Chapter 2

Review of Literature
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Biodiversity is the biological capital of the planet and forms the foundation upon which the human civilization is built. The vast diversity of flora and fauna is the outcome of millions years of organic evolution on the earth. They are interdependent, inter related and interacting with physico-chemical environment facilitating the flow of energy and material recycling. Forest ecosystems fulfill the basic life support functions including watershed protection, soil conservation, climatic regulation, carbon sequestration, biodiversity conservation and pest control (Salati et al., 1999). They also contribute society’s recreational and cultural well being, and support religious traditions and practices. In addition, they provide local communities and national economics with variety of goods including food, fodder, gums, fibre, fuel wood, timber and medicinal products derived from plants and animals, and play an important role in sustaining their subsistence and socio economic development (Boffà et al., 1999).

The total forest area in the world in 2005 which is about 30% of the total land just under 4 billion hectares, corresponding to an average of 0.62 ha. Per capita. But the area of forest is unevenly distributed. About 55 per cent of the world’s forest is located in developing countries, with the remaining 45 per cent in developed countries. The world’s forests are almost equally divided between tropical-subtropical forest and temperate-boreal forest. On a global average, more than one-third of all forests are primary forests where the ecological processes are not significantly disturbed.
Rare tree species and those highly valued for wood or non wood forest products (NWFPs) are in danger of becoming extinct within parts of their range. On average, 5 percent of the tree species native to a country is vulnerable, endangered or critically endangered (Global Forest Assessment-2005). Deforestation, mainly conversion of forests to agricultural land, continues at an alarmingly high rate – about 13 million hectares per year. At the same time, forest planting, landscape restoration and natural expansion of forests have been attempted to significantly reduced the net loss of forest area. On average 104 million hectares of forests were reported to be significantly affected each year by forest fire, pests or climatic events such as drought, wind, snow, ice and floods. (GFA-2005). India supports approximately 16 percent of the world’s human and 18 percent of the livestock population on 2.5 per cent of its geographical area which accounts for 2.5 percent world’s geographical area including 1.8 percent of forest area.

South Deccan Plateau dry deciduous forests of the Indian eco region represent a large area of tall tropical dry forests on the leeward side of the Western Ghats Mountain Range. It extends across the southern Indian states of Karnataka and Tamil Nadu. The eco region’s links to the ancient southern circumpolar continent and Gondwanaland are evident in the biotic links to Africa and Madagascar (Meher-Homji 1989). The eco region’s vegetation is highly influenced by climate. The tall Western Ghats Mountain Range intercepts the moisture from the southwest monsoon therefore; the eastern slopes and the Deccan Plateau receive very little rainfall. Annual rainfall in this area ranges from 900 to 1,500 mm. The undulating hillsides have very shallow soils.
The dry deciduous forests of this eco region are flanked by the moist deciduous forests along the lower elevations and foothills of the Western Ghats to the west and by thorn scrub to the east. The eco region suggests a transition zone between the moist western vegetation and the drier vegetation to the east and characterized by plant species like *Boswellia serrata, Anogeissus latifolia, Acacia catechu, Terminalia tomentosa, paniculata, bellarica, Chloroxylon swietenia, Albizia amara, Cassia fistula, Hardwickia binata, Dalbergia latifolia, Stereospermum personatum, Pterocarpus marsupium, Diospyrous montana, and Shorea talura*, among others (Champion and Seth 1968). One of the important species of this region, Sandal wood (*Santalum album*) has been selectively removed from most of the forests in this eco region. This eco region harbors several important populations of India’s large threatened vertebrates whose populations are fast declining throughout their ranges because of habitat loss and hunting pressure (Sukumar, 1989). The typical grasses in this habitat include the species like *Chrysopogon fulvus, Heteropogon contortus, Eremopogon foveolatus, Aristida setacea, and Dactyloctenium* spp., etc. The forests are also home to a large number of medicinal plants and various other species of botanical interest. The ecoregion is neither exceptionally species rich nor high in endemism. Many ecologists believe that the thorn scrub vegetation represents a degraded stage of the tropical dry forests, modified by human and livestock use over hundreds of years. More than 90 percent of the ecoregion's natural habitat has been degraded or cleared. Most of the dry deciduous forests represented by this eco region have already been degraded due cash crop plantations, excessive fuel wood collection, and overgrazing by large herds of cattle.
The habitat contiguity with the moist deciduous forests along the foothill of the Western Ghats, in particular, has been severed in several areas by conversions to agricultural lands. Large areas of forest land are lost to development projects such as dams, mining, and resettlement of displaced people. The conservation status of the ecoregion was changed from endangered to critical after the analysis of projected threats from the human population.

