Chapter 10
Southeast Asia

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Abstract Rich in biological and cultural diversity important for human survival, tropical forests in Southeast Asia provide a major management challenge. Loss and degradation of forests in the region are driven by a complex interplay of economic, social, cultural, political, and demographic factors. In rural areas, local communities have used traditional knowledge in the management of forest resources for centuries. The arrival of Western colonial rulers and the introduction of scientific forest management gradually marginalized traditional local forest management. Modernization and economic development continue to erode cultural diversity and traditional knowledge. In some communities, villagers have adapted to externally driven socio-economic changes emphasizing commercial economic activities; conversion to institutionalized religions (such as Christianity, Buddhism, and Islam); and formal education. In other societies, local communities continue to manage local natural resources based on traditional knowledge and governance systems. Post-colonial governments from the 1940s to the 1970s maintained policies that gave the state legal control over all, or nearly all, forest lands. In most countries local, traditional management systems are not legally recognised or accepted by state forest management authorities, and their role

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in sustainable forest management has not been recognized. To achieve long-term forest sustainability in Southeast Asia, new approaches involving empowerment of local communities to manage natural forests, along with selective combinations of traditional and modern scientific management practices, may prove to be a way forward.

Keywords Biodiversity conservation • Forest governance • Forest history • Indigenous peoples • Non-timber forest products • Shifting cultivation • Southeast Asia • Sustainable forest management • Traditional knowledge

10.1 Introduction

Of the world's total estimated forest area (4,033 million ha in 2010), 592 million ha (15%) are in Asia, of which 34% (214 million ha) is in Southeast Asia (FAO 2010). Located nearly entirely within the humid tropics, the Southeast Asia region includes the second largest rainforest area in the world (Fig. 10.1). The region is divided between mainland Southeast Asia (Myanmar, Thailand, Lao PDR, Cambodia, and Vietnam) and insular Southeast Asia (Malaysia, Singapore, Brunei-Darussalam, Indonesia, Timor-Leste and the Philippines). The region includes uplands of greater bio-cultural diversity as well as lowlands in river deltas and coastal areas. Several countries in the region (namely Indonesia, Lao PDR, Malaysia, and Myanmar) still have relatively extensive areas of closed forests of between 40% and 50% (Table 10.1). The lush forests and rich biodiversity of the region provided a solid foundation for the early hunting, gathering, shifting cultivation and traditional agricultural societies before adoption of modern agriculture, and the early domestication of many tree and perennial crops such as coconuts, bananas, sugarcane, annual and root crops (rice, taro, etc.) and animals (chickens, pig, water buffalo, etc.) that were integrated into diverse agro-forestry systems.

The region is characterized by tremendous ecological diversity. Indonesia, Malaysia, and the Philippines are 3 of the world's 17 'megadiverse' countries. This outstanding biological diversity is manifested in the region's fauna and flora as well as at the landscape level. Malaysian forests are home to at least 15,000 species of flowering plants and trees, 600 species of birds, 286 species of mammals, 140 species of snakes, and 80 species of lizards (Malaysia 2004). Four biodiversity 'hotspots'—Indo-Burma, Philippines, Sundaland, and Wallacea—in Southeast Asia are among 25 of the Earth's biologically richest and most endangered ecoregions, featuring exceptional concentrations of endemic species and experiencing exceptional loss of habitat (Myers et al. 2000).

Southeast Asia deserves special attention for five main reasons: its high proportion of land under forest, high population, cultural diversity, economic growth rates, and rapid decline in forest area. At present about 48% of land in Southeast Asia is forested. The region has a total population of 575 million (Table 10.1), or about 9% of the world's population. All the nations in the region are composed of many ethnic groups with distinctive languages, customs, norms and values, religious beliefs, customary laws, and institutions. An indicator of its rich cultural diversity is the

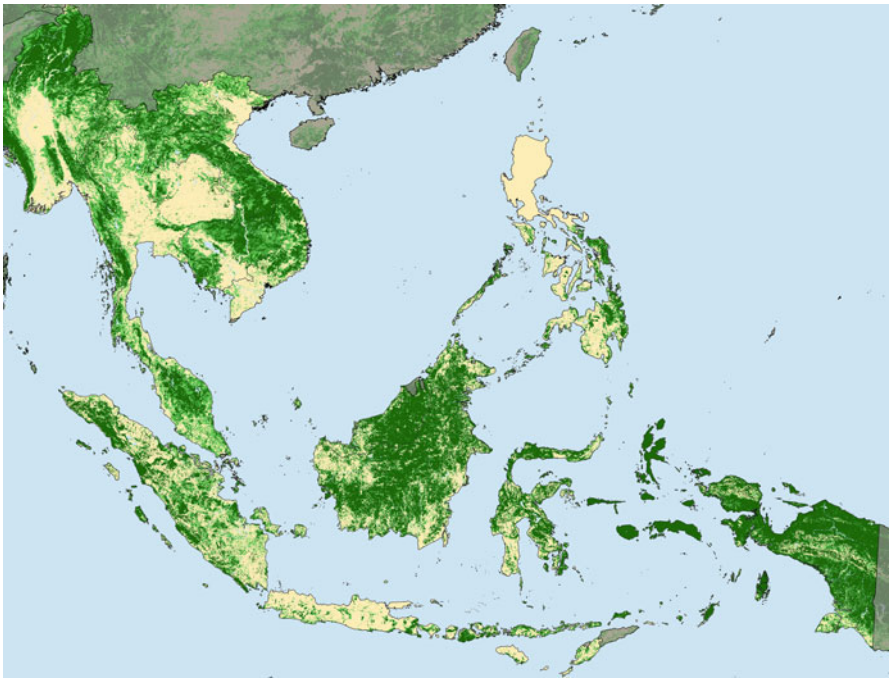

Fig. 10.1 Forest and woodland cover in Southeast Asia (Source: Adapted from FAO (2001)). *Key*: *Dark green* closed forest, *light green* open or fragmented forest, *pale green* other wooded land, *yellow* other land

large number of living languages, ranging from 17 in the small country of Brunei to 722 in the region's largest country, Indonesia. Of the total 1,519 living languages in Southeast Asia, 1,461 (96%) are languages of indigenous peoples.

A substantial percentage of the 557 million people of Southeast Asia are still dependent on the local forest ecosystems, of which humans are an integral part, for a wide array of goods and services needed to sustain their livelihoods. However, throughout the region, rapid population growth and economic development have resulted in widespread forest loss. According to FAO statistics, forest area in Southeast Asia declined at an average annual rate of 1%, from 247.1 million ha in 1990 to 214.1 million ha in 2010 (FAO 2010). In Thailand, for example, forest area has declined from 54% in 1961 (Poffenberger and McGean 1993) to 37% in 2010 (FAO 2010), while the forested area in Indonesia decreased from 62% in 1990 to 50% in 2010 (FAO 2010). The main causes of forest loss in the region are rapid timber exploitation; conversion of forests to agriculture associated primarily with population growth by poor migrants in search of farmland, forced migration, and resettlement of tribal communities (who are increasingly marginalized in their ancestral homelands); absence of effective forest management, which results in degradation of forest soils and vegetation; and conversion of forests to permanent agricultural or tree plantations (Poffenberger 1992). This situation of loss of forest land to oil palm plantation is illustrated in the case of Indonesia (Box 10.1).

