# Chapter 2
# Peatland Degradation, Timber Plantations, and Land Titles in Sumatra


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**Abstract** Peatlands in Riau, Sumatra were relatively untouched by development or deforestation until at least the beginning of the 1970s. But today these landscapes are seriously degraded, with fires breaking out almost every year. Why and how has it come to this? This study attempts to make clear the relationships between the establishment of timber plantation, construction of large-scale drainage infrastructure, peatland degradation, in-migration, increasing fire events, and abandonment of peatland. This study highlights land rights as a factor that may either promote peatland degradation or motivate local people to manage degraded peatlands to better ends. It shows how large-scale drainage introduced by timber plantations since 1990s led to peatland desiccation in Riau, leading to fire events outside the plantation concession areas. Local people reacted to fire by logging and distributing parcels of peatland swamp forest outside the concession to secure land rights and to stop further concession giving to companies by the government. These activities in turn promoted peatland degradation, increasing the incidence of fire and abandonment of peatland. Local people's scramble to secure land rights promoted peatland degradation, but as soon as they obtained land titles they managed the burned lands well. On the other hand, land distributed land without title tended to be abandoned after fires. The intrusion of timber plantations and land distribution also promoted in-migration, which contributed to peatland degradation. One of the reasons why people could distribute these peat swamp forests among themselves was poor governmental management of state forest lands, as the boundaries between the state and nonstate forests remained unclear, especially for the local people.

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## 2.1 Introduction

Peatlands in Riau, Sumatra were covered with dense forest at least until the beginning of the 1970s. Today this area is experiencing serious land degradation, with fires breaking out almost every year. Why and how has it come to this? Many studies on peatland degradation have identified key factors contributing to forest degradation. These include the establishment of timber and oil palm plantations, large-scale drainage projects, intensive land use associated with increased in-migration, and fire. This study picks up from previous research, emphasizing land rights as another important factor that may either promote peatland degradation or motivate local people to better manage degraded peatland.

This chapter aims to show three points based on fieldwork conducted in Bengkalis district, Riau Province, Sumatra, Indonesia between 2010 and 2021. First, it describes historical change in peatland use in the study area. Second, it describes the process of establishing land tenure among local people. Third, it discusses the relationship between the characteristics of land rights and peatland degradation.

### *2.1.1 Background: Development Programs and Peatland Degradation*

Indonesian peat swamp forests were relatively untouched by modern state development initiatives until the early 1960s (Silvius and Suryadiputra 2005). Although the Riau area in Sumatra was logged commercially under the *Panglong* system since the 1860s, there were no related reports of peatland degradation or large-scale fires (Pastor 1927; Jelles 1929; Sewandono 1937). The peat swamp forests have been inhabited by Malay people for a long time with only limited or localized associated ecological damage (Page et al. 2009, pp. 900–01; Furukawa 1992; Momose 2002).

Several important changes occurred in the 1970s, however, including the initiation of large-scale logging, a governmental transmigration program, and spontaneous migration to the peatland area. These changes mark the beginning of peatland degradation (Dohong et al. 2017). The experience of Riau is not unique, as assessments of peatlands throughout insular Southeast Asia reveal dramatic reduction in peat swamp forest cover since 1985 (Hooijer et al. 2006; Miettinen and Liew 2010; Fuller et al. 2011; Miettinen et al. 2012b). Conversion of peat swamp forests to industrial timber and oil palm plantations is often seen as one of the major causes of deforestation (SarVision 2011; Miettinen et al. 2012a). In particular, oil palm cultivation has caused much controversy (Stone 2007; Venter et al. 2008; Sheil

et al. 2009). A majority (62%) of the plantations were located on the island of Sumatra, and over two-thirds (69%) of all industrial plantations were developed for oil palm cultivation, with the remainder mostly being acacia plantations developed for production of paper pulp. Historical analysis shows strong acceleration of plantation development in recent decades: 70% of all industrial plantations have been established since 2000, and only 4% of the current plantation area existed as plantation in 1990 (Miettinen et al. 2012a).

These developments led to systematic drainage of peat swamp forests which has triggered the long-term degradation of peatlands, increased carbon emission in this area (Dohong et al. 2017), and led to regular occurrence of fire. A survey in 2013–2014 (Gaveau et al. 2016) showed that of 404,713 ha burned in those years, 84% (330,000 ha) was peatland, 10% (38,451 ha) of the total burned area was mature acacia tree stands, and 18% (54,870 ha) of burned non-forest lands were oil palm stands. However, 75% (300,000 ha) of the burned area was previously non-forest land, and of this non-forest land, 82% was idle land, that is, unplanted peatlands covered with shrubs and wood debris.

How has the development of timber and oil palm cultivation been related to peatland degradation, and especially peatland fires, outside the concession areas? The idle lands identified by Gaveau et al. (2016) that are prone to burning probably refer to abandoned land. A village in Central Kalimantan surveyed by Maimunah et al. (2018) was affected by forest and peatland fires that destroyed large areas of productive agricultural land. Most of the burned land was then abandoned due to declining fertility, and the farmers began to look for alternative land uses to meet their livelihood needs (Carlson et al. 2013; Maimunah et al. 2018).

Joosten et al. (2012) reported that millions of hectares of the world's drained peatlands have such low productivity and have become so degraded that they have been abandoned. In the absence of management, abandoned and drained peatland sites are particularly susceptible to fire, as partially logged and previously burned forests in the tropics may accumulate considerable dead wood litter, and the dry peat beneath is easily ignited in the dry season.

Despite these accounts it is not clear how acacia and oil palm plantations and associated drainage projects degrade peatlands, or increase vulnerability to fire both within and without concession areas. Does peatland degradation generally lead to abandonment? How do local people who have lived with peatland resources respond to similar threats and challenges?

Studies on peatland degradation conducted by the Ex Mega Rice Project, or MRP (1995–1999), in Central Kalimantan province address these questions at least in part. MRP's goal was to turn 1 million ha of unproductive and thinly populated peat swamp forest into rice paddies in order to address Indonesia's food shortage. The project called for large-scale transmigrations, irrigation canals, and clearing vast areas of peat swamp forests. The project was eventually abandoned, but only after it had caused significant environmental damage and fire, and induced a livelihood crisis (Galudra et al. 2011; Jewitt et al. 2014). The construction of logging roads, land clearing, and a shift by local communities toward shorter fallows within farming systems led to large areas of deforestation, forest degradation, and large

carbon emissions form the tropical peatlands of Central Kalimantan (Medrilzam et al. 2017; Chokkalingam et al. 2005; Law et al. 2015; Medrilzam et al. 2014).

Jewitt et al. (2014) described the history of local livelihood strategies in the area before the MRP, and compared them to conditions during the MRP, and as they were affected by programs following the MRP. Examining a community-based forest management program, logging concession given by the local government, and REDD+ Program in the former MRP area, they demonstrated the limited ability of government programs to rehabilitate degraded peatlands.

How does peatland degradation relate to acacia and oil palm plantations outside the MRP? What is the relationship between the introduction of acacia plantation, oil palm cultivation, drainage projects, in-migration, peatland degradation surrounding acacia plantations, fires, and land abandonment in those areas? How did local people, especially the Malay people, respond to changes? The first aim of this study is to answer these questions based on case study in Riau Province.

### *2.1.2 Land Ownership and Land-Use Management*

This study examines how changes in land tenure relate to shifts in peatland use and degradation. Land tenure conditions influence the continuity and productivity of agricultural production, with many studies emphasizing the role of land-tenure and land-use rights as prerequisites to better land management by small holders (Suyanto et al. 2005). Feder and Noronha (1987) and Feder and Feeny (1993) strongly argue that secure private land ownership effectively incentivizes small farmers to invest in land improvement. Even if land tenure is not guaranteed by government title but is instead based on informal community institutions, it appears that secure access to land encourages farmers to adopt better land-use management.

Does this finding hold true in the case of peatlands? There are some studies on the role of secure land rights, both individual and communal, in promoting forestation or peatland rehabilitation programs or better land use. Nevertheless, there is persistent argument that securing land rights would promote further peatland degradation, especially suggesting that more people would enter the peatland forest in search of secure private land. How are land tenure, especially secure land rights, related to peatland degradation, or conservation and rehabilitation?

Wildayana et al. (2019) argue on the contrary that increasing secure land ownership would promote peatlands degradation. They suggested that granting tenure would empower farmers to claim future land rent and increase land clearing as farmers seek additional income, but the authors do not show any data or other information to support these arguments.

On the other hand, Jewitt et al. (2014) show the importance of customary land rights or land ownership in relation to peatland restoration programs such as REDD+ and community-based forestry management programs. Nawir et al. (2007) also show the significance of customary land ownership to community-based forestry management. Many papers have discussed land tenure in state forest lands (or the

Government-designated state forest area [*Kawasan Hutan*], hereafter refer to state forest, or the Government-designated state forest area, or state forest area, or state forest lands), including their relationship to land-use conflicts in the state forest (Yusran et al. 2017; Kunz et al. 2017); the agrarian reform program, especially the social forest program in state forest area in the peatlands (Resosudarmo et al. 2019); or land ownership and community involvement as a key factor for the success of the agroforestry program in state forest area (Suyanto et al. 2005). Meanwhile, Rietberg and Hospes (2018) described a case in which land acquisitions in an oil palm frontier obscured customary rights and local authority, and resulted in land conflict between the local people and the estate company.