2.1. Vegetation analysis

The great diversity of ecological conditions, mainly determined by topography, has created environments conducive for the development of a wide variety of flora and fauna (EPA and MEDAC 1997, Yirdaw 2001). Vegetation analysis based on the plot method serves to characterize the community, describe its floristic composition and identify economically useful species as well as species of special conservation concern (Keel et al. 1993). Quantitative analysis of vegetation of an area is important indicator and tool for an ecological study and can form the basis for documentation study in the following aspects (Pineda et al. 1994);

1. The analysis of structure and function in ecosystem.

2. Important landscape component

3. A natural resource

4. A basis for biogeography

5. The study of human influence

6. A basis for nature conservation

Vegetation analysis provides basis for objective assessment of conservation (Gentry 1988, Keel et al. 1993). It attempts to synthesize the ecological structure and
function of the community and landscape at different scales. To develop a basis for natural resource management in marginal areas studies with these objectives are being made on increasingly detailed scales of geographical variation (equipotentiality), local and territorial variation (vectoriality) and also regarding local discontinuities referred to as mosaicity (Gonzalez-Bernaldez 1981).

2.2. Anthropogenic disturbance and biodiversity

Globally various types of anthropogenic disturbance threaten the diversity of biological systems (Soule 1991, Barbeir, Burgess & Folke 1994; Heywood 1995; Swanson 1995; Njis and Impens 2000). Consequences of these pressures on diversity resulting in disturbances in functioning of these systems have been proposed (Naeem et al. 1994, 1996, Schulze and mooney 1994, Bolker et al. 1995, Hooper and Vitousek 1997, Tilman 1997, Knops et al. 1997). New perturbations like climate change may aggravate current losses of diversity (Peters and Lovejoy 1992; Gates 1993; Kareiva, Kingsolver & Huey 1993, Boyle and Boyle 1994). Biotic pressures greatly contributed by human activity are detrimental to the vegetation structure of forests. Increasing human populations and concomitant land use intensification has changed the amount, quality and distribution of habitats available to native biota. Consequently, conservationists, land managers and resource planners are concerned with anticipating how natural or human-induced disturbances to ecosystems which affect the pattern of commonness and rarity of the inhabiting biota (Lubchenco et al. 1991, Solbrig 1991).

2.3. Global environmental impact of human activity

There is an increasing concern for the global extent of the environmental impact of human activity on diversity (Vitousek 1994). The loss of species diversity is
unique because it is irreversible and the understanding of the loss of species is critical (Chapin et al. 1998). Current extinction rates are 100 to 1000 times higher than prehuman interference levels and the expected extinction of the current threatened species could increase this rate by a factor of 10 (Pimm et.al. 1995). Polynesians across the pacific islands were supposed to have lost 2000 bird species in the past 1000 to 4000 years (Pimm et.al. 1995, Steadman 1995) which is 15% of the worlds' recorded avian diversity. European settlements in the Hawaiian island have eliminated 84 plant species almost 10% of the native flora. Of the island and another 133 are threatened and at the verge of extinction (Sohner 1994). The Fynbos vegetation of South Africa has lost 36 species and another 618 species are threatened with extinction (Pimm et al. 1995). Biodiversity has decreased in Australia due to vegetation clearing since European settlement (Adamson & Fox 1982,

2.4. Biodiversity inventories and conservation practices

It is important to make comparisons of biodiversity resources between regions to understand specific areas where biodiversity conservation should be concentrated (Rennolls and Laumonier 2000). Forest land management in the tropics, including forest exploitation, replanting of plantations and/ or conversion of land-use, the information that is currently available usually includes course map of geoglogy, soil, and possible topographic map (Nohr and Jorgensen 1997).

