

# **Fire, Deforestation and Land Tenure in the North-Eastern Fringes of Bukit Barisan Selatan National Park, Lampung**

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## **BACKGROUND**

Fires devastated large areas of Indonesia in 1994 and in 1997/1998. In 1997 and 1998, according to the Bappenas/ADB report (1999), the burnt area covered 9.5 million ha, and occurred mostly in Sumatra and Kalimantan. The official burnt areas estimate in 1994 was 5.11 million ha<sup>2</sup>. In both 1997/1998 and 1994, fires produced smoke that caused air pollution, poor visibility, and severe health problems in Indonesia and the neighboring countries of Singapore and Malaysia.

The major causes of fire in Indonesia during the El Niño fire years in 1997/1998 and 1994 are still unclear. Reports of causes of fires include pointing the finger of blame at actors who deliberately set fires such as small-scale farmers and large-scale estates and the amount of land burned and impacts on vegetation and ecosystems are subject to continuing debate. In 1994, the Indonesian government blamed slash-and-burn activity by smallholders as the major cause of fire, and estimated it accounted for more than 90% of total area burned. Environmental NGOs, however, blamed activities by forest concessionaires and plantation owners as the major causes of fires. In contrast, taking advantage of data obtained from fire hot spot information and satellite imagery, all institutions including government agencies believe that plantation owners large scale of pulpwood and oil palm plantation were the major cause of fire in 1997 and 1998 in many parts of Indonesia.

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<sup>1</sup> International Centre for Research in Agroforestry (ICRAF) Southeast Asian Regional Research Programme

<sup>2</sup> A more detailed account at fire history in Indonesia can be found in Dennis (1998)

In order to provide precise information to policy makers, it is important to understand the underlying causes of fires. Thus, policy makers can set appropriate and effective policies to manage fire and smoke problems based on soundly researched information, rather than on assumptions.

CIFOR, ICRAF, and the US-Forest Service are studying the underlying causes and impacts of land and forest fires in Indonesia. The main questions to be addressed in this project are *why, what, who, where, and how much burned*. This study will apply three levels of spatial analysis: island-wide, province, and site level. In this project, we use a combination of remote sensing/GIS techniques and social-economic research to provide the answer.

We conducted eight studies at the site-specific level analysis in Sumatra and Kalimantan. The first site, Sekincau, is located in the mountainous area of western Lampung. It represents a case study of the dynamics of fire in a National Park area and villages on the fringe of that National Park. In this site, land tenure conflicts arise between farmers and the National Park managers. We focus on understanding a relationship between fire, deforestation and land tenure. As population pressure has increased, pressures to convert natural forest to non-forest uses have also increased. The population of Lampung has increased dramatically since the 1970s. The population of Lampung in 1971 was 2.8 million people and population density was 78 person per km<sup>2</sup>. In 1997, the population of Lampung was 6.9 million people (almost 2.5 times 1971) and population density was 209 person per km<sup>2</sup> (increasing by almost 2.7 times). According to RePPProt (1988), 50% of migrants who went to Sumatra since the beginning of the 20 th Century settled in Lampung. As the population increased, forest cover in Lampung has declined. Forest cover in Lampung in 1982 was only 18% (Fraser 1998).

In this study, we examined the hypotheses of the causes of fires developed by Tomich et al (1998). According to the authors, there are three sources of fire: fire as a tool to clear land; fire that accidentally gets out of control; and fire as a weapon in social conflict.

In Indonesia, the conversion of natural forest to agricultural uses has often utilized fire in land clearing. Smallholders and large-scale plantation managers prefer to use slash-and-burn methods in land clearing because it is cheap and easy (Tomich *et al.* 1998). Fire used as a tool in land clearing contributes to the smoke and fire problem. Although fires do not always come from conversion of natural forest (deforestation), the phenomena of deforestation have increased with increasing land development pressures. Therefore, we can suspect that fire a symptom of deforestation.

We believe that there is a relationship between land tenure conflicts and fire. Tomich *et al.* (1998) pointed out that fires were started deliberately as a weapon in social conflicts. There are many conflicts arising between smallholders and large companies resulting from insecure land tenure and from land allocation policies. The allocation of land for large companies is often determined without recognizing the existence or rights of local people who already cultivate that land with no security of tenure. Both large companies and smallholders use fire in a hope of resolving the conflict.

## **METHODOLOGY**

We conducted the study into two stages. In the first stage, we used participatory mapping and group interviews to collect general information about the histories of villages (*Talang*), village characteristics and village sketch maps (Figure 1). The data we obtained using this approach is largely qualitative. We invited formal and informal leaders of villages to attend a number of meetings. Following that we conducted rapid rural appraisals with some of our key informants, and revised our sketch maps through visiting the village areas. We also interviewed Bukit Barisan Selatan National Park officers, as well as Forestry and Estate Crop officers in Lampung.

Since the quantitative data obtained through this approach provide very rough estimates, the next step was to conduct an extensive community survey at sub-*Talang* or sub-hamlet unit. We interviewed formal and informal leaders in all sub-hamlet or sub-*Talang*. We listed all the households in each sub-*Talang* and obtained information about demography, migration and land ownership for each household. We also inquired about slash-and-burn practices and fires in 1997/1998 in these group interviews.

Figure 1. Participatory Mapping



## STUDY SITE

For our study site, we selected register 46B Gunung Sekincau, located in the northeastern part of Bukit Barisan Selatan National Park (Figure 2). According to the official data, the area of register 46B is 28,900 ha. The forest, however, has been converted to coffee gardens. Gintings *et al.* (1999) estimated that the natural forest in this park is about 34% of total area. Population pressure surrounding the park is very high. There are a lot of communities located on the edge or inside the park (Figure 3 and Figure 4). These communities are expanding rapidly in times recent. These communities are not comprised of indigenous people. Most of them are migrants who came from other parts of Lampung and from Java. There are two types of communities: permanent and temporary migrants. Temporary migrants are defines people who stay in the village for a short time and live permanently in other areas. The temporary migrants stay in this village just for growing coffee. They usually stay in these villages only during the harvesting time between June and August. The temporary migrants came from different parts of Lampung and from Java.

