



CASE STUDY

Abnormality in optimal forest management by indigenous people in deforestation

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ABSTRACT

BACKGROUND AND OBJECTIVES: Deforestation threatens 120.5 million hectares of forest, and it occurs at a rate of 115 thousand hectares per year. Economic needs and livelihoods encourage people to cut and farm forest areas. Deforestation is considered to be a random and unstructured process that does not involve indigenous people. This research found that indigenous people and various other parties are continuously involved in forest land encroachment. Social networks have facilitated indigenous people and encroachers (buyers of forest land). This research aims to identify the actors involved in forest encroachment and the social network structure in the deforestation process in the production forest of Dharmasraya, Indonesia.**METHODS:** This study employs an ethnographic case study approach to understanding the drivers of deforestation in the Production Forest Management Unit of Dharmasraya. The Production Forest Management Unit of Dharmasraya covers an area of 33,550 hectares. In customary law, the production forest is owned by four indigenous communities from the *Nagari* (villages): Bonjol, Abai Siat Nagari Sikabau, and Sungai Dareh. In this research, the data were collected through interviews that asked the respondent to report on those with whom she/he shared particular relations. Primary data were collected using in-depth interviews employing the snowball sampling method. The data collection used interview guides relating to the actors involved in forest sales and the deforestation process. Key informant interviews involving 34 key informants were conducted with traditional leaders, representatives of a lineage unit (*Ninik Mamak*) and adat functionaries (*Datuak customary authorities*), *Wali Nagari* (village chiefs), local institutional leaders, the government, companies, and those holding concessions. The secondary data were collected from relevant agencies in the research area. The data were analyzed using descriptive-qualitative tools.**FINDINGS:** Three parties are interested in forest production, namely, the local indigenous people, the companies, and the government and each parties claims the production forest because each party sees itself as being the most eligible for forest ownership; this causes an overlap of forest management and ownership among the actors. The indigenous people have become the most powerful party in the ownership of the production forest. The claims of ownership of forests as customary forests have caused the traditional authorities to sell forests massively. The land sale price varies according to the position of the forest and its distance from villages, the topography, and the access. *Ulayat* (forest) land is considered cheap, ranging between USD 300 and USD 1,300 per hectare, including the *Alas hak*. The *Alas hak* is a signed letter showing that the forest land or communal land has been sold to someone else. There are three models of *ulayat* forest land selling: selling by the customary authorities, selling through a broker, and selling by local people. The research has identified 40 actors involved in production forest management in Dharmasraya. Eight actors were not involved in deforestation or *ulayat* forest selling. Ten actors were involved in deforestation and *ulayat* forest selling indirectly, and 22 actors were directly involved in deforestation through forest selling.**CONCLUSION:** Deforestation occurred because the indigenous people sold forest land massively. The sale of the land claimed as *ulayat* forest is not restricted; anyone interested in opening a plantation in a forest area can buy the land from the customary authorities. Hence, deforestation has occurred as part of a systematic process involving critical figures in the community. *Ulayat* forest land sales involved government officers, such as high-ranking police officers and army personnel, and entrepreneurs, officials, civil servants, and other parties who supposedly understand forestry law. The study also confirmed that the economic factors driving deforestation are facilitated by the social networks between indigenous people and the people holding power. The findings of this study contradict the general fact that indigenous people can manage forests sustainably.DOI: [10.22034/gjesm.2024.01.25](https://doi.org/10.22034/gjesm.2024.01.25)This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

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INTRODUCTION

Indonesia has a forest area of 120.5 million hectares (ha), including production, protection, and conservation forests (MOEF, 2021). It has the most significant tropical peatland in the world, with approximately 15 million hectares of peatland (both forested and non-forested), spread across Sumatra, Kalimantan, Sulawesi, and Papua (CBS, 2018). Unfortunately, from 2000 to 2012, 6 million hectares of primary forest were lost in Indonesia (Margono et al., 2014). From 2018 to 2019, the rate of deforestation in Indonesia was 462.5 thousand hectares, and from 2019 to 2020, the rate of deforestation was 115.5 thousand hectares (MOEF, 2023). As a result, the forest cover decreased to 91 million hectares (49.8 percent (%) of the total land area) in 2015 (FAO, 2015). Deforestation is driven by economic pressure and population growth (Vanclay, 2005), agriculture, and plantation expansion (Ting et al., 2011; Dalla-Nora et al., 2014), illegal logging (Ji et al., 2017), resettlement, road construction, and forest fires (Sunderlin and Resosudarmo, 1996; Geist and Lambin, 2002; Herdiansyah). Forests and indigenous people cannot be separated. In many cases around the world, indigenous people can manage forests sustainably. Several similar studies have shown that indigenous people are particularly effective at reducing deforestation and protecting the forest (Barsimantov and Kendall, 2012). For example, the indigenous land experienced lower deforestation rates in the Brazilian Amazon (Nolte et al., 2013) and lower fire incidence across Latin America (Nelson and Chomitz, 2011); and sustainable forest management by indigenous people in Tanzania (Fragallah et al., 2021) and in the Brazilian Amazon (Walker et al., 2020; Garcia et al., 2021). The research showed the application of local wisdom in independent forest management to maintain the harmony of ecological, economic, and social culture. This fact proves that the local community can preserve the forest if involved. In Indonesia, 50-60 million people live in forest areas and depend on forest resources for survival (Nunes et al., 2019; Kraus et al., 2021). Forests are the only source of livelihood for the community; consequently, however, this causes conflicts regarding forest ownership between local communities and the government (Feurer et al., 2018; Rochmayanto et al., 2023). The literature on the Indonesian forest noted that there has been some land ownership conflict

