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Community Involvement in and Management of Forest Fires in South East Asia

Prepared by
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Project FireFight South East Asia
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Eucalyptus plantation in Congo by Dr. Takeshi Toma, Cifor

Four small cover picture from left to right:

Efforts to extinguish fires East Kalimantan in 1998; © WWF-Cannon/WWF Indonesia

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Field burning in East Kalimantan, normally a prelude to rice cultivation by the Dayaks

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Preface

The forest fires of 1997 and 1998 created enormous ecological damage and human suffering and helped focus world attention on the problem. There is a growing concern within **WWF - The World Wide Fund for Nature** and **IUCN - The World Conservation Union** that action is needed to catalyse a strategic international response to forest fires. There are no ‘magic bullets’ or ‘instant solutions’. The issues to be addressed are complex and cut across many interests, sectors, communities, nations and regions. WWF and IUCN believe that action only take place when fires are burning, with little attempt to address the underlying causes.

This is why the two organisations have joined forces and developed **Project Firefight South East Asia** to secure essential policy reform through a strategy of advocacy using syntheses and analyses of existing information and new outputs. More specifically, the project aims to enhance the knowledge and skills of key stakeholders with regard to forest fire prevention and management and, where necessary, to facilitate the adoption of new and/or improved options. The project works at the national and regional levels across South East Asia to support and advocate the creation of the legislative and economic bases for mitigating harmful anthropogenic forest fires.

As the problem of forest fires lies beyond the capacity of national governments and international organisations to handle alone, the project pursues a multiple stakeholder approach. By combining WWF’s extensive network of National Organisations and Programme Offices in South East Asian, IUCN’s broad-based membership, world-renowned scientific commissions, and collaboration with ASEAN governments, UN agencies, EU projects, CIFOR, ICRAF, RECOFTC, universities, etc., the project ensures popular participation, public awareness, policy outreach and programmatic impact in connection with fire-related issues.

Project FireFight South East Asia undertook studies focusing on three areas of fire management: community-based fire management, legal and regulatory aspects of forest fires, and the economics of fire use in South East Asia. The expected results of these studies are the identification of political, private sector and civil society stakeholders and the legal, financial and institutional mechanisms appropriate to South East Asia that can positively influence their fire-related behaviour. In addition, national and international policies, which promote, or fail to discourage, forest fires are identified.

This report is a review of community involvement in and management of forest fires in South East Asia. Successful experiences of local community-based approaches to fire prevention and control in South East Asia are reviewed and analysed. Particular attention is given to the political, institutional, economic and cultural elements that enable local communities to actively engage and prevent uncontrolled burning. It is anticipated that this report will provide information to South East Asian governments and other stakeholders and will lay the foundation for recognising, financing and utilising community fire control as a component of their fire management strategies.

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List of Abbreviations

ADB	Asian Development Bank
ASEAN	Association of South East Asian Nations
AVHI	Association of Vintar Highlanders Inc.
CCORD	Community Co-ordinator
CESVI	Cooperazione e sviluppo [Cooperation and Development]
CSDC	Comprehensive Site Development Contract
DANCED	Danish Cooperation for Environment and Development
DENR	Department of Environment and Natural Resources
FAO	Food and Agriculture Organization of the United Nation
FLMA	Forest Land Management Agreement
GOL PDR	Government of Lao People Democratic Republic
GTZ	Gesellschaft für Technische Zusammenarbeit (German Agency for Technical Co-operation)
ICRAF	International Centre for Research on Agroforestry
IFFM	Integrated Forest Fire Management Project (GTZ)
IUCN	The World Conservation Union
MARD	Ministry of Agriculture and Rural Development
NGO	Non-Governmental Organization
NIPA	NGOs for Integrated Protected Areas
NTFP	Non-Timber Forest Product
PPFSEA	Project FireFight South East Asia
RECOFTC	Regional Community Forestry Training Centre
RFD	Royal Forest Department
UN	United Nation
WWF	World Wide Fund for Nature

Executive Summary

This review is guided by the Project FireFight South East Asia (PFFSEA)'s aim to document successful community experiences with forest fires and analyse those political, institutional, economic and cultural elements that enable local communities to actively engage in preventing uncontrolled burning.

Community-based forest fire management in South East Asia is attracting more attention, partly because of the overall interest in promoting community-based resource management and partly due to recent catastrophic forest fires, making it imperative to find 'alternative' ways to prevent future outbreaks of similar scale.

Although forest fires have occurred in South East Asia for centuries and are important in the development of terrestrial ecosystems, concerns about changes in fire regimes and their impacts are growing. However, the role of fire in the landscape needs careful assessment. Suppression of fire may lead to more intense fire in the future as a result of accumulated fuel loads. Suppression alone is not always a 'successful' fire management approach. Unfortunately, no reference to the use of small fires to prevent bigger fires in South East Asia could be found.

The use of fires to clear land for 'permanent' agriculture and settlements by local communities is widespread in South East Asia. Whether such fires can be controlled depends on various aspects, such as the presence of fuel, the biophysical conditions of the forest or the availability of firebreaks. The local community's interest in the forest is another important factor.

Uncontrolled fire also occurs because swidden farmers do not adapt their traditional system to the changing biophysical conditions of the surrounding forests. Modifications in local culture and practices also contribute to uncontrolled forest fires. The discontinuation of some traditional forest management systems has led to a knowledge gap, as elders are no longer passing down their experiences to the younger generation. The revival of some of the lost practices should be considered. Inexperienced migrants, who are not traditional swiddeners, have allowed fires to escape. Nonetheless, it is often difficult to distinguish between forest loss due to clearance for shifting cultivation and loss due to escaped fires.

Many governments see swidden agriculture as a primitive system that destroys the forests, without fully understanding its underlying logic. Forest fires attributed to swidden farmers probably reflect this bias against swidden practices. Whilst not all swidden farmers are careful in fire management, forest destruction from swidden fires is probably exaggerated. In fact, examples of 'successful' controlled or prescribed fire use are largely found in swidden agriculture.

Controlled fire use seems to be largely an indigenous initiative, whilst fire suppression is both an indigenous and externally supported activity. They generally appear to focus on avoiding damage to neighbouring fields or villages and to protect forests. Thus, community cohesion and 'attachment' to local resources are important for controlled fire use.

Many countries have also reported that communities use fires to destroy natural forests or plantations in revenge and for political reasons. Therefore, improved fire management could arise from better conflict management and address the underlying causes of forest fires such as inequitable tenure arrangements.

A few communities have successfully taken over forest fire management from sponsored projects, but several things have to be taken into account. The allocation of resources for forest fire management needs careful planning to ensure that poor communities are not overburdened by such arrangements, especially if the results are unlikely to benefit them tangibly or in the near future.

For any community-based fire management systems to be sustainable, incentives for fire management must be largely related to the community's needs. Therefore, when people are interested in managing forest fires, their objectives of fire management have to be clearly understood.

The role of the governments in supporting and implementing fire prevention and control is important. However, it is necessary to analyse the cost-effectiveness of supporting such activities. The integration of several communities in a forest fire management programme is also crucial. When many stakeholders lay claims to forest resources, inter-community co-operation is needed for effective forest fire management. Tenure security is another incentive for community fire prevention and control.

A key concern about externally supported forest fire management is the shift of responsibility from government departments to local communities. This is an important equity issue, especially since beneficiaries are often not identified and it remains unclear whether local communities obtain fair access to the resources they are protecting.

In addition to incentives for effective fire management, sanctions for unsound management are equally important. If forest fires are not managed by local people with vested interests, it will be necessary to change undesirable practices by providing incentives and supporting alternative livelihood strategies. The underlying causes of local resource tenure conflicts also need to be addressed. Use of legal sanctions is crucial in preventing uncontrolled fires. In general, community-enforced fines and other penalties often work better than government legislation in discouraging people from breaking rules.

The case studies in this review show that successful community involvement in forest fire management depends on many factors. It embodies a community's attachment or ownership of and dependence on forest resources. Traditional knowledge of the local biophysical environment and fire usage is important in many communities. Absence of tenure conflict also bolsters a community's interest in fire management. The community's control over its resources can ensure that its interests and concerns are addressed and protected too. Success also rests on compliance with community rules on fire usage.

The report identifies several options to promote community-based forest fire management in South East Asia, such as analysing and compiling existing cases, adding fire management component into existing community-based resource management projects, strengthening projects with community-based fire management components, and designing and implementing community-based forest fire management projects.

