TAMILNADU BIODIVERSITY STRATEGY AND ACTION PLAN

FOREST BIODIVERSITY



Edited by
R. Annamalai

TAMILNADU FOREST DEPARTMENT
GOVERNMENT OF TAMILNADU, CHENNAI

2004

TAMIL NADU BIODIVERSITY

STRATEGY AND ACTION PLAN

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Edited By

R. Annamalai

Tamil Nadu Forest Department

Government of Tamil Nadu
Chennai

2004

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First Edition March 2004

Published by : **Tamil Nadu Forest Department**

Printed at : Lovely Offset Printers,

43-B, Velayutham Road, Sivakasi – 626 123.

Ph : +91-4562-220141, 222181, 227281 Fax : 223141.

E-mail : lovelyoffset@sancharnet.in

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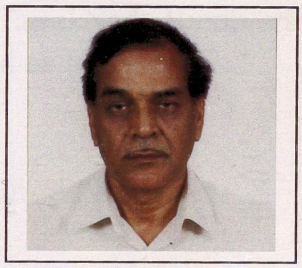

FOREWORD

One sixth of landmass of Tamil Nadu is covered with forests. This includes 12,499 sq.kms of dense forests constituting 9.61% and 8,983 sq.kms open forests constituting 6.91% of geographic area. Tamil Nadu ranks 11th among the Indian States and Union Territories with reference to total forest cover.

The forest eco systems are subjected to continuous threats from forest fringe dwellers. In order to tackle them effectively, detailed strategy and action plan has been attempted in this book. Implementation of such a plan is expected to achieve sustainable use of forest biodiversity and in turn sustainable forest management.

I congratulate **Dr. R. Annamalai, I.F.S.,** for his efforts in this regard.

(J. C. KALA)

PREFACE

As part of the National Biodiversity Strategy and Action Plan, Tamil Nadu Biodiversity Strategy and Action Plan have been prepared. This plan has been structured as follows

Tamil Nadu Forest Biodiversity Strategy and Action Plan
Tamil Nadu Invertebrate Biodiversity Strategy and Action Plan
Tamil Nadu Chordate diversity Strategy and Action Plan
Tamil Nadu Wild Plant diversity Strategy and Action Plan
Tamil Nadu Estuarine Biodiversity Strategy and Action Plan
Tamil Nadu Aquatic Biodiversity Strategy and Action Plan
Tamil Nadu Agro Biodiversity Strategy and Action Plan

Strategy and Action Plan for Forest Biodiversity is discussed in this volume. This has been prepared based on series of workshops conducted involving identified experts. I have written the chapters from 1 to 8 and the chapter 9 is contributed by Dr. T. Sekar and chapter 10 by Prof. K.S. Neelakantan.

I thank the Principal Chief Conservator of Forests for entrusting me the entire responsibility of co-ordinating the whole process of preparation of Strategy and Action Plan for Tamil Nadu.

I have been assisted by ***Mr. M. Senthil Kumar,*** and ***Mr. K. Muthu Kumar*** in compiling the details for this book and their hard work is duly acknowledged. I have been assisted by ***Mr. N. Kandaraj*** in computerizing the entire information of this book.

The assistance rendered by all the office staff and field staff is gratefully acknowledged.

Last but not the least, my thanks are also due to my wife ***Mrs. Banumathi Annamalai,*** my children ***A. Sathish Kumar, A. Karthik Kumar and A. Prasanna Kumar*** who always take pride in my accomplishments.

I welcome suggestions for the improvement of the future editions.

R. Annamalai

Acronyms and Abbrevations

BSI	Botanical Survey of India
CGIAR	Consultative Group on International Agricultural Research
DANIDA	Danish International Development Agency
EB	Electricity Board
FDA	Forest Development Agency
FRI	Forest Research Institute
FRLHT	Foundation for Revitilization of Local Health Traditions
FSI	Forest Survey of India
GBA	Global Biodiversity Assessment
HADP	Hill Area Development Programme
ICFRE	Indian Council of Forestry Research and Education
ITTO	International Tropical Timber Organization
IUCN	International Union for Conservation of Nature and Natural Resources (World Conservation Union)
JFM	Joint Forest Management
KMTR	Kalakad Mundanthurai Tiger Reserve
LPG	Liquefied Petroleum Gas
MFP	Minor Forest Produce
MPCA	Medicinal Plant Conservation Area
NATMO	National Atlas and Thematic Mapping Organization
NBPGR	National Bureau of Plant Genetic Resources
NBR	Nilgiris Biosphere Reserve
NBSAP	National Biodiversity Strategy and Action Plan
NGO	Non Governmental Organization
NTFP	Non Timber Forest Produce
PA	Protected Area
PCCF	Principal Chief Conservator of Forests
RET	Rare Endangered Thratened
RF	Reserved Forests
SFM	Sustainable Forest Management
SFT	State of Forest Report
SHG	Self Help Group
SIDA	Swedish International Development Agency
TAP	Tamil Nadu Afforestation Project
TNBSAP	Tamil Nadu Biodiversity Strategy and Action Plan
UTs	Union Territories
VFC	Village Forest Committee
WG	Western Ghats
WLS	Wildlife Sanctuary

TAMIL NADU BIODIVERSITY STRATEGY AND ACTION PLAN
FOREST BIODIVERSITY

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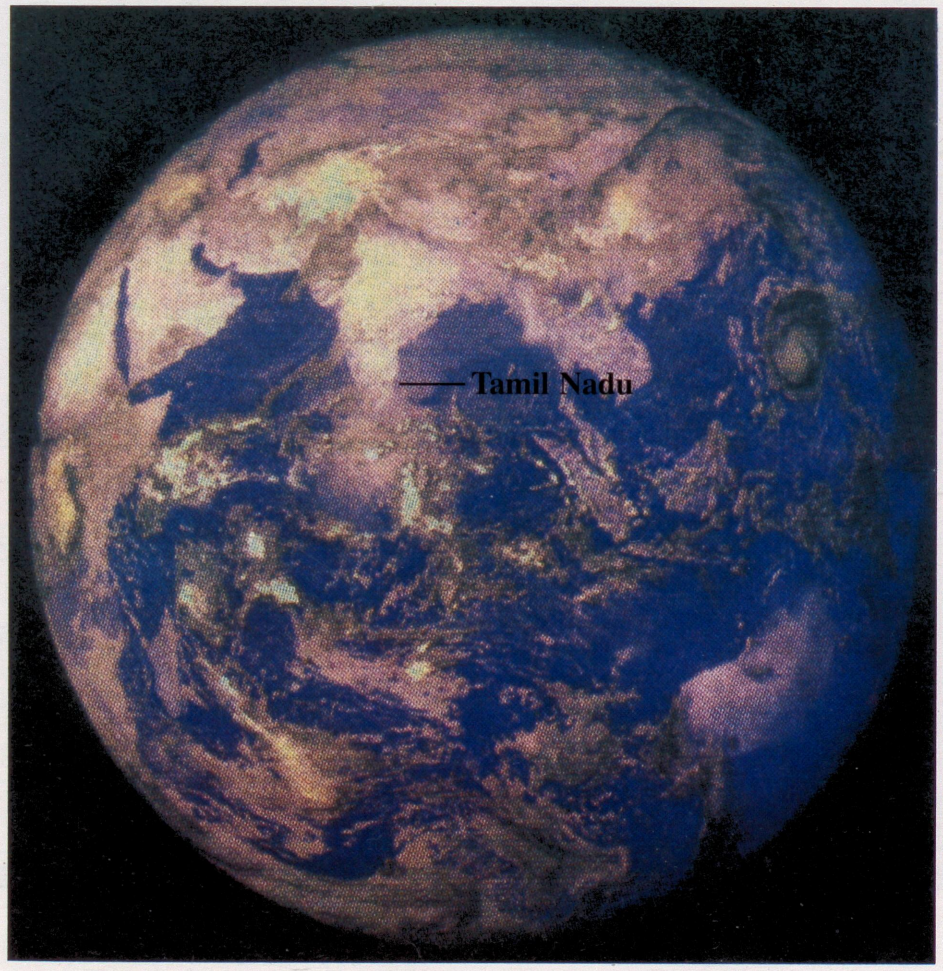
1.BACKGROUND AND INTRODUCTION

1.BACKGROUND AND INTRODUCTION

1.1. Tamil Nadu Setting

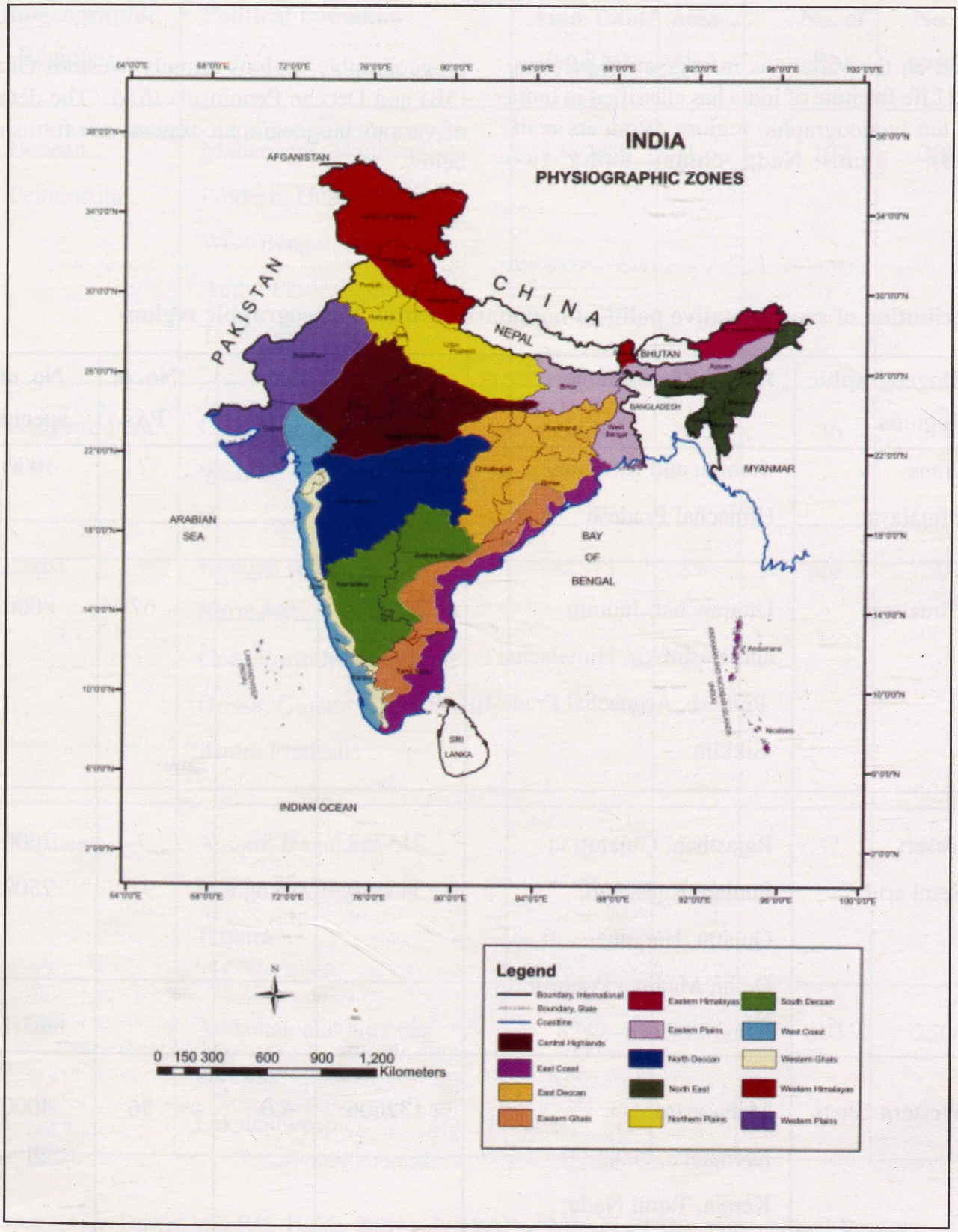
Tamil Nadu is situated at the South-Eastern extremity of the Indian Peninsula and it is the Southern most state of mainland India. It is located between 8^0 05' and 13^0 34' North latitudes and 76^0 14' and 80^0 21' East longitudes. Andhra Pradesh in the North, Karnataka in the Northwest, Kerala on the West, Bay of Bengal in the East and Indian Ocean in the South bound it. With a coast line of 922 Km and land boundary of 1200 Km, the total area of the State is 1,30,19,000 ha. Chennai is the capital.



State / UT	Geographic Area	Recorded Forest Area
Western Himalayas (WH)	338556	96974
Eastern Himalaya (HM)	65317	41160
North East (NE)	123138	72219
Northern Plains (NP)	307489	20169
Eastern Plains (EP)	234215	38238
Western Plains (WP)	319098	14734
Central Highlands (CH)	366706	78794
North Deccan (ND)	355988	89208
East Deccan (ED)	331525	124373
South Deccan (SD)	292416	54293
Western Ghats (WG)	69703	24333
Eastern Ghats (EG)	191698	59373
West Coast (WC)	123921	24180
East Coast (EC)	167493	30389

Tamil Nadu includes three Physiographic zones as shown below:

Sl.No.	Physiographic zone	Districts Covered in Tamil Nadu
1.	Western Ghats	Coimbatore, Kanyakumari, The Nilgiris, Theni, Tirunelveli, Dindugul, Virudhunagar
2.	Eastern Ghats	Coimbatore, Dharmapuri, Dindugul, Erode, Karur, Madurai, Namakkal, Salem, Tiruchirappalli, Perambalur, Tiruvanamalai, Vellore.
3.	East Coast	Chennai, Cuddalore, Villupuram, Thiruvallur, Chengalpattu, Kanyakumari, Ramanathapuram, Thothukudi, Nagapattinam, Thanjavur, Thiruvarur, Sivagangai, Pudhukottai



Source: FSI, SFR, 2001

1.3. Biogeographic Regions

Based on the variations in vegetation patterns, Wild Life Institute of India has classified in India into ten biogeographic regions (Rodgers *et.al.* 2000). Tamil Nadu comes under two biogeographic regions namely Western Ghats (5B) and Deccan Penninsula (6A). The details of various biogeographic regions are furnished below.

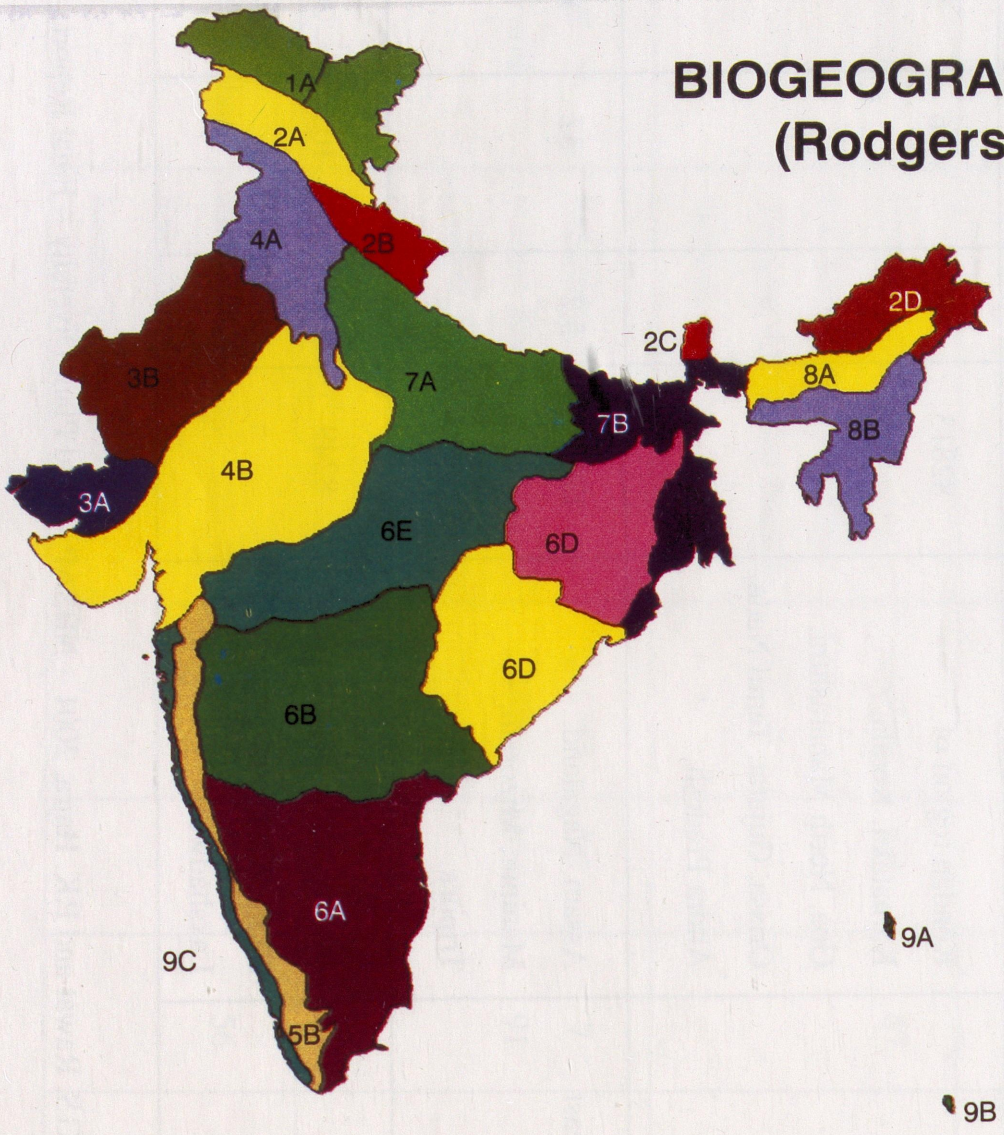
Distribution of representative political boundaries within biogeographic regions

Biogeographic Regions	Political boundary	Area Total (sq.km)	area (%)	No. of PAs	No. of species
Trans Himalaya	Jammu and Kashmir, Himachal Pradesh	1184823	5.6	7	1000
Himalaya	Uttaranchal, Jammu and Kashmkir, Himalachal Pradesh, Arunachal Pradesh, Sikkim	210662	6.4	67	8000
Desert Semi arid	Rajasthan, Gujarat Punjab, Rajasthan, Gujarat, Haryana, Delhi, Madhya Pradesh, Uttar Pradesh	215757 545850	6.5 16.6	7 91	2000 2500
Western Ghats	Maharastra, Karnataka, Goa, Kerala, Tamil Nadu	132606	4.0	56	4000

Biogeographic Regions	Political boundary	Area Total (sq.km)	area (%)	No. of PAs	No. of species
Deccan Penninsula	Maharastra, Madhya Pradesh, Uttar Pradesh, West Bengal, Andra Pradesh, Orissa, Tamil Nadu, Bihar	1380380	41.6	137	3000
Gangetic Plain	Uttar Pradesh, West Bengal, Bihar	354782	10.7	36	2000
Coast	Kondan region of Karnataka, Kerala, Goa, North Maharashtra, Orissa, Gujarat, Tamil Nadu, Andra Pradesh	82813	2.5	26	500
Northeast	Assam, Nagaland, Manipur, Mizoram, Tripura	171341	5.2	37	4000
Island	Andaman and Nicobar group of Islands, Lakshadweep	8249	0.25	103	2500

Source – G.S. Rawat and P.K. Hajra, 2001 – NBSAP – Wild Plant Diversity – Final Report.

BIOGEOGRAPHIC ZONES OF INDIA
(Rodgers and Panwar, 1988)





Biogeographic Zones

- Thar (3B)
- Andaman Islands (9A)
- Assam Hills (8B)
- Brahmaputra Valley (8A)
- Central Highlands (6E)
- Central Himalaya (2C)
- Central Plateau (6B)
- Chhota-Nagpur (6D)
- Deccan Plateau South (6A)
- East Himalaya (2D)
- Eastern Plateau (6C)
- Gujarat-Rajwara (4B)
- Kutch (3A)
- Lakshadweep Islands (9C)
- Lower Gangetic Plain (7B)
- Malabar Coast (5A)
- Nicobar Islands(9B)
- North West Himalaya (2A)
- Punjab (4A)
- Tibetan (1A)
- Upper Gangetic Plain (7A)
- West Himalaya (2B)
- Western Ghat Mountain (5B)

1.4. Brief Background to the TNBSAP

As part of the National Biodiversity Strategy and Action Plan (NBSAP), Tamil Nadu Biodiversity Strategy and Action Plan (TNBSAP) have been prepared. This is being published in six volumes. This first volume deals with the Forest Biodiversity Strategy and Action Plan.

1.5. Scope of the TNBSAP

Definitions of Terms

Tamil Nadu Biodiversity Strategy and Action Plan covers the entire State of Tamil Nadu. The definition of Biodiversity and related terms will be in accordance with CBD and the same is furnished below:

"Biological Diversity" means the variability among living organisms from all sources including, *inter alia*, terrestrial marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

"Domesticated or cultivated species" means species in which the evolutionary process has been influenced by humans to meet their needs.

"Ecosystem" means a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

"Ex-situ conservation" means the conservation of components of biological diversity outside their natural habitats.

"Habitat" means the place or type of site where an organism or population naturally occurs.

"In-situ Conditions" means conditions where genetic resources exist within ecosystems and natural habitats and in the case of domesticated or cultivated species in the surroundings where they have developed their distinctive properties.

"In-situ conservation" means the conservation of ecosystem and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and in the case of domesticated or cultivated species in the surroundings where they have developed their distinctive properties.

"Protected area" means a geographically defined area which is designated or regulated and managed to achieve specific conservation objectives.

"Sustainable use" means the use of components of biological diversity in a way and at a rate that does not lead to the long – term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.

1.6. Scope of Coverage

- **Natural Ecosystem:** e.g. forests, grasslands, wetlands, deserts, mountains, coastal and marine areas, including the historical changes taking place in such ecosystems.

- **Agricultural ecosystems:** e.g. farmlands, pastures, capture fisheries, aquaculture, including historical changes in land-use patterns.
- **"Wild" species and varieties:** species of plants, animals, and micro-organisms existing in their natural state, and the genetic variation within each of these species.
- **Domesticated species and varieties:** species of crops, livestock (including poultry), captive-bred fish, pets and micro-organisms in ex-situ collections, and the genetic variation within each of these species.

1.7. Aspects of Coverage

Conservation of biodiversity at ecosystemic, species, and genetic levels (through *in situ, ex situ, in vitro,* and other measures), and of the associated ecological functions, with a special focus on endemic, threatened, and otherwise critical elements.

Sustainable use of biological resources, implying their use in such a manner as will not imperil their long-term existence, or will not in other ways threaten biodiversity;

Social, economic, political and inter-generational equity, including in decision-making with regard to conservation and use, in sharing of benefits, in access to and protection of knowledge and information relevant to biodiversity, and so on.

Ethical, cultural, scientific, and **economic** dimensions, including:

- The right of species and ecosystems to survive.
- The primacy of survival and livelihoods based on biodiversity, and of creating a stake for people in conservation and sustainable use;
- The implications of research and use of human genetic diversity;
- Various cultural ways of relating to nature; and
- The role of biodiversity in economics and technology.

The Scope of coverage and the Aspect of coverage of TNSAP are as per the NBSAP Guidelines .

1.8. Biodiversity Management Agencies

From the point of view of management, biodiversity may be categorized in to two: Biodiversity under systems of management and Biodiversity not under any system of management. The only biodiversity that is under structured system of management is the biodiversity under the control of forest department. In all the other cases there is no focused approach for biodiversity management. Different agencies controlling the biodiversity are given below.

Management Agency	Type of Biodiversity
Forest Department	Forests, Grasslands, Fresh Water Wetland Bird Sanctuaries, Estuarine Wetlands like Mangroves, Coastal Biosphere Reserve like Gu lf of Mannar Biosphere Reserve. Entire Spectrum of Wild Species Diversity. Forest also includes the Aquatic Biodiversity of the river that passes through the notified forest areas, dams located inside the notified forest areas and tanks and ponds situated inside the forest areas.
Agriculture Department	Agro Biodiversity; cultivated plant diversity
Animal Husbandry Department	Domesticated Animal Diversity
Public Works Deparment	Fresh Water Wetlands, Tanks, Dams and Rivers outside the notified forest areas
Panchayats	Fresh Water Wetlands mainly Tanks; other lands under panchayat control
Fisheries Department	Coastal Fisheries
Revenue Department	Poromboke and village common lands
Private individuals	Private lands mainly Agro ecosystems

1.9. Objectives of TNBSAP:

1. To achieve Sustainable Development
2. To promote Biodiversity Conservation
3. To facilitate Sustainable Use of Biodiversity
4. To attain Sustainable Forest Management
5. To ensure Sustainable Agriculture
6. To strive for Sustainable Coastal Resources Management
7. To promote Food Security, Health Security, Ecological Security and Environmental stability

1.9.1. Sustainable Development:

- **Sustainable development** refers to the concept of meeting the requirements of the present generation without impairing the chances of the future generations from meeting their requirements.

  "Our Common future" 1987 report produced by the world commission on Environment and development, commonly known as **Brundtland commission report** defines sustainable development as that which **"meets the needs of the present without compromising the ability of future generations to meet their own needs".** Thus sustainable development is "development which does not compromise the future". It highlighted the need to integrate environmental and economic objectives to ensure sustainable development of Economical and Social systems.

- The World Conservation Strategy (IUCN 1980) succinctly articulated the rationale for species conservation and absorbed it into the concept of conservation for development.

Living resource **conservation for sustainable development** was seen to have three specific objectives:

- **to maintain essential ecological processes and life support systems** (such as soil regeneration and protection, and the cleansing of waters), on which human survival and development depend;
- **to preserve genetic diversity** (the range of genetic material found in the world's organisms), on which depend the breeding programmes necessary for the protection and improvement of cultivated plants and domesticated animals, as well as much scientific advance, technical innovation, and the security of the many industries that use living resources;
- **to ensure the sustainable utilization of species and ecosystems** (notably fish and other wildlife, forests and grazing lands), which support millions of rural communities as well as major industries.

1.9.2. Biodiversity Conservation:

Conservation is defined as management of human use of the biosphere so that it may yield sustainable benefit to the present generation while maintaining its potential to meet the needs and aspirations of posterity. Thus conservation is positive, embracing, preservation, maintenance and sustainable utilization, restoration and enhancement of the natural environment (**World conservation strategy IUCN, 1980**).

The term *conservation* has not been defined in convention on biological diversity. In *Global Biodiversity Assessment published by UNEP (GBA 1995)*, this term is used both in the narrower sense of preservation or maintenance of some or all of the components of biological diversity and in the broader sense to include also

sustainable use of the components or their recovery or restoration – or both. The concepts of preservation and sustainable use are intimately linked.

1.9.3. Sustainable Use of Biodiversity:

- *'Sustainable use'* means the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations(CBD).

1.9.4. Sustainable Forest Management (SFM):

- **Sustainable Forest Management** (SFM) is defined by the International Tropical Timber Organization (ITTO 1992) as follows; "**sustainable forest management** is the process of managing permanent forestland to achieve one or more clearly specified objectives of management with regard to the production of a continuous flow of desired forest products and services without undue reduction of its inherent values and future productivity and without undue undesirable effects on the physical and social environment".

  Sustainable forest management means **production without reduction**

  Sustainable forest management denotes **harvesting without harming**.

- **Sustained yield** from forests refers to harvesting the "interest" by keeping the "capital " intact. **Sustained yield means "removal in proportion to renewal".** It is defined as (a) The material that a forest can yield annually (or periodically), (b) As applied to a policy, method or plan of management (sustained yield management), implies continuous production with the aim of achieving, at the earliest practical time and at the highest practical level, an approximate balance between net growth and harvest, either by annual or somewhat longer periods. (BCFT)

According to F.R.I. Glossary, Sustained yield is defined as "The yield of timber or other produce from a forest which is managed in such a way as to permit the removal of a maximum and approximately equal volume or quantity of timber or other produce annually or periodically, in perpetuity"

- **Sustained yield forest management** is management of a forest property for continuous production with the aim of achieving, at the earliest practicable time, an approximate balance between net growth and harvest, either by annual or some what longer periods (Society of American Foresters, 1958, In Junus Kartasubrata 1992). In 1817 Cotta wrote the principles of sustained yield forestry. He developed a forest regulation system called "Periodic yield and regeneration block" method. This system was widely practiced in Germany and spread to all other countries (Simon 1991). The doctrine of sustained yield dictated the essence of working plan, to outline timber felling for a certain period of planning. Planning in classical forestry is just to do inventory for estimating the standing volume of timber, based on which the annual cut can be calculated.

1.9.5. Sustainable agriculture:

"According to the Consultative Group on International Agriculture Research (CGIAR) "Sustainable agriculture is the successful management of resources to satisfy the changing human needs, while maintaining or enhancing the quality of environment, and conserving natural resources". (J.C. Katyal)

The hallmark of this description is the harmony in maintaining buoyancy and dynamism in agricultural growth for meeting basic human needs and protection and conservation of natural resources-land, climate and bio-inhabitants. This fusion of human needs with care for natural resources is what constitutes the integrated concept of sustainability.

The integrated concept of sustainable agriculture owes its origin to the philosophy of 'holism'. According to the philosophy of holism **"all things are connected and their interactions in nature are complex. Stimulus to one creates response not only in that but also in the system as a whole".** Appreciation of the theory of holism is very much embedded in Indian traditions and scriptures. An ancient Tamil proverb goes as follows, "No fodder, no cattle, no cattle, no manure, no manure, no crop".

For Instance, if the vitality of natural resources (here 'soil) is impaired because of neglect or misuse, agricultural sustainability and environmental quality and the linkage between these in the quest for human survival will be at stake.

Narrated in more direct terms, deterioration of natural resources makes farming inefficient and vice versa. In fact, it is the farming inefficiency, which is at the root of triggering wide scale discussions at various national and international forums on sustainable agriculture.

1.9.6. Sustainable Coastal Resources Management (SCRM):

Sustainable coastal resources management is the process of managing Coastal Resources to achieve one or more clearly specified objectives of management with regard to the production of a continuous flow of desired Coastal products and services without undue reduction of its inherent values and future productivity and without undue undesirable effects on the physical and social environment.

1.9.7. Food Security, Health Security, Ecological Security, Evolutionary Security and Environmental Stability

- **Food Security** depends on the conservation of Traditional varieties of crop plants and Traditional varieties of domestic animals. It also depends on the conservation of Wild relatives of crop plants and Wild relatives of domestic animals. These are the Gene banks for breeding of plants and animals and also raw materials for genetic engineering.

- **Health Security** depends on the conservation of Medicinal plants.
- **Ecological Security** depends on the proper functioning of the Ecosystem processes.
- **Environmental Stability** depends on the proper maintenance of Ecological balance.
- **Evolutionary Security** depends on the process of speciation on the principles of survival of the fittest.

2. RECORDED FOREST AREA

2.1. Recorded Forest Area definition

2.2. Recorded Forest Area in India and Tamil Nadu

2.3. Recorded Forest Area – Comparison between India and Tamil Nadu

2.4. Position of Tamil Nadu among States

2.5. District wise recorded forest area in Tamil Nadu

2.6. Trends in recorded forest area in Tamil Nadu

2.7. Trends in per capita recorded forest area in India and Tamil Nadu

2.8. Number of villages having recorded forest area

2.9. Recorded forest area in land utilization of Tamil Nadu

2.10. Recorded forest area and Actual forest cover

– Comparison India and Tamil Nadu

2.11. District wise recorded forest area and forest cover comparison

2.12. Encroachment in recorded forest area

2.13. Social Forestry areas

2. RECORDED FOREST AREA

2.1. Recorded Forest Area – Definition:

In India, the terms "forest" is used in a legal sense. An area of land recorded as forest in revenue records or proclaimed to be forest under a forest law or Act is described as forest. Thus, "forest area" is an area recorded as forest in the government records. Often this term is also written as "recorded forest area". This should, however, not be confused with forest cover which is entirely based on the capability of remote sensing satellite sensor and has nothing to do with the legality of land use or land ownership.