between indigenous people and the state/forest companies (Muur, 2018; Maring, 2022). Generally, the indigenous people are against the state and the companies that grab the forest for plantation. In retaliation, the indigenous people removed the forest from the companies and changed the forest into plantation areas (Suryadi et al., 2020; Rangga et al., 2021). In other cases, deforestation occurred as the forest was changed into a plantation (Harun and Dwiprabowo, 2014). In West Rinjani, Indonesia, the indigenous people who claimed the forest as an adat forest changed it into a plantation (Mukarom et al., 2015). These cases show that the indigenous people who live around the forest can become actors in deforestation. Several studies explain that indigenous people have the potential to be the main actors in deforestation; however, many believe that deforestation is purely due to economic factors (Wicke et al., 2011; Brun et al., 2015; Siregar et al., 2023). This research explains new facts about structured and systematic deforestation by indigenous people. This study describes the localized deforestation of 33,000 ha of production forest claimed by indigenous people as customary land (*ulayat*) in Dharmasraya District, West Sumatra Province. Furthermore, it describes the systematic and structured process through which this has happened; the process has involved local people and outsiders in a social network. Forest conversion into agricultural land has reached 85% of the total forest production in the last ten years (Mutolib et al., 2017). From 2000 to 2019, the forest area of the Production Forest Management Unit (PFMU) of Dharmasraya reduced from 86 to 12%, and plantations increased from 10 to 81% of the total area (Rudy et al., 2021). The indigenous people are leaders in a social network with many actors that are cutting and opening the forest for agriculture and plantation land through land transactions. At the same time the Ministry of Environment and Forestry has declared the forest land as the working area of the PFMU of Dharmasraya to strengthen its status as a state forest (Rudy et al., 2021). By setting up a PFMU, the central government expects the state body to conduct management activity on the ground. Unfortunately, indigenous people and various other parties are continuously involved in forest land encroachment. Social networks have facilitated indigenous people and encroachers (buyers of forest land). However, a case like this has yet to be reported. Consequently,

a measure taken to combat deforestation has yet to be effective. As this paper argues, there is no random process of deforestation. Instead, it is a result of the social networks among the parties involved. This study aims to identify the actors involved in forest encroachment and the social network structure in the deforestation process in the production forest of Dharmasraya, Indonesia. It is hoped that this research can explain how deforestation occurs in a structured manner through the contribution of local communities. This study was carried out in the PFMU of Dharmasraya, West Sumatra, Indonesia, from 2016 to 2018; it then continued in 2021 to identify the level of deforestation in the PFMU of Dharmasraya.

MATERIALS AND METHODS

Methods and Research site

This study employs an ethnographic case study approach to understanding the deforestation process. The ethnographic method was chosen deliberately so that the problem of deforestation at the research location could be explained well and in detail. Obtaining research data on the actors who have been involved in deforestation tends to be difficult if using non-participatory interview methods. An ethnographic approach is considered to be the most appropriate method to describe the problem of deforestation and to provide input to policy makers to prevent continuous deforestation; this is in line with research that uses ethnographic methods to identify cases of forest decline in the Goderich community, Canada (Jackson, 2015). This study was conducted in Dharmasraya District, West Sumatra Province, Indonesia. Dharmasraya is 220 kilometers (km) to the east of Padang City, the provincial capital of West Sumatra. In this district, the PFMU of Dharmasraya covers an area of 33,550 ha (Mutolib et al., 2016). In accordance with customary law, four indigenous communities own the production forest: Nagari Bonjol, Abai Siat Nagari Sikabau, and Sungai Dareh

Data Collection and informants

In this research, the data were collected by interviews in order to gather social network data (Marsden, 2011); the respondent was asked to report on those with whom she/he shared particular relations. Collecting network data can be conducted by presenting the respondent with a list of network

members and the people who have a relationship with the respondent (Marin and Wellman, 2010). The secondary data were collected from relevant agencies, such as representatives of the PFMU of Dharmasraya, the Dharmasraya Bureau of Statistics, and the Dharmasraya Forestry Service. In contrast, additional primary data were collected using an in-depth interview employing the snowball sampling method. The data collection used interview guides relating to the actors involved in the forest sales and the deforestation process. Key informant interviews involving 34 key informants were conducted with the traditional leaders (Nagari Custom Density or KAN leader), representatives of the lineage unit (*Ninik Mamak*) and adat functionaries (*Datuak customary authorities*), *Wali Nagari* (village chief), local institutional leaders, the government, companies, and those holding concessions. The research also included anthropological observations, in which the researcher stayed within the community for five months, giving more reliable, valid, and accurate information. The distribution of the informants is displayed in Table 1.