We conducted a community survey of 19 communities/sub-*Talang* (in 5 big *Talang*) located in the western part of register 46 B. We focused our work in the western part of

register 46 B because fires occurred in this area in 1997/1998. According to official data, fires damaged 100 ha of forest in this area. We found this estimation of burned areas to be an under estimate.

Originally; these *Talang* comprise temporary housing near coffee gardens. Some of these *Talangs*, however, have been developing into a village. In the administrative areas, each of these *Talangs* must be part of the administrative village (*desa*) that mostly located along the main road. However, there is no rule that *Talang* should be part of the closed village. Therefore, many *Talangs* are not part of contiguous spatial units with their home villages.

Because of complexity of the areas of the village, we do not use villages as the unit for the analysis. We use *Talang* and sub-*Talang* as the unit of analysis. Our total sample size consists of 19 sub-*Talang*, and 84% of the total sample unit are located inside the National Park and 16% are located outside or on the border of the National Park.

Figure 2. Location of Study Site

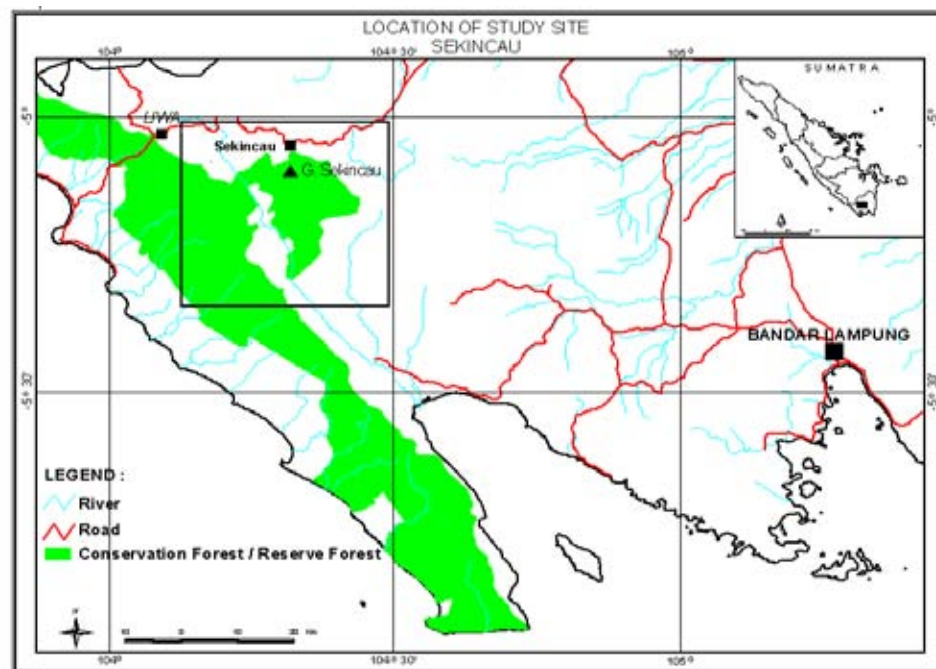


Figure 3. Sketch Map of the Study Site

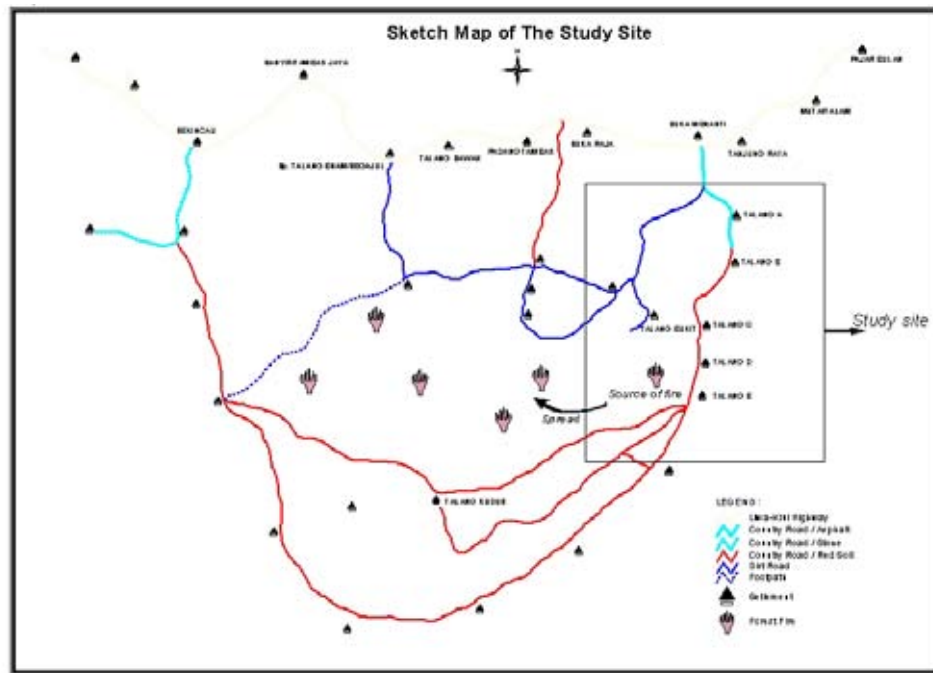


Figure 4. New Migration in National Park



## GENERAL DESCRIPTION

Table 1 provides information about the study site. *Talang A* is located on the boundary of the park of Gunung Sekincau Register 46b with an elevation of 800 m above sea level. *Talang A* is the administrative center for this site and located on a flatter area than the others. *Talang A* is divided into 3 RT (administrative neighborhoods). This *Talang* is the nearest to the main road. It is about 6 km from the start of asphalt road. Accessibility from the main road/sub-district center to *Talang A* is good, with public transportation by minibus (4 vehicles operating) and motorcycle or *ojek* (26 motorcycle).