Recorded forest area is reflected in statistics maintained by the Forest Department and also in the Land utilization statistics maintained by the Revenue Department. The definitions adopted by these two departments are not identical. The definitions adopted by the Revenue Department for land utilization statistics runs as follows:-

Forest is defined as "All actually forested areas on the lands classed or administrated as forests under any legal enactment dealing with forests, whether State owned or private." If any portion of such is not actually wooded but put to some agricultural use, that portion shall be included of cultivated or uncultivated land

In India the recorded forest area is categorized into "Reserved Forest", "Protected Forest" and "Unclassed Forest". In Tamil Nadu, 4th category namely Reserved Land also comes under "Recorded Forest Area". These categories are defined below:

Reserved Forest (RF):

An area notified under the provisions of Indian Forest Act or the State Forest Act having full degree of protection. In Reserved Forests all activities are prohibited unless permitted. In Tamil Nadu Reserved Forests include all the forest areas notified under Sec.16 of the Tamil Nadu Forest Act.

Protected Forest (PF):

An area notified under the provisions of Indian Forest Act or the State forest Acts having limited degree of protection. In Protected Forests all activities are permitted unless prohibited. In Tamil Nadu there is no protected forests.

Unclassed Forest (UF):

An area recorded as forest but not included in reserved or protected forest category. Ownership status of such forests varies from state to state.

Reserved Land (RL):

Forest Area notified under Sec.26 of the Tamil Nadu Forest Act and in the process of settlement for eventual notification under Sec.16 of the Tamil Nadu Forest Act as Reserved Forest.

2.2. Recorded forest area in India & Tamil Nadu:

The Total recorded forest area in India is 768437 Sq.km constituting 23.38% of Geographic Area which includes 423311 Sq.km of Reserved Forest, 217245 Sq.km of Protected Forest and 127881 Sq.km unclassed Forest.

The total recorded forest area in Tamil Nadu is 22871 Sq.km constituting 17.59% of Geographic Area which includes 19325 Sq.km of Reserved Forest, 2240 Sq.km of Reserved Land and 1306 Sq.km of unclassed Forest.

The recorded forest area as percentage to Geographic area is furnished in Table 2.2.a. The categories of Recorded Forests area is furnished in table 2.2.b. and in figures 2.2.a and 2.2.b.

Table 2.2.a.
Recorded Forest Area as percentage to Geographic Area:

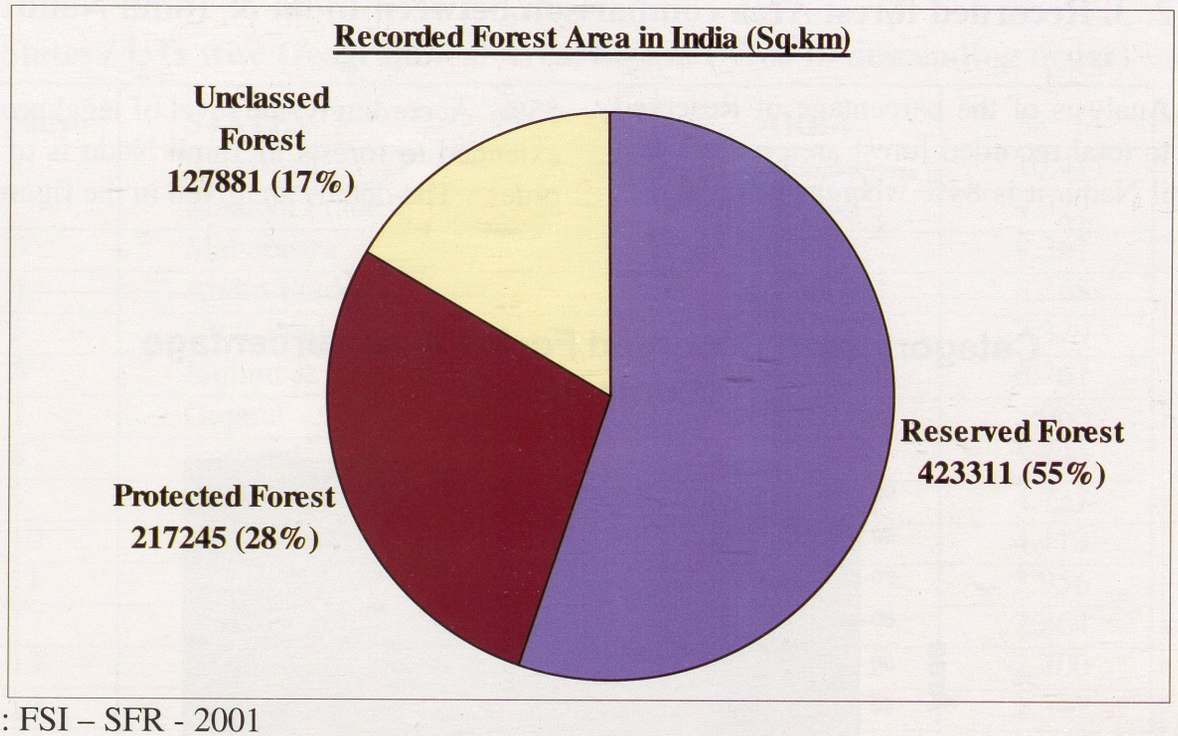
	India	Tamil Nadu
Recorded Forest Area	768436	22871
Geographic Area	3287263	130058
Recorded Forest Area as % to Geographic Area	23.38	17.59

Source: FSI – SFR – 2001

Table 2.2.b.
Categories of Recorded Forest Area in India and Tamil Nadu. (Sq.km.)

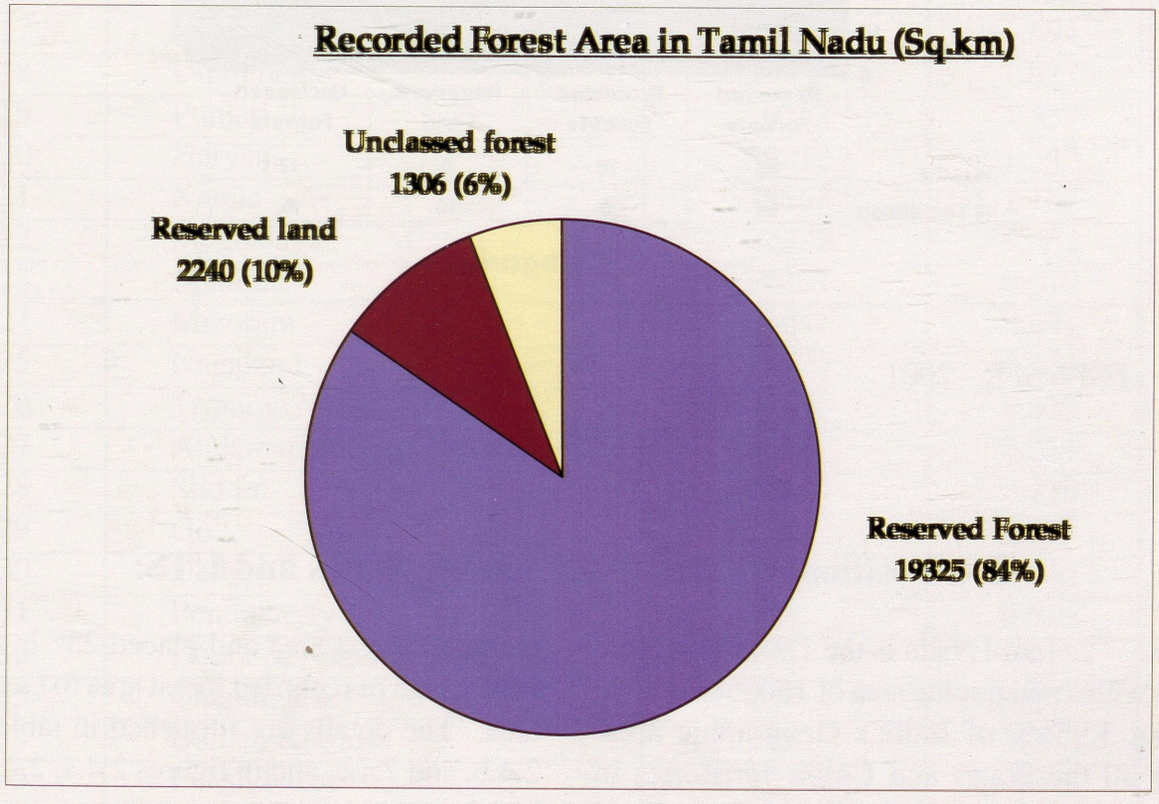
Category	India		Tamil Nadu	
	Area	%	Area	%
Reserved Forest	423311	55	19325	84
Protected Forest	217245	28	0	
Reserved land	0		2240	10
Unclassed forests	127881	17	1306	6
Total	**768437**	**100**	**22871**	**100**

Source : FSI – SFR – 2001 and PCCF, Tamil Nadu



Source : FSI – SFR - 2001

Fig-2.2.a.

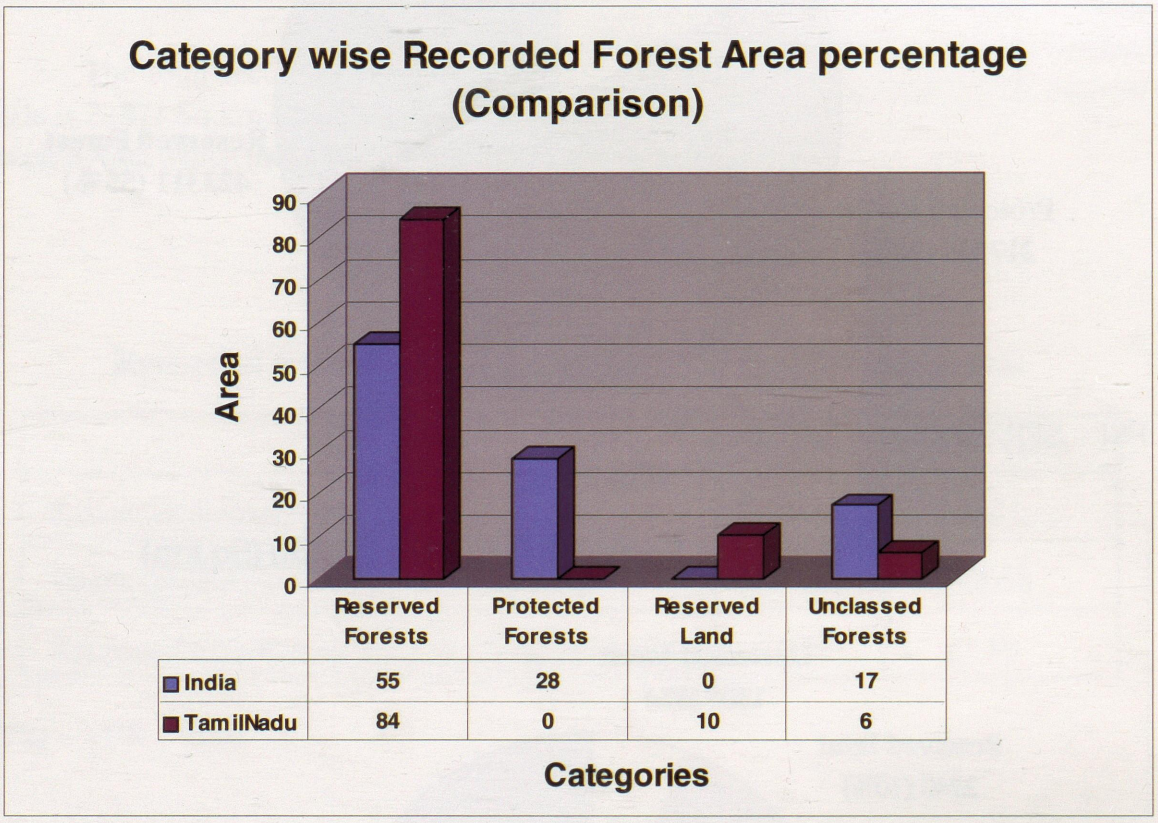


Source : FSI – SFR - 2001

Fig-2.2.b.

2. 3. Recorded forest Area comparison between India & Tamil Nadu:

Analysis of the percentage of Reserved Forest to total recorded forest area reveals that in Tamil Nadu, it is 84% whereas in India it is 55%. Accordingly, the level of legal protection extended to forests in Tamil Nadu is of higher order. The details are given in the figure 2.3.a.



Source : FSI – SFR - 2001

Fig-2.3.a.

2.4. Position of Tamil Nadu among States and UTS:

Tamil Nadu is the 11th largest State in India with a geographic area of 130058 Sq.kms. covering 3.956% of India's Geographic area. Among all the States and Union Territories in India, Tamil Nadu is placed 13th in terms of total recorded forest area and placed 23rd in terms of Percentage of recorded forest area to Geographic area. The details are furnished in tables 2.4.a., 2.4.b. and 2.4.c. and in figures 2.4.a, 2.4.b, 2.4.c, and 2.4.d.

Table 2.4.a.

States / UTs wise Geographical Area. Sq.km (Area in descending order)

Sl.No	STATES	AREA	%
1	Rajasthan	342239	10.411
2	Madhya Pradesh	308245	9.377
3	Maharastra	307713	9.361
4	Andra Pradesh	275069	8.368
5	Uttar Pradesh	240928	7.329
6	Jammu & Kashmir	222236	6.761
7	Gujarat	196022	5.963
8	Karnataka	191791	5.834
9	Orissa	155707	4.737
10	Chhattisgarh	135191	4.113
11	Tamil Nadu	130058	3.956
12	Bihar	94163	2.864
13	West Bengal	88752	2.700
14	Arunachal Pradesh	83743	2.547
15	Jharkhand	79714	2.425
16	Assam	78438	2.386
17	Himachal Pradesh	55673	1.694
18	Uttaranchal	53483	1.627
19	Punjab	50362	1.532
20	Haryana	44212	1.345
21	Kerala	38863	1.182
22	Meghalaya	22429	0.682
23	Manipur	22327	0.679
24	Mizoram	21081	0.641
25	Nagaland	16579	0.504
26	Tripura	10486	0.319
27	Andaman & Nicobar Islands	8249	0.251
28	Sikkim	7096	0.216
29	Goa	3702	0.113
30	Delhi	1483	0.045
31	Pondicherry*	491	0.015
32	Dadra & Nagar Haveli	480	0.015
33	Chandigarh	114	0.003
34	Daman & Diu	112	0.003
35	Lakshdweep*	32	0.001
		3287263	

Source : FSI – SFR – 2001

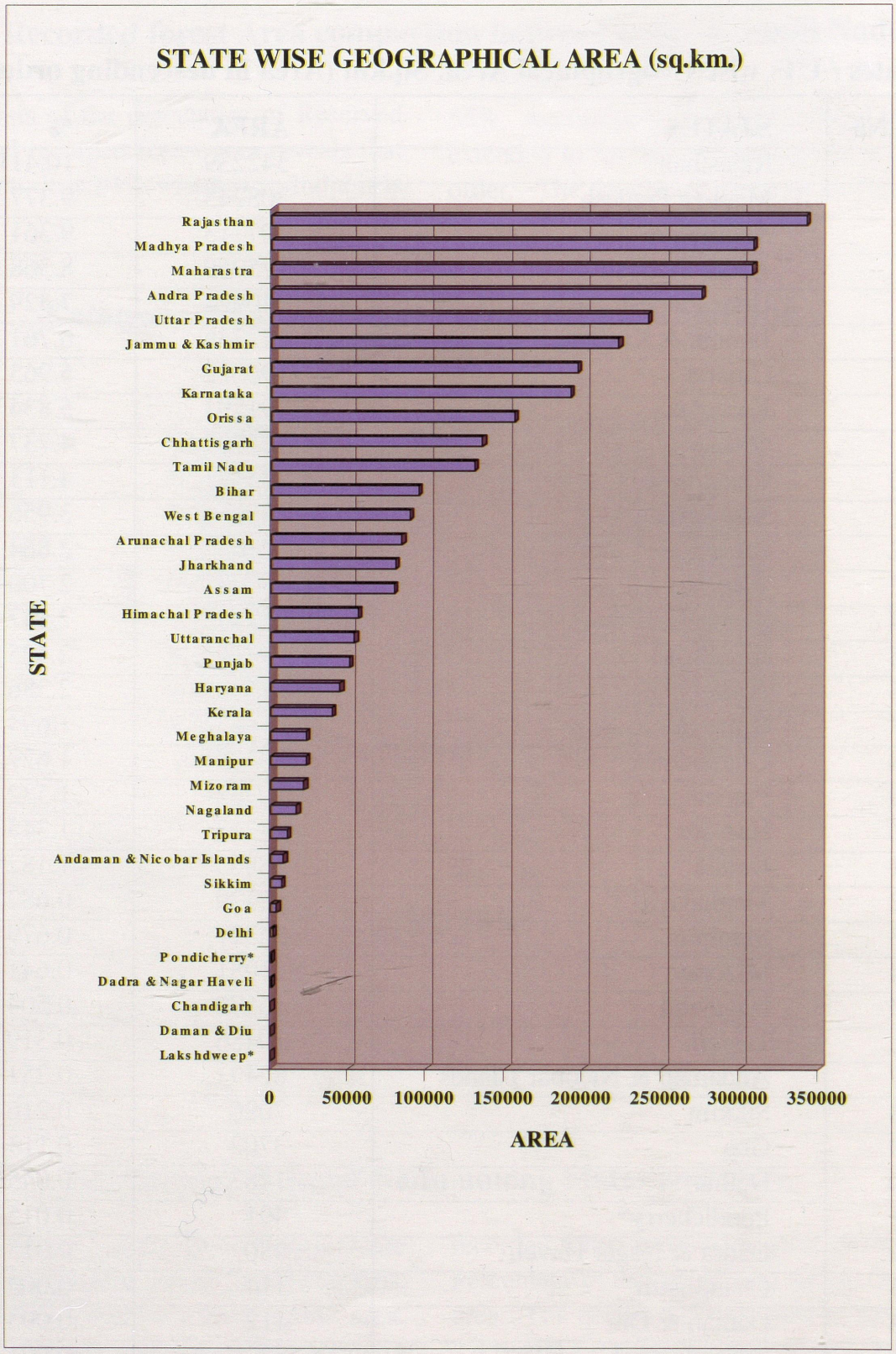


Fig. 2.4.a.

Source : FSI – SFR - 2001

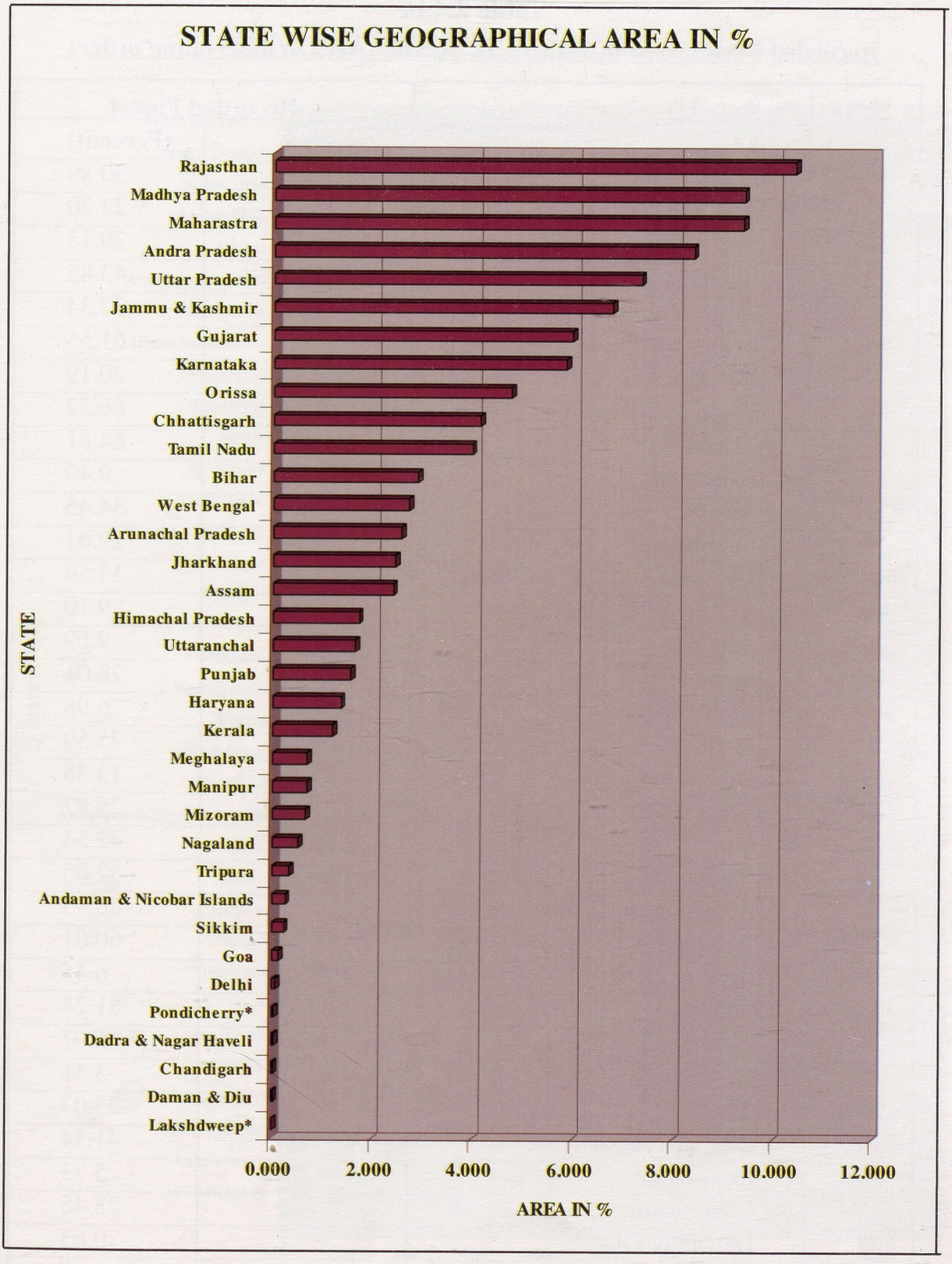


Fig. 2.4.b.

Source : FSI – SFR – 2001

Table 2.4.b.

Recorded Forest Area in State / Uts. Sq.km. (Area in descending order)

Sl.No	State/UT	Recorded Forest	
		Area	(Percent)
1	Madhya Pradesh	95221	30.89
2	Andra Pradesh	63814	23.20
3	Maharastra	61939	20.13
4	Chhattisgarh	59285	43.85
5	Orissa	58135	37.34
6	Arunachal Pradesh	51540	61.55
7	Karnataka	38724	20.19
8	Himachal Pradesh	37033	66.52
9	Uttaranchal	34662	64.81
10	Rajasthan	32494	9.49
11	Assam	27018	34.45
12	Jharkhand	23605	29.61
13	Tamil Nadu	22871	17.59
14	Jammu & Kashmir	20230	9.10
15	Gujarat	18999	9.69
16	Manipur	17418	78.01
17	Uttar Pradesh	16826	6.98
18	Mizoram	15935	75.59
19	West Bengal	11879	13.38
20	Kerala	11221	28.87
21	Meghalaya	9496	42.34
22	Nagaland	8629	52.05
23	Andaman & Nicobar Islands	7171	86.93
24	Tripura	6293	60.01
25	Bihar	6078	6.45
26	Sikkim	5765	81.24
27	Punjab	3059	6.07
28	Haryana	1551	3.51
29	Goa	1224	33.07
30	Dadra & Nagar Haveli	203	41.34
31	Delhi	85	5.73
32	Chandigarh	32	28.45
33	Daman & Diu	1	0.63
34	Lakshdweep	0	0
35	Pondicherry	0	0
		768436	**23.38**

Source : FSI – SFR - 2001

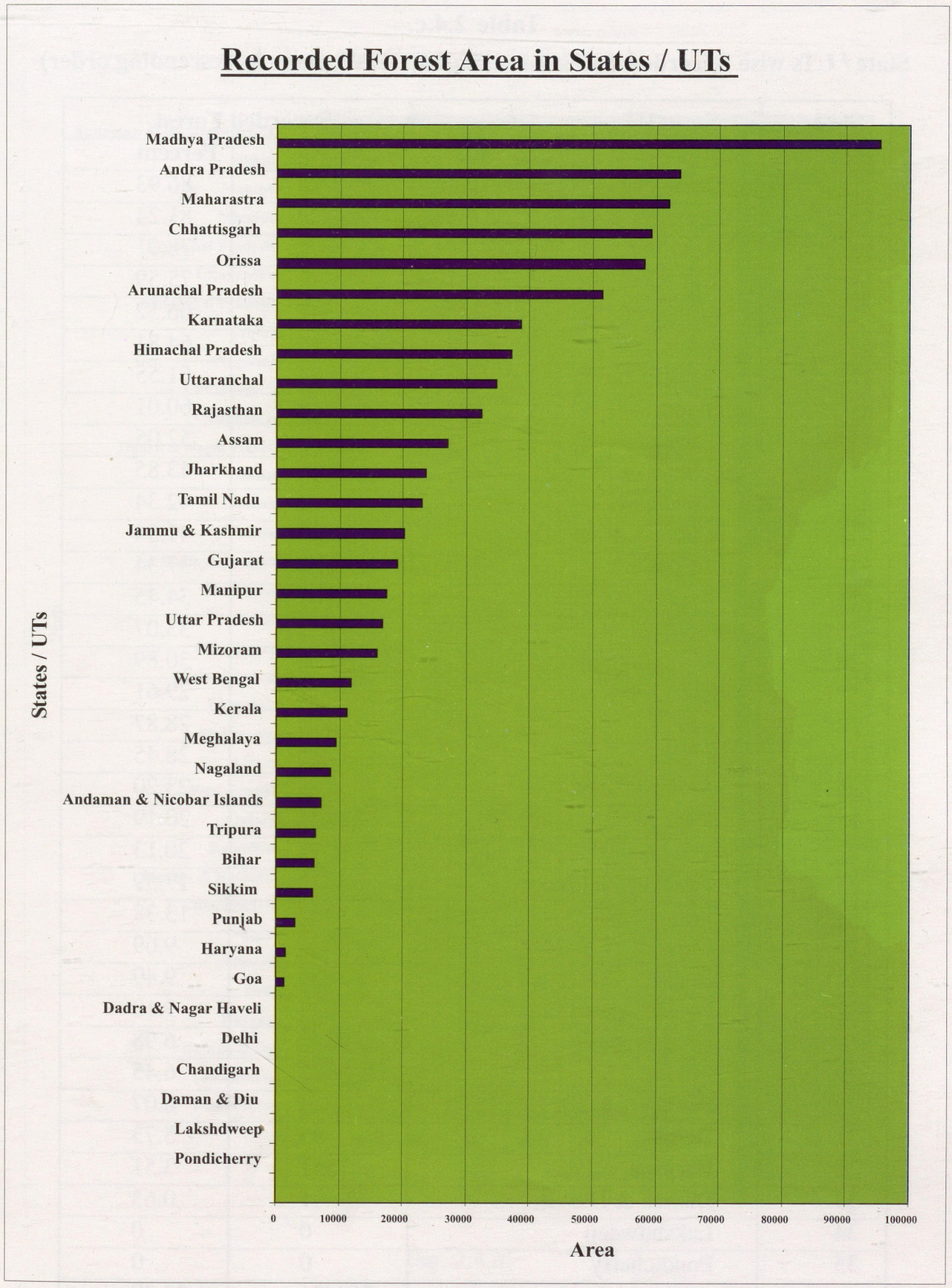


Fig. 2.4.c.

Source : FSI – SFR – 2001

Table 2.4.c.

State / UTs wise Recorded Forest Area. Sq.km (Percentage in descending order)

Sl.No.	State/UT	Recorded Forest	
		Area	Percent
1	Andaman & Nicobar Islands	7171	86.93
2	Sikkim	5765	81.24
3	Manipur	17418	78.01
4	Mizoram	15935	75.59
5	Himachal Pradesh	37033	66.52
6	Uttaranchal	34662	64.81
7	Arunachal Pradesh	51540	61.55
8	Tripura	6293	60.01
9	Nagaland	8629	52.05
10	Chhattisgarh	59285	43.85
11	Meghalaya	9496	42.34
12	Dadra & Nagar Haveli	203	41.34
13	Orissa	58135	37.34
14	Assam	27018	34.45
15	Goa	1224	33.07
16	Madhya Pradesh	95221	30.89
17	Jharkhand	23605	29.61
18	Kerala	11221	28.87
19	Chandigarh	32	28.45
20	Andra Pradesh	63814	23.20
21	Karnataka	38724	20.19
22	Maharastra	61939	20.13
23	Tamil Nadu	22871	17.59
24	West Bengal	11879	13.38
25	Gujarat	18999	9.69
26	Rajasthan	32494	9.49
27	Jammu & Kashmir	20230	9.10
28	Uttar Pradesh	16826	6.98
29	Bihar	6078	6.45
30	Punjab	3059	6.07
31	Delhi	85	5.73
32	Haryana	1551	3.51
33	Daman & Diu	1	0.63
34	Lakshdweep	0	0
35	Pondicherry	0	0
		768436	**23.38**

Source : FSI – SFR - 2001

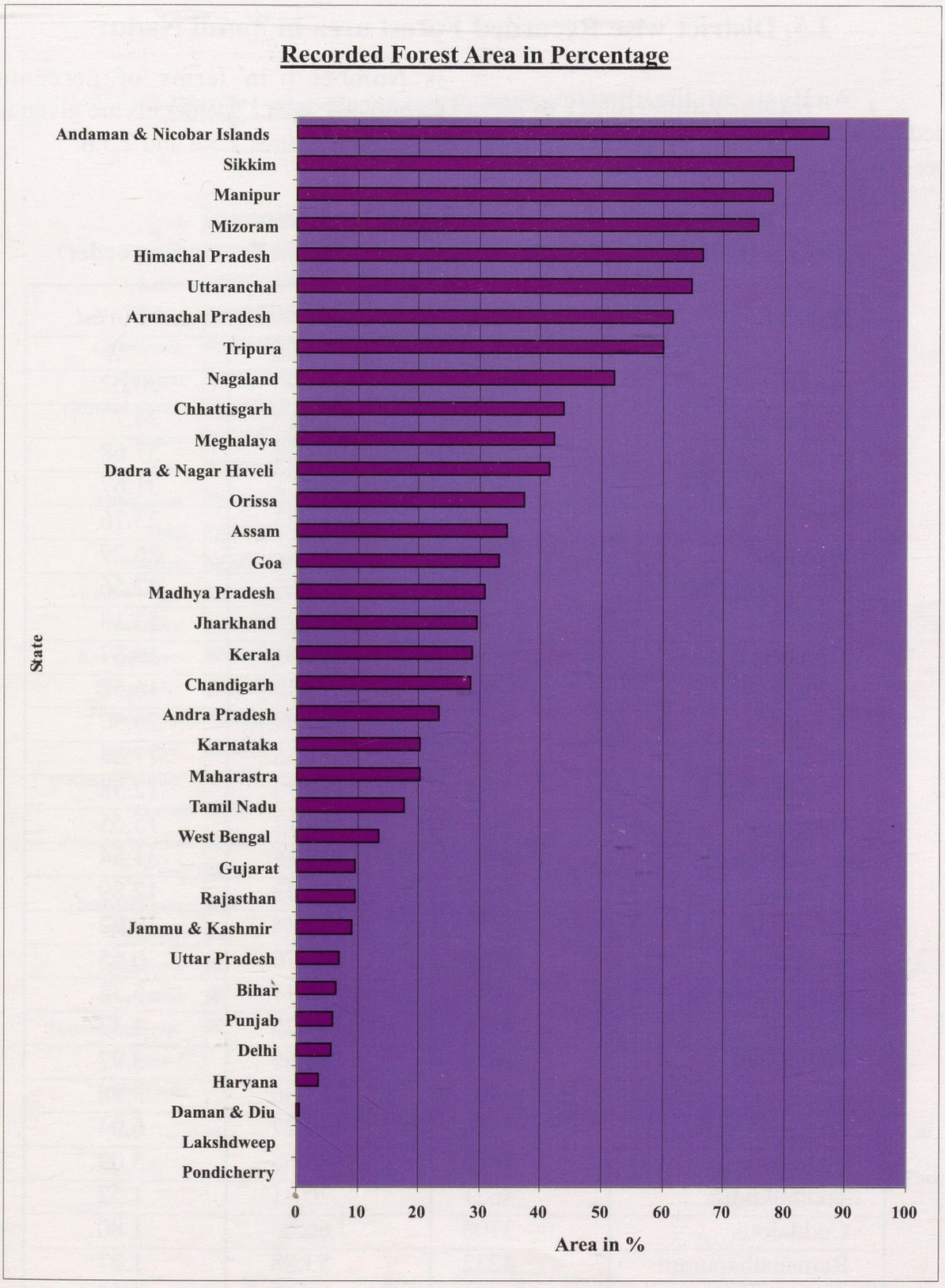


Fig. 2.4.d.