An additional source that is widely available is remotely sensed information. The main objective of biodiversity inventory is to map a region under management so as to highlight the sub regions of high conservation value so that they may be included in a management plan which ensures biodiversity conservation. The conservation implication of the discovery of a higher dimension of diversity on such a
combined analysis would be that conservation areas would need to span the regions and would need to be chosen in order to maintain this higher diversity, by including as conservation areas representatives of any groupings (Rennolls and Laumonier 2000). Phytosociological analysis of a plant community is the first and foremost basis of the study of any piece of vegetation, as it is a prerequisite to the understanding of community structure and organisation. According to Dansereau (1960), species composition is one of the major characters of plant community. While discussing the importance of species diversity, Odum (1963) pointed out that the number of species reflects the gene pool and adaptation potential of the community. Species diversity is a very useful parameter for comparing two communities especially to study the influence of biotic disturbances or to know the state of succession and stability in the community. McNaughton (1967) working in California annual grassland stated that diversity is a mechanism which generates community stability. The plant climate of the site (Raunkiaer, 1934) and also to a certain extent, the effect of biotic operations (Pandeya, 1953) is revealed by the classification of flora in the various life form classes. Natural vegetation of the Indian subcontinent has been subjected to dramatic alterations largely through human interference for a long period and the kind and magnitude of interference is, however, diverse and varied (Saxena, 1991).

Majority of the earlier ecological studies were directed towards the description of vegetation (Meher Homji, 1964). Plant cover of a region can be viewed and analysed from two different aspects i.e., floristic aspects (Henry and Swaminathan 1978) and the physiognomic aspects of vegetation (Meher Homji 1978). Flora of a region gives an exhaustive list of plants observed and the vegetation cover that clothes it (Meher Homji, 1964). Detailed qualitative and quantitative vegetation analysis of the Tirumala hills forest was carried out by Naithani et al. (2006) using random
sampling method. A total of 27, 40 and 18 species were recorded for the three different groups of species composition.

Regeneration survey in the two tropical forests of Chittagong division conducted by Shah Nawaz (2006) included 84 sample plots were laid covering different slope aspects. The results revealed 290 individuals of 32 tree species from 20 families and 25 genera indicating that the natural regeneration potentiality of the two degraded forests is significant.

Seetharam et al. (2000) in their study involving structure composition and regeneration status of Bidar district in dry deciduous forests using belt transects of size 250x4 m. recorded a total of 243 species belonging to 197 genera and 54 families were recorded from 15 transects. These species include 44 are tree species, 31 shrubs species.

In a study on the woody plant diversity of Doon valley, Negi (2006) reported about 674 taxa belonging to 62 families spread across 368 genera. This total taxa include 591 trees, 35 shrubs, 12 climbers, 15 palms and also 21 bamboo species. It was found that results of 13 species as threatened due to habitat loss and 7 species due to massive exploitation.

Parthasarathy (2001) investigated the changes in woody species structure, composition and abundance in three sites of 1 ha each in tropical wet evergreen forests of Sengaltheri. In a total of 3.4 ha 2676 stems of GBH covering 125 species were enumerated.

Sumant and Pal (2003) have reviewed the diversity and conservational status of medicinal plants in Uttaranchal state through extensive field and literature surveys.
Study recorded a total of 701 species of medicinal plants comprising 138 tree species, 135 shrubs, 421 herbs and 7 ferns. Study also revealed that about 178 species were native to Himalaya, 9 species were endemic, and 7 species were entered in the red data book of Indian plants.

Brittoo et al. (2001) analysed tree diversity in two 1 ha plots of a sacred forests in Mallinganatham of Tamil Nadu. Study revealed a poor species status (25 species, and basal area 10.67 m²/ha, 319 stems). But among two sites conserved site recorded higher diversity than the unconserved one.

An analysis of the floristic diversity of Bhitarkanika National Park, Orissa was carried out by Reddy et al. (2006). A total of 372 species including 172 herbs, 91 trees, 57 climbers belonging to about 262 genera and 100 families were recorded during the study. Nagaraja et al. (2005) assessed the species diversity and composition in logged and unlogged rainforests of Kudremukh National Park. Logged forests in the study recorded lower stem density but higher species richness (508 stems/ha, 54 species) compared to unlogged forests (630 stems, 45 species).

Kushwah and Kumar (2002) reviewed the status of flora in eight protected areas of Madhya Pradesh. This extensive study documented an average species diversity range (H') of 1.72 to 2.50 and evenness (E) of 0.539 to 0.752 in this area.

Subramani et al. (2007) conducted floristic studies in Renuka Wildlife sanctuary in Himachal Pradesh. A total of 395 species belonging to 3156 genera and 115 families were recorded. Study also noted favourable environmental conditions for the higher percentage occurrence of therophytes.
Tripathi et al. (2006) while working on the vegetation characteristics in tropical forests of Andaman Islands reported about 49 trees and shrub species belonging to 27 families. According to the authors the less species diversity in these forests due to higher dominance of a particular species. In a study on the spatial patterns of trees and shrubs in Savanadurga (Murali et al. 2003) reported that spatial variation of trees was high but similarity were low among the species suggesting that the pattern of tree diversity is influenced by the spatial heterogeneity.