Mizuno et al. (2021) showed that majority of peatlands in the study's research site are located in the state forest, and that there are overlapping land rights in the peatland area. Many people obtained land by clearing, inheritance, purchase, and distribution, and most of these transactions were conducted according to customary practice. Land rights based on customary practice, however, are frequently not recognized by the local government. This study extends Mizuno et al. (2021), examining the relationships between the introduction of acacia plantations and the prevalence of oil palm cultivation, land tenure and land rights, and peatland degradation or conservation. It examines households holding certificates of land rights or land titles, whether customary or statutory, or secured or non-secured, seeking to answer the question of whether secured land rights promote better land management, or encourage further peatland degradation. The particular status of land rights can be verified by examining the certifying land title letters. Many the villagers have letters of SKT (*Surat Keterangan Tanah*), which is based on customary rights, while other villagers have certificate letters of land ownership *(Sertifikat Tanah*) issued by the Indonesian National Land Agency (*Badan Pertanahan Nasional*, BPN). Some villagers have no letter to certify their land rights. Generally, land ownership letters are thought provide more secure land rights than SKT customary rights-based letters. Having a SKT letter is still thought to be better than having no letter at all, however.

## 2.2 Methodology

### *2.2.1 Selection of Research Site and Its General Description*

Research was conducted in Tanjung Leban village (*Desa* Tanjung Leban), Bukit Batu sub-district (*kecamatan*), Bengkalis district (*kabupaten*), in the east part of Riau province (*propinsi*). This village is located in the peatland area that faces the Malacca Straits. The village was selected for the following reason.

Furukawa (1992) identified two different groups of people making use of peat swamp forests. Malays are characterized as members of a "culture of transit", people whose multiple livelihoods strategies shift as easily as do their domiciles. Traditionally, the Malays have not exploited the peatland intensively; if they have made use of it, they have done so without degrading the landscape—for example, by engaging in

fishery, rubber production, small-scale slash and burn, and so on. The second group comprises immigrants such as Javanese and Banjarese who have exploited the peatland tidal forests on a large scale, clearing fields, planting rice, and establishing themselves as permanent residents (Furukawa 1992). This study selected the Malay village in order to better understand the process of peatland degradation in an area in which peatlands had been relatively well maintained at least until the beginning of the 1980s.

Tanjung Leban was originally a Malay settlement. This study traces the village history further back, as well as the in-migration to the village and expansion of the land exploited in the last few decades. The village significantly expanded at the end of the 1990s, partly because of the intrusion of timber plantations in the 1990s, and again in the 2000s due to the exploration of former peat swamp forests, the inflow of migrant workers in large-scale logging operations and timber smuggling, and oil palm cultivation. The village thus provides insights into the relationship between the intrusion of timber plantations and peatland degradation, the development of land use and tenure system in a traditional Malay village, and the expansion of oil palm cultivation in a former peat swamp forest, which is mainly the Government-designated state forest area.

Tanjung Leban village has a population of 1145 (601 male and 544 female), and where there were 321 households in 2010 (Bukit Batu sub-district 2010). The village covers 17,000 ha that extend to the protected area of the Giam Siak Kecil–Bukit Batu Biosphere Reserve. The bio-reserve was recognized by UNESCO in 2011 and consists of a 178,222-ha core area, a 222,425-ha buffer zone, and 304,123 ha of transition areas. Administratively, the bio-reserve belongs to both Bengkalis and Siak districts. Extensive *Acacia crassicarpa* and oil palm plantations are found in the buffer zone and transition areas. The surveyed village includes natural peat swamp forest, timber plantations, and areas owned or utilized by local people; most of these lands consist of peatland on a flat terrain. Only around 1 km from the seashore that faces the Malacca Straits is alluvial soil, and it is in this area, at the border between the alluvial soil and peatland, that people have traditionally settled. The peatland was covered by peat swamp forest a until the middle of the 1990s. A majority of this peat swamp forest is within the state forest area, and all of the Giam Siak Kecil Biosphere Reserve is within the state forest area and is therefore state land (Mizuno et al. 2016). According to the authors' calculations in April 2020 based on the map shown by the Peatland and Mangrove Restoration Agency (*Badan Restorasi Gambut dan Mangrove*, BRGM) of 27,960 ha of the research area, 24,358 ha (87.1%) was peatland, and 3602 ha (12.9%) was non-peatland; on the other hand, as much as 28,206 ha (99.1%) was state forest, and only 246 ha (0.9%) was APL (area of other use, outside of state forest area) (Mizuno et al. 2021).

*Panglong* logging, mainly led by Chinese entrepreneurs in Singapore and featuring the *ongka* logging system of wood rails and sleighs, has been conducted here since the 1920s (Jelles 1929, p. 484). The government has issued logging concessions (*Hak Pengusahaan Hutan*, HPH) since the 1970s and industrial forest plantation concessions (*Hutan Tanaman Industri*, HTI) to private companies in this state land since the 1990s. The landscape changed drastically in the 1990s as timber

companies began planting *Acacia crassicarpa*, and trees grown in the concession areas began to be supplied to the giant paper company located at Perawang, Riau Province. Such timber plantations started operations at the end of the 1990s (Masuda et al. 2016).

Tanjung Leban consists of three major sub-villages (*dusun*), namely, Bakti, Air Raja, and Bukit Lemkung. Many migrants moved to Air Raja and Bukit Lemkung from North Sumatra since around 2000. The *Acacia crassicarpa* plantations and the accompanying road and canal construction made the thick peat swamp forest accessible to people from outside this region. The migrants to Air Raja and Bukit Lemkung are mainly Javanese born in the Medan area in North Sumatra.

In contrast, Bakti sub-village mainly comprises Malay people who have inhabited the area for a long time, principally on their own lands, some of which are not in the state forest. The authors chose to investigate Bakti sub-village because of the high percentage of Malays among the population and because it has the longest history among all the sub-villages of Tanjung Leban. It thus provides insight into customary law of the area as well as the changes that have taken place over time. Usually, a *dusun* comprises several hamlets. However, in the case of Bakti sub-village, there is only one hamlet (Bakti hamlet),[1] so the former is the same as the latter. For clarity, Bakti sub-village is hereafter referred to as the "surveyed sub-village" and Bakti hamlet as the "surveyed hamlet." The administrative village of Tanjung Leban is called the "surveyed village."

### 2.2.2 Data Collection

In total, the authors completed 71 household survey questionnaires in the Bakti hamlet. The primary survey was conducted from 2010 to 2012. Supplemental information about social and ecological changes was collected until the beginning of 2021. The authors investigated whether household lands are peatland or not; the history of land acquisition, land use, and land titling; peatland conditions, including the depth of the peat layer and whether and when the land has experienced fire; existing vegetation; and agricultural inputs and yields for each plot of land. They surveyed the composition of household members, education, occupation, ethnicity, birthplace, history of migration, and so on. Intensive study was concentrated on Bakti sub-village.

On the local perceptions of whether the land is peatland or not vary, each person provides his or her own answer. There are many lands that have a thin peat layer.

[1] The surveyed sub-village consists of two RWs and four RTs. An RT (*Rukun Tetangga*) is a neighborhood organization comprising around forty households. One RW (*Rukun Warga*) consists of two to four RTs. More Malay people live in RT01/RW01, RT02/RW01, and RT03/RW02 compared with RT04/RW02, where there are more migrants. Consequently, the authors conducted household surveys using a complete survey approach in RT03/RW02 and RT02/RW01. They also conducted household surveys to some extent in RW01/RW01.

Sometimes people say that the peat layer has already disappeared, or that "*menjadi tanah hitam,*" or "*menjadi kilang manis*," i.e., "the land is not peatland anymore." The authors asked the peatland status of each plot of land. People sometimes answered that within the home garden, half is peatland and the other half is mineral soil. In these cases, the authors divided the plot and counted each part as either peatland, or non-peatland.

### 2.2.3 *Land Tenure: de Jure Land Rights and de Facto Land Rights*

The authors investigate land tenure and land title to determine the strength or security of land rights, and when and how those rights were obtained, and what relation they may have to peatland degradation. They mainly analyze the land *owned* by the respondents because sharecroppers or leasers do not know, or are not familiar with, the history of land acquisition, titling, and burning. As will be shown later, the amount of land leased to the respondents is small, so the authors' analysis is representative for the hamlet surveyed. All analyses compare the differences between peatland and non-peatland.

Land tenure is defined as "the right, whether defined in customary or statutory terms, that determines who can hold and use land, including forests and other landscapes and resources, for how long, and under what conditions" (Resosudarmo et al. 2014).

The discrepancy between de jure rights and de facto rights over land tends to manifest as land disputes, careless land use, or overlapping of land management subjects and rights. The conditions of de jure rights and de facto land rights can be studied in the process of land acquisition and land titling. For both of these there are customary and statutory practices. Customary land rights sometimes become the basis for statutory practices, but in most cases the state has tended to neglect customary way. There is a wide range of non-statutory land rights, from strongly secured to weak and unsecured. For example, secure customary rights are sometimes established through well-recognized letters or well-recognized custom, while in other cases some lands are claimed without any letter of certification or by obscure customary practices. This study pays special attention to such differences.

There are many different ways to certify land rights in Indonesia, and land prices differ according to the types of land titling (Mizuno and Shigetomi 1997). Land titles can secure the right to the land when the land is disputed, and titles issued by the agrarian office can be mortgaged. On the other hand, letters issued from the village office according to the customary way are not recognized by the agrarian office and cannot usually be mortgaged in banks.

During colonial times, land rights possessed by Europeans were based on the civil code (*Burgerlijk Wetboek*). Their lands were registered and a written certificate (*een schriftelijk bewijs*) was issued. Europeans could obtain right of land ownership

(*eigendom recht*). On the other hand, Indonesians could get rights of possession (*bezitrecht*) on land based on customary law without registration. Indonesians did not then have land titles, only an excerpt from the land rent registration book (called Buku Letter C, and the excerpt was called *girik* or *kikitir,* among other names). This excerpt was considered a document demonstrating the amount of land tax owed, and identifying the payee, it was not considered a certification of land ownership. This excerpt was issued to people who possessed land and paid the land tax in the island of Java (Mizuno 1991), but not to those in islands outside Java and Madoera (Madura).