Source : FSI – SFR - 2001

2.5. District wise Recorded Forest area in Tamil Nadu:

Analysis of the district wise recorded forest area reveals that Erode district is Number-1 in terms of area, and Nilgiris district is Number-1 in terms of percentage to Geographic area. The details are given in Table 2.5.a. and figures 2.5.a and 2.5.b.

Table 2.5.a.

District wise recorded forest area in sq.km. (Area in descending order)

District	Geographic	Recorded Forest	
	Area	Area	%
Erode	8209	2463.96	30.02
Dharmapuri	9622	2383.65	24.77
Salem	5235	1972.30	37.68
Vellore	6077	1924.61	31.67
Coimbatore	7469	1774.93	23.76
Dindigul	5580	1466.83	26.29
Tiruvannamalai	6191	1396.66	22.56
Nilgiris	2549	1354.36	53.13
Tirunelveli	6810	1319.01	19.37
Villupuram	7190	1192.45	16.58
Theni	2764	809.94	29.30
Madurai	4277	741.58	17.34
Virudhu Nagar	4283	538.73	12.58
Namakkal	3413	534.12	15.65
Kanyakumari	1684	531.15	31.54
Perambalur	3695	476.43	12.89
Tiruvallur	3413	372.84	10.92
Sivagangai	4086	271.76	6.65
Kancheepuram	4474	238.11	5.32
Tiruchi	4511	197.25	4.37
Pudukottai	4651	184.69	3.97
Karur	2901	173.36	5.98
Nagapattinam	2140	129.27	6.04
Thanjavur	3415	105.66	3.09
Toothukudi	4621	70.41	1.52
Cuddalore	3706	66.63	1.80
Ramanathapuram	4232	53.88	1.27
Chennai	144	2.82	1.96
Tiruvarur	2716	0.36	0.01
	130058	**22747.75**	**17.49**

Source : FSI – SFR – 2001 and PCCF, Tamil Nadu & Statistical Hand book of Tamil Nadu

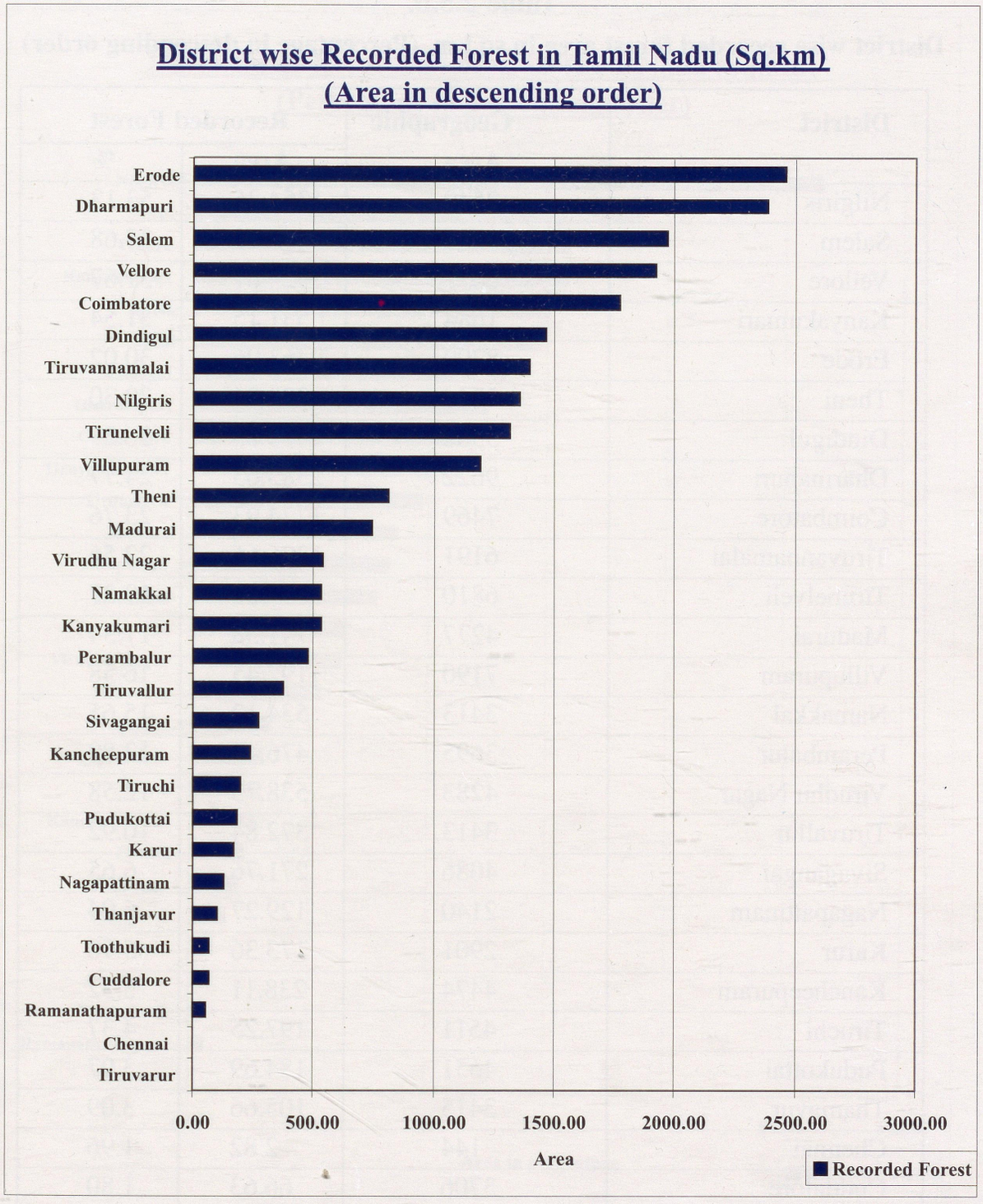


Fig. 2.5.a.

Source : FSI – SFR – 2001, PCCF, Tamil Nadu and Statistical Hand book of Tamil Nadu

Table 2.5.b.

District wise recorded forest area in sq.km. (Percentage in descending order)

District	Geographic Area	Recorded Forest	
		Area	%
Nilgiris	2549	1354.36	53.13
Salem	5235	1972.30	37.68
Vellore	6077	1924.61	31.67
Kanyakumari	1684	531.15	31.54
Erode	8209	2463.96	30.02
Theni	2764	809.94	29.30
Dindigul	5580	1466.83	26.29
Dharmapuri	9622	2383.65	24.77
Coimbatore	7469	1774.93	23.76
Tiruvannamalai	6191	1396.66	22.56
Tirunelveli	6810	1319.01	19.37
Madurai	4277	741.58	17.34
Villupuram	7190	1192.45	16.58
Namakkal	3413	534.12	15.65
Perambalur	3695	476.43	12.89
Virudhu Nagar	4283	538.73	12.58
Tiruvallur	3413	372.84	10.92
Sivagangai	4086	271.76	6.65
Nagapattinam	2140	129.27	6.04
Karur	2901	173.36	5.98
Kancheepuram	4474	238.11	5.32
Tiruchi	4511	197.25	4.37
Pudukottai	4651	184.69	3.97
Thanjavur	3415	105.66	3.09
Chennai	144	2.82	1.96
Cuddalore	3706	66.63	1.80
Toothukudi	4621	70.41	1.52
Ramanathapuram	4232	53.88	1.27
Tiruvarur	2716	0.36	0.01
	130058	**22747.75**	**17.49**

Source : FSI – SFR – 2001, PCCF, Tamil Nadu and Statistical Hand Book of Tamil Nadu

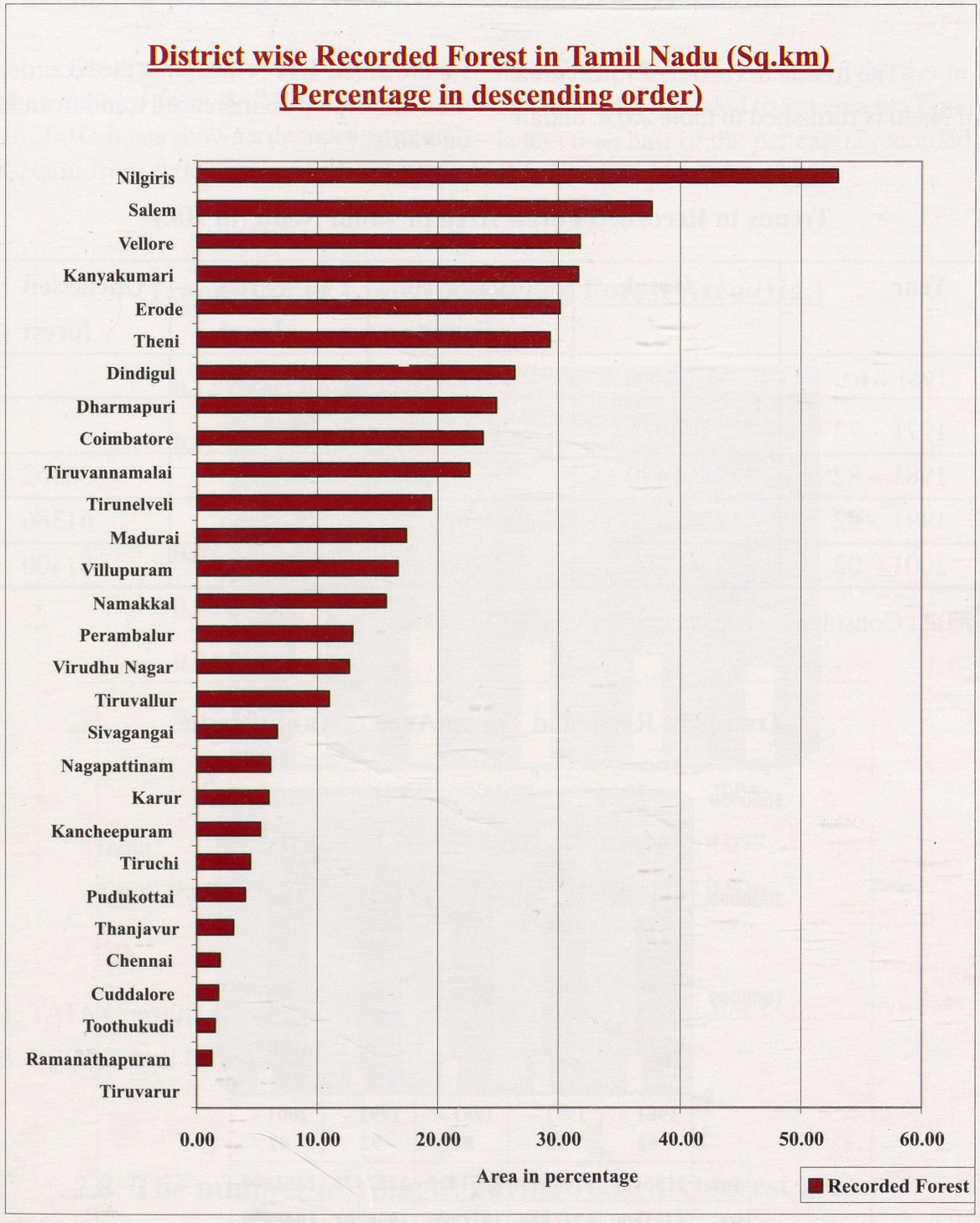


Fig. 2.5.b.

Source : FSI – SFR – 2001, PCCF, Tamil Nadu and Statistical Hand Book of Tamil Nadu

2.6. Trends in recorded forest area:

The trends in recorded forest area for Tamil Nadu is furnished in table 2.6.a. and in Figure 2.6.a. It is evident that the recorded forest area has shown an increased trend from 1961-62 onwards.

Table 2.6.a

Trends in Recorded Forest Area in Tamil Nadu (in Ha.)

Year	Total	Reserved Forests	Reserved Land	Unclassed forest
1961 – 62	2106400	1723800	382600	
1971 – 72	2104025	1722844	381181	
1981 – 82	2201430	1811900	333168	56362
1991 – 92	2252472	1936701	254385	61386
2001 – 02	2262800	1948600	252800	61400

Source : Tata Consultancy Report and PCCF, Tamil Nadu.

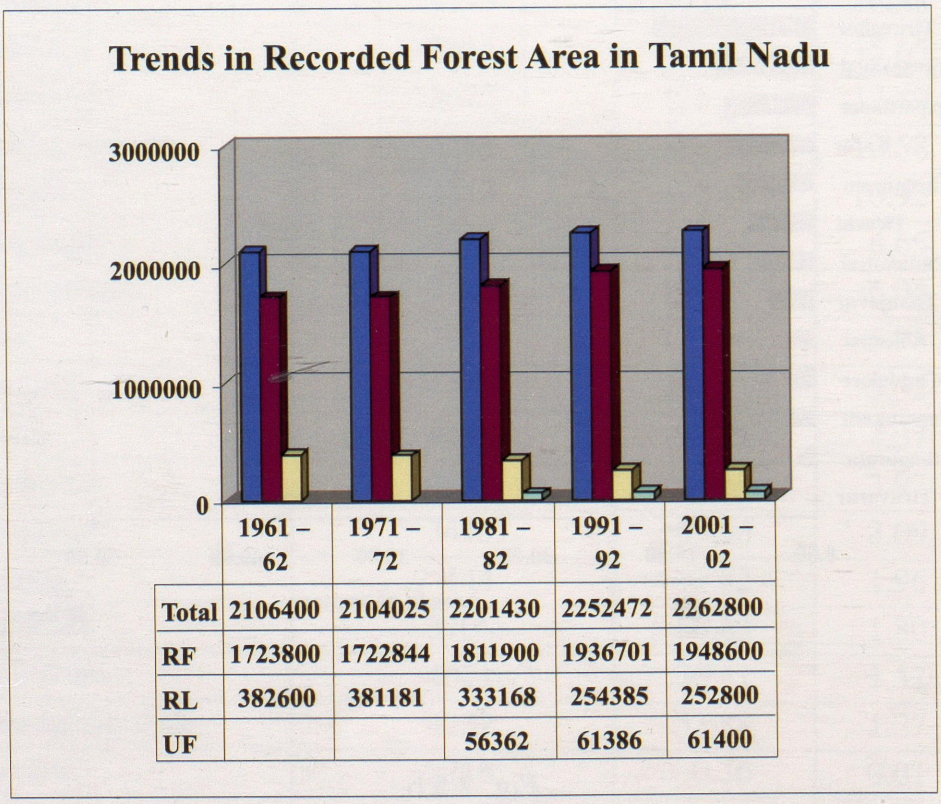
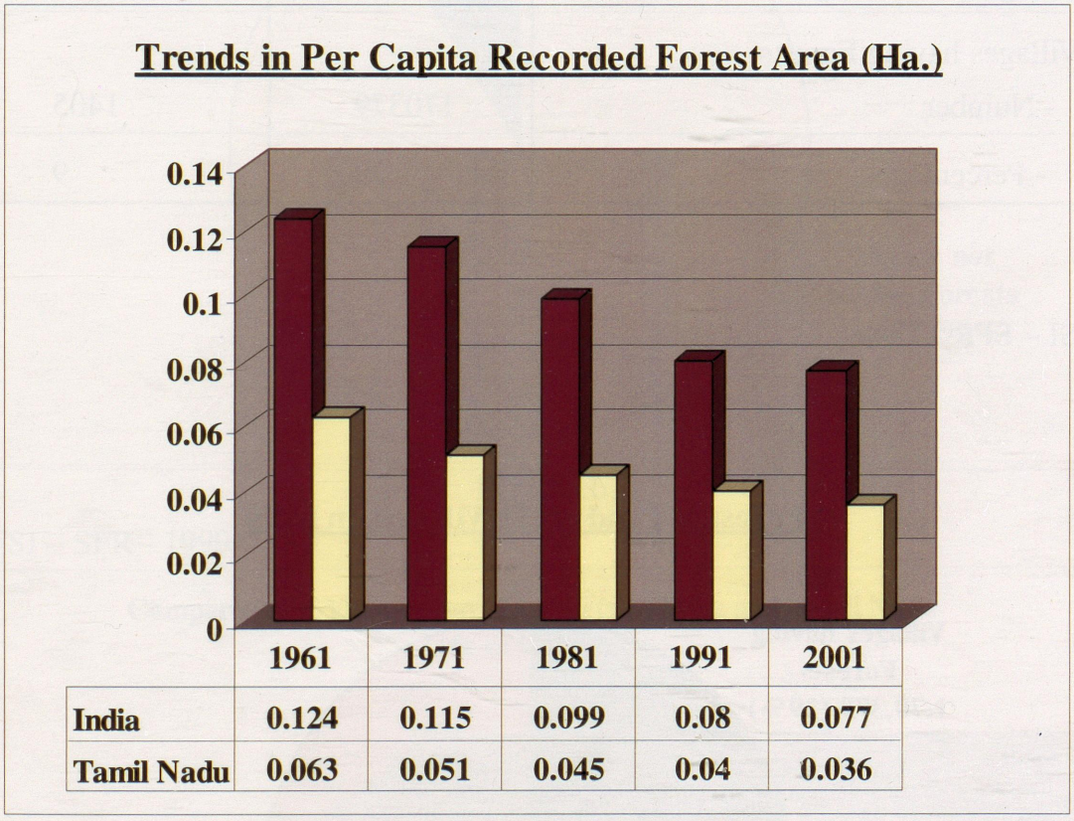


Fig. 2.6.a.

Source : Tata Consultancy Report and PCCF, Tamil Nadu.

2.7. Trends in per capita recorded forest area in India and Tamil Nadu:

The per capita recorded forest area for India has reduced from 0.124 ha. in 1961 to 0.077 ha in 2001. It has shown a decreasing trend for Tamil Nadu from 0.063 ha in 1961 to 0.036 ha in 2001. As it can be seen in the figure 2.7.a., the per capita recorded forest area for Tamil Nadu is less than half of the per capita recorded forest area of India.



	1961	1971	1981	1991	2001
India	0.124	0.115	0.099	0.08	0.077
Tamil Nadu	0.063	0.051	0.045	0.04	0.036

Fig. 2.7.a.

Source: 1. TATA Consultancy Report 2. ICFRE - Forestry Statistics India – 2000
3. PCCF, Tamil Nadu

2.8. The number of villages having recorded forest area:

In India 170379 villages constituting 29% are having recorded forest area as land use. In Tamil Nadu 1405 villages covering 9% of total villages are having recorded forest area as land use. When compared to India (29%) the percentage of villages having forest as land use in Tamil Nadu (9%) is much less. The details are furnished in the table 2.8.a and in the figures 2.8.a, 2.8.b., 2.8.c.

Table 2.8.a

Forest as Land use in villages

Forest as Land use in villages	India	Tamil Nadu
Villages not having Forests	416895	14417
Villages having Forests - Number	170379	1405
- Percentage	29	9

Source: FSI – SFR - 1999

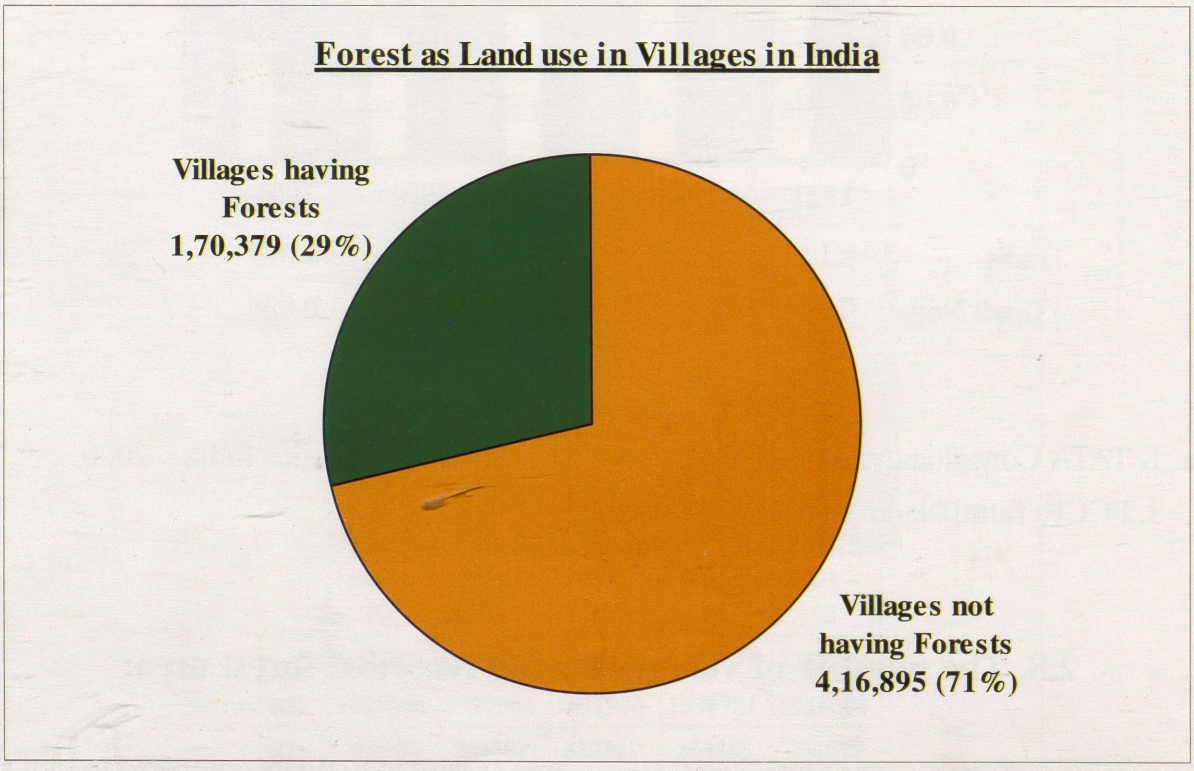


Fig. 2.8.a.

Source : FSI – SFR - 1999

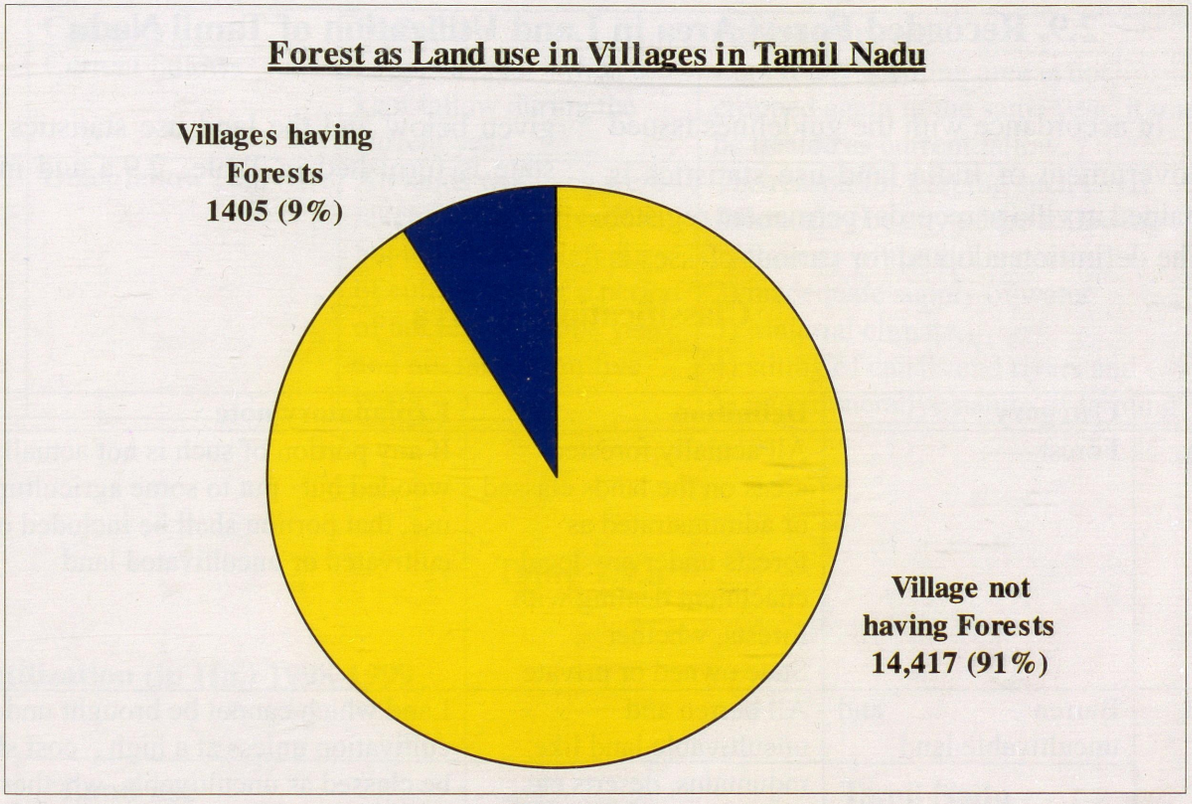


Fig. 2.8.b.

Source : FSI – SFR - 1999

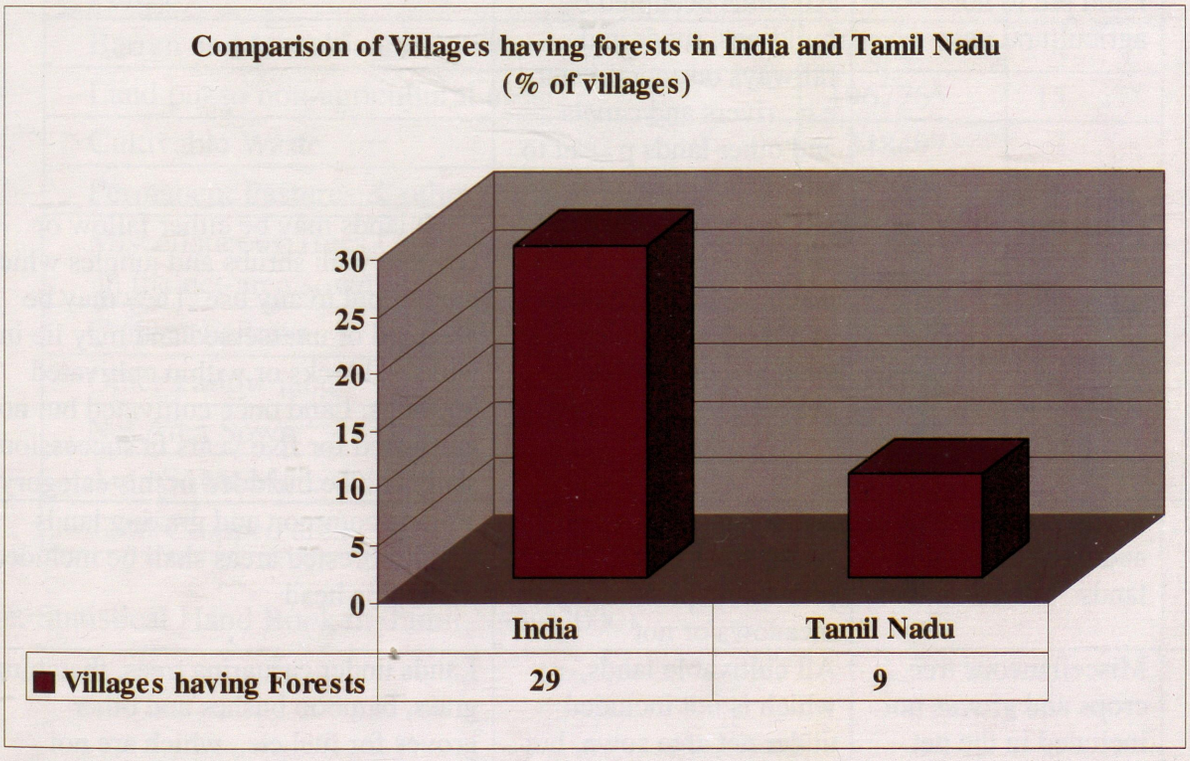


Fig. 2.8.c.

Source : FSI – SFR – 1999

2.9. Recorded Forest Area in Land Utilization of Tamil Nadu

In accordance with the guidelines issued by Government of India land use statistics is maintained in village records (permanent register A). The definition adopted for various classes is given below and the land use statistics for the state is furnished in Table 2.9.a and in figure 2.9.a.

Classification of Area

	Category	Definition	Explanatory note
A.	Forest	All actually forested areas on the lands classed or administrated as forests under any legal enactment dealing with forests, whether State owned or private	If any portion of such is not actually wooded but put to some agricultural use, that portion shall be included of cultivated or uncultivated land
B.	Barren and uncultivable land	All barren and uncultivable land like mountains, deserts etc.,	Land which cannot be brought under cultivation unless at a high cost shall be classed as uncultivable, whether such land is in isolated blocks or within cultivated holdings
C.	Land put to non agricultural uses	All lands occupied by buildings, roads and railways or under water, e.g., rivers and canals and other lands p ut to non-agricultural uses	
D.	Cultivable waste	All lands available for cultivation, whether not taken up for cultivation or abandoned after a few years for one reason or the other	Such lands may be either fallow or covered with shrubs and jungles which are not put to any use. They may be assessed or unassessed and may lie in isolated blocks or within cultivated holdings. Land once cultivated but not cultivated for five years in succession shall also be included in this category
E.	Permanent pastures and other grazing lands	All grazing lands, whether they are permanent pastures and meadows or not	Village common and grazing lands within forested areas shall be included under this head
F.	Miscellaneous tree crops and groves not included in the net area sown.	All cultivable lands, which is not included under net area sown, but is put to some agricultural use.	Lands under casuarina trees, thatching grass, bamboo bushes and other groves for fuel etc., which are not included under 'orchards', shall be classed under this category.

	Category	Definition	Explanatory note
G.	Current fallows	Cropped areas which are kept fallow during the current year	E.g., if any seedling area is not cropped again in the same year, it may be treated as current fallow.
H.	Other fallow land	All lands whi ch were taken up for cultivation but temporarily left out of cultivation for a period of not less than one year and not more than five years	The reason for keeping such lands fallow may be any of the following :- 1) Poverty of the cultivators. 2) inadequate supply of water 3) Malarial climate, 4) silting of canals and rivers and 5) unremunerative nature of farming.