1. Introduction

In recent years, large-scale forest fires in South East Asia, particularly in Indonesia, have grabbed worldwide attention (Rowell and Moore, 2000). Their negative impacts, such as the loss of human lives, properties and livelihoods, and the loss or reduction of biodiversity and ecosystem functions have been felt at local, national and global levels.

To better understand forest fires in South East Asia, it is important to comprehend the causes of fire and the role of local communities in fire use and management as well as mismanagement. This report thus reviews information on:

- the role of communities in forest fires and their involvement in forest fire management in South East Asia; and
- political, institutional, economic and cultural elements that enable local communities to actively participate in fire management and prevent uncontrolled burning.

Based on the analysis of published and ‘grey’ literature, and consultations with resource people,

- a draft of principles and criteria for community involvement in forest fire management and control was prepared; and
- potential sites for the establishment of pilot community-based fire management schemes were identified and evaluated.

This review is guided by the Project FireFight South East Asia (PFFSEA)’s aim to document successful community experiences with forest fires and analyse those political, institutional, economic and cultural elements that enable local communities to actively engage in preventing uncontrolled burning.

It is useful to clarify key words used in this report, such as ‘success’, ‘community experiences’ and ‘forest fire management systems’. Generally, ‘success’ is achieved when results meet management objectives. However, frequently, management objectives vary among different stakeholders. There can be multiple and even contradictory objectives, and they may not be explicit. Thus success is often a subjective term and perceptions of success will vary among stakeholders with different objectives. In addition to learning from success, learning from failure is also important. Therefore, this review also investigates examples of forest fire management failures.

The term ‘community’¹ is taken broadly to include anything from a household, a group of households, a settlement, to a group of settlements. Normally, a single

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¹ There is no agreed definition of ‘community’ within the social sciences literature (Gauld, 2000). Gilmour and Fisher (1991) note that “*community* has a number of connotations. It suggests a group of people who share a set of common interests (residence, kinship, religion, affiliation, etc.). It is implied that members of a community may act jointly in respect to these common interests. Individuals may belong to a number of communities, depending on which set of interests are relevant in a given situation.”

household is not considered a community. However, many informants believed that in Vietnam household involvement was important for exploring community forest management issues, including forest fire management. This study draws on examples from forests and associated land uses such as shrublands and grasslands, and documents experiences of private and common property forests only. It excludes experiences from forests and plantations owned by commercial companies.

It is also important to recognise that community 'involvement' covers a wide spectrum of situations, from forced participation (coercion) to free and willing participation in activities developed by the actors themselves (empowerment).

The study examines examples of both indigenous (or local) forest fire management systems and supported (or sponsored) systems. An indigenous system is locally developed and recognised. This could either be an 'old' or traditional system, or a relatively recent one. A supported system is where community fire management has been recognised and supported by external agencies (governments, international organisations and others). This may include support to an existing indigenous system through formalising, modifying, or otherwise elaborating on it, or instituting new systems.

2. Background: Fires in the South East Asian landscape

Many vegetation types in South East Asia owe their existence to fires, thus pointing to a long history of forest fires. Local people have been key agents for maintaining a fire regime that has created a diversity of ecosystems. Kowal (1966) believes that many South East Asian forest types, such as the Malaysian pine forests and Indonesian *Casuriana* forests, are of pyrogenic origin. According to him,

“the Malaysian Pine Fire Climax formation is but one example of a broad series of diverse communities resulting from man’s use of fire in the tropics. Much, perhaps most, of tropical grasslands and savannahs have had origin in this way.”

Cockburn (1974) reports that extensive tracts of grassland in Western Sabah are due to a great fire that destroyed its forest around 1915, following a severe drought. Fires are common in most deciduous (or seasonal) forests in South East Asia and the so-called ‘fire climax’² pine forests in Myanmar, Thailand, Lao PDR, Cambodia, Vietnam, Philippines (Luzon) and Indonesia (Sumatra) (Goldammer, 1997). In Brunei, forest fires occur in coastal heath and beach forests, which experience a long dry season, windy conditions, have high fuel loads and are easily accessible (Hassan and Manila, 1997). Peatland forests are susceptible to fires, especially if there is a combination of human activities and drought conditions. Fires are thought to have promoted deciduous tree species at the expense of less fire tolerant evergreen species in northern Cambodia (Wharton, 1968). Here, grasslands exist with scattered deciduous trees. Goldammer (1997) believes that many of the monsoon forests of continental South East Asia would reconvert to evergreen rainforests if the anthropogenic fires were eliminated.

At the other end of the spectrum, the tropical rainforests of South East Asia have been vulnerable to forest fires only during severe droughts. Extensive forest fires have occurred in Indonesia throughout its history, often during cyclical droughts (Goldammer, 1997). These forests are normally not susceptible to fires because of the damp debris in the forests and the high humidity. However, little is known about the exact causes and types of fires that have burnt in the tropical rainforests in the past.

² This is an example of how the forests adapt to regular occurrences of fires in the natural environment (Goldammer, 1997)

Although forest fires have occurred in South East Asia for centuries and are an important factor in the development of terrestrial ecosystems, concerns about changes in fire regimes and their impacts are growing. For example, Pogayed (1991) notes that in the Philippines,

“wildfire regimes in the Central Cordillera forests have changed. Increasing population pressure and demand for agricultural, grazing and settlement land have brought new fire patterns to the island which are more detrimental to the forest environment than ever before.”

During the Vietnam War, approximately 12% of South Vietnam’s forest cover was converted to areas dominated by extremely flammable grasses, e.g. *Imperata cylindrica* and the exotic species *Pennisetum polystachyon*, through use of herbicides, explosives, mechanical land clearing and burning operations (Goldammer, 1992). Fires occur in these locations almost annually.

Although forest fires have occurred in South East Asia for centuries and are an important factor in the development of terrestrial ecosystems, concerns about changes in fire regimes and their impacts are growing.

The expansion of grasslands in the Philippines in recent years has increased the threat of fires spreading to the forests (Malayang III, 2000). Past fires and logging residues increase the vulnerability of the forests. Logging operations in Indonesia, for example, have opened the forest canopy, drying out the forest floors. Accumulated residues become combustible materials for future fires. More importantly, logging roads and improved access encourage migrants into forested areas, thereby increasing the use of fires in the vicinity. Abandoned logging roads can develop into potential corridors for fires when they are overgrown with grass and other vegetation, especially during the dry seasons or droughts.

Forests are being converted and degraded to accommodate the demands of increasing human populations, with negative impacts on biodiversity and watershed values. Any further loss of forests to fires is clearly undesirable, and the impacts of forest fires on human life, property and livelihood will be more intensive. There are also concerns that forests damaged by fires will be more susceptible to future fires, and that forest fires also contribute to global climate change (Rowell and Moore, 2000).

Many human activities trigger forest fires directly or indirectly. Fires are often used to clear forests for agricultural lands, settlements and paths (e.g. in Myanmar, Sein *et al.*, 1999). They are also used to maintain grasslands by inhibiting succession. People also rely on fire as a land clearing and preparation tool in swidden agriculture, and to

- burn over-mature plantations to re-establish new plantations, such as rubber plantations in Indonesia (Gouyon, 1999);
- improve access to facilitate the collection of honey, rattan and burnt fallen wood (Chuntanaparb *et al.*, 1993);
- hide evidence of illegal logging (e.g. in Thailand, Fehr, 1993) or to divert attention from such sites (e.g. in Indonesia);
- increase production of resin (e.g. in Cambodia, Emerson, 1997) and mushrooms (e.g. in Cambodia, Baird, 2000). Burning of undergrowth apparently improves certain mushroom production. Fire can also remove dried resin in *dipterocaps* and ensure better flow of resin;
- flush animals from their hideouts or encourage growth of new shoots so

that wild animals can be lured to the area and be hunted (Savet, 1999; Daltry and Momberg, 2000; Baird, 2000; Bouaket, 1999);

- clear vegetation to increase visibility of snakes or other wild animals, and bandits; and
- suppress weeds and pests (e.g. in Myanmar, Sein *et al.*, 1999).