The Basic Agrarian Act (UUPA) of 1960 unified these dualistic systems of land rights, and stipulated that the right of land ownership would be based on customary law. The Act obliged the government to register land all over the country. However, Article 19 Clause 3 of the Act stipulated that land registration be implemented in consideration of the state of the government and society. Here, majority of the land owned by Indonesians began to exist as land with the right of ownership without registration or titling. Since the 1980s, the government implemented the National Land Registration Program (*Prona*), yet by 1991 the percentage of registered land only amounted to 1.9% of the total.[2] The program of land registration has proceeded at a somewhat similar pace since then.

In 2001, MPR (People's Representative Board) passed the "TAP MPR" a decision allowing the government to implement agrarian renewal (*Pembaruan Agraria*). The administration of current President Joko Widodo has targeted redistribution of 9 million ha through TORA (*Tanah Obyek Reforma Agraria*, agrarian reform program), which deals with land titling and redistribution to small-scale or landless farmers through Government Regulation No. 86 Year 2018 on Agrarian Reform (Resosudarmo et al. 2019; Muchsin et al. 2019; Arisaputra 2015). Land registration and land titling has therefore accelerated.

People whose land is registered posses a land certificate which varies depending on the kind of land right. The most common certificate letter is a land ownership certificate (*sertifikat hak milik tanah*). How were these enforced in the surveyed village?

In some places in Sumatra, a "letter of statement" had been issued to Indonesians who possessed land based on customary rights (the colonial system called this right *Inlander bezitrecht*, or the "possession right of indigenous people"). For example, in Jambi a regulation issued in 1930 (*Regeeringsomslagvel* No. 30318, 17 October 1930) enabled a village head (*kepala kampung*), or an assistant to the Resident, to make a letter of statement (*surat keterangan*) for an Indonesian who had inheritable rights of individual possession (*erflijk individueel bezitrecht*). The letter of statement was to be attached to a map (*schetskaart*). Letters of statement have been issued ever since. For example, from 1958 to 1 April 1963, the agrarian office in Jambi City and

[2]The area of land that had been registered was only 1.9% for all land in Indonesia. On the other hand, in areas that have been able to levy land tax outside the forest, 6.8% was registered at the beginning of the 1990s (Harahap 1991/1992, p. 26).

Jambi Region (*Kantor Agraria Daerah dan Kantor Agraria Kota*) issued thousands of letters of statement such as the Letter of Statement for the Right on Land (*Surat Keterangan Hak Tanah,* SKHT) and the Letter of Statement for the Land Ownership (*Surat Keterangan Hak Milik*, SKHK) (Parlindungan 1978, pp. 16–32).

Under the Basic Agrarian Act of 1960, Letters of Statement made by the village head or excerpts from the land rent registration book were incorporated into the agrarian office administrative system. If a person wishes to register land, they can submit a registration proposal with the letter of statement made by the village head and recognized by the assistant of the *wedana* (today the *camat,* or head of the sub-district), and the excerpt from the land rent registration book mentioned above. If the proposal is approved, this makes clear the right to the land according to Government Regulation No. 10 of 1961 regarding land registration.[3]

Recent government regulations tend to use the role of the village head more actively. Government Regulation No. 24 of 1997[4] on land registration stipulates that land without any supporting documents can be certified when the land is de facto managed or overseen by the person for 20 years or more, at which point a letter of statement can be issued by the village head.

The government tends not to recognize letters issued by village office or sub-village office (SKT discussed later) on the state forest (*kawasan hutan*), however. Local government has repeatedly warned the sub-district office and village office not to issue SKT in state forest lands, and the 1998 Forestry Act prohibited people from making use of state forest without permission from the Government (Mizuno et al. 2021).

How many people own such letters in the surveyed village/hamlet? It is entirely possible that other kinds of letters also exist. When registered land is transferred, the official transaction document depends on the kind of transaction. In the case of a land purchase, an official document of land purchase (*Akta Jual Beli Tanah*) should be made by the Land Official Documents Officer (*Petugas Pembuatan Akta Tanah*, PPAT) or the head of the sub-district (*camat*), and submitted to the agrarian office by the landholder. When the land is not yet registered, people who wish to have it registered should make the certificate of transaction according to Government Regulation No. 10 of 1961. Thus, people often rely on the certificate of land purchase to certify their right to the land. In some cases they have this document even before the land is registered (Mizuno 1991). Moreover, for land that is not registered, people sometimes have the official document of land purchase which certifies the right to the land.

[3] Peraturan Pemerintah No. 10 tahun 1961 tentang Pendaftaran Tanah. Recent government regulations, especially those issued by local governments, tend to use the SKT more actively. Government Regulation No. 24 of 1997 on land registration (Peraturan Pemerintah No. 24 Tahun 1978 tentang Pendaftaran Tanah) stipulates that land without any document to certify land rights can be certified when the land is controlled de facto by the person for 20 years or more, and letter of statement can be issued by the village head.

[4] Peraturan Pemerintah No. 24 Tahun 1997 tentang Pendaftaran Tanah.

How are these conditions reflected in the survey site? And how do these different titling documents and condition related to changes in land tenure in general, and to use of peatland and peatland degradation, including fire and land abandonment? The following section describes our findings.

## 2.3 Findings

### *2.3.1 Formation of the Surveyed Settlement, In-Migration, and Peatland Degradation*

#### 2.3.1.1 Changes in Peat Swamp Forests Were Closely Related to Changes in the Local Population's Ethnic Composition

Present-day respondents to our household surveys began living in the hamlet in the 1930s. One Malay respondent born in 1952 in the surveyed hamlet said that his father, who was born in Bengkalis Island, moved to the surveyed hamlet in the 1930s. Some other families moved to the hamlet during the Japanese occupation of 1942–1945.

Since that time permanent settlement (even as people remained mobile across the area) is relatively recent compared to the Bukit Batu area along the Bukit Batu River. According to an encyclopedia of geography published in 1869, "At Bukit Batu, there are three hundred to four hundred fishery boats that belong to the houses in this area. In the same name village along with the same name river there is a small fishery port" (Veth 1869, p. 173).[5] The surveyed hamlet is about 60 km from Sungai Pakning town, the capital of Bukit Batu sub-district. Sungai Pakning has a port from which a regular ferry boat departs for Bengkalis Island, where the capital of the district is located about 50 km from the surveyed hamlet.

Around 200 m south of the coast of the surveyed village, a main road connects Sungai Pakning and a big oil-port town, Dumai, which is located 30 km to the northwest. At the moment this is good paved road newly built in the 1990s. It replaced a small road (built in the 1970s) nearer the seashore that connected both towns. Before that there was no road, and so the people went to these towns on small sailboats, especially as needed to transport birthing mothers and the sick.

In the 1920s, Bengkalis Regency (Afdeeling Bengkalis) had a population density of just 2.23 persons/km$^2$, yet in 1925 it exported 6000 tons of rubber, making it the largest exporter of any of the sub-regencies on the east coast of Sumatra. There were 1.36 million rubber trees in Kampar-Siak district, which included the surveyed village at the time. Of these, latex was harvested from 1.05 million trees, and

[5] When Englishman Anderson made an expedition in 1823, he mentioned Bukit Batu as a place of considerable trade and large fish catches (3–400 boats with 2–3 persons each were found, especially for fisheries) (Schadee 1918, p. 39).

3200 tons of rubber were exported (Departement van Landbouw, Nijverheid, en Handel 1926, pp. 15–18, 28).

We can see from the above that rubber cultivation spread extensively throughout Bengkalis Regency as early as the 1920s. According to present-day residents, rubber has been cultivated at least since the 1930s, but widespread cultivation of rubber trees in the surveyed village occurred after the 1950s. On the other hand, betel palm trees were planted mainly in the surveyed hamlet until the 1950s.[6] *Panglong* logging extended operations in Bengkalis Regency in the 1920s, and was the most active business in Indonesia at the time. The most important logging activities then took place in the peat swamp forest areas (Endert 1932, p. 733).

All villagers who began living in the surveyed hamlet in the 1930s were Malay, and many of their children were born in the surveyed hamlet. Some of them married fellow villagers; however, many married couples began arriving from outside the hamlet. Several such couples that moved into the hamlet were Javanese, some were born in Riau, but many were immigrants from Java Island, or Javanese who came from North Sumatra, particularly the Medan area.

Here, if one member of a couple originated from the surveyed village, the couple is categorized as "local residents." In other words, a "migrant" couple is one in which both members of the couple are not from the hamlet. Ethnic makeup is determined by the ethnicity of the parents of each member of the couple. In the case of migrants, the year of arrival is the year the first member of the couple arrived in the village. In the case of local residents, the arrival year indicates that the couple's earlier year of birth in the surveyed hamlet.

Among 71 respondent households, 34 contained one or more members originally from the surveyed hamlet. Among those 34 households, 14 are Malay-Malay couples. The remaining couples are Malays married to someone of different ethnicity, with the exception of one Javanese couple. The majority of mixed-ethnicity spouses are Javanese (15 cases include couples of mixed ethnicity of Malay, Javanese, and others). Other ethnic groups in this table include Minangkabau, Banjare, Sundanese, Buginese, Chinese, and Ocu Bangkinan. The Ocu Bangkinan are a minority group that mainly stays in Kampar district, Riau, which is adjacent to the Minangkabau's area in West Sumatra.

In the remaining 37 couple-based households, neither member was born in the surveyed hamlet. Among these migrants, 17 households migrated to the surveyed hamlet prior to 1995, when there were no large-scale *Acacia crassicarpa* plantations (prior to 1984, 7 households comprised migrant couples; and from 1985–1994, 10 households had migrant couples).

