

RESEARCH ARTICLE

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Conservation and management of sacred groves, myths and beliefs of tribal communities: a case study from north-India

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Abstract

Background: Traditional and indigenous communities in India are of the religious belief that medicinal groves and plants are sacred in nature. Sacred groves (SGs) are patches of trees on forest land that are protected communally with religious zeal and connotations. These forest areas have been protected since ages by traditional societies and indigenous communities with their socio-cultural and religious practices. Sacred groves as a rule are treated piously. Sacred trees are prohibited from cutting and not axed except when wood is needed for the religious purposes like construction and repair of temple buildings or in cases like worshipping, death ceremonies and temple rituals. Thus, SGs carry direct and everlasting pious status and assist in maintaining social fabric of the society.

Results: From the present study it is concluded that, religious identification of medicinal plants and practices have influenced the folklore towards a sense of selfless services in the name the Gods. However, during the course of modernization, mechanization and globalization in the recent past has transformed and weakened both cultural and biological integrity. Changes in social belief, modernization and erosion of cultural practices are some of the major factors contributing towards degradation of the ancient institutional heritage which need to be looked into.

Conclusion: The present study is, therefore intended to propose management and conservation as an alternative strategy towards the sustainability of forests around human settlements and also an attempt to explore the role of SGs in conservation and management of different ecosystem services.

Keywords: Conservation; Ecosystem services; Sacred groves; Sustainability; Traditional

Background

India is among the 12 mega biodiversity countries in the world having 25 hot spots of the richest and highly endangered eco-region of the world (Myers et al. 2000). Due to increasing pressure of population, degradation and depletion of forests, it remains a challenging task to manage forests in a sustainable manner. India is classified under one of the low forest cover countries and account for 23.8% of total geographical area of the country (FSI Forest Survey of India 2005). This percentage is still low as highlighted in the Forest Policy (1988). There are about 0.63 million villages (Rehmani 2012), out of which

nearly one-third are in the vicinity of forests. Thus, quite a large population is traditionally dependent on forests for a variety of reasons such as food, shelter, fodder, timber, and medicine which are directly linked to livelihood of these societies. Conservation of natural resources including biodiversity has been an integral part of several indigenous communities in and around the forest areas. The concept of sacred groves is very old and has existed since the time of Rig-Veda (an ancient Indian sacred collection of Vedic Sanskrit hymns), when tree worship was quite popular and universal. Buddha's study and enlightenment was also in the company of a banyan tree (Negi 2005). The concept and beliefs of sacred trees and groves of forests are one of the best practices to conserve the natural resources. Sacred groves (SGs) are small forest areas that are left untouched by the local inhabitants to be con-

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served by the local village folk deities and are of special spiritual significance to them (Figure 1). Sacred groves, also known as church forests, fetish forests and sacred forests, are found all over the world including Ethiopia, Japan, Morocco, India, and Ghana (Cardelús et al. 2013). The concept of SGs has been a part of rich traditional and diverse culture of Indian societies for many generations. Sometimes, they are also known as natural museums of giant trees, treasure houses of threatened species, dispensaries of medicinal plants, regulators of water sheds, recreation centers for urban life, veritable gardens for botanists, gene banks of economic species, paradise for nature-lovers and laboratory for environmentalists (Bhagwat 2009; Manikandan et al. 2011). Interestingly, they are found worldwide in all part of different continents i.e. Africa, Asia, Europe, Australia and America (Hughes and Chandran 1997). Around 1,00,000 to 1,50,000 sacred groves are reported in India (Malhotra et al. 2007). In India the highest number of SGs (5000) has been reported to be present in state of Himachal Pradesh followed by Kerala and Chhattisgarh. Different

scientific reports revealed that these SGs can support and conserve different fauna and flora (Khan and Tripathi 2004; Chandran et al. 1998; Sukumaran and Jeeva 2008; Ray and Ramachandra 2010; Singh et al. 2010). Indian ancestors were fully aware about that the importance and significance of natural resources that sustained them which were necessary to be conserved for the sustenance of future generations. They lived in harmony with nature and thereby played an important role in conservation of biodiversity.