Table 10.1 Selected land and forest characteristics of Southeast Asian countries

	Brunei-Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Timor-Leste	Vietnam	Total
Land area (million ha) (2010)	0.6	18.1	190.4	23.7	32.8	67.7	30.0	0.07	51.3	1.5	32.9	449.1
Forest area (million ha) (2010)	0.4	10.1	94.4	15.7	20.5	31.8	7.7	0.002	19.0	0.7	13.8	214.1
Percent forest area (2010)	63.3	55.8	49.6	66.2	62.5	47.0	25.7	2.9	37.0	49.3	41.9	47.7
Closed forest area (million ha)	n.a	6.70	91.7	11.9	16.0	26.8	4.3	n.a.	6.2	0.2	8.7	172.4
Percent closed forest area	n.a	37.0	48.2	50.2	48.9	39.5	14.2	n.a	12.1	11.3	26.5	38.4
Population (million) (2008)	0.4	14.6	227.3	6.2	27.0	49.6	90.3	4.6	67.3	1.1	87.1	575.5
Annual population growth rate (%) (2008)	1.8	1.7	1.2	1.9	1.7	0.9	1.8	2.9	0.6	3.2	1.1	1.7
Number of living languages	17	25	722	89	145	116	181	31	85	19	108	1,519
Number of indigenous languages	15	23	719	84	137	111	171	21	74	19	106	1,461
Indigenous population (million) (2007)	0.3	0.1	1.1	6.0	3.4	30	8.4	–	0.9	n.a.	7	57.2
Annual GDP growth (%) (2008)	−1.5	6.0	6.0	7.5	4.5	2.0	4.6	1.2	4.8	6.8	6.2	4.3

Sources: Land area, forest area, percent of forest area, population, population growth rate (FAO 2010); indigenous population and groups (Sobrevila 2008, www.vwam.com); living and indigenous languages (Lewis 2009); closed forest area (Guerra et al. 2006)

Box 10.1 Oil Palm Plantation Expansion and the Loss of Forest Resources in Indonesia

- Oil palm plantations have expanded rapidly in Indonesia in the past decade and currently cover seven million ha, managed by more than 600 companies.
- An additional forest area of 11 million ha was allocated to the oil palm industry but never planted; after cutting and selling the wood, the companies simply abandoned the lands.
- Over the next 10 years, local and provincial governments plan to issue licences for an additional 20 million ha for oil palm plantation. It is expected that most of the permits will be issued in forest areas, as the timber obtained from forest conversion can pay for plantation establishment costs.
- The government decentralization process, which started in 2000, affected the regulation of the plantation sector; the expansion of the oil palm plantations was no longer controlled nationally. The process of land acquisition for oil palm plantations is carried out locally, with political support given by the district government to oil palm plantation companies in exchange for financial support.

Source: Sirait (2009).

Very few large, ecologically intact natural forests, also known as the 'frontier forests' (World Resources Institute 1987), remain in Southeast Asia, largely confined to the islands of Borneo, Sumatra, Sulawesi, and Irian Jaya (Bryant et al. 1997, cited in Theilade et al. 2005). It is estimated that up to 42% of the total 200–300 fish species currently in Southeast Asia's peat swamp forests would disappear over the next century if habitat destruction continues at its present rate (Ng 2005).

In addition to conversion of forest lands for agricultural production, and unsustainable timber harvests, there have been uncontrolled, human-induced forest fires, particularly in recent decades, that have resulted both in forest loss and in serious impacts on human health. These fires, arising mainly from large-scale land clearing for industrial plantations and forestry practices that predispose forests to fire, have become an annual concern in many Southeast Asian countries, especially in Indonesia, where such large-scale fires occur almost every year. In 1982–1983, for example, forest fires destroyed 3.5 million ha of tropical forest in East Kalimantan (Boer 2002), of which 80% occurred in logged-over forest areas (Lennertz and Panzer 1983). The highly destructive peat forest fires in 1997 and 1998 affected five million ha of forest in East Kalimantan, Indonesia (Boer 2002). The resulting smoke from the peat swamp fires stretched over a million square kilometres, adversely affecting the health of up to 70 million people in the Southeast Asian region (Moore 2001). The haze between August and October 1997 caused by forest fires in Indonesia resulted in an estimated loss of US$300 million to Malaysia (Mohd Shahwahid and Jamal 1999) and up to US$9 billion in the Southeast Asian region as a whole between 1997 and 1998.

The impact of deforestation and forest fires on annual carbon release to the atmosphere is considerable. Based on an average carbon stock in live vegetation in Asian tropical moist and seasonal forests of 200 Mg C per ha (Houghton and Hackler 1995), an estimated 465 Tg C y^{-1} was released from Southeast Asia's forests between 1990 and 2000. This amounts to approximately 26% of net carbon release from tropical forests and 29% of world forests during this period. Available FAO statistics showed that in 2005 the carbon stock of Southeast Asian countries ranged from 50 Mt in Brunei to 6,725 Mt in Indonesia (FAO 2005). The region's terrestrial carbon stock will continue to decline if the loss of forest cover persists.

The manner in which forest resources are managed will have long-term impacts on Southeast Asia's biological and cultural diversity as well as global climate change. While modern scientific forest management practices are becoming more dominant in the region, the role of traditional knowledge in forest management is declining rapidly. In this chapter, we will discuss the role that these 'unscientific' traditional forest management practices have historically played in the sustainable management of forests in Southeast Asia, as well as the obstacles and opportunities that exist for the preservation and adaptation of these practices to meet the changing needs of their practitioners and society at large.

10.2 Traditional Forest-Related Knowledge in Forest Management

Traditional forest-dependent communities have developed a wide variety of forest and related agricultural management systems to sustain daily livelihoods and to ensure their food security and long-term survival. Studies have shown that in many situations swidden systems, or shifting cultivation, and associated forest management practices is a rational economic and environmental choice for farmers in the humid tropical uplands (Conklin 1957; Fox 2000; Mertz 2002). Nevertheless, more often than not these local management systems, and the associated local institutions and customary laws that support them, are not legally recognised or accepted by state forest management authorities, and their role in sustainable forest management has been ignored, if not forgotten.

10.2.1 Traditional Beliefs and Forest Management Practices of Forest-Dependent Communities

Over generations of living with forests, forest-dependent communities in Southeast Asia have developed their traditional forest-related knowledge (TFRK) to guide their use and management of forests. Many communities hold cultural and traditional beliefs conducive to forest conservation. These traditional beliefs and the customary institutions of local communities play an important role in regulating forest management.

For example, among the Kenyah of Long Uli in East Kalimantan, Indonesia, customary lands are designated and used for settlement and cultivation (ladang), protected forest (tanah ulen), fruit-tree groves (pulung bua), and fishing and hunting. Each village has regulations (hokum adat) for harvesting and distributing timber and non-timber forest products that determine when designated land can be opened for collection purposes and prohibit cultivation of this land. In addition, the community maintains two separate forest protection areas: one reserved for the village council, the products from which are to be used for village development, and another whose products are reserved for orphans and widows (Sirait et al. 1994).

Similarly, to the Dayak people in East Kalimantan, simpukng (a mixed fruit garden or forest garden) is established for environmental and economic benefits (vegetables, spices, honey, rattan, fruit trees, timber, construction materials, fuelwood, and medicinal plants) where rituals and spiritual beliefs influence its management and utilization (Mulyoutami et al. 2008). In Sumatra, Indonesia, the villagers in Jambi Province use the presence of ninik mamak (traditional leaders) and traditional taboos in conserving and using forest resources such as medicine plants, honey collection, rubber planting, fishing, hunting, rice, and vegetable farming with regulations that ensure the 'adat forest' (traditional forests) are managed on a sustainable basis (Zuraida 2008).

The Ikalahan people in the mountains of northern Philippines have a sophisticated system of forest management where forests are delineated for different functions, such as conservation, income-generation, and environmental service purposes, and their traditional farming practices are designed to conserve the soil and water (Dolinen 1997). For the aboriginal Semai community, 1 of 18 indigenous communities in Peninsular Malaysia, planted and inherited forest land species that have social, cultural and religious significance are either community-owned, family owned, or individual owned (Lim 1997).

Among forest-dependent traditional communities in Southeast Asia, certain forests or tree species are commonly believed to be associated with the tutelary spirits and deities of their villages and ancestors. These forests or tree species of cultural importance are locally protected with a perceived need to live in harmony with these spirits and deities. For example, the Khmu people in Laksip Village, Luang Prabang, Laos, believe that their tutelary deity lives in a high mountain to the northeast of the village. Forests there are well-preserved, and the mountain also serves as an important watershed for the village and others further downstream. The ethnic minority communities of Ratanakiri Province, Cambodia, believe that local spirits inhabit certain forests and forbid harvest of any forest products in those sacred areas (Poffenberger 1999). Sacred forest sites are important for forest and biodiversity conservation as well as local social-economic functions in Indonesia (Wadley and Colfer 2004; Soedjito 2006). Indigenous peoples in the Cordillera, Philippines believe many water-bearing tree species are associated with spirits (anito), so they conserve these trees (Carino 2004), which are important for watershed conservation in the region. In the northwestern mountain region of Vietnam, the local Thai ethnic community's beliefs in spiritual and magical power have been the basis of customary laws governing their management of natural resources (Pham and Trung 2004).

The relevance of local traditional forest-related knowledge in the sustainable management of forest resources is evidenced from various research findings. Even though much of the land in the mountainous regions of mainland Southeast Asia previously under shifting cultivation has been converted to permanent agriculture or plantations (for cash crops such as cabbage, fruit orchards, and plantations of rubber, tea and teak), the traditional knowledge and practices used in indigenous forest and land management remain (Rerkasem et al. 2009b). In this region, traditional forest management skills have been gradually adapted and incorporated into new cropping systems, and into forest management practices used for protection of headwater supplies for irrigation and domestic consumption, as well as for management of live fences and fuelwood forests (Rerkasem et al. 2009b).