Jha and Uma Nanduri (2003) conducted plant diversity studies in various forest blocks of Ghusur Orissa which are representing various levels of degradation stages. The number of different species in closed forest was found to be 71 while in case of open and scrub forests it was 55 and 38 respectively. Study also revealed that the number of trees decrease as the representation of shrubs, herbs, and grasses increase. Supriya Devi L. and Yadava P.S (2006), in their study the floristic diversity of *Dipterocarpus tuberculatus* dominated forest of Manipur situated along the Indo-Myanmar Border, north-eastern India reported a total of 123 species belonging to 48 families.

The quantitative features such as density and importance value index of species varied greatly. The study shows the diversity index of shrubs and herbs were found to be higher than the tree species. The concentration of dominance was recorded highest in the tree species. The presence of low number of higher girth class of tree species and higher number of saplings and seedlings observed in the forest suggests frequent regeneration.

A Phytosociological Study of tropical dry deciduous forests of Boudh district, Orissa, India Sahu et. al. (2007) recorded a total of 187 species (trees 91, shrubs 10,
climbers 12 and herbs 74) in a four hectare sampled area. Study revealed a species rarity of 18%. The reported Shannon-Weiner index (H') is 4.51; with Simpson's value 0.92 infer that tropical dry deciduous forests are also species diverse systems.

A large number of India's livestock population graze in forests, causing serious damage to regeneration and productivity. The use of forests beyond its carrying capacity and encroachments, upon forest lands are the main cause of the continuous degradation of forests. It has been reported that a present 70% of forest has no natural regeneration and 55% is prone to fire. Anthropogenic perturbations to the larger extent can alter the structure and composition of forest ecosystems (Sundarpandian and Swamy, 2000; Swamy et al., 2000). Anthropogenic disturbances have played an important role not only in creating "unhealthy" vegetations conditions, but also interfere in altering natural functions of ecosystems (Campbell and Liegel, 1996; Kalabokidis et al., 2002). Phytosociological studies in India were mainly confined to the temperate forests of Himalayas (Saxena and Singh, 1982; Singh and Singh, 1987; Ramakrishnan et al., 1996) and limited information is available for the tropical forests. [Singh et al., (1981), Rai and Proctor (1986), Pascal,(1988), Sukumar et al,(1992), Chandrasekara and Ramakrishnan, (1994), Jose et al., (1994), Ganesh et al., (1996), Meher Homji and Pascal, (1996) Swamy, (2000), Swamy et al.(2000), Bhat et al., (2000), Ramesh, (2001), Utkarsh, (2001), and Menon et al., (2001).Detailed qualitative and quantitative vegetation analysis of the Tirumala hill forest carried out by Naithani et al. (2006) using random sampling method reported a total of 27, 40 and 18 species were recorded for the three different groups of species composition.
Biswas and Misbahazzaman (2006) described the tree species composition of Idagaon Forest Reserve in Bangladesh based on diameter class distribution. Percentage distribution of trees in different DBH classes showed that about 23 percent of the trees belong to the lower girth class of 5-10 cm in those forests. The observations suggest the lack of regeneration of superior tree species.

In a study on the woody plant diversity of Doon valley, Negi (2006) reported about 674 taxa belonging to 62 families and 368 genera. These total taxa include 591 trees, 35 shrubs, 12 climbers, 15 palms and also 21 bamboo species. About 13 species have been reported as threatened due to habitat loss and 7 species due to massive exploitation.

Kala (2006) worked on the plant community composition and species diversity in the alpine meadows of Uttarakhal. A total of 194 herbaceous plants were sampled in the valley indicated Shannon diversity index range of 0.72 to 2.93 in eleven segregated plant communities.

Tripathi et al. (2006) in a study on the vegetation characteristics in tropical forests of Andaman Islands reported that about 49 trees and shrub species belonging to 27 families. According to the authors the less species diversity in these forests is due to the effect of higher dominance of a particular species.

Chowdhury and Huda (2003) made an investigation on phyto diversity of under growth in forests of Bangladesh and recorded a total of 445 species from 82 families and determined the maximum diversity, equitability, species diversity index values as 6.07, 7.15, 0.90 and 0.98 percents respectively.
The grasses constitute an important group represented by 245 genera and 1,256 species, of which 21 genera and 139 species are endemic. About 600 species belonging to 58 genera are referred as palatable to live stock (Arora et al., 1975). Hooker (1896) gave an account of Indian grasses and described about 151 genera and 846 species.