Forest fires are also often caused by negligence during charcoal making, campfires and smoking, burning trash, agricultural residues or pastures, or when children play with fire (FAO, 1991). For example, in the Cordillera region in Central Luzon, forest fires caused by “*large numbers of settlements and intense agricultural activity in the valleys during the dry season*” including “*fires originating from the valleys where much of the grassland was regularly fired during the dry season for grazing*” are “*probably an important factor causing the pine forests of the higher elevation steep slopes as well as grasslands below*” (Kowal, 1966). Similarly, fires started by agricultural activities are serious threats to biodiversity in limestone hills in East Asia (Vermeulen and Whitten, 1999).

In Thailand, most forest fires are caused by deliberate or accidental human activities, “*especially by the rural people who live in or adjacent to forest*” (Samran and Akaaraka, 1997). From the 1980s to mid-1990, the authors reported that:

- 26% forest fires were due to activities associated with the collection of non-timber forest products (NTFP);
- 18% through burning agricultural residues (especially in shifting agriculture);
- 15% by hunters; and
- 16% by carelessness.

Arson and the use of fires on agricultural land and for land conversion are major causes of forest fires in Brunei (Hassan and Manila, 1997). In Malaysia, negligence and agricultural activities are considered to be the most important causes of forest fires (Hassan and Manila, 1997). In 1983, escaped agricultural fires caused catastrophic forest fires in nearby drought affected forests in Kalimantan, Indonesia (Lenner and Panzer, quoted in Dennis, 1999). The disastrous forest fires of 1997/98 in Indonesia occurred mainly because of land clearance for large-scale plantations and timber estates (Dennis, 1999; ICRAF, 1997).

Use of fires in or near forests can potentially lead to uncontrolled forest fires. Whether such fires can be controlled depends on various aspects, such as the presence of fuel, the biophysical conditions of the forest or the availability of firebreaks. The local community’s interest in the forest (e.g. whether any precautions are taken to avoid uncontrolled forest fires, or whether there are mechanisms to put out small fires before they become uncontrollable) is another important factor.

2.1. Concepts of fire and fire management

Before these are discussed, it is important to be clear about concepts and definitions of fire and fire management. An uncontrolled forest fire occurs when no attempt is made to contain or suppress the fire. A controlled fire is used for a specific purpose, and is contained and managed.

Use of fires in or near forests can potentially lead to uncontrolled forest fires. Whether such fires can be controlled depends on various aspects ... The local community’s interest in the forest is another important factor.

Fire management essentially incorporates efforts to maintain the fire within a desired fire regime (adapted from Schweithelm, 1999). A fire regime is “*the set of natural or induced fires that have occurred within a defined area over a given period, and takes into account the frequency of fires, intensities of individual fires, seasons of their occurrences, patchiness of their occurrences over the area, and time elapsed since last fire. Though used to describe what has occurred in the past, the term is also often used in prescribing a management goal to be achieved over a given period in the future*” (Nature Conservation Council of NSW, 2001).³

A fire management system enables clear assessment of needs and identification of steps to meet them. Many models and approaches have evolved worldwide. In various ways with varying degrees of success, these fire management systems attempt to balance the requirements for an effective approach tuned to national and local needs and resources. Oversight of a fire management system is a key role for government. Fire management is most effectively broken down into four discrete components:

- Prevention involves all measures that impede the outbreak of fire or reduce its severity and spread.
- Preparedness (pre-suppression) includes the actions and activities needed to ensure organisations are fully prepared for any fire suppression measures.
- Response (firefighting, also called suppression) refers to the control and extinguishing of unwanted fires. These actions attain the highest profile in most media coverage of fires, which can (and has) influence public and political opinions towards a firefighting-dominated response to fires.
- Recovery refers to attempts to prevent recurrence of fires and further degradation of the forest in the short term, and to re-establish the original structure, biodiversity and productivity of agricultural and forest lands over the long term.

2.2. Stakeholders and their fire management objectives

The definition of ‘desirable’ forest fire management can differ within a community, and between a community and other stakeholders, such as the government. For example, the forest department may promote fire suppression on grassland, whereas community members may prefer burning to maintain grasslands for grazing domestic and wild animals. Governmental prohibition of grass burning, for example in Sumbawa, Indonesia, often breaks down a sustainable production system (see McNeely, 1995). Discussions of ‘success’ must be linked to stakeholder groups and their perspectives, and recognise where and how various opinions arise and what this means for negotiating and supporting fire management.

³ <http://www.nccnsw.org.au/glossary/Fireregime.html>

3. Communities and uncontrolled forest fire use

To many indigenous communities, poor migrants, land speculators and forest estate companies, fire is one of the least expensive methods to clear forests and prepare land for permanent agriculture and other land uses. Aiming to burn as much forest as possible, little attempt is made to control the fires. Arson and careless swidden farming have also caused uncontrolled fires. These situations can be considered as ‘failures’ in forest fire management and it is important to learn from them.

Uncontrolled forest fires are generally symptomatic of the breakdown of local control over natural resources and may be a sign of tenure conflicts. Forest conversion for agriculture by migrants and local people using fires has also been attributed to poverty and greed. Therefore, any analysis of forest fires needs to take into account the underlying causes of forest destruction. Prevention of uncontrolled fires cannot succeed without adequate attention to these issues.

3.1. Fire as a tool for conversion to agriculture and other uses

Use of fires to clear land for ‘permanent’ agriculture and settlements by local communities is widespread in South East Asia (Fehr, 1993; Malayang III, 2000; WWF, undated; Standing Office, NCFPPS, 2000). Poverty is often a driving force for land clearance and poor migrant farmers are usually blamed for using fires to clear land. These people include ‘spontaneous’ migrants, who have moved to a new area in search of better livelihood options, ‘forced migrants’ displaced by civil disturbances or big infrastructure projects such as dams, or people ‘resettled’ under government transmigration programmes, such as in Indonesia. Migrants, however, are not the only people using fires to clear forests. Indigenous people also rely on fires to clear forest areas for agriculture and other uses. In some countries, plantation companies are significantly accountable for forest fires that contribute to forest degradation. In Indonesia, a “*considerable part of the forest fires have been caused by land clearing operations where vegetation was ignited in order to prepare the area for plantations*” (Bureau of International Co-operation and Investment 1997; ICRAF, 1997).

In Cambodia, ex-Khmer Rouge soldiers have settled in forest areas under government programmes or independently. Many Khmer refugees returning from camps in Thailand have also burnt forests to clear land for settlements and agriculture (Harvey, 2000; Burgess, 2000, *pers. comm.*⁴). Sometimes, powerful Phnom Penh land speculators hire local people to clear forestlands to claim ownership to these

To many indigenous communities, poor migrants, land speculators and forest estate companies, fire is one of the least expensive methods to clear forests and prepare land for permanent agriculture and other land uses.

⁴ Sara Burgess, Project Advisor, Extension and Resource Management, Cambodian-German Forestry Project, Department of Forestry and Wildlife, Phnom Penh, Cambodia.

areas, e.g. in Kirirom National Park in Cambodia (Nhal Thoun, 2000, *pers. comm.*⁵). Such a practice by powerful outsiders for land speculation is known in other South East Asian countries.

Obviously any attempt at controlled use can also accidentally cause big forest fires, especially when a fire escapes and becomes too big for any community to suppress. To avoid such occurrences, safeguards such as firebreaks and regular reduction of fuel loads in the forest (through low intensity burning or physical removal) are also important.

3.2. Arson

A number of countries have also reported that communities use fires to destroy natural forests or plantations in revenge and for political reasons.

In the 1980s, local people in Philippines allegedly destroyed many government tree plantations that had been established on grasslands through arson because the government contractors who established the plantations did not pay their wages. Elsewhere, some communities supposedly burnt down plantations to generate employment by replanting the burnt areas. It is also speculated that the plantations were burnt because local communities did not want the grassland to be converted into forest in the first place. Such incidences are also reported in Cambodia (Rotha, 2000, *pers. comm.*⁶). In these cases, fire use reflects dispute amongst different stakeholders.

Arson in Indonesian forests has primarily arisen from conflicts between communities and the private sector (UN Centre for Human Settlements, 1999; Tomich *et al.*, 1998). Communities allegedly set fire to forest ‘concession’ areas, granted by the state to logging or plantation companies, because their traditional tenure over the area was disregarded and encroached upon. Both indigenous communities and migrant farmers have also committed arson against each other over land conflicts. Logging and plantation companies, too, are accused of arson to destroy forest gardens of local communities and then ‘buy’ their land cheaply. In Kalimantan, people have reportedly set forest on fire in anticipation of compensation from mining or plantation companies that are to be established in the area.

