Chapter 9
South Asia

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Abstract Forests of the South Asian region, including major 'hotspots' of biodiversity, have been sustainably managed for generations by ethnically and culturally diverse traditional societies. The rich traditional forest-related knowledge possessed by the traditional societies in the region is closely linked to cultural diversity as well as to biodiversity in all its scalar dimensions (i.e., genetic, species, ecosystem, and landscape diversity). This knowledge, generated through an experiential process, has ensured sustainability of diverse forested ecosystems as well as livelihoods of forest-dependent communities. In recent times this knowledge base has been severely eroded, due in large part to deforestation and associated land degradation, processes

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triggered by forces external to traditional socio-ecological systems. Successful efforts have been made towards conserving traditional forest-related knowledge and linking it with formal scientific forest knowledge to develop 'hybrid technologies' relevant to sustainable forest management. To facilitate this process, it has been helpful to elucidate broad, generalizable, principles of traditional forest-related knowledge, rather than viewing this knowledge stream as 'local knowledge.' One such key principle that has contributed towards community participation in sustainable forest management initiatives relates to socially valued species that typically have important ecological keystone values. The protected 'sacred groves' that are abundant in the region are important learning sites both for understanding ecosystem dynamics and as a resource base for sustainable forest management practices. This is the context in which emerging institutional arrangements in the South Asian region, such as community forestry, joint forest management, and forest user groups are to be seen.

Keywords Biodiversity • Collaborative forest management • Cultural landscapes • Forest history • India • Nepal • Non-timber forest products • Sacred groves • Shifting cultivation • Traditional knowledge

9.1 Introduction

South Asia—which includes Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka—is the home of more than 20% of the world's population and is renowned for its rich cultural diversity. The region's high population growth, along with its rapidly expanding industrial economy, is placing increasing demands on an already stressed natural resource base, including its forests. World Bank (2005) estimates suggest that by 2050, South Asia's population is likely to exceed 2.2 billion; an estimated 600 million people live below the poverty line (on less than US$ 1.25 a day) in 2000, a substantial proportion of those being located in the forested areas of the region. Ongoing deforestation in the region, and the expected impacts of climate change on forest ecosystems and agroforest landscapes, will be felt most directly by the already impoverished sectors of society, particularly those in traditional communities living in the forested areas.

The population of forest dwellers in South Asian region is estimated to be between 120 and 150 million, of whom up to 90 million (World Bank 2005) constitute traditional societies generally referred to in the region as 'tribals.' In India alone are 427 distinct ethnic groups officially designated as 'scheduled tribes' comprising 7.8% of the country's total population according to 1981 national census data (Dube et al. 1998). Largely confined to hilly terrain and mountains, the population densities of forest-dwelling communities are generally very low, and particularly so in Bhutan. As an integral part of the forested landscape, they depend on local natural resources for their livelihood needs. In addition to these forest-dwelling communities, another 350–400 million people are directly dependent on forests for products and various ecological services (Poffenberger 2000).

The South Asia region is characterized by a rich cultural diversity. According to the Anthropological Survey of India there are 91 eco-cultural zones inhabited by 4,635 major communities, speaking more than 1,500 languages or dialects in India alone.[1] This includes the 645 officially recognized scheduled tribes mentioned above. Thousands of endogamous groups and sub-sects are structured around the Hindu caste system, which also contributes to the extraordinary cultural diversity of India that is indicative of the richness of the region as a whole (Dube et al. 1998). The majority of those who live in forested areas still hold and follow a variety of nature-based religious beliefs and practices, even if they are adherents of other religious belief systems such as Hinduism, Islam, Buddhism, Sikhism, and Christianity. The richness in cultural diversity in the forested areas is matched by an equally diverse range of subsistence-based natural resource use practices, including hunting, gathering, shifting cultivation, traditional settled farming, and nomadic herding. As a result of 'modernization' and many decades of external social, economic, and political influences, energy-subsidized and intensive agricultural practices such as plantation crops are now common, especially in areas closer to urban centres.

The region's cultural diversity extends throughout the broad range of eco-climatic zones found in the region, from the humid tropical evergreen rainforests, sub-tropical deciduous forests and dry desert scrub jungles at lower elevations, to sub-temperate, temperate forests, alpine scrub jungle, and meadows at higher elevations. Such an eco-culturally diverse environment has contributed towards the development of rich bodies of traditional forest-related knowledge, often referred to as 'local knowledge,' that forest dwellers continue to value. This knowledge base is now gaining more and more recognition and credibility as the basis for expanding community involvement in forest conservation and management in the region.

Given that policy planners and developmental agencies emphasize regional planning processes for conservation-linked management of natural resources for livelihood development in rural societies, one cannot afford to look at small location-specific socio-ecological systems as isolated entities. In other words, for a viable regional planning process towards conserving and indeed sustainably managing forests, it becomes necessary to arrive at generalized principles regarding traditional forest-related knowledge, so that this knowledge and associated practices may be effectively linked with those arising from formal scientific forest knowledge application on a regional scale. This is the context for the following discussion on the history and current status of forests and forest management in the South Asian region. In this discussion we will consider diverse pathways that may be used to link the two knowledge streams for sustainable management of forests and associated agricultural systems, with concern for the food security of all stakeholders and of the forest-dwelling communities in particular.

Linking knowledge systems as the basis for sustainable forest management is indeed complex, particularly since traditional forest-related knowledge, unlike

[1]The 1991 Indian census recognized 1,596 'mother tongues,' of which 114 had more than 10,000 speakers.

formal scientific forest knowledge, has a certain degree of location-specificity and includes socio-ecological and socio-cultural dimensions with tangible and intangible values. Linking knowledge systems at the socio-ecological process level poses additional challenges, although the South Asian region has had some experience with this since the early 1970s in the context of sustainable forest management in the shifting agricultural landscapes (Ramakrishnan 1992a). In this chapter, we will highlight both traditional forest-related knowledge (TFRK) and associated agricultural system management systems based on that knowledge, examples of generalized formal scientific principles that can be learned from these traditional practices, and selected examples of how traditional knowledge may be combined with formal scientific knowledge in 'hybrid technology' formulations for effective community-based sustainable forest management.

9.2 Forests of South Asia: The Socio-Ecological Context

9.2.1 Regional Overview—Forest Ecosystem Diversity and Extent

The countries of South Asia are endowed with rich, though shrinking, forests resources. According to FAO statistics, the total forest area in the region was estimated to be 79.2 million ha, or 2.0% of the world's total (FAO 2009) (Fig. 9.1). The region's remaining forests are concentrated in the Himalayan region from northern Pakistan and northwestern India through Nepal and Bhutan to Arunachel Pradesh (in India), and in other higher elevation areas of northeastern India and southeastern Bangladesh, central and eastern regions of India, the mountainous Western Ghats of India from western Maharashtra to southern Kerala and Tamilnadu, and in Sri Lanka.

The complexity and diversity of the region's geologic history, soils, topography, and climate have given rise to a tremendous diversity of tropical, subtropical, temperate, and sub-alpine forest ecosystems of exceptionally high plant and animal species diversity (Champion and Seth 1968; Stainton 1972; de Rosayro 1950). A variety of tropical forest types (tropical wet evergreen, semi-evergreen, and moist deciduous) are found at varying elevations in Sri Lanka; in the Andaman Islands, and India's Western Ghats and northeastern states; and in Bangladesh. Extensive (though rapidly disappearing) mangrove forests are found in the coastal Sundarbans of Bangladesh and West Bengal (India) and in isolated patches on both the eastern and western coasts of India, and in Pakistan. Tropical dry deciduous, thorn, and dry evergreen forests occur in the sub-Himalayan regions of Pakistan and in central and southern peninsular India. Subtropical broadleaf, pine (coniferous), and dry evergreen forests occur at middle elevations in the western and central Himalayas from Pakistan eastwards through northern India, Nepal, and Bhutan; and in isolated locations in northeastern India, Rajasthan, and southeastern India. Wet, moist, and dry temperate broadleaved and evergreen (coniferous) forests are common at higher

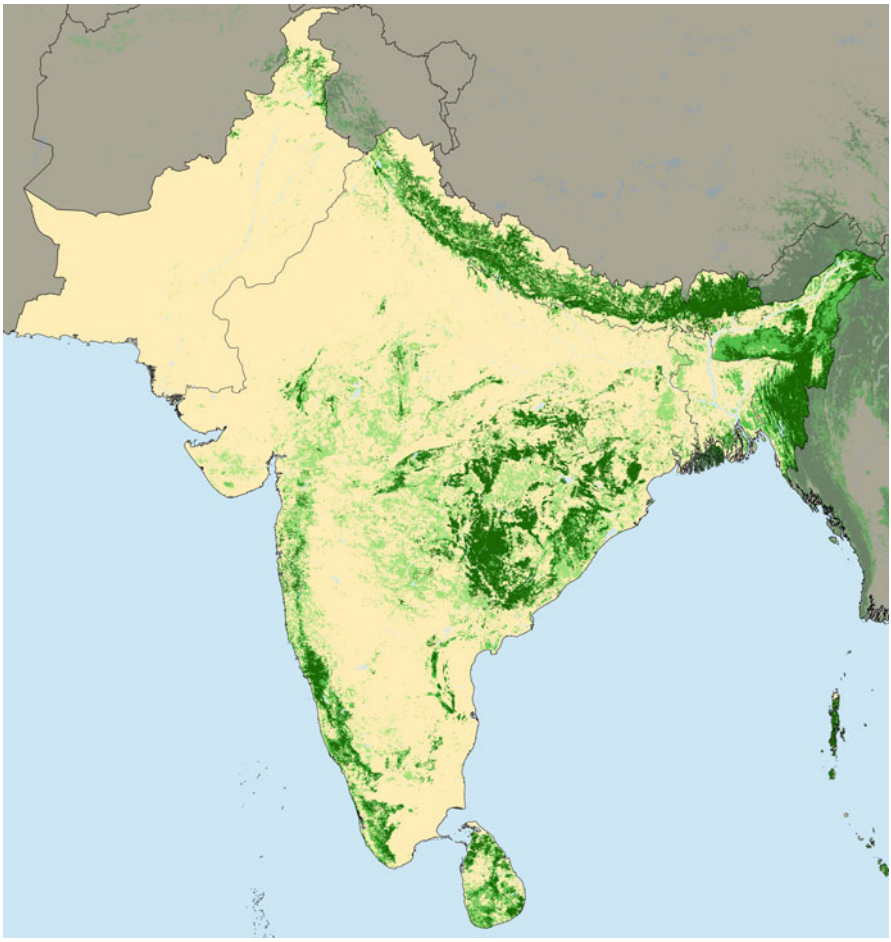

Fig. 9.1 Forest and woodland cover in South Asia (Source: Adapted from FAO (2001)). Key: *Dark green* closed forest, *light green* open or fragmented forest, *pale green* other wooded land, *yellow* = other land

elevations of the Himalayan region from northern Pakistan southeastwards through northern India, Nepal, and Bhutan to high elevation sites in Arunachel Pradesh (India). Finally, subalpine and alpine forests occur in the Himalayan region at elevations above the temperate forest zone.

