

Community-based fire management, land tenure and conflict: insights from Sumatra, Indonesia

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Abstract

A collaborative research project involving the Center for International Forestry Research (CIFOR), International Centre for Research in Agroforestry (ICRAF), United States Department of Agriculture Forest Service and the European Commission found that community-based fire management in parts of Indonesia can have both positive and negative impacts on the forest environment, and can lead to short- and long-term changes in income. This paper examines two examples from Lampung Province in southern Sumatra, Indonesia, where communities manage fire in different forest types to increase income generation, but without a conscious effort to maintain environmental services or achieve biodiversity conservation. In Sekincau, located in a national park, communities manage forest fire to facilitate the establishment of coffee gardens in the residual understorey or in open areas. Based on knowledge of fire behaviour, communities often encourage fire to escape from adjacent areas and burn in previously illegally logged forest. Fires are also managed to prevent damage to adjacent coffee gardens. This suggests that the community knows how to manage fire to meet specific objectives.

In Menggala in the vast swamps of east Lampung Province, the traditional communities use fire as a tool for burning organic matter to prepare the ground for “traditional swamp rice cultivation” (sonor) during extended dry periods. The fires burn large areas of swamp forest well beyond the boundaries required for rice production. The fires have facilitated the regeneration and expansion of areas of *Melaleuca cajuputi*, a fast-growing species that responds positively to disturbance. The regenerating forests are harvested for domestic consumption and supplementing income through the production and sale of charcoal, poles and sawn timber.

1. Introduction

Large-scale fires and associated smoke are an increasing problem in Indonesia and surrounding countries. Major fires occurring in the El Niño years 1982/83, 1987, 1991, 1994, and 1997/98 (Dennis, 1999) burned huge forest areas and caused significant economic losses, both in Indonesia where most fires occurred, and in neighbouring countries. The economic costs of the 1997/98 fires in Indonesia have been estimated to exceed US\$9 billion, with carbon emissions high enough to elevate Indonesia to one of the largest polluters in the world (ADB and Bappenas, 1999; Barber and Schweithelm, 2000). There are several underlying causes for the fires. If they are not addressed, unwanted fires will continue to burn in many parts of Indonesia with the ensuing negative impacts on the forest environment. The fires also generate large amounts of emissions from the burning of peat soils and the resultant smoke and haze have led to cross border problems (Applegate *et al.*, 2001; ADB and Bappenas, 1999).

As research on underlying causes of fire in Indonesia has indicated (Applegate *et al.*, 2001), perverse policy and institutional incentives (e.g. inappropriate land-use allocation, lack of tenure security) and external forces (e.g. demographic changes) have influenced the communities' use of their knowledge of fire behaviour in sustaining their livelihoods. Therefore, it is understandable that community-based fire management is considered by many to be an important approach to address the problem of recurring fires and their related negative impacts. However, documented knowledge about the conditions under which this approach may work is limited (Ganz *et al.*, 2001).

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This paper outlines two cases in Lampung Province of South Sumatra, Indonesia (Figure 1). The communities of Sekincau and Menggala manage fire in different forest types to meet similar goals of income generation. They also use it as a tool to gain access and control of resources. In Sekincau, but without a conscious effort to maintain environmental services or conserve biodiversity of the burned forest and forestlands.

In the two examples, community-based fire management is defined as the conscious use of fire to meet a specific objective. The results of community fire management may not always be positive, which depends on whose perspective is adopted to judge the outcomes. The paper argues that communities' livelihood systems and their relationships with the wider socio-economic and institutional environment need to be understood to ascertain how community-based fire management may be used to improve local livelihoods while avoiding (or minimising) negative environmental impacts.