The main economic activities in the surveyed village prior to 1995 were in fisheries, dry rice shifting cultivation (*ladang*), rubber cultivation, and logging. Vast peat swamp forests were found, yet people cultivated the non-peatland and the border areas between peatlands. Secondary forest areas increased due to logging

[6] Authors' interviews with respondents No. 16, 30, 60, and 61 in March 2011, October 2014, and December 2014.

(Watanabe et al. 2016). Yet the technical difficulties of the traditional system of *ongka*, which was used for logging prior to 1995, limited logging areas (Watanabe et al. 2016; Masuda et al. 2016; Momose 2002). In-migration also increased prior to 1995, partly because the surveyed village was considered a place with rich resources to be exploited, and partly because there were opportunities to work in logging—conducted by either the concession company (HPH) or local people. Until this time, land was acquired through inheritance, purchase, or clearing the forests, as will be described in the following section. Opening up of the road connecting Sungai Pakning and Dumai in the 1990s enabled further inflows of people. The matter of their land acquisitions will also be discussed in detail below.

Table 2.1 accordingly shows that the surveyed hamlet was formed first by Malays in the 1930s; they were gradually followed by an inflow of Javanese who married local residents during 1950–1980. Finally, migrant couples started to move into the village in significant numbers after 1985, and this increased after 1995.

#### 2.3.1.2 Peatland Degradation in the Hamlet Is Closely Related to Intrusion of Timber Plantation Since 1998

The *Acacia crassicarpa* plantations were established in this area in 1998 by a timber company representative of the paper, pulp, and timber industry, while a number of companies received industrial tree plantation concessions in the beginning of the 2000s at the Giam Siak Kecil area. In order to plant *Acacia crassicarpa*, the groundwater table level should be reduced to 70 cm below the soil surface.[7] Many ditches were built to reduce the peatlands water table, discharging huge amounts of water into the sea. These ditches dried out the peat swamps, rendering them extremely vulnerable to fire. Fires began to appear in the dried peatland surrounding the acacia plantation at the end of the 1990s.

This period also marks the beginning of large-scale logging in the remaining peat swamp forests. After President Suharto stepped down in 1998, rules and laws were generally loosened in Indonesia, and traders from Malaysia became more willing to buy illegally logged timber. Informal village leaders organized logging groups equipped with chainsaws, vessels to carry timber, and heavy equipment such as power shovels, sometimes with financing provided by the timber traders. The groups would log a particular block of the forest, and then distribute the former forest lands to the villagers. Many of these distributed lands were part of the state forest area. For example, a block consisting of upward of 300 ha was logged at the initiative of informal local leaders who had the businesses such as timber trader backed

[7] Supiandi reports that *Acacia crasicarpa* and oil palm can grow at the underground water level of 60–100 cm at the peatland (Sabiham 2009, pp. 242–243).

**Table 2.1** The ethnic makeup of surveyed household couples in 2010 and 2011, the origin of surveyed households, and the year when they took up residence in the surveyed hamlet (unit: number of households) (Source of data: Authors' survey in 2011–2014)

| | Local residents | | | | | Migrants | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Malay | Malay | Javanese | Malay | | Malay | Malay | Javanese | Malay | Javanese | | |
| | Malay | Javanese | Javanese | Others[a] | | Malay | Javanese | Javanese | Others[a] | Others[a] | | |
| | | Others[a] | | | Total | | Others[a] | | | | Total | Total |
| 1935–1944 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 3 | 3 |
| 1945–1954 | 1 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 1955–1964 | 2 | 3 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 1965–1974 | 7 | 4 | 0 | 2 | 13 | 0 | 2 | 0 | 0 | 0 | 2 | 15 |
| 1975–1984 | 4 | 4 | 0 | 2 | 10 | 0 | 2 | 0 | 0 | 0 | 2 | 12 |
| 1985–1994 | 0 | 1 | 0 | 0 | 1 | 5 | 3 | 2 | 0 | 0 | 10 | 11 |
| 1995–2004 | 0 | 2 | 0 | 0 | 2 | 2 | 7 | 5 | 2 | 1 | 17 | 19 |
| 2005–2011 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 1 | 0 | 3 | 4 |
| Total | 14 | 15 | 1 | 4 | 34 | 10 | 16 | 7 | 3 | 1 | 37 | 71 |

[a]Others are Minangkabau, Sudanese, Buginese, Chinese, Banjar, and Ocu Bangkinang

financially by Malaysian traders. The leaders received half of the lands cleared, while the remaining part was distributed to the nearby villagers in parcels of about 2 ha each.[8]

An informant reported that local people also advanced to clear the peat swamp forest in order to counter the further intrusion of industrial timber plantations into lands they viewed as their own lands.[9] In this way, deforestation was a strategy by local people to secure their traditional their common lands in the peat swamp forest. Such small-holders would also plant oil palm on cleared peatlands, and since oil palm cannot grow in peat swamp conditions, people intentionally kept the lands dry, making the peatland even more vulnerable to fire. Many ditches were expanded in the period of large-scale illegal logging between 1998–2006, further drying the peat swamp.

Watanabe et al. (2016) analyzed land-use changes in the 21,800 ha around our surveyed village of Tanjung Leban. In 1993, 77.5% of the area was natural forest; secondary forest covered 14.1%; and only 5.1% was farmland or oil palm land. However, with the start of acacia plantations in 1998, large-scale logging and subsequent opening up of farmland for oil palm, the area of natural forest decreased to 29.5% by 2006. Area of Acacia plantations increased to 37.2%, and farmland or oil palm land increased to 20.1% by 2006.

This drastic change in land use, the influx of new businesses related to the large-scale logging, distribution of former forest lands and new possibility of small-scale cultivation of oil palm: all attracted many immigrants. These migrants were usually first engaged in many sorts of casual labor, including oil palm maintenance and management of small shops. Later they obtained parcels of peatland and began to plant oil palm. At the same time, the original Malay settlers also often planted oil palm in the newly distributed lands. The change in landscape has altered the attitude of traditional Malays who once made use of the land without transforming the landscape drastically.

The influx of immigrants also changed the ethnic composition of the surveyed village from pure Malay to a complex composition of Malay and others, especially Javanese. This shows the patterns of migration and settlement through marriage and the openness of Malay people to other ethnic people.[10] Today the head of the surveyed village is always a Malay, but Javanese also occupy some important positions such as head of the Village Consultation Body (*Badan Persyawataran Desa*, BPD).

Watanabe et al. (2016) shows that in 2010, 18% of the area around the village was covered in immature oil palms; 4.7% of land was covered in mature oil palms.

[8] Authors' interview with respondents such as No. 16 on December 16, 2014, No.73 on December 14, 2017

[9] Authors' interview with respondent No 6 on January 22, 2022.

[10] In the surveyed hamlet, there are Christian Batak people who keep pigs. There are Chinese rubber merchants. Majority of the people there are Muslim. This information shows the openness of Malay people. These conditions cannot be imagined at the Sundanese village where author had conducted intensive field research in Bandung district, West Java (Mizuno 1996).

Although many lands were planted with oil palm, the palms often require 3 years before they are productive, and in this time, they require relatively dry soils. Many oil palm fields therefore burned before reaching maturity, and those lands became barren or turned into grasslands. In 2010, barren land covered 18.8% of the area around the surveyed village; grasslands covered 18.5%. As Gaveau et al. (2016) deduced, draining in concession lands promotes fire outside the concession. Concession companies typically have facilities to prevent fire, such lookout towers and fire brigades, however, so were able to protect their own assets from fires, while small-holders had little ability to prevent fires on their lands.

The following section will discuss changes in land use and land tenure along with peatland degradation. The authors investigate land tenure and type of land use, how the land was acquired, and the documents certifying land titles.

#### 2.3.1.3 Change in Land Tenure Along with Peatland Degradation and In-Migration

The 71 households in the surveyed hamlet own a total of 843.2 ha, with each household owning an average of 11.9 ha. Some of their lands are located outside of the hamlet and even outside of the boundary of the surveyed village. Peatlands account for 660.9 ha or 9.3 ha of households landholdings. Cultivated—or operated—land accounts for 536.4 ha, or an average of 7.6 ha per household. The surveyed households lease a total of 20.2 ha (an average of 0.3 ha) while people from outside the hamlet lease a total of 9.3 ha. The gap between the amount of land owned and the amount of land operated is due to the large area that is not being operated at all. Most uncultivated land is abandoned; it comprises 264.7 ha of the total area, or 3.7 ha per household. A total of 33.0 ha is reserved land; households reserve land when they haven't yet decided on how to use it, when it's fallow, or if they have more land than they need at any given moment. Nearly 83.8% of owned land—a total of 690.2 ha—has been burned, the majority of it peatland.

The short history of the surveyed hamlet described above partly indicates the process of land acquisition. Here the authors explain the process more systematically for all land owned by respondents, and its relation to peatland vs non-peatland, and finally, to land titles.

Inheritance (*warisan*), donation during lifetime (*bagi-bagikan tanah kepada anak* or *hibah*), purchase (*beli*), and clearing the forest to convert to farmland (*buka lahan sendiri*) are the main means of acquiring land. As explained earlier, the distribution of land (*pembagian lahan oleh masyarakat*) has recently picked up pace.