According to FAO estimates for the period 1990–2000 (FAO 2001), the region as a whole has had a negative rate (0.13% per annum) of forest cover change. Forest cover in Bhutan and Maldives remained roughly the same during this period; it increased in Bangladesh and India but decreased in Nepal, Pakistan, and Sri Lanka. Plantation programmes contributed to the increase in forest cover within the region, the preferred species being teak (*Tectona grandis),* Indian rosewood *(Dalbergia sissoo*), and/or exotic Eucalyptus. While forest cover loss has generally slowed in

many countries during the past 20 years in comparison with periods of very rapid deforestation during the nineteenth and particularly the twentieth centuries, the estimated annual losses remain high (1.3–1.9%) in some countries, notably Nepal, Pakistan, and Sri Lanka. In any case, the forest cover in the region, according to more recent assessments of FAO (2009), ranges from a low of 2.5 and 6.7% of the total land area in Pakistan and Bangladesh, respectively, to a high of 68% in the Himalayan kingdom of Bhutan, with India (22.8%), Nepal (25.4%) and Sri Lanka (29.9%) lying between these extremes. Per capita forest area in the region varies widely among countries, from 0.006 to 0.012 ha in Bangladesh and Pakistan to 4.93 ha in sparsely populated Bhutan (Table 9.1).

9.2.2 The Present Status of Forests

While most of the region's forests have been used and managed for a variety of purposes (such as wild foods and other non-timber forest products, shifting agriculture, forest grazing of livestock, and timber extraction) for centuries, if not millennia, the intensification of these uses during recent generations has resulted in extensive loss of forest cover (Chokkalingam et al. 2000), and expansion of degraded forests dominated by weedy species, including invasive alien species that now cover vast tracts of land (Ramakrishnan 1991).

Regardless of their condition, the region's forested landscapes are the home of most of the region's 'traditional societies.' In India alone these communities represent a substantial segment of the population, and include communities who are classified by the government as 'tribal,' as well as many other communities who are not included in this political category but nonetheless live as an integral part of the forested mountain ecosystems of the country. The near-term subsistence livelihood needs of these marginalized traditional societies are under constant threat given their direct or indirect dependence upon forest resources. Recognition of this reality has important implications for sustainable forest management in the region. Given the long predominance of secondary forest formations in the region, much of the forest-related knowledge possessed by traditional societies is largely derived from their long experience in the management of these secondary forests. A comparative analysis of shifting agricultural forested landscapes conducted in northeast Indian, where fallow cycles range from 5 to 60 years, is illustrative of this (Ramakrishnan 1992a).

9.2.3 The History of Forest Degradation and Its Consequences

The natural vegetation of South Asia has been subject to human disturbances of varying intensity during the thousands of years of recorded history in this region. From the Vedic period (ca. 1500 BC) through the until the early sixteenth century, human population densities and rates of natural resource exploitation appear to

Table 9.1 Forest cover change in South Asian region (1990–2000)

	Land area	Forest area in 2000					Forest area change 1990–2000	
		Natural forest	Forest plantation	Total forest				
Country	000 ha	000 ha	000 ha	000 ha	%	ha/ capita	000 ha/ year	%
Bangladesh	13,017	709	625	1,334	10.2	n.s.	+17	+1.3
Bhutan	4,701	2,995	21	3,016	64.2	1.5	n.s.	n.s.
India	297,319	31,535	32,578	64,113	21.6	0.1	+38	+0.1
Maldives	30	1	–	1	3.3	n.s.	n.s.	n.s.
Nepal	14,300	3,767	133	3,900	27.3	0.2	−78	−1.8
Pakistan	77,087	1,381	980	2,361	3.1	n.s.	−39	−1.5
Sri Lanka	6,463	1,625	316	1,940	30.0	0.1	−35	−1.6
Total	**412,917**	**42,013**	**34,652**	**76,665**	**18.6**	**0.1**	**−98**	**−0.1**

Source: FAO (2001). n.s. = not significant, indicates a very small value

have been relatively low compared to today (Erdosy 1998; Allchin 1998). While available information on the ecological history and particularly pre-colonial deforestation in South Asia is limited, studies examining the period from 500 BC to 1500, and particularly from 1600 to 1760, suggest that on the Indian subcontinent there were periods of rapid forest loss (Gadgil and Guha 1992). Extensive deforestation took place in the Indus and Ganges river basins and in semi-arid regions during very early periods, and further forest loss appears to have been taken place during periods of military expansion of pre-colonial kingdoms (Filiozat 1980; Lal 1985; Grove 1995).

Starting in the late eighteenth century, intensive commercial exploitation of teak, sal (*Shorea robusta*), and other valuable tropical timbers was initiated to supply European and, to a lesser extent, local markets for shipbuilding materials. The struggle for colonial domination of India between England and France in the late eighteenth century, which shifted from Bengal to the Malabar coast during this period, was spurred by competition for control of peninsular India's forest resources to meet the needs of these countries' shipbuilding industries following the decimation of their domestic forests and loss of their North American colonies (Grove 1995). In the case of the Terai forested region of Nepal, however, during this period, exploitation of forest wealth remained centred around a few ruling elites (Malla 2001; Gautam et al. 2004).

During the nineteenth century, the pace of deforestation accelerated first with the expanding influence of the East India Company over India's forest resources and later under direct British colonial rule (over present-day India, Pakistan, and Bangladesh), when administrative and land-use policies were established that usurped traditional land tenure arrangements and long-established forest utilization practices. These new policies resulted in centralized government control over the majority of India's forests to promote logging, develop roads and railroad systems, and expand India's permanent agricultural land base. Despite the introduction of modern (European) forest management practices intended to balance forest protection and commercial production in the late 1800s, India's forest area steadily declined during the first half of the twentieth century because of official disregard of timber cutting limits established for reserved and protection forests, illegal logging, and pressures from traditional forest users (Gadgil and Guha 1992). In Nepal, unlike India, a centralized forest service was not established until the 1950s. Consequently, local Nepalese communities lost control over the management of their forests for a much shorter period during the latter half of the twentieth century than was the case in India.

India's rapidly growing population and the demands of its agricultural and industrial development plans since 1947 have further eroded India's forest wealth. Expansion of permanent agriculture, often into marginally productive forest areas; construction of new roads and hydroelectric facilities; expansion of coal, iron, and bauxite mines; and the cumulative daily pressure of millions of rural communities that rely on a shrinking forest resource base for fuel, fodder, grazing land, and innumerable non-wood forest products have all contributed to reductions in both the extent and quality of the country's remaining forests.

In the development of forest policies in the South Asian region, local communities living within the forests have often been blamed by government agencies, usually unfairly, for mismanagement, over-exploitation, and degradation of forest resources. Consequently official perspectives on sustainable forest management are often based on incorrect premises. For example, extensive research in northeastern India showing that farmers practising shifting cultivation are not the primary causative agents for deforestation and land degradation, suggesting that a very different perspective is needed to evaluate sustainable forest management practices and policies in shifting agricultural landscapes (Ramakrishnan 1992a, 2008a).

During the colonial period, and subsequently, the dominant approach of state forestry authorities was to promote plantation forestry in areas where the natural forest cover had been destroyed. In the central Himalayan region, for example, large-scale wood extraction of timber from natural mixed oak forests began in the 1840s and 1850s, arising from increased demand for timber by government agencies for developmental works in the plains regions. With increasing state control, large-scale timber extraction from natural forests continued until the early 1920s (Dangwal 2005). Over time, extensive oak-dominated mixed forests in the central Himalayan region were converted into pine plantations and/or secondary forest formations (Sinha 2002). Deforestation in the Chittagong hill tracts of southeastern Bangladesh, as well as in as in the northeastern hill areas of India, has resulted in expansion of secondary successional bamboo forest formations in areas used for shifting agriculture (commonly referred to as *jhum* in this region (Ramakrishnan 1992a)).

The assertion that governmental policies and market pressures have been the primary drivers of deforestation and land degradation was reinforced by the results of a comprehensive set of Tri-Academy-sponsored studies involving India, China, and the United States (Wolman et al. 2001). The conclusions of these studies were supported by a global analysis done on land use and land cover change (Lambin et al. 2001). These studies strongly suggest that communities living in the forested areas are, at worst, proximal drivers of land use/land cover change only at the local level.

Human impacts on forested ecosystems of varying intensities and frequencies have occurred for centuries, and considerably longer, in most of the South Asia region. It is therefore not surprising that much of the traditional forest-related knowledge possessed by tribal and other communities who depend on forests for their livelihoods is connected with the extensive, diverse, secondary forest formations found in the region, since people in these communities have long managed such forests and their biodiversity for meeting their survival needs (Ramakrishnan 2008a, b). Much of the traditional knowledge that local communities possess tends to be largely centred around socially valued early-successional tree species, typically fast-growing species with narrow crown forms (Boojh and Ramakrishnan 1982a, b; Shukla and Ramakrishnan 1986) that allow good light penetration beneath their shade for sustaining traditional agriculture on which forest dwellers depend for their food security.

9.3 History of Traditional Forest-Related Knowledge

Traditional societies of South Asia practise a wide variety of natural resource (including forest) use systems that have evolved over centuries, adapting to diverse and often changing local environmental conditions. While the origins of traditional forest-related knowledge in South Asia certainly predate the first settled agricultural communities that appeared in the region about 10,000 years ago, the *documented* history of traditional forest-related knowledge in South Asia can be broadly considered in three phases: (i) the pre-colonial era from the Vedic period (ca. 1500–500 BC) until the end of the Muslim period in the mid-nineteenth century, (ii) the colonial era of the British Empire (1864–1947), and (iii) the contemporary era since the mid-twentieth century.

9.3.1 The Pre-Colonial Era (1500 BC to Mid-Nineteenth Century)

While there is evidence of human activity of Homo sapiens as long as 75,000 years ago, little is known about the forest utilization practices of peoples who inhabited the South Asia region prior to the Vedic period (ca. 1500–500 BC), ushered in by the mainly pastoralist Aryan tribes who migrated into the region from Central and Western Asia, presumably during the last centuries of the Indus Valley Civilization (3300–1300 BC). The Vedic Civilization, which eventually exerted control over much of the Gangetic plain, provided the earliest records of how people of the region viewed forests. According to *Vedas* (the earliest Sanskrit literature and oldest scriptures of Hinduism), forests were worshipped as Vanaspate, literally meaning 'Oh Lord of the Forest' (Vannucci 1993).

Throughout the pre-colonial phase, clear-cut ethnic boundaries remained in a state of flux, with geographical movement occurring over long distances, particularly among shifting agriculturists or communities practising nomadic pastoralism or transhumance (Sivaramakrishnan 2009). Even small endogamous groups generally did not occupy the same location for long periods of times and did not have exclusive delineated natural resource access and use rights (Guha 1999; Cederlof and Sivaramakrishnan 2006).