The application of traditional forest management is clearly demonstrated in a study in Thailand conducted as part of the Highland Mapping Development and Biodiversity Management Project of the Inter-Mountain Peoples' Education and Culture in Thailand Association (IMPECT) in collaboration with the Forest Peoples Program (Charoenniyomphrai et al. 2006; Colchester et al. 2006). The study focused on the knowledge, customs, and traditions practiced by the Hmong and Karen (Pga k'nyau) peoples in the sustainable use and conservation of natural resources and biodiversity, and examined how these highland communities have adapted to the impacts of externally imposed laws, policies, and development processes (Box 10.2).

10.2.2 Technological Practices and Strategies

10.2.2.1 Traditional Agroforestry and Shifting Cultivation Systems

Agroforestry may be defined as 'land use based on planted trees, provid[ing] productive and protective (biological diversity, healthy ecosystems, protection of soil and water resources, terrestrial carbon storage) forest functions' (van Noordwijk et al. 2003). With their extensive knowledge of useful trees, plants, and animals, people in rural communities throughout Southeast Asia have developed a high diversity of agroforestry systems, many of which have been described in the literature (Christanty et al. 1986; Hong 1987; Soemarwoto and Conway 1992; van Noordwijk et al. 2003; Belcher 2001; Michon and Bouambrane 2004; Michon et al. 2007). The forests in which local agroforestry practices take place have been termed 'domestic forests' by Michon et al. (2007). People in traditional communities also rely heavily on traditional knowledge for predicting weather to plan and prepare their agroforestry activities and minimize impacts of extreme weather events, as described by Galacgac and Balisacan (2009) in Ilocos Norte Province in Northern Philippines

Agroforestry in Southeast Asia includes both simultaneous and sequential systems. Examples of simultaneous systems are the common forest gardens established by planting around houses, which persist even after people have

Box 10.2 Traditional Knowledge, and Customary and Sustainable Use of Natural Resources Among the Hmong and Karen (Pga k'nyau) in Thailand

The Hmong and Pga k'nyau communities in Thailand have a dual system of leadership made up of traditional leaders and elected village heads recognised by the government. The traditional leaders hold authority based on the history and structure of the community. They play the main role in building a relationship between people in the community and natural resources and biodiversity management, by guiding their customary use of soil, water, forest, animal, and plant resources. Indigenous knowledge about customary resource use is expressed as patterns of thought, production, beliefs, customs, traditions, and rituals. All of these tangible expressions result in a balance between the maintenance of life and dependence on nature as appropriate for each people. The process of transmitting this knowledge from one generation to another is incorporated into customs such as teachings, songs, legends, stories, rituals, and practical daily activities, especially those related to their agricultural and forest-dependent work.

There are similarities between the Hmong and Pga k'nyau in their categorization of, and beliefs about, the ownership of natural resources, in that the ultimate owners are supernatural entities such as the Lord of the Water, the Lord of the Forest, the Lord of the Mountain, or guardian spirits. Both communities believe that these spirits are the caretakers and guardians of natural resources. People using these resources ask permission to do so only in order to maintain their livelihoods. After having been granted permission by the spiritual owners, they are required to use the resources carefully and sensibly. These beliefs aid in the sustainable use and conservation of resources.

The work of various government and non-governmental agencies has caused adaptations to occur or has been met with community resistance in the past. For example, Mae Pon Nai village has struggled against the thinking of government and religious organizations, and has not accepted a great deal of outside cultural influence. Khun Ya village has not adopted monoculture cash crops because they believe it destroys their indigenous agricultural methods. Community members have joined together at the community, watershed network, and national people's network levels in order to find appropriate solutions to their problems.

Source: Charoenniyomphrai et al. (2006).

moved away. These forest gardens are rich in edible fruits, oil seeds, rattans, medicinal plants, resins, and other useful species meeting the needs of the Dayak people in Borneo (Brookfield et al. 1995). In the case of Sarawak in Malaysia, the local communities maintain forest land cleared for padi farming (temuda),

Fig. 10.2 Agroforest in Chiang Mai Province, Northern Thailand (Photo: Liang Luohui)

and pulau, forest areas set aside for production of essential items such as timber for house construction, boat building, jungle vegetables, rattan and other non-timber forest products, hunting, and protection of water catchment areas (Majid-Cooke 2005).

Sequential systems include a variety of rotational agroforestry and shifting cultivation practices, all of which include a short phase of cropping (usually lasting from one to a few years) followed by a relatively long phase of forest fallow. The cropping phase for producing mainly annual food crops involves clearing of secondary growth, burning, dibbling the seeds of annual crops, weeding and harvest. The cropping phase typically involves diverse mixtures of crops (cereals, root crops, vegetables, etc.) that support a balanced diet for shifting cultivators, with minimal disturbance of soil structure, soil seed banks, and root-mats because of zero tillage, while preserving some mature trees for subsequent forest regeneration (Figs. 10.2 and 10.3). The fallow phase is essential to help restore soil fertility lost during the preceding cropping phase. The forest is an integral and essential part of the shifting cultivation system (Conklin 1957; Colfer et al. 1997).

Fig. 10.3 A local farmer in Chiang Mai Province, Northern Thailand explaining his techniques for managing this agroforest for producing a special type of bamboo to make traditional pipes (Photo: Liang Luohui)

The duration and management of the fallow phase differ across cultures, space, and time. The duration of the forest fallow phase is normally above 10 years—sufficient for recovery of soil fertility—with a general preference for the forest re-growth of between 10 and 20 years (Brookfield et al. 1995). As forests re-establish through natural successional processes during the fallow phase, products of these natural forest fallows are collected by the local people. Inter-planting of useful trees with food crops during the cropping phase and enrichment planting during the forest fallow phase are practices widely used by indigenous communities to produce forest products and to accelerate soil regeneration (Burgers et al. 2005; Michon et al. 2007).

10.2.2.2 Management of Non-timber Forest Products

The indigenous peoples of Southeast Asia have been using and managing non-timber forest products for centuries, if not millennia (Fig. 10.4). Swidden farming, collection of forest fruits, traditional medicines, building and handicraft materials, and hunting and fishing continue to be practiced by these forest-dependent communities (Plant 2002). The aromatic resin, gaharu is a valuable non-timber forest product produced by trees of the genus *Aquilaria* found in tropical forests South and Southeast Asia (Lim et al. 2008). Until recently the process of the resin formation was poorly understood by forest scientists, but

Fig. 10.4 Edible pupae of forest insects are a traditional non-timber forest product in Luang Prabang Province, Northern Lao PDR (Photo: Liang Luohui)

Penan collectors of Indonesian Borneo have long recognized the complex ecology of resin formation involving site conditions, soils, associated trees, microclimate, fungi, and insects (Donovan and Puri 2004). In the Philippines, NATRIPAL (Nagkakaisang Tribu ng Palwan), an association of indigenous people in Pelawan Province, was organized in 1989 to advocate for recognition of ancestral tenurial rights and to enhance indigenous people's organizational capacity in sustainable management, trading, and marketing of non-timber forest products such as wild honey and almaciga (*Agathis philippinensis* Warb) resin (Ella 2008).

Traditionally, fruit trees, bamboo, and rattan are inter-planted with annual crops during the cropping phase in rotational agroforestry systems in Indonesia (Christanty et al. 1986; Belcher 2001). Rubber has been integrated by local farmers into their rotational agroforestry based on local knowledge to create a biodiversity-rich jungle rubber system (Penot 2004). Benzoin production from *Styrax tonkinensis* is integrated with hill rice under shifting cultivation in Laos (Kashio and Johnson 2001; Takeda 2006). In Sumatra (Indonesia), the establishment of damar (*Shorea javanica*) forest gardens with fruit trees such as durian (*Durio ziebethinus*), nangka (*Artocarpus heterophyllus*), manggis (*Garcinia mangostana*), petai (*Parkia speciosa*), and duku (*Aglaia dookkoo*) generates cash income and has biodiversity values (Poffenberger 2006).

