

PRESENT STATUS OF CERTAIN PLANT DIVERSITY RICH REGIONS/AREAS OF INDIA AND THE SIGNIFICANCE OF THE LONG TERM ECOLOGICAL RESEARCH IN FORESTRY

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Abstract: During the last two decades much has been written about the biodiversity richness of country. Avoiding all the numerical details about the documented species an attempt has been made to provide information about the relative forest systems of India. For classifying the vegetation the altitude has been adopted as vital factor in detailing the vegetation. The Darjeeling district has been cleared off the forest for tea plantation while in Sikkim this has been done for cultivation. Prime forests in India are left in a few localities because of tremendous amount of population increase. The high density biodiversity rich forests may be listed as the Sacred Groves of Meghalaya, Silent Valley, Valley of Flowers, Pachmarhi Forest, Kala Top, Chadwick Falls, Glen, Deoban, Kalamuni, Jaber Khet, Chitray Forest, Chungthang, Lachung, Shem Bagnaur, etc.

INTRODUCTION

India lying between 8°4'-37°6' N Lat. and 68°-7'-97°25' E. Long. Covering an area of 32, 87,590 km² is one of the mega-diversity centers of the world. The rich vegetation of the country is represented by about 65000 species of plants (a great majority has not even been documented so far) flourishing in majority of the perceptible ecosystems varying from wet tropical rain forests to alpine forests. Marine and fresh water as well as desert vegetations are not lacking either. It is a well established fact that quite a good proportion of the plant wealth has been utilized during the last two centuries alone, much of it in the post Independence period due to political vicissitudes, developmental activities and the pressures of the ever increasing, population which is now more than one billion (10 x 10⁸). A big part of India's population lives in more than 5, 00,000 villages. These people and the urban poor draw their requirement of fire and fuel-wood from the natural vegetation creating pressures on woodlands.

During the last two decades much has been written about the biodiversity richness of the country as a whole and on regional basis. Avoiding all the numerical details about the documented species and the endangered ones, I will confirm myself to providing information about the selective forests systems of India based upon my field observations made during the past 50 years or so.

DARJEELING DISTRICT OF WEST BENGAL AND SIKKIM STATE

The region with Darjeeling lying at 27°3' N Lat. and 88°18' Long supports the typical monsoon forests. There is always difficulty of classifying the vegetation of these forests but we adopted the altitude as vital factor in detailing the vegetation as (i) Low hill tropical – subtropical forests, up to 900 m, (ii) Middle hill subtropical forest, 750-1500 m, (iii) Upper hill warm or wet temperate forests, 1500-2700 m, (iv) *Rhododendron* – conifer cold temperate to sub-alpine forests, 2700-3600 m and (v) Alpine scrub forests and grasslands, 3600-4300 m or above. Details of forests wealth of woody species and ecology of Pteridophyte vegetation as well as their habitat and distribution are provided by Mehra and Bir (1964). The vegetation consists mainly of broad leaved and coniferous forests rich in timber yielding species, terrestrial and epiphytic growth of orchids, liverworts (thallose and leafy), ferns, fern allies, lichens and fungi while medicinal plants and ornamentals being in plenty. Oak trees of the middle and upper hill forests are laden with epiphytic fern vegetation.

Most of the mountain slopes between 600-2100 m in Darjeeling District have now been cleared off the forests for tea plantation while in Sikkim this has been done for cultivation. Two examples of extremely rich and dense forests with plenty of ground vegetation around Darjeeling are of Leboing Forest (1200-1800m)