Clearing the forest to make farmlands is customary in the village. Some respondents in the fields said that they paid *uang pancang (uang* means money, *pancang* means the place marked with stake at the hillslope to indicate a person's intention to cultivate the land [Adatrechtbundel 1916, pp. 174, 187]), or money indicating intention to cultivate the land) to the leader of the hamlet (*penghulu*) in order to gain permission to clear land. A study of Jambi shows the customary right to clear the forest and convert it to farmland is privately owned. People can claim rights to

**Table 2.2** Area of land respondents owned in 2010–2014 according to acquisition type and year of acquisition (unit: ha) (Source of data: Authors' survey in 2010–2014)

| Year of acquisition | Inherited | Purchase | Cleared | Distributed | Others | Total |
|---|---|---|---|---|---|---|
| Peatland | 62.2 | 91 | 264.4 | 210.2 | 33.6 | 661.4 |
| 1965–1974 | 0.0 | 0.0 | 15.5 | 0.0 | 0.0 | 15.5 |
| 1975–1984 | 6.4 | 8.0 | 34.5 | 0.0 | 3.5 | 52.4 |
| 1985–1994 | 8.3 | 20.0 | 111.4 | 0.0 | 0.0 | 139.7 |
| 1995–2004 | 32.4 | 47.1 | 101 | 93.7 | 8.0 | 282.2 |
| 2005–2014 | 12.7 | 14.6 | 2.0 | 90.5 | 2.0 | 121.8 |
| Unclassified | 2.4 | 1.3 | 0.0 | 26.0 | 20.1 | 49.8 |
| Non-peatland | 60.2 | 45.9 | 63.1 | 2.5 | 10.6 | 182.3 |
| 1935–1944 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 1.2 |
| 1945–1954 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 |
| 1955–1964 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 |
| 1965–1974 | 0.0 | 0.0 | 10.5 | 0.0 | 0.0 | 10.5 |
| 1975–1984 | 22.4 | 11.0 | 17.5 | 0.0 | 3.5 | 54.4 |
| 1985–1994 | 9.3 | 9.3 | 21.8 | 0.0 | 0.0 | 40.4 |
| 1995–2004 | 12.2 | 18.3 | 13.3 | 0.5 | 0.5 | 44.8 |
| 2005–2014 | 9.1 | 6.0 | 0.0 | 2.0 | 0.2 | 17.3 |
| Unclassified | 4.0 | 0.3 | 0.0 | 0.0 | 6.4 | 10.7 |
| Total | 122.4 | 136.9 | 327.5 | 212.7 | 44.2 | 843.7 |

the land by building a sign using the branch of a tree. Swidden lands that go fallow after cultivation of dry rice revert to communal forest (Parlindungan 1978, pp. 15–16).

Table 2.2 shows the area of land according to how it was acquired and the year it was acquired.

Table 2.2 shows data only for land owned by present-day respondents. Therefore, if the parents of the respondent cleared the land in the 1930s and their daughter inherited the land in 1952—and still owns the land today—only the acquisition in 1952 is listed as inheritance in this table. The respondents made no mention of communal lands.[11]

[11] Masuda (2012) extensively discussed communal land (*tanah ulayat*) at a village in Pelalawan district, Riau province, Indonesia, based on fieldwork in 2000–2001 and 2003–2005. Studies on customary law have discussed the communal land in Jambi, Riau, and East Sumatra. For example, a collection of customary laws in Jambi (Adatrechtbundel 1912, pp. 199–205) showed that there were many types of uncultivated lands where customary community's disposal rights (*beschkkingsrecht*) were exercised, and all lands except the land where individual use rights appeared because of the clearing were thought as the land communal use rights were excised by the village (*doesoen*) or the district. Villagers who want to clear these lands should get permit from the head of the village or district. In the village surveyed for this paper, the village head mentioned that the land was communally possessed by the village. Much land ownership and stewardship is based on customary rights; however, no one claimed individual rights on the communal land in the household survey we conducted. Respondents only mentioned privately owned land and its utilization. This paper therefore discusses these privately owned lands.

Table 2.2 shows that present-day households inherited land obtained before national independence in 1945. It also shows that peatlands were already cleared during 1965–1974, and that the percentage of cleared land compared to land acquired by other means is decreasing over time. The percentage of non-peatland is higher for inherited lands than for others. For inherited, purchased, and cleared lands, many non-peatlands are found, yet almost all distributed lands, which were acquired after the advance of acacia timber plantations into the former peat swamp forest beginning in 1995, are peatlands. Inherited, purchased, and cleared land have basis in customary titling practices, so at least 63.4% of peatland and 92.7% of non-peatland were acquired on the basis of customary rights. As described above, most of the distribution took place after the intrusion of acacia plantations and illegal logging in the dried peat forest. People reported that some lands were also distributed by local government districts (*kabupaten*) promoting the planting of oil palm.

On land titling, the Prona program was implemented in the surveyed village, so many villagers have the associated land ownership certificates. Still, only some lands have been covered by the program. Some villagers have registered lands independently of the Prona program, and have corresponding certificates. In the field, many people possess land certification documents issued by the village office. This Letter of Land Statement (SKT) is issued by the village head. Sometimes the SKT is called *Surat Segel* because the seal of the government indicating payment of tax is printed on the letter. This letter originated from the colonial government policy in Sumatra as described earlier.

On land titling, in the field we find the Letter of Land Compensation (*Surat Ketrangan Ganti Kerugian* or SKGK) made at the time of transaction and signed by the land seller, the land buyer, the village head, head of the sub-village, head of the RW,[12] head of the RT, and owners of neighboring land. This letter of land compensation functions as an official document of land purchase in the field, just like the *Akta Jual Beli Tanah* formally issued by the PPAT.

As explained above, the head of sub-district, or *camat*, traditionally functions as a PPAT in rural areas. Some people therefore believe that the *camat* has more authority to certify land rights, so they have both SKT and SKGK signed by the *camat*.

The authors found four mains kinds of documents certifying land rights. The first is the Letter of Statement made by the village head (SKT) that has its origin in customary rights; the second is the SKT recognized by the head of the sub-district (SKT *camat*); the third is a letter related to the transaction, usually a purchase of land, the Letter of Land Compensation (SKGK). There are SKGKs signed by the *camat* and not signed by the *camat.* The fourth is a certificate of land ownership (*sertifikat tanah hak milik.*). The fourth document, a certificate of land ownership, clearly has the strongest authority to certify the land rights. It is based on the Torrens system that uses a cadastral map and is registered at the government agrarian office (*Badan Pertanahan Nasional*, BPN). The other letters are based on customary rights

[12] On RW and RT, see footnote 1.

**Table 2.3** Land owned by respondents in 2010 and 2012 according to document certifying the land rights, year of acquisition, and peatland status (unit: ha) (Source of data: Authors' survey, 2010–2014)

| Year of acquisition | No letter | SKT | SKT *camat* | SKGK[a] | Certificate | Others | Total |
|---|---|---|---|---|---|---|---|
| Peatland | | | | | | | |
| 1965–1974 | 5.5 | 9.0 | 0.0 | 1.0 | 0.0 | 0.0 | 15.5 |
| 1975–1984 | 10.0 | 35.9 | 0.0 | 0.0 | 6.5 | 0.0 | 52.4 |
| 1985–1994 | 49.8 | 28.8 | 21.0 | 1.5 | 38.6 | 0.0 | 139.7 |
| 1995–2004 | 142.7 | 101.0 | 0.0 | 22.9 | 11.6 | 4.0 | 282.2 |
| 2005–2014 | 57.5 | 49.6 | 2.0 | 2.5 | 4.1 | 6.0 | 121.7 |
| Unclassified | 26.0 | 7.4 | 0.0 | 0.0 | 1.3 | 14.8 | 49.5 |
| Sub-total | 291.5 | 231.7 | 23.0 | 27.9 | 62.1 | 24.8 | 661.0 |
| Non-peatland | | | | | | | |
| 1935–1944 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.2 |
| 1945–1954 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 |
| 1955–1964 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 |
| 1965–1974 | 7.5 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.5 |
| 1975–1984 | 19.5 | 23.4 | 5.0 | 0.0 | 6.5 | 0.0 | 54.4 |
| 1985–1994 | 6.5 | 14.0 | 7.1 | 0.3 | 7.3 | 5.3 | 40.4 |
| 1995–2004 | 6.2 | 7.6 | 9.1 | 21.2 | 0.7 | 0.0 | 44.7 |
| 2005–2014 | 1.0 | 15.5 | 0.0 | 0.0 | 0.6 | 0.2 | 17.3 |
| Sub-total | 43.9 | 64.5 | 21.2 | 21.5 | 15.1 | 5.5 | 171.5 |
| Total | 335.4 | 296.2 | 44.2 | 49.4 | 77.2 | 30.3 | 832.5 |

[a]SKGK here includes those signed by the *camat* and those not signed by the *camat*, but signed by the village head

recognized by the people concerned, the village head, the head of the sub-village, the owner, and the people who own neighboring land.

The first three kinds of documents do not rely on cadastral survey maps but still have some authority, especially among villagers, and even in the government sector because these letters have been incorporated into the government administration as mentioned above. These letters are also easily contested especially by the government, especially in cases at the state forest.[13] Besides those letters, many villagers have no letters to certify their land rights. Once the rights of land are disputed, such people have no further documents demonstrating their land rights or claims.

Table 2.3 shows the area of land according to the type of document certifying the land rights, whether the land is peatland or not, and the year when the land was acquired.

Table 2.3 shows that among the areas reported by survey respondents, lands without any certifying document are the largest category. The amount of land

[13]Letter of Circulation No. 9/SE/V6/2013 issued by the head of national land body in 2013 (Surat Edaran No. 9/SE/VI/2013 Kepala Badan Tanah Nasional RI) defined the format of the letter of statement issued by the village head (SKT). The circulation said the land certified should be out of the government designated state forest area (*kawasan hutan*).