In their traditional management systems, local people in northern Laos enrich forest fallow with paper mulberry (Burgers et al. 2005). Extensive plantations of teak (*Tectona grandis*) were established in this way during the nineteenth and early twentieth centuries in Myanmar, Thailand, Indonesia (Ball et al. 1999), and currently in Laos. Apart from wild gathering, local people have long cultivated useful tree species for non-timber products in Southeast Asia, such as damar (*Shorea javanica*) to produce resin and timber in agroforestry farms (Michon et al. 2007),

and rattan (*Calamus caesius*) in swidden fields, to earn income and mark landholdings (Belcher 2001).

10.2.2.3 Landscape Management

In many Southeast Asian countries, a variety of local ecosystem or land use types form complex landscape mosaics (Forman 1995). Local communities sustain themselves with the natural resources available from these landscapes, of which forests are an integral part. Their traditional wisdom and experience enable traditional communities to make the full use of the landscape through classification of the landscape into appropriate land use units that are managed under different customary regulations. Land units important to watershed and social-cultural development are often designated as sacred sites for protection, as discussed earlier (Sect. 10.2.1). The Kenyah people in East Kalimantan, Indonesia, allocate the land and forests in the village landscape to different land uses such as settlement and cultivation (lading), forest protection (tanah tulen), fruit-tree groves (pulung bua), fishing, hunting, and harvesting of timber and non-timber forest products (Sirait et al. 1994). In western Java, Indonesia, the indigenous Kasepuhan community in the Halimun Mountains uses the surrounding land and forests for various uses by adopting different land use models including sawah (paddy field), huma (swidden cultivation), talun (agroforestry garden), kebon (garden), leuweung titipan (entrusted forest), leuweung tutupan (closed forest) and leuweung bukaan (open forest) for watershed conservation and limited non-timber forest product collection (Hendarti and Youn 2008). Elsewhere in Indonesia the traditional coastal landscape management integrates paddy fields for rice-fish culture, tambak ponds for polyculture, and mangrove forests for coastal fisheries enriched by waters flowing from the paddy fields (Davidson-Hunt and Berkes 2001). Indigenous farming communities in the Cordillera region of the Philippines harmonize muyong system (meaning forest or woodlot), swidden farms, and rice terraces on the landscape (Camacho et al. 2011).

10.3 Emergence of 'Scientific' Forestry and Conservation Management

10.3.1 Colonialism and Scientific Forestry

The history of Southeast Asian countries is marked by waves of Western commercial exploitation followed by political domination over the past few hundred years. Apart from Thailand, all other countries in the region were under some form of European colonial rule during their recent history, in addition to their occupation by Japanese forces during World War II (1941–1945): Brunei (1888–1984), Malaya (1824–1957), Singapore (1824–1963), and Myanmar (1824–1948) under the British

colonial rule; Cambodia (1863–1953), Lao PDR (1894–1954), and Vietnam (1885–1954) under French rule; Indonesia (1800–1945) under the Dutch; and the Philippines under the Spanish (1521–1898) and the United States (1899–1941). Colonialism transformed nearly all aspects of forest resource management and utilization, as well as the forest-based livelihoods of local communities. For example, during the French colonial period, extensive rubber plantations were developed in forest areas in Vietnam and Cambodia, with forest-dependent indigenous peoples employed to work in the plantations (Lang 2001).

Colonialism in Southeast Asia resulted in dramatic changes in forest control, use, and management by the state. The erosion of customary forest management systems and the rise of state agencies and private companies as forest managers coincided with the rapid loss of forests in the twentieth century (Poffenberger 2006). In the Philippines, for example, highly regulated, centrally controlled (and industry-biased) forest policies and management approaches were applied from the colonial period until the early 1980s (Pulhin et al. 2008). Post-colonial governments in Southeast Asia from 1940 to the 1970s maintained centralized policies stipulating that all lands in the public domain, which included all classified forest lands, belonged to the state. Indigenous peoples were deprived of their customary rights to their land, including forests, and the benefits arising from the utilization of forest resources.

10.3.2 Protected Areas and Biodiversity Conservation

One impact of Western colonialism can be seen in current approaches to protected area management. The Western-based conservation system that predominates in Southeast Asia and much of the rest of the world—seen by many as 'eco-colonialism' (Cox 2000)—imposes Western conservation paradigms and power structures on indigenous forest-dwellers (Nicholas 2005). In contrast to traditional (i.e., indigenous) approaches, including customary law and governance systems, Western conservation ethics tend to emphasize resource protection, legal use, intellectual property rights, and wise use of the protected areas. As a result, the presence of indigenous peoples in and around protected areas has and continues to be seen as a liability rather than an asset for effective protected area management.

There is a growing appreciation of the fact that protected area establishment has very often been detrimental to indigenous peoples' interests, most obviously when their access to protected areas is denied. Traditional knowledge, institutions, and practices have usually been and continue to be sustainable in terms of meeting livelihood needs without jeopardizing long-term biodiversity conservation objectives and forest ecosystem functions. In the Philippines, the 'muyong' system of the Ifugaos contributes to forest conservation and regeneration, soil conservation, watershed rehabilitation, sustainable farming (Camacho et al. 2011), and meeting livelihood needs such as food, fuelwood, construction materials, and medicine (Butic and Ngidlo 2003). The muyong are typically rich in plant biodi-

versity. A study of 67 muyong woodlots plots (each 625 m^2; total sampling area 4.2 ha) reported a total of 264 plant species belonging to 71 plant families in (Rondolo 2001). The average number of plant species per woodlot was 30, and ranged from 13 to 47. Nearly 90% of these species (234 of 264) were considered useful (Ngidlo 1998).

10.3.3 Industrial Forestry

The rise of Western colonial powers in Southeast Asian countries, nationalization of forests in the twentieth century, the continued emphasis on timber production in the post-colonial period, economic globalization, and rising demand for timber by emerging economic giants such as China and India have resulted in both the development and expansion of the commercial timber industry and concentration of ownership and control of forest lands, principally by states. By 2005, FAO (2010) shows forest ownerships in Southeast Asia is mainly with the states—Brunei, Cambodia, Lao PDR, Myanmar, and Singapore (100%); Malaysia (98%); Indonesia (91%); Thailand (88%); Philippines (85%); and Vietnam (72%). The process witnessed the expansion of timber industry operations throughout Southeast Asia where vast areas of forests were deforested. As noted earlier, the rise of state forest agencies and private companies as forest managers has coincided with an accelerating loss of natural forests the region during the post-World War II era. In Southeast Asia, tropical rainforests receded from 250 million ha in 1990 to 60 million ha in 1989 (Poffenberger 2006), a decline of 76%. In the meantime, indigenous systems of management were displaced, erosion of customary forest management occurred, and this further accelerated deterioration of forests. In short, the state gained legal and administrative control over most if not all forests at the expense of local and indigenous communities (invalidating their customary laws and other aspects), favouring industrial interests (individuals and firms) by granting concessions for, or giving away, large forest areas.

By promoting 'scientific forestry,' the colonial and later modern states gradually took control of the forests and imposed centralized technocratic management from the nineteenth and twentieth centuries until the present. In Vietnam, until the 1980s, almost all lands and forests were administered directly by the state and its subsidiary bodies. In the 1980s, the state began to experiment with means of devolving rights over land to households and individuals and to the private sector. Such land reforms resulted in increases in agricultural production, and since the 1990s similar reforms have begun to be undertaken in the forests. About 18% of the country's 12.6 million ha of natural forests were leased to individuals and firms to manage, and only 4.4% to local communities, indicating priority given to individuals and firms. Government policies that encourage capital investment and allow joint ventures and corporations to control forest and agricultural lands are expanding in scope, and state agencies continue to pursue policies aimed at curbing swidden farming

Fig. 10.5 Conversion of traditional shifting cultivation to teak plantation in Luang Prabang Province, Lao PDR (Photo: Liang Luohui)

(Colchester and Fay 2007). Similarly, the Indonesian government controls all forests; of Indonesia's estimated 86 million ha of forest, about 27% was allocated to private companies for logging and plantation, while about 0.2% was given limited use rights as 'community forest' (Colchester and Fay 2007). This eventually led to state management of forests mainly for the sake of industrial forestry interests. The state hands the rights to harvest timber to private companies, thus excluding local communities from the forests (WRM 2002b). Consequently, swidden agriculture, once the dominant form of land use throughout the uplands and much of the lowlands of Southeast Asia, is being replaced by other land uses (Rerkasem et al. 2009a)(Fig. 10.5).