With the emergence of Buddhist and Jain cultural identities, and their political dominance from the sixth century BC onwards, rulers of kingdoms and empires during this early period enforced measures to protect animal life through protection of their forest habitats. Generally speaking, consistent with Buddhist and Hindu religious traditions, forests during this phase were commonly viewed as spiritual abodes, and special efforts were made to delineate specific forest areas to provide protection to wildlife (Karan 1963; Thapar 2001; Rangarajan 2002; Cederlof and Sivaramakrishnan 2006).

Between the late seventeenth and mid-nineteenth centuries, extensive forest areas under the control of Muslim rulers (Mughals) were protected as royal hunting preserves, which had implications for wildlife conservation. While villagers practising

settled agriculture in forested areas during this period were granted usufruct rights, access to the forests was controlled by the community leadership. This situation existed throughout much of India as well as in Bangladesh, Nepal, Pakistan, Sri Lanka, and Bhutan.

In general, the rural landscape of the Indian sub-continental region prior to the eighteenth century included large areas of secondary forests with discrete and discontinuous patches of old-growth forests, and savannahs. The population density in India during most of this period is estimated to be relatively low (35 persons/ km^2), increasing to about 70 persons/ km^2 by 1881 (Guha 2000). On the basis of available descriptive information, Trivedi (1998) estimated that during the Mughal period (1526–1850), forest cover may have been somewhat more than 50% in the more populated Indo-Gangetic plains of the Indian sub-continent, and conjectures that in other parts of India and other regions of South Asia it may have exceeded 60% of the land area. Richards et al. (1985) suggests that in the last quarter of nineteenth century, about 33% of India was cultivated, 33% was forested, and about 20% of land was grassland or savannah.

Commercial agriculture did not emerge until the beginning of the nineteenth century (Ludden 2002; Rangarajan 2002), when intensified traditional agricultural practices were promoted, based on well-developed tank (reservoir) and canal irrigation networks that supported diversified farming systems for cereals, vegetables, oil seeds, and other crops (Ludden 2002), and a network of production centres and distribution networks. The increased concentration of political authority and land-based economic activities during this period suggests that vast tracts of land were temporarily depopulated or only sporadically used by nomadic groups, and that extensive farming resulted in net increases in patchy wooded areas well into the nineteenth century (Sivaramakrishnan 2009).

While most regions of South Asia followed the patterns discussed above, the case of Bhutan, though analogous in many respects, also differs from the perspective of land ownership and user rights. The unified kingdom of Bhutan came into existence only in the early seventeenth century, when the lama Ngawanag Namgyal defeated three Tibetan invasions, subjugated rival religious schools, and established himself as ruler (Shabdrung) over a unified ecclesiastical and civil administration system. Prior to this time the country was dominated by a number of 'valley'-based kingdoms ruled by hereditary kings, chiefs, or lamas (Karan 1963; Aris 1979). After Ngawanag Namgyal's death, divisions within the kingdom eroded the power of the shabdrung until 1885, when Ugyen Wangchuck once again consolidated power.

9.3.2 The Colonial Era

Early British colonial land management policies viewed forests as both a source of raw materials and areas for agricultural expansion. The advent of railways, specifically the increased demand for timber for their construction, dramatically changed forest utilization patterns in the region. Railway requirements for wood and selective

harvesting of valuable timber like *Shorea robusta*, for example, degraded the entire northern hills and forested plains (Richards and Tucker 1989).

During the nineteenth century centralized forest management was seen by the British imperial rulers as a necessity, which led to the creation of the Imperial Forest Department in 1864. The British rulers during this period also asserted state control over remaining forested lands, and assigned ownership of all cultivated lands falling within the otherwise forested landscape. British control and management of forests from the mid-nineteenth century until 1947 in most parts of present-day India, Pakistan, and Bangladesh, marked a break from the pre-existing patterns of forest control and management. The creation of a separate forest service by the British colonial government, and related legal measures initiated by it during this period, conferred significant powers to the newly constituted forest departments. This led to the creation of separate 'reserved' and 'protected' categories of forests, supported by formal science-based silvicultural 'working plans' for each of the management units of state-owned forests.

Subsequent to the creation of a state forest service, forest dwellers were used as labour to clear the forest, and allowed to cultivate in the cleared land and take care of the introduced teak saplings, enabling the locals to cultivate the land from seedling growth till the canopy closed. They were then moved to another forested site to start the process all over—the taungya system of forest management, which could be viewed as a compromise approach towards shifting agriculture, prevalent at the time. The forest department reasserted control over and reforested the land with tree plantations of high timber value such as teak. In the context of state-sponsored forestry, the taungya system of community participation has to be seen as an important milestone in the recognition of community forest rights.

While the British are generally credited with initiation of the taungya system of community participatory forest management, it appears that this practice pre-dated their arrival. Local Karens from the Tonze forest of northern Burma had already been raising teak as part of their traditional fallow management practice, which perhaps was adopted by the British when they gained control of these lands (Blanford 1958; Gadgil and Guha 1992). This same taungya system of forestry is practised by the local ethnic minorities living in the high mountain areas of Yunnan (in China) that border Arunachal Pradesh State in India. In Yunnan, these practices have existed for at least three centuries before the British came into the region, suggesting that this knowledge is indeed, traditional (Menzies 1998). Unlike the British, who emphasized teak plantations, the Chinese ethnic minorities cultivate a multipurpose species preferred by the community, *Cunninghamia lanceolata*, for rehabilitating *Imperata cylindrica*-infested grasslands. This traditional wisdom of the local people was based on a combination of ecological, social, and economic considerations. What is implied in this traditional approach to taungya is that tree selection should be based on community values. More recent attempts made in the Darjeeling Himalaya by foresters to introduce tree species of high timber value, in an attempt to revive the taungya system, have not succeeded (Shankar et al. 1998).

The rural populations that had previously depended on forests and managed them in a more-or-less sustainable manner experienced an erosion of their traditional

forest use rights, and contributed to the over-exploitation of forests now owned by the colonial government. This, combined with excessive harvesting of timber by the state, led to widespread forest degradation.

9.3.3 The Contemporary Era

The post-colonial governments (after 1947) maintained the forest policies created by the British. It is estimated that in more recent times, deforestation rates have been between 1% and 3% per year in Bangladesh, Pakistan, Nepal, and Sri Lanka. In India alone the rate of deforestation was estimated to be about one million ha per year between 1970s and 1980s (Poffenberger 2000).

These drastic changes in forest ownership, control, and management, begun by the British and continued by post-colonial governments in the region, also led to large-scale displacement of forest-dependant people and controversial conversions of natural forests to monocultural plantations of commercial tree species, as in the case of pine plantations in Bastar in central India. These policies and practices have sparked much public debate on state forest policies, particularly in India (Gadgil and Guha 1992).

With much of the natural forests of the region either converted to permanent agriculture or otherwise degraded to varying degrees, the 'biosphere reserve' concept—developed in the 1970s through UNESCO's Man and the Biosphere Programme (Batisse 1982)—has emerged as a useful model for integrating conservation of biological and cultural diversity while promoting sustainable economic and social development of cultural landscapes based on traditional values, local community efforts ,and conservation science, particularly in the 'buffer zones' of protected areas (Ramakrishnan et al. 2002). Government agencies responsible for forest conservation in all countries of the region are becoming increasingly aware that the forest management principles that are valid for 'buffer zone' management of nature reserves could be the basis for managing other forest areas that are not part of protected area networks. Leading this process were India's policy changes that resulted in 'joint forest management' initiatives (Gupta 2006), to be discussed further in Sect. 9.6.

There is also a growing realization in the region amongst all forest stakeholders, particularly environmental activists, that humans are an integral part of the cultural landscapes they have been created over generations, and that accepting this reality could effectively address sustainable conservation of what still remains of the region's biodiversity 'hotspots.' Building bridges between 'nature' and 'culture,' particularly in situations where traditional societies live, has emerged as one of the priorities arising from recent debates over conservation. Indeed, there is a rapidly developing environmental activist movement to conserve and/or recreate 'nature' around human settlements, even in urban centres (Ramakrishnan 2008a, b, Shutkin 2000). In these efforts, non-governmental environmental activists in the region, both national and international, are playing key roles in creating broader public

environmental awareness. Of late, there has also been increasing efforts towards rediscovering and conserving the traditional institutional arrangements that have contributed, or could contribute, towards the integrity of forested cultural landscapes (Maurer and Höll 2003).

9.4 Conservation of Forested Cultural Landscapes Through Traditional Forest-Related Knowledge and Practices

Traditional local institutions that governed resource use in the pre-colonial and colonial eras can still be found in many locations. These include, for example, the Kipat system of forest management of the Rai and Limbu communities of Nepal, the Shingo Nua system of the Sherpas in the Everest Himalayan region of Nepal, and the Sokshing (woodlot for collection of leaf litter) system of the Bhutanese (Wangchuk 1998). All of these are participatory approaches for non-timber forest resource use by local communities, though governmental agencies retain decision-making powers regarding timber production and harvest. However, many non-governmental activist groups are working towards a better integration of non-timber forest product-related issues (which have been delegated to forest dwellers) with timber production-related issues that are pursued by the foresters. The following case studies are illustrative of the forest dwellers' viewpoints in which the concept of 'forested cultural landscape' bridges 'nature' and 'culture,' a perspective that is now serving as a basis for community participatory sustainable forest management, moving beyond the conservation vs development 'dilemma', and towards conservation linked sustainable development.

9.4.1 Conserving the Demojong Cultural Landscape in Sikkim Himalaya

The Demojong is a sacred landscape located in the west Sikkim Himalaya. Connected to the Buddhist Tibetan belief system, it has well-defined boundaries, and is supported by a traditional institutional system. It is a landscape rich in biodiversity, extending from the snow clad peak of Khangchendzonga through Alpine meadows interspersed with rhododendron scrub jungle, to conifer and mixed evergreen forests, and finally into sub-tropical rainforests (Ramakrishnan 2003). There are a number of glacial lakes in the alpine zone that feed the sacred river Rathong Chu that runs through the landscape (Fig. 9.2). The soil, the water, the biota, the visible water bodies, the river, and the less obvious notional lakes on the river bed, along with many monasteries and temples, are all held sacred by local communities of diverse cultural backgrounds who inhabit this watershed and manage a variety of traditional land use systems.