Bor has published a monumental volume containing 1200 species of grasses from Indian sub continent. Among the pioneers Buchnan-Hamilton (1807), Cameron (1880, 1894), and Meebolde (1909) who have worked on the flora of Mysore before the reorganization of the Botanical Survey of India. Apart from this many contributors in this field especially for Bangalore and Mysore regions include Thirumalachary, Khan and Swamy (1942), Thirumalachar, Razi and Swamy (1949), Venkatesh and Govindu (1946), Razi (1946,1950), Rao and Shastry (1964), Kammathy et a., (1967), Raghavan (1964,1970, 1971), Naithani (1966), Deshpande and Singh (1976) etc.

2.5. Traditional Knowledge and Ethnobotany

Human life and knowledge of preserving it as a growing concern must have come into being almost simultaneously. All known early cultures Egyptian, Babylonian, Jewish, Chinese, Indus-valley etc, had their own glorious and useful systems of medicine and health care. The term Ethno botany was first used by Stragburger (1896). Sometimes this term is referred to as synonymous with economic botany, and traditional medicines. However, Ethno botany broadly defined involves all aspects of direct relationship of plants with man. Its scope is therefore, very wide. Usage of plants by human beings found place in ancient Sanskrit, Greek and Arabic literature, ethno graphics, travelogues, herbals, etc. even prior to the coinage of the term Ethno botany (Mudgal, 1986). “Introduction to Ethno botany” by Faulk (1958).
was the first book on ethno botany in which he highlighted the uses of economic plants in general. Interestingly pleoethnobotany a recent introduction in the field of ethno botany deals with the study of the remains of plants cultivated or utilized in archaeological contexts. An elaborate work on this field was done by Renfrew (1973).

World’s richest medicinal plant heritage is found in India. It hosts about 8 percent of the flowering plant species of the world. Of the total about 19,000 species recorded in India, nearly 8,000 species (about 40% of vascular plants in India) have been identified to be of medicinal value in traditional systems of medicine and are used by the people of India in local health cultures for human, veterinary and agriculture related applications (across ten bio-geographic zones and 25 biotic provinces and 4635 ethnic communities).

The knowledge of these plants is mainly undocumented and transmitted through an ‘oral’ tradition. Around 1800 species are systematically documented in the codified Indian Systems of Medicine. Medicinal plants of India are well represented among different life forms - trees, shrubs, herbs, grasses and climbers; only a small proportion of them are lower plants - lichens, ferns and algae. Out of the total of about 8,000 medicinal plants species, about 700 species are in extensive trade (of which only 80 species are from cultivated source), 42 are imported and the remaining (about 90%) are primarily collected from the wild. About 50 species of medicinal plants are included in the Official Red Data book of Botanical Survey of India.

Majority of the tribal populations living in forests depend on traditional medicines and do not have access to modern systems of medicine, medicinal plants are being increasingly used by rural communities. There are people collecting them for sale and export. Some of the medicinal plants species of India might become extinct if
appropriate conservation measures are not taken. The Indian Medical Heritage flow in two streams Non-codified 'oral folk stream' and a 'codified classical stream'. Both these streams are seen in all parts of the country.

The Local Health Traditions are not isolated disjoint traditions but they are an intrinsic part of the great Indian Medical Heritage. The healer may be a farmer, or a labourer, a barber, or a shopkeeper, a blacksmith, or a shepherd or even a wandering monk. The medical service in most cases is non-commercial and the healer does not depend on this service for a living.

Out of 247 angiosperm families and 2,984 genera recorded in India (Karthikeyan, 2000), the families Asteraceae, Euphorbiaceae, Lamiaceae, Fabaceae, Rubiaceae, Poaceae, Acanthaceae, Rosaceae and Apiaceae contribute the larger proportion of medicinal plant species with Asteraceae sharing the highest number of medicinal plant species. Analysis based on FRLHTs database shows that among the different life forms of medicinal plants, trees constitute a little more than one third proportion (36%). shrubs are around one fifth (21%); herbs less than one third (28%) and climbers and liane form less than one fifth (15%) of the Indian medicinal plant taxa. Medicinal plants occur across diverse habitats and vegetation types. It is estimated that around 70% of India's medicinal plants generally occur in the tropical regions, and remaining 30% are found in the temperate hilly regions and alpine zones of Himalaya.