10.3.4 Modern Agriculture Development

Many innovative practices have been developed and used by local communities to improve the productivity and sustainability of shifting cultivation systems in Southeast Asia (Cairns and Garrity 1999; Rerkasem 2003; Burgers et al. 2005; Rerkasem et al. 2009a). In spite of the availability of these innovations, government policies in the region have generally aimed to curtail what are perceived to be 'backward' traditional shifting cultivation practices and to encourage conversion to sedentary agriculture. Such policies have often led to unforeseen and counterproductive consequences. For example, a land allocation program initiated in Laos

in the early 1990s to stop shifting cultivation sought to increase land tenure security, enable farmers to invest in land development for sedentary agriculture, and preserve previously fallow land for forest conservation. However, the allocation of extensive fallow lands for forest conservation led to a shortening of the fallow phase in the remaining lands to less than 3 years (rather than a conversion to sedentary agriculture), which resulted in land degradation and yield declines (Rerkasem et al. 2009b). The shortening of the fallow phase has also made it impossible for these farmers to continue benzoin production from *S. tonkinensis,* as these trees take 7 years to mature (Takeda 2006).

In summary, the overall impact of Western colonialism, development of modern states and the adoption of scientific forestry emphasizing timber production for international markets, and agriculture development, has been the reduction in the forest areas in Southeast Asian countries. Infrastructure development, improved communication and transportation networks, and intrusion of external markets have transformed and marginalised the traditional forest communities, resulting in denial of their customary rights, as well as erosion and loss of traditional knowledge, practices, and institutions.

10.4 Current Challenges in Conservation and Sustainable Utilization of Traditional Forest-Related Knowledge

10.4.1 Governance Issues and the Legal Rights of Local Communities

In the Southeast Asia region, despite the existence of laws that consider the rights of local communities (Table 10.2), competing interests in forest land use have often led to serious local problems such as increases in rural poverty and land conflicts, as illustrated below in the following examples from, Cambodia, Thailand, and Vietnam (Colchester and Fay 2007).

In Cambodia, the Community Forestry Sub-Decree (CFSD) was passed by the Royal Government in 2003 (Oberndorf 2006). However, the weakness of government implementation of forest laws and policies, and competing interests in forestlands from the state and the private sector, have prevented effective enforcement of existing laws protecting the rights of local communities. Delineation of indigenous lands is at an experimental stage; individual land titling has focused on urban areas, and little attention is given to agricultural and forest lands of local and indigenous communities (Colchester and Fay 2007). Community rights regarding forests are largely ignored by forest concessionaires in Cambodia, leading to serious land conflicts. While nearly one million ha of forest concessions have been granted, only 20% of farmlands have been registered and only 200 small pilot community forestry areas have been established (Colchester and Fay 2007). In addition to timber concessions, controversial land concessions for agro-industrial crops like cassava, sugar

Table 10.2 Specific laws related to land and forest ownership, customary use and management rights, and traditional forest-related knowledge in selected Southeast Asian countries

Country	Law	Remarks
Cambodia	Land Law (2001)	Grants collective land ownership rights to indigenous communities. This enables the indigenous peoples to self-determine development (NGO Forum on Cambodia 2006)
	Forest Law (2002)	Leases areas of production forest and permanent forest reserve to local communities to manage and benefit from the resources
Indonesia	Constitution	Accords the state a controlling power over land and natural resources and recognize customary law communities (Colchester and Fay 2007)
	Basic Agrarian Law (BAL) (1960)	Recognizes the collective rights in land of customary law communities but treats these as weak usufructs on state lands subordinate to state plans and interests (Colchester and Fay 2007)
	Forestry Law (1999)	Limited use rights in forests can be accorded as long-term 'customary forests,' 'special purpose areas,' and 'village forests,' and as short-term 'community forests'(Colchester and Fay 2007)
Lao PDR	Constitution	All forest land lands belong to the 'national community represented by the State.' The law allows the government to allocate rights of 'rational usage' of forest areas to villages and individuals, while the customary use of natural resources within village boundaries is also explicitly recognized (Colchester and Fay 2007)
Philippines	Indigenous Peoples' Rights Act (1997)	Protects indigenous communities' rights in general, including their rights to traditional knowledge (Disini 2003)
Malaysia	Aboriginal Peoples Act (1954)	The customary rights of aborigines' lands within the national legal framework are stated to include aboriginal reserves, aboriginal areas, rights of occupancy, compensation for fruit or rubber trees, and compensation for use of aboriginal areas and aboriginal reserves
	Sabah's Land Ordinance (Cap 68)	Native customary rights to land are outlined
	Sarawak Land Code (Cap 81)	Determines land tenure and administration in the state, and provides for native land and native customary land. (Majid-Cooke 1999)
Thailand	Thai Constitution	Provides recognition of customary natural resource management by tribal and indigenous peoples (Anonymous 2006)
	Community Forestry Act (1996)	Enables the rural community to have a legal right to manage the land and forest in the village (Rerkasem and Yimyam 2011)
Vietnam	Constitution	Vests all lands and forests in the state (Colchester and Fay 2007)
	Land Law (1993)	Allocates forest land to other users such as forest companies, communities, households, and individuals (Sam and Trung 2001)
	Law on Forest Protection and Development (1991)	Identified three categories: protection (watershed, sandy and sea wave); special use forest (parks, conservation, historical and cultural parks); and production forest (Sam and Trung 2001)

cane, rubber, pulpwood, and palm oil have brought about local land use conflict and resistance from local villagers (WRM 2006). Although national data on the status and poverty of forest peoples is lacking, hardship and increasing conflict have resulted from the loss of forest resources and encroachment of land concessions (Colchester and Fay 2007).

In Thailand, under Royal patronage and through various foreign assistance programs, efforts have been made to promote alternative upland economies in forested regions, including substituting flower, fruit, and vegetable production for swidden farming and opium cultivation. Co-management of protected areas is also being tested, with mixed results (Colchester and Fay 2007). While there have been some successes in protected area co-management, these have not been extended to other communities owing to lack of an enabling legal framework.

However, the spontaneous spread of 'community forestry' in Thailand, where village committees assume management responsibilities over forests and woodlots, is notable. According to Asia Forest Network,[1] area under community forest management totalled 328,000 ha in 1998 or 1% of the total 30 million ha of forest land in Thailand. Studies by the University of Chiang Mai (Colchester and Fay 2007) suggest these community forests extend over some 1.3 million ha, a figure that does not include the wider areas under customary land management systems. Approximately 0.2 million ha of community forests have been 'permitted' by the Royal Forest Department, although the legal basis for this is unclear. On the other hand, the Thai government continues to pursue an intermittent policy of exclusion and resettlement of upland communities, while encouraging tree plantations and tea estates in uplands forests (Colchester and Fay 2007).

In Vietnam, while existing laws allow communities to hold forest and associated agricultural lands, the tenure afforded them is weaker than that available to individuals and households. Under the 1993 Land Law and a decree issued in 1994 (Poffenberger 1999), forest land is allocated on long-term, transferable leases to individuals, households, and enterprises, providing them with strong rights to control and manage resources. The law is less clear about transfers to communities. Moreover the Civil Code does not recognize communities as having legal standing, and only 4.4% of forests in Vietnam are currently allocated to communities as such (Colchester and Fay 2007).

10.4.2 Forest Resource Degradation and Intensification of Agricultural and Tree Crop Production

While it is now recognized that the principal causes of forest destruction and degradation in the Southeast Asia region are conversion of forests to permanent agriculture and large-scale plantations for wood, fibre, and commodities such as oil palm (Climate Change Monitoring and Information Network 2009), the practice of

[1] www.asiaforestnetwork.org/tha.htm

shifting cultivation and those who practise it continue to be unfairly blamed for destruction of forests (Cairns 2008).

Of particular concern is the major threat to traditional forest-related knowledge in the region posed by the sustained drive to replace shifting cultivation by permanent commercial agriculture (especially oil palm), accompanied by efforts to deprive the forest dwellers and forest-dependent communities of their decision-making rights. By 2009, oil palm plantation development in Indonesia covered more than seven million ha managed by 600 companies and one million small landholders. There are plans to develop another 20 million ha of oil palm plantation, mainly in forest areas (Sirait 2009).

External influences such as deforestation and forest degradation, development of agricultural crops in the surrounding areas, and depletion of forest resources in the vicinity of forest-dependent communities have resulted in changes in local ways of living. Such changes give rise to new needs and values among local populations that often result in the erosion and loss of traditional knowledge. In the case of Indonesia, oil palm plantation development has already resulted in detachment of indigenous peoples from their customs and cultures because of individualization of ancestral lands, descendant group lands, and household lands. The land conversion process also creates conflicts that damage community solidarity and local institutions (Sirait 2009).