*Talang B*, *Talang C*, *Talang D* are located inside the National Park. These *Talang* are located in hilly areas or sloping plains, at an elevation of 900-1050 m. The roads to these *Talang* are unpaved with difficult access. The only public transportation available is “a Jeep Hardtop” that is predominantly used for transporting coffee. During rain this jeep hardtop cannot pass this road, so residents must walk around 1-2 hour to reach these *Talang* (see Figure 5).

**Table 1. Site Characteristics**

<i>Talang</i>	Number of Sub- <i>Talang</i>	Elevation	Distance to Main Road (km)	Location in the Park
Site S:				
<i>Talang A</i>	3	800	6	Border
<i>Talang B</i>	1	900	7	Inside
<i>Talang C</i>	2	950	10	Inside
<i>Talang D</i>	6	1,050	11-30	Inside
<i>Talang E</i>	7	1,100	12-37	Inside

This site has only one elementary school (located in *Talang A*). Other services such as a market and health center are located in the main street of Way Tenong, the sub-district center. A weekly market is held in Way-Tenong sub-district every Thursday.

*Talang* E is located farthest from the main road and closest to the natural forest. More land is available in this *Talang* than in other *Talang*. The elevation is 1,100 m. *Talang* E includes 7 sub-*Talang*. One Sub-*Talang* is the administrative center, with an elementary school and a weekly market. The distance from the center *Talang* to the main road is 12 km. The other 6 *Talang* are located around the center *Talang* with the distance to the main road of between 15 and 37 km (Figure 5).

Figure 5. Sketch Map of Sidomakmur

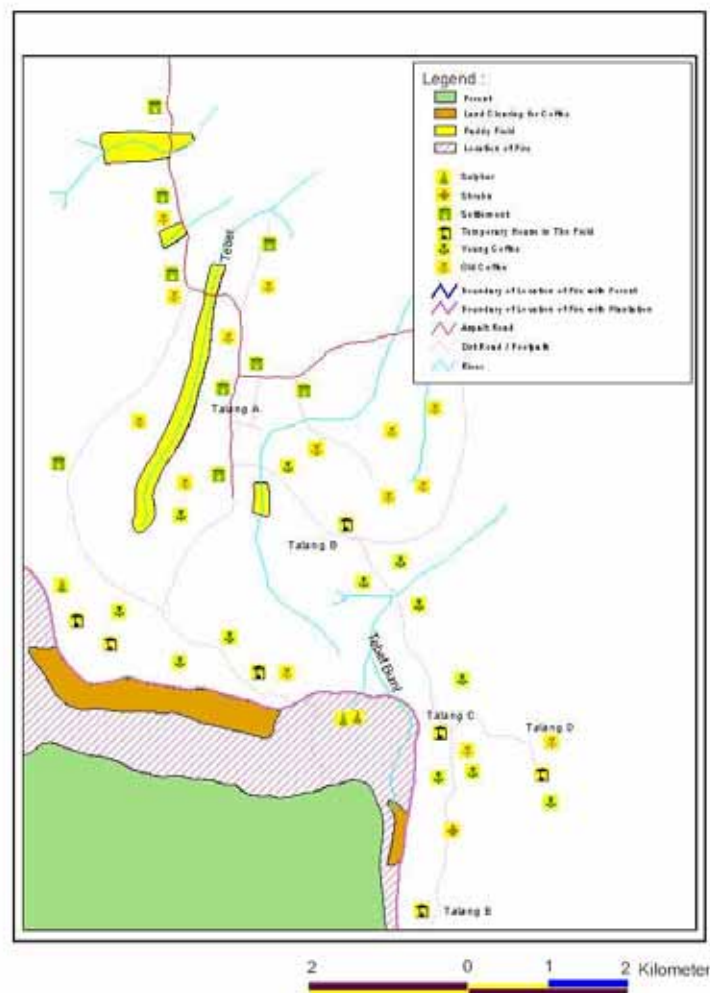
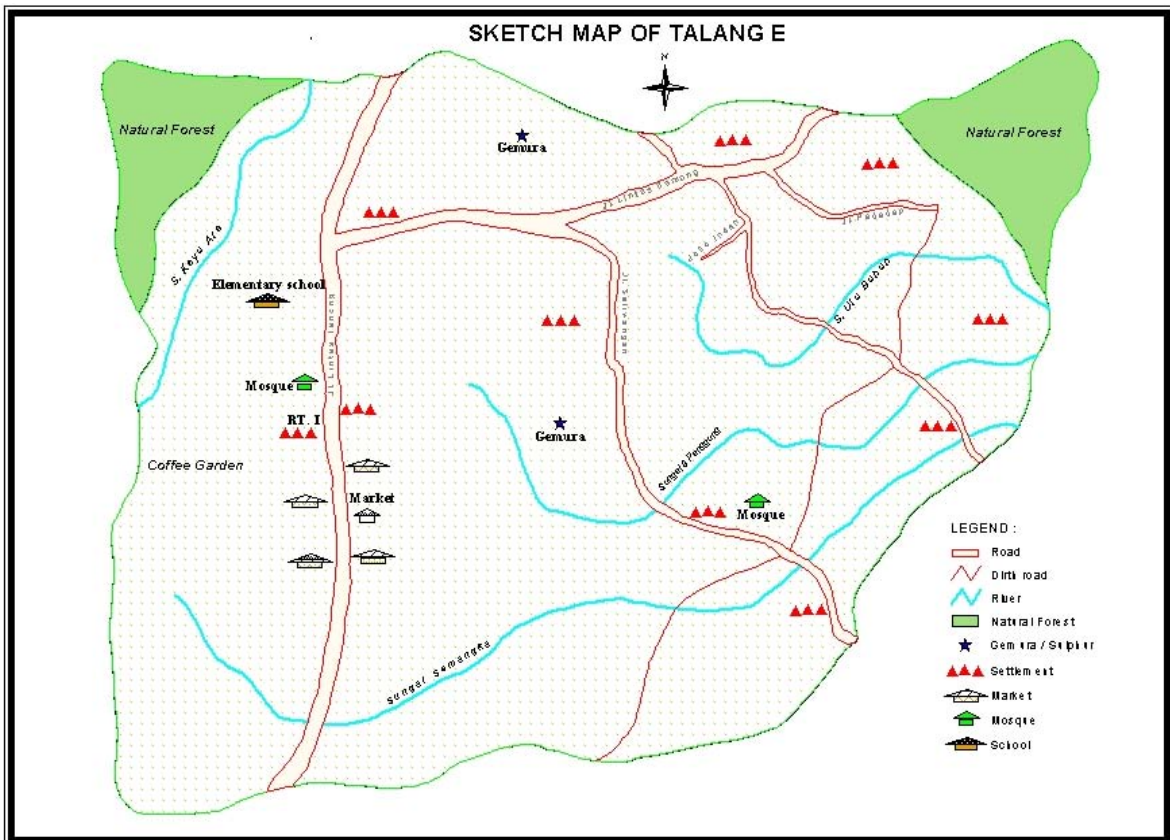