In India, different religions having different traditions, beliefs, and rituals are associated with conservation of biodiversity and forests. In Hindu religion, it is a traditional belief that nature shows a reverence for five basic elements i.e., Earth (*Prithvi*), Fire (*Agni*), Water (*Jal*), Air (*Wayo*) and Space (*Akash*). All the five elements are treated as a body of God and are worshipped. These five elements are protected for religious, cultural and spiritual reasons. There are many studies entitled to further quantify this ethics, which leads to biodiversity conservation and sustainable ecosystem (Pal and Mukhopadhyay 2011).



Figure 1 Sacred trees around temple.

The SGs play an important role in ecosystem services such as clean environment i.e., air, soil and water conservation, flora and fauna conservation, carbon sequestration, temperature control and conservation of traditional knowledge. They are therefore, the epicenter of ecological conservation research and policy regarding conservation and management of forest at state and national levels (Ray and Ramachandra 2010). There are several studies carried out by various researchers on this subject highlighting significant role and potential of the SGs. The present paper therefore, explores the role of SGs in conservation and management of different ecosystem services in Indian society.

Results and discussion

Taboos for plant and animal conservation

From the current study it was found that, in Chamoli district of Uttarakhand state (India), people believed that when a village rural girl gets married, the married couple has to plant a seedling of a tree in bride's house. Planting a tree seedling is a cultural and traditional practice in this region which later gained momentum in late eighties and succeeded in creating a lot of awareness among the locals. Planting of sapling as a marks of respect, is undertaken by VIPs during their visit to various establishments. This practice has been popular and planting a tree seedling has been taken up by non-government organizations (NGOs) as an important movement (Maiti Andolan) which includes list of taboos that slowly intensified, spreading to nearby areas of the region. This is a new and novel approach for biodiversity conservation in the hilly region through plantation, where the occurrence of land slide and natural hazards are more frequent. Another example of such conservation is the alpine plants *Saussurea obvallata* and *Delphinium vestitum* locally called Dongar and Loshkar; which have been protected through local customs and beliefs by linking these plants with local deity and not allowing any one from the village or outside to pluck the flowers except the village priest during specific day and time only (Meenakshi et al. 2011).

Taboos are the unwritten, orally transmitted traditional and social rules that regulate human behavior (Colding and Folke 1997; Banjo et al. 2006). In rural areas of India, many plants and animals are considered as pious and sacred religiously having imbibed cultural values among the tribal communities. The religious belief serves as an instrument of protection of those rare forest species (Pandey 2003).

Approach towards Eco-retreats

The devastating impact of pollution, supplemented by deforestation can only be restored by green lung area of the sacred groves which, besides providing numerous tangible products remains the storehouse of the life gas-oxygen. If these storehouses are not properly managed

and conserved, the future generation will definitely be deprived off this valuable asset (Anthwal et al. 2006). As a part of school curriculum, school children are often asked to plant saplings in school compounds to understand the importance of trees. Planting for the programme are supplied by the local forest department for this purpose. Saplings of the plants like sandal (*Santalum album*) are specially planted in lower areas, which have specially seen the severest cutting and elimination out of greed.

Belief and myth towards soil and water conservation

Sacred groves play an important role in soil and water conservation. They improve the soil stability of the region and act as soil binder. Plants like vetiver grass (*Vetiveria zizanioides*) and *Eucalyptus* spp are maintained to bind the soil thereby preventing soil erosion. In India, water of different rivers are treated as holy among all sources and used in all rituals and worships. People take holy dip/bath at the confluence of two or three rivers called prayag or sangam (meaning union) in different parts of the country i.e., Devprayag, Allahabad, Nasik etc. As most of the cities and town are settled on the bank of rivers ie., Ganga, Yamuna, Brahmaputra, Godavari, Krishna, Kaveri, etc. which are, not only considered sacred but are also a source of drinking water supply cities in the country. Small natural water bodies are maintained, near SGs to take care of drinking water problem during drought. Villagers are now improving the surrounding areas of water bodies with concrete structure to conserve natural flowing Waterbodies and maintain it in a hygienic condition.