Table 2.9.a

Land utilization (in Ha.) 1998-1999

Land use	Tamil Nadu	
	Area	%
Forest	2140342	16
Barren and Uncultivable Land	477517	4
Land put to non-agricultural uses	1967765	15
Cultivable Waste	348497	3
Permanent Pastures & other Grazing lands	123451	1
Miscellaneous Trees Crops & groves not included in the net-area sown	239501	2
Current Fallows	955507	7
Other Fallow land	1110728	9
Net Area Sown	5634514	43
Area Sown More than once	992611	
Total Cropped area	6627125	

Source: Statistical Hand Book of Tamil Nadu(2000)

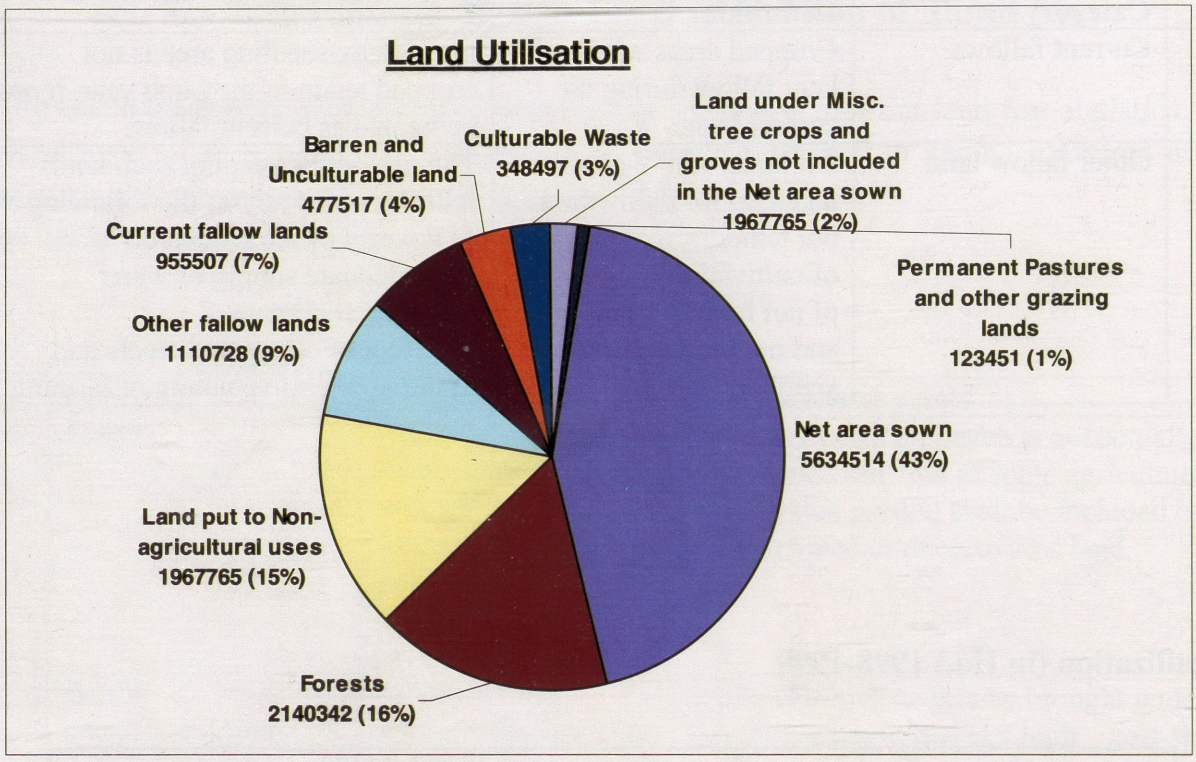


Fig 2.9.a.

2.10. Recorded Forest Area and Actual Forest Cover – Comparison (Sq.Km)

Table 2.10.a.

	India		Tamil Nadu	
	Area	**%**	**Area**	**%**
Recorded Forest Area	768436	23.38	22871	17.59
Actual Forest Cover	675538	20.55	21482	16.52
Difference	92898	2.83	1389	1.07

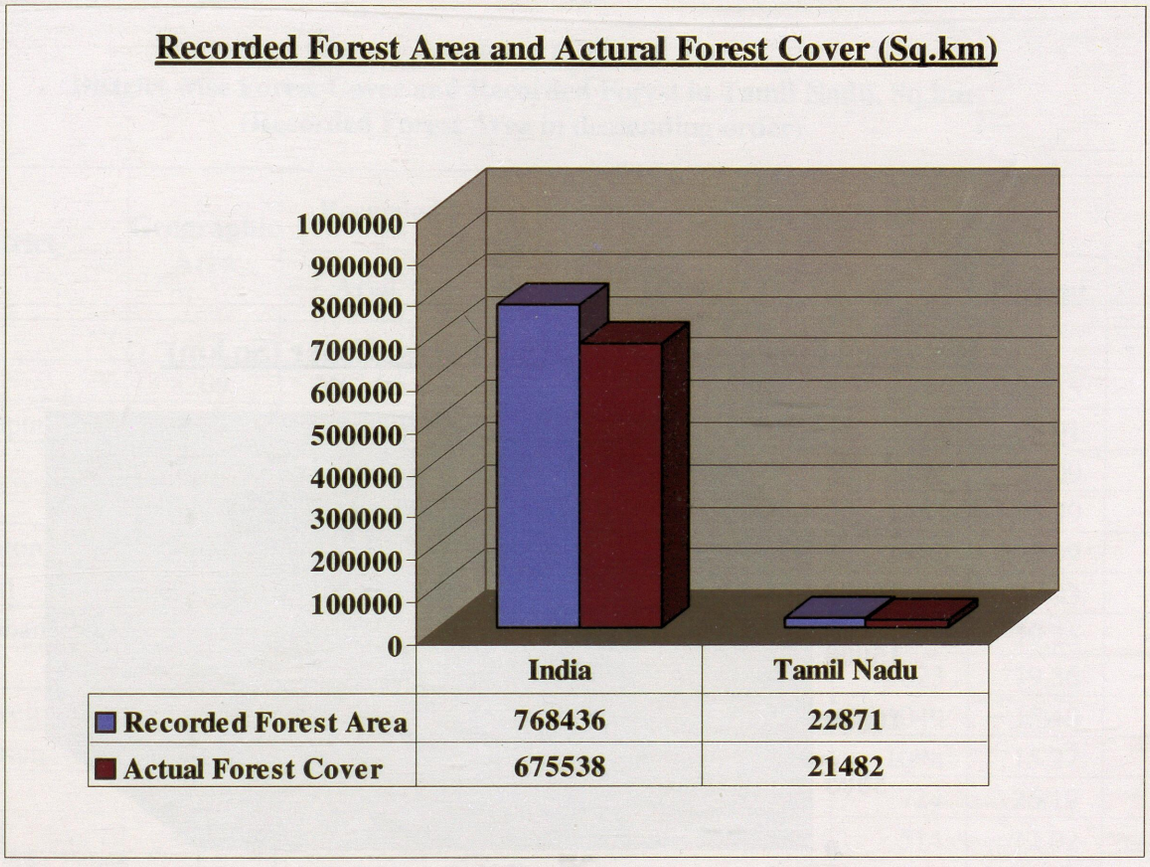


Fig 2.10.a

Source : FSI – SFR - 2001

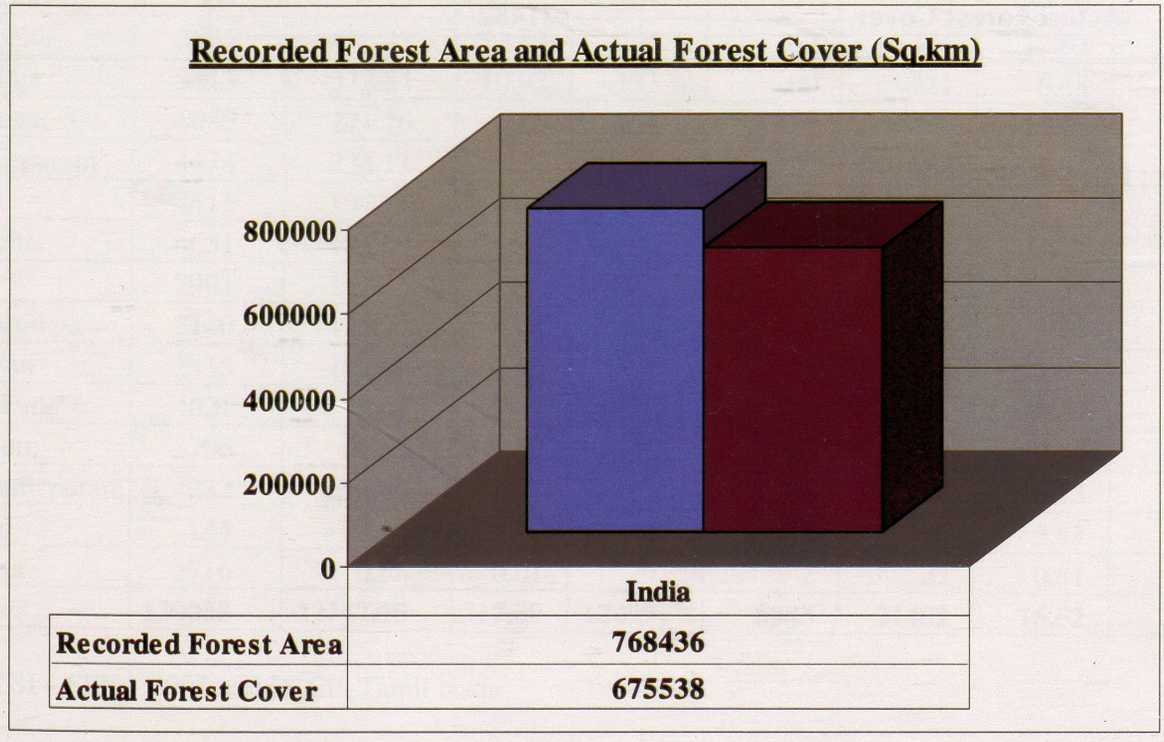


Fig. 2.10.b.

Source : FSI – SFR - 2001

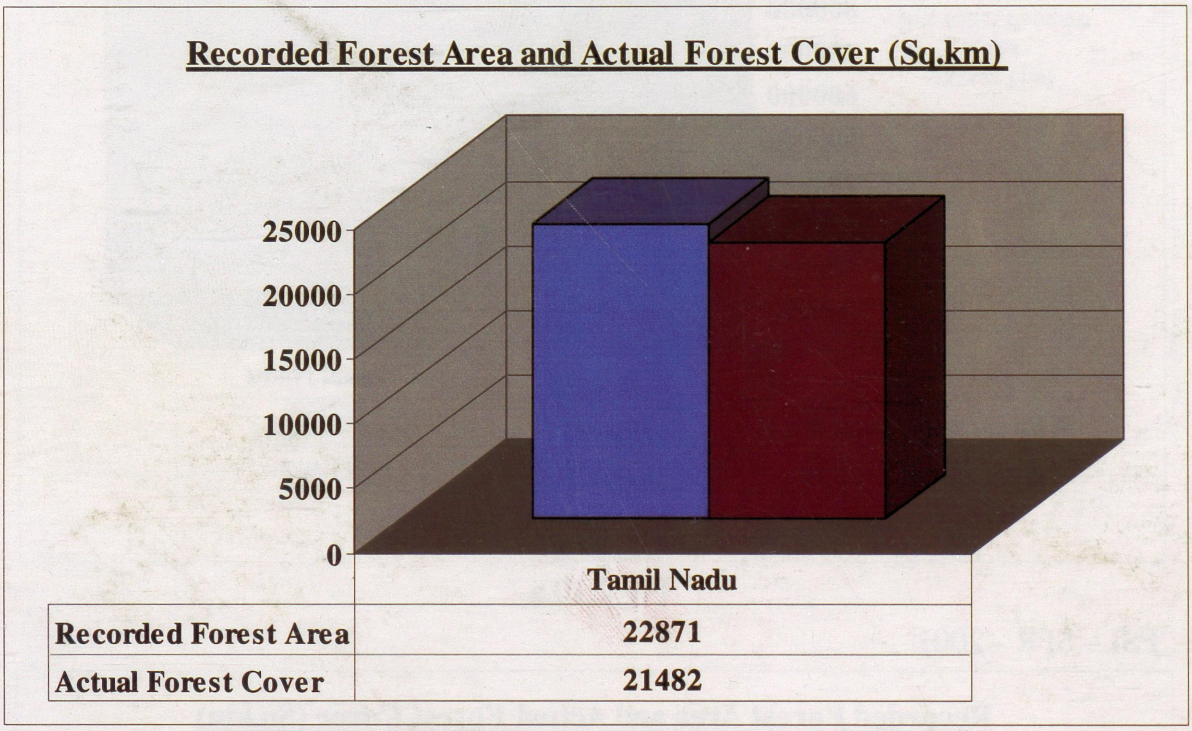


Fig. 2.10.c.

Source : FSI – SFR - 2001

2.11. District wise Forest Cover and Recorded Forest in Tamil Nadu comparison

Table 2.11.a
District wise Forest Cover and Recorded Forest in Tamil Nadu. Sq.km
(Recorded Forest Area in descending order)

District	Geographic Area	Recorded Forest		Forest Cover				Scrub
		Area	%	Dense Forest	Open Forest	Total	Percent	
Erode	8209	2463.96	30.02	1115	1032	2147	26.15	8
Dharmapuri	9622	2383.65	24.77	1090	1605	2695	28.01	97
Salem	5235	1972.30	37.68	557	547	1104	21.09	23
Vellore	6077	1924.61	31.67	984	474	1458	23.99	99
Coimbatore	7469	1774.93	23.76	1072	720	1792	23.99	0
Dindigul	5580	1466.83	26.29	731	437	1168	20.93	39
Tiruvannamalai	6191	1396.66	22.56	856	336	1192	19.25	0
Nilgiris	2549	1354.36	53.13	1067	956	2023	79.36	27
Tirunelveli	6810	1319.01	19.37	777	272	1049	15.40	230
Villupuram	7190	1192.45	16.58	656	442	1098	15.27	294
Theni	2764	809.94	29.30	358	366	724	26.19	27
Madurai	4277	741.58	17.34	276	238	514	12.02	85
Virudhu Nagar	4283	538.73	12.58	208	103	311	7.26	452
Namakkal	3413	534.12	15.65	345	175	520	15.24	216
Kanyakumari	1684	531.15	31.54	363	142	505	29.99	30
Perambalur	3695	476.43	12.89	205	269	474	12.83	217
Tiruvallur	3413	372.84	10.92	131	90	221	6.48	226
Sivagangai	4086	271.76	6.65	355	125	480	11.75	57
Kancheepuram	4474	238.11	5.32	295	105	400	8.94	492
Tiruchi	4511	197.25	4.37	275	99	374	8.29	4
Pudukottai	4651	184.69	3.97	96	127	223	4.79	88
Karur	2901	173.36	5.98	45	30	75	2.59	75
Nagapattinam	2140	129.27	6.04	64	14	78	3.64	27
Thanjavur	3415	105.66	3.09	47	23	70	2.05	78
Toothukudi	4621	70.41	1.52	118	27	145	3.14	135
Cuddalore	3706	66.63	1.80	231	167	398	10.74	10
Ramanathapuram	4232	53.88	1.27	161	56	217	5.13	32
Chennai	144	2.82	1.96	1	4	5	3.47	1
Tiruvarur	2716	0.36	0.01	20	2	22	0.81	111
	130058	**22747.75**	**17.49**	**12499**	**8983**	**21482**	**16.52**	**3180**

Source : FSI – SFR – 2001 and PCCF, Tamil Nadu

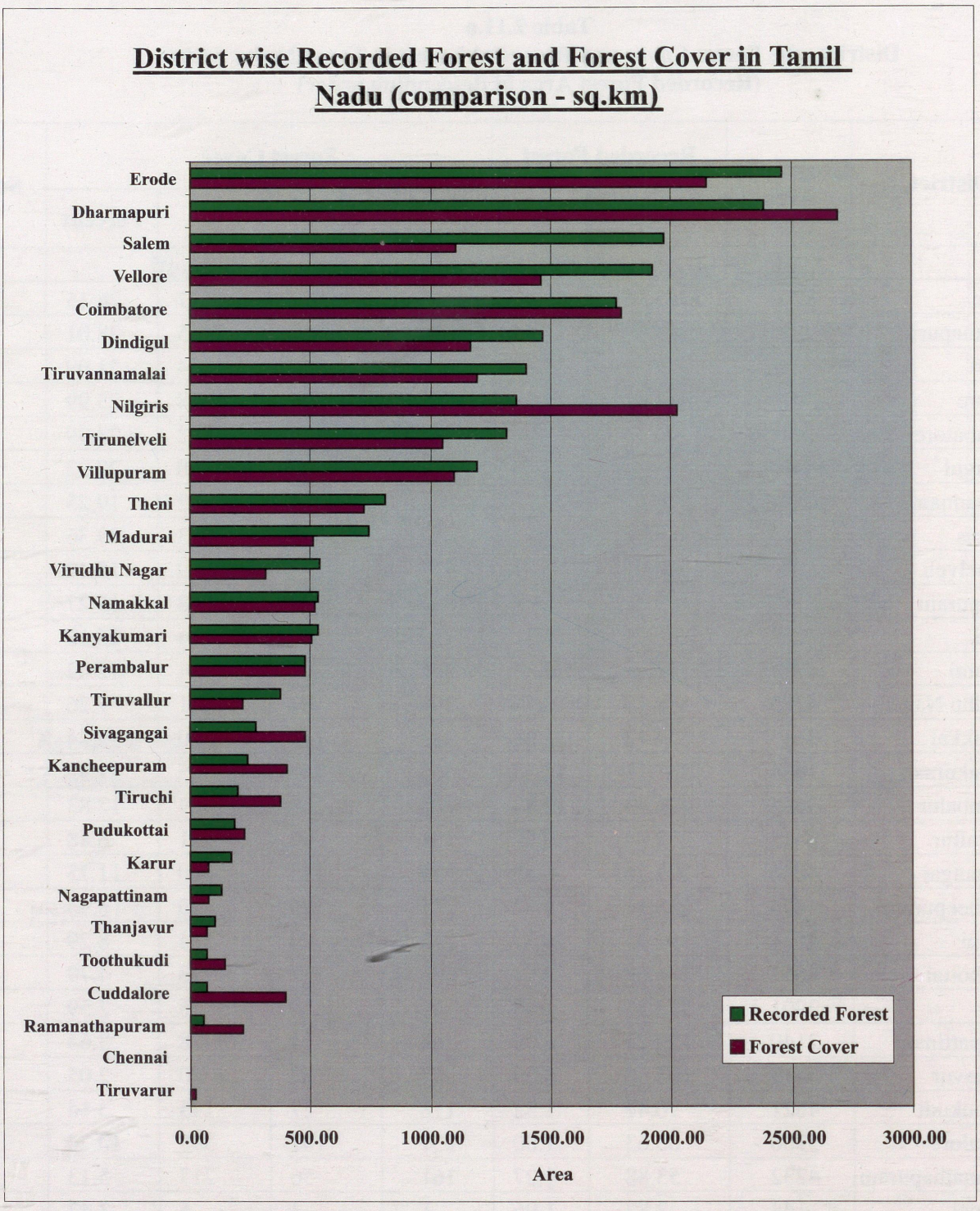


Fig 2.11.a

Source : FSI – SFR - 2001

2.12. Encroachment in Recorded Forest area in India and Tamil Nadu:

Table 2.12a

Statewise Forest Area Encroachment in India (Ha)

Sl.No.	State / Uts	Area
1	Madhya Pradesh	247189
2	Assam	131196
3	Andra Pradesh	76116
4	Arunachal Pradesh	34226
5	Maharastra	22758
6	Rajasthan	22000
7	Tamil Nadu	20900
8	Kerala	20800
9	Gujarat	17265
10	Himachal Pradesh	16667
11	West Bengal	14775
12	Uttar Pradesh	14493
13	Karnataka	12395
14	Meghalaya	11216
15	Bihar	9943
16	Orissa	8595
17	Goa, Daman & Diu	6638
18	Jammu & Kashmir	5370
19	Punjab	3177
20	Andaman & Nicobar Islands	2847
21	Tripura	1522
22	Nagaland	900
23	Dadra & Nagar Haveli	698
24	Haryana	287
25	Manipur	57
26	Chandigarh	3
27	Chhattisgarh	NA
28	Delhi	NA
29	Jharkhand	NA
30	Lakshdweep	NA
31	Mizoram	NA
32	Pondicherry	NA
33	Sikkim	NA
34	Uttaranchal	NA

Source: NBSAP – Wild Plant Diversity – 2002

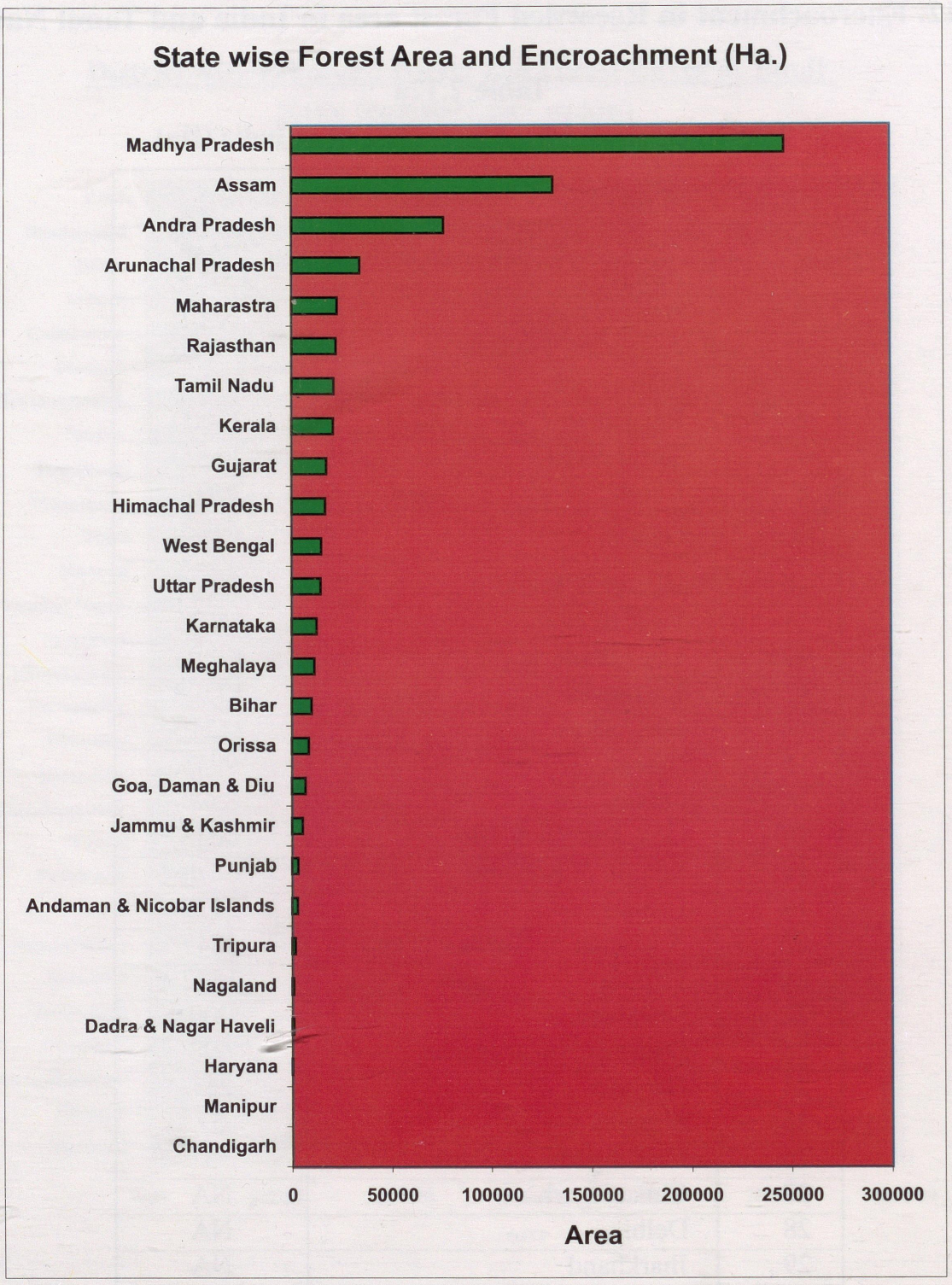


Fig. 2.12.a

Source: NBSAP – Wild Plant Diversity – 2002

Table 2.12.b

DISTRICTWISE/DIVISIONWISE ENCROACHMENT DETAILS IN TAMIL NADU (Area in Ha.)

Circle	Division	District	Encroachment in Reserved Forests		Encroachment in Reserved Land		Total Encroachment	
			No	Area	No	Area	No	Area
Dindigul	Dindigul	Dindigul	104	138.16	1296	1969.74	1400	2107.9
Dindigul	Kodaikanal	Dindigul	536	538.16	0	0.00	536	538.16
Project Tiger	DD, Ambasamudram	Tirunelveli	91	9.06	0	0.00	91	9.06
Vellore	Vellore	Vellore	901	18.06	0	0.00	901	18.06
Vellore	Tirupattur	Vellore	0	0.00	0	0.00	0	0
Vellore	Tiruvannamalai	Thiruvannamalai	48	3.06	0		48	3.06
Salem	Salem	Salem	695	473.54	1329	1625.64	2024	2099.18
Salem	Attur	Attur	2	6.36	1127	1213.58	1129	1219.94
Madurai	Madurai	Madurai	512	233.60	207	239.00	719	472.6
Madurai	Theni	Theni	126	141.30	2993	6101.33	3119	6242.63
Virudhunagar	Sivaganga	Sivaganga	1	0.80	62	30.50	63	31.3
Erode	Erode	Erode	22	25.28	0	0.00	22	25.28
Erode	Sathy	Erode	9	441.12	0	0.00	9	441.12
Chennai	Chengalpattu	Kancheepuram	464	659.98	0	0.00	464	659.98
Chennai	WLW, Chennai	Chennai	0	0.00	0	0.00	0	0
Dharmapuri	Dharmapuri	Dharmapuri	45	57.72	0	0.00	45	57.72
Dharmapuri	Harur	Dharmapuri	3	0.06	7	20.28	10	20.34
Dharmapuri	Hosur	Dharmapuri	687	1448.49	247	233.25	934	1681.74
Dharmapuri	Kalakuruchi	Salem	0	0.00	1	0.73	1	0.73
Dharmapuri	Villupuram	Villupuram	998	414.56	136	39.65	1134	454.21
Tiruchy	Tiruchy	Tiruchy	72	52.71	0	0.00	72	52.71
Tiruchy	Tanjore	Tanjavur	750	21.01	292	15.61	1042	36.62
Tiruchy	WLW,	Nagapattinam	0	0.00	0	0.00	0	0
Coimbatore	Nilgiris North	The Nilgiris	188	39.11	0	0.00	188	39.11
Coimbatore	Nilgiris South	The Nilgiris	192	108.05	0	0.00	192	108.05
Coimbatore	Gudalur	The Nilgiris	562	220.00	2379	1252.50	2941	1472.5
Coimbatore	Coimbatore	Coimbatore	0	0.00	0	0.00	0	0
Coimbatore	WLW, Pollachi	Coimbatore	1	0.75	2	0.58	3	1.33
Coimbatore	WLW, Ooty	The Nilgiris	0	0.00	0	0.00	0	0
Tirunelveli	Tirunelveli	Tirunelveli	8	14.07	0	0.00	8	14.07
Tirunelveli	Kanyakumari	Kanyakumari	437	670.85	0	0.00	437	670.85
TOTAL			**7454**	**5735.86**	**10078**	**12742.39**	**17532**	**18478.25**

2.13. Social Forestry:

The details of social forestry areas are given in the following tables.

Table 2.13.a

AREA UNDER SOCIAL FORESTRY (PRE-SIDA PERIOD)

Year of Raising	No. of Plantations	Area in Ha.	% share area	Seedlings planted	% share seedlings
1960	5	153.60	0.13	42560	0.04
1961	26	765.32	0.62	654015	0.50
1962	51	1404.64	1.15	948995	0.84
1963	93	2867.92	2.34	2685517	2.37
1964	70	1795.25	1.46	1602266	1.41
1965	73	1622.68	1.32	1662407	1.47
1966	51	1137.68	0.93	940421	0.83
1967	52	1234.09	1.01	1194914	1.05
1968	40	1068.40	1.87	823870	0.73
1969	50	1234.13	1.01	1071868	0.95
1970	41	923.37	0.75	802140	0.71
1971	69	1517.18	1.24	1605217	1.42
1972	96	2991.97	2.44	2210442	1.95
1973	149	3981.93	3.25	3485395	3.07
1974	192	5607.73	4.57	5205022	4.59
1975	184	5117.41	4.17	4578689	4.04
1976	310	9154.67	7.47	8156177	7.19
1977	425	12101.22	9.87	11938444	10.53
1978	646	15358.87	12.53	15252965	13.45
1979	835	19308.59	15.75	18118807	15.98
1980	1187	33233.78	27.11	30411442	26.02
Total	**4645**	**122580.43**	**100.00**	**113392374**	**100.00**

Table 2.13.b.

AREA UNDER SOCIAL FORESTRY (POST-SIDA PERIOD)

Year of Raising	No. of plantations	Area	% share area	Seedlings planted	% share seedlings
1981	1574	33766.26	13.23	40317065	11.29
1982	1878	32782.79	12.84	46474655	13.01
1983	1827	29278.43	11.47	49518485	13.86
1984	1949	30166.39	11.82	43876606	12.28
1985	1631	19785.48	7.75	27473824	7.69
1986	1478	20948.25	8.21	26740114	7.49
1987	1389	15584.75	6.11	2.930340	5.86
1988	1130	15402.57	6.03	24552736	6.87
1989	962	15060.24	5.90	19772140	5.53
1990	840	12462.29	4.88	18327541	5.13
1991	679	13921.66	5.45	16631595	4.66
1992	799	14837.62	5.81	21326909	5.97
1993	22	699.32	0.27	273610	0.08
1994	3	35.00	0.01	70000	0.02
Year not available	100	519.57	0.20	939886	0.25
Total	**16261**	**255250.62**	**100.00**	**357235506**	**100.00**
1960 to 1980	4645	122580.43		113392374	
1981 to 1994	16261	255250.62		357235506	
NET TOTAL	**20906**	**377831.05**		**470627880**	

Table 2.13.c

COMMUNITY WASTELAND DEVELOPMENT PROGRAMME

Sl. No	Plan Period / Year	Area planted (ha.)	
		During the period	Cumulative
PRE-SIDA PERIOD			
1.	Pilot Scheme (1960/61)	934	934
2.	Third Five Year Plan (1961/62 – 1965/66)	19,359	20,293
3.	Post Third Five Year plan (1967/68 – 1968/69)	6,271	26,564
4.	Fourth Five Year Plan (1969/70 – 1973/74)	14,997	41,561
5.	Fifth Five Year Plan		
	(1974/75)	6,836	48,397
	(1975/76)	6,645	53,042
	(1976/77)	11,823	66,865
	(1977/78)	11,470	78,335
	(1978/79)	11,933	90,268
6.	Annual Plan (1979-80)	15,714	1,05,932
7.	Annual plan (1980/81)	27,051	1,33,033
SIDA PHASE I (7 years) (1981/82 to 1987/88)			
a) Block planting (ha.)		1,40,363	2,73,396
b) Strip planting (Km.)		8,819	-
SIDA – PHASE II (7 years) (1988-89 to 1995-96)			
a) Block planting (ha.)		78,440	3,51,836
b) Strip planting (Km.)		1,687	-

Table 2.13.d

FARM FORESTRY AND AGRO FORESTRY PROGRAMME

Plan period	No. of seedlings supplied to the public (in lakhs)
SOCIAL FORESTRY SCHCME PHASE I (1981 – 82 to 1987 – 88)	
a) Tree Cultivation Incentive Programme	445.20
b) Tree Cultivation Extension Programme	1215.40
Total	**1660.60**
SOCIAL FORESTRY SCHEME PHASE II Agro forestry in dry lands by Agriculture department	
No. of seedlings distributed	Not available

Table 2.13.e

COMPONENT WISE ACHIEVEMENT

1.	Tank foreshore plantations (ha.)	2,11,431	Total
2.	Poramboke plain plantations (ha.)	14,331	
3.	Hillock plantations (ha.)	37,993	
4.	Fodder plantations (ha.)	2,975	
5.	River bed plantations (Km)	3,333	2,66,730
6.	Road Avenue plantations (Km)	5,852	
7.	Railway line plantations (Km)	1,613	
8.	River canal plantations (Km)	2,660	
9.	Tank bund plantations (Km)	2,279	15,737
10.	Tree cultivation incentive programme (Million Seed lings)	44.5	
11.	Tree cultivation extension programme (Million Seed lings)	121.5	166.0

Table 2.13.f.

