red beans) for about 10% per yield	Sell all of yields wet red coffee beans to UB Forest with 70% part
Profit sharing	Farmer are required to deposit 100.000,00- per ha protected forest areas	Farmers are not required for any deposit

The different of right and obligation was defined by the shape of the management of SFC and UB Forest; about the actors involved, the kinds of yield of forest, and the regulations implementation. It implied there were various kinds of bundles of rights, namely access and withdrawal, management, and exclusion rights. This transfer of rights from SFC to Brawijaya University was carried out in compliance with the applicable administrative procedure. UB Forest then drew up a management master plan for the next 20 years. This management plan is also laid down in a management map. The 20 years is divided into five-yearly work plans (RKL). Every RKL is divided into five-yearly work plans (RKT), making up 20 RKT in total.

“University of Brawijaya needs a Field Laboratory as an education, research, and training activities of civitas academica. It could improve the quality of education matter, research, and community empowerment in and around the forest”

Based on its SWOT (Strength-Weak-Opportunity-Threats) analysis, Brawijaya University implemented the following strategies in forest development include 1) optimizing the authority and bargaining position of UB Forest in forest and environmental management; 2) the human resources of UB Forest engage in national and international cooperation in education, research, and community services of civitas academica, developed the industry of forest yields and environment; 3) increased the support of central and regional governments and other stakeholders in fund-raising and sustainable management; 4) improvement in technology and information; 5) conducted management planning concerning the forest area and the role of the community in forest management; and 6) developed entrepreneurship in forest and environment management [4].

The transfer of Land rights from SFC to Brawijaya University takes the form of a change in status from corporate domain land to socialized and as educational and research purposes. The fact that education, research, and training purposes were not always directly accommodating to the

government made it necessary to transfer the management rights to an educational institution. The transfer of the management rights from SFC to Brawijaya University carried out by the Ministry of Environment and Forestry caused did no change in the species of stands in the forest (i.e., pines (*Pinus merkusii*) and mahogany (*Swietenia macrophylla*) as landscape (Figure 4). The only difference was that education aims were currently predominantly used by the forest.

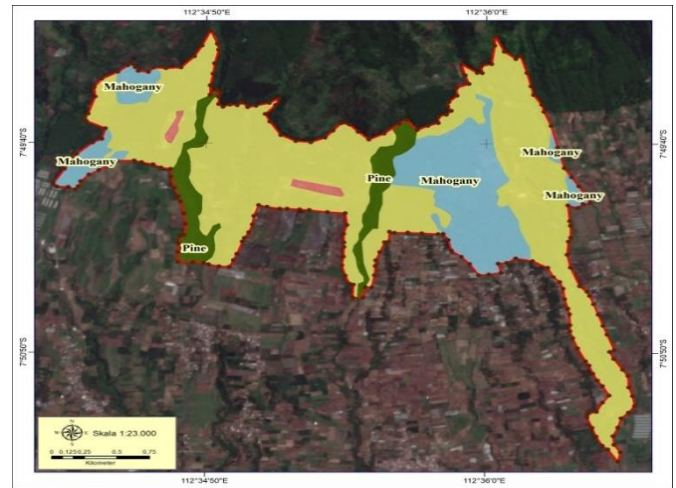


Figure 4. Land cover of UB Forest
Source: On screen digitization Sentinel 2A (2022)

3.2 Different backgrounds for the land right regime changed by transfers of rights

The transfers of mangrove forest (kajapah and kahayan) land rights to Lampung University and Brawijaya University took place against disparate backdrops. The reason transfer of mangrove forest rights to Lampung University is the strong will of the surrounding community who have experienced abrasion trauma. It makes threatens the safety of their village.

“I often offered a new car by prawn ponds entrepreneurs, but I always rejected. I was afraid the damaged of abrasion from the high tide of the sea. It damaged our live at the land along the coastal (Head Village said)”

The mangrove forest in Lampung Province faced more dynamic conditions [2] and was more prone to conversion attempts than rainforests. The abrasion hitting the mangrove forest back in the 1990s caused the communities living around the forest to be more cautious and conscious in clearing the forest for traditional prawn cultivation purposes. It also showed that forest degradation in a developing country was avoidable with government forest management and protection activities [24]. The evolution of changes in ownership rights in mangrove forests is clear evidence that the interaction of actors, especially the community, has an important role in forest sustainability for their future lives. Meanwhile, UB Forest does not go through the process of community trauma. UB Forest is a pure grant from the government to be an educational and research forest.

The community-initiated higher education institution, in this case, Lampung University in 2006, was driven more by the communities' trust that the university would develop a wiser, more environment-friendly mangrove forest management plan. The awareness of community about mangrove function as a greenbelt brought the strong

motivation to maintain the mangrove forest. The main function of this forest was as a land protection from the dangerous of high tide level from sea.

The natural phenomenon like abrasion and re-cutting activities in the mangrove forest also urged the communities to seek protection through higher education institutions' facilitation. The local government also shared the positive spirit to protect the mangrove forest from re-logging to prawn ponds again, especially the Forestry District in East Lampung Regency. For this reason, mangrove forest re-forestation around of 100 ha occurred in 1995. This effort met success by year 2004 with 700 ha of mangrove forest ecosystem grown to the sea [2, 19]. The institution of mangrove forest management showed in Table 3.

Different from Lampung Mangrove Forest management, the UB Forest was managed by Brawijaya University was state forest. Under the direction of Brawijaya University, forest areas are used for certain educational, research, and training purposes. In this case, the decentralization of forest management gives Universitas Brawijaya had the authority to manage forests effectively and increase productivity and sustainability. Under Article 8 of Law Number 41 of 1999 concerning Forest Areas for Special Purposes (KHDTK), Forestry Specific Purpose Regulation No P 15 Year 2018, and Rector Regulation No. 2 Year 2020, the UB determined the number of special allotments of forest areas, including education and training. This law allowed Brawijaya University as an educational institution to use the forest to improve the quality of its academic community. The stakeholders involved forest farmers, UB Forest, Ministry of Forestry & Environment, Forestry District of Regency, and Live Environment District of Regency. The institutional management of UB Forest showed in Table 3.