Data analysis

The data were analyzed using descriptive–qualitative tools. Data analysis followed the approach described, using data reduction, data display, and conclusions (drawing or verifying) to provide a descriptive answer to the research questions (Miles and Huberman, 1994). To identify the actors and social structure involved in production forest encroachment, we used a qualitative research approach with the stakeholders and social network analysis (SNA), employing UCINET and NetDraw software (Borgatti et al., 2002; Prell, 2011). This research used the centrality approach to measure the actors who were more “central” to the social structures and more likely to be influential or powerful according to three indicators: 1) degree of centrality, 2) closeness centrality, and 3) betweenness (Hanneman and Riddle, 2011). UCINET is a comprehensive package used for the analysis of social network data as well as other 1-mode and 2-mode data. This technology uses the following SNA methods to identify the centrality of the actors in deforestation. In addition, UCINET is integrated with the NetDraw program to draw social network diagrams (Borgatti et al., 2002).

Table 1. Key Informants

Stakeholder	Number of informants	Information
<i>Nagari</i> Bonjol	7	Customary authorities (3), Wali <i>Nagari</i> , Head of KAN, and <i>Ninik mamak/adat</i> leader
<i>Nagari</i> Abai Siat	7	Customary authority (1), Wali <i>Nagari</i> , Head of KAN, and <i>Ninik mamak/adat</i> leader
<i>Nagari</i> Sungai Dareh	4	Wali <i>Nagari</i> , Head of KAN, and <i>Ninik mamak/adat</i> leader
<i>Nagari</i> Sikabau	7	Customary authority (1), Wali <i>Nagari</i> , Head of KAN, and <i>Ninik mamak/adat</i> leader
Dharmasraya Forestry service	3	Head of Dharmasraya forestry service, Secretary, and Head of protection of forest division
PFMU Dharmasraya	1	Head of PFMU of Dharmasraya
BPN (National Land Agency) of Dharmasraya	1	Head of infrastructure division
Koto Besar Chiefdom	2	Father of king, council of elders chief, KAN of Koto Besar
Private companies	2	PT. AWB and PT. SMP
Total	34	

PT (Private Limited Company), AWB (Andalas Wahana Berjaya), SMP (Silago Makmur Plantation)

Table 2. Stakeholders claim in PFMU of Dharmasraya management

Stakeholders	Claim to the forest
Government/PFMU of Dharmasraya	Production forest of Dharmasraya as state forest and forest managed by PFMU of Dharmasraya. Ministry of Forestry Republic of Indonesia Decree Number SK.695/Menhut-II/2013 Date 21 October 2013.
HTI Company	IUPHHK (forest timber product exploitation permits) with Minister of Forestry of Republic Indonesia decree No.621/Kpts-II/2009, October 5th, 2009, for PT. Dhara Silva Lestari with area of 15,357 ha and PT. Inhutani with 13,721.68 Ha.
Local/Indigenous People	Forest in PFMU as <i>ulaya land</i> /communal land and owned by local people. This is in accordance with the <i>Adat</i> of Minangkabau, West Sumatra.

RESULTS AND DISCUSSION

Multiple claims on forest land

Forest management in the PFMU of Dharmasraya is complicated. Three parties are interested in forest production, i.e., local indigenous people, the companies, and the government (PFMU of Dharmasraya) (Table 2). Three parties are claimed the production forest because each party sees itself as being the most eligible for forest ownership; this causes an overlap of forest management and ownership among the actors. In reality, the indigenous people have become the most powerful party with regard to the ownership of the production forest. All the communities in Dharmasraya and West Sumatra claim that the forest is customary/*ulayat* forest, not state forest, which strengthens the indigenous people's claim over the forest land. This condition was exploited by customary authorities and a few local elites to sell the *ulayat* forest. The overview of the stakeholders interested in the PFMU of Dharmasraya is displayed in Table 2.

The central government only recently tried to regain

control over forest land by creating the Production Forest Management Unit (PFMU). As a result, the Ministry of Environment and Forestry issued decree No. SK.695/Menhut-II/2013, dated 21 October 2013, on the PFMU of Dharmasraya. The decree was issued after almost 15 years of the forest management of a previously forested concession area with an area of about 66,000 ha; the concession lasted from 1972 to 2002. The history of forest management in the FMU of Dharmasraya is shown in Table 3.