Approach towards Carbon sequestration

Estimation of carbon stocks and stock changes in tree biomass are necessary for reporting to the United Nations Framework Convention on Climate Change (UNFCCC) and which is required for Kyoto Protocol reporting also. Very little work has been done so far for estimation of the carbon sequestration potential of the sacred groves except for few reports, where carbon sequestration potential of various species was estimated in Maharashtra (Hangarge et al. 2012). The tree, *Terminalia bellirica* was found to be dominant of sequestering 327.78 tonnes of carbon followed 221 tonnes by *Ficus amplissima* (Hangarge et al. 2012). The species *Gnidia glauca* had lowest carbon sequestration potential i.e. 0.0808 tonnes. A SGs having thick vegetation possesses high carbon sequestration potential thereby contributing to reduced concentration of CO₂ in the atmosphere (Hangarge et al. 2012).

Traditional knowledge for conservation and management

Traditional societies are characterized by their close inter-connection with nature and its resources. Hence, the traditional communities depend upon natural resources and

biodiversity more for their livelihood (Ramakrishnan 1996). Even now the NGOs working in the region make it a point to plant important utility plants like soap nut (*Sapindus mukorossi*), arjun (*Terminalia arjuna*) Roxb., sandal (*Santalum album*) to strengthen the SGs in different lower regions.

Conservation of Medicinal and Aromatic Plants through local belief

The SGs are believed to be a treasure house of medicinal and aromatic plants. Though most of the indigenous people residing near the groves are illiterate, they have scrupulously nurtured their traditional customs, rituals, ceremonies and a way of forest life through folk beliefs with great vigour. The fact that sanjeevani found in Himalayan region was used by Lord Hanuman (A Hindu deity) to resuscitate Lakshman the brother of Lord Rama is well known to all Indians. There is a need for protection of large number of medicinal plants as an important component of SGs in different parts of India which is already documented in various studies (Vartak et al. 1987; Bhandary and Chandrasekhar 2003; Pandit and Bhakat 2007). In Doonagiri village of Nanda Devi Biosphere Reserve, Uttarakhand state, tribal people of Bhotiya community have an ancient practice of conserving the medicinal plants of the region for centuries. This is mainly attributed to their religious belief. They have deep faith that if someone from outside the village uproots the medicinal plants from their village, it is treated as an evil act which may bring misery of great order to the village folks. They nurture a belief that Lord Hanuman came to their village and uprooted all their medicinal plants which was the cause of untreatable diseases, which struck the people later. Thus, medicinal plant conservation is an integral part of sustainable living by these people with the nature (King-Oliver et al. 1997). Till now medicinal plants like mint (*Mentha arvensis*), coriander (*Coriandrum sativum*) and fenugreek (*Trigonella foenum-graecum*) are planted as an important component of SGs and preserving Himalayan ecosystem.

Approach towards animal conservation

Almost all Hindu Gods are associated with animals, birds and creatures as their vehicles or vahanas. This concept is to promote harmony in nature to maintain ecosystem. Protection of animals and other creatures along with human beings is essential to maintain ecological balance. As a result, all categories of wild and domesticated animals were identified/attached to Gods (Table 1). For instance, Garuda (eagle) Vahanam (Vah in Sanskrit language means to carry or to transport) was symbolized with Lord Vishnu, Peacock to Muruga, Bull to Lord Shiva, Tiger to goddess Durga and Rat to Vinayaka. Thus, all gods typically or mythologically are

symbolized with animals as their vahanas often called the deity mounts. The association of animals with Gods as Vahanams (vehicles) is a deliberate attempt to weave mythology for protection of animals and plants in order to maintain ecological balance. Often, God is iconographically depicted riding animals as (or simply mounted upon) vahana. Even one of the trees, Kalpavrusha, is treated as vahana. Lord Shiva uses lion skin for his attire and as supports a reptile king cobra as an ornament. Serpents are venerated on Nagpanchami day and offered milk for maintaining the natural food chain and preserving environment of SGs. Monkeys as a part of respect to Lord Hanuman and bears were also treated as gods and remained a part of the army force of Lord Rama (Table 1).