INTERFACE FORESTRY PROGRAMME (SIDA PHASE II)

Sl. No	Year	Area planted (ha.)	
		During the period	Cumulative
1.	1988-89	690	690
2.	1989-90	2323	3013
3.	1990-91	2653	5666
4.	1991-92	6807	12473
5.	1992-93	7757	20230
6.	1993-94	7054	27284
7.	1994-95	5981	33265
8.	1995-96	2200	35465

3. FOREST COVER

3.1. Forest Cover – Definitions

3.2. Forest Cover – India and Tamil Nadu

3.3. Forest Cover – States

3.4. Change in Forest Cover – India and Tamil Nadu

3.5. Trends in Forest Cover

3. FOREST COVER

3.1. Forest Cover - Definitions

Land Cover:

Forest Survey of India, in State of Forest Report 2001 has classified the whole of the geographical area of the country in to two broad categories of land cover, i.e. "forest cover" and "non-forests"

Forest Cover:

Forest cover consists of all lands having tree canopy density of more than 10% that can be interpreted from satellite data. According to SFR – 2001 Forest Cover includes all lands more than 1 ha. in area with a tree canopy density of more than 10 % irrespective of tree species and its legal status, ownership, or land use.

Canopy (or crown) refers to the cover of branches and foliage formed by the crown of trees.

Canopy density refers to the present area of land covered by the canopy of trees. Also referred to us "Crown density".

Forest cover is further classified in to two classes only in SFR – 2001 namely dense forest and Open forest. These are defined below.

Dense forest includes all lands with a forest cover of tree with a canopy density over 40 %.

Open forest includes all lands with a forest cover of trees with a canopy density between 10 to 40%.

Forest cover has been taken to comprise of all woody and perennial tree species including bamboos, palms, coconut, apple, mango, neam, peepul, etc. Thus all lands with tree crops such as agro forestry plantation, fruit orchids, tea and coffee estates with trees etc have been included in forest cover.

Forest cover has not been separately assessed for recorded forest and as such it does not indicate actual status of changes inside the Recorded Forest Area.

Lakshadweep with no recorded forest area, a coral island with no chances of rock or soil with only one tree species namely coconut has been ranked no. 1 in terms of percentage of Forest cover to geographic area among all States and Union territories. How many foresters will accept this as forest cover is a moot point.

Non-forest:

The category "non-forest" includes all lands without forest cover, such as agricultural croplands, grasslands, wastelands, scrub, water bodies, riverbeds, snow covered mountains and built up areas. Only "Scrub" has been classified as a separate class within "non-forest". Scrub denotes lands having bushes and / or poor tree growth with canopy density less than 10 percent. Such lands are delineated largely within or around continuous forest areas.

Critically look at the SFR –2001 concept of non-forest reveals many things which is not acceptable. Non-forest includes wetlands inside

the recorded forest areas it also includes grass lands and reed lands inside the recorded forest area. All these are category of lands which are very important from biodiversity conservation point of view and categorizing them as non-forest will do great injustice to the concept of biodiversity conservation. Reed lands in Kalakad Mundanthurai Tiger Reserve are important habitat of Elephants where they permanently reside. Grasslands in Western Ghats are important habitat for Nilgiri Tahr, Bison, Sambhar etc. Wetlands inside the forest areas are important habitats for Amphibians, Reptiles, Birds and Mammals. Non-forest also includes scrublands. Scrub is mostly found in recorded forest area, which is degraded due to various reasons. They are also important category of habitat for many wild animals.

3.2. Forest Cover – India and Tamil Nadu:

Forest cover as per SFR – 2001, for India and Tamil Nadu are furnished in the Tables 3.2.a. and in figures 3.2.a., 3.2.b., 3.2.c, 3.2.d. The total forest cover of the country as per 2001 assessment is 675,538 km^2 and this constitutes 20.55 percent of the geographic area of the country. Of this, 416,809 km^2 (or 12.68 percent) is dense forest cover while 258,729 km^2 (or 7.87 percent) is open forest cover. The non-forest includes scrub estimated to cover an area of 47,318 km^2. The total forest cover for Tamil Nadu is 21482 km^2 constituting about 16.52 %. This includes 12499 km^2 constituting 9.61% of dense forest and 8983 km^2 constituting 6.91% of open forest. Tamil Nadu ranks 11th among the all states and union territories with reference to total forest cover as furnished in the table below.

The Forest cover map of India and Tamil Nadu are given figures 3.2.a, 3.2.b. respectively.

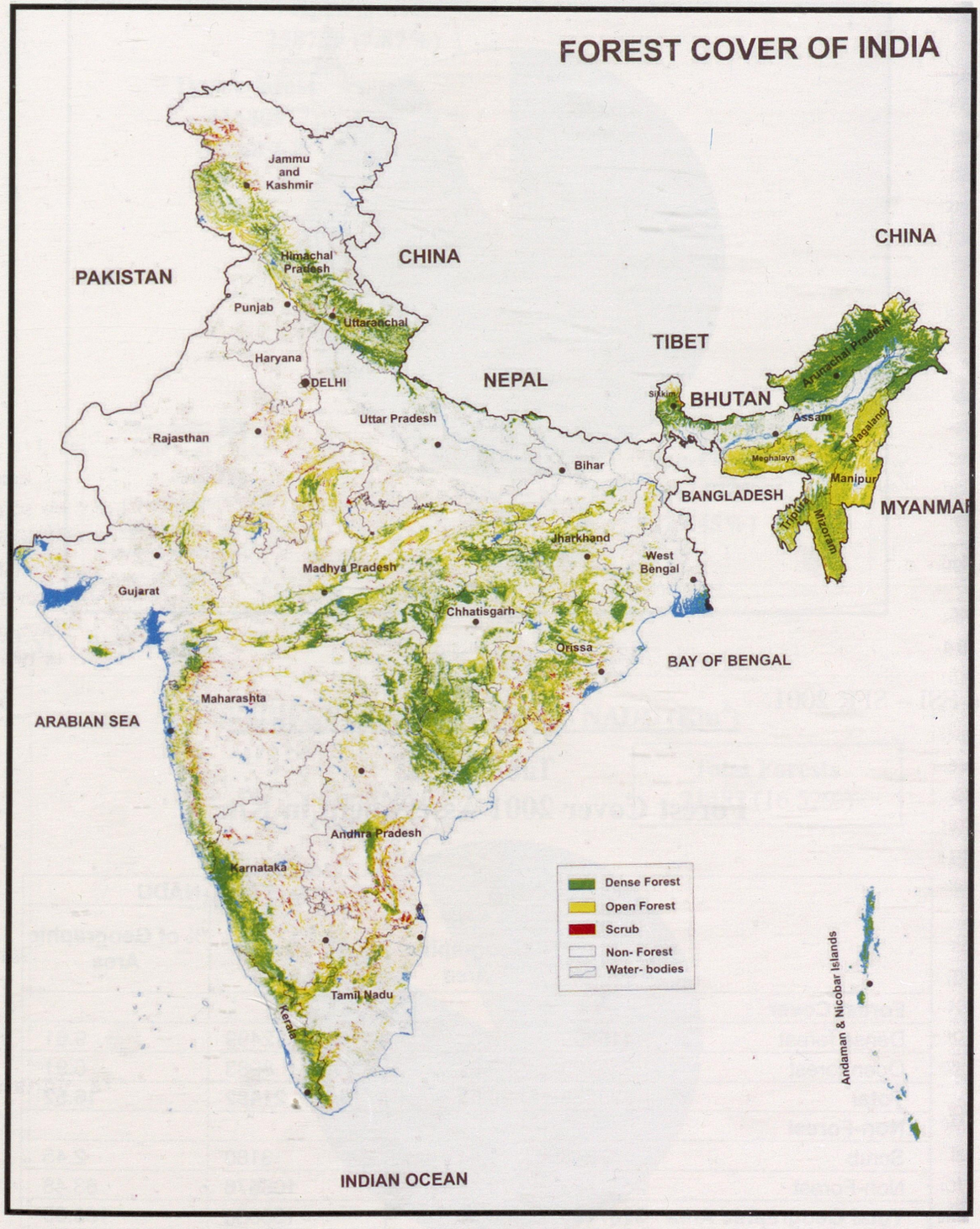


Fig. 3.2.a.

Source FSI – SFR 2001.

Forest Cover of Tamil Nadu

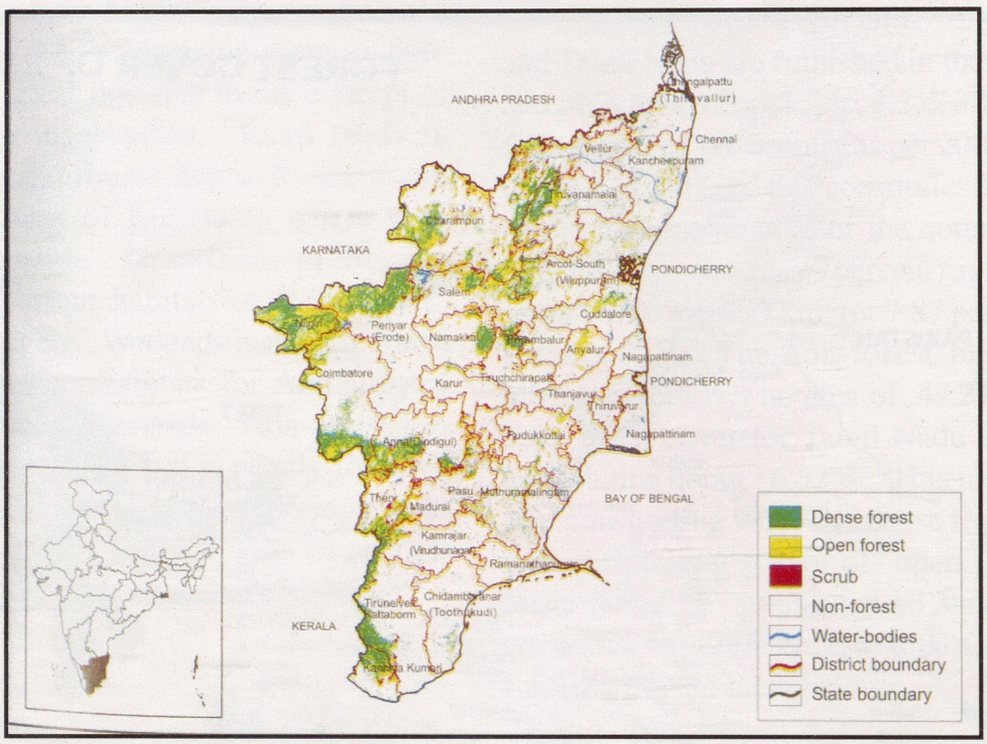


Fig 3.2.b.

Source FSI – SFR 2001.

Table 3.2.a.
Forest Cover 2001 Assessment in Km²

	INDIA		TAMIL NADU	
	Area	% of Geographic Area	Area	% of Geographic Area
Forest Cover				
Dense forest	416809	12.68	12499	9.61
Open forest	258729	7.87	8983	6.91
Total	**675538**	**20.55**	**21482**	**16.52**
Non-Forest				
Scrub	47318	1.44	3180	2.45
Non-Forest	2611725	79.45	108576	83.48
Total Geographic Area	**3287263**	**100.00**	130058	**100.00**

Note: Total Forest Cover includes Mangroves
Total Non-Forest includes Scrub
Source : FSI – SFR - 2001

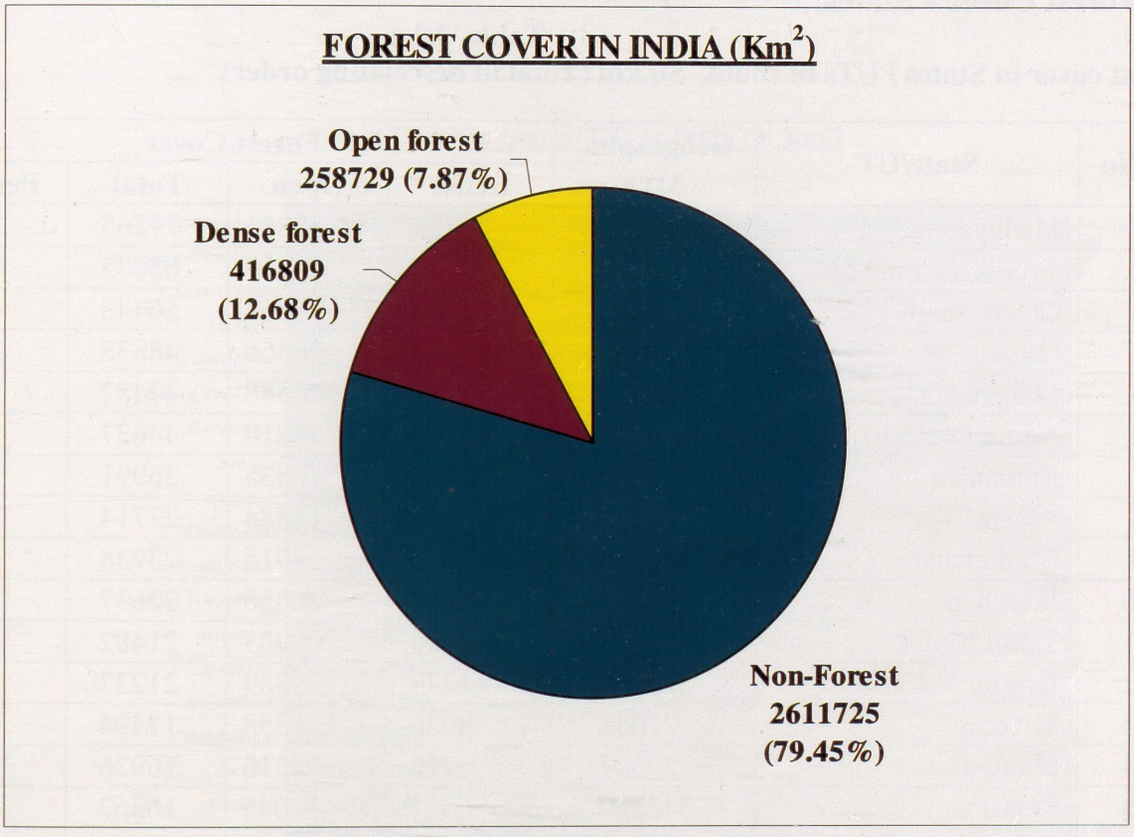


Fig. 3.2.c.

Source : FSI – SFR – 2001

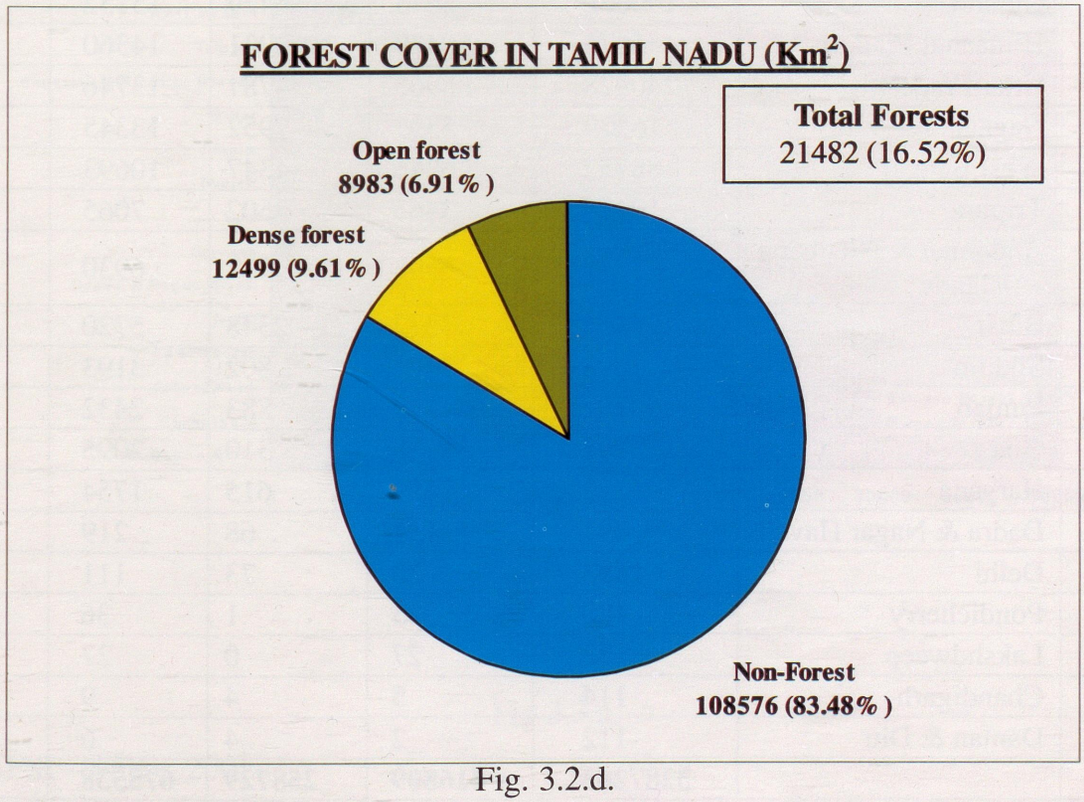


Fig. 3.2.d.

Source : FSI – SFR - 2001

3.3. Forest Cover – States:

Table 3.3.a.

Forest cover in States / UTs in India. Sq.km (Total in descending order)

Sl.No	State/UT	Geographic Area	Forest Cover			
			Dense	Open	Total	Percent
1	Madhya Pradesh	308245	44384	32881	77265	25.07
2	Arunachal Pradesh	83743	53932	14113	68045	81.25
3	Chhattisgarh	135191	37880	18568	56448	41.75
4	Orissa	155707	27972	20866	48838	31.37
5	Maharastra	307713	30894	16588	47482	15.43
6	Andra Pradesh	275069	25827	18810	44637	16.23
7	Karnataka	191791	26156	10835	36991	19.29
8	Assam	78438	15830	11884	27714	35.33
9	Uttaranchal	53483	19023	4915	23938	44.76
10	Jharkhand	79714	11787	10850	22637	28.40
11	Tamil Nadu	130058	12499	8983	21482	16.52
12	Jammu & Kashmir	222236	11848	9389	21237	9.56
13	Mizoram	21081	8936	8558	17494	82.98
14	Manipur	22327	5710	11216	16926	75.81
15	Rajasthan	342239	6322	10045	16367	4.78
16	Meghalaya	22429	5681	9903	15584	69.48
17	Kerala	38863	11772	3788	15560	40.04
18	Gujarat	196022	8673	6479	15152	7.73
19	Himachal Pradesh	55673	10429	3931	14360	25.79
20	Uttar Pradesh	240928	8965	4781	13746	5.71
21	Nagaland	16579	5393	7952	13345	80.49
22	West Bengal	88752	6346	4347	10693	12.05
23	Tripura	10486	3463	3602	7065	67.38
24	Andaman & Nicobar Islands	8249	6593	337	6930	84.01
25	Bihar	94163	3372	2348	5720	6.07
26	Sikkim	7096	2391	802	3193	45.00
27	Punjab	50362	1549	883	2432	4.83
28	Goa	3702	1785	310	2095	56.59
29	Haryana	44212	1139	615	1754	3.97
30	Dadra & Nagar Haveli	491	151	68	219	44.60
31	Delhi	1483	38	73	111	7.48
32	Pondicherry	480	35	1	36	7.50
33	Lakshdweep	32	27	0	27	84.38
34	Chandigarh	114	5	4	9	7.89
35	Daman & Diu	112	2	4	6	5.36
		3287263	**416809**	**258729**	**675538**	**20.55**

Source : FSI – SFR – 2001

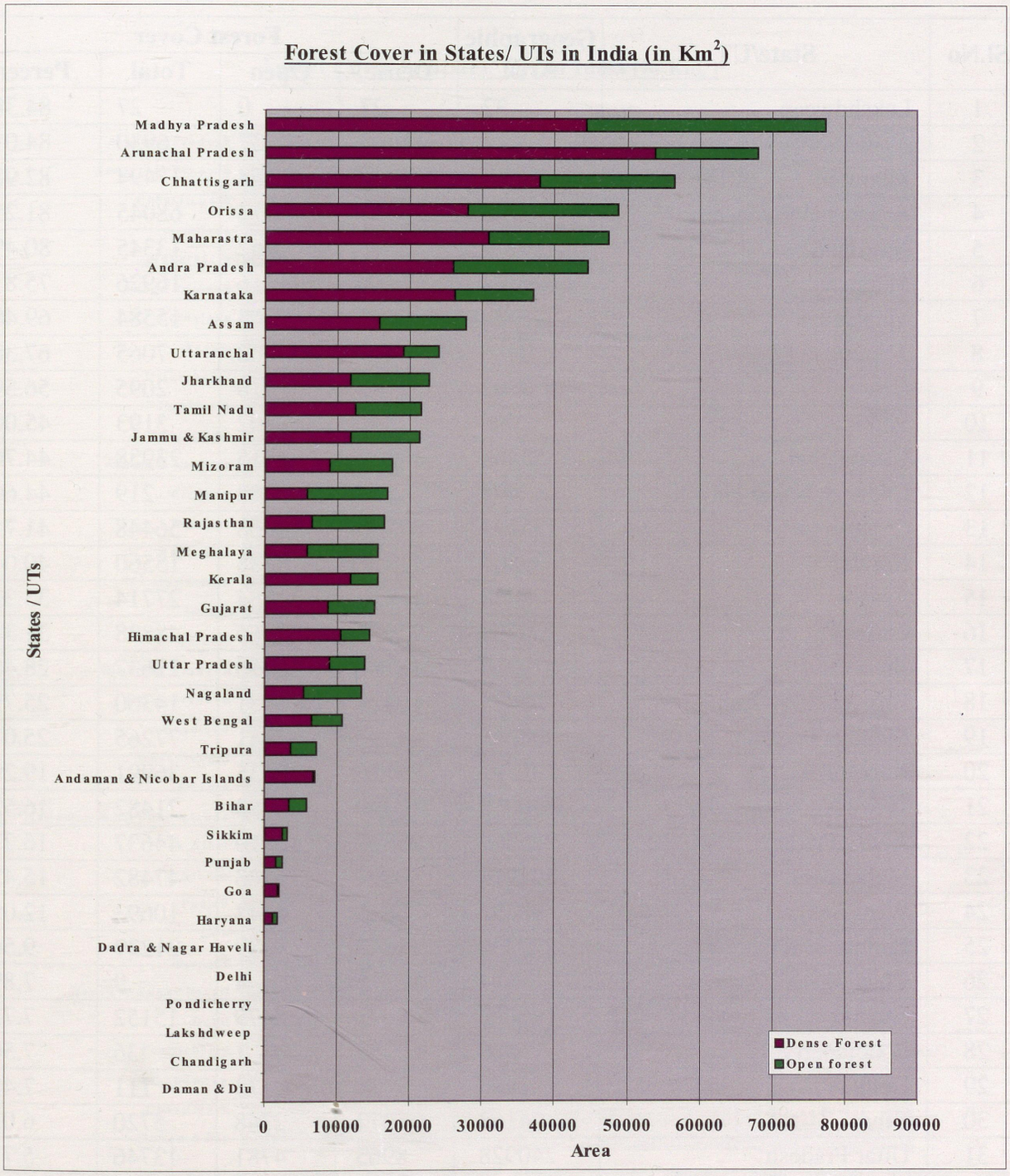


Fig 3.3.a.

Source : FSI – SFR – 2001

Forest cover in States / Uts in India. Sq.km (Percentage in descending order)
Table 3.3.b.

Sl.No	State/UT	Geographic Area	Forest Cover			
			Dense	Open	Total	Percent
1	Lakshdweep	32	27	0	27	84.38
2	Andaman & Nicobar Islands	8249	6593	337	6930	84.01
3	Mizoram	21081	8936	8558	17494	82.98
4	Arunachal Pradesh	83743	53932	14113	68045	81.25
5	Nagaland	16579	5393	7952	13345	80.49
6	Manipur	22327	5710	11216	16926	75.81
7	Meghalaya	22429	5681	9903	15584	69.48
8	Tripura	10486	3463	3602	7065	67.38
9	Goa	3702	1785	310	2095	56.59
10	Sikkim	7096	2391	802	3193	45.00
11	Uttaranchal	53483	19023	4915	23938	44.76
12	Dadra & Nagar Haveli	491	151	68	219	44.60
13	Chhattisgarh	135191	37880	18568	56448	41.75
14	Kerala	38863	11772	3788	15560	40.04
15	Assam	78438	15830	11884	27714	35.33
16	Orissa	155707	27972	20866	48838	31.37
17	Jharkhand	79714	11787	10850	22637	28.40
18	Himachal Pradesh	55673	10429	3931	14360	25.79
19	Madhya Pradesh	308245	44384	32881	77265	25.07
20	Karnataka	191791	26156	10835	36991	19.29
21	Tamil Nadu	130058	12499	8983	21482	16.52
22	Andra Pradesh	275069	25827	18810	44637	16.23
23	Maharastra	307713	30894	16588	47482	15.43
24	West Bengal	88752	6346	4347	10693	12.05
25	Jammu & Kashmir	222236	11848	9389	21237	9.56
26	Chandigarh	114	5	4	9	7.89
27	Gujarat	196022	8673	6479	15152	7.73
28	Pondicherry	480	35	1	36	7.50
29	Delhi	1483	38	73	111	7.48
30	Bihar	94163	3372	2348	5720	6.07
31	Uttar Pradesh	240928	8965	4781	13746	5.71
32	Daman & Diu	112	2	4	6	5.36
33	Punjab	50362	1549	883	2432	4.83
34	Rajasthan	342239	6322	10045	16367	4.78
35	Haryana	44212	1139	615	1754	3.97
		3287263	**416809**	**258729**	**675538**	**20.55**

Source : FSI – SFR – 2001

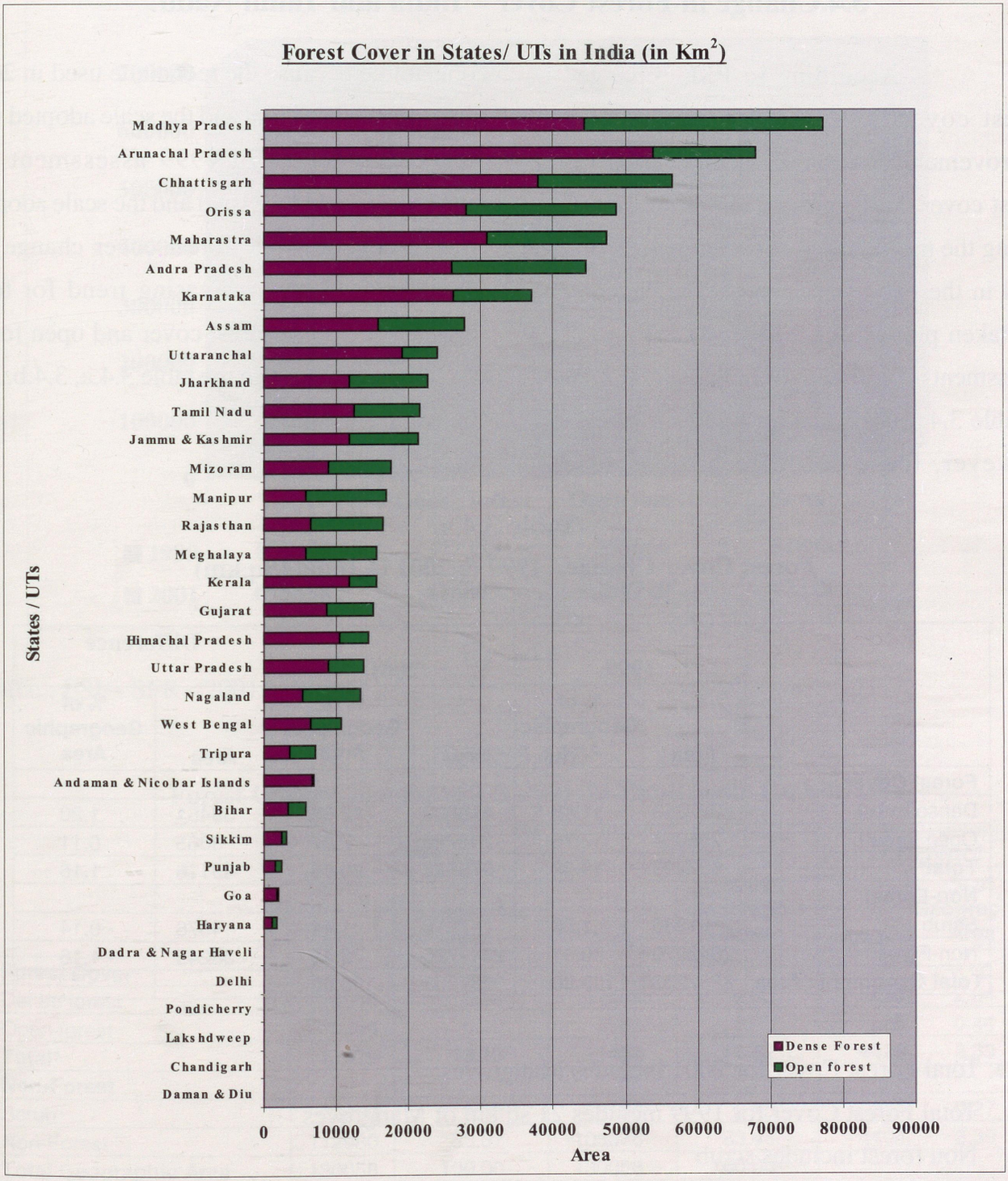


Fig. 3.3.b.

Source : FSI – SFR - 2001

3.4.Change in Forest Cover – India and Tamil Nadu:

According to FSI, "change" in forest cover imply determining increase/ improvement or decrease/deterioration in the forest cover on the ground that has taken place during the time elapsed between periods of data used in the two assessments. The change that has taken place from 1999 assessment to 2001 assessment is furnished for India and Tamil Nadu in table 3.4.a, 3.4.b. and in figures 3.4.a., 3.4.b. However, these two data are not strictly comparable because the technique used in 2001 assessment was digital and the scale adopted was 1:50,000 whereas in 1999 assessment the techniques used was visual and the scale adopted was 1:2,50,000. The forest cover change for Tamil Nadu shows increasing trend for total forest cover, dense forest cover and open forest cover as can be seen in the table 3.4.a, 3.4.b. and figures 3.4.a, 3.4.b.

Table 3.4.a.