**Table 2.4** Land owned by respondents in 2010–2011 according to peatland status, land use, and type of document certifying the land rights (unit: ha) (Source of data: Authors' survey, 2010–2014)

| Land use | No letter | SKT | SKT *camat* | SKGK[a] | Certificate | Unclassified | Total |
|---|---|---|---|---|---|---|---|
| Peatland | 291.5 | 231.6 | 23.0 | 27.9 | 62.2 | 10.5 | 646.7 |
| Home garden | 27.3 | 51.9 | 4.0 | 8.9 | 41.3 | 2.0 | 135.4 |
| Farmland | 264.2 | 179.7 | 19.0 | 19.0 | 20.9 | 8.5 | 511.3 |
| Non-peatland | 43.9 | 68.4 | 21.2 | 21.5 | 16.1 | 5.5 | 176.6 |
| Home garden | 30.0 | 25.5 | 14.1 | 3.5 | 13.6 | 0.3 | 87.0 |
| Farmland | 13.9 | 42.9 | 7.1 | 18.0 | 2.5 | 5.2 | 89.6 |
| Total | 335.4 | 300.0 | 44.2 | 49.4 | 78.3 | 16.0 | 823.3 |

[a]SKGK here includes those signed by the *camat* and those not signed by the *camat*

certified by the SKT is not small, however, while the lands recognized by government-issued land certificates are less than 10% of the total. Both peatlands and non-peatlands are recognized by these documents. The percentage of peatland is higher among lands lacking documentation and among lands with SKT. Lands without documents increased especially after 1995 following establishment of the acacia plantation in this area, but undocumented land was also found in earlier days (1935–1954). SKTs are found regardless of the year, and is especially indicative of land sales and acquisitions. The reason why so many lands are without letters will be discussed later.

Older people who owned land in 1935–1954 did not have any titling letters, but the rise in migration into the village and the subsequent increase in population and demand for land, seems to have incentivized interest in more secure land rights through documentation.

Table 2.4 shows land use (home garden [*pekarangan*] or farmland [*kebun*]), the type of document certifying land rights, and whether the land is peatland or non-peatland.

Table 2.4 shows that the percentage of non-peatland is higher among home gardens compared with farmlands. The percentage of land covered by land certificates is higher among home gardens compared with farmlands. All four types of documents are found for both peatland home gardens and non-peatlands home garden, while some people had no documentation at all.

### *2.3.2 Peatland Degradation and the Land Tenure System*

Here we discuss peatland degradation in relation to the above-mentioned land conditions, such as peatland status, the type and year of land acquisition, and land titling. We first discuss the issue of burning, and second, the issue of land abandonment.

#### 2.3.2.1 Peatland Burning on Land Owned by Respondents

As explained in Mizuno et al. (2016), peatland fire is a serious issue. How does this fire relate to the varieties of land mentioned above, such as the way the land is acquired and the status of the land title? (Tables 2.5 and 2.6)

We find some important trends in this Table 2.5. The percentage of peatlands burned is higher than that of non-peatlands. The percentage of burned lands is higher among those whose lands were acquired through distribution and clearing while the percentage is somewhat lower for inherited lands and purchased non-peatland. Even in non-peatland areas, however, a majority of the total area has burned. Here the data show how serious and extensive the issue of burning is.

In the following table we check the issue of burning according to the type of land certification letters (Table 2.6).

**Table 2.5** Land owned by respondents in 2010 and 2011 according to type of acquisition, peatland status, and burned status (unit: ha) (Source of data: Authors' survey, 2010–2014)

| Burned status | Inherited | Purchased | Cleared | Distributed | Unclassified | Total |
|---|---|---|---|---|---|---|
| Peatland | 62.1 | 90.9 | 264.4 | 210.2 | 14.0 | 641.6 |
| Not burned | 8.3 | 14.2 | 4.0 | 22.0 | 4.5 | 53.0 |
| Burned | 53.8 | 76.7 | 260.4 | 188.2 | 9.5 | 588.6 |
| Non-peatland | 60.2 | 45.8 | 63.1 | 2.5 | 5.0 | 176.6 |
| Not burned | 30.3 | 26.8 | 15.8 | 0.5 | 1.5 | 74.9 |
| Burned | 29.9 | 19.0 | 47.3 | 2.0 | 3.5 | 101.7 |
| Total | 122.3 | 136.7 | 327.5 | 212.7 | 19.0 | 818.2 |
| Not burned | 38.6 | 41.0 | 19.8 | 22.5 | 6.0 | 127.9 |
| Burned | 83.7 | 95.7 | 307.7 | 190.2 | 13.0 | 690.3 |

**Table 2.6** Land owned by respondents in 2010 and 2011 according to the document certifying the land rights, burned status, and peatland status (unit: ha) (Source of data: Authors' survey, 2010–2014)

| Burned status | No letter | SKT | SKT *Camat* | SKGK[a] | Certificate | Unclassified | Total |
|---|---|---|---|---|---|---|---|
| Peatland | 291.5 | 231.6 | 23.0 | 27.9 | 62.1 | 10.5 | 646.6 |
| Not burned | 6.0 | 32.4 | 3.0 | 2.9 | 4.2 | 4.5 | 53.0 |
| Burned | 285.5 | 194.2 | 20.0 | 25.0 | 57.9 | 6.0 | 588.6 |
| Unclassified | 0.0 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.0 |
| Non-peatland | 43.9 | 68.4 | 21.2 | 21.5 | 16.1 | 5.5 | 176.6 |
| Not burned | 18.2 | 23.4 | 2.1 | 16.8 | 8.9 | 5.5 | 74.9 |
| Burned | 25.7 | 45.0 | 19.1 | 4.7 | 7.2 | 0.0 | 101.7 |
| Total | 335.4 | 300.0 | 44.2 | 49.4 | 78.2 | 16.0 | 823.2 |
| Not burned | 24.2 | 55.8 | 5.1 | 19.7 | 13.1 | 10.0 | 127.9 |
| Burned | 311.2 | 239.2 | 39.1 | 29.7 | 65.1 | 6.0 | 690.3 |
| Unclassified | 0.0 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.0 |

[a]SKGK here includes those signed by the *camat* and those not signed by the *camat*

From Table 2.6, we can see that the percentage of land not burned is higher for non-peatlands with letters of certification and SKGK. In other words, certified lands with a letter of certificate and SKGK are burned somewhat less for non-peat land than those without. Despite this finding, the fact remains that burned lands are found among lands with all types of certifying documents, and among both peatlands and non-peatlands that do not have documents.

#### 2.3.2.2 Land Abandonment in Relation to Land Use, Acquisition, Type, and Land Title

One of the causes of serious peatland degradation is land abandonment. A desolate landscape comprises extensive dried and barren peatland that is not cared for by the local people. This abandonment of peatland is both the reason for and result of peatland degradation and fire. The extensive area of abandoned land shown here is in accordance with the data on idle lands shown by Gaveau et al. (2016).

To understand the cause of land abandonment, we investigated the correlation between land use and land acquisition. Our hypothesis was that lands inherited by respondents from parents, or lands purchased by the respondents, would be better managed than land distributed by informal leaders. We supposed that people considered inherited or purchased lands as more socially and economically valuable, and that land certified with letters that strongly secured land rights would be better managed. On the other hand, we supposed that land with relatively weak titling would be less well managed.

Table 2.7 shows the relationship between land use land acquisition. Land use here is subdivided into land owned and operated, leased, fallow or reserved, and abandoned. In the case of fallow or reserved lands, people said that "*tanah itu sedang istirahat* [the land is taking a rest]" or "*belum pakai tanah itu* [the land is not utilized yet]." In the case of abandoned lands, people answered *"karena sering kebakaran, tanah itu jadi kosong* [because quite often the land is burnt, so now the land is empty]" or *"tanah itu kebakar terus, sekarang tidak tanam lagi* [the land is continuously burnt so now we do not plant on the land]," and so on.

According to Table 2.7, peatlands are abandoned far more frequently than non-peatlands. Lands acquired through distribution constitute the largest percentage of abandoned lands; cleared lands have the second highest rate of abandonment. On the other hand, lands acquired by inheritance or purchased were less commonly abandoned.

Now we turn to how land use relates to the type of document that certifies the land title (Table 2.8).

Among abandoned lands, 81.5% do have no corresponding certifying documents, while almost no land with a SKT *camat*, SKGK, or a certificate is abandoned, according to Table 2.8. On the other hand, owned and operated lands have various certifying documents, and some have no documents.

How about the relationship among the burning experience, land use, and documents to certify the land rights? Although peatland burning is a serious issue in the

**Table 2.7** Land owned by respondents in 2010 and 2011 according to land use and when it was acquired (unit: ha) (Source of data: Authors' survey, 2010–2014)

| Acquisition type | Owned and operated | Leased | Fallow or reserved | Abandoned | Unclassified | Total |
|---|---|---|---|---|---|---|
| Peatland | 369.4 | 3.5 | 17.0 | 255.7 | 1.0 | 646.6 |
| Inherited | 55.1 | 0.0 | 0.0 | 6.0 | 1.0 | 62.1 |
| Purchased | 75.7 | 0.0 | 2.0 | 13.2 | 0.0 | 90.9 |
| Cleared | 153.4 | 0.0 | 0.0 | 111.0 | 0.0 | 264.4 |
| Distributed | 80.2 | 0.0 | 8.5 | 121.5 | 0.0 | 210.2 |
| Unclassified | 5.0 | 3.5 | 6.5 | 4.0 | 0.0 | 19.0 |
| Non-peatland | 145.8 | 5.8 | 16.0 | 9.0 | 0.0 | 176.6 |
| Inherited | 50.5 | 0.0 | 8.6 | 1.0 | 0.0 | 60.1 |
| Purchased | 33.4 | 0.0 | 5.4 | 7.0 | 0.0 | 45.8 |
| Cleared | 60.9 | 2.3 | 0.0 | 0.0 | 0.0 | 63.2 |
| Distributed | 0.5 | 0.0 | 2.0 | 0.0 | 0.0 | 2.5 |
| Unclassified | 0.5 | 3.5 | 0.0 | 1.0 | 0.0 | 5.0 |
| Total | 515.2 | 9.3 | 33.0 | 264.7 | 1.0 | 823.2 |