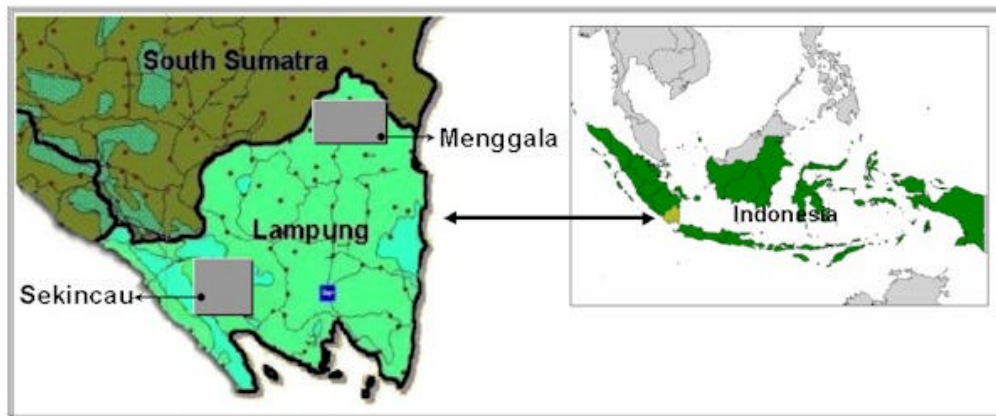


Figure 1: Location of study sites in Sumatra, Indonesia

2. Methodology

The methodology used to identify the extent of community-managed fire regimes involved the use of geographic information system (GIS) to integrate the results of socio-economic research with remote sensing analysis. Local people's narratives and sketch maps were incorporated with land cover change and burn scar maps derived from satellite images.

3. Sekincau: community-based fires and land tenure conflicts

The burn scar analysis from satellite imagery for this site identified three main zones of burning, characterised by a distinctive burn scar pattern. In Zone 1 (see Figure 2 and Table 1), burn scars are small (3 ha on average) and widely scattered, accounting for 1 percent of the area. Overlaying the 1997 burn scar map with the land cover maps for 1985 and 1994 shows that much of the forest area had already been converted to coffee gardens by 1985. Field observations confirmed that the forest was burned regularly to expand the coffee gardens (Suyanto *et al.*, 2000a).

Burn scars in Zone 2 are large, with an average size of 28 ha, and account for as much as 21 percent of the zone. The majority of burn scars are located near or adjacent to primary forest. The analysis showed that much of the area covered by the 1997 burn scars was still natural forest in 1994.

Zone 3 exhibits very large burn scars. Although the number of burn scars is less than in other zones, the average size is much larger (87 ha) and accounts for 29 percent of the zone. Historical satellite data show that this area has burned repeatedly since 1994, and probably in earlier years. In 1985, much of this area was already cultivated and converted to coffee gardens. The site is located in a national park, and the burning of the forest by communities to prepare the land for coffee production has resulted in conflicts between local people and the Forestry Department over

tenure and use rights. Data on distribution of coffee areas by different tree age were used to estimate area and year of establishment. The burned areas in 1997/98 covered 310 ha. Approximately 77 percent of the total land was cleared by fire in 1997/98.