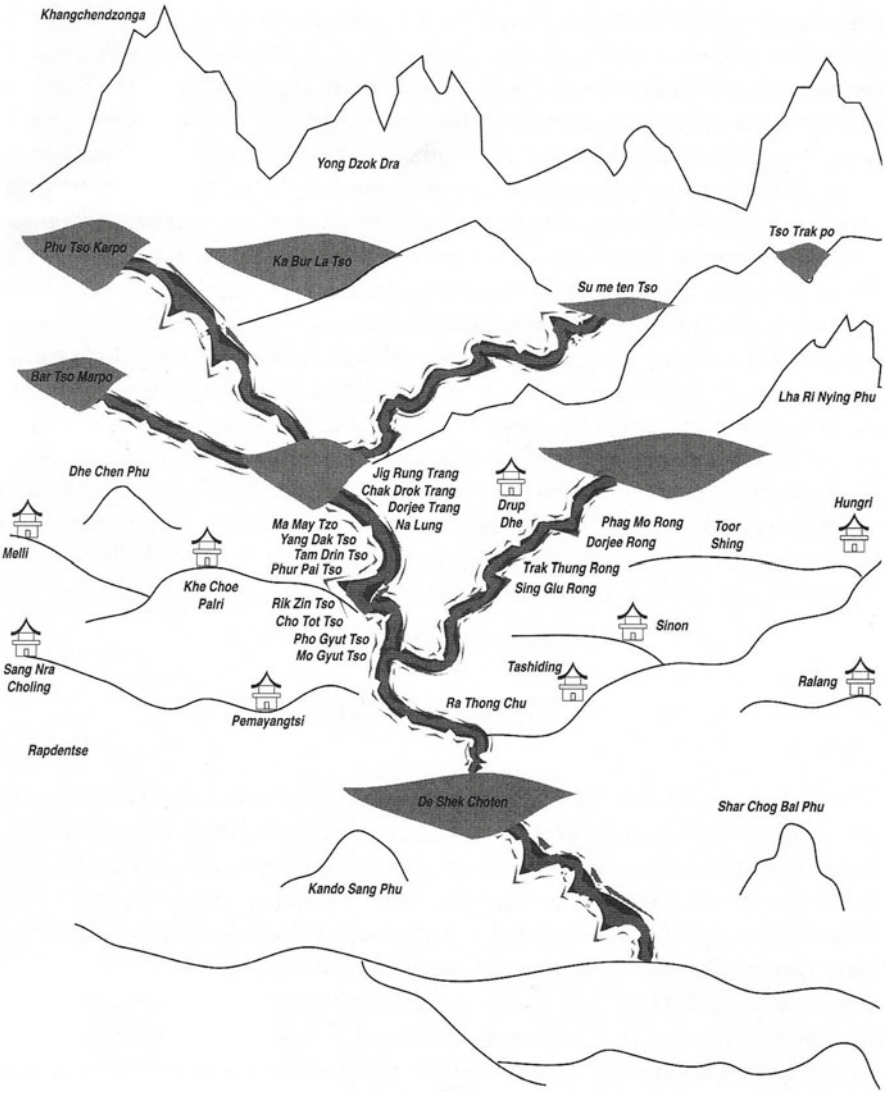

Fig. 9.2 Demojong, the land of hidden treasures. Pictorial depiction of holy sites in West Sikkim, Eastern Himalaya, with the sacred river system Rothong Chu running down the slope (*shaded thick line*); many sacred lakes (*shaded patches*) and monasteries are to be found scattered all over the landscape

The sacred nature of the landscapes is defined by Tibetan Buddhist philosophy (Box 9.1), which defines the sacred boundaries and identifies specific cultural and institutional norms and arrangements that often are codified to delimit human usage. The air, soil, water, and biota are all considered sacred. Alterations of the landscape

Box 9.1 Demojong, the Land of the Hidden Treasures! (Ramakrishnan 2003)

Padmasambhava, who is highly revered and worshipped by the Sikkimese Buddhists, is considered to have blessed Yoksum and the surrounding landscape in West Sikkim District. It is believed that a large number of hidden treasures (ter) were hidden by Lhabstsun Namkha Jigme in the Yoksum region, and that these sacred treasures are being discovered slowly and will be revealed only to enlightened Lamas, at appropriate times. It is said that the last such discovery was made by Terton Padma Lingpa 540 years ago. Conserving these treasures and protecting them from polluting influences is considered important for human welfare.

The area below Mount Khangchendzonga in West Sikkim, referred to as demojong, is the core of the sacred land of Sikkim. Yoksum is considered to be a lhakhang (altar) and mandala where offerings are made offerings to the protective deities. No meaningful performances of Buddhist rituals are possible if this land and water is desecrated. Any large-scale human-induced perturbation in the land of the holy Yoksum region would destroy the hidden treasures, the ters, in such a manner that the chances of recovering them sometimes in the future by a visionary will be diminished. Further, any major perturbation to the river system would disturb the ruling deities of the 109 hidden lakes of the river, leading to serious calamities, a past example of this being that of Lake Khecho-Palri, which is believed to have moved away from the river during a period of bloodshed.

Indeed, the very cultural fabric of Sikkimese society is dependent upon the conservation of the entire sacred landscape of interacting ecosystems. It is not merely a question of protecting a few physical structures or ruins. The uniqueness of this heritage site is that the value system of the people here is interpreted in a more holistic sense—the soil, the water, the biota, the visible water bodies, the river, and the less obvious hidden lakes on the river bed, are all to be protected along with the physical monuments.

are restricted, circumscribed by cultural norms, and the guiding principles for resource use are strictly enforced through social institutions. Broad community participation is ensured through a variety of rituals that involve the diverse communities living within the landscape boundaries, each of which have their own pre-determined rights for natural resource use. While these and many other sacred landscapes have use restrictions, traditional societies live as an integral part of it; they are involved in a variety of agriculture and animal husbandry practices and extraction of resources such as fuelwood, fodder, food, and medicinal species from the natural ecosystems, both fresh water and forest. In such landscapes, natural ecosystems are closely linked to the village ecosystem functions in a sustainable manner.

Social institutions do allow small ecosystem alterations, whilst larger destabilizing alterations are prohibited. For this reason there was a strong social reaction when government agencies attempted to initiate a hydro-electric project within the Demajong landscape region during the late 1990s. The project was abandoned within a few years after the developmental initiative was initiated, in response to community pressure, and the government agencies have taken steps to conserve this cultural landscape. Pant et al. (1996) studied land cover/land use changes in this area between 1960 and 1985 in this area using aerial photographs and Landsat TM false colour composite image (spectral bands 2, 3 and 4) of the respective years. The study revealed a total change of 27%, consisting of changes/conversion from one cover type/land use pattern to another out of the total area. It is significant to note, however, that between 1985 and 1998, adverse or negative changes were only 1.52%.

This case study is also indicative of the intensity with which traditional societies hold on to the intangible values that they cherish, even at the cost of their lives. Further, it shows that the human security angle of 'knowledge systems' in general and traditional knowledge in particular is very important at the local and regional levels (Ramakrishnan 2009), and raises important questions about the role that traditional forest-related knowledge could have in enhancing global human security under threat in this era of global environmental change (Brauch et al. 2009).

9.4.2 The Chipko Movement in the Central Himalayan Garhwal Region

Oak forests (dominated by *Quercus* spp.) in the Central Himalayan region are socially valued, including for their ecological keystone role in sustaining soil fertility management by providing high-quality leaf litter, and their dense root systems that help to conserve water in the soil profile (this dense root mat is often compared to the thick matted hair of the god Shiva of Hindu mythology, who is said to have used his matted hair to control the force of the mighty river Ganga (Ganges) as it descended from heaven!). Selective harvesting of these forests and their replacement with pine plantations in India's central Himalaya region inspired the grassroots movement in the 1970s known as Chipko, which gained global publicity (Box 9.2). More than 1,500 km to the east, in the northeast Indian State of Arunachal Pradesh, oaks are also socially valued. This parallelism that exists in social values centred around oaks in two geographically separated parts of the country is indicative of social selection operating independently and coming to similar conclusions, suggesting that what is socially valued invariably tends to have ecological value (Ramakrishnan et al. 1998). As will be discussed below in Sect. 9.7.1, this principle was important for initiating a community participatory conservation and developmental programme in Nagaland in the 1990s.

Box 9.2 The Story of the Chipko Movement

The 'Sarvodaya' (peoples' enlightenment) movement begun by the great Indian leader Mahatma Gandhi was the philosophical basis for the Chipko movement in the central Himalayan Garhwal region led by Gandhian workers Sundarlal Bahuguna and Chandi Prasad Bhatt, who were involved in community participatory social forestry activities in the early 1970s (Weber 1987).

For years tensions had been mounting between local communities and timber contractors coming into the region from outside, centred around harvest of timber from the natural oak-dominated forests. This conflict came into the open in the early 1970s when local women, led by Bahuguna and Bhatt, organized to prevent the impending harvest of oak trees by hugging them, the implication being that foresters would need to 'cut us down before cutting the trees.' This direct community action became known as the Chipko (meaning "to stick" in Hindi) movement, a protest against the exploitation of forest resources that had been ongoing in the region since the British colonial period that ended in 1947.

The communities living in the area perceive the oak species of their forests to be sacred. This value system is expressed by them through folk-music, documented in *Nanda Devi Prakriti Samrakshan Geet* ('folk-music linked with nature conservation'), a product of a UNESCO initiative (Ramakrishnan et al. 2000), and in numerous local poems and folk-tales also woven around oaks, locally called banjh.

In this region, oak litter is a highly valued resource that is used to maintain soil fertility in traditional settled agricultural systems; this organic litter from these keystone species has always been the mainstay for the sustainability of agriculture in the mid-elevations of Garhwal region. With extensive deforestation of mixed oak forests and their replacement by pine plantations, sustaining soil fertility and water in the soil profile became a major problem.

The general belief that was propagated when the Chipko movement got underway was that the local communities wanted to share in the benefits accruing to the timber merchants. However, the fundamental underlying reason for this movement was the erosion of traditional agricultural systems resulting from large-scale land degradation that has been going on for several decades in the region, arising from the conversion of biodiversity-rich mixed oak forests into pine plantations (Ramakrishnan 2008a; Ramakrishnan et al. 2000).

9.4.3 Sacred Khejri (Prosopis cineraria) Forests of the Bishnois in Rajasthan (India)

The Bishnois, who inhabit the desert region of Rajasthan in northwestern India, are a people whose cultural values include the belief in the absolute protection of all life. For the past 500 years they have managed their surrounding cultural

(dry forest) landscapes consistent with these values. The Bishnoi sect was founded in 1486 by the spiritual leader Saint Jambeshwarji, whose name refers to the 29 ethical vows to which the Bishnois adhere, of which non-violence is an important one. Their concept of protecting nature arose in the year 1730, when 363 Bishnoi men, women, and children of the village Peepsar laid down their lives to protect their local forests when the then Prince of Jodhpur came to the area to hunt and to harvest trees to fire lime kilns. With the founding of this new sect under their spiritual leader, natural resource management practices, rules, and regulations that were consistent with their ethical principals were institutionalized.