Figure 6. Sketch Map of *Talang E*



## DEMOGRAPHY AND MIGRATION

No official population statistics are available for this site. However, Table 2 shows demographic characteristics based on our extensive community survey. At present, the total number of households is 697 and the total population is 2,599, consisting of 49% male and 51% female. More than 60% of the population live in *Talang E* and *Talang D*, where land is still relatively abundant and close to the natural forest. The population in *Talang A* is also quite large (23% total). *Talang A* has housing, a school and public services. The lowest population is in *Talang B*. *Talang B*, however, is very near to *Talang A*. Therefore, many of *Talang A* people own coffee gardens in *Talang B*.

The education level of household heads is generally (more than 86%) below or equal to 6-year schooling. The education level in *Talang A* and *E* is slightly higher than in other *Talangs*. Almost all households work in the agriculture sector, with most engaged in growing coffee. We found that less than 13% of households worked in the non-agriculture sector, such as trade, teaching, driving, house construction and others. The ethnic majority (between 83%-91%) in *Talang A*, *Talang B* and *Talang C* are Javanese and a small proportion of others are Sundanese and Semendo. On the other hand, *Talang D* and *Talang E* live in an ethnically mixed community. The major ethnic groups are Semendo (18-38 %), Javanese (35-40%) and Sundanese (23-26%) (Table 3).

**Table 2. Demography Characteristics**

<i>Talang</i>	Number of Households	Population			% of HH who hold > 6 years schooling	% of HH working in	
		Male	Female	Total	%	Agricultural	Non-Agricultural.
SiteS:	697	1,282	1,317	2,599	14	99	13
<i>Talang A</i>	157	228	309	597	15	99	14
<i>Talang B</i>	41	96	76	172	5	100	14
<i>Talang C</i>	71	132	131	263	0	100	0
<i>Talang D</i>	126	243	244	487	4	100	2
<i>Talang E</i>	302	583	557	1,140	23	97	20

**Table 3. Percentage of households by Ethnic**

<i>Talang</i>	Number of Households (HH)	Ethnic (%)			
		Javanese	Sundanese	Semendo	Others
Site S:	697	58	16	17	9
<i>Talang A</i>	157	87	4	6	3
<i>Talang B</i>	41	83	8	10	0
<i>Talang C</i>	71	91	4	4	0
<i>Talang D</i>	126	35	26	38	1
<i>Talang E</i>	302	40	23	18	29

Demographic trends in our study site are heavily influence by migration from Java. They migrated to our study site because of difficult living conditions elsewhere and when the pioneer from their family was successfully established through growing coffee, the relatives or friends migrated to the area (See Box 1).

Table 4 shows the percentage of households by the year of their arrival in the village. This table shows a relationship between year of arrival and distance traveled in kilometers. A majority of migrants came to the nearest *Talang* in later years and came to the farthest *Talang* in more recent years. This finding is consistent with the analytical transect developed by group participatory meeting and the survey and determined the distribution of coffee gardens by age of trees reported in the previous section. We also found that the age of household heads in *Talang* D and E were relatively younger than in others *Talang* (Table 5). This indicates that the migration occurred when the migrant was young, generally below the age of 30 years.

**Table 4. Percentage of households by the year of arrival time in the village**

Sites	Number of Households	Year of the arrival time in the village				
		70-80	81-85	86-90	91-95	>95
Site S:	697	17	10	27	27	19
<i>Talang</i> A	157	49	6	17	18	10
<i>Talang</i> B	41	15	44	15	10	17
<i>Talang</i> C	71	17	24	30	23	7
<i>Talang</i> D	126	3	10	43	35	9
<i>Talang</i> E	302	6	4	27	32	31

**Table 5. Percentage of households by Age of Households Head**

Sites	Number of Households	Age of Household Head				
		20-30	31-40	41-50	51-60	> 60
Site S:	697	36	41	14	8	1
<i>Talang</i> A-	157	28	48	9	13	3
<i>Talang</i> B	41	27	49	20	2	2
<i>Talang</i> C	71	39	34	16	11	0
<i>Talang</i> D	126	42	39	13	6	0
<i>Talang</i> E	302	39	38	16	6	1