In many traditional Hindu mythological literatures the killing or hurting a cat is a crime which is also sinful and harmful. If any person is involved in killing the cat he has to make a statue of the cat of gold/bronze metal and kept submerged in deep water to get solace and relief from the effects of the committed sin. The scientific reasoning behind the Hindu mythology was that cat kills and eats many insects and rats as an integral part of food chain, thereby preventing the spread of many viral diseases. Hence, cats need to be protected which are human friendly with their livelihood practices. In Rajasthan (western-India), the Bishnoi community treats Black Buck Deer as their child and killing or harming them is considered a great sin. Thus, Bishnoi cult supports the wildlife protection act as Black Buck Deer is considered as human friendly in selected localities (Kala and Sharma 2010). Such incidences are widely prevalent and practiced in other countries also. The cow worship is another example of deep religious belief in India. Cow milk is treated as source of balanced diet for children in the Indian food basket. Cow dung is treated as having anti infection properties and used for domestic purposes. Cow urine is believed to possess rich chemical content and is highly useful to treat disease of human beings and is also applied as pesticide. With all its multidimensional uses of cow products, cows are treated sacred and prohibited from killing and worshipped in the name of Kamadhenu (Table 1).

Conservation of floral diversity

India is among the few countries where trees or forests are also worshiped during their religious rituals. Majority of plants/trees are accepted as sacred by Hindus and hence worshipped. Sacred groves are the best example of *in-situ* conservation of biodiversity, where flowers like hibiscus (*Hibiscus rosa-sinensis*), marigold (*Tagetes erecta*), jasmine (*Jasminum officinale*) Brahmakamal (*Saussurea obvallata*) are found in plenty. These SGs harbour many endemic species some of which are at different threat levels in different regions in the country. The state of Uttarakhand is endowed with world heritage site valley of

Table 1 List of some common animals, birds & reptiles and their associated beliefs

S. No.	Scientific name	Local name	Beliefs/uses
1	<i>Panthera tigris</i>	Tiger	Used in rituals and medicine.
2	<i>Elephas maximus indicus</i>	Elephant	In Hindu mythology, during Sagar Manthan (Milk sea churning), the Gods (Angels) and the demons (Asura) churned the ocean for the elixir of life called "Amrit" (Nectar) which make them immortal. From the churning the 'navratnas' (nine jewels) surfaced. Some of these jewels were the Aeravatha (white elephant), Karpavruksha (tree), Kamadhenu (Holy cow). Therefore considered to be sacred among Hindus.
3	<i>Bos Taurus</i>	Cow	In Hindu mythology the cow is considered holy The cow is equated to one's own mother (hence the expression 'Gaumata). In Hindu mythology, Kamadhenu, the wish-fulfilling celestial cow. It is believed that cow could grant any wish for those who worship cow.
4	<i>Bos taurus</i>	Bull	Bull occupies a special place in Hindu mythology. The reverence of the animal has been one of the central themes of Hinduism, since ancient times. Bull is vehicle/vahana of lord Shiva.
5	<i>Antilope cervicapra</i>	Black buck	It is also known as Krishna Mruga in Kannada.
6	<i>Macaca mulatta</i>	Monkey	Monkey is known to be associated in the army of Hindu God Hanuman hence considered sacred.
7	<i>Felis catus</i>	Cat	Cats are associated with fertility and the goddess of birth, Shakti.
8	<i>Pavo cristatus</i>	Peacock	Hindu mythology peacocks are associated with the goddess Saraswati (goddess of education & knowledge). The feathers thus represent qualities like: kindness, patience and good fortune.
9	<i>Naja naja</i>	Snake	The snake is commonly called ('Nag' in Hindi language) is worshipped by people across the country. Some of the snakes are considered in mythology as 'protectors' and other categories as harmful/destroyers'. Lord Shiva wore snake as an ornament. Lord Vishnu sleeps on snake with thousand heads Adiseshu (King cobra) as his bed on milk sea.
10	<i>Bos grunniens</i>	Yak	The bushy tail is in great demand as a fly-wish (fan) in many Buddhist monasteries and temples.
11	<i>Gyps indicus</i>	Indian Vulture	According to the epic Ramayana, when Ravana was abducting Sita to his kingdom of Lanka, a fierce battle took place between him and the vulture King Jatayau. The bird was fatally wounded in its attempt to rescue Sita from Ravana.
12	<i>Columba turica</i>	Dove/Pigeon	Goddess Rati, the Goddess of passion and lust and the consort of Kama, the God of love, is believed to be usually depicted with a pigeon as her vahana.
13	<i>Corvus splendens</i>	House Crow	The house crow occupies a special place in Hindu religious rituals. It is usually identified with departed souls of ancestors. In Hindu the ritual of 'pinda pradhana' (offering of cooked rice balls) to the crow.
14	<i>Sus scrofa</i> Linnaeus	Wild Boar	The third avtara of Lord Vishnu was Varaha, a boar. Varaha is generally depicted having a boars head on human body. Varahi is the Hindu Goddess Durga in the form of a wild boar.
15	<i>Ratufa indica</i>	Squirrel	Squirrels are considered sacred in India and are not to be harmed. Squirrels are association with Lord Rama. During the construction of the Adi Sethu (bridge) at Rameshwaram by Lord Rama and the vanara sena, a little squirrel also contributed in its own little way. Lord Ramas pleased by the creatures dedication, caressed the squirrels back and ever since, the Indian squirrel carried white stripes on its back, which are believed to be the mark of Lord Ramas fingers.