The dominant forest species in this region is khejri (*Prosopis cinerarea*), a legume tree used for a variety of purposes. This species, revered by the community, is valued for its edible pods (for food), leaves (as livestock fodder and green manure), and branches (for fuelwood and construction materials). All parts of the tree are of medicinal value to the local people. A nitrogen-fixing species, it improves soil quality through its production of nutrient-rich leaf litter. It forms a deep taproot penetrating to more than 30 m depth; its extensive root mass helps to stabilize the sandy desert soil and shifting sand dunes, and as a windbreak it protects the rain-fed farmlands from strong desert winds. Khejri is also an eco-cultural keystone species; its presence endowes the landscape with a distinctive cultural identity and provides habitat for a diverse assemblage of associated plant and animal species that play important functional roles in the village ecosystem. Indeed, the Bishnoi villages stand out as islands of biodiversity in an otherwise over-exploited desert landscape. The sacred groves of the Bishnois, called orans, are widely known in the Indian region for their conservation value for khejri and its associated wildlife, particularly the blackbuck (*Antelope cervicapra)*. The value system of the Bishnois, expressed in the management of khejri forests through social institutions that determine resource use, has resulted in the creation of these productive, species-rich cultural landscapes wherever a Bishnoi village, or cluster of villages, has been located.

In stark contrast to these small, sacred, islands of biodiversity created by the Bishnoi's traditional knowledge and wisdom, vegetation of the larger arid landscape is now dominated by the closely related, exotic, tree species *Prosopis juliflora,* which forms an extensive single-species stands over large tracts of land. This tree, known as mesquite in its native Central and South American range, was introduced to Rajasthan (and other dry locations in India and Pakistan) from Australia by foresters beginning in the late nineteenth century, primarily for rehabilitating the otherwise largely degraded dry and arid landscapes. This species has spread far beyond where it was originally planted, its movement and regeneration greatly enhanced by livestock, which relish the seed pods and thereby facilitate the spread and germination of seeds. For the traditional farmer, *P. cineraria* is an important agroforestry species, non-invasive, with great value for soil fertility management and food security, unlike the invasive exotic *P. juliflora*, which is generally regarded as a weed in the farmers' plots, which they attempt to control by uprooting and burning. Managing invasive alien tree species such as *P. juliflora* is a problem that often defies scientific solutions (Drake et al. 1988), and is major challenge for sustainable management of forested areas in many tropical areas (Ramakrishnan 1991).

9.4.4 *Beyul Khumbu: The Sherpas in the Sagarmatha (Mount Everest) National Park, Nepal*

The case study of the indigenous Sherpa people living in the buffer zone area of Sagarmatha (Mount Everest) illustrates how intangible values have contributed towards conservation and sustainable management of this national park in Nepal (Spoon and Sherpa 2008). The Sherpas consider this landscape—the beyul (the sacred hidden valley set aside by the progenitor of Tibetan Buddhism, Guru Rinpoche)—to be a refuge for people living in the area and for sustainable use in times of need. Refraining from negative actions that are inconsistent with Buddhist philosophy—which prohibits harming any living beings, plants or animals (including humans)—the Sherpas maintain their beliefs in numerous location-specific spiritual values and taboos that ensure sustainable practices within the beyul landscape. These include protector deities and spirits associated with natural features, such as mountains, trees, rocks, and water bodies. Since the area is now a protected area, rapidly increasing tourism has been a source of income for the Sherpas, and has promoted development of local infrastructure.

9.4.5 *Traditional Agricultural Systems as an Integral Part of the Forested Landscape*

Traditional societies living in forested landscape have developed a range of agricultural systems that are managed at low intensities relative to more 'conventional' permanent cropping systems. They view their traditional agricultural practices as integral parts of the cultural landscape that they treasure, reflected in the intangible values associated with their land use practices. Such values are intimately connected with the food security concerns that they must deal with in their forested environment. Uncertain food security within many such communities is exacerbated by the losing battle they have to face with developmental agencies' continual efforts to convert them to modern settled farming practices, despite their repeated rejection arising partly from the threat that such changes would pose to their very cultural identities (Ramakrishnan 2008b). These cultural values motivate their continued reliance on traditional agricultural practices. There are numerous examples of culture-linked practices and beliefs that are connected to the livelihood concerns of shifting agricultural and other traditional communities of the region, examples of which are highlighted in Box 9.3.

Learning from such examples of societies who maintain their livelihoods and cultural identities while working with nature (to provide tangible benefits linked with intangible values) is increasingly seen as an effective and viable basis for addressing forest sustainability concerns involving local communities. This desire to 'get back to nature' can be seen even in urban communities in the region (and elsewhere in the world), if only symbolically, through public interest and promotion of urban forestry and even urban agriculture (Shutkin 2000).

Box 9.3 Examples of Spiritual Beliefs and Practices Associated with Shifting Cultivation and Conservation Practices in South Asia and Himalayan Region

- The tradition of maintaining a sacred grove for each village, with a variety of religious ceremonies performed within the groves during the year to propitiate natural elements before initiating slash-and-burn agriculture, is indicative of the sacredness attached to them by different ethnic groups of northeast India. While many of these traditions are eroding because of modern influences on these societies, many remain well-protected, for example the Mawsmai sacred grove in Cherrapunji and Mawphlong grove nearer to Shillong in Meghalaya, India.
- In the Garo hills of Meghalaya (India), the first two Garos (the tribal group inhabiting this area) to initiate shifting agriculture, locally called jhum, are believed to be the spiritual couple Bone Nirepa and Jane Nitepa. Their blessings as well as that of their deity, Misipa, are sought for a good harvest.
- The Wanchos of Arunachal Pradesh (India), like many other ethnic groups in the region, traditionally sacrifice cocks, pigs, buffalos, and even the socially treasured domesticated gaur (*Bons frontalis*), known locally as mithun, to propitiate the spirits of nature on different occasions to sustain soil fertility and ensure good crop yields.
- The Baigas of Madhya Pradesh (India), who practise shifting cultivation, view the use of a plough to prepare their agricultural fields as tearing the breast of mother earth. They therefore prefer to directly sow seeds after clearing and burning secondary forest vegetation from their fields, without ploughing.
- The Buddhist Dai (T'ai) tribe of Xishuangbanna in Yunnan Province of China, bordering the northeastern Indian region, where shifting agricultural is also practised, have many holy hills, Nong Ban and Nong Meng, belonging to a village or village clusters. These holy sites are spread over a large area, and include hundreds of small or large forested reserves and/or designated sacred woodlands.
- Sri Pada (also known as Adams Peak) in Sri Lanka, a biodiversity-rich forested landscape, is considered by the Buddhists, Christians, Hindus, and Muslims as a place of worship and is protected (Wijesuriya 2001).
- For the Kanis, a hunter-gatherer society living in the Agasthyamalai hill region of the Western Ghat mountains in southern India, specific ecosystems, rock shelters, marshy swamps, and large trees with huge buttresses are considered abodes of their local spirits of worship, the mountain as a whole being the abode of the supreme God, Agasthyamuni, who is revered as an ancient sage of wisdom.
- The folk-music, festivals, and associated cultural and spiritual values of local communities living in the Nanda Devi cultural landscape (a UNESCO world heritage site located in the central Himalayan Garhwal mountain region in India) offers opportunities also for learning lessons on sustainable management of the larger Biosphere Reserve itself.

9.5 Integrating Traditional Forest-Related Knowledge with Formal Scientific Forest Knowledge

Conventional forestry in the region has often promoted monoculture plantation forestry as a replacement for natural forest management. In pursuing this, the most convenient and silviculturally well-known species have been promoted, with an exclusive focus on those valued for timber. In the central Himalayan region, for example, extensive plantations have been established of *Pinus roxburghii* at higher elevation sites, and various species of (non-native) *Eucalyptus* and *Acacia* at lower elevations. Replacement of natural mixed-species natural forests by plantations has been very often deeply resented by local communities, and has inevitably caused conflicts between forest managers and communities, such as those discussed earlier with respect to the Chipko movement. In recent times, fire events in pine plantations have been on the rise. These conflicts, in our view, strengthen the rationale for appropriate integration of traditional and formal scientific forest-related knowledge as a means to more effectively address the social, economic, and cultural dimensions of sustainable forest management (Ramakrishnan 1992b).

While governmental policies and market pressures since the colonial period have promoted exploitation of forest resources (Wolman et al. 2001), the blame for deforestation and land degradation has typically been placed on forest dwellers, in particular those practising shifting agriculture (Ramakrishnan 1992a; Ramakrishnan et al. 2006). Traditional forest dwellers have repeatedly rejected development pathways offered to them that are not based on a value system that they understand and appreciate. This has led to their marginalization and has created conflicts between them and government development agencies, which has had implications for peace at local and regional levels (Ramakrishnan 2009). In this context an examination of the linkages and potential synergies between traditional and formal scientific forest knowledge is particularly relevant.

9.5.1 Ethnobotanical Knowledge: Traditional Medicine and Lesser-Known Species of Food Value

The South Asian region is richly endowed both with extraordinarily rich biodiversity and the traditional forest-related knowledge related to its use to help meet the daily food and health security of people. Ethnobotany—the study of how people use plants for food, medicine, and in ritual contexts; how they view and understand them; and their cultural, symbolic, and spiritual roles—is an area of traditional forest-related knowledge that has received considerable attention by scholars and scientists in the South Asia region for the past 500 years, and increasing attention in the scientific literature over the past century. European studies of South Asia's flora, the source of the overwhelming majority of drugs used in the ancient traditional systems of medicine in the region—Ayurveda,

Siddha, Tibetan, and Unani (Van Alphen and Aris 1995)—can be traced to Garcia da Orta's 1563 *Coloquios dos simples e drogas he cousas medicinais da India* (Markham 1913) and van Rheede's 12-volume *Hortus malabaricus* in the late seventeenth century (Rheede tot Draakestein 1678–1703). Knowledge of traditional Indian medicine, and the service of its local practitioners, was critical to the survival of early European traders and colonists in India given the near total ignorance of tropical diseases and their treatment by European physicians (Parrotta 2001).

The documentation of traditional forest-related knowledge in the Indian subcontinent (particularly in present-day India, Pakistan, Bangladesh, and Sri Lanka) during the British colonial period was extensive, and built on the large pre-existing body of knowledge recorded in Sanskrit, Pali, Tamil, and other ancient South Asian languages. A great deal of information derived from or highly relevant to traditional forest-related knowledge was included in forest floristic surveys and forest management research conducted under the auspices of the British colonial government in the late nineteenth and early twentieth centuries (c.f. Hooker 1875–1897; Troup 1921). Such information was also found in works on economic and medicinal botany such as those by Ainslie (1826), Watt (1889–1896), Dymock et al. (1890), Nadkarni (1908), and Kirtikar and Basu (1935).