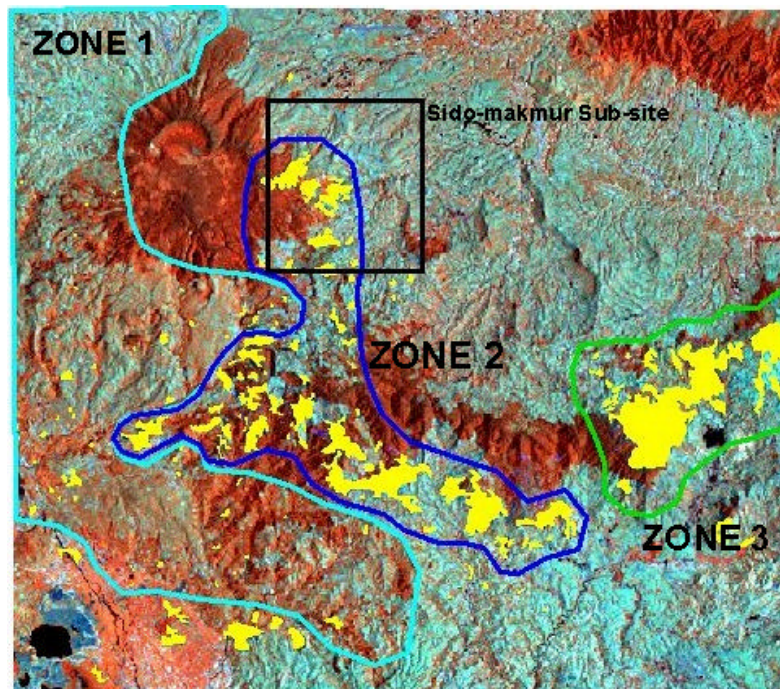


Figure 2: Burn scar patterns in Sekincau

Table 1: Statistics of burn scar patterns

Burn scar zone	1	2	3
Size of zone (ha)	13,371	6,548	3,286
Number of burn scars	48	48	11
Total area of burn scars (ha)	142	1,358	960
Area of burn scars in zone (%)	1	21	29
Average size of burn scar (ha)	3	28	87

In Sido-Makmur in Zone 2 (Figure 2), fires destroyed the forest in the national park. Based on research findings, the so-called “uncontrolled” fire that “escaped” from the farmers’ fields burned the forest during El Niño years because the young coffee gardens are generally located near forests. On the other hand, interviews with local communities provided no evidence to show that fires spread to neighbouring farmers’ coffee gardens. This suggests that farmers can manage fire effectively and prevent it from escaping into coffee gardens, but enable it to escape and burn forest areas to expand coffee gardens.

The traditional (adat) law has a system of penalties that are imposed on farmers who mismanage fires and destroy neighbours’ fields. On the other hand, there is no incentive for communities or individuals to control the spread of fire into the natural forest, which in this case is a national park. On the contrary, communities and individuals stand to gain from forest fires in the park because the fire facilitates the establishment of coffee gardens in the area. While field investigations indicated the skills of local communities in the use fire on steep slopes by allowing

the prevailing winds to fan the fires into forest areas, many individuals denied that their land clearing activities were a cause of fires. Many insisted that they were very careful in managing fires when clearing the land. Most survey respondents blamed the forest fires on accidents from the campfires and discarded cigarette butts of illegal loggers.

The demographic composition in the study site is heavily influenced by migration from Java and Javanese communities from established settlements in Lampung. People moved to the area because of hardships and poor livelihood opportunities elsewhere. The positive initial evaluations from “pioneers” and increased family incomes from growing coffee have persuaded many families to relocate. Although land tenure is uncertain, because most of the coffee gardens are located inside the national park, “private” land tenure in the park is gradually becoming more secure. Farmers feel that the government will not take their land away because their community is established and developed with roads and other public services. The feeling of secure land tenure has increased during the “reformation” period (mid-1998 to the present). Confrontation with the authorities is less likely compared with the past when government authorities often tried to evict the coffee growers from the park.

The research results indicate a strong relationship between fire and deforestation. The establishment of coffee gardens using fire for site preparation is most active in areas where natural forest is still relatively abundant. Also, judging from the proximity of the burned forest areas and young coffee gardens, it is most likely that the fire spread during land preparation activities outside forest areas to the natural forest. The analyses therefore suggest that there may be two types of fires in this area: those that are managed and those that are allowed to burn uncontrolled. The managed fires come from the activities of smallholders for forest clearing, while uncontrolled fires can also occur in natural forest as a result of escaped fires from land clearing and illegal logging inside the national park.

4. Menggala: fire and traditional “sonor” rice cultivation

The second study site is located in the swamp areas in eastern Lampung Province. During the El Niño years of 1997/98, this area was characterised by burned swamps. The villagers of the Mesuji community are the main residents who manage fire for the production of swampland rice or “sonor”. The Mesuji people came from South Sumatra to Lampung in the early 1900s, and brought with them the sonor technology. Over the last 10 years, farmers have practised the sonor system in each of the very dry years of 1987, 1991, 1994 and 1997. These years coincided with the El Niño phenomenon. According to the chief of the Mesuji people, thousands of hectares of swamp forest were burned and cultivated under the sonor system in 1997, with most households cultivating approximately 5 ha each (Suyanto *et al.*, 2000b).