At present, the entire forest of the PFMU of Dharmasraya is claimed as *ulayat* forest by the indigenous people in Dharmasraya. According to customary law, the *ulayat* forest is an asset to be used for the welfare of the entire community and therefore its members. The indigenous people only recognize forests as communal land and do not recognize the state law and state forests. The study area, which is the working area of the PFMU of Dharmasraya, is considered by indigenous people to be Tanah *ulayat*. In general, *ulayat* land is owned by two parties, namely the Kingdom of Koto Besar

Table 3. History of forest management in PFMU of Dharmasraya

Year	Owner	Function of Forest	Area (ha)
1972	PT. Ragusa Ltd.	Forest Concession Rights (HPH)	66,000
2002	PT. Inhutani	HTI 15, 000 ha for Meranti trees (<i>Shorea leprosula</i>)	32,749
2002	PT. Incasi Raya, PT. AWB, and PT. SMP	Land use rights (HGU) of oil palm plantation	33,251
2007	PT. BRM	HTI (part of HTI Inhutani)	764
2007	PT. Dhara Silva	HTI (part of HTI Inhutani)	17,114
2013	PFMU Dharmasraya	HTI (including PT. Dhara Silva Lestari, Inhutani and BRM)	32,749

HTI (industrial plantation forest), BRM (Bukit raya mudisa)

(*Nagari* Bonjol and Abai Siat) and the other kingdoms (*Nagari* Sikabau and Sungai Dareh). Under the current administrative system, the area falls into four *Nagaris*, but Bonjol, the dominant area, covers more or less 70% of the total PFMU of Dharmasraya working area. While *ulayat* Abai Siat is predicted to be only around 1,000 ha, the rest is *ulayat Nagari* Sikabau and Sungai Dareh (as estimated by the head of the PFMU of Dharmasraya). The *ulayat* of Sikabau and Sungai Dareh is under the authority of *Datuak Gadang*, who lives in Sikabau. Therefore, this independent *ulayat* is unrelated to Koto Besar or the other kingdoms. Meanwhile, the *ulayats* of Bonjol and Abai Siat were part of the Koto Besar kingdom. The *ulayat* of the Koto Besar kingdom was initially one *ulayat*, but with the population growth, the *Nagari* land was divided into clan land in each *Nagari*. However, oral history keeps spreading from generation to generation. As a traditional hierarchy, the *ulayat* of *Nagari* Abai Siat is under the authority of *Datuak Tanaro Mudo*. At the same time, *Nagari* Bonjol shares the largest *ulayat* with Kerajaan Koto Besar, which has an area as large as 50,000 ha. According to the oral history, Bonjol has its privilege as a former agricultural area of the *Puti Langguak Princess*, the founder of the Koto Besar kingdom. Hence, the name Bonjol means agricultural field. The Koto Besar kingdom delegated authority to "*Datuak Mandaro Kuniang*" as treasurer to manage the *ulayat* land, which belonged to the Melayu clan and exists in the present *Nagari* Bonjol. The present *Datuak Mandaro Kuniang* is held by S (disguised name) after he received it from his predecessor *Sulaiman Datuak Mandaro Kuniang*. Aside from *Datuak Mandaro Kuniang*, two other figures also have authority over part of the *Nagari* Bonjol *ulayat* land. These are A (disguised name) and D (disguised name), both of whom have limited authority.

However, *Datuak Mandaro Kuniang* has more extensive authority, which is recognized by many, even though the government claims this *ulayat* land as a state forest. With a permit obtained from these traditional rulers, people feel secure about buying and clearing the forest. The same thing was found at the other two *Nagaris*. These traditional leaders play a crucial role in managing communal land; people only obtain access to the land with their permission, and they also play a central role in deforestation.

Deforestation, forest land selling, and the role of indigenous people

Under Minangkabau customs, *ulayat* forest land is communally owned (Alandra et al., 2018; Medaline et al., 2022). Therefore, it is forbidden to sell it. However, much of this land in the study area has recently been sold by the elites of a clan. It is difficult to pinpoint a specific reason for this, but in earlier times, the land was sold at a low price to high-ranking military personnel and government officials. It is also clear that the *ulayat* rights holders had close links with these influential figures, facilitating the land sales. Social network analysis achieved its purpose in analyzing this case. Table 4 shows the parties that hold power and have the authority to manage the *ulayat* forest.

The land sale price varies according to the position of the forest and its distance from villages, the topography, and the access. The price of *ulayat* (forest) land is considered to be cheap, ranging between USD 300 and USD 1,300, including the *Alas hak*. The *Alas hak* is a signed paper showing that the forest land or communal land has been sold to someone else. The *Alas hak* is issued by the *Nagari* and signed by the customary authorities, *Mamak Kepala Waris* (MKW), *Mamak Kepala Kaum* (MKK),

Table 4. Parties involved in the sale of *ulayat* forest land

Position	Authority
<i>Ulayat</i> land rightsholder	To sell the <i>ulayat</i> forest
Ruler of customary land (MKW)	To sell the <i>ulayat</i> forest
Chief of council of elders	Proof of sale for <i>ulayat</i> forest
Wali Nagari (<i>village chief</i>)	Purchase <i>ulayat</i> forest