Forest Cover Change - 1999 & 2001 in India (Sq.km)

	1999		2001		Difference	
	Area	% of Geographic Area	Area	% of Geographic Area	Area	% of Geographic Area
Forest Cover						
Dense forest	377358	11.48	416809	12.68	39451	1.20
Open forest	255064	7.76	258729	7.87	3665	0.11
Total*	**637293**	**19.39**	**675538**	**20.55**	**43116**	**1.16**
Non-Forest						
Scrub	51896	1.58	47318	1.44	- 4578	- 0.14
Non-Forest	2649970	80.61	2611725	79.45	- 38245	- 1.16
Total Geographic Area	3287263	**100.00**	**3287263**	**100.00**		

Note: Total Forest Cover for 2001 includes Mangroves

Total Forest Cover for 1999 includes 21 sq.km of Mangroves

Non forest includes scrub

Source : FSI – SFR – 2001

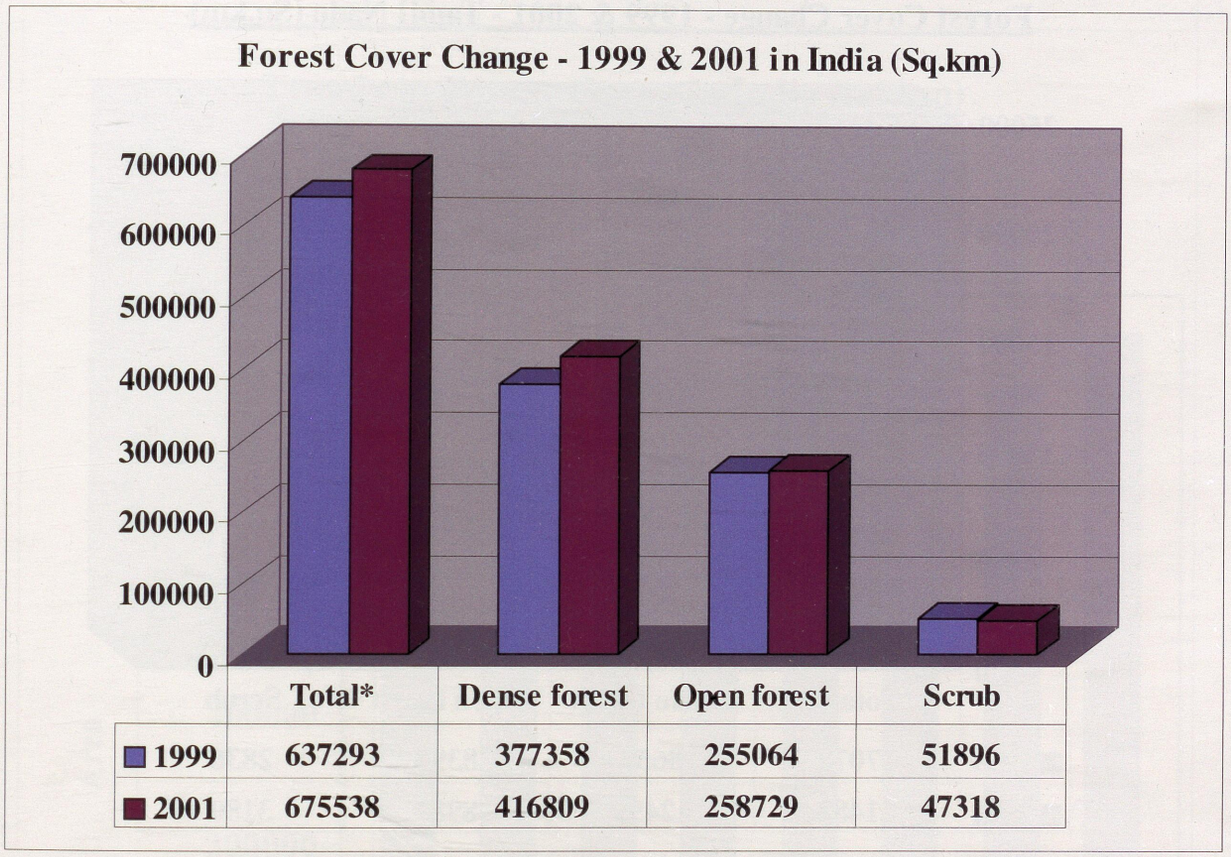


Fig 3.4.a

Source : FSI – SFR - 2001

Table 3.4.b.
Forest Cover Change 1999 & 2001 in Tamil Nadu (sq.km)

	1999		2001		Difference	
	Area	% of Geographic Area	Area	% of Geographic Area	Area	% of Geographic Area
Forest Cover						
Dense forest	8659	6.66	12499	9.60	3840	2.94
Open forest	8398	6.46	8983	6.90	585	0.44
Total*	**17078**	**13.13**	**21482**	**16.52**	**4425**	**3.39**
Non-Forest						
Scrub	2836	2.18	3180	2.45	344	0.27
Non-Forest	112980	86.87	108576	83.48	- 4404	- 3.39
Total Geographic Area	130058	**100.00**	130058	**100.00**		

Note: Total Forest Cover for 2001 includes Mangroves
Total Forest Cover for 1999 includes 21 sq.km of Mangroves
Non forest includes scrub

Source : FSI – SFR – 2001

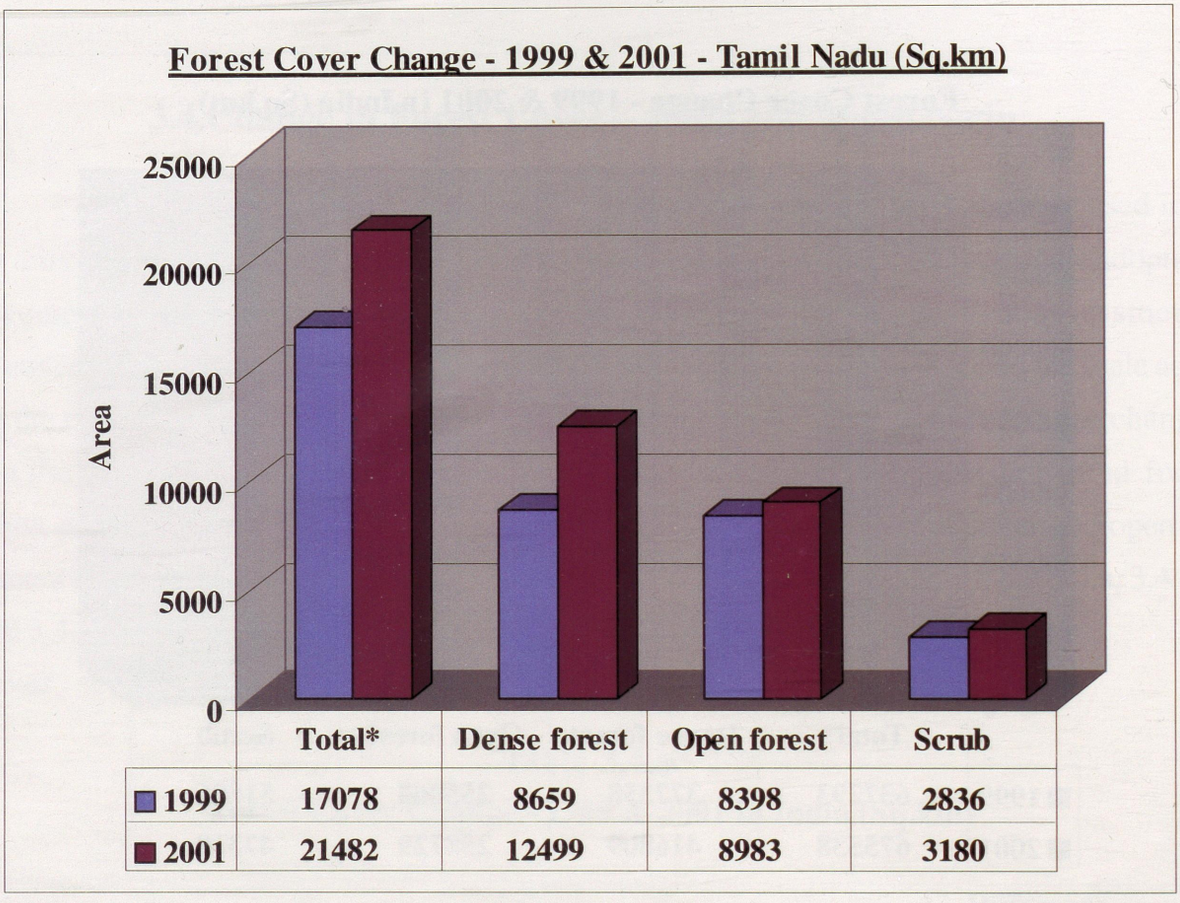


Fig. 3.4.b.

Source : FSI – SFR - 2001

3.5. Trends in Forest Cover:

FSI, has carried out forest cover assessment from 1987 onwards at every two years interval. The trends in forest cover assessment for various periods for India and Tamil Nadu are furnished in Table 3.5.a. 3.5.b. and figures 3.5.a. to 3.5.e. The technology adopted for various years of assessment are not uniform and as such the data is not strictly comparable. The trend changes for Tamil Nadu indicates steadily increasing trend.

Table 3.5.a

Trends in Forest Cover in India (Sq.km)

Year	Area	% of Geographical Area
1987	640819	19.49
1989	638804	19.43
1991	639364	19.45
1993	639386	19.45
1995	638879	19.43
1997	633397	19.27
1999	637293	19.39
2001	675538	20.55

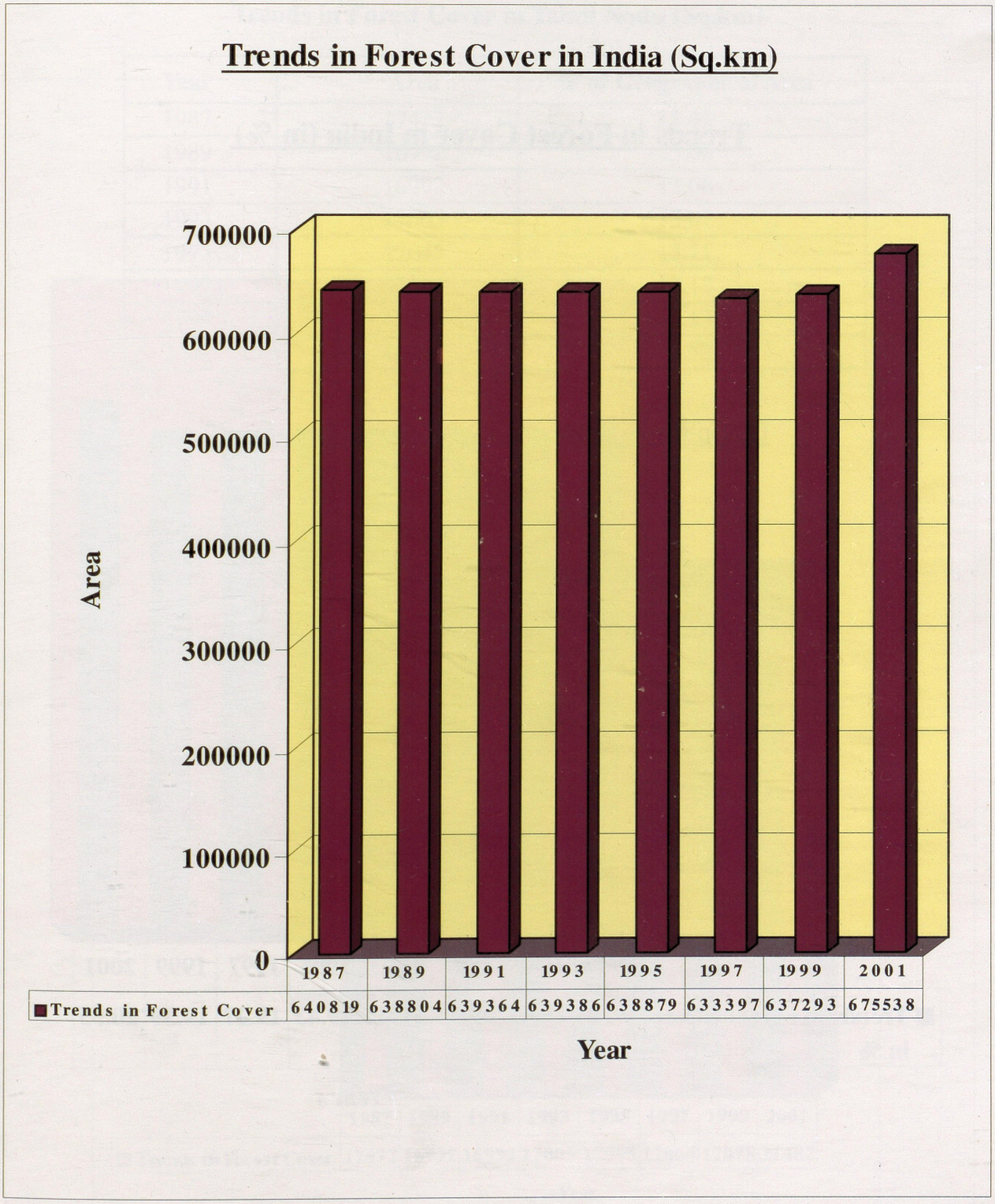


Fig. 3.5.a.

Source : FSI – SFR – 2001

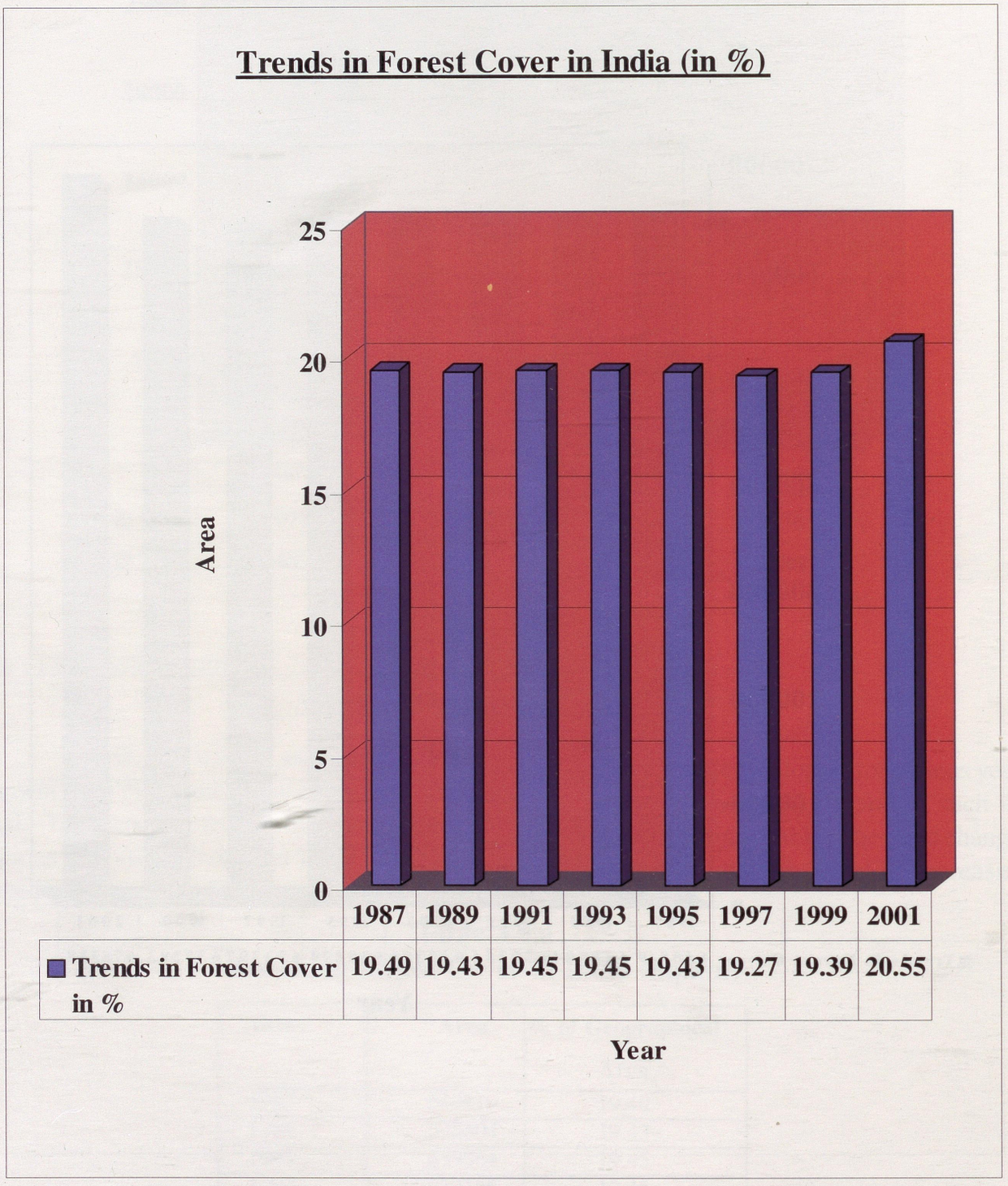


Fig. 3.5.b.

Source : FSI – SFR - 2001

Table 3.5.b

Trends in Forest Cover in Tamil Nadu (Sq.km)

Year	Area	% of Geographical Area
1987	17472	13.43
1989	16992	13.06
1991	16992	13.06
1993	17005	13.07
1995	17045	13.11
1997	17064	13.12
1999	17078	13.13
2001	2148?	16.52

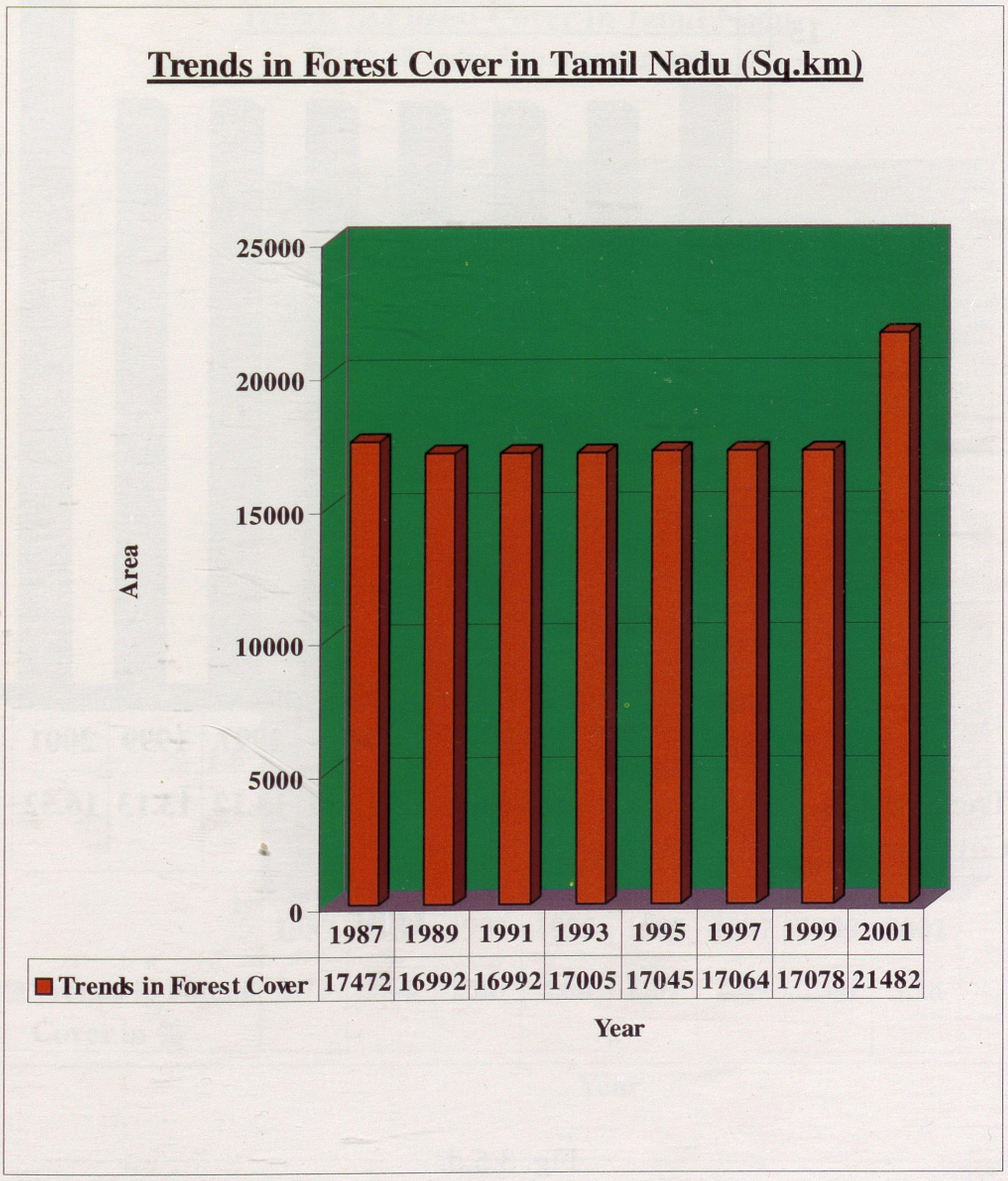


Fig. 3.5.c.

Source : FSI – SFR – 2001

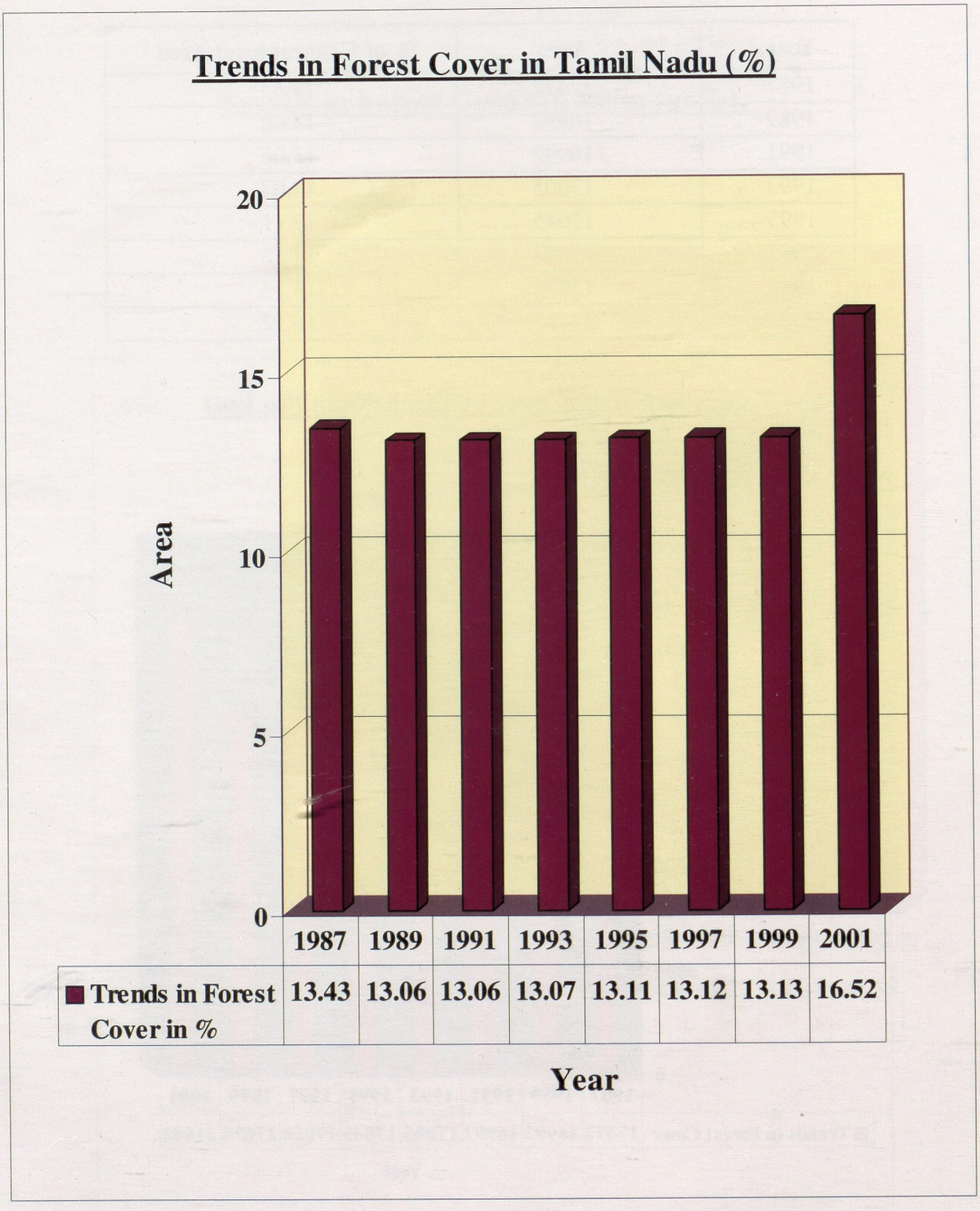


Fig. 3.5.d.

Source : FSI – SFR - 2001

Tabel 3.5.e.

Trends in Forest Cover - Tamil Nadu - % to India

Year	India	Tamil Nadu	
	Area	Area	% to India
1987	640819	17472	2.73
1989	638804	16992	2.66
1991	639364	16992	2.66
1993	639386	17005	2.66
1995	638879	17045	2.67
1997	633397	17064	2.69
1999	637293	17078	2.68
2001	675538	21482	3.18

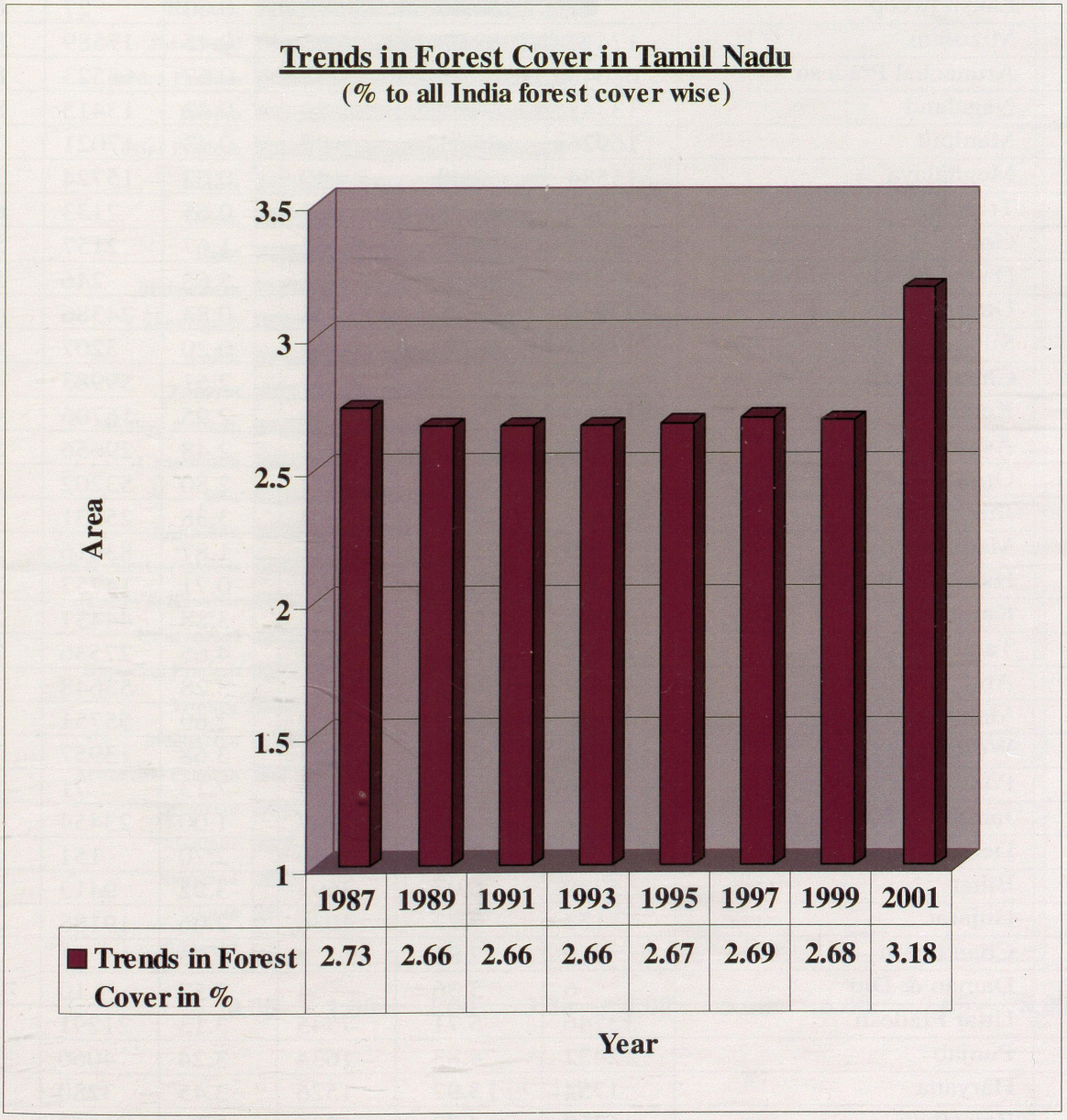


Fig. 3.5.e.

Source : FSI – SFR – 2001

4. TREES OUTSIDE FOREST (TOF) AND TREE COVER

Trees outside forest include all trees growing outside recorded forest area. But tree cover includes only those trees in non-forest areas that do not constitute block plantation or woodlots more than 1 ha in area since these have been included as Forest Cover. The area under tree cover is a "Notional" area. It is an area covered if all the trees included in the assessment of tree cover are brought together to constitute a block of tree land or forests. (FSI - SFR 2001)

An overview of State/UT wise Forest and Tree Cover: (Sq.km)

Sl.No.	State/UT	Forest Cover		Tree Cover		Forest and Tree Cover	
		Area	Percent	Area	Percent	Area	Percent
1	Andaman & Nicobar Islands	6930	84.01	83	1.01	7013	85.02
2	Lakshdweep	27	84.38	0	0.00	27	84.38
3	Mizoram	17494	82.98	95	0.45	17589	83.44
4	Arunachal Pradesh	68045	81.25	478	0.57	68523	81.83
5	Nagaland	13345	80.49	70	0.42	13415	80.92
6	Manipur	16926	75.81	95	0.43	17021	76.24
7	Meghalaya	15584	69.48	140	0.62	15724	70.11
8	Tripura	7065	67.38	68	0.65	7133	68.02
9	Goa	2095	56.59	62	1.67	2157	58.27
10	Dadra & Nagar Haveli	219	44.60	27	5.63	246	50.23
11	Uttaranchal	23938	44.76	448	0.84	24386	45.60
12	Sikkim	3193	45.00	14	0.20	3207	45.19
13	Chhattisgarh	56448	41.75	3535	2.61	59983	44.37
14	Kerala	15560	40.04	1146	2.95	16706	42.99
15	Assam	27714	35.33	1942	2.48	29656	37.81
16	Orissa	48838	31.37	4364	2.80	53202	34.17
17	Jharkhand	22637	28.40	2694	3.38	25331	31.78
18	Madhya Pradesh	77265	25.07	5751	1.87	83016	26.93
19	Himachal Pradesh	14360	25.79	397	0.71	14757	26.51
20	Karnataka	36991	19.29	7446	3.88	44437	23.17
21	Tamil Nadu	21482	16.52	6054	4.65	27536	21.17
22	Andra Pradesh	44637	16.23	9011	3.28	53648	19.50
23	Maharastra	47482	15.43	8269	2.69	55751	18.12
24	West Bengal	10693	12.05	3264	3.68	13957	15.73
25	Pondicherry	36	7.50	35	7.13	71	14.63
26	Jammu & Kashmir	21237	9.56	2217	1.00	23454	10.55
27	Delhi	111	7.48	40	2.70	151	10.18
28	Bihar	5720	6.07	3693	3.92	9413	10.00
29	Gujarat	15152	7.73	4036	2.06	19188	9.79
30	Chandigarh	9	7.89	2	1.75	11	9.65
31	Daman & Diu	6	5.36	4	3.57	10	8.93
32	Uttar Pradesh	13746	5.71	7545	3.13	21291	8.84
33	Punjab	2432	4.83	1634	3.24	4066	8.07
34	Haryana	1754	3.97	1526	3.45	3280	7.42
35	Rajasthan	16367	4.78	5286	1.54	21653	6.33
	TOTAL	**675538**	**20.55**	**81471**	**2.48**	**757009**	**23.03**

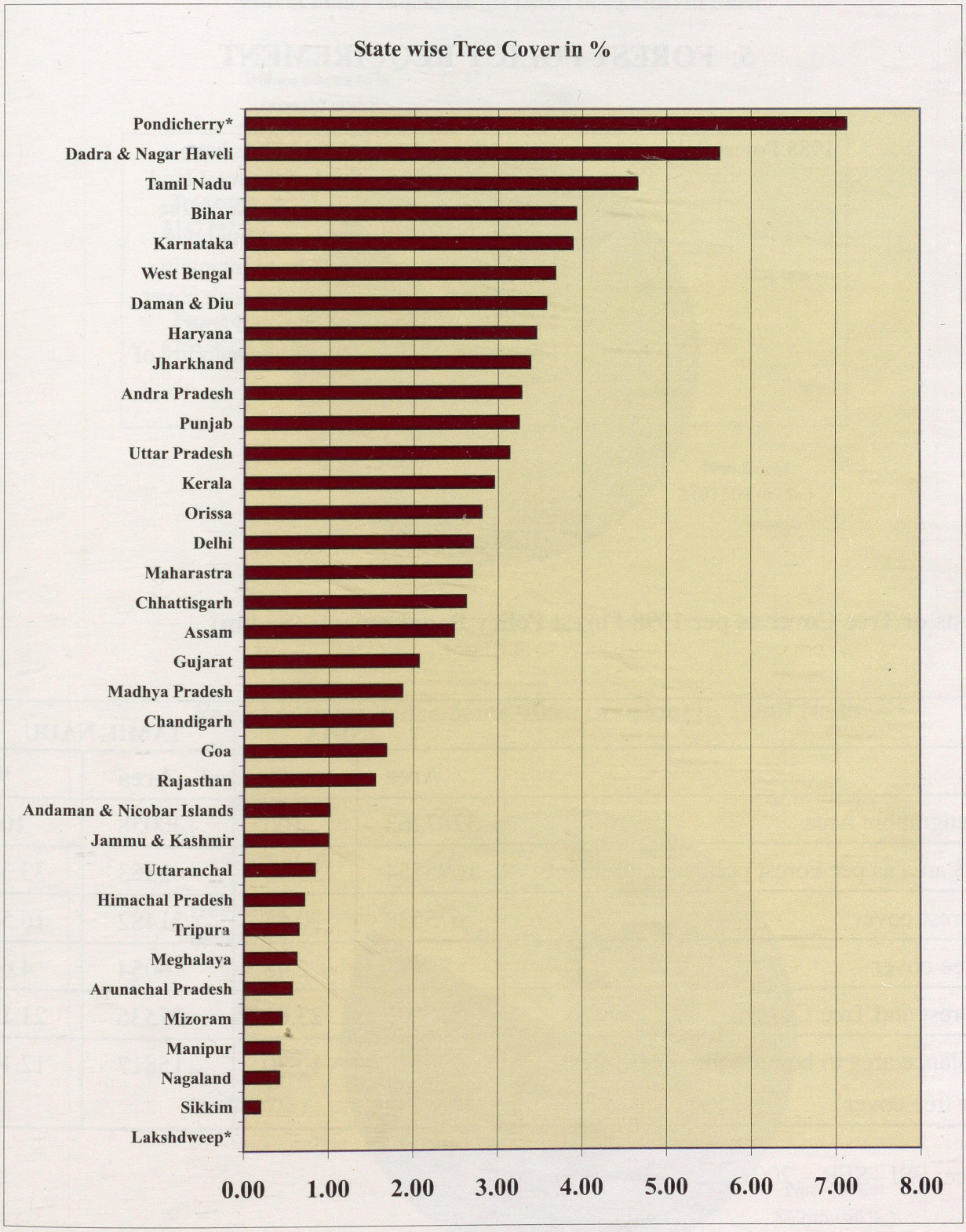


Fig. 4.a

Source : FSI – SFR – 2001

5. FOREST POLICY REQUIREMENT

1988 Forest Policy	The National goal should be to have a minimum of one -third of the total land area of the country under forest or tree cover. In the hills and in mountainous regions, the aim should be to maintain two-thirds of the area under such cover in order to prevent erosion and land degradation and to ensure the stability of the fragile ecosystem.