The Mesuji people live along the rivers, which are dominant features in this area. Their main livelihood is fishing and sonor. They also harvest *gelam* trees (*Melaleuca* spp.) from the swamp forest for house construction and for sale. Under the sonor system, farmers plant rice only after a considerable drought, usually associated with an El Niño event. A 5- to 6-month dry period ensures that the water table is low enough for the successful burning of swamp forest. The fire removes the organic matter and provides an ash bed, which facilitates the early growth of the young rice seedlings. Characteristically, the Mesuji communities burn the swamp in September and October. Although land preparation requires relatively little labour inputs, shortage of labour for harvesting has been a problem. Therefore, many seasonal workers from transmigration areas are under contract to assist in the harvest. The traditional owners and labourers share the harvest equally. This generous payment highlights the severe labour shortages in the area, even to the point that some rice fields could not be harvested in 1997. Average yield per hectare under the sonor system is 4 metric tonnes of unhulled rice, which is almost double the yield of the non-sonor farming system.

The communities only set out to burn as much swamp forest as they require for the sonor production, but make no conscious effort to control the fires, which burn beyond the designated area. The desirable characteristic of the sonor system is its extremely low labour demand. Following the burning of the swamps and the sowing of the rice seeds, the farmers usually return to the field only after the harvest 6 months later. By this time, the water table has risen to levels

where it is necessary to travel through the fields by boat. Following the harvest, the forest areas are fallowed for 3 to 4 years (depending on the dry season cycles). During this period, the swamp forests, often dominated by gelam trees, regenerate and occupy the site.

The sonor practice is a community-based fire management approach that uses fire to prepare land, rather than one that aims to control the spread of fires. One of the side benefits of the sonor system is the development of *Melaleuca* spp., a fast growing, light-demanding species with a wide range of end uses. Preliminary investigations suggest that the vast swamp ecosystem south of the Musi River, an area including the study site, have been largely converted from primary swamp forests to grasslands and *Melaleuca*-dominated forests following logging and transmigration site developments. The repeated fires over a short time span of less than 25 years have altered the forest resource, which is now dominated in many places by *Melaleuca cajuputi*.

This “new” forest provides the raw materials for pole, sawn timber and charcoal industries operated informally by local people and migrants. The operations appear to extend over a vast area and sustain the livelihoods of many people. Observations suggest that the *Melaleuca* spp. regeneration is perhaps largely a feature of disturbed freshwater swamp forests. The issue of modified peat swamps therefore needs to be examined more closely. With the potential of generating new income from the resource, research will be undertaken to determine the social and biophysical aspects of community-based forest management of this resource and the judicious use of fire by the communities to promote regeneration and sustained productivity.

5. Conclusions

Community-based fire management is defined in the paper as the conscious use of fire to meet a specific objective. From the perspective of a community, or an individual, the objective could be the maintenance of livelihoods. This may involve clearing forest to plant coffee or rice, or to secure rights to the land, which may have negative impacts on the environment. Whether local communities consider such impacts as negative depends to a large extent on the effects on their livelihoods. Environmental changes that have global, but not local-level, impacts are unlikely to mean much to local communities. The ignorance of local communities about localised environmental changes that may affect their livelihoods needs also to be addressed. If in specific cases the use of fire has these unrecognised effects, it could be possible to reduce the occurrence and/or the extent and intensity of the fires while benefiting local communities.

For organizations promoting the use of community-based fire management, the objective of fire management could be the reduction of the negative impacts of fires on the local and global environment. These organizations need to recognise that their definition of negative impacts may differ from the communities’ perspectives.

It is obvious that introducing community-based fire management demands detailed knowledge of environmental impacts, communities’ livelihood systems and their relationships with the wider socio-economic and institutional environment. This requires research on existing livelihood systems (e.g. environmental sustainability, economic opportunities) and ways of improving them, the policy and institutional environments affecting livelihoods and environmental management, and the relationships between rural livelihoods and the corporate sector.

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