the head of KAN (*Kerapatan Adat Nagari*), Wali Nagari, and the witnesses. The size of the land sold varies between 25 and 1,000 ha (Mutolib et al., 2016). This forest land has become an attractive proposition for outsiders at such a low price. The buyers come from various professions and backgrounds from outside of Dharmasraya District. Why do they dare to cut down and sell in a state forest area? In Indonesia, in the eyes of the state, the forest is legally owned by the government, but the local community does not recognize the legitimacy of this claim (Hapsari, 2018; Anugrah et al., 2022). The recognition of customary law in the PFMU of Dharmasraya is robust, and the local community is not concerned about the repercussions if the forest is used in illegal ways in the eyes of the state. However, cutting down trees and selling *ulayat* forest land must be approved by the customary authorities or MKW. Indigenous people only dare to open and sell the forest with this approval. The existence of the customary authorities is highly influential in forest land selling. Hence, the forest encroachment/cutting activities started with slashing and felling trees in the forest, followed by burning to clear the land. After the forest was burned and cleared, the farmers planted oil palm and/or rubber, but strangely, many left the cleared plot without planting a single seedling. There is speculation regarding the selling of the land by using the forest clearing to mark the *ulayat* land ownership. Companies or other parties who want to take land that local people have opened must compensate those who have cleared the forest. As a result, forest land sales increase, and the forest is increasingly threatened. However, this finding is not an isolated case. Although legally the forest is owned by the state, indigenous locals assume that their customary rights have greater legitimacy than the state claims because the indigenous people were there before the state (Larson, 2012; Shrinkhal, 2021). In addition, recognizing customary law, which is very strong in the community, has caused them to have no fear or

worry when clearing forest land, which is prohibited by state law.

Mechanism of ulayat forest land selling

In *Ulayat* forest selling in the PFMU of Dharmasraya, the customary authorities and buyers only use the *Alas hak* as a basis for ownership, and they do not necessarily use a statutory legal certificate from the government. The *Alas hak* is issued by the Nagari government under the approval of the customary authorities. Furthermore, the *Alas hak* is signed by Wali Nagari, head of KAN. What is the *Alas hak*? Based on Basic Agrarian Law (BAL), Law Number 5, of the year 1960, the Government of Indonesia has determined that the land in the whole of the Republic of Indonesia should be registered, as is envisaged in Article 19 of the BAL for the legal certainty of land. Land registration for the first time, according to the Government Regulation of Indonesia no 24, of the year 1997, Article 1 clause 9, is the process of land registration activities against the land object that has not been registered based on Government Regulation No. 10, of the year 1961, on land registration. The *Alas hak* is defined as evidence of land tenure and can be an evidence tool to show the juridical relationship between the land and owner; it can also show the formal and official history of land ownership published by the village government. Juridically, the *Alas hak* is usually in the form of written evidence, such as a letter of decision, an affidavit or a letter of recognition of customary land ownership. The implementation of *ulayat* land registration in Minangkabau preceded the creation of an *Alas hak*. Therefore, the requirement for the national land title is the existence of an *Alas hak*. Consequently, an interesting question related to the sales of the *ulayat* forest in Dharmasraya concerns whether the *ulayat* forest can be the basis for the land title. Based on state law, the answer is no because the *ulayat* forest falls within the state claim as a forest area. Therefore, the National Land Agency of Indonesia (BPN) will refuse and not issue

a formal land title for the land inside the forest area. So, what caused the people to dare to buy land when it is legally prohibited by the state? The buyers of the *ulayat* forest do not consider the state land law and only recognize the customary law regarding forest ownership in Dharmasraya. Therefore, the buyers argue that cutting down and changing the forest into rubber and oil palm plantations is not against the law because the forest is customary and not a state forest. Hence, the Constitutional Court's Decision no. 35/PUU-X/2012 on customary forests provides the opportunity for forest land sales (especially *ulayat* forest) that incur deforestation. The process of *ulayat* forest selling in the production forest of Dharmasraya is conducted by three actors with different processes. The customary authorities are the leading actor in *ulayat* forest selling. In addition, there is the broker, who serves as the accomplice of the customary authorities, and the local people who have bought the *ulayat* forest from customary authorities and resold it. So, there are three models of *ulayat* forest land selling in the PFMU of Dharmasraya.

Model 1

Selling by customary authorities: In this process, the customary authorities become the sole actor in the *ulayat* forest selling. The customary authorities conduct the transactions and communicate directly with prospective buyers of the *ulayat* forest land. The prospective buyers and customary authorities negotiate over the *ulayat* forest land to determine the price, location, and land area. After the agreement, the customary authorities will take care of the *Alas hak* in the *Nagari* office as proof that the *ulayat* forest has been owned by the buyers. An *Alas hak* means that *ulayat* forest land has been transferred and no longer bears communal land property rights.

Model 2

Selling through a broker: In this process, the customary authorities do not sell the *ulayat* forest directly but authorize someone to sell the *ulayat* forest. The broker will offer prospective buyers and negotiate the price, location, and area. After the agreement, the brokers assist the buyers in making the *Alas hak* in the *Nagari* office. This case is evidence of a social network in forest selling between the customary authorities and the buyers through the broker.