More recently, a large and expanding literature dealing with the traditional utilization of the region's flora by local and tribal communities has developed, including: major works by government organizations such as the Indian Council for Scientific and Industrial Research (cf. CSIR 1948–1992, 1986) and individual scientists (cf. Jain 1991, 1997; Saklani and Jain 1994; Maheshwari 1996; Manandhar 2002), as well as journal articles published in dozens of peer-review journals such as Ethnobotany, Economic Botany, Journal of Ethnobiology , and the Indian Journal of Traditional Knowledge, among others. In an effort to systematically document, and strengthen intellectual property protection of, traditional knowledge related to the use of plants in Indian systems of medicine (Ayurveda, Unani, Siddha, and Yoga), the Indian Government has created an extensive online database, the Traditional Knowledge Digital Library, available online since 2009. The database includes thousands of traditional drug formulations recorded in classical texts involving 308 plant species.[2] At the local level in India, 'people's biodiversity registers'—consisting of records of individual people's knowledge of biodiversity, its use, trade, and efforts for its conservation and sustainable utilization—have been established; these registers are recognized in the Indian Biological Diversity Bill of 2000 (Hansen and Van Vleet 2007). Throughout the region, numerous research and grassroots development programmes have been initiated in recent years to promote the cultivation and processing of locally (and in some cases internationally) valued medicinal plant species as well as their sustainable management in natural forests where their over-exploitation is a serious concern (Parrotta 2002).

[2] Available online at: http://www.tkdl.res.in/tkdl/langdefault/common/home.asp?GL=Eng

In light of the ongoing degradation and loss of forests (and their biodiversity) in the region, ethnobotanical aspects of traditional forest-related knowledge have gained recognition and importance in recent years. This interest is often focused on the conservation of species of medicinal value and 'lesser-known' wild food species from forests (CSIR 1948–1992; National Academy of Sciences 1975, 1979; Bodekar et al. 1997; Valiathan 1998; Parrotta 2001). In order to maximize the potential of the region's biodiversity and related traditional knowledge for human well-being, particularly for forest-dependent communities, in-situ conservation of these resources should be an essential element of sustainable forest management planning.

9.5.2 Socially Valued Tree Species of Ecological Keystone Value

Formal (scientific) silvicultural knowledge of individual tree species, while important, should not be the sole criterion in tree species selection for sustainable forest management activities. Rather, such knowledge needs to be complemented with knowledge of the social and religious values attached to tree species so as to enhance community support for and participation in sustainable forest management. As discussed earlier, socially valued species typically have ecological keystone roles. For example, in shifting agricultural landscapes of northeastern India, favoured nitrogen-fixing trees such as *Alnus nepalensis* and many bamboo species—such as *Dendrocalamus hamiltoni, Bambusa tulda,* and *B. khasiana*—have been found to selectively concentrate key elements such as N, P, and K in their biomass and litterfall; these processes contribute to accelerated forest succession, rapid soil nutrient accumulation, agricultural productivity (and food security), and enhanced of biodiversity at the landscape scale (Ramakrishnan et al. 1998). These insights regarding the ecological roles of socially valued species were used to formulate the Nagaland landscape redevelopment project (NEPED and IIRR 1999) through an 'incremental pathway' discussed elsewhere in this chapter (Sect. 9.7.1).

People in forest-dependent communities are more often concerned less with the availability of large timber than with the supply of smaller trees, used primarily as fuelwood, and non-timber forest products used for a wide variety of purposes in their daily lives. There is growing public recognition of the importance of biodiversity conservation and sustainable utilization of forest resources and its relevance to the livelihoods and food security of local and tribal communities in the South Asia region. Perhaps less well-appreciated by the public and policy makers is the vital role that the holders and users of traditional forest-related knowledge play in biodiversity conservation, and the importance of such traditional knowledge, specifically that associated with their management of forest resources for non-timber products (medicinal plants, wild foods, etc.), and the role of socially valued species with ecological keystone value in biodiversity conservation and sustainable traditional agricultural in the region.

9.5.3 Sacred Groves as a Resource for Rehabilitation/Restoration of Degraded Sites

Religious beliefs and ceremonies associated with forests and individual plant species are very common across the cultural spectrum of India and elsewhere in South Asia. While these beliefs and practices are well-documented in Hindu and later Buddhist religious texts and mythologies, their roots are in many cases much deeper, arising from the ancient cultures, beliefs, and practices of diverse peoples of the subcontinent that pre-date the migration of the Indo-European (Aryan) peoples from the northwest, some of which survive in today's tribal communities (Jain 1997; Majapuria and Joshi 1997; Gupta 2001). Sacred groves, a reflection of the spiritual significance and cultural value of forests in traditional societies of the region, are excellent examples of the natural forests rich in biodiversity that once existed over more extensive areas in South Asia. These forest stands have been rigorously conserved for socio-cultural, religious, and economic reasons, typically for countless generations (Hughes and Chandran 1998). While much is known about the sacred groves of India (Ramakrishnan et al. 1998), the information available from other countries of the region is much more limited.

9.5.3.1 India

There are very early references to South Asian forests in Vedic texts dating from 1400 to 700 BC, in which forests were classified by their principal uses, such as Tapovana (for meditation; Vannucci 1993); Pashuvan (for conserving deer and other animals); Hastivana (for conserving elephants); Mrigvana (for a combination of wildlife conservation, hunting, and leisure activities); and Dravyavana (for production forestry; Rawat 1991). These detailed classifications indicate that use restrictions were imposed on the ancient peoples of the Indian subcontinent, with an important focus on wildlife conservation. In these very ancient Hindu scriptures, there also are references to: Mahavana, where Lord Shiva (a major Hindu deity) resides; Srivana, suggesting 'sacredness' in a general sense; and Devavana, referring to the sacred gardens of the gods, a forest of prosperity where presiding deities of villages are placed. The tradition of sacred groves is indeed very ancient and, amongst many traditional societies of the region, their protection remains important.

The precise number and area of sacred groves in the region is unknown. Malhotra et al. (2001) reported 4,415 sacred groves covering 42,278 ha, although this is probably an underestimate of their total number and extent. Sacred groves are found in a variety of forest ecosystem types, including coastal mangrove forests. Today, sacred groves in India survive primarily as isolated patches in otherwise degraded forest landscapes (Swamy et al. 2003), and most of these forests are degraded to varying degrees because of rapidly changing societal values that weaken the resolve of communities to protect them. Rao (1996) documented 13,720 such groves in India alone.

A survey of 79 of these, ranging in size from 0.01 to 900 ha with a total area of 10,511 ha, found that most were located in the catchment areas of major rivers and streams and that only a small fraction (totalling 138 ha) were totally undisturbed.

Sacred groves in India typically have a presiding deity and associated folklore, beliefs, taboos, and rituals (Swamy et al. 2003). Customary religious tradition often requires that permission be granted by the local priest for cutting a tree only after a sacrifice is offered. In other cases, protection of these forests is stricter, as in the Mawsmai sacred grove in the Cherrapunji region of Meghalaya in northeastern India, where the Khasi religious tradition prohibits the removal of even a fallen twig from the sacred grove (Ramakrishnan 1992a). In Meghalaya, each village is said to have had a sacred grove attached to it in ancient times, though many of these were said to have been destroyed, due to changing value systems associated with the spread of Christianity in this region. Despite impact of religious conversion and associated prohibition of earlier practices, traditional values still remain in many communities, integrated with newly acquired religions values. Given the diversity or cultures and religious practices throughout India where sacred groves are found and maintained by communities, it is not possible to generalize about offerings in the form of animal sacrifices associated with these sites, but these practices do occur, often in connection with festivals and religious ceremonies. Animistic values and organized religious beliefs often remain intermingled in India, as along the Kerala coastal areas and in the north-eastern hill regions.

9.5.3.2 Nepal

In Nepal there are a large number of 'sacred fields' or 'kshetras'—environmental complexes that may include religious edifices, shrines, sacred objects of the natural world (such caves, hot or cold springs, lake, rivers natural formations such as rocks and caves, lakes, rivers, springs, and of course protected forests, i.e., sacred groves) (Messerschmidt 1989; Ingles 1990; Hamilton 2002). Many of the plants protected within these forests are associated with Hindu religious mythology and ceremonies and are valued in traditional Ayurvedic medicine, a Nepali tradition shared with India (Singh et al. 1979; Majapuria and Joshi 1997; Parrotta 2001).

Among Nepal's traditional communities, many trees are viewed as sacred, among which species such as *Ficus religiosa, F. bengalensis,* and *Michelia kisopa* are more venerated than others (Manandhar 2002). These sacred forests are associated with protective deities of the Buddhist and/or Hindu pantheons. Authority over these community-managed forests is exercised by 'pujaris' or priests, well-versed in religious scriptures, who are selected by local communities on a rotational basis. Elsewhere in Nepal, Sherpas living in the Khumbu valley of Nepal maintain sacred groves surrounding Buddhist temples. With a rich cultural/religious traditions embedded in the society and with very many governmental initiatives taken towards conservation of sacred forests of Nepal, these community conserved forests seem likely to maintain their high conservation value in the future.

9.5.3.3 Sri Lanka

Buddhist tradition values forests as sites of unlimited benevolence, making no demands on anyone. Sacred groves in this country have an important role as sheltered environments for fostering peace and harmonious coexistence with nature, and as sites for revitalization of Sri Lanka's traditional culture of peace. In Sri Lanka, a land rich in Buddhist traditions, any geographical site may becomes a protected sanctuary if there is a consensus among the people who use that site that it be preserved for meditation and promoting peace. There are very many such protected groves in the Sri Lanka, arising from the Buddhist belief in protecting life in general and protecting forests in particular for their benevolence (Withange 1998). Many of the important sacred groves have now been given protected area status through various acts enacted by the Sri Lankan government. Some of the more well-known of these reserves are Domba Gas Kanda, Yagirala, Kalugala, and Viharakelle. There are larger forested landscapes such as Ritigala, and Samanola Kanda (Adam's Peak) that are also considered sacred, with many Buddhist traditions and mythological stories woven around them. In addition, smaller groves are to be found as 'temple forests' associated with monasteries and hermitages, protected and tended by Buddhist monks.

9.5.3.4 Bangladesh

Sacred groves are also found in Bangladesh, particularly in areas where Hindu and Islamic traditions coexist. These sometimes occur as small patches of trees attached to the shrines of Muslim saints (Islam et al. 1998). The sacred groves of the Chittagong hill tracts in southeastern Bangladesh (which has a close eco-cultural affinity with the northeastern hill region of Mizoram State in India) have been under constant threat, and little is known about the present status of the groves in this region.

9.5.3.5 Afghanistan

In Afghanistan, there are at present more than 150 recorded sacred groves, part of the historical cultural traditions that are now being revived and managed following local Islamic traditions and values (Zaman 1998). The sacred grove tradition most likely developed during the long period of history in which Hindu, Zoroastrian, Buddhist, and non-institutional religions were practised by the people of present-day Afghanistan prior to the influence of monotheistic religions (i.e., Judaism, Christianity, and Islam) in the region. Traditional Islamic communities in Afghanistan today continue to protect and manage these sacred groves. While often strictly protected, some tree-cutting may be permitted for specific reasons.