Table 5.a.

Forests or Tree Cover as per 1998 Forest Policy Requirement: (Sq.km)

	INDIA		TAMIL NADU	
	Area	**%**	**Area**	**%**
Geographic Area	3287263	100	130058	100
1/3 area as per Forest policy requirement	1095754	33.33	43353	33.33
Forest cover	675538	20.55	21482	16.52
Tree cover	81471	2.48	6054	4.65
Forest and Tree Cover	757009	23.03	27536	21.17
Balance area to be brought under forest or tree cover	338745	10.30	15817	12.16

Source: FSI –SFR – 2001

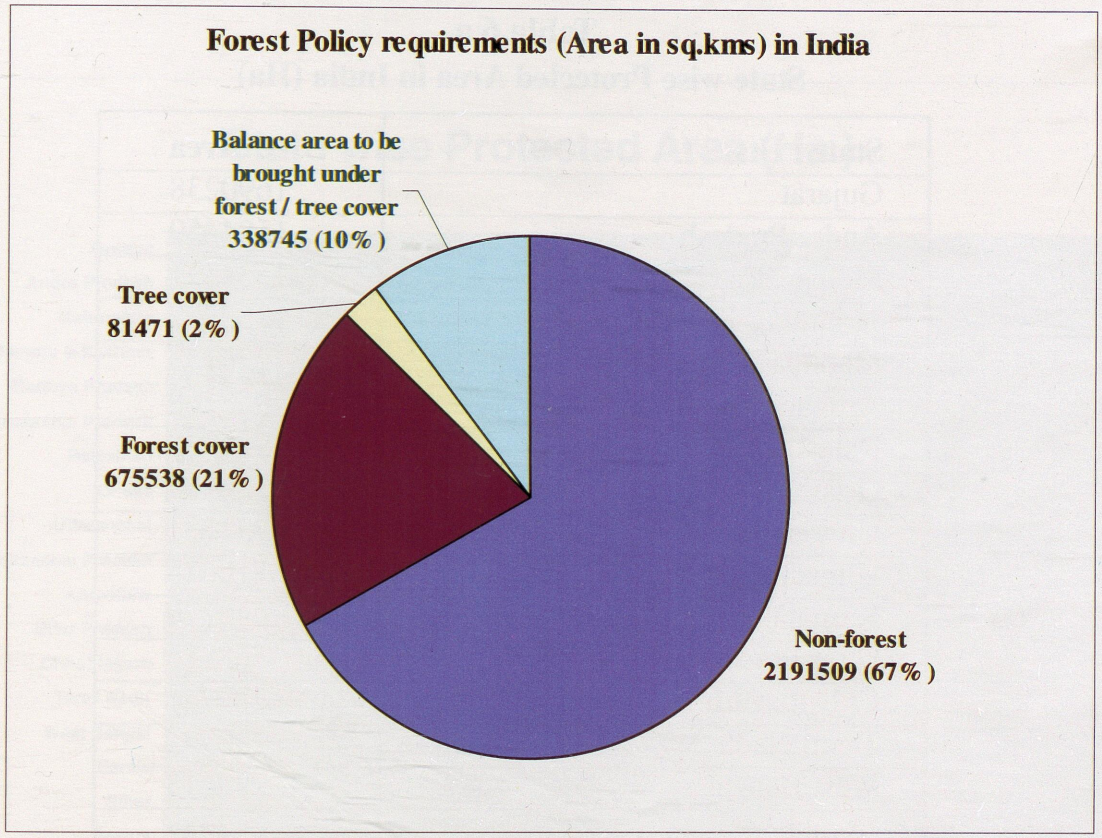

Forest Policy requirements (Area in sq.kms) in India
Balance area to be brought under forest / tree cover 338745 (10%)
Tree cover 81471 (2%)
Forest cover 675538 (21%)
Non-forest 2191509 (67%)

Fig. 5.a.

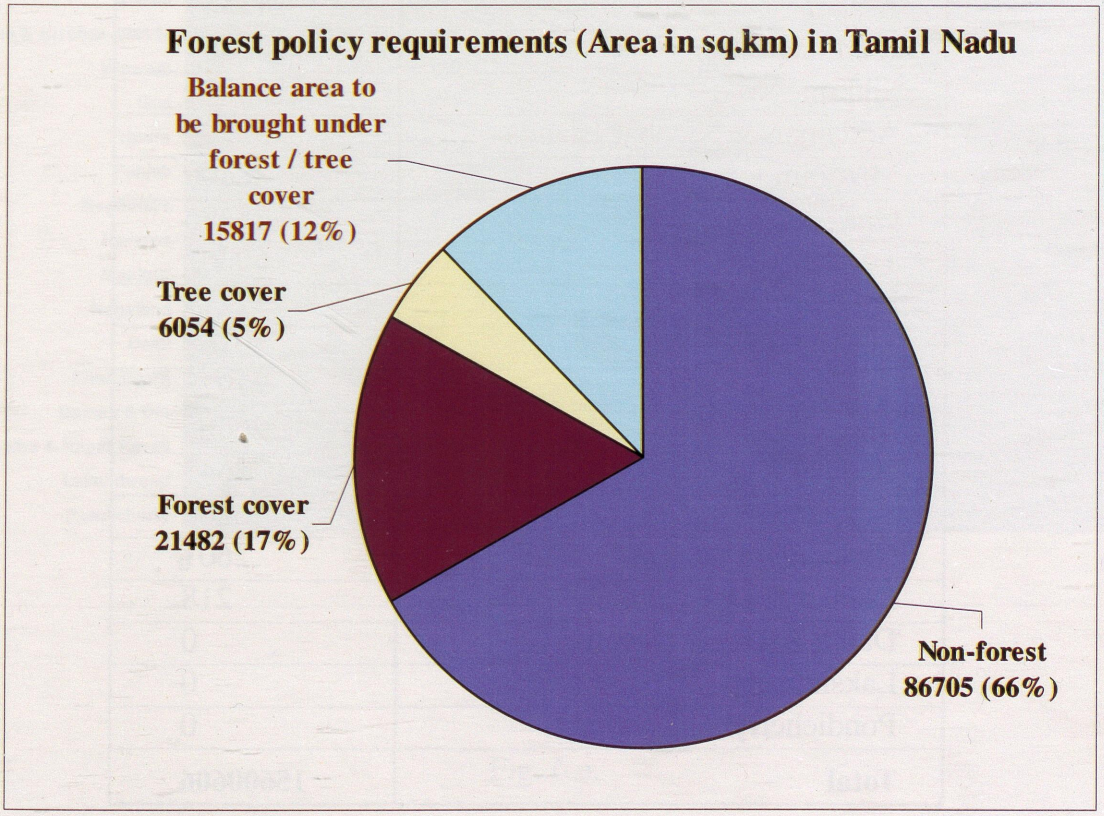

Forest policy requirements (Area in sq.km) in Tamil Nadu
Balance area to be brought under forest / tree cover 15817 (12%)
Tree cover 6054 (5%)
Forest cover 21482 (17%)
Non-forest 86705 (66%)

Fig. 5.b.

6. PROTECTED AREA

Table 6.a.

State wise Protected Area in India (Ha)

State / Uts	Area
Gujarat	1690238
Andra Pradesh	1584459
Maharastra	1534371
Jammu & Kashmir	1482222
Madhya Pradesh	1230133
Arunachal Pradesh	958268
Rajasthan	956936
Orissa	796185
Uttaranchal	731721
Himachal Pradesh	716625
Karnataka	640279
Uttar Pradesh	568815
Chhattisgarh	487741
Tamil Nadu	290992
West Bengal	279613
Kerala	267988
Bihar	240390
Assam	211359
Jharkhand	205367
Sikkim	204910
Andaman & Nicobar Islands	152927
Mizoram	88400
Goa	75496
Tripura	60362
Punjab	31779
Meghalaya	30168
Haryana	27975
Manipur	26665
Nagaland	22643
Delhi	2760
Chandigarh	2601
Daman & Diu	218
Dadra & Nagar Haveli	0
Lakshdweep	0
Pondicherry	0
Total	**15600606**

Source: FSI – SFR –1999

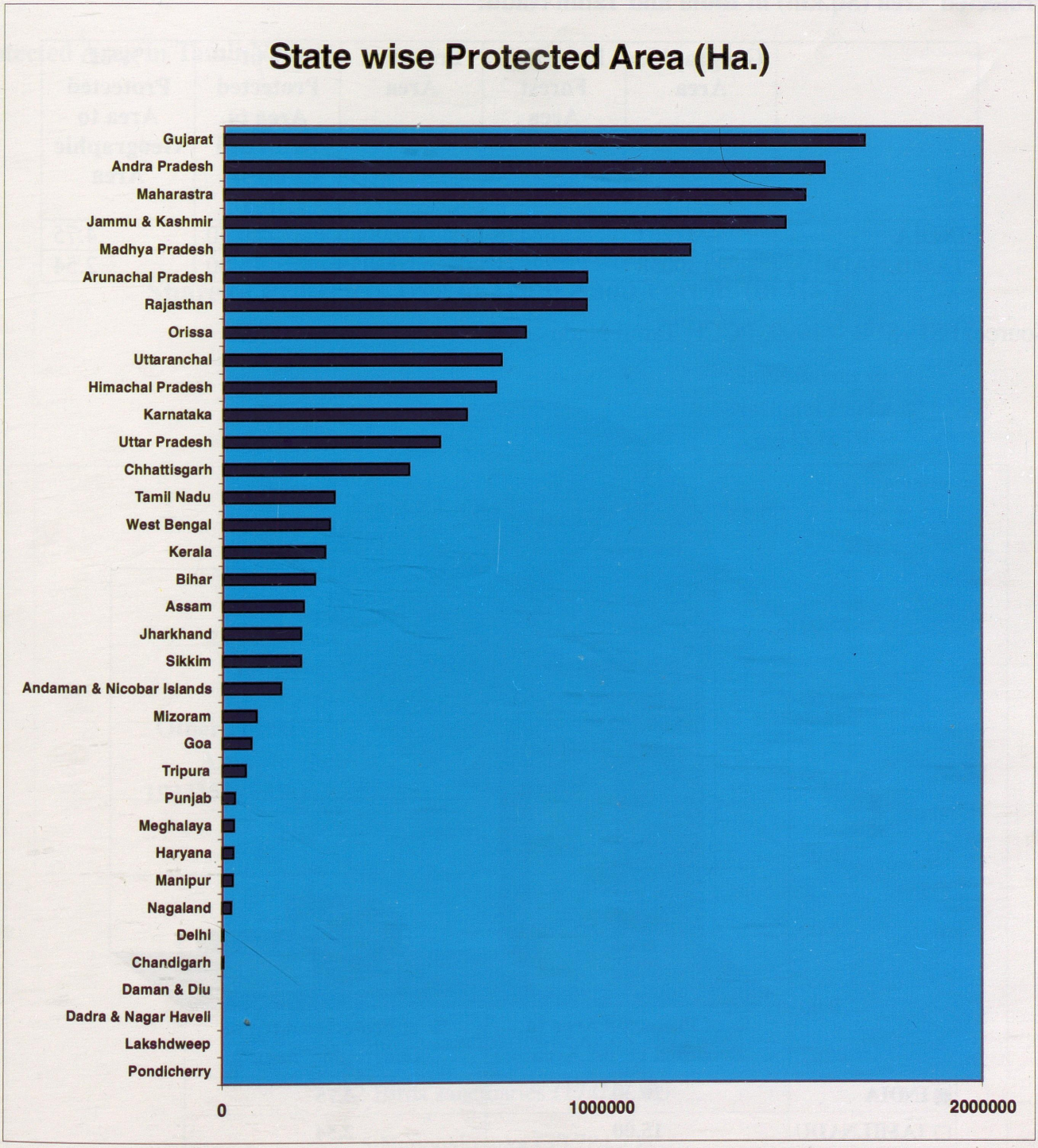

State wise Protected Area (Ha.)
Gujarat
Andra Pradesh
Maharastra
Jammu & Kashmir
Madhya Pradesh
Arunachal Pradesh
Rajasthan
Orissa
Uttaranchal
Himachal Pradesh
Karnataka
Uttar Pradesh
Chhattisgarh
Tamil Nadu
West Bengal
Kerala
Bihar
Assam
Jharkhand
Sikkim
Andaman & Nicobar Islands
Mizoram
Goa
Tripura
Punjab
Meghalaya
Haryana
Manipur
Nagaland
Delhi
Chandigarh
Daman & Diu
Dadra & Nagar Haveli
Lakshdweep
Pondicherry
0
1000000
2000000

Fig. 6.a.

Table 6.b.

Protected Area (Sq.km) in India and Tamil Nadu:

	Geographic Area	Recorded Forest Area	Protected Area	% of Protected Area to Recorded Forest Area	% of Protected Area to Geographic Area
INDIA	3287263	768436	156006	20.30	4.75
TAMILNADU	130058	22871	3305	15.00	2.54

Source: FSI –SFR – 1999, PCCF, Tamil Nadu

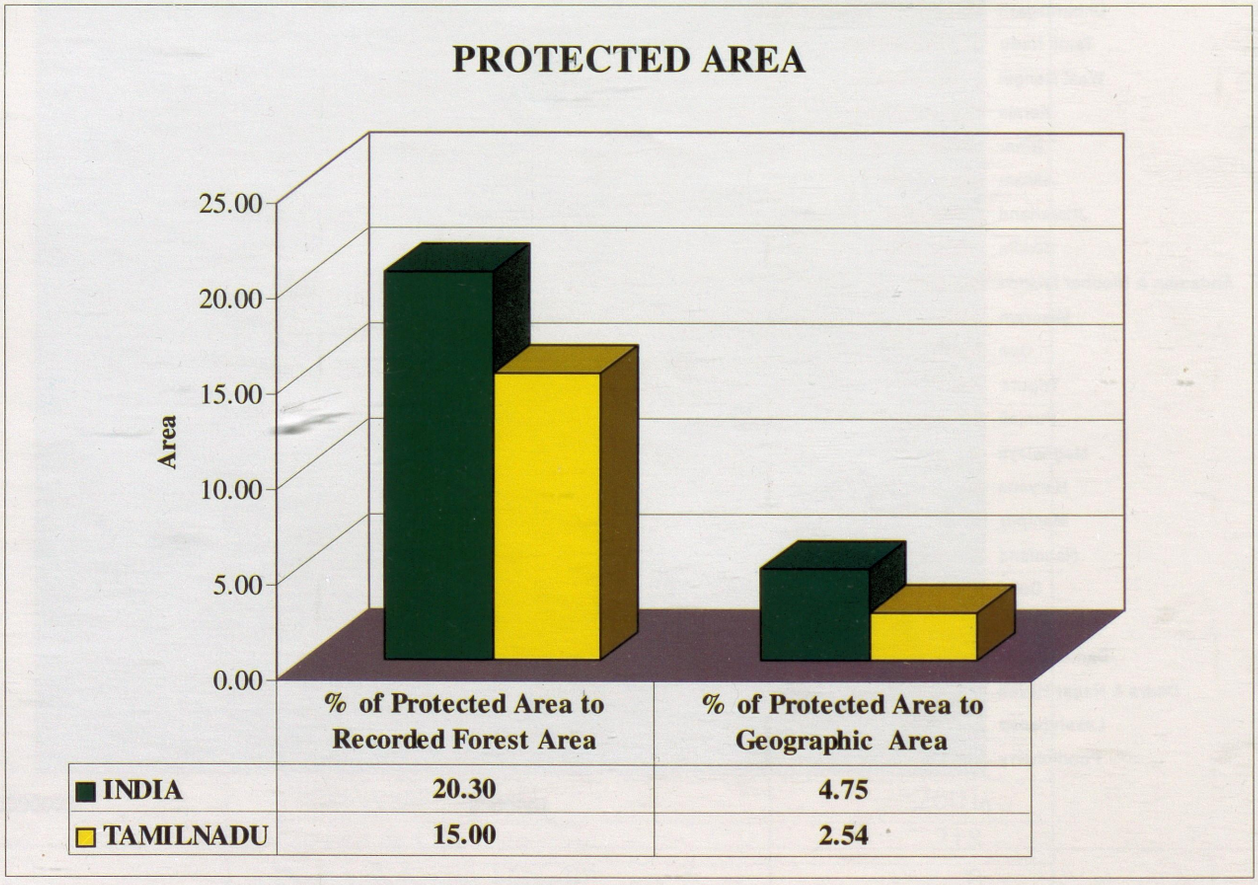


Fig. 6.b.

Source: FSI – SFR – 1999, PCCF, Tamil Nadu

Protected Area in Tamil Nadu:

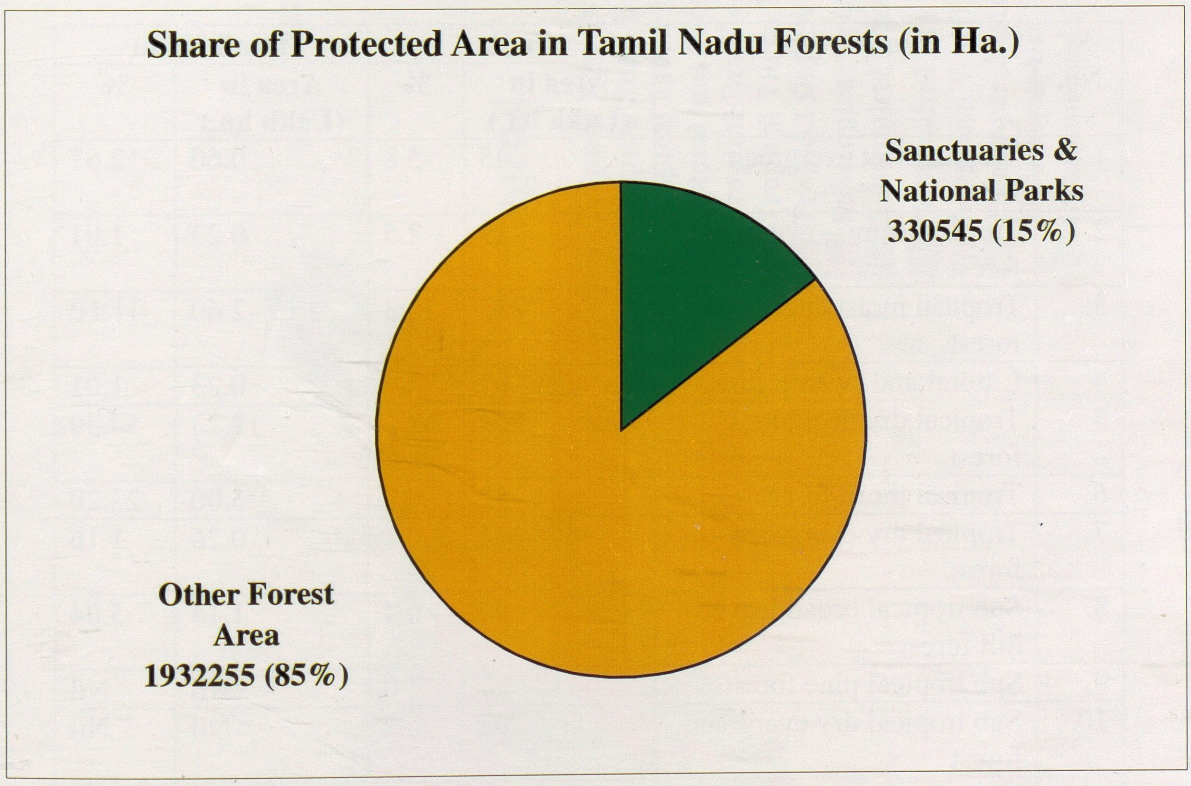


Fig. 6.c.

8 Wildlife sanctuaries (2,82,685.57)

12 Birds sanctuaries (17,074.59)

5 National parks (30,784.23)

7. FOREST TYPE GROUPS – INDIA & TAMIL NADU

Table 7.1.

Forest Type groups in India and Tamil Nadu

S. No.	Forest type	India		Tamil Nadu	
		Area in (Lakh ha.)	%	Area in (Lakh ha.)	%
1.	Tropical wet evergreen forest	45	5.8	0.60	2.67
2.	Tropical semi – evergreen forest	19	2.5	0.23	1.01
3.	Tropical moist deciduous forest	233	30.3	2.60	11.10
4.	Littoral and swamp forest	07	0.9	0.23	1.01
5.	Tropical dry deciduous forest	294	38.2	12.23	54.30
6.	Tropical thorn forest	52	6.7	5.00	22.20
7.	Tropical dry evergreen forest	01	0.1	0.26	1.16
8.	Sub tropical broad leaved hill forest	03	0.4	1.14	5.04
9.	Sub tropical pine forest	37	5.0	Nil	Nil
10.	Sub tropical dry evergreen forest	02	0.2	Nil	Nil
11.	Montane wet temperate forest	16	2.0	0.34	Nil
12.	Himalayan moist temperate forests	26	3.4	Nil	Nil
13.	Himalayan dry temperate forests	02	0.2	Nil	Nil
14.	Sub-alpine forests			Nil	Nil
15.	Moist alpine-scrub			Nil	Nil
16.	Alpine scrub	33	4.3	Nil	Nil
	Total	**770**	**100**	**22.52**	**100**

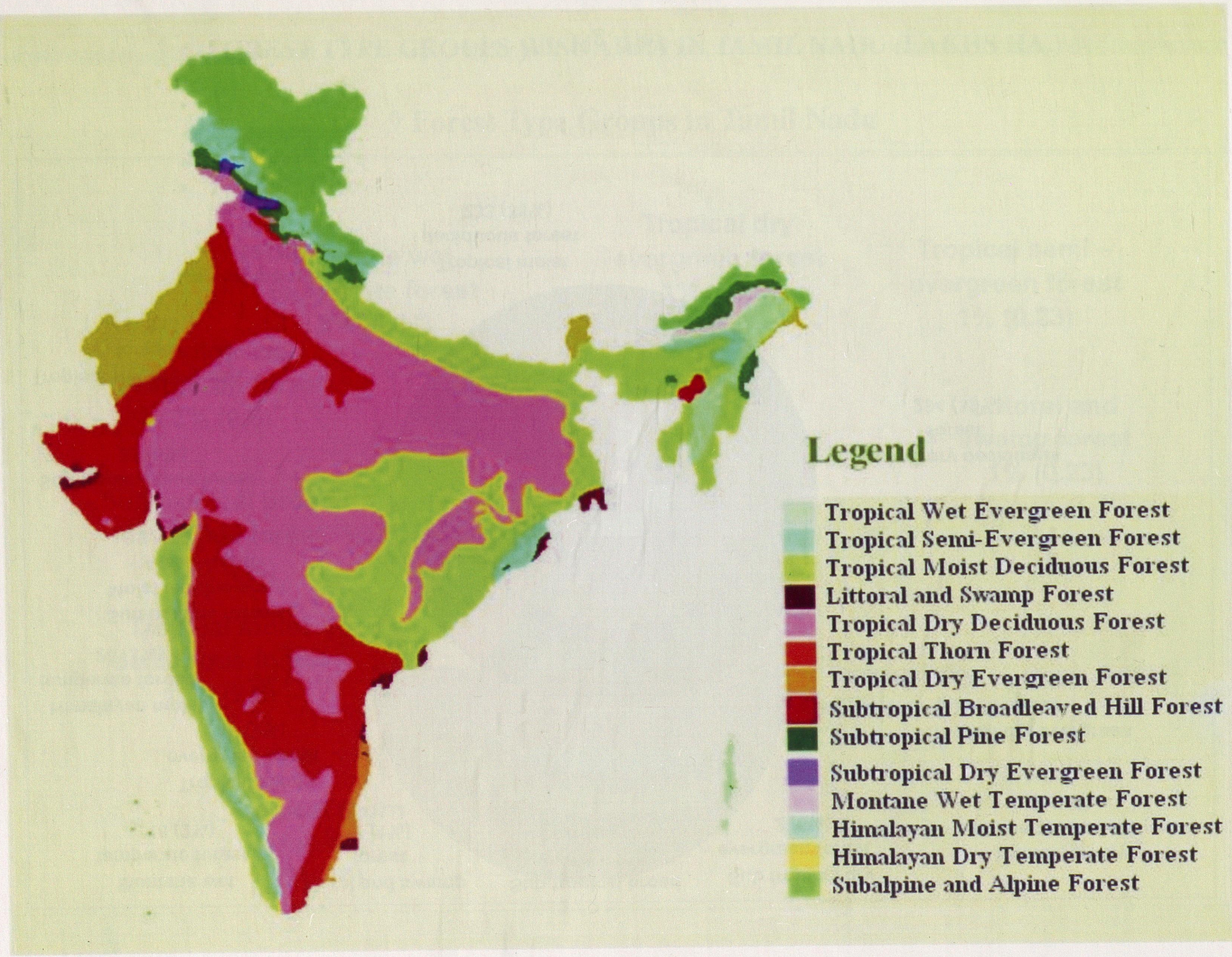


Fig. 7.a
Forest Types of India

FOREST TYPE GROUPS WISE AREA IN INDIA (LAKHS HA.)

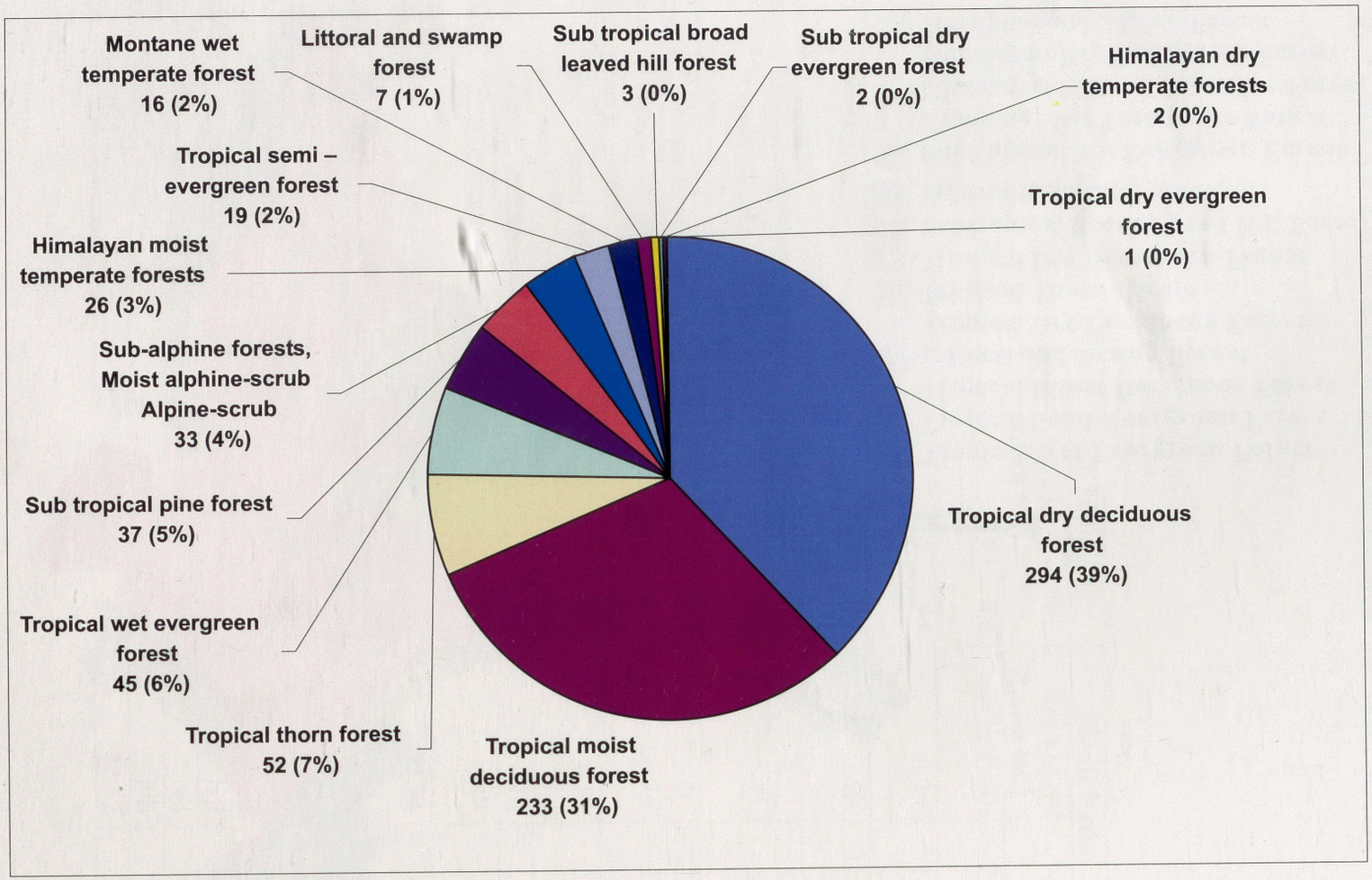


Fig. 7.b.

FOREST TYPE GROUPS WISE AREA IN TAMIL NADU (LAKHS HA.)