### Box 1. In-depth interview with Mr. W: A story of the successful migrant.

Mr. W is an example of a successful spontaneous migrant in *Talang A*. He is 42 years old and married. He has one son and two daughters. He was born in Purwodadi, Central Java. In 1973, when he was 16 year old, he joined his parents who migrated to Way-Abung 2 in Central Lampung. Five months after they arrived in Lampung, his father passed away. The life of this family became very difficult and poor. They did not have any piece of land. Mr. W worked as agricultural labor. Before his father died, his father advised him that he should go to the forest to get a better life. In 1979, Mr. W came to *Talang A*. He said he only brought 1000 rupiah and ten-kg rice. He began his life work as coffee garden laborer. In 1981, he opened up about one ha of secondary forest. In the first year, he planted coffee inter-cropped with rice. He grew rice only one season. In 1982, he got married to a Javanese woman. One year later, Mr. W purchased one hectare of young coffee garden (3 year old). He paid with one ton of coffee. He said that his life became better because he had his own house and happy family. In 1985, he bought motorcycle. He also invited his relative from Way-Abung to come to *Talang A*. The relative worked as a laborer in his garden until finally the relative owned their land. In 1991, he purchased another one hectare of coffee garden (5 year old) for 2 million rupiah. In 1994, the price of coffee increased and reached 5,000 rupiah per kg. At that time, the production of coffee was also high. He made a lot of money. He invested his money in buying two ha of wet rice field and one ha of upland field in Way-Abung. I asked him why did you buy land in far areas from his home. He replied, profoundly, that we should be smart and wise, as an aphorism he said "*sedia payung sebelum hujan* (preparing umbrella before raining)". In other word, he realizes that because his coffee garden is located in the . It is possible that someday the government will remove all coffee gardens from the park. With the insecure tenure, he invested some money in a safer place. During the fire period in 1997, he acknowledged that fires only destroyed forest areas. Fire did not occur in his coffee garden or within its neighborhood. In 1998, while people much of Indonesia suffered because of the economic crisis, residents in Sekincau site, including Mr. W got gained from the increase in coffee prices. The coffee price at farm level during harvesting time in June to August 1998 was 13.3 to 15.8 thousand rupiah or an increase of around 4 times over the previous year. At that time, the production of coffee was also very high. There are many stories that farmers bough many expensive goods such as motorcycles, electronic goods and appliances. Mr. W was no exception for he bought a car.

## HISTORY OF THE STUDY SITE

For many year the Semendo people who migrated from South Sumatra have practiced shifting cultivation in West Lampung. The Semendo people started migrating in 1876 and again between 1920 and 1930. Many villages in West Lampung were established by the Semendo (Sevin 1989). The inheritance system of the Semendo people, whereby land is inherited by the eldest daughter stimulated the other children to look for new land elsewhere. It was customary for the Semendo people to open the forest using slash-and-burn techniques. During the first two years after clearing, they planted upland rice.

Coffee is intercropped with rice during the first year. Coffee is harvested from the third to the seventh year. After seven years, they fallow the land and move to open up forest in other areas. Besides the declining soil fertility, the main reasons they practiced shifting cultivation (planting coffee and rice) was because they needed to plant rice to fulfill their food consumption needs. The practice of shifting cultivation by Semendo people in the study site at present, however, has now become a more permanent agricultural system, due to increasing population and reduced land availability.

According to one old Semendo respondent who came to Sukananti village in 1938, chiefs of the Semendo people allocated the areas in *Talang A* for growing only upland rice using shifting cultivation. They did not allow the planting of coffee in this area. They thought this area was appropriate for growing rice because it is flat, fertility is high and it is close to houses. By 1977, however, the soil fertility had declined and they left this area. Land cover in 1977 was largely *Imperata* sp dominated grassland in the flat areas at low elevation, and bush and secondary forest in the middle elevation and natural forest at the higher elevations (See Figure 7).

Mr. M, a Semendo person, who came to the *Talang A* in 1977, claimed this area (*Talang A* and *Talang B*) under his authority. He was a very strong leader and respected by all people in this area. He married a Javanese woman and welcomed Javanese people to come and to build the community in this area.

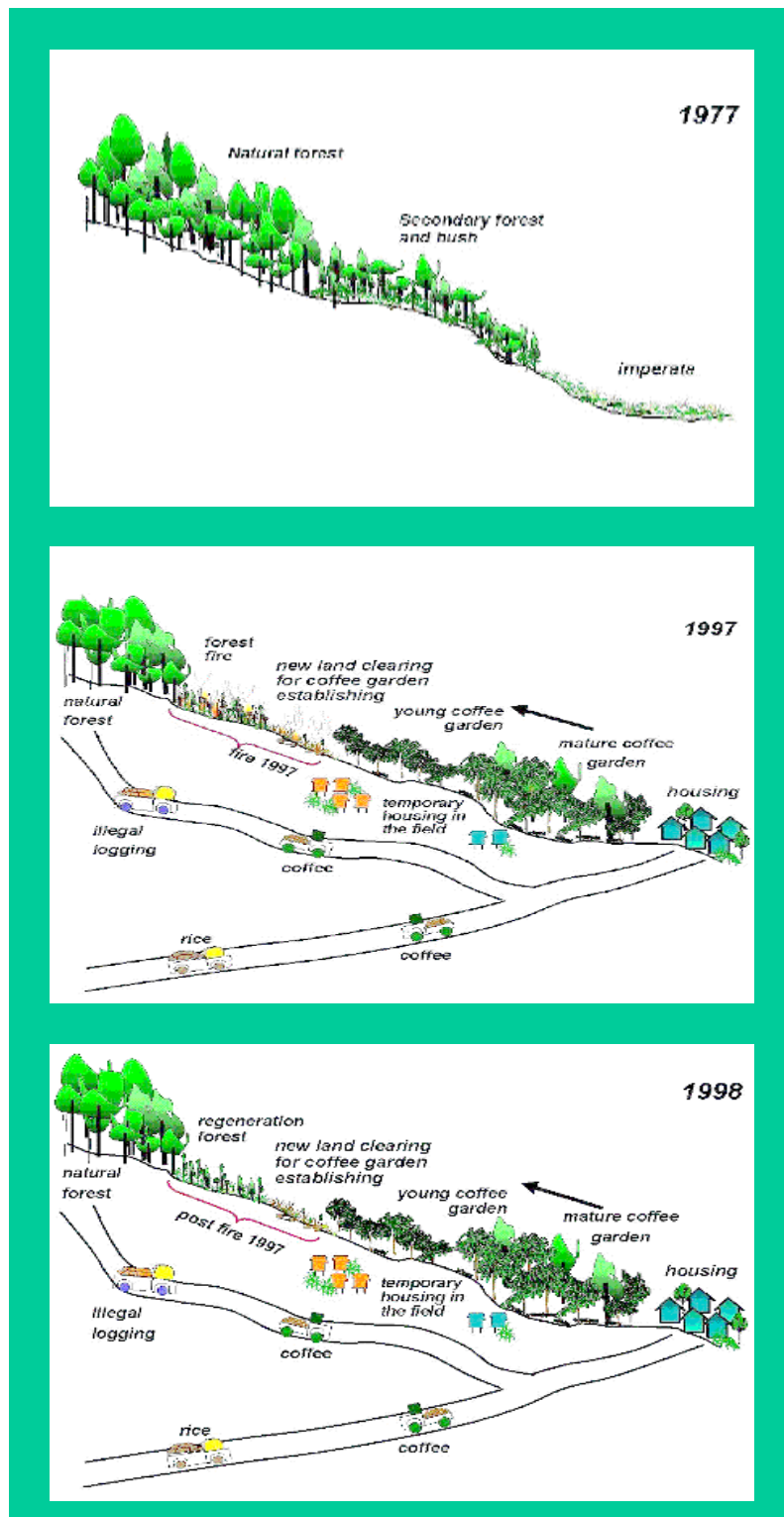
Mr. M organized the land use of this area. The area in *Talang A* is allocated for housing and public services. He divided the land into 1,250 square meter lots per household for housing. Some Javanese came to this area and obtained the land for housing and for agricultural production from Mr. M. They obtained 1,250 m<sup>2</sup> land for housing by paying Mr. M. Rp. 50,000. Mr. M would also permit them to use *uncultivated* land for growing coffee. The price of the *uncultivated* land, however, depended on the kindness of Mr. M. If they did not have money, they often worked as agricultural laborers for Semendo people. Some of these people got land as wages for their work.