Therefore, improved fire management could arise from better conflict management and addressing the underlying causes of forest fires such as inequitable tenure arrangements. In Indonesia, for example, more equitable government allocation of property rights over land and forests is a very important issue in preventing land and forest fires (Hariadi Kartodihardjo and Kukoh Murti Laksono, 1999).

3.3. Swidden and uncontrolled forest fires

Uncontrolled fire from shifting agriculture is one of the three main causes of deforestation in Lao PDR (GOL PDR 1990, in Rigg and Jerndal, 1996). Bouaket (1999) estimates that 90% of forest fires originate from upland farmers’ swidden cultivation practices conducted without firebreaks, “*year after year*”, although he recognises that reliable statistics are unavailable. Similarly in Cambodia, fires started

⁵ Nhal Thoun, Director, Kirirom National Park, Cambodia.

⁶ Ken Serey Rotha, Local Advisor, Community Forestry Research Project, Phnom Penh, Cambodia.

... improved fire management could arise from better conflict management and addressing the underlying causes of forest fires such as inequitable tenure arrangements.

by shifting cultivators have been identified as a contributor to forest fires (Savet, 1999).

In the Philippines, fires from slash and burn activities are considered to have created large areas of grasslands (DENR, 2000; Javier, 2001, *pers. comm.*⁷), but are not thought to be the major cause of forest fires (Patiga, 2001, *pers. comm.*⁸). It has been observed that relatively few precautions are taken by some farmers of the Gaddang ethnic group to confine fires to single plots (Wallace, 1970), with occasional accidental burning of nearby forests.

Pham and Truong (1997) report that shifting cultivators in Vietnam burnt 10-20 times the area intended because of uncontrolled fires. Annually, 20,000 to 30,000 ha of forest are burnt in this manner, with fire damaging up to 100,000 ha in some years. In Dalat and Vinh, slash and burn agriculture is considered to be the main cause of forest fires (FAO, 1991). Here, 10,000 ha per year were estimated to be lost to forest fires (Haque, 1992).

In Indonesia, it is now largely recognised that swidden agriculture was not the major cause of the catastrophic fires of 1997/98. However, in many areas, swidden agriculture is considered to be a cause of forest fires. For example, 17% of forest fires in Bukit Soeharto area were caused by shifting cultivators in 1996, with the remaining 83% caused by fires escaped from burning underground coal seams (Abberger, 1998).

In some instances, uncontrolled fire occurs because swidden farmers do not adapt their traditional system to the changing biophysical conditions of the surrounding forests. Poor understanding of a different environment, lack of attachment to the land and inadequate experience in the use of fires are some of the major reasons why migrants contribute to forest fires. In the past, many swidden farmers need not take precautions against spreading fires because the surrounding damp tropical rainforest acted as a firebreak. For example, the Ilongots in the Philippines used no precautionary techniques such as backfires due to the dampness of the surrounding forest (Rosaldo, 1981). However, climate change and the opening of tropical forests after logging have dried out such forests and increased fuel loads.

In addition to changes in ecological conditions, modifications in local culture and practices also contribute to uncontrolled forest fires. Much of the ancestral knowledge of forest fire management is lost, as more people forsake traditional practices and adopt different livelihood systems or move to other areas. In Cambodia, the Kavet of Vuen Say and Ta Veng, Ratanakhiri Province, have largely abandoned the 'no fire during the dry season' rule and stopped clearing a narrow buffer zone around the outer edges of their swidden fields before burning (Baird *et al.*, 1996). According to Baird (2000, *pers. comm.*⁹), this erosion of local rules is due to their forced relocation to a new area and the associated disintegration of traditions. He believes that the lack of secure land tenure also compounds the problem, as people will be less motivated to prevent fires. Local production systems and land tenure are being threatened in many

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⁷ Jesus A. Javier, Chief Forest Management Specialist, Reforestation Division, DENR, Quezon City, Philippines.

⁸ Nilda S. Patiga, Senior Forest Management Specialist, Forest Management Bureau, DENR, Quezon City, Philippines.

⁹ Ian Baird, University of Victoria, Canada.

parts of Indonesia, because of concessionaires, estate crop companies, and the ‘importation’ and use of migrant labourers (Potter and Lee, 1999). It has also been suggested that when more than one ethnic group coexist because of migration, the traditional fire control mechanisms of each group tend to be more difficult to implement, causing conflict and confusion (Colfer, 1999a, 1999b).

In many South East Asian countries, inexperienced migrants, who are not traditional swiddeners, have allowed fires to escape. Nonetheless, it is often difficult to distinguish between forest loss due to clearance for shifting cultivation and loss due to escaped fires. For example, in Myanmar,

“slash-and-burn cultivation (Taungya) has been an age-old practice with many ethnic races who live in the mountainous areas of the country, and is still being practised widely. This is the main cause behind forest fires occurring in Myanmar. However, as it is carried out merely on a subsistence scale, and as the natural forests buffer the areas, the spreading of fire to adjoining areas is minimal. Besides, burning is normally done under close supervision of the villagers” (Thinn, 1999).

Many governments see swidden agriculture as a primitive system that destroys the forests, without fully understanding its underlying logic. Forest fires attributed to swidden farmers probably reflect this bias against swidden practices and limited representation of swidden farmers in discussion of the issue.

Many governments see swidden agriculture as a primitive system that destroys the forests, without fully understanding its underlying logic. Forest fires attributed to swidden farmers probably reflect this bias against swidden practices and limited representation of swidden farmers in discussion of the issue. Whilst not all swidden farmers are careful in fire management (Olofson, 1981), the figures of forest destruction from swidden fires are probably exaggerated. Thrupp *et al.* (1997) also challenge the conventional view that shifting cultivation is a major cause of tropical deforestation. Wandel (1997) notes that *“shifting cultivation, forest fires and other ‘damage’ to the forest are often traditionally attributed exclusively to ethnic minorities and may stigmatize them in a way that could lead to discrimination.”* Similarly, in Thailand, McLeod (1971) states that

“hill tribes are blamed for many fires but some tribes are very careful with fire. So far as available record shows they are the only people who have fought wildfires in Thailand. However, shifting cultivators as practised by the lowland Thai farmers is another matter. In their need for land, these people are pushing into the foothills and mountain forests in ever increasing numbers and their slash and burn methods are extremely lacking in finesse as far as fire use is concerned.”

Thus, analysis of stakeholders’ perceptions of ‘uncontrolled’ fire is very important in supporting forest fire management.

4. Community management of forest fires in South East Asia

Examples of ‘successful’ controlled or prescribed fire use are largely found in swidden agriculture. Here many communities have rules for fire use, techniques for preventing the spread of fires and arrangements for fire suppression. Some rules include prohibiting fire when there is a drought and permitting the burning of dried slash only just before the onset of the rainy season. There are also rules about the timing and location of swiddening. Various techniques such as protecting valuable trees, burning against the wind, back burning, and constructing firebreaks are employed. When fires start to spread, every effort is made to suppress them and advance warning is given to others who are likely to be affected.

On the other hand, examples of fire suppression are largely from community forest management efforts to protect the forest against fire damage. In one example in Thailand, grassland was converted to forest largely by suppression of fires. Nonetheless, not much information is available on community management of forest fires. Most information is incomplete and does not illustrate fully the community motivation, community arrangements, fire management techniques or the nature of the fire regime. Using fire to reduce the fuel loads, or prescribed burning, to avoid high intensity fires in future, is an important fire management approach. Unfortunately, no example of such a practice in South East Asia can be found.

Controlled use of fire seems to be largely an indigenous initiative, whilst fire suppression is both an indigenous and externally supported activity. Controlled fire use in swidden system and fire suppression in community forests generally appear to focus on avoiding damage to neighbouring fields or villages and to protect forests. Thus, community cohesion and ‘attachment’ to local resources are important for controlled fire use.

4.1. Controlled use of fire

Examples of controlled use of fires in swidden agriculture and grassland management abound in South East Asia. Many swidden-farming communities have strong traditional fire management rules. In Cambodia, the Brao-Kavet villagers can use fire only to create new fields or re-establish fallow fields in the forest. They can be fined for breaking the rule¹⁰ (Baird *et al.*, 1996). Firebreaks are made around freshly cut swidden fields by removing inflammable materials along the perimeter to minimise risks of destroying future swidden areas in the forests (Baird, 2000, *pers. comm.*).