The case of the forests associated with upland rice production in the Philippines further illustrates the threats, issues, and concerns about traditional forest-related knowledge. The owners of 'muyong' forests (Box 10.3) are now practising enrichment planting to enhance depleted muyong areas. Some muyong owners are choosing to use non-native, often fast-growing, tree species for assisted natural regeneration or enrichment plantings to take advantage of their short rotation periods and/or potential future income potential. These include fast-growing exotic species such as *Gmelina arborea,* and *Cassia spectabilis,* or high value species like *Swietenia macrophylla* (planted as in investment for retirement or college education expenses of children and grandchildren). Inclusion of these exotic species may pose threats to muyong biodiversity (due to their high potential for regeneration in disturbed habitats). There have been cases where muyong owners were tempted to clear portions of their woodlots for replacement with such exotic tree species. In some cases, local people cleared muyong forests for tambo or tiger grass (*Thysanolaena maxima*) production, or to implement sloping agricultural land technology (SALT[2]) practices that are completely alien to what the people have been doing in the area for many generations. Consequently, over the past 50 years, the size of the cultivated terraces had significantly shrunk, from 15,000 ha to just about 5,000 ha today. In a 2003 survey, local officials mentioned that one third of the rice terraces in the Barangay of Bangaan in Banaue are already damaged (Cagoco 2006).

[2]SALT is a technology package of soil conservation and food production that integrates several soil conservation measures to minimize soil erosion and maintain soil fertility, and involves planting field crops (such as legumes, cereals, and vegetables) and perennial crops (such as cacao, coffee, banana, citrus and fruit trees) in bands 3–5 m wide between double rows of nitrogen-fixing shrubs and trees planted along the contour (MBRLC 1988; Tacio 1993; Evans 1992).

Box 10.3 Agroforestry Practices and Local Forest Management of the Ifugao in the Philippines

The Banaue Rice Terraces of the Ifugao, a UNESCO World Heritage Site in Ifugao Province in the Cordillera Administrative Region in north central Luzon, have been supported for 2,000 years by indigenous knowledge management of muyong, locally owned agroforests that cap each terrace cluster. These communally managed forests areas are rich in biodiversity (Conklin et al. 1980). The terraces serve as a rainwater and filtration system and are saturated with irrigation water year-round. The Ifugao rice terrace paddy farming system allows protection and conservation of significant and important agricultural biodiversity and associated landscapes, while promoting tourism based on their aesthetic value. All these are made possible by local agroforestry and forest management practices.

Ifugao culture and laws. Ifugao culture revolves around rice, which is considered a prestige crop. There is an elaborate and complex array of rice culture feasts inextricably linked with taboos and intricate agricultural rites, from rice cultivation to rice consumption. Partaking of the rice beer (bayah), rice cakes, and betel nut is an indelible practice during the festivities and ritual activities.

Ifugao's muyong system of management. Muyongs are privately owned forests or woodlots typically up to 5 ha, which are inherited from generation to generation. Muyongs are managed through collective effort under traditional tribal practices and play an important role within the tribal economy. They are the primary source of fuel wood, construction materials, wood carving materials, food, and medicines. The muyong system involves a forest conservation strategy, watershed rehabilitation techniques, a farming systems, and assisted natural regeneration (ANR), all of which are living proof of the Ifugao's knowledge of silviculture, agroforestry, horticulture, soil and water conservation, enrichment planting and protection, and efficient silvicultural, harvesting, and good wood utilization practices.

Agroforestry and multiple cropping. Traditionally, the Ifugaos adopted agroforestry in woodlots and multiple cropping in swiddens as economic insurance in case of crop failure in the terraces. The integration of value-added tree crops and herbs in natural muyong vegetation and swiddens has been found to be highly compatible. Species preferred for enrichment of natural vegetation are mostly rattan, coffee, santol (*Sandoricum koetjape),* and citrus, while bananas, taro, and cadios (*Cajanus cajan*) are integrated into swidden farms (Butic and Ngidlo 2003). Rondolo (2001) found that almost all woodlots contained commercial plantings of coffee (88%), bananas (66%), and citrus (49%). Edible rattan (*Calamus manillensis*) is also included in almost all woodlots. Rattan is integrated in woodlots for its edible fruits and poles/canes

(continued)

Box 10.3 (continued)

for handicraft. Betel palm (*Areca catechu*) and ikmo (*Piper* spp.) are also cultivated in the woodlots for betle nuts, ritual purposes, and medicinal values.

The 'ala-a' system way of forest sustainability. Besides the privately owned muyong, traditional communal forest (ala-a) management is also important. The ala-a are generally located on lands not cultivated as swidden, lands too far from villages to be covered by a private claim, or lands not identified as hunting grounds. The ala-a are communally managed for fuelwood collection, construction materials, food, medicine, and other products that may be used in homes or farms. The use of the ala-a is controlled by consensus that the resource is to be shared, following two basic rules—no burning, and no gathering beyond what is needed for personal use. The ala-a are not used as sources of wood for sale outside the village.

Sources: Conklin et al. (1980), Ngidlo (1998), Dacawi (1982), Klock and Tindungan (1995), Rondolo (2001), Butic and Ngidlo (2003), Elazegui and Combalicer (2004), Camacho et al. (2011).

10.4.3 Erosion and Loss of Traditional Forest-Related Knowledge

The widespread land alienation that accompanied agricultural crop development in Southeast Asia by colonial rulers, nationalization of forests, and expansion of timber industry in the twentieth century have generally brought about the progressive erosion and loss of traditional forest-related knowledge throughout Southeast Asia (Poffenberger 2006). Land alienation and the granting of land concessions by the governments have resulted in removal of extensive native forest areas and forest resources from local management and use.

The colonial period witnessed the creation of 'dual societies' (Boeke 1966), namely a capital-intensive growth sector involving extractive industries, manufacturing, and estate agriculture on the one hand and an 'underdeveloped' subsistence sector on the other. The subsequent expansion of modern commercial agriculture into the subsistence sector saw the erosion and even loss of traditional knowledge. In rural areas, swidden agriculture was maintained in some areas for social and cultural reasons, amidst cash income generation from commercial crop cultivation. Padoch et al. (2007) noted that 'swidden is gradually disappearing in most parts of Southeast Asia.'

Hence, despite their importance in sustaining rural livelihoods, traditional forest-related knowledge and practices are fast disappearing in most Asian countries (Parrotta et al. 2009). The indigenous communities of Peninsular Malaysia of about

150,000 people are also rapidly losing their traditional knowledge as a result of increasing loss of forest areas, integration into mainstream society, urbanization, changing lifestyle, and lesser interests among the younger generation to learn traditional knowledge (Lee et al. 2009; Chai et al. 2008). Consequently, most indigenous communities at present are facing serious difficulties maintaining their traditional cultures, natural resource utilization practices, and traditional forest-related knowledge because of varying degrees of influence from outside economic, social, and cultural forces (Molintas 2004). Traditional shifting cultivation, hunting, collecting forest products, and fishing for livelihood among the aborigines of Peninsular Malaysia has now diversified to include non-traditional activities such as planting of cash crops (corn, fruit trees, vegetables, and rubber) and earning income from nearby oil palm estates (Fadzil and Hamzah 2008).

10.4.4 Modernization and Its Impacts

Colonialism also brought about the spread of formal education to local indigenous communities. While formal education increased literacy in rural communities, it also transformed rural livelihoods as formal education tends to discourage the use of indigenous knowledge and the practice of local traditions. In the Philippines, the Ifugaos are inclined to set aside their indigenous knowledge systems as they gain more education (Save the Ifugao Terraces Movement 2008).

Together with modern education, institutionalized religions have been introduced relatively recently in many areas, displacing traditional religious beliefs and practices, which has changed the manner in which forest resources were perceived, understood, and used at the local level. Formal education erodes traditional knowledge when youth are taught that their parents' religious beliefs, cultural practices, and traditions are 'superstitious,' 'backwards,' or otherwise lacking or inferior, and that their traditional practices are not scientific. Institutionalized religion generally erodes traditional knowledge by denying the existence of the spiritual world and perspective on human relationships with nature that often underlie traditional knowledge and practices. Institutionalized religion (evangelical and Catholic) forbidding traditional practices such as animal offerings among the Ifugaos in the Philippines have resulted in the loss and extinction of rituals (Cagoco 2006). The conversion to modern religion has changed body of knowledge, belief, and customs of affected communities, thus resulting in the neglect and loss of traditional knowledge, values, norms, and practices.