9.5.3.6 The Value of Sacred Groves for Biodiversity Conservation and Forest Ecosystem Restoration

With their often astonishing biodiversity, sacred groves have an important function as sites to learn about the composition, structure, and function of forest ecosystems otherwise absent from the deforested or degraded landscapes in which they occur. Such information can have important application value in forest rehabilitation and ecological restoration projects. This was illustrated in studies of the sacred grove in the village of Mawsmai, located near Cherrapunji in the northeastern Indian state of Meghalaya. This village grove stands out as an island of rich biodiversity, a small remnant of the forest ecosystem that once dominated what is now a highly degraded landscape (in spite of an annual average rainfall of 12 m). This grove is so well-protected that even removal of dead wood from it remains prohibited. Studies of ecosystem structure and function in some of the sacred groves and the surrounding degraded land led to identification of many socially valued keystone species in the groves, which have had meaningful implications for the rehabilitation action plan for this high-rainfall, hilly region (Ramakrishnan 1992a). As biodiversity conservation sites, this and other sacred groves are of great ecological value (Ramakrishnan et al. 1998; Swamy et al. 2003). Programmes to conserve them for their plant and animal biodiversity values have been initiated by governmental and non-governmental agencies in India, for example in the Khejri tree dominated sites of Rajasthan discussed earlier, and sacred groves in Kerala in southern India. These emerging efforts should be seen as major landmarks in the conservation and restoration of degraded systems in the South Asian region.

9.5.4 Applying Traditional Forest-Related Knowledge to Current Forest Management Challenges

Significant opportunities exist for better use of traditional forest-related knowledge to resolve the significant conflicts that exist between state forest management authorities and local and tribal communities in the South Asia region. As discussed above, socially valued tree species, which invariably have ecological keystone value, should be given a high priority in forest restoration initiatives. An emphasis on species and management practices that are valued by the traditional community greatly enhances prospects for their active support for and involvement in forest management activities aimed at benefitting multiple stakeholders. This requires, among other things, an effort to reconcile silvicultural attributes and timber values with local social values in selecting species for reforestation, watershed restoration, and/or forest enrichment plantings so as to ensure community involvement in forest landscape management.

Given the progressive degradation of forest landscapes and biodiversity loss over very extensive areas of this region, socially valued ecosystems such as sacred groves have a key role to play in forest landscape restoration and other conservation

management initiatives, both as reference systems and sources of biodiversity for planting or natural recolonisation of restored forest sites. Thus, what is needed is a reconciliation of traditional forest-related knowledge and formal science-based knowledge to promote forest management approaches that aim to reconstruct natural cultural landscapes based on values that local communities understand and appreciate, and therefore participate in and benefit from.

9.6 Collaborative Forest Management Initiatives in South Asia

In an effort to develop an effective institutional framework and mechanisms for greater involvement of local communities in the management of forest resources, several participatory forest management approaches have emerged in different countries in South Asia. These include community forestry (CF), joint forest management (JFM), and forest user groups (FUG), which differ in their institutional, tenurial, decision-making, and benefit-sharing arrangements. While India and Nepal have pursued these approaches on national scale, other countries in the region have only begun making cautious moves towards community participatory forest management. These decentralized approaches have been integrated them into national policy frameworks in India and Nepal, whose experiences will be considered in below in Sect. 9.6.1.

According to Rasool and Karki (2007), while India, Nepal, Bangladesh, and Bhutan are all moving from centralized to participatory forest management through these new institutional approaches, the magnitude and pace of the movement is greater in Nepal and India. Aside from JFM, all participatory forest management mechanisms are supported by state legislation, although the degree of institutionalization may vary. While forest user groups in Nepal have full decision-making authority, community forest management groups in Bhutan and joint forest management committees in India have limited authority. Considerable variation also exists in the degree of participation of local people—in Nepal local participation is very high, in Bangladesh it is very low, and in Bhutan and India it is intermediate. Although all these initiatives emphasize regulated participation arrangements, effectiveness of the participatory processes efforts vary, and tend to depend on the quality and extent of the forest resources, as well as the quality of local-level leadership.

9.6.1 Joint Forest Management in India

Over the past two decades, the focus in forestry in India has shifted towards conservation forestry, with people's participation as part of the joint forest management initiative of the Government of India. In return for providing improved forest protection, communities receive better access to non-timber forest products for subsistence use as well as a share of net commercial timber revenues. The state

retains most of the control and decision-making over forest management, regulation, monitoring, timber harvesting, and forest product marketing (Gupta 2006). Under JFM arrangements, forest governance issues are handled through a forest protection committee (FPC), or van sangrakshan samiti (VSS), along with an executive committee (EC). Typically, FPCs and VSSs having one member from each family of the specific village or a group of villages.

Since its initiation in the 1970s, JFM has spread throughout the country, and today involves around 85,000 village committees and 17.3 million ha of forest land. Since JFM as a model is weighted in favour of state forest department control over planning, investment, management, harvesting, and marketing, participating communities often fail to gain optimal benefit from this otherwise well-conceived initiative. They view it only as a means through which fuelwood, fodder, and non-timber forest products may be obtained to meet their subsistence needs. The more recent Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act of 2006 (applicable for the non-tribal population living in the forests) is an attempt to give the original forest dwellers legal forest use rights (to support their livelihoods and enhance food security) while addressing sustainability concerns in the management of community forest resources, specifically conservation of biodiversity and related sustainability concerns.

A number of shortcomings in implementation of JFMs have been reported. In many cases forest protection has not been successful because of poor monitoring of the forest conservation measures by relatively inactive FPCs, constraining meaningful interaction amongst the stakeholders. In other situations, decision-making power has remained vested with the state forest departments, which are often reluctant to accept genuine community-participatory management (Gupta 2006). Often, as in other largely male-dominated societies, women (the custodians of traditional forest-related knowledge) and their interests are not adequately represented in JFM decision-making processes (Sarin 1998). Although JFM represents a significant step towards ensuring greater community participation in forest management, and empowerment of forest-dependent communities, state forest departments for the most part continue to follow a top-down approach towards decision-making. Further, for reasons related to industrial exploitation of forest resources, community-based customary and informal institutions have also been undermined (Springate-Baginski and Blaikie 2007; Sarin et al. 2003). Gupta (2006) rightly points out that if JFM is to be an effective tool for community-participatory sustainable forest management in India, a change in mindset and organizational culture amongst a large section of the state foresters will be required.

9.6.2 Community Forestry in Nepal

Although organized state-linked forest management on a large scale began in Nepal around 1880, most of the forests of Nepal were not under state control, but rather under de facto community control prior to the mid-1950s (Nagendra 2002).

Traditional and indigenous forest management practices were prevalent in the Nepal hills during this period. Since populations were small, and forest resources relatively extensive, pressures on Nepal's forests in the past were far less than those which exist today. In response to the adverse environmental and socioeconomic impacts arising from nationalization of forests and widespread deforestation, since the early 1970s efforts have been made to engage local communities in forest management through community forestry, leasehold forestry, and park buffer zone projects. Subsequent to the National Forest Act of 1976, a community-oriented group of foresters working in the districts met to promote a new form of forestry based on their experience of working with local people in forest management.

The Forest Act of 1993 formally established five categories of national forests: (i) community forests that are entrusted to village-level user group for management and sustained utilization; (ii) leasehold forests on land leased by central or local authorities to individuals or groups; (iii) government-managed forests in which production forests units are managed by the central government; (iv) forests belonging to religious institutions; and (v) strictly protected forests. Being based on a legislative framework, the legal rights of the forest dwellers are assured in the Nepalese context, in contrast to the situation in India where the legal rights for forest resources are vested with the forest department, whose officials also have the power to transfer rights to non-timber forest product resources through administrative orders. By 2009 an estimated one-third of Nepal's population was participating in the direct management of approximately 25% of the country's forests (United Nations 2010).

As a consequence of community forestry, there has been a significant improvement in forest conditions and increased forest cover in the middle hills of Nepal (Nagendra et al. 2005; United Nations 2010). This has resulted in increased access to forest products and development of forest-based small-scale enterprises, resulting in a greater flow of economic benefits to local communities, which strengthened local institutions and contributed to improvements in provision of forest ecosystem services (United Nations 2010). These positive benefits are mostly confined to the middle hill regions, where local indigenous systems of management have been practised for decades or even centuries in many locations. While the participation of women and other poor or disadvantaged groups in community forest management appears to be improving in recent years, the equitable distribution of benefits within communities is a persistent challenge. For example, according to data from the Community Forestry Division of the Ministry of Forest and Soil Conservation, women's participation in forest user groups is only 24%, and their role in decision-making negligible in spite of the fact that their involvement in implementing community forestry activities is very high (Kanel 2004).

In the Terai region—the belt of marshy grasslands, savannas, and forests between the Himalayan foothills and the Indo-Gangetic Plain of the Ganges, Brahmaputra, and their tributaries—the results of community forest management have been poorer. There are a number of reasons for this, including the large geographical area covered, high ethnic heterogeneity within forest user groups, high timber value of these forests, and the relative weakness of local institutions in the region, which has limited participation of stakeholders in defining and implementing community

forest management policies (Bampton et al. 2007). Pravat (2009) argues that over the past 3 centuries, exploitation of forests in the Terai gradually became institutionalized, creating significant barriers to changes in existing power structures necessary to create the conditions for equity and ecological sustainability in forest management. The state, he maintains, continues to have a major stake in the forests of the Terai given their significant revenue contribution to the government, which has favoured continued control over the region's valuable forests. If managed more efficiently, the forests of Terai have the potential to boost the local economy, while also generating significant revenue for the country as a whole, transforming the presently cost-intensive forestry sector to an income generating one. However, given years of political instability and the continued reluctance of the state to engage in democratic, participatory and inclusive governance, it has yet to be seen whether transparent, accountable, and sustainable forestry in the Terai can be achieved in the near future. The risk of retaining the leading role of the state, with its commercial interest in timber extraction and its reluctance to promote a governance framework that involves all stakeholders, is that Nepal will squander forest resources of the Terai with no long-term benefit to the country and its people. However, with the real involvement of people, sustainable forestry practices could be promoted, contributing to improved quality of life for local communities living in forest areas.

To conclude, while there have been significant recent developments in collaborative forest management in both India and Nepal forest areas outside of protected areas, participatory forest management efforts in other countries of the region are, at present, largely confined to buffer zone management in protected Biosphere Reserves (Ramakrishnan et al. 1998).

9.7 The Emerging Developmental Pathways for Forested Landscapes in South Asia

Forested landscapes of South Asia may be characterized by diverse typologies of socio-ecological systems that include: (i) traditional societies who are highly dependent on forest ecosystems for their livelihoods and food security; (ii) modernized rural communities living in highly degraded landscapes, with energy-intensive land-use practices; and (iii) those falling in between these two extremes. Although sustainable forest management in the region needs to focus on conservation and effective management of the region's existing forest resources, ecological restoration and/or rehabilitation of tree cover in extensive degraded landscapes is becoming an increasingly critical need. This consideration is the basis for the following discussion of three distinct developmental pathways, based on linking traditional and formal scientific knowledge to varying degrees, for designing appropriate landscape management strategies (Swift et al. 1996). The first of these, the 'incremental pathway' discussed below, is particularly relevant for traditional forest dwellers.