Many communities in Indonesia have also established effective systems of fines and penalties for mismanaging fires and causing damage to their neighbour’s property (Fay, 1997; Bambang Soekartiko, 1997; Vayda, 1999). For example, the Kantus of

¹⁰ One exception is burning the undergrowth around malva nut trees (after collecting nuts from forest floor) to clear the forest floor.

Tunkul Batu, Kalimantan, protect forests and long houses when preparing swidden fields by removing inflammable residues from the perimeter of the swidden (Dove, 1985).¹¹ Similar precautions are also taken by the Wehea Dayaks of Diak Lay (Josayma, 1995). When clearing a field, they gather the slashed vegetation into small piles to isolate the burn. In addition, they reserve natural buffer strips 20-30 meters wide alongside the fields that also serve as a seed source for regeneration, a corridor for the movement of animals, humans and birds, and as a microclimate to slow pests from other swidden fields.

In Thailand, the Po Karen used to maintain “*firebreaks methodically cleared around the perimeter of all fields*” whilst preparing swidden fields through burning (Hinton, 1978). Walpole *et al.* (1994) note that the Alangan Mangyan of Mindoro, Philippines, “*provides a five meter space between his lot and the neighbouring areas*” and that “*wind directions and degree of slope influencing the spread of fire are determined prior to the activity.*” Furthermore, “*generally fires are well controlled and of low intensity.*”

In the Cambodian Brao-Kavet community, it is largely the elderly men who initiate the burning of dried slash in swidden fields because of their knowledge and skills in getting a ‘good burn’ and avoiding escaped fires (Baird, 2000, *pers. comm.*). In Bhutanese villages, several fire specialists called *mesungpa* are invited to lead the field burning and every household in the village has to participate in this activity (Upadhaya, 1995).

The timing and direction of burns are important in swidden farming (Box 1). This is also supported by observation of Karen practices (Trakarnsuphakorn, 1997):

“Burning of swidden field starts from the highest point of the designated area, because wind blowing against the direction of burning is strongest at this point, thus allowing better control of fire. Starting fire at the lower slope is more risky, as the fire can spread if there is an upward wind draft. When fire moves down and reaches mid-slope, fire is also started from the bottom of the slope. The villagers are on the alert and ready during this process in case the fire gets out and spreads to the village.”

¹¹ Dove reports that from the 69 separate swiddens prepared in Tunkul Batu during 1975 and 1976, fires rarely escaped more than 4 to 5 meters into the forest because of high rainfall and green vegetation. The burnt area itself acted as a firebreak.

Box 1: Swidden in Cambodia

To ensure that fire from the swidden field (chamkar) does not spread to other fields or surrounding forest, all plant debris (cut from the field) are piled in the middle of the field and burnt. The perimeter of the field is swept about 5 meters into the forest to remove any flammable materials. Burning of the debris is done against the wind for thorough burning and to prevent the fire from spreading beyond the burn area. It is usually done in the afternoon of the dry season, as it is hotter and a better burn is achieved. Usually old people are in charge of the burning because they are more experienced. Other villagers are warned in advance so that they can take precautions to protect their fields.

(Information from a Kui woman, 2000)

Swidden farmers also avoid damaging neighbouring fields in other ways. For example, the Kantus of Tunkul Batu warned owners of adjoining swidden fields before starting their burns (Dove, 1985). Obeying strong traditional laws (adat), the Dayak farmers did not burn swidden fields during the severe drought of 1997/98 largely because of the high risk of burning adjacent forest gardens, and the severe fines that would be imposed according to the adat (Gönner, 1999).

Many swidden farmers also try to protect useful plants on their fields. In the Philippines, traditional Hanunoo farmers use a variety of methods to control burning, such as firebreaks, back burning, removing cut underbrush to protect domesticated trees, and sheathing useful vines (Conklin, 1957). Protection of useful trees in swidden fields against fire is also reported in other groups, such as the Alangan Mangyan (Walpole *et al.*, 1994) and the Ifugaos (Cureg and Doedens, 1992). Since fires reduce the production of future swidden fields, many communities, such as the Lua' in Thailand, actively control and fight escaped swidden fires (Kundstadter, 1978; Zinke *et al.*, 1978). Unfortunately, details about the techniques used for fire control are unavailable.

Although the examples cited are from indigenous communities, cases of recent migrant communities practising safe burning, generally to protect the community and neighbouring agricultural land, are increasing (Abberger 1997, 1999). Vayda (1999) reports that migrant Bugis farmers in Teluk Pandan, Kutai National Park, Indonesia, laid down rules to avoid the spread of fires in 1997 as they had more than 400 ha of economically valuable trees.

In addition to controlled use of fires in swidden agriculture, there are many examples of controlled fire use in South East Asian grasslands. These grasslands are burnt annually to promote new shoots for grazing domestic animals, and to lure wild animals to the area for hunting.

In the Dupinga watershed of Central Luzon, Philippines, Walpole *et al.* (1993) reported that local communities have established firebreaks, fire lines and a systematic monitoring system to prevent fires escaping from grasslands. Here, swidden farmers burn *Imperata* grasslands to clear land for agriculture or to promote the sprouting of grass for roofing. In the past, no firebreaks were made and fire escaped upwind to larger grassy areas and neighbouring forests. This damaged both natural forests and

state-sponsored efforts at reforestation along the foothills of Dupinga. As a consequence, fires were one of the most important factors of forest degradation.

4.2. Forest fire prevention and suppression

Simple rules aimed at fire prevention in forests managed by communities have existed for many decades (Box 2). Some communities have developed similar rules in recent times. These may be simple precautions against forest fires, as exemplified in Cambodia by Article 21 of the rules for Sorm Thom Commune: “*while burning for resin, required to ensure fire safety in the community forest boundary*” (Anon, undated). Enkiwe *et al.* (1998) highlight another example of how local communities have inculcated forest fire control measures into their daily lives in the Cordillera, Philippines:

“When adjoining lands to their forest are fire prone areas, the village people maintain a fire line ranging from five to ten meters wide. This is frequently patrolled during summer or dry season. This method prevents the destruction of their traditionally managed forest.”

Box 2: Customary law in Bali

Villagers of Tenganan, Bali, Indonesia, follow customary law or ‘awig-awig desa’, which includes a provision for punishment for fire damages:

“if one of the villagers burns bush or garbage that causes other trees to be burnt he will be fined in accordance with the damage done and he should also perform a religious purification ceremony” (Tantra, 1990).

In traditional Tay society in Saoha Village of Sao Mai District, Vietnam, conventions regulating forest and natural resource protection existed before 1954 (Vuong, 1998). Every member of the village was obliged to protect the village’s resources and keep the village safe from intruders. They had many rules, including those for dealing with forest fires. With the destruction of forests from timber extraction, charcoal making, and other external factors, these customs have disappeared.

The Social Forestry Development Project in Song Da watershed in Vietnam, co-ordinated by the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) and the Ministry of Agriculture and Rural Development (MARD), supports the development of local forest rules. Villagers helped to draft the regulations and monitor their implementation. The penalties are serious enough to deter violation of the rules. Forest fires during the dry seasons have declined significantly as a result and forest conditions have improved remarkably. While tangible benefits are unclear, many villagers protect the forest without financial compensation (Pham, 1999).

In other places, such as Mount Kitanglad in the Philippines (Box 3) and Upper Nan watershed in Thailand (Box 4), external agencies have supported local forest protection initiatives that build on traditional resource protection arrangements. The Kitanglad Volunteer Force act as ‘forest guards’ who prevent and fight forest fires

(Pangging Santos, 2001, *pers. comm.*¹²). An interesting aspect in the Thailand example is the establishment of a watershed network because rules could not be enforced even though 67% of the villages had their own regulations to control fires. Many fires were started in other villages or by hunters at night (Hoare, 1999a).

Box 3: Kitanglad Volunteer Guards

In Mount Kitanglad National Park in Mindanao, Philippines, Kitanglad Integrated NGOs, Inc., a local non-governmental organisation (NGO), collaborated with NGOs for Integrated Protected Areas (NIPA), a national NGO, and the Department of Environment and Natural Resources (DENR) to establish the Kitanglad Volunteer Guards, comprising volunteers from different ethnic communities in the area. Traditionally, these communities have special responsibilities for protecting their territories and resources. Therefore, being members of the Volunteer Guards is not a new practice. A council of tribe elders has to endorse their appointment. The DENR, which manages the national park, also organises an oath-taking ceremony for the guards. Kitanglad Integrated NGOs, Inc. trains the guards and also provides venues for meeting and transport. The guards are mobilised to suppress forest fires and help the government in other conservation activities.