In practice, the transfer of land rights was influenced by time and technology [25]. This study showed that resource characteristics influence the development of mangrove forest land rights. The technology used in mangroves changes the resources, utilization models, and stakeholders involved. Berger et al. [12] stated that it should acquire in-depth knowledge of natural processes and the relevant institutional, cultural, economic, social, and political dynamics in mangrove management in Northeast Brazil in the sense of integrated coastal (zone) management. The conventional way of using mangroves can leave damage [21]. Users exploit the economic benefits without considering the sustainability of the resource using aquaculture ponds. Indirect use in mangrove management by converting mangroves into shrimp farming happens in many countries, including Thailand, Malaysia, Vietnam, and Indonesia [2, 26]. The factor of resource capacity and community needs can also change the ownership of forest voting rights, as Brawijaya University did. Several forests designated for educational activities are also available in several provinces in Indonesia. Strengthening local institutions and developing Common Pool Resources (CPRs) networks are essential for good governance in forest management [22].

The transfer of rights in both forest (mangrove and rain forest) caused differences in the implementation of bundles of right) (see Tables 3 and 4). Regulations on mangrove forests are still national and do not yet exist at the site level. Meanwhile, UB Forest has been equipped with more detailed rules, namely the existence of the President of Brawijaya University Regulation in regulating the sustainability of forest products and the involvement of both national and international actors.

Table 3. Institutional management of Mangrove Forest

Bundles of rights	Entities of Management Institution		
	Mangrove forest as nature forest	Regulations	Stakeholders involved
Access & Withdrawal	1. Access and beneficiaries the forest	Law of UU 41 Tahun 1999 about Forestry	1. Forest farmers
	2. Cultivate the fish on forest land		2. LMC
	3. Cultivate the agricultural plant around the forest		3. Ministry of Forestry & Environment
	4. Maintain itself the plantation from pest and disease		4. Forestry District of Province
	5. Forest protection from fire and illegal logging		5. Forestry District of Regency
	6. Harvest the fish and agriculture		
Exclusion Management	Report to forest holder if illegal logging, forest fire, were happened		
	Manage itself the kinds of fish cultivation, agriculture plantation		

Table 4. Institutional management of UB Forest

Bundles of rights	Entities of Management Institution		
	UB Forest as plantation forest	Regulations	Stakeholders involved
Access & Withdrawal	1. Access and beneficiaries the forest	1. Law of UU 41 Tahun 1999 about Forestry 2. Forestry Specific Purpose Regulation No P 15 Year 2018 3. Rector Regulation No. 2 Year 2020	1. Forest farmers
	2. Cultivate the fish on forest land		2. UB Forest
	3. Cultivate the agricultural plant around the forest		3. Ministry of Forestry & Environment
	4. Maintain itself the plantation from pest and disease		4. Forestry District of Province
	5. Forest protection from fire and illegal logging		5. Forestry District of Regency
	6. Harvest the fish and agriculture		
Exclusion Management	Report to forest holder if illegal logging, forest fire, were happened		
	Manage itself the kinds of agriculture plantation		

Based on various explanations, that forest resources (both mangroves and rainforest) that were collective characteristic. The granting of private ownership rights on forest land often

results in unsustainability in their management. The involvement of many parties as collective action in management and supervision is needed in its sustainability

efforts. Community involvement in forest management as a CPRs induced its sustainability [15]. Furthermore, institutional land rights regimes (local, national, and global) and mangrove forest management with unique characteristics along the coast require an ecological and economical approach to achieve sustainability in achieving community welfare [27]. Then, the management based on community and the other stakeholder involved in the forest management was better than only by state forest management. The real participation of community should base on their need and increase their welfare. It should not be loading by the other interest. It was like political, economics, and capitalism [28]. It is true in Asian countries but not in Africa and Latin America. Meanwhile, state forest management is better than open-access management. The same is the case in the fishery field, where state-forest management is superior to open-access one [29].

4. CONCLUSIONS

Land rights transfer of mangrove forests management (kajapah and kahayan type) was highly dependent on the geographical conditions, the actors involved, and the regulation. The land rights regime of kajapah; as mangrove forest starts from open access and private right, state right and then the last was communal right with the collective action needed, but the kahayan type starts from open access and the last private right. While land right regimes of UB Forest as rainforest also two-stage, by SFC right (corporate right) to social right as educational and research purposes (University of Brawijaya). UB Forest right's stratum was the same as the mangrove of Kajapah type, that is, proprietor right. The transfer of land rights of kajapah forest was induced more by preserving the mangrove forest from the prawn ponds. Both of the transfers of rights were conducted faithfully to the applicable administrative procedures, and they did not change the vegetation formation.

The suitable management of mangrove forest and UB Forest was collective action. Private ownership rights on that forest land often results in unsustainability in their management. Community based management and the involvement of many parties as collective action in the forest management and supervision is needed in its sustainability efforts. The effectiveness of regulation implementation on its management was fully needed to manage the vary stakeholders and the unique forest.

Further research is needed in understanding and analyzing the capacity of the community (cognitive, affective, and motoric aspects) at various levels (direct and indirect users) in understanding the characteristics of forests and how to preserve various forest uses, namely in the use of wood, non-timber, tourism, and environmental services; mapping the interests and powers of forest managers; and application of forest sustainability principles. The high level of community capacity is expected to create sustainable forest use.

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