An important element of these land management pathways is the selection of appropriate tree species to be planted and managed. The fundamental principle involved in the linkage of traditional and formal knowledge systems is that socially

valued species are ecologically significant keystone species. This principle is based on extensive research in northeastern India on the ecological, silvicultural and socio-cultural attributes of early successional tree and bamboo species (Ramakrishnan 2008a, b). These research findings have been confirmed by studies conducted elsewhere in India and other South Asian countries (Ramakrishnan et al. 2000, 2002), and through a global analysis (Ramakrishnan et al. 1998).

9.7.1 The Incremental Pathway: Improving Agroforest Landscape Management

Institutional arrangements for community participatory forest management can be effective, but only when forest management adequately addresses sustainable livelihood issues, which requires a perspective that considers sustainable land use more broadly (as opposed to just forests). Most people in traditional rural communities in the region are economically marginalized, and depend heavily on subsistence agriculture. Sustainable forest management, therefore, needs to be connected with sustainable development of traditional agricultural practices, without making drastic departures from the traditional land use practices and cultural values (Ramakrishnan 2008b). By building upon their traditional forest-related knowledge in a step-by-step fashion to generate 'hybrid technologies' (the incremental pathway; Swift et al. 1996), both forest biodiversity conservation and local food security objectives can be met. The redeveloped land use systems resulting from this process can enhance both natural as well as human-managed agro-biodiversity.

For traditional societies that still possess a rich body of traditional forest-related knowledge, an appropriate strategy for restoration and/or rehabilitation of their cultural landscapes is to build upon this traditional knowledge, introducing formal science-based technologies only to the minimal extent needed to achieve desired outcomes. This developmental initiative, described below, is an outcome of an intensive trans-disciplinary study carried out by a large network of scientists in northeastern India, which led to the conclusion, discussed earlier, that socially valued species are invariably ecological keystone species (Ramakrishnan 1992a).

The principles outlined above formed the basis for a major developmental initiative in the Indian State of Nagaland, the Nagaland Environmental Protection and Economic Development (NEPED) project, based on the incremental pathway. This rural development initiative involved over a thousand villages organized into village development boards (VDBs). A primary objective of the initiative was to enhance the role of trees and forests in the landscape, which had declined over a period of time because of deforestation and land degradation (NEPED and IIRR 1999). It should be noted that the VDBs were also formed in a ways that blended the traditional modes of institution-building of each of the tribal groups involved, with modern elective processes already introduced and operationalized in the region. The objective of this blending of the 'traditional' and 'modern' in this process of local-level institution building (i.e., of the VDBs), was to make these institutions both participatory and more effective. Over a brief period of time, communities were able to derive higher

economic returns by building, step by step, upon the traditional knowledge available with the local communities, without making drastic departures from traditional agricultural practices. The initiative emphasized participatory testing of about a dozen tree species in more than 200 test plots with the involvement of VDBs, rather than testing pre-selected species being transplanted into the field site by extension agents.

This participatory approach for sustainable landscape management has received wide acceptance in the region. Over a period of 10 years, this agroforestry-based approach for enhancing food security and improving soil, water, and forest biodiversity management was tested in more than 800 villages (covering a total area of about 33,000 ha), in replicated farmers' plots (approximately 5,500 ha).

The socially valued species used were fast growing, early-successional, tree species with narrow crown forms that allowed light penetration to the ground level for crop growth during the initial few years of tree growth. As forest cover increased, tree species with broader crown forms were planted as the late-successional trees to form biodiversity-rich late-successional forests. The previously available (formal scientific) knowledge regarding the tree growth strategies, architecture, and ecological characteristics of the species ultimately chosen for planting at different stages complemented the traditional forest-related knowledge of the local farmers (Ramakrishnan 1992a, b). By building upon the traditional knowledge available within the local communities in an incremental fashion, it was possible to accelerate fallow regeneration in the jhum-affected areas, and enhance biodiversity in the resultant secondary forests (Ramakrishnan 1992a). Inclusion of traditional forest-related knowledge as an integral part of this programme triggered community participation, too, since the forest enrichment and rehabilitation techniques developed were based on a value system that the diverse communities could relate to. Although different stakeholders involved in this initiative had varied interests and objectives, all were addressed: (i) the foresters' interest in forest management for biodiversity conservation; (ii) the local communities' interest in redevelopment of their agricultural systems based on improved fallow management principles; (iii) the objective shared by both foresters and farmers to improve soil fertility and productivity, reduce erosion, and the conservation of biodiversity across the agro-forest landscape; (iv) increased carbon sequestration, an important objective in India's climate change mitigation strategy; (v) conservation and further development of locally available traditional forest-related knowledge; and (vii) respect for and preservation of the cultural identity of diverse ethnic forest dwellers of the region, which has had implications for conflict resolution and peace (Ramakrishnan 2009), a critical issue in the region.

9.7.2 Other Development Pathways for Increasing Tree Cover in Highly Degraded Landscapes

Elsewhere in India, government-supported forest management objectives remain largely focused on increasing tree cover across the landscape based on applying agroforestry principles for sustainable agriculture; at the same time socially valued

species are also used for social forestry and rehabilitation of forest cover, thus increasing tree cover in the landscape unit as a whole. To meet these objectives, 'rediscovered' traditional forest-related knowledge has been used to promote tree planting to restore forest cover in degraded landscapes, with species selection based on community values (i.e., use of socially valued tree species that have ecological keystone value). One such agroforestry initiative, carried out in tea gardens of the mountainous Kodagu (Coorg) region of southwestern Karnataka in southern India, involved the development and use of an in-situ soil fertility management technology known as bio-organic fertilization (fertilisation bio-organique, or FBO). This technology, developed by a group of Indian and French scientists in collaboration with tea garden managers as part of the international Tropical Soil Biology and Fertility programme (TSBF), is based on improved management of organic residues to improve the sustainability of tea cultivation, and uses keystone earthworm species in the soil subsystem as indicators of soil health (Senapati et al. 2002). The results of this work in the Kodagu tea-growing region have been increased tree cover at the landscape level, increased yields of high-quality of tea leaves with a substantial reduction (30 to 50%) in inorganic fertilizer use, enhanced biodiversity (above- and below-ground), and improved soil health in the tea plantations, (Senapati et al. 1999). The FBO technology was patented jointly by Indian and French scientists in 1997 and has since been adopted in China.

Ultimately, the design of land management pathways for sustainable livelihood development of local communities needs to be appropriate to, and compatible with, a diversity of socio-ecological conditions. Agroforestry models developed and promoted to improve food security of forest dwellers can contribute to improved tree cover and enriched biodiversity in deforested and/or degraded agro-forest landscapes. While consideration of ecological economic principles is important in this process (Ramakrishnan 2008a), it is equally important that people in local communities—as well as their objectives, values, and traditional knowledge—be incorporated in the development of land use development practices (Ramakrishnan et al. 2005; Ramakrishnan et al 2006).

9.8 Traditional Forest-Related Knowledge in the South Asian Region: Where Do We Stand Today?

Countries in South Asia are moving through a historic reconsideration of their approaches to forest management, arising from the failure of government-controlled industrial management models to sustain the region's natural forests, which have only accelerated deforestation. At the same time, growing concerns of rural communities throughout the region over the deterioration of local ecosystems has led to the emergence of grassroots environmental movements oriented towards forest conservation. Nepal and India are taking leadership roles in formulating national policies for community participatory, decentralized, village-based approaches to forest management. Further, pressures are building upon political leaders, professional

foresters, and the forest science community to develop more effective and more sustainable approaches to forest stewardship, as evidenced by experimentation in recent decades with joint forest management (JFM) initiatives in the region.

On the applied research front, much progress has been made in working towards a better understanding of traditional forest-related knowledge, and understanding its relationships with formal knowledge to elucidate generalized integrative principles that can be applied across socio-ecological systems. For such an effort to succeed at the community level, there is an increasing realization that two aspects of traditional knowledge need to be fully appreciated, namely: (i) the 'intangible' dimension that requires the respect and preservation of cultural values of people living in forested areas and allowing these communities to develop economically, socially, and culturally with minimal external interference; and (ii) the introduction of formal scientific forest knowledge to traditional communities to the extent required to facilitate adjustments that socio-ecological landscape systems need for sustainable management of forest and agricultural resources in the changing contemporary context, where external influences have already had significant impacts on communities and their agroforest landscapes.

Promotion of a more equitable relationship between traditional and formal scientific forest-related knowledge streams has made it possible to develop 'hybrid technologies.' While such efforts have begun to yield positive results in the region, much work remains to foster these developments.

In education, since the 1980s there has been an increasing emphasis on traditional knowledge-based conservation approaches in areas of South Asia where traditional societies predominate. The implications for sustainable livelihoods and other development issues are becoming more apparent. At the university level in India, for example, sustainability science with its emphasis on ecological economics is rapidly gaining importance. There is also an increasing realization within the academic and scientific communities that conserving cultural values is important for conserving biodiversity, for promoting natural resource sustainability, and for enhancing human well-being more generally. This is an area in which the Anthropological Survey of India is becoming increasingly involved in its evaluations of the socio-cultural dimensions of sustainable natural resource management (Mitra 2007).

Academic efforts in the field of sustainability science, at the interface between the natural and social sciences, has contributed towards promotion of traditional forest-related knowledge as a powerful tool in community participatory resource management efforts. It is an important part of the university teaching/research curriculum in northeast India, and is used in joint forest management training in this region (Malhotra et al. 2004), with potential applications throughout India (Gupta 2006). These efforts are gradually facilitating better interaction between natural and social scientists in forestry training and research, more so in India than in other countries of the region.

Within the South Asian region's extensive network of local, national, and international non-governmental organizations (NGOs) working for conservation-related sustainable development, traditional forest-related knowledge and technologies are increasingly viewed as powerful tools for enhancing community participation.

Many NGOs working in the region are already influencing changes in government policies in the region, particularly in India and Nepal, although progress is this direction is slow.

The challenges of emerging environmental uncertainties in forest resource management can no longer be faced from narrow perspectives, but require adoption of interdisciplinary sustainable forest management principles. The progressive marginalization of forest-dependent traditional communities, a historical process that has accelerated over the past century or more of excessive exploitation of forest resources, has led to increasing political and social conflict in South Asia, as in many other parts of the world. In this context, it is important to consider the varied dimensions of human security that Brauch et al. (2009) discusses at the global level, as well as those related to linking knowledge systems for socio-ecological system security of traditional forest dwellers, particularly in South Asia (Ramakrishnan 2009). In this regard the two major forest management decentralization initiatives of the South Asian region, i.e., Joint Forest Management (JFM) in India, and Forest User Groups (FUG) in Nepal, may be seen as positive development towards more sustainable forest management. The rapid empowerment of traditional forest-dependent communities, both through governmental and non-governmental efforts, is enabling traditional societies to make their voices heard in natural resource policy formulation and developmental action plans that are open to stakeholder participation. In this process, non-governmental voluntary organizations in general, and youth in particular, are playing a key role in the region.

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