flowers, where different flowers are found in abundance near SGs. Sacred groves are the natural gene pool preserver and example of habitat preservation through community participation (Gadgil and Vartak 1975). Scientific reports also confirm the fact that SGs protect a variety of flora and fauna (Ray and Ramachandra 2010). Sukumaran et al. (2008) highlighted the species richness of 212 miniature sacred groves of Tamil Nadu. Due to this deep rooted religious system, many trees are not axed as they are supposed to increase longevity. In Uttarakhand, *Cedrus deodara* is treated as a religious tree and worshipped during rituals and religious ceremonies. In Madhya Pradesh, the Gond tribes only use the fallen parts of the tree and cutting this sacred tree is totally prohibited. The neem tree (*Azadirachta indica*) is considered to be a manifestation of Goddess Durga. Besides, Tulsi plant (*Ocimum sanctum*) is worshipped as Goddess by women throughout the country which is supposed to enhance the longevity of their husbands' life.

Socio-cultural functions to the sacred groves

Many rituals are performed in the sanctity of SGs for want of rains, good health of livestock and for fending off any impending disaster. In some parts of Karnataka, people offer miniature images of cattles to keep their livestock's healthy (Kalam 1996). Among the Bhils of Ratanmal, food and liquor are offered to SGs on the occasion of Deepawali a national festival (Nath 1960). Likewise, in West Bengal, social gathering takes place in the vicinity of SGs on the occasion of Salui and Karam festivals (Deb and Malhotra 1997). Different festivals such as Holi, Deepawali, and Navratri are performed around SGs in Ratnagiri district of Maharashtra (Godbole et al. 1998). Similarly, Anthwal et al. (2006) reported several festivals related to SGs in Uttarakhand. Many plants species have also been associated with religious festivals viz: *Azadirachta indica* (Sheela asthami, Nimb saptami), *Ficus bengalensis* (Vrat savitiri), *Aegle marmelos* (Bilvamengal sawan ke somvaar), *Musa paradisiaca* (Kadii vrat) and *Ficus*

religiosa (Somvari amavasya) due to popular and common beliefs (Table 2).