The development and increased availability of modern medical services has reduced the dependence of many rural communities on traditional medicine, as shown among indigenous peoples in Malaysia (Lim 1997; Baharuddin et al. 2009). Expertise in traditional medicine is transferred from one generation to the next through the practices of traditional knowledge, often associated with traditional belief systems. The preference for modern (allopathic) treatments and

medications, especially among the young, contributes to the decline of traditional medical practices.

Changing economic conditions erode traditional practices as youth are more interested in generating cash income from modern agricultural farming and being engaged in wage-earning opportunities in the commercial agricultural and industrial sectors. In general, rural youth tend to migrate to the urban areas seeking employment and income-generating activities. In Thailand, for example, the main factors that play a role in cultural erosion and changes in social and economic activities taking place in upland communities relate to the influences of the external development system that emphasizes commercial economic concepts, religion, and formal education (Charoenniyomphrai et al. 2006).

Contacts between indigenous peoples and the West during colonialism and the successive independence of local societies have intensified the process by which local communities have become less attached to and seemingly less dependent on nature and specifically on forests compared to the past. Many peoples in the developing Southeast Asian countries have felt that the progress to be achieved is measured by the degree of technological achievement imported from the West, the change from a subsistence economy to a market-oriented economy, and the change from the traditional mode of production to the modern mode of production. Many tribes in Indonesia are undergoing a degradation of their practices because of intense contact with outsiders (Boedhihartono 1997).

10.5 The Role of Traditional Forest-Related Knowledge in Solving Contemporary Forest and Associated Agricultural Resource Management Challenges

Despite the varying consequences of external social, economic, and environmental circumstances on local communities, the practice of traditional knowledge persists and has a great potential to continue to contribute to sustainable management of forests and complex agroforest landscapes. The integration of modern development and local forest management based on traditional forest-related knowledge has taken place in a variety of ways in various contexts since the colonial era. It is important to note that many traditional farming practices in Southeast Asia evolved to minimize soil erosion and fertility loss, and to ensure healthy and rapid forest succession. The case of the Ifugao peoples in the mountainous region of the Philippines, discussed earlier (Box 10.3), is an excellent example of the integration of traditional agricultural and forest knowledge and management practices to sustain livelihoods, forest biodiversity, and environmental services over countless generations. Their traditional management systems emphasize environmental preservation and protection against landslides and other forms of erosion, as well as management of woodlots for the supply of needed fuel, construction materials, and irrigation (Conklin et al. 1980).

10.5.1 Agrodiversity Practices

An important means of integrating modern and traditional practices by local communities is through agrodiversity, which is defined as the dynamic variation in cropping systems, outputs, and management practices in agroecosystems. Agrodiversity is characterized by bio-physical differences and the changing ways in which farmers manage diverse genetic resources, natural variability, and their agricultural practices in dynamic social and economic contexts (Brookfield 2001). The success of agrodiversity has been demonstrated in the case of mountains farmers in northern Thailand, who manage agroforest edges to produce medicinal plants, building materials, food plants, and timber in addition to cultivation of modern crops such as cabbage, pepper, carrot, lettuce, tomato, and potato (Rerkasem et al. 2002).

10.5.2 Community/Social Forestry

Over the past few decades, some Southeast Asian governments have initiated forest tenure reforms in favour of customary tenure and management, in recognition of the land claims of indigenous and other local communities, the limits of state forest management, and the growing evidence of the potential of indigenous knowledge and customary management for sustainable forest management. In the Philippines, the previously centralized forest policy has been reformed through the democratization of access to forest land and resources (Pulhin et al. 2008). The Community-Based Forest Management Program (CBFM) was implemented, particularly after the end of Marcos' dictatorial rule in 1986, to tap the potential of people to sustainably manage forest resources and to tackle the problems of inequitable access to forest resources and massive forest depletion. Under the CBFM program, organized upland communities (People's Organizations) receive titles to manage, and benefit from, forest lands for a period of 25 years, renewable for another 25 years subject to certain conditions. Nationwide, thousands of these People's Organizations have received titles for a total of approximately 5.7 million ha through the implementation of this program.

10.5.3 Traditional Forest Protection Strategies

Local forest protection strategies have been applied by local communities in the Philippines. Such strategies, known locally as the lapat (literally, 'to prohibit') system, are implemented by the Isneg and Tingguian people of Abra Province. The lapat is an age-old traditional system of regulating the use of natural resources among the upland tribal communities (Parades 2005) and is passed on from generation to generation. The system involves imposition of taboos within a designated

area (which may be as large as a whole mountain) over a period of time, which prohibits the exploitation of forest resources such as rattan vines, lumber, fruits, animals, fish, and wild vegetables. The lapat enables natural recovery of forests from earlier anthropogenic disturbances, allowing trees and other plants to regenerate and wildlife to reproduce for the benefit of current and future generations. The system is based on customary and local laws whose enforcement is overseen by an organization of the elders (elected or informally recognized) called lapat panglakayen. The lapat penglakayen is authorized to issue permits to cut trees for community use; when timber is transported outside the area or sold for commercial purposes, the Department of Environment and Natural Resources (DENR) issues the permits (Parades 2005). All in all, the practice of lapat and the policies imposed by the DENR blend harmoniously in this region, facilitating implementation of government policies on forest protection.

Such local forest protection strategies are also practised among the Tai and Mong communities in northwestern Vietnam (Poffenberger 2006), where land is held under communal tenure. In these communities, villagers classify forests according to their function, such as old-growth protected areas (Pa Dong), younger secondary forests that are part of long rotation swiddens (Pa Kai), early regenerating forests (Pa Loa), and bamboo forests (Pa). Similarly, in Kompong Phluk Village on the northeastern shores of Tonle Sap (Great Lake) in Cambodia, the community has since 1948 protected the flood forest, which provides habitat for more than 200 species of fish in the lake (Evans et al. 2004).

10.5.4 Co-management of Natural Forests

Application of forest co-management in Southeast Asia is not new. In Eastern Indonesia, the Dutch colonial government and post-colonial Indonesian government promoted kemiri (*Aleurites moluccana*) planting by local communities in reforesting abandoned swiddens and degraded forest areas (Koji 2002). The Southeast Asia Sustainable Forest Management Network Secretariat, based at the Centre for Southeast Asian Studies at the University of California at Berkeley, has initiated a research program on forest co-management, applying community and 'scientific' forest management systems. In Thailand, rural communities and the Royal Forest Department have worked together to regulate access and regenerate access degraded natural forests, as described in Box 10.4 (Poffenberger and McGean 1993). In the Philippines, with the passing of the Indigenous People's Act in 1997, the area of forests under Community-Based Forest Management (CBFM) increased from less than 200,000 ha in 1986 to about six million ha in 2005 (Pulhin et al. 2005), or about 38% of the country's total forest land involving more than 690,000 households (Pulhin et al. 2008). In 2005, community holders of management rights of public forests amounted to 47% in the Philippines, 100% in Timor-Leste, and 2% in Cambodia (FAO 2010).

Box 10.4 Local Community/Forestry Department Cooperation in Forest Management in Northern Thailand

Case 1. The Dong Yai's 12 communities in northeast Thailand are heavily dependent on non-timber forest products to sustain daily livelihoods. The forest resources in the vicinity were under persistent threat as the forest had been periodically cleared by villagers for agriculture during the past 100 years. This motivated villages to take action to ensure sustainability of forest benefits. With the assistance, support, and leadership provided by Tambon Council, the Royal Forest Department's regional office, and researchers at Kasetsart University, local communities led by village elders were empowered to organize local forest protection committees and establish their own use rules and responsibilities. Consequently, the former kenaf (hemp: *Hibiscus cannabinus*) fields established since the late 1950s in Dong Yai are now under community protection and have regenerated into the largest remaining lowland stand of dry dipterocarp forest in the region.

Case 2. In the northern sub-watershed of Nam Sa in northern Thailand, unsustainable land-use practices led to conflicts over land resources use between midland and upland indigenous communities, resulting in rapid forest and environmental deterioration. To reduce social conflicts, micro-watershed land-use committees and resident community group networks were organized. Ecological resource and land-use mapping tools were used to enhance villagers' understanding of the importance of upstream–downstream watershed linkages. The Royal Forest Department and the midland indigenous peoples (Karen, Hmong, and Lisu) worked together to replace their steep-slope swidden practices with upland forest protection and lowland irrigated paddy cultivation. The application of decentralized controls over clearly defined micro-watershed areas by the local villages has reduced the threat of fire, illegal logging, and upland erosion, and has also resulted in impressive natural forest regeneration.