Model 3

Selling by local people: The meaning of local people in this research is not only the members of the clan in the *ulayat* forest but the people from the four *Nagaris* who sell the land inside the forest area. In some cases, local people purchase the *ulayat* forest from customary authorities, but not for farming; they purchase the *ulayat* forest for resale. The locals who purchase the *ulayat* forest get lower prices than prospective buyers from outside Dharmasraya because they are members of a clan or a kinship. Local people sell land ranging from two ha to hundreds of hectares. When they resell the land, it is facilitated by social networks. Customary authorities have a central role in granting permits to sell *ulayat* land. Related parties, in this case the government, can reduce the rate of deforestation of *ulayat* forests by collaborating with the customary authorities. The government can provide sustainable forest management options that benefit the customary authorities and indigenous communities. Decisions taken by the customary authorities in managing *ulayat* forest land become absolute decisions that are followed by the community. The model for selling *ulayat* forest land in Dharmasraya is different from that in North Sumatra, where the role of the customary authorities is less dominant. Local communities who sell do not need permission from the customary authorities but are required to hand over money to obtain permission to sell *ulayat* land (Hidayat and Lukitaningsih, 2022).

Social network of the actors in deforestation

The research has identified 40 actors involved in production forest management in Dharmasraya. Eight actors were not involved in deforestation or *ulayat* forest selling. Ten actors were involved in deforestation and *ulayat* forest selling indirectly, and twenty-two actors were directly involved in deforestation through forest selling, as shown in Table 5.

This study investigated whether forest encroachment and deforestation were the results of systematic processes; these processes are different from what is commonly understood. More interestingly, the economy is not the only driving factor of deforestation; deforestation is also due to misconduct by local elites. They can also do it through the facilitation of social networks among traditional rulers with other influential figures in government

Systematic deforestation by indigenous people

Table 5. The actors involved in deforestation and forest selling in production forest in Dharmasraya

No.	Actors	Explanation	Role in deforestation
1	King of Koto Besar	<i>Ulayat</i> land in some sub-districts is part of the <i>ulayat</i> owned by the kingdom of Koto Besar. However, control of the <i>ulayat</i> has been given to every customary authority in each <i>Nagari</i> .	Indirect
2	<i>Adat</i> leaders of Koto Besar Kingdom	Koto Besar kingdom has an <i>adat</i> structure; they have the authority to manage all aspects of the <i>adat</i> , including <i>ulayat</i> property. They can rebuke the customary authorities from each <i>Nagari</i> if they deviate from the <i>adat</i> .	Indirect
3	Customary authorities/CAs (S)	Someone from the <i>Nagari</i> /clan/subclan who has the power to control and manage the <i>ulayat</i> land. In Bonjor, there are three Cas and one in Abai Siat and Sikabau. The <i>ulayat</i> of <i>Nagari</i> Sungai Dareh is affiliated with Sikabau.	Direct
4	Head of KAN Wali <i>Nagari</i>	The highest leader of the <i>adat</i> in a <i>Nagari</i> in Minangkabau society.	Direct
5	(Village/ <i>Nagari</i> chief)	Leader of <i>Nagari</i>	Direct
6	Notary	Working under the control of the customary authorities, they work to issue a buy and sell agreement. Some of the buyers request it.	Indirect
7	Broker (S)	Someone who has a relationship with the customary authorities. The broker helps the customary authorities to sell the <i>ulayat</i> forest	Direct
8	<i>Adat</i> leader (S)	Seller of <i>ulayat</i> forest.	Direct
9	Dharmasraya Forestry service	After the PFMU is established, the management of the forest is given to the PFMU. The Dharmasraya forestry service has the task of coordinating with the PFMU in forest management.	No
10	PFMU	Forest management authority of production forest of Dharmasraya.	No
11	Local Community (S)	Indigenous people who take the forest for resale.	Direct
12	Local community (Encroachers who take forest)	Indigenous people who take the forest for farming.	Direct
13	Police (B)	Buyers of forest <i>ulayat</i>	Direct
14	Soldiers (B)	Buyers of forest <i>ulayat</i>	Direct
15	Investors/Businessmen (B)	Buyers of forest <i>ulayat</i>	Direct
16	Officials (B)	Buyers of forest <i>ulayat</i>	Direct
17	Civil servants (B)	Buyers of forest <i>ulayat</i>	Direct
18	Dharmasraya community (B)	Buyers of forest <i>ulayat</i>	Direct
19	West Sumatera community (B)	Buyers of forest <i>ulayat</i>	Direct
20	West Sumatera outsiders (B)	Buyers of forest <i>ulayat</i>	Direct
21	Pensionary of police (B)	Buyers of forest <i>ulayat</i>	Direct
22	Pensionary of soldiers (B)	Buyers of forest <i>ulayat</i>	Direct
23	Pensionary of civil servants (B)	Buyers of forest <i>ulayat</i>	Direct
24	House of Representatives (B)	Buyers of forest <i>ulayat</i>	Direct
25	PT. SMP	NESHPI is owned by PT SMP. SMP collaborates with Koskopabo to sell the oil palm FFB (fresh fruit bunches).	Indirect
26	PT. AWB	None. Conflict of forest claim between AWB and local people from Sikabau still continues.	No
27	PT. Dhara Silva	Almost all forest area owned by PT Inhutani grabbed by local people.	No
28	PT. Inhutani	Almost all forest area owned by PT Inhutani grabbed by local people.	No
29	Buyer of FFB	Consists of Koperasi, companies, and traders. They purchase FFB from the people who have plantations in forest areas.	Indirect
30	Co-operative of KOSKOPABO	Koskopabo purchases the oil palm FFB (fresh fruit bunches) from NESHPI, which is an area in the forest.	Indirect
31	Workers of forest cutting	Forest buyers hire the workers to cut and clean the forest.	Direct