Threats to the sacred groves

SGs are showing sign of weakening and decrease in terms of cultural, biological and ecological integrity in different states of the country. The number of SGs in different states also depends upon the magnitude of these threats which is area specific (Table 3). Over the past few decades many people have lost their rights of forest management to the government. Many scholars have worked on conservation of sacred groves through socio-cultural practices in different parts of India (Gadgil and Vartak 1975; Boojh and Ramakrishnan 1983; Khiewtam and Ramakrishnan

1989; Rodgers 1994; King-Oliver et al. 1997; Tiwari et al. 1998; Sinha and Maikhuri 1998; Sunitha and Rao 1999; Basu 2000; Kushalapa et al. 2001; Bhagwat et al. 2005; Jaryan et al. 2010; Kala and Sharma 2010; Anthwal et al. 2010). There are several reasons for this decrease in terms of area and number, primary being lack of documentation as a result of which it becomes difficult to conserve and maintain them. No legislative protection has been implemented so far in India.

Lack of awareness in terms of long term future benefits has also resulted in the destruction of SGs. Various religious beliefs, influx of large number of pilgrims and tourists and conversion to other religions axing of plants for monetary benefit have contributed consistently for

Table 2 List of some sacred plants in Hindu mythology

S. No.	Scientific name	Local name	Family	Beliefs/uses
1	<i>Aegle marmelos</i> (L.) Corr.	Bail	Rutaceae	Ritual/medicine/sacred
2	<i>Artemisia nilgirica</i> (Clarke)	Kunju	Compositae	Ritual
3	<i>Atrocarpus heterophyllus</i> Lamk.	Theibong	Moraceae	Ritual
4	<i>Azadirachta indica</i>	Neem	Meliaceae	Ritual/medicinal
5	<i>Blumea balsamifera</i> (L.) DC.	Bari ilaichi	Compositae	Ritual/medicine
6	<i>Betula utilis</i>	Bhoj patra	Betulaceae	Ritual/sacred
7	<i>Calotropis procera</i> (Ait.) R. Br.	Aak	Asclepiadaceae	Rituals
8	<i>Cedrus deodara</i>	Deodar	Pinaceae	Sacred
9	<i>Cynodon dactylon</i> Pers.	Dhoob	Poaceae	Ritual
10	<i>Datura stramonium</i>	Datura	Solanaceae	Ritual/medicinal
11	<i>Desmostachya bipinnata</i>	Kush	Gramineae	Ritual
12	<i>Elaeocarpus Ganitrus</i> Roxb.	Rudraksha	Eleocarpaceae	Sacred/Ritual
13	<i>Emblica officinalis</i>	Amla	Phyllanthaceae	Sacred/medicinal
14	<i>Erythrina indica</i> Lam.	Paribhadra	Faboideae	Ritual
15	<i>Ficus benghalensis</i>	Bargad	Moraceae	Ritual/sacred
16	<i>Ficus religiosa</i>	Peepal	Moraceae	Sacred
17	<i>Mangifera indica</i> L.	Mango	Anacardiaceae	Ritual
18	<i>Musa paradisisca</i>	Banana	Musaceae	Ritual
19	<i>Ocimum sanctum</i> L.	Tulsi	Lamiaceae	Sacred/medicinal
20	<i>Pinus roxburghii</i>	Chir	Pinaceae	Ritual
21	<i>Princepia utilis</i>	Bhakel	Rosaceae	Ritual
22	<i>Prosopis cineraria</i>	Khachri	Leguminosae	Rituals
23	<i>Prunus cerasoides</i>	Paiya	Rosaceae	Rituals
24	<i>Punica granatum</i>	Daru	Lythraceae	Ritual
25	<i>Santalum album</i>	Sandal	Santalaceae	Ritual
26	<i>Saussurea obvallata</i>	BramKamal	Asteraceae	Sacred
27	<i>Terminalia arjuna</i> (Roxb.)	Arjun	Combretaceae	Ritual/medicine
28	<i>Toona ciliata</i> M. Roem.	Tun	Meliaceae	Ritual
29	<i>Xanthoxylum achanathopodum</i>	Timoor	Rutaceae	Sacred/Rituals/medicine
30	<i>Zanthoxylum armatum</i>	Timoor	Rutaceae	Ritual/medicine
31	<i>Quercus leucotrichophora</i>	Oak	Fagaceae	Sacred