Analysis of the native medicinal flora of Karnataka and Tamilnadu has shown that the number of medicinal plant species recorded in the dry forests (Tropical Dry Deciduous and Tropical thorn forests) is higher than those recorded in the wet forests.
A recent survey report is available in the form of database developed by Prof. Kameshwar Rao, Bangalore University.

The Western Ghats, Kodagu District Chikkamangalur District, eastern ranges like Biligiri-rangana hills, Savandurga hills, Sandur hills (Bellary district), Kappat hills (Gadag district), Manvi hills (Raichur district), Chincole forest (Gulbarga district) are believed to have relatively higher population densities of medicinal plants in Karnataka.


Hussain and Rehman 2003 studied ‘Orchids’ an important group of plants for traditional system of medicine in India. Reshma, 2004 has reported some biochemical aspects of \textit{Lageneria vulgaris} sinn of cucurbitaceae for anthelmic, antibacterial and anti-inflammatory and also for intestinal troubles.

families in the treatment of different human disorders, veterinary medicine, fodder, vegetables and gum etc. Dubey et.al. (2008) reported 357 plant species belonging to 256 genera and 94 families used by the local people in curing various diseases.

Sood and Sanjaykumar. (2008) reported that 211 plant species belonging to 142 genera, 64 species of plants are in being use for gastro intestinal problems, 54 species for skin diseases, 33 species for joint problems.

An Ethnobotanical study of Medicinal plants in Chandauli district, Uttar Pradesh, India (Singh and Singh.2008) reveals that about 40 medicinal plants are in common use Most of the plants (94.6%) were being reportedly used to treat human diseases. The most frequently used plant parts were roots (45%), followed by leaves (42.5%). Malik and Animesh kumar (2008) 50 medicinal plants belonging to 28 families are being used by the villagers.

A study in Uttara Kannada District in Karnataka, records the use of 52 herbal preparations from 31 plants belonging to 21 families. (Harsha, et al. 2003). A total of 45 species of plants used by Kunabi community in Karnataka were reported to be to 26 families and are used to treat a wide range of discomforts like fever, cough, skin diseases, snake bites, jaundice etc.

Shrestha and Dhillion (2003) observed that the ethno botanical uses of wild species among nine rural communities managing local forest resources in the Bonch Village Development Committee (BDC), Dolakha district, Nepal. Local communities possess knowledge of 113 medical remedies derived from 58 species belonging to 40 families to treat a wide range of ailments. Roots and leaves were the most frequently used plant parts. Local people are familiar with the plants involved in treating common ailments particularly cough, digestive problems, fever, headache and skin
Viswanathan *et al.* (2002) revealed about 68 medicinal plant species and 81 preparations used for curing 48 ailments in Tamil Nadu, India.

Millat-e-Mustafa *et al.* (2001) reported a total of 55 ailments, among which diarrhea and dysentery and cough, skin diseases, fever, constipation, wound, venereal diseases and intestinal worms were commonly treated by herbal medicine.

Fridur *et al.* (2001) recorded that *Nyctanthes arboritristis* JL (NAT) is a widely used reputed medicinal plants of traditional type. FAO (1984) reported that more than 500 species of medicinal plants have been listed from the undergrowth vegetation of the forests and village groves. Many of them are used by the villagers and tribal communities for human and animal treatments (Khan, 1991) but these valuable medicinal plant species have been reported to be disappearing rapidly in Bangladesh.

Shrestha and Dhillion (2003) observed that the ethno botanical uses of wild species among nine rural communities managing local forest resources in the Bonch Village Development Committee (BDC), Dolakha district, Nepal. Local communities possess knowledge of 113 medical remedies derived from 58 species belonging to 40 families to treat a wide range of ailments. Roots and leaves were the most frequently used plant parts. Local people are familiar with the species dealing with common ailments particularly cough, digestive problems, fever, headache and skin diseases. Sadhu *et al.* (2003) reviewed that according to the traditional use of the plant for anti-inflammation and analgesia, *Leucas aspera* collected from Khulna, Bangladesh in March 2000, was tested for its prostaglandin (PG) inhibitory and antioxidant activities. Viswanathan *et al.* (2002) revealed that 68 medicinal plant species and 81 preparations are used for curing 48 ailments in Tamil Nadu, India.
Pramono (2002) demonstrated that the use of plant substances for medication was less toxic compared to that of synthetic chemical compounds. While there is a general concern about the negative side effects of synthetic compounds, the medicinal plants substances are considered to be less dangerous. Baumann et al. (2001) reported that understanding the importance of the use of medicinal plants from socio-economic context for medication is accumulated into a traditional knowledge of health care. Before the modern systems for health care medicinal plants had been the only means for people to be cured from illness.