Continued Table 5. The actors involved in deforestation and forest selling in production forest in Dharmasraya

No.	Actors	Explanation	Role in deforestation
32	Workers of plantation	Plantation owners are dominated by those outside Dharmasraya. Some people are hired to manage the plantation. The workers stay on the plantation, and plantation owners pay for all the needs of the workers, including living costs and plantation costs.	Indirect
33	Gold miners	They take the gold in the rivers and must obtain permission from the customary authorities.	No
34	Encroachers who take logs	Encroachers obtain the permission from the customary authorities to take the logs. They must open the access and share the benefits with the customary authorities.	Direct
35	Wood factory	The wood factory purchases the logs from the encroachers.	Indirect
36	Bulldozer owners	Encroachers hire the bulldozers to open the access and flatten the land in the forest area.	Direct
37	Agriculture and Plantation Service	Does not have the authority in production forest management. But sometimes indigenous people take oil palm and rubber seedlings to be planted in forest areas.	No
38	BPN Dharmasraya	National Land Agency of Dharmasraya	No
39	Ex-Bupati (Ex-regent)	Ex-regent of Dharmasraya purchased the land for plantation in production forest area from customary authorities.	Direct
40	NESHP	NESHP (nucleus estate smallholder oil palm <i>plantation</i>). Some of the NESHP is located in the production forest. Palm oil companies, local people, and Koperasi have a role in establishing the NESHP.	Indirect

S (seller of *ulayat* land), B (buyer of *ulayat* land)

bodies, such as the military, members of the legislative bodies, police officers, and other civilian officials. Forest encroachment and deforestation are a result of this network. The findings of this study are at odds with other studies that explain deforestation as an unstructured and accidental process resulting from economic demands (Bhattarai *et al.*, 2021; Billah *et al.*, 2021). Unfortunately, this fact has been less documented (Table 5). PT. SMP is involved in deforestation because it has opened an oil palm plasma plantation in a forest area. The company and the local communities through the co-operative of Koskopabo claim that the plasma plantation (palm oil) is included in a non-forest area, but the results of satellite image identification show that the plasma plantation (palm oil) is included in the production forest area. Social networks facilitate land acquisition in the PFMU of Dharmasraya; it all began with the land acquisition by the local high-ranking police officer who purchased forest land with an area of 140 ha from a local elite in the years 2004-2005. This acquisition created at least two impetuses; first, land sale was perceived as legal; second, it paved the way for a social network of land sales. This social network developed rapidly as more police officers purchased *ulayat* land from local elites. Later, like a snowball, the networks got bigger and bigger, attracting

other sectors of government officials, military men, pensioners, legislative members, and the middle class. It also triggered locals to obtain land clearing permits to sell the plots. These networks caused systematic deforestation. Social networks of forest land sales are becoming more prominent as many have found them profitable. The buyers meet the right holder network to buy cheap land for investment with robust proper recognition since the right holders transfer the right. The right holders also feel secure against state laws on forest land encroachment, especially in dealing with forest use permit holders and the PFMU since the buyers are of the state apparatus. The buyers would help to strengthen the recognition of *ulayat* land ownership to maintain their plantation inside the state forest area. Consequently, the forest land sale is unstoppable and leads to massive deforestation. In the future, the Dharmasraya production forest will be under threat and clear danger, especially with its status as a production forest. Regarding the utilization of *ulayat* land among the Minangkabau, land sale and the deforestation that it has caused can also be viewed as inconsistent with ideal communal land usage. Among the Minangkabau people, *ulayat* land is a reserve land for the future expansion of agriculture; so, it is forbidden to transfer the land rights. Minangkabau people consider *ulayat* land as

belonging to future generations, and its usage must be considered for the future generations. What has happened in the Dharmasraya districts is against tradition. It is not a collective action in managing the local forest but a collaboration to grab benefits from the selling of *ulayat* land. The interviews reveal that the current practices of *ulayat* sales are against local custom, but they admitted that time had changed many things. It is not considered as wrongdoing, and the *ulayat* land institution is no longer relevant due to the current economic pressures. However, it is probably changing the mindset of local people; their perception accelerates *ulayat* land sales and causes severe deforestation. SNA identifies the actor roles through approaches to the degree of centrality, the betweenness centrality, and the closeness centrality. The degree of centrality is thus seen as a measure of an actor's level of involvement or activity in the network. Indegree centrality is the number of ties received by an actor from others, and outdegree centrality is the number of ties given by an actor to others. In this case, the customary authorities have most of the ties in the network (indegree centrality and outdegree centrality have 27 paths/links); this means that the customary authorities became the actors most involved in deforestation and forest land selling in the PFMU of Dharmasraya. Betweenness centrality calculates how often an actor sits on the geodesic path (the shortest path), linking two other actors together (Prell, 2011). In the communication network, betweenness centrality measures how many potentially controlling actors are in the network. For example, in the deforestation and selling of *ulayat* forest land, the customary authorities become an actor with the most links with other actors (187 links/path). The logic of closeness centrality can be summarized as follows: if an actor is not central, he generally needs to rely on others to relay messages through the network (Freeman, 1978). Closeness centrality is determined by the short path lengths linking actors together: it measures centrality as the distance between actors, whereas actors with the shortest distance to other actors are seen as having the most closeness centrality (Prell, 2011). For example, in the deforestation in Dharmasraya, the customary authorities became the actor who had the shortest distance from the other actors (score: 35). The results of the centrality analysis prove that the customary authorities are the parties who play

the greatest role in the deforestation process in the PFMU of Dharmasraya.