In 1983, the military village development program (*ABRI masuk desa*) built an unsealed road. The establishment of this road was very important in the development of this site, since it made the area more attractive for new migrants. Along with an increase in the price of coffee in 1985, the numbers of households and coffee garden in this site also increased.

Although from 1982 to 1985, new migrants came to this area, there were also some households who departed because of uncertainty over land tenure. Since 1982, the area of register 46B was designated as part of Bukit Barisan Selatan National Park. There was a rumor that the government would prohibit agriculture activities in this site. Although land tenure security was uncertain, the high incentives for growing coffee continued to attract people to the area and the forest inside the park was logged, burned and planted with coffee. In 1994, the government paved the road. This was taken by local people as evidence of increased land tenure security. By 1995, the number of households in this site had increased.

Illegal logging using chainsaws has increased since 1995. It was reported by our respondent that three rich residents own 25 chainsaws. The illegal logging activities are supported illegally by the military, police and government officers. In 1997, fires occurred in October destroying around 500 ha of natural forest (qualitative estimate by farmers). The fires are reported to have started from *Talang E* and spread to the eastern part. In 1999, farmers have continued to expand their coffee garden in the burned areas and areas that had been illegally logged and burned.

Figure 7 Transect of Study Site



## FIRES AND CAUSES OF FIRES

During the El Niño year of 1997, official figures state that fires in Lampung burned 21,311 ha of forest areas (*kawasan hutan*) (See Table 6). In terms of total area, the largest fires occurred in the National Park, followed by the Production Forest and the logged Protection Forest. In terms of proportion, however, the highest proportion of burnt areas occurred in Production Forest (4.5 %), following by National Park (2.1%) and Protection Forest (1.4 %). (*Kanwil Kehutanan Lampung*/Forest Administration for Lampung). It is important to note that not all forest categories are covered by trees. Therefore, we can hypothesize that not all fires occurred in forested areas, or destroyed the forest cover.

Fires in 1997 commenced in April. From April to June, the total area of forest burned was only around 1,000 ha in Lampung. The total forest area burned increased to 4,635 ha in August. The largest forest fires occurred in September and the forest area burned reached 8,027 ha, double that of the previous month. In October, the area of forest land burned declined to around 4,000 ha and by November was down to 2,500 ha.

According to *Kepala Dinas Perkebunan-Lampung* ( Chief of Plantation Administration for Lampung), more fires occurred on forest area land than in plantation areas. Official data until October 1997 shows that fire in plantation areas was only 4,644 ha (Table 7). Fire particularly affected large-scale plantations (67%). On the other hand, fires only damaged 25% of non-project smallholder plantations and 8% of project-smallholder plantations. In large scale-plantations, fire destroyed oil palm plantation (41%) and sugarcane plantation (40%). In non-project smallholder, fire occurred in sugarcane (66%) and coffee (23%). While in smallholder projects, all fires took place in rubber plantation.

In our study site, fire occurred in October 1997 and destroyed 100 ha of natural forest (official data). Our respondents, however, estimated that forest fires actually burned around 500 ha. This estimation is based on their observation and involvement in fire fighting. During that time, people from around the park walked for 1.5 to 2 hours and



cut the vegetation along 3 km of the forest to form a fire break to reduce the spread of the fire to smallholder gardens.

Fire first occurred in areas near *Talang E* and *Talang D*. Then, it spread to the eastern part of Sekincau (Figure 5). Forestry officers blamed the fire on slash-and-burn methods used for land clearing by farmers around the forest. The likelihood of fire from land clearing by farmers escaping to forest during an El Niño year is high because the areas of young coffee garden are located closed to the forest areas burned by fire. We did not find any evidence that fires spread out to farmer's garden. This suggest that community base fire management systems are evident. The communal (*adat*) law has applied a system involving penalties that are imposed on farmers who mismanage fire and destroy to their neighbor's field. On the other hand, there are no incentives for farmers to control fire from spreading to natural forest. In fact, farmers gain from the forest fire. They will more easily be able to establish coffee garden in the forest areas after the fire.

Farmers, however, denied that their activity in land clearing was a cause of fire. Farmers argued that they are very careful in managing fire. Most of our respondents believed that the forest fires in our site occurred as result of accidents. They blamed the activities of illegal loggers who make campfires and discard cigarette butts as the main cause of the forest fires.