Oudhia (2001) reported that the water hyacinth (Eichhornia crassipes) was used to Chhattisgarh, India as a medicinal plant. The main use of this weed is in goiter treatment and also as a styptic treatment of wounds in this region. Maiti and Mishra (2000) documented that 13 plant species having anti venom property were used by various tribal communities like Munda, Sava, Santal and Lodha. Mosaddik and Alam (2000) reported that a decoction of Mikania cordata is commonly used to treat gastric ulcer in the Rajbari district of Bangladesh. They have evaluated the anti-ulcerogenic effects of the alkaloidal fraction of whole plants of M. cordata on diclofenac sodium induced gastrointestinal lesion in rats. Silori et al. (2000) reported the findings of a survey was conducted in 1996 in five villages in Pithoragarh district of the buffer zone of the Nanda Devi Biosphere Reserve, where the Bhotiya tribe cultivated medicinal plants on their agricultural fields. The aim of the survey was to understand the socio economics of medicinal plant cultivation and evaluate the future prospects of these practices in promoting sustainable development among the local community.

Ahsan et al. (1997) reported that wild medicinal plants play an invaluable role in the health services and the very livelihood of majority of the rural population.
Given the importance of herbal medicines the Government of Bangladesh has brought the system of Unani and Ayurvedic Medicine under the National Drug policy in 1982 to ensure availability, commercial manufacturing and marketing of quality Unani and Ayurvedic medicine and drugs.

Silva (1997) reported that according to the World Health Organization (WHO), medicinal plants form the basis of traditional and indigenous health care needs used by the majority of the world population. This trend of using medicinal plants does not occur only in developing countries but also in developed countries. In recent years, there has been a growth in traditional medicine due to increase in interests in complementary medicine in industrial countries as well as the interests of the international pharmaceutical industries. Modern pharmacopeia still contains at least 25 percent drugs derived from plants and many others, which are synthetic analogues, built on prototype compounds isolated from plants.

Leach (1994) describes a very similar pattern of medicinal plant knowledge and use among the Mende of West Africa where healers regularly visit primary forest not only to collect specific medicinal plants species, but also to seek assistance from forest spirits to learn about new medicines and as means of demonstrating their bravery and power to other villagers.

2.6. Sacred groves as *In situ* conservation

Sacred lands are found everywhere around the world. In all parts of Africa, various tribes consider different types of groves as sacred. In West Asia, Babylonians and Assyrians hadplanted sacred groves. Palm forest with altar has been reported from Arabia. Sacred Oakgrove was present in Asia Minor. Sacred mountains and lakes are present in Madagascar. Many Siberian people honoured sacred groves.
Village groves are present in Korea. In Japan, Shinto shrines, as a rule, are surrounded by trees. Buddhist temples in Japan and China have tree-gardens. Traditional Chinese honour sacred mountains with trees. Buddhist monasteries and temples of Thailand have sacred groves. Indonesia has monkey-forests. Sacred groves were also present in Greece, Italy, France, Scandinavia, Sweden, Finland, British Islands, Arctic Russia, New Zealand, and Polynesia. Sacred groves are present in Nepal and Sri Lanka. In America, both pre-Columbian people and the settlers maintained sacred groves. In San Francisco AIDS National Memorial Grove (1996) was started in memory of those who died by AIDS and of other AIDS patients. India is a land of diverse natural resources. It is also a country with the strongest traditions of nature conservation anywhere in the world.

Since time immemorial, conservation of natural resources has been an integral aspect of many indigenous communities all over the world in general and India in particular. It is true that India has suffered an almost unabated devastation of its natural biological heritage, and much of what remains has been preserved through the ages because of a host of conservation-oriented socio-cultural and religious traditions.

One such significant tradition of nature conservation is that of dedicating patches of forests or groves to some deities and spirits by the local people, both tribes and non-tribes. Such forest pockets, referred to as sacred groves. Although named differently in different states of India and managed by local people for various reasons, all sacred forests are islands of biodiversity protecting a good number of plant and animal species including some rare, threatened and endemic taxa.