Box 4: Community-based approach to forest fire management in Northern Thailand

The Royal Forest Department's (RFD) Upper Nan Watershed Management Project in Northern Thailand is supported by the Danish Cooperation for Environment and Development (DANCED). The project covers 45 villages inhabited by 20,000 people from 5 ethnic groups within an area of 1,007 km².

Uncontrolled forest fires between January and May are probably the most serious environmental problem in the watershed. The project aims to implement fire prevention and control systems on 160 km² to reduce the incidence of forest fires by 50% by the year 2003.

In early 1998, many people returned from Bangkok to their villages as the economic recession in Thailand had reduced off-farm employment opportunities. These returnees were blamed for increased incidences of forest fires that burnt 21% of the project area through hunting and gathering activities (41%), and escaped fires from shifting agricultural areas (34%).

¹² Esperanza Pangging Santos, Program Officer, IPAS-PCU Office, Ninoy Aquino Park and Wildlife Nature Centre, Quezon city, Philippines.

Box. 4 Continued

During late 1998 and early 1999, the RFD and community co-ordinators (CCORD) facilitated the formation of Village Watershed Networks in mini-watersheds to reduce the number of uncontrolled fires. Preliminary assessments by April 1999 showed that less than 5% of the project area was burnt during that period. The main reasons for this reduction were:

- development of Village Watershed Networks with their own rules, regulations, and fines for causing forest fires;
- improved communication networks with the establishment of base stations and provision of two-way radios and knapsacks for village fire volunteers, and improved road maintenance;
- availability of RFD funds to erect firebreaks and employ fire guards;
- community fire management awards provided for the most effective village fire management system in 1999;
- better database on forest fire management from the CCORD 1998 Survey, and Landsat images of the burnt area;
- provision of DANCED Village Development Funds for shifting cultivators to convert to permanent paddy fields and orchards; and
- early rainfall in February and March 1999 that shortened the fire danger period.

(Adapted from Hoare, 1999b)

The role of the governments in supporting and implementing fire prevention and control is important. However, it is necessary to analyse the cost-effectiveness of supporting such activities ...

Thailand has other examples of community forest fire management where external support, particularly from the government, has been important, such as in Dong Yai and Nam Sa where communities have been managing forest resources with the assistance of local forest officers and university staff. The villagers create firebreaks, remove leaf litter and raise the alarm of fire outbreaks with loud speakers. They douse fires with water from crude fire extinguishers, throw sand over the flames, as well as beat the fires with sticks and palm fronds. Similarly, in Nam Sa, with support from the RFD and the Chiang Mai University, local communities patrol the areas to prevent forest fires during the dry season. As many as 10 people may be enlisted to monitor and extinguish fires (Chuntanaparb *et al.*, 1993). Typically, the fires are caused by swidden cultivators or hunters. Any outsider caught setting fires deliberately is turned over to the RFD for punitive actions.

The role of the governments in supporting and implementing fire prevention and control is important. However, it is necessary to analyse the cost-effectiveness of supporting such activities before these examples can be qualified as 'successful.' The integration of several communities in a forest fire management programme is also crucial. In Lao PDR, villagers have proposed collaborative resource management and fire protection and control activities involving 24 communities around the Xe Bang

Nouan National Biodiversity Conservation Area (Dechaineux, 2000, *pers. comm.*¹³). Discussions on the potential organisational structure, rules and regulations for fire management are ongoing.

At the end of some externally supported projects, a few communities have successfully taken over forest fire management. Box 5 illustrates such a case in the Philippines. Multi-stakeholder partnerships, local leadership and linking income from non-forest activities to fire prevention and control activities are some salient features of this experience.

Another example in the Philippines for raising funds for forest fire management is the 'No Fire Bonus' scheme of the DENR and local or municipal authorities, which upland communities are entitled to if they maintain 'no fire occurrence' in their area (Costales *et al.*, 1997). Likewise in Vietnam, the Council of Ministers decided to pay local residents for fighting fires and reward them when no fire breaks out (Government of the Socialist Republic of Vietnam, 1994). Still, the cost-effectiveness of such schemes to reduce uncontrolled forest fires needs to be evaluated. It is possible that successful prevention of annual forest fires will result in fewer but larger and more destructive forest fires in the long term. The role of fire in the landscape needs to be understood and reassessed before effective management of fire regimes can be attained.

Some communities suppress forest fires to assist natural regeneration, as the Pakhasukjai in Thailand (Box 6). In this case, the villagers were interested in fire control for cultural reasons and to provide for subsistence needs. Supporting alternative livelihood strategies of communities who live in or near the forest is a suitable incentive to suppress outbreaks of forest fires. For example, the introduction of agroforestry in Nueva Ecija, Philippines, encouraged the villagers to establish firebreaks. This has reduced the number of forest fires as a result (Segura, 1985). Similarly in Nusa Tenggara Timur, Indonesia, the use of fire has been reduced when shifting cultivators turned to more intensive and commercial production systems. Fox (2000) believes that the slow shift from subsistence farming to commercial agriculture provides an incentive for controlling fires.

Tenure security is another incentive for community fire prevention and control. Leasing forestland to the Compo Ikalahan villagers in Imugan, Nueva Vizcaya, Philippines, has reduced forest fire incidences by about 80% (Aguilar, 1986). This phenomenon is also witnessed in Vietnam (Tuan, 2000, *pers. comm.*¹⁴). The lessees are obliged to protect their forests against fires, and thus many have constructed fire lines.

¹³ Rachel Dechaineux, Field Advisor, NTFP Project, Vientiane, Lao PDR.

¹⁴ Tuan Ha Cong, Vice Director, Forest Protection Department, Office of the National Committee for Forest Fire Management, PFD, Hanoi, Vietnam.

Box 5: Community-based fire management in the Canaam Watershed Sub-project in the Philippines

The Canaam watershed is located in Vintar, Ilocos Norte, Philippines. It covers an area of 542 ha with 7 settlements comprising 271 households. Mainly used for grazing, the area is burnt annually to reduce the growth of *Imperata* and other grasses. Between 1995 and 1998, a reforestation project was implemented through a Comprehensive Site Development Contract (CSDC), financed by the Asian Development Bank and the Philippine Government. The Association of Vintar Highlanders Inc. (AVHI), a conglomeration of 11 co-operatives and association of local farmers, manages the area under a Forest Land Management Agreement (FLMA).

AVHI has established a unit to prevent and protect the plantations against fires, and for information dissemination, training and security. The unit comprises 25 crews, with 10 members in each crew. It prepares, and also periodically reviews, fire protection plans in co-ordination with the technical staff from various other units. It has set up 5 lookout towers, a communication system with several portable two-way radios, and water containers/depositories at strategic locations. The unit provides transport for fire fighting crews and has purchased basic fire fighting equipment. The crews are also trained in basic fire fighting techniques. The lookout towers are manned around the clock during the dry season.

AVHI raises funds to support the activities of the protection and fire prevention unit and to maintain the facilities and equipment. Members are taught to generate income through various means including pig raising and furniture making. Ten percent of such income is allocated for forest protection. AVHI also saves a substantial amount of money from the operational cost of plantation development. This is used as a revolving credit fund for members. Again, a certain percentage of the interest earned is set aside for plantation protection and management. Income is also generated through leasing an AVHI vehicle to members. Forest fire occurrence in the area has decreased and people's involvement in fire control and management is significant. Factors that contributed to the success of the project include:

- Community organisation: The project worked with existing community organisations, largely to facilitate income generation activities. AVHI members claimed that the most important factor for the success was its members' unity.
- Participation and support of local leaders: Local leaders are very influential and their involvement has strengthened the support for the project. Several local government officials are AVHI members and some are elected to the Board of Directors.
- Availability of funds for forest protection: The different AVHI income-generating activities ensure financial support for forest fire control and protection.

Box. 5 Continued

- Availability of equipment and communication system: AVHI purchased a vehicle and installed a communication system for effective project management.
- Institutionalisation of the FLMA: This agreement provides a basis for sharing benefits between the government and the community from future harvests from the forest plantations.