Source: Poffenberger and McGean (1993).

10.5.5 Co-management of Protected Areas Established for Biodiversity Conservation

To complement the modern protected areas, recognition of the indigenous sacred natural sites, even in some official protected areas, could enhance and restore social norms for protection of natural forests important to the spiritual well-being of local communities. There is thus a need to encourage and strengthen the positive contribution of indigenous peoples to the conservation of biodiversity and protected areas (Borrini-Feyerabend et al. 2004a).

The efforts and experiences of the Dayak in East Kalimantan province, Indonesia, provide an excellent example of the integration of traditional and modern forest management. The local communities formed the Alliance of the Indigenous People of Kayan Mentarang Park (FoMMA) in 2000. The park, situated in the interior of East Kalimantan, Indonesia, at the border between Indonesia and Malaysia, is central to the World Wildlife Fund (WWF) Heart of Borneo initiative; the initiative aims to protect the transboundary highlands of Borneo, which straddle the three Southeast Asian nations of Indonesia, Malaysia, and Brunei Darussalam. FoMMA represents the concerned indigenous people in the Policy Board (Dewan Penentu Kebijakan) of Kayan Mentarang National Park, which was set up in 2002 under a Decree of the Ministry of Forestry to preside over the park's management, and includes representatives from the central government (the agency for Forest Protection and Nature Conservation), as well as the provincial and district governments and FoMMA. The operating principles of the Policy Board emphasize coordination, competence, shared responsibilities, and equal partnership among all stakeholders (Borrini-Feyerabend et al. 2004a; Borrini-Feyerabend et al. 2004b). The 2002 Decree dictated that the park was to be managed through collaborative management, indicating the Indonesian government's recognition of customary law in national park management. Similarly, experiments in co-management of national parks are underway in Thailand at the Kuiburi National Park through the establishment of two working groups, namely a core management team comprising park personnel and a park management board working group that includes local people and other stakeholders (Parr et al. 2008).

10.5.6 Climate Change Mitigation and Adaptation

In Southeast Asia, the main direct relevance of traditional forest-related knowledge to climate change lies in its potential to enhance or augment scientific knowledge of forest fire and its management. In the case of Indonesia, recent extensive forest fires have reduced not only forest cover but also the quality of forests and their environmental functions such as carbon sequestration and climate change regulation (Boer 2002). The smoke and haze from these fires have affected the health of people, not only in Indonesia but also in neighbouring countries.

There is a growing appreciation that forest-dependent communities have relied and continue to rely on traditional knowledge and skills to protect forests against fire. In Thailand, for example, practices using traditional knowledge that are widely used in fire management include creating fire lines around homes and temples, using backfires to stop approaching fires, and controlling the spread of fire to minimize destruction of community properties (Makarabhirom et al. 2002).

Local forest management practices to reduce the incidence of forest fires was illustrated in the case of Vietnam, where the government made the decision to improve forest management and protection in 1993 by allocating forestlands to organizations, households, and individuals for long-term sustainable forest uses.

Villagers' efforts to prevent logging, grazing, and land clearance by burning and other damaging activities in forested areas have benefited communities tremendously. They actively reduced fuel loads and practise sustainable agriculture. Consequently, forest cover increased with regeneration and the incidence of forest fires has decreased (Linh 2002).

However, the application of local traditional forest-related knowledge to prevent and control forest fires in East Kalimantan, Indonesia, has had limited impact as governmental and private company interests generally take priority over community needs. In the long run, it is necessary to apply traditional knowledge in combination with scientific knowledge of fire behaviour and fire management technologies (Boer 2002).

While traditional forest-related knowledge may be very important to climate change mitigation and adaptation, a key concern, or question, is how best to create synergies for the benefit of forest-dependent communities between the use of their traditional knowledge on forest management and the evolving international efforts such as REDD (Reducing Emissions from Deforestation and Forest Degradation). Despite the potential carbon and biodiversity conservation benefits of these emerging opportunities, current formulations of REDD programs are viewed by many as having severe potential negative impacts on indigenous peoples. For example, since only forests that are immediately threatened to be destroyed or degraded would be considered under REDD, this could actually encourage deforestation and subsequently the erosion and loss of land rights, livelihoods, and traditional forest-related knowledge of local and indigenous communities (Climate Change Monitoring and Information Network 2009; Rai 2009). The challenge then is to achieve a win-win situation where local and indigenous communities can play a specific role in mitigating climate change without losing their rights, livelihoods, and traditional forest management practices.

10.5.7 Use of Expert Farmers to Promote Indigenous Knowledge and Forest Conservation

Promotion of indigenous knowledge and technical practices must follow a 'bottom-up' approach, rather than conventional extension approaches to introduce technologies. Farmers typically possess superb understanding of and good skills in management of natural resources and are often successful in responding to natural and social changes (Brookfield 2001). A good example of collaborative research on farmers' management of natural resources is the United Nations University's recent People, Land Management and Environmental Change (PLEC) project. Implemented from 1999 to 2002, the project has created a national farmer-to-farmer training program, known as the Farmers' Field School project, for tribal communities in northern Thailand (Rerkasem and Fuentes 2002).

Scientific evaluation of these farmers' practices has found that they are both profitable and environmentally friendly (Rerkasem 2003). Therefore, it is best to enlist these expert farmers to teach others about local knowledge and practices. The teaching by expert farmers does not mean simple extension or replication, but instead aims to explain local knowledge in both social as well as technical respects

and to show how local knowledge facilitates the expert farmers' rational decisions in resource management. Such 'learning from expert farmers' can occur through informal exchanges or formal meetings, and the organization of learning activities can be facilitated directly by outsider researchers or through farmers' associations. Through the PLEC project discussed above, many researchers, technicians, and officials who had previously looked down on farmers' practices have come to respect these farmers' knowledge and innovations. The learning process from farmers has also raised farmers' self esteem and enabled them to feel more responsible for resource conservation.

10.6 Conclusions and Recommendations

Rich in both biological and cultural diversity, the tropical forests in Southeast Asia and the socio-economic and ecological goods and services they provide are important for human survival at local, national, and international levels. Over the past few decades, traditional forest-related knowledge and practices in this region have been changing rapidly in response to myriad external economic, social, cultural, political, and demographic changes. Such changes are also threatening traditional practices and sustainable forest management.

Despite these changes, the experience of Southeast Asian countries in involving local communities in forest management may provide some insights and hope for long-term forest management. Indigenous forest management systems could provide important insights and tools for promoting forest sustainability. By involving local people in forest management activities, villagers can become local custodians of forest genetic resources, as shown through the experience of a number of effective partnerships between local communities and government agencies for the protection, conservation, and management of forests in the region.

The future of sustainable forest management in Southeast Asia lies in the partnership between 'scientific' forest managers and local forest-dependent communities. These communities are in an appropriate position to protect their forest resources, because the villagers depend on these resources to meet their social, economic, cultural, and religious needs. Based on these examples from Southeast Asia, achievement of sustainable forest management should give serious consideration to community-based development strategies. However, if local communities are to play a greater role in managing forests, a greater degree of authority over forest management and utilization needs to be shifted back to them.

Governments worldwide that are signatories to international agreements such as the Convention on Biological Diversity (CBD) and UN Convention to Combat Desertification (UNCCD) have recognized and agreed that forests need to be managed sustainably to ensure planet Earth's health and human survival. It is essential to incorporate local traditional knowledge in forest management in view of changing forest management paradigms (from an emphasis on timber yield to sustainable

multipurpose forest management) and market demands for implementation of forest certification that requires respect for traditional use rights of local communities and protection of their sites of economic, cultural, and religious significance (Lim 2008). Forest policies based on the notion that local communities are ignorant and destructive need to be re-examined and changed (WRM 2002a). Forest-dependent communities who still possess their rich traditional knowledge and wisdom regarding ecosystem function and sustainable management practices clearly have a role to play in sustainable forest management in Southeast Asia.

The first step to be taken by governments in Southeast Asian countries is to mainstream traditional forest-related knowledge in policy formulation with regards to sustainable forest management. While most governments in the region have laws that respect and recognize the rights of indigenous peoples, the unfortunate reality is that their management of forest resources is mainly confined to customary lands outside of protected forest areas and forest reserves. It is time for governments to adjust their policies for sustainable forest management, and to develop and implement appropriate strategies to combine the application of traditional forest-related knowledge with scientific forestry to ensure better management of forests for present and future generations.

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