Sacred groves, in general, are repositories and nurseries of many of the local ayurvedic, unani, tribal and other folk medicines which are the original sources that
slowly entered into the modern medicines after careful screening. Protection of a large number of medicinal plants in sacred forests of different parts of India is some of well documented studies (Gadgil and Vartak, 1975, 1976; Bhandary and Chandrasekhar, 2003; Bhakat and Pandit, 2004, 2006; Dash, 2005; Khumbongmayum et al., 2004; Pandit and Bhakat, 2007). Nature worship has been a key force of shaping the human attitudes towards conservation and sustainable utilization of natural resources. Such traditional practices have been invariably operating in different parts of India.

Sacred groves are the repositories of rare and endemic species and can be regarded as the remnant of the primary forest left untouched by the local inhabitants and protected tem due to the belief that the deities reside in these forests. Sacred groves (SGs) are segments 'of landscape, containing vegetation and other forms of life and geographical features that are delimited and protected by human societies under the belief that to keep them in a relatively undisturbed state is expressive of an important relationship of humans with the divine or with nature (Hughes and Chandran, 1998). Malhotra, 1998; Das and Malhotra, 1998; and for biological conservation related studies Chandrashekara & Sankar, 1998; Deb et al. 1997; Deshmukh et al., 1998; Pushpangadan et al., 1998; Gokhale et.al., 1998; Ramakrishnan, 1998; and also Ramakrishnan et al. (eds.), 1998.

Arunachal Pradesh has SGs attached to Buddhist monasteries called as Gumpa Forest Areas (GFAs), which are managed by Lamas. The monasteries are mainly found in the western districts, namely, Tawang and West Kameng. 58 GFAs are reported from the state. Other districts namely lower Subansiri, Siang are also having SGs (Chatterjee et al., 2000).
In plains and foothills of western Assam, the forest dwelling tribes like Bodo and Rabha have tradition of SGs locally called than. Karbi Anglong district also has about 40 SGs (Deb, 1995). In Haflong district in the foothills of Assam, SGs of the Dimasa tribe are called madaico. Many anthropological studies on tribals give account of the tradition of SGs in Chhattisgarh, the new State carved out from the Madhya Pradesh.

Villages in Bastar have three kinds of SGs, namely, matagudi, devgudi and gaondevi. Different tribes have their own Mata or Gaondevi or goddess in devgudi. Twenty nine SGs have been reported from Banaskantha district of Gujarat. The sizes of the groves range between one acre to two square kms (Gupta et al., 2000). In Himachal Pradesh, the tradition of sacred groves is generally known as dev van. The tradition is reported from Shimla, Mandi, Kullu districts and Lahaul and Spiti. Groves of various sizes are found. However, larger groves spread over few hectares are used for controlled use of resources by the local people.

There are about 10,000 temples in the State Himachal Pradesh with well defined management committees and Biradari Panchayats (Caste councils). Almost all the major deities in the State have their own groves and hence the State can be called as Land of Deities and Sacred Groves (Sharma, 2000).

The links of the forests with the deities of their respective villages of the Western Ghats of Karnataka were referred to by Buchanan (1870), who travelled through Uttara Kannada in 1801. The forests are the property of the gods of the villages in which they are situated, and the trees ought not to be cut without having leave from the Gauda or headman of the village, who here also is the priest to the temple of the village god.
The SGs are referred to by different names in various parts of Karnataka such as devarabana, devarakadu, hulidevarakadu, nagabana, Bhutappanbana, jatakappanbana, chowdibana, etc. On the other hand, larger groves function as resource forests, offering both livelihood sustenance and ecological security. The people of the village may gather fallen deadwood, non-wood produce such as pepper, mango, jackfruit, etc., and tap toddy from a palm (Caryota urens) (Chandran and Gadgil, 1993). In Kodagu about 873 devarakadus spread over 10,865 acres were counted, registered and their boundaries were marked in 1873 by the forest department (Kalam, 1996). According to the records of the forest department about 1214 devarakadus spread over an area about 6299.61 acres exist; where 352.28 acres are encroached resulting to 5947.23 acres under the devarakadus in Kodagu district (Kalam, 1996). The first authentic report on the SGs appeared in the Census report of Travancore published in 1891 in which Lt. Ward and Lt. Corner reported the presence of 15,000 sacred groves in Travancore of Kerala, (1827).

Literature survey reveals that there are meager reports on the biodiversity of Jogimatti forest of Chitradurga, Karnataka. Hence the present investigation of Plant diversity status of Jogimatti forest was undertaken with the following objectives.

Objectives:

To Study

- Plant diversity and Phytosociology and enumeration of grasses.
- Medicinal plant diversity and documentation of Traditional Knowledge.
- Sacred Groves as In-situ conservation Strategy.