CONCLUSION

Three parties are interested in forest production: local indigenous people, the companies, and the government (the PFMU of Dharmasraya) and each party claims the production forest because each party sees itself as being the most eligible for forest ownership; this causes an overlap of forest management and ownership among the actors. The indigenous people have become the most powerful party in the ownership of the production forest. The claims of ownership of the forests as customary forests have caused the traditional authorities to sell forests massively. All the communities in Dharmasraya and West Sumatra claimed that the forest was the customary/*ulayat* forest, not state forest; this strengthens the indigenous people's claim over forest land. The customary authorities and a few local elites have exploited this condition to sell the *ulayat* forest. The land sale price varies according to the position of the forest and its distance from villages, the topography, and the access. The price of *ulayat* (forest) land is considered cheap, ranging between USD 300 and USD 1,300, including the *Alas hak*. The *Alas hak* is a signed paper showing that the forest or communal land has been sold to someone else. The traditional leaders who play a role in the sale of customary land are 1) the *ulayat* land rights holder (customary authorities), 2) the ruler of the customary land (MKW), and 3) the chief of the council of elders. The *Nagari* (village chief) plays a role by issuing *alas hak* of the *ulayat* forest. There are three models of *ulayat* forest land selling in the PFMU of Dharmasraya, namely selling by customary authorities, selling through the broker, and selling by local people. The research identified 40 actors involved in production forest management in Dharmasraya. Eight actors were not involved in deforestation or *ulayat* forest selling. Ten actors were involved in deforestation and *ulayat* forest selling indirectly, and twenty-two actors were directly involved in deforestation through forest selling. The social network facilitates deforestation through land sales. Land encroachment is not a random process; it makes use of the social structure in the community where the *ulayat* land rights holders play a crucial role. Land buyers come from various sectors of society that understand the statutory and

customary laws. Legal pluralism paves the way for land transactions using customary law. The buyers are from various backgrounds; they are civil servants, police officers, members of the legislative bodies, and local figures at the district and provincial levels. They are tied by a mutual relationship and protect each other from state law. Strong recognition of customary land rights provides secure land transactions. The land was sold at a low price, which triggered huge transactions involving forest land. The social network has become large and more significant and involves many actors. The fact that indigenous people and local elites are the main actors in the forest land transactions that led to deforestation has severe implications for forest management in Indonesia. Moreover, these findings provide feedback on the recent Constitutional Court ruling stating that the *ulayat* forest was excluded from the state forests through the Constitutional Court's Decision no. 35/PUU-X/2012. Therefore, the criteria and indicators of customary land management by indigenous people must be integrated into forest management to ensure forest conservation in the future. Integrated forest management to prevent the abuse of customary authority through the management of forests in an irresponsible and unsustainable manner.

AUTHOR CONTRIBUTIONS

A. Mutolib performed the literature review, designing research, collecting research data, analyzed and interpreted the data. Y. Yonariza performed has contributed in arranging study permits, managing and providing the study locations, compiled the data and manuscript preparation. A. Rahmat performed the spatial analysis to identify the deforestation, interpretation of the data results and manuscript preparation.

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CONFLICT OF INTEREST

The author declares that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy have been completely observed by the authors.

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ABBREVIATIONS DEFINITION

%	Percent
BAL	Basic agrarian law
BPN	Badan pertanahan nasional (National land agency)
CBS	Central Bureau of Statistics
FAO	Food and agriculture organization
FFB	Fresh fruit bunches
ha	Hectare
HGU	Hak guna usaha (Land use rights)

HPH	Hak penguasaan hutan (Forest concession rights)
HTI	Hutan tanaman industri (Industrial plantation forest)
IUPHHK	Izin usaha pengelolaan hasil hutan kayu hutan tanaman industri (Forest timber product exploitation permits)
KAN	Kerapatan adat nagari (Council of the elder chief)
KOSKOPABO	Koperasi Sawit Koto Besar Padang Bungur dan Bonjol (Cooperative Organization)
Km	Kilometer
MKK	Mamak kepala kaum (Leader of a tribe or clan)
MKW	Mamak kepala waris (Ruler of customary land)
MOEF	Ministry of environment and forestry
NESHP	Nucleus estate smallholder oil palm plantation
PFMU	Production forest management unit
PT	Perseroan terbatas (Private limited company)
PT AWB	PT Andalas wahana berjaya
PT BRM	PT Bukit raya mudisa
PT DSL	PT Dhara silva lestari
PT SMP	PT Silago Makmur Plantation
SNA	Social network analysis
USD	United states dollars

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