and Tiger Hill-Senchal Lake forests (2100-2400m) that have been badly decimated during 1970s and 1980s. High altitude vegetation of *Rhododendron* scrub forests both in Darjeeling (Tonglu-Sandakphu-Phalut) and Sikkim (Nathu La) has been the prey of tourist flux which needed firewood to keep warm in dak bungalows. Extensive road building activities resulted in huge vegetation destructions because this was never restored. East and North Sikkim as well as Teesta-Gangtok road environs which were once botanists paradise for *Rhododendron* and orchid flower beauties were also fatally damaged. Beautifully hanging from tree branches plants of *Lycopodium* along Gangtok – Pakyong – Rani Khola and Singtam – Gangtok roads between 500 m -1500 m as well as bird's nest fern around Teesta and tree ferns in Kurseong forests are altogether missing now because of piracy by trade people. Stationing of troops around Chhangoo lake and Nathu La near Indo-Tibetan border since 1962 resulted in huge destructions of Silver fir (*Abies densa*) forests over large areas and now the landscape shows extensive growth of Bambucaceae (*Arundinaria* and *Bambusa* species). There is massive forest destruction and biodiversity loss in Sikkim because of forest clearing for cultivation of cereal crops, vegetables and fruits. Forests area is gradually shrinking presently with Dense Forest (with 40-70% tree canopy) area percentage of the total geographical area being only 34.14 in Sikkim State and 34.89 in Darjeeling District (Anon., 1997).

MEGHALAYA

Garó, Khasi and Jaintia Hills, once part of Assam and lying between 25°47' – 26°10' N Lat. and 89°45' - 92°-47' Long. has been a reservoir of rich plant wealth on the Indian subcontinent as per documented information. Amongst these, flora of Khasi Hills particularly attracted attention of the celebrated botanist and they described the area as "the richest in India". The forests are mainly tropical and subtropical (up to 1200m) and warm temperate types 1200-1800 m or above. These are chiefly confined to Upper Shillong and Shillong Peak (1966m). Mainly broad leaved and *Pinus kesiya* forests dominate the hills but *Cryptomeria japonica* is cultivated as ornamental avenue tree in Shillong. Rolling grasslands are the conspicuous elements of the general landscape of these hills. Forests on Cherapunjee hills

have been badly damaged, having practically lost the characteristics plant wealth. Environs of Shillong are excellent with beautiful dense forests of Pine (*P. kesiya*) which often appear to be of secondary types and extending beyond Barapani downwards. Dense forests area in totality is only 18.03% while 57.77% is of highly degraded type (10 - 40% canopy) with the state lost 854 km² of forests between the years 1987-1997 due to anthropogenic factors. Practice of shifting agriculture and unregulated tree felling are responsible. The redeeming feature is that nearly 1000 km² of forest area (forest with nearly 100% canopy) in Meghalaya is under "Sacred Groves or Forests" which is left undisturbed since time immemorial due to religious beliefs. These forests groves are rich in flora (Tiwari *et al.*, 1999). Mawphlong sacred grove (75 ha area) near Shillong situated amongst rolling grasslands is very rich in plant diversity and famous with botanists. The sacred groves of Meghalaya are the Sanctuary of as many as 45 species of rare and threatened plants of the state.

GARHWAL HIMALAYA (PRO PARTE UTTARANCHAL)

The vegetation of the region comprised by Districts of Chamoli, Dehra Dun, Tehri, Garhwal and Uttarkashi of Uttarakhand lying between 29°26' – 31°28' N. and 77°49' - 80°6' E Long. and covering an area of about 25000 km² was surveyed during March-April and June-September 1977-1981. The forest vegetation is categorized into: A. Upto 1000 m alt. (1) Tropical Moist Deciduous Forests (2) Tropical Fresh Water Swamp Forests (3) Dry Deciduous Forests. B. Between 1000-1500 m (4) Himalayan Montane Sub-Tropical Forests. C. Between 1500-3300 m (5) Himalayan Moist Temperate Forests (Moist Temperate Oak Forests, Oak Scrubs, Moist Deodar Forests, Moist Temperate Deciduous Forests, Moist Mixed Coniferous Forests, Upper West Himalayan Temperate Broad Leaved Forests. D. Between 3000-3800 m (6) Sub-Alpine Forests (West Himalayan Birch-Fir Forests) (7) Above 3500 m (Birch – *Rhododendron* Scrub). The species contents and their distribution in these forests types are detailed out by Bir *et al.* (1987). On the face of it presently the Garhwal Himalayan region seems very rich in plant wealth but the forests have seriously been affected by biotic