Farmers traditionally used fire in land clearing. We used data of distribution of coffee areas by different age of trees in estimating area burned for land clearing purposed. The burned areas in 1997-1998 covered 310 ha. Around 77% of the total land are cleared areas in 1997-1998 was located in *Talang E*. This evidence suggests two things. Firstly, it seems there is strong relationship between fires and deforestation in this site. The establishment of coffee garden (using fire in land clearing) is very high in the areas which natural forest are still relatively more abundant. Second, it is most likely that fire spread from land clearing activities to natural forest because the location of the burned forest areas are closed to young coffee gardens and the first source of fire came from *Talang E*.

We can conclude that there are two types of fire in Sekincau: controlled and uncontrolled fire. Controlled fires come from the activities of smallholder in land clearing. Uncontrolled fires occurred in natural forest that could be come both from the spread of fire from land clearing and from illegal logging activities.

**Table 6. Forest Fires areas in Lampung Period 29 April to 21 November 1997**

<b>Forest Classification</b>	<b>Total Areas (Ha)</b>	<b>Forest Fire areas (Ha)</b>	<b>% of Forest Fire</b>
National Park	470,005	10,048	2.14
Protection Forest	313,856	4,463	1.42
Production Forest	151,587	6,800	4.49
<b>Total</b>	<b>935,428</b>	<b>21,311</b>	<b>2.28</b>

Note: Not all forest classification is covered by forest trees.

Source: Kanwil Kehutanan Lampung (Forest Administration for Lampung)

**Table 7. Fires on Plantation Areas in Lampung 1997**

	<b>Fires Areas (Ha)</b>	<b>Type of Tree Plantation (% of fire areas)</b>				
		<b>Oil Palm</b>	<b>Sugarcane</b>	<b>Coffee</b>	<b>Rubber</b>	<b>Others</b>
Small-scale plantation:	1,530 (33)	1	51	17	29	2
Non-Project Smallholder	1,167 (25)	1	66	23	6	3
Project Smallholder	363 (8)	0	0	0	100	0
Large-Scale Plantation	3,114 (67)	41	40	0	2	16
<b>Total</b>	<b>4,644</b>	<b>28</b>	<b>44</b>	<b>6</b>	<b>11</b>	<b>11</b>

Analysis from Dinas Perkebunan Lampung Data

## DEFORESTATION

To better understand the relationship between fire and deforestation, this section outlines the causes of deforestation in Lampung. According to the head of Dinas Kehutanan Lampung (Forestry Administration), the total forest land area in Lampung is 1,083,749 ha or 32% of the entire areas of Lampung Province. The condition of the forest, however, has been degraded in most areas and much of the forest land is without forest cover. He noted that the destruction of forest reached 62 % in Protection Forest,

41 % in National Parks and 76 % in Production Forest (Koridor newspaper, edition 14/Th 1/1-7 July 1999).

The development of coffee gardens, along with the increasing migration and illegal logging activities are the main causes of deforestation in the National Park, in the study site. We define the term deforestation as the situation where natural forest cover has been converted to another land use classification<sup>3</sup>. The farmers in our site argue that they do not directly open the natural forest for growing coffee. Most of them cultivated the bushy land or *Imperata* sp grassland or secondary forest that had already been cultivated under a shifting cultivation system by the indigenous Semendo people. In more recent years, however, non-Semendo people also developed coffee gardens by direct conversion of natural forest. There is a tendency, however, for farmers who opened natural forest to shift the responsibility to Semendo people. The second source of the coffee land are areas of forest previously of illegal logged illegally. Recently, they also cultivated in the areas of burned natural forest. They argue that this land is empty land or bushy land and it is not natural forest anymore. Therefore, they cultivate that land for coffee. Whatever the justification, in fact most of the natural forest within the National Park has already been logged and converted to coffee gardens and the rate of deforestation in this site is very high (Figure 8).

**Figure 8 Mosaic of coffee garden and new opened land**



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<sup>3</sup> Sunderlin and Resosudarmo (1996) suggested to use the term of deforestation that is proposed by FAO (1996). Deforestation define as a land use changed from natural forest to others land use classification.

Based on extensive a community survey, we found that the mean area of ownership of coffee gardens per household is 1.77 ha and the mean ownership and cultivated area or coffee gardens per household is 1.88 ha (See Table 8). The mean ownership and cultivated area of coffee gardens per households in *Talang* E is higher than in others *Talang*. This indicates that land in *Talang* E is more abundant than land in others *Talang*.

The distribution of the areas of coffee garden is shown in Table 9. The total area of coffee garden (1,273 ha), owned by farmers is *Talang* A (19%), *Talang* B (4%), *Talang* C (9%), *Talang* D (17%) and *Talang* E (51%). The age of coffee garden on the site is relatively young. 75% of the total coffee gardens have ages below 10 years and only 11% of coffee areas are more than 15 years old. The oldest coffee gardens are located largely in *Talang* A and the youngest coffee gardens are located largely in *Talang* E. Coffee gardens between the ages 5 and 10 years are located largely in *Talang* B, C and D. This evidence suggest that the oldest coffee gardens are mostly located in the *Talang* that are nearest to main road and youngest coffee garden mostly located in the *Talangs* that are farthest to main road. This result is expected, because it is more costly and, so less profitable to cultivate plots furthered from the market, as argued by Angelsen (1996). Moreover, the effect of distance to main road in our study seems consistent with the finding of Chomitz and Gray (1994). Using Belize data, Chomitz and Gray found a significant positive effect of development of rural road on deforestation.

In 1998-99, the area of new coffee gardens developed was 139 ha. Most of the plantings were located in areas that were burned in the previous year. It should be noted that most of these former burned areas were claimed by farmers. If farmers slash the border of the areas and plant “andong” trees as a border sign, then the local societies recognize their use rights to this land. Farmers have already claimed much of the previously burned land. Accurate data, however, are difficult to obtain since this area is clearly located in the National Park, and the state does not recognize these informal claims.