Table 3 Total Sacred groves distribution in India (Adopted from Malhotra, 1998 and Malhotra et al., 2001)

Sr. No	State	Number of SGs	Generic name	Reference
1	Andhra Pradesh	750	*	WWF (World Wildlife Fund) Andhra Pradesh (1996)
2	West Bengal	670	Bankura	Deb et al. (1997)
3	Uttaranchal	1	Bugyal, Devban	
4	Tamil Nadu	448	Kovilkadu/ Nandavana	Amrithalingam, 1998
5	Sikkim	56	Gumpa forest area	Chatterjee et al. 2000
6	Rajasthan	9	Orans Kenkris	Jha et al. 1998
7	Orissa	322	Jahera/Thakuramma	Malhotra and Das 1997
8	Meghalaya	79	Ka Law Kyntang	Tiwari et al. 1998
9	Manipur	365	Gamkhap, Umanglai	Devi, 2000; Khumbongmayum et al. 2004
10	Maharashtra	1600	Devrai, Devrahati	Deshmukh et al. 1998
11	Kerala	2000	Sarpakkavu/Nagavanam	Rajendraprasad 1996
12	Karnataka	1214	Devarabana/ Sidharavanam	Kalam 1996
13	Jharkhand	21	Sarana/Jaherthan	
14	Chhattisgarh	2000	Devgude, Malgudi	
15	Gujarat	29	*	Gupta et al. 2000
16	Haryana	248	*	NAEB National Afforestation and Eco-development Board 1995
17	Himachal Pradesh	5000	Dev ban	Sharma 2000
18	Assam	40	Miadaico	Deb et al. 1997
19	Arunachal Pradesh	58	Gumpa Forest	Chatterjee et al. 2000
Total		13720		

*Generic names are unavailable.

the degradation of these well flourished areas of vegetation to a mere crunch of trees in many parts of India. Greed for certain plants like sandal (*Santalum album*) has resulted in decrease of their numbers in India and particularly in Himalayan SGs. The indigenous species found in the sacred groves are threatened by the introduction of exotic weeds such as Common Floss flower (*Eupatorium odoratum*), Shrub verbenas (*Verbena officinalis*), Lantana (*Lantana camara*) and Parthenium (*Parthenium hysterophorus*) etc. Likewise, grazing, lopping and removal of biomass have also resulted in dwindling of the groves. Encroachments of SGs areas by local communities or various other government departments, migration and immigration of people have contributed to the extinction of SGs. The most recent threat to SGs is witnessed from the process of modernization, industrialization, greed of land mafias and construction of building structures resulting is loss of cultural and ecological importance among the younger generation of local people.

For providing necessary protection to the SGs and maintain their natural identity and sanctity it is imperative that cooperation of the people is extended. The surrounding village communities need to be educated and guided for sustaining the sanctity of existing grove and strengthening them. Legislation by the state government against cutting of such important trees need to be in place as is existing against cutting of khair (*Acacia catechu*) in

state of Himachal Pradesh, where severe punishment is awarded for violation of the directions. During contact with woman in the villages adjoining different SGs, it was felt that they were more enthusiastic regarding conservation and preservation of different plants. Their concern was of rapid loss of important plants of utility in recent years and felt that the following issues need to be addressed without fail (Table 4).