factors and are decreasing/shrinking decade after decade. Maximum damage to forests is near inhabitations, especially the hills resort (e.g. Mussoorie). The indiscriminate lopping of trees is for fodder, for fire and fuel-wood. Heavy grazing, extensive agriculture, highly accelerated road building activities, blasting for quarrying of lime stone (Rajpur, Sahastradhara near Dehra Dun), hydro-electric works, new township colonies, etc. are responsible for unplanned forest cutting. Pine tapping is extensive with the results trees are drying up and their trunks often break. Opening of Valley of Flowers

for grazing has done immense damage to herbaceous flora. Tourist rush for religious places casts heavy burden on forest based resources. There is massive decrease in good quality forest cover and consequent loss of biodiversity. Dense forest cover (as percentage of total land area) in Chamoli 27.61%, Dehra Dun 40.25%, Garhwal 40.56%, Tehri Garhwal 40.96% and Uttarkashi 32.67%

CENTRAL INDIA

Pachmari, Tamia, Patal Kote and Chhindwara in Hoshangabad District of Madhya Pradesh forests in

Table -1: Dense Forest Cover in the Assessed Hill Regions/Areas of India*

Sl. No.	Regions/Areas	Total geographical area (km ²)	Total forest area (km ²)	Percentage of geographical area (km ²)	Dense forest (km ²)	Percentage of geographical area (km ²)	Percentage of the total forest area (km ²)	Open forest (km ²)	Scrub forests (km ²)	Change in Forest cover as compared to 1995 data
A. Himalaya										
1.	Sikkim State	7,096	3,129	44.09	2,423	34.14	77.43	706	439	+2
2.	Darjeeling District (W.B.)	3,149	1,455	46.20	1,099	34.89	75.53	356	—	+7
3.	Meghalaya	22,429	15,657	69.80	4,044	18.03	25.82	11,613	849	-57
4.	Garhwal Himalaya (Uttarakhand pro parte)	30,135	13,557	44.98	10,415	34.56	76.82	3,132	400	—
	(a) Chamoli Distt.	9,125	3,125	34.54	2,520	27.61	79.94	622	22	—
	(b) Dehra Dun Distt.	3,088	1,570	50.84	1,243	40.25	79.17	327	90	—
	(c) Garhwal Distt.	5,440	3,176	58.38	2,207	40.56	69.48	969	115	—
	(d) Tehri Garhwal Distt.	4,421	2,560	57.90	1,811	40.96	70.74	749	132	—
	(e) Uttarkashi Distt.	8,061	3,099	38.44	2,634	32.67	84.99	465	41	—
B. Central India										
5.	Pachmarhi Hills, Hoshangabad District (M.P.)	10,037	3,288	32.75	2,829	28.18	86.04	459	—	-69
C. South India										
6.	Palni Hills (Kodaikanal) Madurai District (Tamil Nadu)	12,624	2,132	16.88	1,066	8.44	50.00	1,066	787	+1
	Total	85,470	39,218	45.88	21,876	25.59	55.78	17,732	2,475	-116

* Based on State of Forest Report 1997 (Anon., 1997)

+Scrub Forest area excluded because it is of no consequence for timber yield. Dense Forest with (40-70%) tree canopy and Open Forest with 10-40% tree canopy.

and around Pachmarhi Hills are only of broad leaved types. Mostly forests between 200 m – 1350 m (Dupgarh highest peak in Satpuras) are divisible into (i) Tropical Dry Deciduous Forests. *Tectona grandis* is usually dominating in Dry Teak bearing forests with other timber species. *Harwickia* forests are marked by dominance of *H. binnata*. Mixed Deciduous Forests include a large number of evergreen and deciduous forests (iii) Montane Sub-Tropical Forests are met with on isolated and exposed hill tops. The vegetation closely resembles the typical dry deciduous type through usually with higher percentage of evergreens. Biodiversity rich forests localities are Matkuli (450m), Singhanama (500m), Pagara (750m), Panarpani (900m), Mahadeo Hill (1050m), Down Hill (800m), Jambu Deep (1000m), Dupgarh (1050m – 1350m), Tamia (1050m), Patakot (600m) and Pachmarhi (1076m).