(Adapted from Castillo, 2000)

The role of fire in the landscape needs to be carefully assessed. Suppression of fire may lead to more intense fire in the future due to accumulated fuel loads. Suppression alone is not always a ‘successful’ fire management approach. Unfortunately, no reference to the use of small fires to prevent bigger fires in South East Asia could be found.

The discontinuation of some traditional forest management systems has led to a knowledge gap as elders are no longer passing down their experiences to the younger generation. The revival of some of the lost practices should be considered. It is also uncertain how the changes in fire regimes, particularly fire suppression, in an area affect local biodiversity. In many parts of the world, changes in fire regimes have decreased biodiversity and also contributed to more intense forest fires (Jackson and Moore, 1998). Thorough assessment is advisable before short-term fire suppression strategies can be considered ‘successful’. A key concern about externally supported forest fire management is the shift of responsibility for fire suppression from government departments to local communities. This is an important equity issue, especially since beneficiaries are often not identified and it remains unclear whether local communities obtain fair access to the resources they are protecting.

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5. Principles and criteria for community involvement in forest fire management and control

Minimal external support or intervention is needed in communities with effective forest fire management systems, perhaps only to strengthen the legal arrangements for recognition and reward. Valuable lessons can be learnt from these examples.

Successful community involvement in forest fire management depends on a variety of factors. It embodies a community's attachment or ownership of and dependence on forest resources. Traditional knowledge of the local biophysical environment and fire usage is important in many communities. Absence of tenure conflict also bolsters a community's interest in fire management. The community's control over its resources is significant to ensure that its interests and concerns are addressed and protected too.

Success also rests on compliance with community rules that ban fires in certain locations or at certain time of a day or season. It is also affected by arrangements for preventing and monitoring fire escapes, training for proper use of fire in the forest, and provision of appropriate equipment for fighting fires. Financing more costly fire management measures, such as watchtowers, vehicles and reliable communication equipment, are important especially when the forest is commercially valuable.

Human activities are the most important causes of forest fires in South East Asia.

5.1. Understanding and assessing the context of forest fires: Are fires really uncontrolled?

Human activities are the most important causes of forest fires in South East Asia. It is therefore critical to identify the key actors who use fires in forests and involve them in the development and implementation of all forest fire management strategies. It is equally important to analyse the reasons for uncontrolled forest fires, by asking:

- Are they due to internal factors such as the breakdown of local resource management arrangements? If yes, what exactly is causing this breakdown and can it be reversed?
- Are they due to external influences (e.g. indigenous communities' conflicts with migrants or forest estate companies; relocation of communities; 'development' interventions), despite the presence of local management systems?
- Are they compounded by the local communities' non-adaptation to different climatic and ecological condition?

Box 6: Pakhasukjai community forest

In Chiangrai Province of Northern Thailand, a group of Loi Mi Akha families established Pakhasukjai Village in 1976 after fleeing a conflict along the Thai-Burma border. Pakhasukjai was then largely covered by *Imperata cylindrica* and bamboo, with small forest patches and scattered large trees. Fire swept through the grasslands every year and inhibited forest regeneration.

As forests are important to the Akha, the villagers decided to reforest part of the grassland and several simple rules were formulated. The designated community forest was to be protected from fire and farming was prohibited in the area. All trees were shielded from human use and domestic animals.

To reduce the threat of fire, the Pakhasukjai villagers constructed a firebreak around the forest perimeter every year before the start of the dry season. Community work groups were formed, with one representative from each family, to prepare the firebreak, repair trenches and fences (requiring 5-6 days per year), and fight any fire that might endanger the village.

Any family that failed to contribute labour was fined. A higher levy was imposed if no family member helped out when a fire occurred at night. Any villager who cut a tree without permission had to treat the village elders to whiskey, or be fined a pig if he refused to apologise. In addition, the tree would be confiscated. Some families were asked to permanently fallow fields close to the village to reduce the risk of fire.

No longer subject to frequent fires, tree stumps and roots coppiced and seedlings grew in the protected area. Within five years, the shade of these trees began to suppress grass growth. Harvesting of grass roofing materials every year also increased the survival rate and growth of trees.

Today the community forest covers an area of approximately 579 ha. The Pakhasukjai villagers no longer find it necessary to maintain a firebreak around the forest, although community firefighting groups continue to be formed when needed. Forest fires pose less of a danger mainly because of the decline in field burning. Fields planted with contour hedgerows and terraced for wet rice cultivation are not burned, and farmers are increasingly interested in using crop residues as mulch and organic fertiliser. Those villagers who burn their fields do so earlier in the season when the vegetation and the soil have higher moisture contents. Also, fires are lighted in the morning or evening when it is not so windy. Grass and straw are often cut and piled before burning, reducing the likelihood of fires spreading into neighbouring fields and the forest. The disappearance of large game animals from the area has also ended the practice of setting fires to drive them out towards the hunters.

(Adapted from Durno, 1996)

Generally, ‘natural’ forest fire regimes for different vegetation types are poorly understood, and their impacts on local subsistence economies and biodiversity values are not well appreciated. There is a tendency to classify all forest fires as being destructive and thus undesirable. To rectify this shortcoming, Jackson and Moore (1998) identify a number of issues that should be investigated:

- local ecology, e.g. what is the likely ‘natural’ role of fire for the indigenous ecological regime (e.g. tropical rainforest, woodlands, grasslands, tall closed forest);
- history of the community’s use of fire;
- history of the area, including both ecological and socio-economical changes; and
- inter-relationships among people, fire and ecology that have contributed to the current situation and options for future interactions.

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When people are interested in managing forest fires, their objectives of fire management have to be clearly understood. Many ‘outsiders’ consider forest fire suppression to be ‘successful’. However, this may contradict the community’s desires and the necessity for maintaining ecological diversity, a case well illustrated by grassland management. Furthermore, if forest fires are not managed by local people with vested interests, such as those who clear the forests for ‘permanent’ agriculture, it will be necessary to change undesirable practices by providing incentives and supporting alternative livelihood strategies. In many instances, the underlying causes of local resource tenure conflicts also need to be addressed. Use of legal sanctions can play a crucial role in avoiding the occurrence of uncontrolled fires.

5.2. Community incentives for forest fire management

For any community-based fire management systems to be sustainable, incentives for fire management must be largely related to the community’s needs.

“As far as future fire management and prevention is concerned, the case points to the importance of determining not simply whether or not communities have traditional sanctions against failing to prevent land-clearing fires from going out of control but also whether they have the incentives and ability to institute and apply sanctions even if they have not traditionally had them” (Vayda, 1999).

Many communities have already shown some interest in controlling fires that threaten their lives, livelihoods and properties. Potential losses may be immediate and financial in nature (e.g. loss of orchards or houses) or may be related to longer-term values (e.g. fewer forest products to be collected or no site for future swidden agriculture). Some people also value the forest for non-monetary reasons (e.g. religion, aesthetics, or simply a love of nature).

Other more practical incentives for forest fire management may include:

- providing external support from governments, international organisations and NGOs to initiate and finance work by community ‘volunteers’, and to build firebreaks and fire lines;
- improving community skills in fire management such as training communities to use simple tools for fighting fires, e.g. in Lao PDR (CESVI, 2000);
- offering alternative livelihood strategies; and
- increasing tenure security through the lease of forestland.

5.3. Community sanctions for starting uncontrolled forest fires

In addition to incentives for effective fire management, sanctions for unsound management are equally important. This report has not discussed government legislation on forest fires because it is addressed in a separate review commissioned by PFFSEA. In general, community-enforced fines and other penalties often work better than government legislation in discouraging people from breaking rules. However, the government has a role in preventing uncontrolled forest fires, especially when offenders are not members of the community. Policies that deter land conversion and migration may be critical in stopping some forest fires. In Lao PDR’s Kaleum District, Sekong Province, some people have even been jailed for indiscriminate burning (Baird *et al.*, 1996).

5.4. Community arrangements and organisation

When many stakeholders lay claims to forest resources, inter-community co-operation is needed for effective forest fire management. Defunct community arrangements may be revived or adapted to suit changing conditions. External support agencies can help to develop and implement appropriate arrangements in recently settled areas. These agencies have to recognise and respect local methods of controlling fires. Community participation is obviously necessary for collaboration with external support agencies, although the degree of participation in decision-making will vary among individuals and communities. In South East Asia, village chiefs or a council of elders often play a major role in decision-making. Governmental agencies are usually called in as arbitrators during disputes or as law enforcers to punish offenders who are not community members.