Conclusion

In the words of Dr. M.S. Swaminathan, "Unlike a botanical garden, where a wide range of trees and plants are collected and cultivated for the purpose of our education and enjoyment, the sacred groves are one method of

Table 4 Issues concerns for SGs conservations

S. No	Concerns for conservation
1	Capacity building of woman regarding importance of SGs land planting by forest department for immediate multiplication of such plants for release in different villages
2	Appointing contact persons in villages on monthly basis if not on regular basis as in case of water carriers in school for maintenance of identified SGs specially near village and place of worship.
3	Involvement of school children for creating awareness and augmentation of SGs
4	Regular visits by forest staff for guidance and maintenance of SGs.
5	Scientific management of water bodies around SGs

expressing the gratitude of human beings to the trees which sustain and support life under a given agro-ecological condition". We therefore need immediate measures to stop the destruction of SGs and start their conservation as being an integral part of the social and cultural life in rural India. Documentation of all the sacred groves needs to be taken up on high priority basis so that management and conservation programs for these threatened groves can be initiated. The bondage between people, their beliefs and rituals associated with SGs in the past have hidden scientific truth. Many ancient trees are surviving till date due to the sacred belief and worship. However, in the past heavy inflow of tourists around sacred groves, threatened their very existence. Loss in faith and religious conversions in general has further intensified the magnitude of erosion of beliefs and value system. Hence, revival of SGs institution for the conservation of valuable biodiversity and ecosystem services is necessary. At the same time the cultural, biological, social and ecological importance of SGs cannot be ignored. Therefore, there is a great need for restoration and management of SGs to preserve scientific ecological system. A scientific understanding of harmony and co-existence of flora and fauna will strengthen the importance of SGs and play an important role in designing strategies for their rehabilitation and management for maintenance of sustainable ecological balance. Awareness building regarding the importance of sacred groves is first and foremost step needed to be taken for the revitalization of these traditional values, practices and beliefs among the youth. Benefit sharing should be promoted within the local communities for conserving and maintaining the groves. Stringent legislation followed by punishment accordingly is definitely needed for long and healthy life of sacred groves and therefore conservation as a whole.

Some positive signs

- The Social Forestry wing of the Kerala Forest Department has signed memorandums of association with the owners of select groves for protection, enhancement of biodiversity and awareness programmes and 15 sacred groves have received assistance for their conservation efforts (The Hindu, May 5, 2013, India)
- Chilkigarh a sacred grove being located almost in trijunction of the three states (West Bengal, Bihar and Orissa) is known for its rich and unique floral wealth was indiscriminately exploited earlier and presently the entire sacred complex has been taken over by the local Kanak Durga Temple trust consisting of members from Chilkigarh and adjoining villages. They have revived the concept of social fencing through inculcating the traditional

socio-religious and ecological values of plants and simultaneously getting economic benefits through the tourists, visitors and devotees.

Methods

A good number of SGs are found scattered in the hills of Garhwal and Kumaon region (Uttarakhand) India near the bank of rivers, Bhagirathi, Mandakani, Alaknanda as well as in the world famous spiritual centers of Yamunotri, Gangotri, Kedarnath and Badrinath. The places are visited by pilgrims in thousands, throughout the year. To collect information for the present study, a small team was constituted to visit such areas with a prepared questionnaire on different type of plants, utilized by people in adjoining villages, extinct plants and their use for religious ceremonies and awareness of these plants as well as common animals & birds attached to associated beliefs. Ten centers each were visited in the areas of Uttarkashi, Pauri, Tehri and Chamoli for this purpose. Necessary information was collected from five people in each centre majority of whom were functioning priests serving in the area. Thus, a total of 200 people were contacted for their views on the present status of the SGs. The information was later compiled and tabulated.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

LSK contributed in the experiment design, data collection and manuscript writing and editing. VKB, MB and AKT helps in manuscript writing and data collection. All authors read and approved the final manuscript.

Acknowledgements

Authors are thankful to Haramaya University, Dire-Dawa, Ethiopia for providing necessary facilities. Contribution and help from traditional medicine practitioners (Vaidyas) and other local healers of the study area in India are hereby acknowledged.

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Received: 19 February 2014 Accepted: 24 April 2014
Published: 20 June 2014

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doi:10.1186/s40068-014-0016-8

Cite this article as: Kandari *et al.*: Conservation and management of sacred groves, myths and beliefs of tribal communities: a case study from north-India. *Environmental Systems Research* 2014 **3**:16.

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