**Table 2.8** Land owned by respondents in 2010 and 2011 according to land use and documents certifying the land title (unit: ha) (Source of data: Authors' survey, 2010–2014)

| Type of certifying document | Owned and operated | Leased | Fallow or reserved | Abandoned | Unclassified | Total |
|---|---|---|---|---|---|---|
| Peatland | 369.4 | 3.5 | 17.0 | 255.7 | 1.0 | 646.6 |
| No letter | 74.0 | 0.0 | 2.0 | 215.5 | 0.0 | 291.5 |
| SKT | 186.4 | 3.5 | 6.5 | 34.2 | 1.0 | 231.6 |
| SKT *camat* | 21.0 | 0.0 | 2.0 | 0.0 | 0.0 | 23.0 |
| SKGK[a] | 23.9 | 0.0 | 0.0 | 4.0 | 0.0 | 27.9 |
| Certificate | 60.1 | 0.0 | 2.0 | 0.0 | 0.0 | 62.1 |
| Unclassified | 4.0 | 0.0 | 4.5 | 2.0 | 0.0 | 10.5 |
| Non-peatland | 145.9 | 5.8 | 16.0 | 9.0 | 0.0 | 176.7 |
| No letter | 36.8 | 0.0 | 6.1 | 1.0 | 0.0 | 43.9 |
| SKT | 58.8 | 5.5 | 2.1 | 2.0 | 0.0 | 68.4 |
| SKT *camat* | 21.2 | 0.0 | 0 | 0.0 | 0.0 | 21.2 |
| SKGK[a] | 16.2 | 0.0 | 0.3 | 5.0 | 0.0 | 21.5 |
| Certificate | 12.6 | 0.0 | 2.5 | 1.0 | 0.0 | 16.1 |
| Unclassified | 0.3 | 0.3 | 5.0 | 0.0 | 0.0 | 5.6 |
| Total | 515.3 | 9.3 | 33.0 | 264.7 | 1.0 | 823.3 |

[a]SKGK here includes those signed by the *camat* and those not signed by the *camat*

**Table 2.9** Burned land owned by respondents in 2010 and 2011 according to land use and land title documents (unit: ha) (Source of data: Authors' survey 2010–2014)

| | Owned and operated | Leased | Fallow or reserved | Abandoned | Unclassified | Total |
|---|---|---|---|---|---|---|
| No letter | 92.1 | 0.0 | 3.6 | 215.5 | 0.0 | 311.2 |
| SKT | 193.0 | 7.0 | 2.0 | 36.2 | 1.0 | 239.2 |
| SKT *camat* | 37.1 | 0.0 | 2.0 | 0.0 | 0.0 | 39.1 |
| SKGK[a] | 25.7 | 0.0 | 0.0 | 4.0 | 0.0 | 29.7 |
| Certificate | 63.1 | 0.0 | 2.0 | 0.0 | 0.0 | 65.1 |
| Unclassified | 4.0 | 0.0 | 0.0 | 2.0 | 0.0 | 6.0 |
| Total | 415.0 | 7.0 | 9.6 | 257.7 | 1.0 | 690.3 |

[a]SKGK here includes those signed by the *camat* and those not signed by the *camat*

study village as has been shown at Table 2.3, not all lands have been burned. So how have the people responded to the burning of land?

Table 2.9 shows the relationship between land use and land titles for burned land.

As has demonstrated in Table 2.3, burning is extensive and a serious problem in the research site, leading to the abandonment of several lands. As Table 2.9 shows, of the entire burned area of 690.2 ha, as much as 257.7 ha (37.3%) have been abandoned, while 414.9 ha (60.1%) are still owned and operated. Many factors would influence these outcomes, as will be comprehensively analyzed in the conclusion. Here we examine only the relationships between burning and kind of documents certifying land rights. Of abandoned burned land, 83.6% (215.5 ha) has no certifying letter, while 36.2 ha (14.0%) have SKT. Of burned land with titling certificates, none has been abandoned. Burned land that is still managed (414.9 ha in total) has many variations of land titling. Some of this land has no corresponding letter of certification, but a majority of burned but operated land does have some kinds of letter to certify the land rights.

Figure 2.1 shows the relationship between land abandonment and letters to certify the land rights.

As discussed above, the government-issued land certificate is the strongest kind of certification, while having no letter at all is the weakest. Government land certificates are based on cadaster survey and so is integrated into the land registration of National Agrarian office. On the other hand, SKT is not based on cadaster survey, so it is said to bear less authority than the land certificate as land title. Although SKT is not based on the cadaster survey, the latter was recognized by the head of village office and in many cases by the head of sub-district office. The SKT made by the head of sub-district (the SKT authorized by head of sub-district was authorized by the head of village beforehand) carries greater authority than the SKT made only by the village head. SKGK is the letter to certify the transaction of land assuming the land certificate would be made, so the SKGK is thought to be a letter under the system of land certificate, even though it is not based on cadaster survey.

As a consequence, we can assume that following the land certificate, the second most secure is the SKGK, the SKT authorized by the head of sub-district, and the SKT authorized by the village head come in third. The weakest is no letter. From

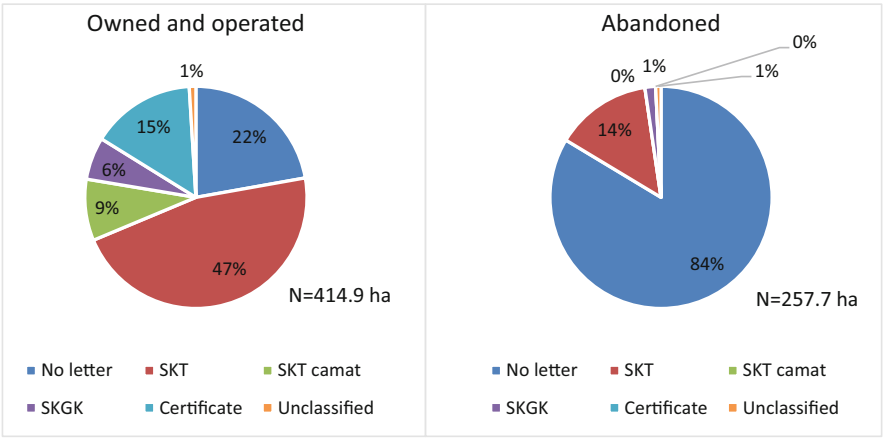


**Fig. 2.1** Relationship between land titling and peatland abandonment at surveyed village

Fig. 2.1, we can say that under the strongest land right, more farmers continued to manage their lands even after fire. The weaker the land rights, the more likely the land is abandoned after burning.

Two categories of land, abandoned peatland and managed land, both exist entirely without any certifying documents. In order to better understand meaning of these categories, we analyze the year the lands were acquired in Table 2.10.

Table 2.10 shows that almost all abandoned lands have been acquired relatively recently, especially since 1995, and that almost no abandoned lands were acquired prior to 1984. On the other hand, lands that are owned and operated today have often been acquired since village establishment.

Table 2.3 shows that many actively managed lands without title were acquired from the 1930s to 1984. This is because traditional Malays often felt no need to seek any land title, and have remained so on their lands since the early days without title of any kind.

### *2.3.3 Analysis and Discussion of Abandoned Land*

Abandonment of land is one of the most apparent manifestations of peatland degradation and has led to increasing incidence of fire, as explained by Joosten et al. (2012). To curb further land abandonment, we should understand why lands are abandoned in the first place.

We have seen how land titling influences abandonment of burned land. This section will present a more comprehensive discussion. So far we understand that many factors are related to land abandonment besides land title. Land cover type (whether the land is peatland or not), burn status, acquisition process, and year of acquisition all seem to be related land abandonment. Although there are many plots

**Table 2.10** Land owned by the respondents in 2010 and 2011 according to acquisition type, peatland status, and year of land acquisition (unit: ha) (Source of data: Authors' survey, 2010–2014)

| Year of land acquired | Owned and operated | Leased | Fallow or reserved | Abandoned | Unclassified | Total |
|---|---|---|---|---|---|---|
| Peatland | 369.5 | 3.5 | 17.0 | 255.7 | 1.0 | 646.7 |
| 1965–1974 | 15.5 | 0.0 | 0.0 | 0.0 | 0.0 | 15.5 |
| 1975–1984 | 47.9 | 3.5 | 0.0 | 1.0 | 0.0 | 52.4 |
| 1985–1994 | 95.7 | 0.0 | 0.0 | 44 | 0.0 | 139.7 |
| 1995–2004 | 158.0 | 0.0 | 6.0 | 118.2 | 0.0 | 282.2 |
| 2005–2011 | 43.8 | 0.0 | 10.5 | 66.5 | 1.0 | 121.8 |
| Unclassified | 8.6 | 0.0 | 0.5 | 26.0 | 0.0 | 35.1 |
| Non-peatland | 145.9 | 5.8 | 16.0 | 9.0 | 0.0 | 176.7 |
| 1935–1944 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 1.2 |
| 1945–1954 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 |
| 1955–1964 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 |
| 1965–1974 | 10.5 | 0.0 | 0.0 | 0.0 | 0.0 | 10.5 |
| 1975–1984 | 46.4 | 3.5 | 4.5 | 0.0 | 0.0 | 54.4 |
| 1985–1994 | 28.4 | 2.3 | 7.8 | 2.0 | 0.0 | 40.5 |
| 1995–2004 | 38.0 | 0.0 | 1.7 | 5.0 | 0.0 | 44.7 |
| 2005–2011 | 14.1 | 0.0 | 2.0 | 1.0 | 0.0 | 17.1 |
| Unclassified | 4.3 | 0.0 | 0.0 | 1.0 | 0.0 | 5.3 |
| Total | 515.4 | 9.3 | 33.0 | 264.7 | 1.0 | 823.4 |

of abandoned land, there are as many plots that have not been abandoned although the lands experienced burning. What factors determine whether the plot is abandoned or not? Here we use multiple co-regression to analyze the factors that determine abandonment. Whether a plot is abandoned or not is qualitative data that can be analyzed with a probit model.