Low altitude forests of Teak and Sal have been badly damaged due to frequent cutting. Ground growth is poor. These forests are of secondary nature only some forests around Pachmarhi town are undisturbed but the tourist pressure is very high. A large number of ferns *Lycopodium* and *Psilotum* are endangered in the region (Hoshangabad including District : Dense Forests 28.18% of the total area).

SOUTH INDIA: KODAIKANAL (PALNI HILLS)

Kodaikanal town popularly called “Princes of South” is located on the southern summit of Palni Hills (Eastward off shoot of Western Ghats with 2080 km² area) in Madurai District of Tamil Nadu. There is gradual change in the composition of flora and main forests of Palni Hills are between 250 -1800 m and above. Higher altitudes forest vegetation (1800 – 2200m) is associated with water courses and called “Sholas”. There are five main types (i) Tropical Thorn Forest (250-500 m), (ii) Tropical Dry Deciduous Forests (800-1000 m), (iii) Tropical Moist Deciduous Forests (1000-1300m) (iv) Tropical wet evergreen forests (1300-1800 m) and (v) Montane Wet Temperate Forests (above 1800m). The Shola forests have 2-3 tree stories and thick undergrowth. The forests vegetation characteristics and species details are provided by Bir and Chatha (1988). Biodiversity rich forests are around Tiger Shola (1800 m), Shambagonur (1800-2200 m), Bear Shola (1900-2000m), Pillar Rocks (2100m), Mori Point (2200m). Southern Montane wet grasslands are common between 1800-2200m.

Dwarfed trees of *Rhododendron nilgaricum* are common at 2100m and above particularly the Pillar Rocks area. *Strobilanthes kunthianus* a conspicuous shrub at middle and high altitudes (Pillar rocks especially) is said to flower at about 8 years interval.

Lower, middle and upper hill forests, especially the “Sholas” of Palni Hills which at one time considered as the store house of valuable diversity of timber species are today in great part replaced by *Eucalyptus*, *Alnus nepalensis* and *Acacia* plantations (Bir, 2002). Wherever existing the natural forests are badly decimated and mutilated beyond recognition with the result timber resources and plant wealth have been determentally affected. As per writers observations there is tremendous change in forests between early 1960s and 1980s. As many as 48 species of flowering plants including timber species are endangered (Bir and Chatha, 1988, Bir, 2002). Dense Forest cover of Madurai District is only 8.4% of the total area.

The foregoing account clearly indicates that:

1. Prime forests or totally undisturbed forests in India are left in a few localities/areas because of tremendous amount of population increase with the result that some sort of human interference does exist in every forest.
2. Amongst the high density biodiversity rich forests with respect to number of plant species and number of populations of individuals species may be listed the Sacred Groves of Meghalaya, Silent Valley (Western Ghats), Valley of Flowers (Uttarakhand), Pachmarhi Forests (Madhya Pradesh), Kala Top Forests (Dalhousie), Chadwick Falls and Glen (Shimla), Deoban – Chakrata and Kalamuni – Pithoragarh (Uttarakhand), Jaber Khet Forests (Mussoorie), Chitray Forests – Tonglu (Darjeeling), Chungthang – Lachung (North Sikkim), Shembaganur Forests (Kodaikanal), etc. These needs special attention for protection and monitoring of progress on their conservation on long term basis.
3. The forested areas of presently assessed regions show the presence of dense forest cover on nearly 70% or above of area except for Meghalaya, Presently, this aspect is satisfying.

4. Forest Survey of India pattern of assessment of forest cover density on district or state basis does not exactly show the true position about the forest thickness as related to ground vegetation as well as their bio-mass yield potential. We need to have both qualitative and quantitative assessment of each bio-diversity rich forest areas and be not merely be satisfied with inventorising the species number.
5. Earmarking of primary forest areas in every state is essential and steps should be taken for their protection. It is essential to evaluate bio-diversity richness on the basis of population statistics.

Finally there is need for long term ecological research programmes (LTERP) in forestry. Present method of 3-5 years research project duration does not help in carrying forward the good results obtained for future implementation. The gap between research based institutions and forest policy implementations agencies needs to be bridge for well planned forestry services in the country.

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