Profitability of coffee attracts people to establish coffee garden. The real domestic price of coffee fluctuated during 1977 to 1998 (Table 10). It is estimated, however, during that period the real domestic price of coffee increased by 11% per annum. During 1990 to 1998 (more recent years), the real domestic price of coffee increased by 25% per annum. To avoid the effect of economic crisis, we exclude the year 1998 in our estimation. The growth of real domestic coffee price was 6% per annum during 1977 to 1997 and it was 14% per annum during 1990 to 1997. Although we exclude the effect of the economic crisis, the growth of domestic price of coffee was still high and positive.

The second cause of deforestation is illegal logging that is organized by rich farmers with support from the military, police and others government officers. The logging of natural forest now is largely occurring in *Talang E*.

**Table 8. Average size of coffee garden per households (Ha)**

Sites	Land-Owned	Share-cropped	Total Land
Site S:	1.77	0.11	1.88
<i>Talang A</i>	1.37	0.12	1.54
<i>Talang B</i>	0.91	0.21	1.03
<i>Talang C</i>	1.59	0.06	1.80
<i>Talang D</i>	1.72	0.12	1.78
<i>Talang E</i>	2.10	0.03	2.13

**Table 9. Distribution of coffee plantation by age of coffee and Talang.**

Sites	Total areas of coffee garden (Ha)	Age of Coffee Garden						
		0-1 year	2 year	3 year	4 year	5-10 year	11-15 year	>15 year
Site S:	1273	139	162	77	52	535	173	135
<i>Talang A-</i>	242	22	11	7	7	18	74	103
<i>Talang B</i>	47	9	1	3	0	31	3	0
<i>Talang C</i>	122	6	13	4	5	94	0	0
<i>Talang D</i>	215	6	1	1	2	205	0	0
<i>Talang E</i>	647	96	136	62	38	187	96	32

**Table 10. Coffee bean price at farm gate in Lampung**

Year	Consumer Price Index <i>1998=100</i>	Coffee price		% <i>change</i>
		<i>Nominal</i>	<i>real</i>	
1977	10,39	1.210	11.646	
1978	11,23	725	6.455	-45
1979	13,06	1.164	8.915	38
1980	15,41	1.100	7.139	-20
1981	17,30	585	3.381	-53
1982	18,92	558	2.949	-13
1983	21,17	905	4.276	45
1984	23,38	1.051	4.496	5
1985	24,50	1.198	4.890	9
1986	25,90	2.706	10.446	114
1987	28,33	2.119	7.481	-28
1988	30,61	1.643	5.368	-28
1989	32,57	1.435	4.406	-18
1990	35,10	1.400	3.989	-9
1991	38,40	1.397	3.638	-9
1992	41,31	1.333	3.227	-11
1993	45,28	1.522	3.361	4
1994	49,14	4.225	8.598	156
1995	53,77	4.360	8.108	-6
1996	58,09	2.275	3.916	-52
1997	61,93	3.276	5.290	35
1998	100,00	11.410	11.410	116
Average annual growth		1977-1998		11
		1977-1997		6
		1990-1998		25
		1990-1997		14

Source: Dinas Perkebunan-Lampung Barat) (1999)

(Plantation Administration for West Lampung District

## LAND TENURE

The land tenure security in this site is weak because most of the coffee gardens are located inside the National Park. The settlers realize that their land could be taken back by government at any time. Inspection of this area by park officers, is very weak. It is a public secret that the illegal logger or farmer who clears forest can collude with the park officers, avoiding official sanctions for these illegal activities. According to the Head of Lampung's Forestry Unit, coffee farmers have paid about 20% of coffee production to certain officials from various government offices, including officials from the provincial forestry unit (Observer, 16 Aug 1999) in order to enable their activities to continue.

In fact, private land tenure in the park is gradually becoming more secure. Farmers feel that the government will not take their land because of the development of their community including the development of roads and other public services. The feeling of the security of land tenure has increased since the reformation period (mid-1998 to the present) in Indonesia.

Although none of this informally held “private” land has a government title, local society recognizes the land rights of local populations. Transferring of land rights through informal sale of land and share cropping are commonly practiced. The value of the land has been increasing sharply. In 1985, the price of 1,250 m<sup>2</sup> of land for housing was only Rp.50,000. The price of this type of land increased to 2 million rupiah in 1995 and 5 million in 1999. Similar to this, the uncultivated land price in 1985 was Rp. 250,000 per hectare. The price of this type of land has increased to Rp.500,000 in 1995 and 1 million rupiah in 1999. This evidence indicates that people have confidence that security of land tenure has increased on this site.

Tenancy under sharecropping of coffee gardens is also commonly practiced. A new young migrant initially works as a tenant under a share tenancy system. Under this system, all output and input is shared equally between informal property owner and tenant.

Although security of land tenure has been increasing, it is still not fully secure, creating conditions for extraction of profit from the West Lampung coffee fields and around Bukit Barisan National Park, for reinvestment elsewhere. We found evidence that farmers who got surplus from coffee cultivation invested their money outside the village. Some of them bought rice fields in Central Lampung, bought palm oil fields in Pesisir Lampung Selatan and built houses in Java.

## **CONCLUSION**

Fires in 1997/1998 in Sekincau site can be categorized as controlled fires and wild (accidental) fires. Controlled fires came from the activity of land clearing for the establishment of coffee gardens by smallholders. The underlying causes of fire in

Sekincau relate to deforestation, migration, and land tenure. There are two sources of deforestation: establishment of coffee gardens by smallholders and illegal logging activities. The establishment of coffee garden greatly increased with the increase in migration and profitability of coffee production. The feeling of the security of informal land tenure in the park has increased in recent years, thus attracting more migration to the site. Approximately half of the migrants are temporary migrants who extract profit from the coffee fields inside Bukit Barisan National Park.

During drought period, such as El Niño, fire from land clearing and illegal-logging activities easily spreads to natural forest and become uncontrolled forest fires. The amount of land burned and impacts of uncontrolled fires are much greater than controlled fires started by smallholders.

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