Among the variables showing as important factors above, we review the following: peatland status, experience of fire, type of acquisition (especially distribution), documents certifying land rights, year of acquisition, and the area of land plots. Peatland status is judged by the respondents. If a plot comprised part peatland and part non-peatland, we divided the plot and counted it as two plots. We asked the respondent the history of fire for each plot. If a land has been burnt, it was classified as "burned." Table 2.7 shows that land acquired through distribution most often correlates to land abandonment. We therefore classified land acquisition into two types only, that is, by distribution or not. Whether lands were with certifying documents, or not is important factor that influence on land abandonment as discussed earlier, here we employing the factor of certifying document by classifying into two categories: those with documents and those without. This was done because as long as a person has a document of certification, they can claim their right to the land if there is a dispute, but if there is no document at all it is difficult to claim rights to the land. All documents also have legal basis in either customary law or public law as has been shown. The availability of certifying documents represents the factor of

ownership, which is important because in cases of leasing land, such as sharecropping. Lands under those arrangements were not included because sharecroppers do not know about, or are not often familiar with, official documentation or history of fire. According to Table 2.10, year of land acquisition seems also to be closely related to whether the land is abandoned or not. The size of the land plot may be influential as well because if the land is too large, it may not be easily managed.

Some correlations among these factors seem to exist. We analyzed the correlation between the variables of the year of acquisition, burned status, land area, and the document certifying the land right.[14] Peatland status is correlated with fire history and acquisition type is correlated with the year of acquisition. We therefore dropped the variables of peatland status and acquisition type to avoid the problem of multicollinearity. The variable of fire history therefore represents both the factors of peatland (or not) and of fire (burned or not), and the variable of land acquisition year represents both the way the land was acquired and the year it was acquired.

Considering the factors mentioned above, we have assumed the following linear equation:

$$\mathrm{DA} = \mathrm{F1}\ (\mathrm{YEA}, \mathrm{FIR}, \mathrm{ARE}, \mathrm{DOC})$$

In order to examine the influence of these factors on land abandonment, we have assumed the following linear equation parameters:

DA: Dummy variable of abandonment of land for each plot (1: Abandoned in, 0: Abandoned out)
YEA: Year of land acquisition
FIR: Dummy variable for the burned status of each plot (1: Experience of burning in, 0: Experience of burning out)
ARE: Area of land of each plot (in hectares)

[14] Correlation among the variables is as follows:

| | Peatland status | Year of acquisition | Burned status | Area of plot | Type of acquisition | Document certifying the land right |
|---|---|---|---|---|---|---|
| Peatland status | 1 | 0.2968 | 0.3682 | 0.1577 | 0.3710 | −0.0765 |
| The year of acquisition | 0.2968 | 1 | 0.0426 | −0.0138 | 0.4462 | −0.0271 |
| Burned status | 0.3682 | 0.0426 | 1 | 0.1843 | 0.2186 | −0.1155 |
| Area of plot | 0.1577 | −0.0138 | 0.1843 | 1 | 0.0071 | −0.1345 |
| Type of acquisition | 0.3710 | 0.4462 | 0.2185 | 0.0071 | 1 | −0.3754 |
| Document certifying the land right | −0.0765 | −0.0271 | −0.1155 | −0.1345 | −0.3754 | 1 |

**Table 2.11** Results of probit model estimation

| Variable | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| C | −133.7682[a] | 28.6678 | −4.6662 | 0.0000 |
| Year of land acquisition | 0.0674[a] | 0.0143 | 4.6409 | 0.0000 |
| Burned status | 1.1345[a] | 0.3252 | 3.4885 | 0.0005 |
| Area of land | 0.0131 | 0.0199 | 0.6573 | 0.5110 |
| Document certifying the land rights | −1.2178[a] | 0.2303 | −5.2881 | 0.0000 |
| McFadden R-squared | 0.365799 | | | |
| Log likelihood | −78.42526 | | | |
| Total obs | 238 | | | |
| Obs with Dep = 0 | 187 | | | |
| Obs with Dep = 1 | 51 | | | |

[a]= 1% significance level

DOC: Dummy variable for document certifying the land title (1: With any kind of document in, 0: Without any document out).

As Table 2.11 shows, the variables of year of land acquisition, burned status, and document certifying the land rights are significantly correlated to land abandonment (all variables are significant with level of 1%). On the other hand, the area of land has no correlation with abandonment. These factors explain as much as 37% of abandonment. This means that whether land is peatland or not, manner of land acquisition (especially through distribution), and the existence of documents certifying land rights are significantly correlated to land abandonment.

Although fire is quite common in the surveyed village, the year of land acquisition, the type of land acquisition, and the existence of documents to certify land rights is much more determinant of whether land is abandoned. Lands distributed after 1985, and especially after 1995, were often peatlands and were frequently abandoned after fire. However, lands acquired prior to 1984, and acquired by inheritance, purchasing and clearance have typically not been abandoned, although many of them are also peatlands and have experienced fire.

## 2.4 Discussion and Conclusion

Gaveau et al. (2016) have shown that though much plantation land has burned, far more land outside of concession areas has burned. What is the relationship among the timber plantation, drainage, peatland degradation, in-migration, fire and abandonment of peatland?

At the research site, our surveys show that serious peatland degradation and fire began to take place since the end of the 1990s. Since the middle of the 1990s timber plantations started operations requiring large-scale drainage that dried up land outside the concession, leaving it vulnerable to fire.

Observing fire in the peat swamp forest outside the concession, local people began cutting trees in the forest and sold timber to Malaysia when the rule of law loosened after President Suharto stepped down. Once the timber companies began to drain peatlands, so beginning the occurance of fire, people moved into the forest area to cut trees and distributed the land among themselves. They did this partly for profit and partly to secure land rights. People thought that if they did not secure land rights in the peat swamp forest, even more land would be given to the companies as concession.

In this situation, securing land rights promoted peatland degradation because after securing the peatland many of these small land holders planted oil palm, often only to abandon the land later. This information on the history of peatland degradation obtained from local people accorded with the finding from the multiple correlation analysis—that there is a greater likelihood for land to be abandoned when it has been acquired through distribution.

In-migration to the area began in 1930, but no associated peatland degradation was found. On the other hand, when the economic activities were enhanced especially since the middle of the 1990s, many non-Malay couples immigrated to the village, also contributing to peatland degradation.

Clearing, inheritance, and purchase of land began at the beginning of the 1930s, while land distribution began typically in the middle of the 1990s. More people thus began to secure land rights by getting land titles. These changes, especially from the middle of the 1990s, have encouraged the Malay people to cultivate the peatland intensively by planting oil palm or rubber.

The results of this study clearly show that people who have secured land rights by obtaining land titles tend to better manage the peatland, while those without land titles tend to abandon the land after burning. Thus securing land rights on peatland has two different consequences. First, the motivation to secure land rights has promoted further land distribution when there is competition in the peat swamp forest between people and companies. Second, once people have acquired peatland, the stronger the land right, the better the peatland management.

The foregoing discussion should also be related to the state forest. One government document states that many SKT documents have been issued for the Government-designated state forest area, or state forest area.[15] As per the current government forestry policies, SKT and SKGK issued on state forest area tend not to be recognized. The village heads and *camat* are prohibited from issuing the SKT and SKGR.[16] But the boundary of the state forest area is not clear. When interviewed, the village head said that he did not know the boundary.[17] The former vice village head

[15] Badan pertanahan Nasional, Petunjuk Pelaksanaan Kegiatan Inventarisari Penguasaan, Pemilikan, Penggunaan dan Pemanfaatan Tanah (IP4T) Dalam Kawasan Hutan Jakarta: Kementrian Agrarian dan Tata Ruang, Badan Pertanahan Nasional, 2015.

[16] See footnote 11. Tribune Pekanbaru, March, 27, 2013 'KADES dan CAMAT Jangan kelaurkan SKT dan SKGR (Village officers and *camat* are prohibited from issuing the SKT and SKGR, http://pekanbaru.tribunnews.com/2013/03/27/camat-dan-kades-jangan-keluarkan-skt-dan-skgr).

[17] Authors' interview with village head on 28 March 2011, in the surveyed hamlet.

said the land 1 km inland of the seashore is government-designated state forest.[18] Another former village officer reported that the area within a radius of 5 km from the seashore is people's land, and land further inland of that is government-designated state forest.[19] Data shown above on the area of the state forest (Mizuno et al. 2021) is only the data based on the map shown on the BRGM home page in 2020, but it was not shared with local people, including the village head.

Since around 2000, distributed land was located further inland, so the village office was thought to be reluctant to issue the SKT. This ambiguity of state land borders is also one reason why so many distributed lands did not have proper documentation. Logging in the peat swamp forest outside the concession and distribution of land in the 2000s took place in the state forest. Weak state management of its forest areas and the ambiguity of boundaries facilitated the intrusion of timber plantations and, consequently, the degradation of peatland and abandonment of burned peatland. This condition of the state forest is not unique to the research site because state forest covers 65% of the Indonesian land area, and all timber plantations operate in state forest areas.

A confluence of factors contribute to peatlands degradation. This study shows that past degradation can be associated with specific terms of land use and title. Importantly, this study also shows that good peatlands management has been supported by secure land titling, especially those that support longstanding customary land practices, and can do so again.

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[18] Authors' interview with respondent No. 60 on 24 December 2014, in the surveyed hamlet.

[19] Authors' interview with respondent No. 65 on 30 March 2011, in the surveyed hamlet.

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