5.5. Community awareness, skills and techniques

Communities in South East Asia have developed various forest fire management approaches, especially in swidden farming, such as:

- establishing firebreaks, buffer strips and fire lines;
- preventing fire from spreading by piling slash in the middle of the field, burning only in early morning or evening of the dry season and against the wind, and back burning;
- protecting valuable trees by removing underbrush and sheathing useful vines;
- relying on experienced villagers to manage the fires;

- forewarning all households in the community about the fire to be set so they can take precautions, and announcing fire outbreaks over the village loud speaker;
- implementing a monitoring system for patrolling fire-prone areas during the dry season, and building watchtowers; and
- encouraging community involvement in fighting fires.

5.6. Resources for forest fire management

The allocation of resources for forest fire management needs careful planning to ensure that poor communities are not overburdened by such arrangements, especially if the results are unlikely to benefit them tangibly or in the near future. Some current options for consideration include:

The allocation of resources for forest fire management needs careful planning to ensure that poor communities are not overburdened by such arrangements, especially if the results are unlikely to benefit them tangibly or in the near future.

- ad hoc community involvement or more ‘organised’ community volunteers (such as the Kitanglad Volunteer Guards) requiring only limited financial inputs;
- development of alternative livelihood strategies such as animal husbandry;
- fund raising activities by the community; and
- external support from governments, international organisations, NGOs and universities. Such support can help promote inter-community co-operation and strengthen the community’s technical skills for fire management. Two important issues to consider are:

Raising awareness of forest fires: Many agencies rank ‘awareness raising’ as a key factor for successful fire management. However, most communities are already aware of the problems and damages of uncontrolled fires. For example, in southern Laos (Kaleum District, Sekong Province) villagers know that random burning can significantly affect the rate of forest regeneration in fallow swidden fields (Baird *et al.*, 1996). Similarly, Duldulao (1975) notes that swidden cultivators in Mount Makiling, Philippines, highly value their forests and realise that fires can easily destroy unprotected forests. Thus it is expedient to capitalise on this awareness to promote action on the ground.

Compensations for preventing fires: Plans like the ‘No Fire Bonus’ scheme and rewards can be emulated. However, their costs and benefits need to be more thoroughly analysed.

6. Recommendations

Community-based forest fire management in South East Asia is attracting more attention. This is partly due to the overall interest in promoting community-based resource management and has also its origin in the recent catastrophic forest fires (especially in Indonesia), making it imperative to find ‘alternative’ ways prevent future outbreaks of similar scale.

Given the dearth of in depth analysis of community fire management initiatives, the PFFSEA can support the preparation of case studies on this topic, particularly on indigenous efforts and their impacts on fire regimes. A constructive approach would be to formulate a conceptual framework for investigating community forest fire management, including socio-economic and technical aspects. Case studies should then be developed based on this framework in collaboration with projects and organisations that promote community-based resource management. The examples discussed in this report should be analysed in more detail to determine the factors for success.

As a follow-up, pilot community-based fire management projects can be implemented to enhance the learning process.

6.1. Community-based forest fire management pilot schemes

Several options to promote community-based forest fire management exist in South East Asia (Table 1).

In many countries, fire-prone areas have been identified, and could be used for initiating community-based fire management programmes or projects. For example, about 56% of Vietnam’s 9 million ha of forest are considered to be fire-prone (Government of the Socialist Republic of Vietnam, 1994). These include lower montane evergreen forest of the Central Highlands and the Mekong Delta (Pham and Truong, 1997), where *Melaleuca leucadendron* forests are routinely burnt. Forest fires occur in the Northwest, Northeast and Central Vietnam, in the highlands, and in West and East Nam Bo (Standing Office, NCFPS, 2000). One of the areas with the highest wildfire risk is Dalat, Lam Dong Province, northeast of Ho Chi Minh City. This was once a project area for an FAO-supported project ‘Forest Fire and Insect Pest Management’. During the Vietnam War, approximately 12% of South Vietnam’s forest cover was sprayed and damaged by herbicides. Explosives, mechanical land clearing and burning operations damaged other forest areas. Extremely flammable grasses, e.g. *Imperata cylindrica* and *Pennisetum polystachyon*, now dominate these areas. Fires occur almost every year.

In the Philippines, “*natural forest fires are common in dry montane forests, pine forests and forests interspersed with grassland. They occur quite rarely in deciduous forests. Forests on Mount Malindang, Mount Kitanglad, Mount Apo and in Mindoro Island have been severely affected by forest fires*” (DENR, 1997).

Additional criteria for selecting potential pilot project sites have to be formulated, such as community interest, potential threats of uncontrolled fires to local and national economies and livelihoods, and impacts of uncontrolled fires on biodiversity and watershed functions.

Table 1: Options for establishing pilot community-based forest fire management schemes in South East Asia

Steps	Potential action	Sites/Partners	Comments
1.	Analyse existing cases	Upper Nan Project in Thailand	
2.	Add a fire management component in existing community-based resource management projects	There are projects in South East Asia that cover community forestry, protected area management, watershed management or forest restoration. Many projects face forest fire 'problems' and may be interested in incorporating community-based forest fire management components.	Both IUCN and WWF implement several such projects that could integrate a community fire management component.
3.	Strengthen projects with community-based fire management components	Many organisations, e.g. the CESVI in Lao PDR, and projects, e.g. Integrated Forest Fire Management Project (IFFM) in Kalimantan, Indonesia, are interested in promoting community-based fire management.	Technical skills need to be upgraded to improve overall resource management and tenure security.
4.	Design and implement community-based forest fire management project	Key problematic areas, e.g. fire-prone areas, interested communities.	See examples from Vietnam and Philippines in this report.

6.2. Other recommendations

Other underlying causes for forest fires, such as tenure and access, must be examined in more detail. Indigenous knowledge of fire regimes is poorly documented in South East Asia. Unlike the use of fire in grasslands, community forestry usually stresses fire *suppression* as a major success. Reference to controlled or prescribed burning to avoid higher intensity forest fires in the future is lacking. This is probably a reflection of the poor understanding and appreciation of the important ecological role of fires in forests, and thus all fires are normally declared undesirable (Payne, 1995). Jackson and Moore (1998) also call for a better understanding of the role of indigenous systems of fire use and management in maintaining biological and cultural diversity, and of the potential impact on this diversity, if fire regimes are altered. Clearly, for some forest ecosystems, using fires regularly is beneficial and needs to be promoted, as illustrated

in Kakadu National Park in Australia where indigenous people have used fires for many centuries. They have contributed to the biodiversity in the park, and park management relies on their knowledge and skills to maintain biodiversity (Beltran, 2000). PFFSEA can help emphasise the importance of fires in maintaining biodiversity for different ecosystems in South East Asia. Recognising fires as an important process in maintaining and/or enhancing ecosystem values is a necessary condition for garnering support for community-based fire management.

Government support for community-based forest fire management needs to be promoted. Policies and practices that enable appropriate indigenous fire use and management practices, as well procedures for considering the role of fire in collaborative forest management agreements have to be supported (Jackson and Moore, 1998). Community-based forest fire management is probably most effective as part of an overall community resource management strategy and cannot be implemented in isolation.

At the regional level, the Association of South East Asian Nations' (ASEAN) Haze Action Plan has not addressed the issue of community-based fire management. PFFSEA should aim to influence this group through regular interactions and dissemination of relevant information to raise awareness of options for involving rural communities in forest fire management. However, at the national level, it is probably more effective to focus on policies and practices.

PFFSEA obviously needs to work closely with relevant government departments in each country to raise the profile of community-based forest fire management. Seminars, workshops, and field-level activities are recommended.

To improve documentation of community practices and to promote field activities, PFFSEA should work with a wide range of organisations and networks that promote collaborative forest management in South East Asia. The project's partnership with the Regional Community Forestry Training Centre (RECOFTC) in Bangkok is a positive step in this direction. The project should also seek to strengthen contacts and partnerships with community forestry working groups in Vietnam and Cambodia, which are supported by the Sustainable Management of Resources in the Lower Mekong Basin Project (SMRP) (Helmrich, 2000, *pers. comm.*¹⁵). These groups comprise representatives of governments, projects and NGOs, and are therefore potentially very influential.

¹⁵ Hans Helmrich, Senior Technical Advisor, Sustainable Management of Resources, Lower Mekong Basin Project.

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