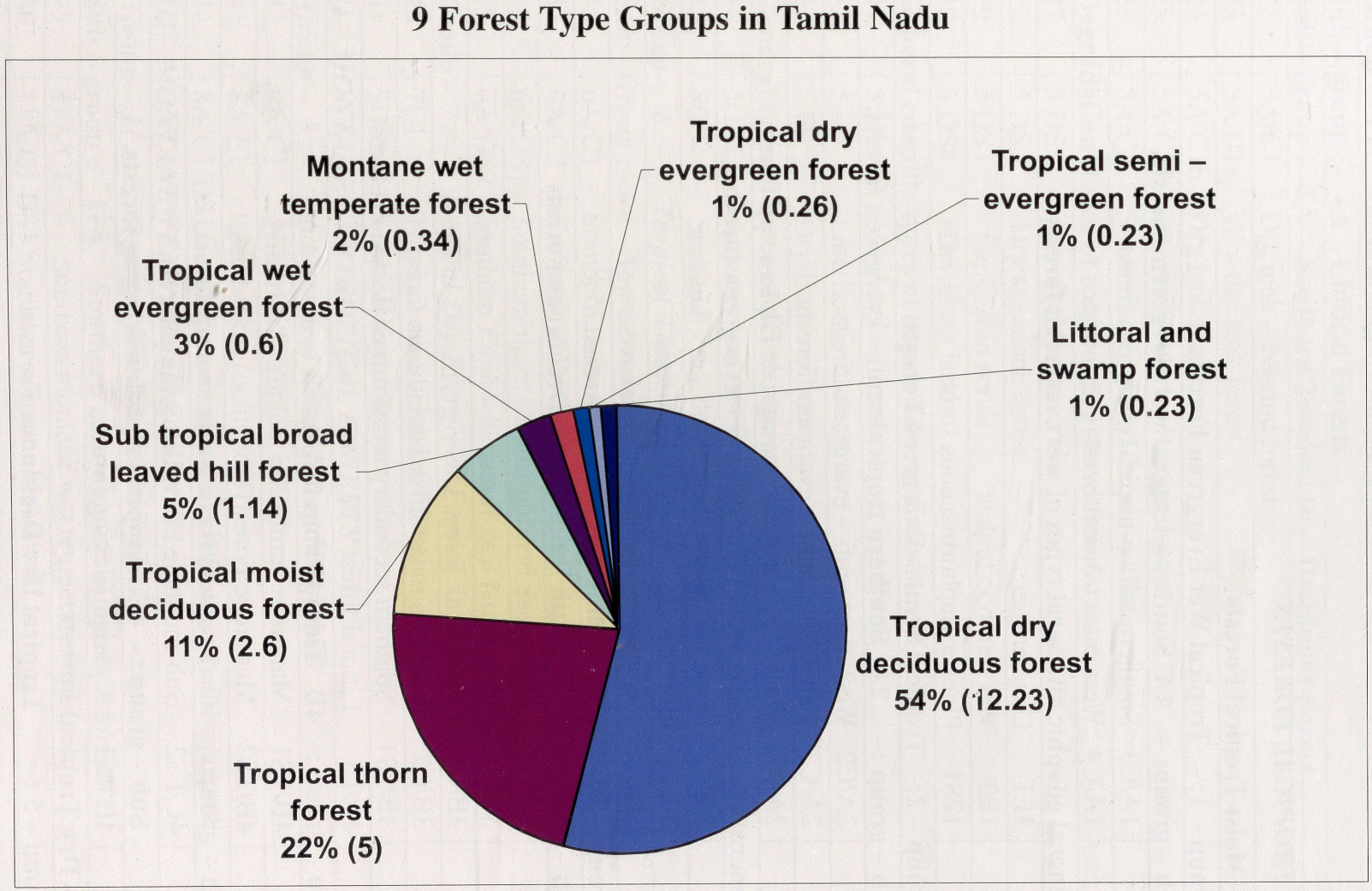


Fig. 7.c.

Forest Types in Tamil Nadu

I - TROPICAL FORESTS	
A– Moist Tropical Forests	
Group – 1: - Tropical Wet Evergreen Forests.	
Sub – group: – 1A Southern tropical wet evergreen Forests.	
1.	1A/C3 Southern hilltop tropical evergreen forest
2.	1A/C4 West coast tropical evergreen forests.
General edaphic and seral types of wet evergreen forests: -	
3.	1E1 Cane brakes
4.	1E2 Wet Bamboo brakes
5.	12S1 Pioneer Euphorbiaceous scrub
Group – 2:– Tropical Semi – Evergreen Forests.	
Sub – group :– 2A Southern tropical semi – evergreen forests.	
6.	2A/C2 West coast semi – evergreen forests.
7.	2A/C3 Tirunelveli Semi – evergreen forests.
8.	2A/2S1 West coast secondary evergreen Dipterocarp forest.
General edaphic and seral types of semi – evergreen forests.	
9.	2 E3 Moist bamboo brakes
10.	2 E4 Lateritic semi – evergreen forests.
11.	2/2S1 Secondary moist bamboo brakes
Group – 3 :- Tropical Moist Deciduous Forests.	
Sub – group :– 3B South Indian moist Deciduous Forests	
12.	3B/C1 Moist teak bearing forest
13.	3B/C1/1a Very moist teak forest
14.	3B/C1/1b Moist teak forest
15.	3B/C2 Southern moist mixed deciduous forest.
16.	3B/2S1 Southern secondary moist mixed deciduous forest
17.	4A/L1 Littoral forest
Sub – group :– 4B Tidal swamp forests	
18.	4B/TS1 Mangrove scrub
19.	4B/TS2 Mangrove Forest
Sub – group :– 4C Tropical fresh water swamp forest.	
20.	4C/FS2 Sub-montane hill valley swamp forest.
Sub – group :– 4E Tropical riparian fringing forests.	
21.	4E/RS1 Riparian fringing forest.
B – Dry Tropical Forests.	
Group – 5 :– Tropical Dry Deciduous Forests.	

Group – 4 :–	**Littoral and Swamp Forests**	
Sub – group :– 4A	**Littoral Forests**	
Sub – group :– 5A	**Southern Tropical Dry Deciduous Forest**	
22.	5A/C1	Dry teak – bearing forest
23.	5A/C1a	Very dry teak forest
24.	5A/C1b	Dry teak forest
25.	5A/C2	Dry red sanders – bearing forest
26.	5A/C3	Southern dry mixed deciduous forest.
Degradation stages of tropical dry deciduous forests:		
27.	5 DS1	Dry deciduous scrub
28.	5 DS2	Dry savannah forest
29.	5 DS3	*Euphorbia* scrub
30.	5 DS4	Dry grass land
General edaphic types of dry deciduous forests:		
31.	5 E4	*Hardwickia* forest
32.	5 E7	Laterite thorn forest
33.	5 E9	Dry Bamboo brake
General several types of dry deciduous forests:		
34.	5/1S1	Dry tropical riverain forest
35.	5/2S1	Secondary dry deciduous forest.
Group – 6 :–	***Tropical Thorn Forests***	
Sub – Group :– 6A	***Southern tropical thorn forest***	
36.	6A/C1	Southern thorn forest
37.	6A/C2	Karnatak umbrella thorn forest
38.	6A/DS1	Southern thorn scrub
39.	6A/DS2	southern *Euphorbia* scrub
Group – 7 :–	***Tropical Dry Evergreen Forests***	
40.	7C1	Tropical dry evergreen forest.
41.	7DS1	Tropical dry evergreen scrub
II – MONTANE SUBTROPICAL FORESTS		
Group – 8 :–	***Sub-tropical Broad leaved Hill forests***	
42.	8A/C1	Nilgiri sub-tropical hill forest
43.	8A/E1	Reed brakes (ochlandra)
44.	8A/C1/DS1	South Indian sub-tropical hill savannah woodland.
III – MONTANE TEMPERATE FORESTS		
Group – 11 :–	***Montane Wet temperate Forests***	
Sub – group :– 11A	**Southern montane wet temperate forests :**	
45.	11A/C1	Southern montane wet temperate forests
46.	11A/C1/DS1	Southern montane wet scrub
47.	11A/C1/DS2	Southern montane wet grassland

8. FOREST BIO DIVERSITY STRATEGY AND ACTION PLAN

8.1. Implement Forest Policy

8.2. Implement National Forestry and Wildlife Action Plans

8.3. Increase the Protected Area for *in situ* conservation

8.4. Restore the degraded forests

8.5. Preserve all the existing Grasslands

8.6. Maintain the existing positive trend in Forest Cover

8.7. Consolidate the Joint Forest Management

8.8. Expand Eco Development

8.9. Promote Agro forestry

8.10. Promote Social forestry

8.11. Adopt Watershed Management as a core strategy

8.12. Awareness creation and sensitization

8.13. Strengthen symbiotic relationship between Tribals and Forests

8.14. Acquire Private forest enclaves in Protected Areas

8.15. Minimize the pressure from other enclaves

8.16. Minimize diversion of Forest Lands

8.17. Prevent and Manage Fire

8.18. Reduce Headloading

8.19. Reduce Grazing

8.20. Minimize Trade Pressure on Sandal wood

8.21. Prevent destructive methods of MFP collection

8.22. Reduce Trade pressure on wild medicinal plants

8.23. Prevent destructive methods of wild plant collection

8.24. Prevent further encroachment

8.25. Speed up settlement process

8.26. Review mining policy

8.27. Reduce exotic plantations

8.28. Prevent poaching

8.29. Minimize accidental death of wild animals including electrocution

8.30. Rescue and release of wild animals

8.31. Minimize Man-Animal conflict

8.32. Prevent pollution

8.33. Prevent spread of Invasive alien species

8.34. Reduce pilgrims and tourists pressure

8.35. Prevent habitat fragmentation

8.36. Evolve species specific conservation plans

8.37. Integrate biodiversity conservation in Forest Planning

8.38. Training and Capacity building

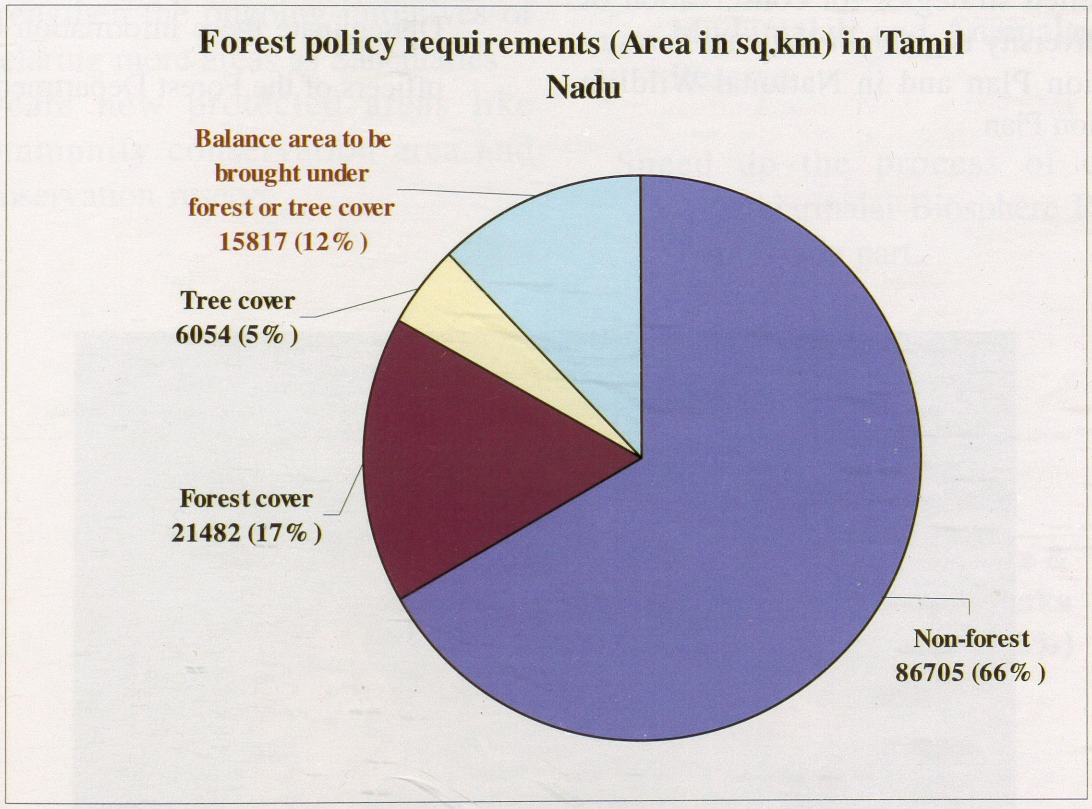
8.39. Promote Research on survey of biodiversity

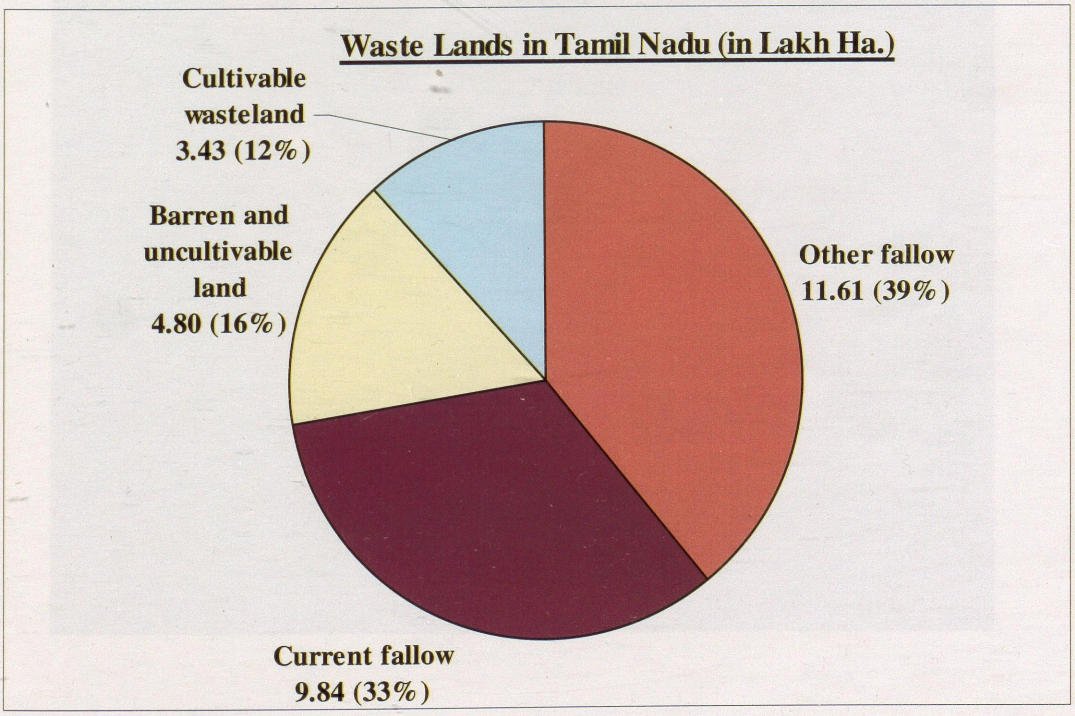
8.40. Evolve monitoring strategies for red listed and other important species

8.41. Evolve recovery strategies for red listed species

8.1. IMPLEMENT FOREST POLICY

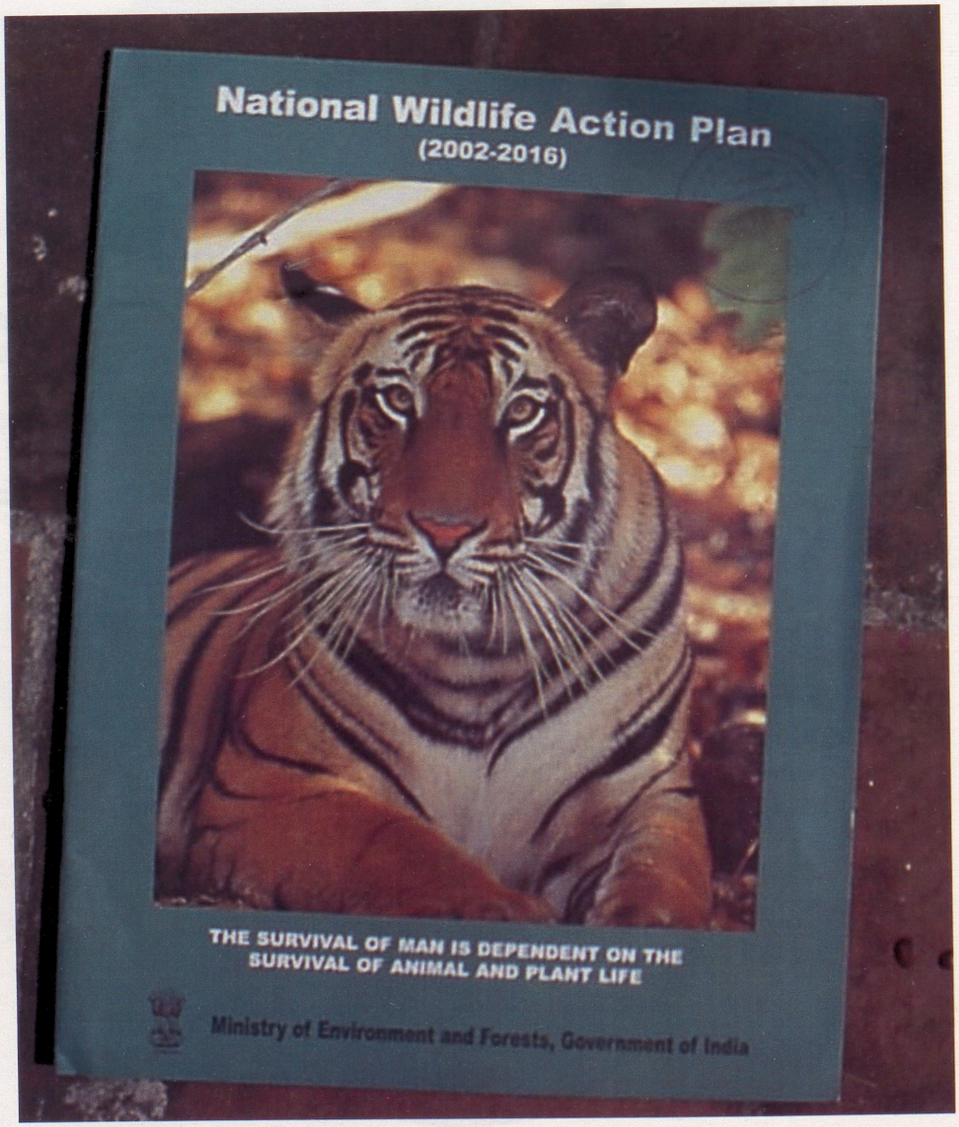
❖ Promote tree planting in waste lands to increase the tree cover to 1/3 geographical area of the State





8.2. IMPLEMENT NATIONAL FORESTRY AND WILDLIFE ACTION PLANS

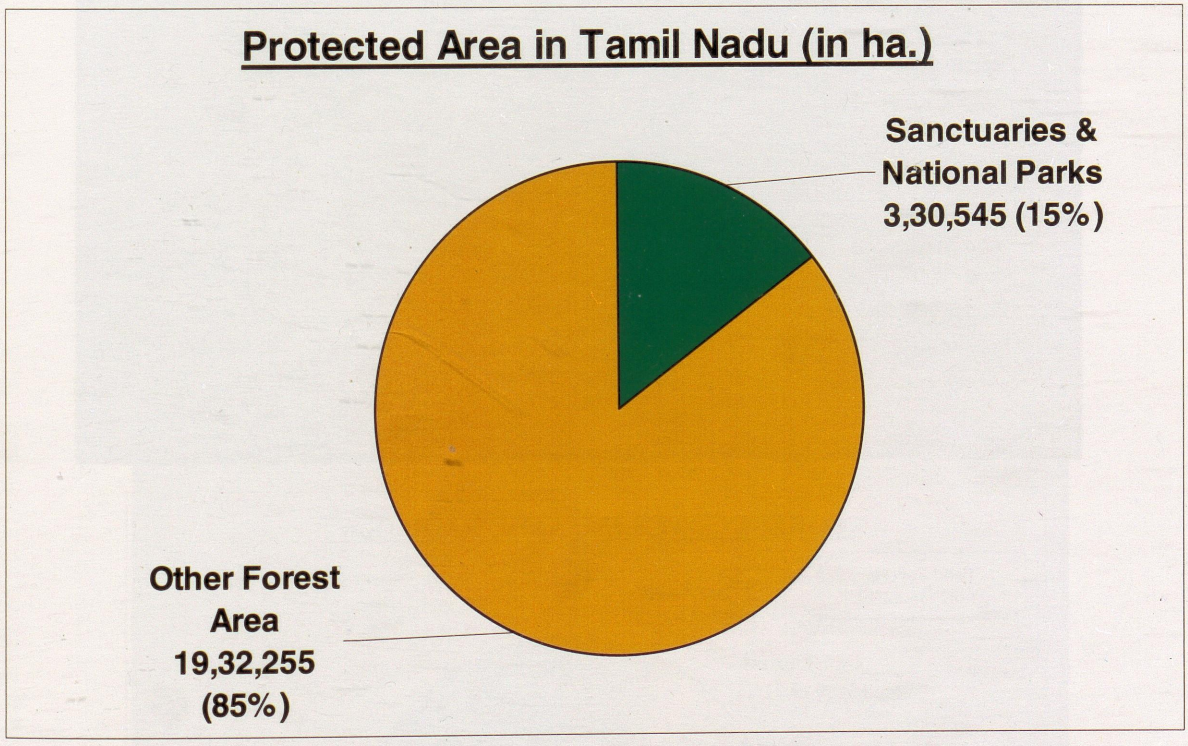
- Detailed strategies for conservation of biodiversity is given in National Forestry Action Plan and in National Wildlife Action Plan
- They have to be implemented in the State Disseminate these information to all the officers of the Forest Department



8.3. INCREASE THE PROTECTED AREA FOR IN SITU CONSERVATION

- ❖ Strengthen the ongoing initiatives of declaring more areas as Sanctuaries
- ❖ Create new protected areas like community conservation area and conservation reserve
- ❖ Speed up the process of declaring Mudumalali and Anamalai as Tiger Reserve

Speed up the process of declaring Agasthiarmalai Biosphere Reserve of Tamil Nadu part.

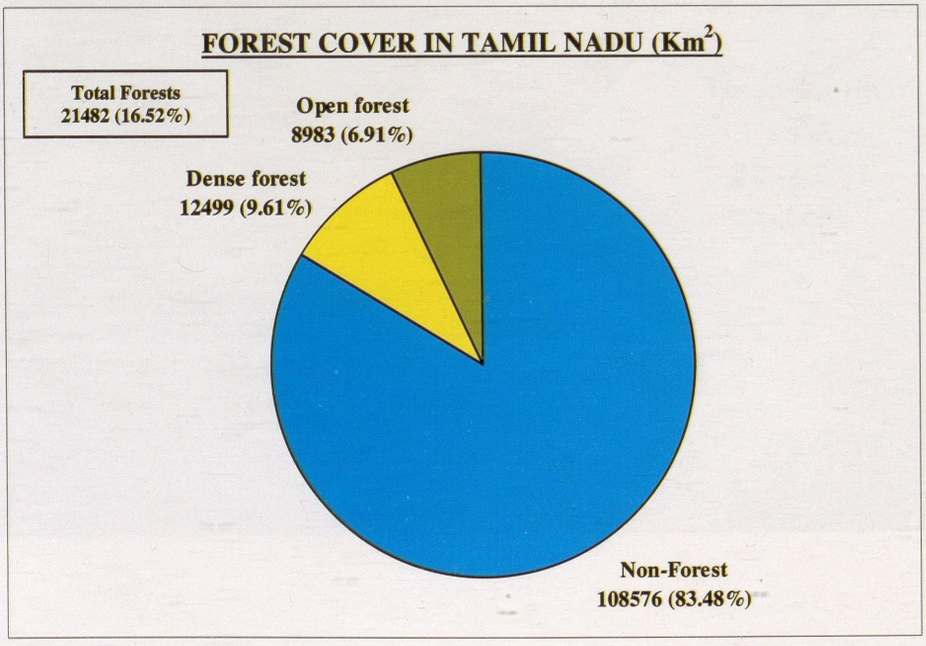


8 Wildlife sanctuaries (2,82,685.57)
12 Birds sanctuaries (17,074.59)
5 National parks (30,784.23)
1 Tiger Reserve
3 Biosphere Reserves

8.4. RESTORE DEGRADED FORESTS

- Restore degraded forest and open forest by gap filling to create dense forest in the non-protected areas.
- Carefully assess the need for replanting the degraded areas and open forests in the protected areas taking the habitat requirements of wild animals in to consideration





8.5. PRESERVE ALL THE EXISTING GRASSLANDS

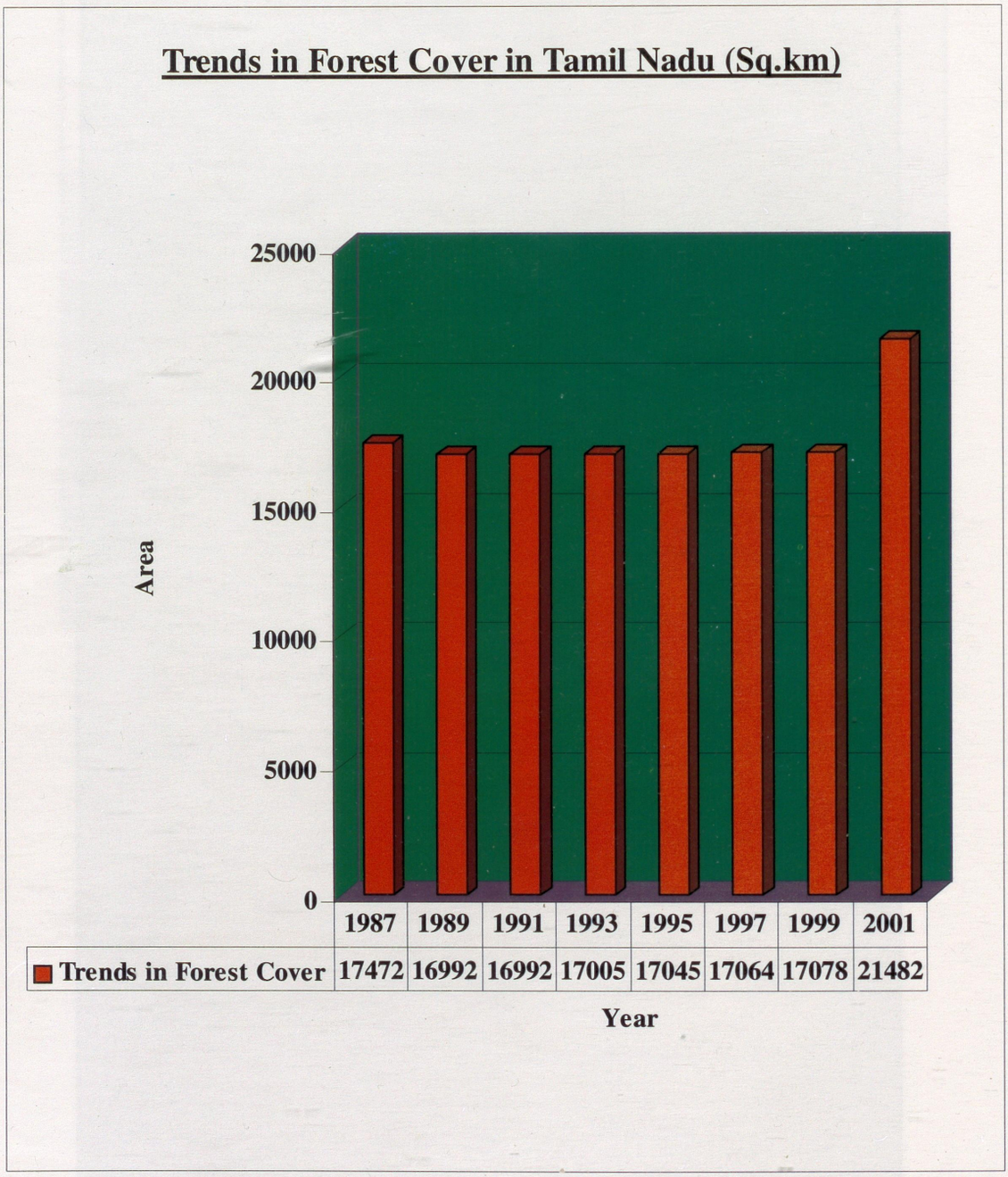
- In the past grasslands have been converted to plantations and it is a ecological disaster.
- Preserve all the existing grasslands as such.
- Do not convert any of the existing grasslands in the forest areas.





8.6. MAINTAIN THE EXISTING POSITIVE TREND IN FOREST COVER

- Maintain the present positive trend in the forest cover change by strict protection and restoration



8.7. CONSOLIDATE THE JOINT FOREST MANAGEMENT

- ❖ Consolidate the gains of the JFM in about 1000 VFCs
- ❖ Facilitate sustainability of the VFCs to sustain JFM
- ❖ Extend JFM to all the 3072 Forest Fringe hamlets under TAP / FDA / Other Schemes
- ❖ Provide corpus fund of Rs.5.00 lakhs for attaining financial sustainability through micro credit and revolving fund for reducing forest dependency (Adopt KMTR model)
- ❖ Promote SHGs in all VFCs by Forest Department, NGOs, Womens Development Corporation, Banks etc to reduce poverty which is the basic reason for forest dependency
- ❖ Please refer 2 books on JFM by the author namely JFM concepts, policies and





8.8. EXPAND ECO DEVELOPMENT

- ❖ Consolidate the gains of Eco Development in KMTR and further strengthen the ongoing initiatives (For details please refer Eco Development in KMTR, Status Report 2004 by the Author)
- ❖ Extend KMTR model of Eco Development to all the Protected Areas
- ❖ Provide corpus fund of Rs.5.00 lakhs for attaining financial sustainability through micro credit and revolving fund for reducing forest dependency
- ❖ Promote SHGs in all VFCs by Forest Department, NGOs, Womens Development Corporation, Banks etc to reduce poverty which is the basic reason for forest dependency





8.9. PROMOTE AGRO FORESTRY

- Promote Agro forestry as a Alternative Production Strategy for meeting the fuel, fodder, small timber, timber and green leaf manure needs of the farmers
- Utilize the ongoing Wasteland and Watershed Development Programmes for increasing Agro forestry
- Promote tree seedlings nurseries by Private Agencies, NGOs, Agriculture Department, Horticulture Department, and Forest Department





8.10. PROMOTE SOCIAL FORESTRY

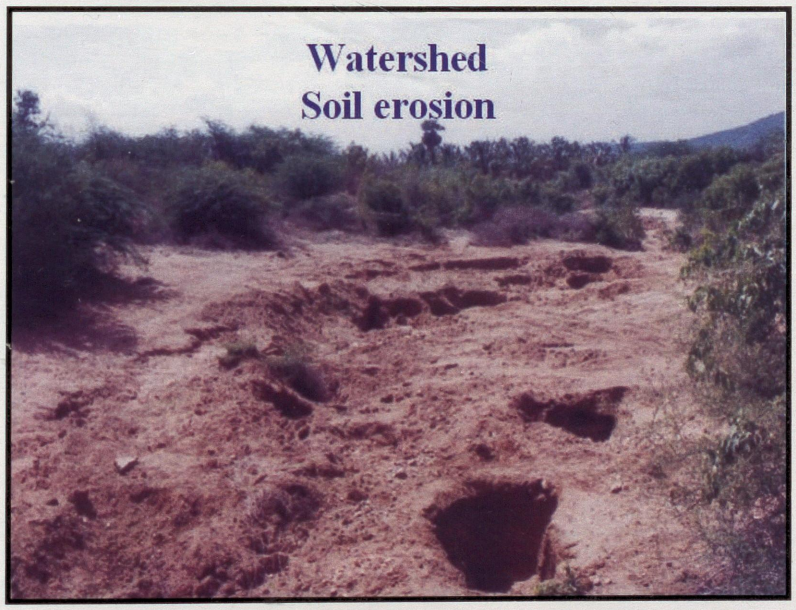
- Promote social forestry as a alternative production system for meeting the wood based requirements of rural population and industries
- Consolidate all the gains of social forestry and retain all the social forestry plantations as such
- Replant felled / failed tank bed areas
- Expand Strip plantation along the Railway lines, road sides, canal sides, river sides, etc.
- Notify the hillock and revenue puramboke plantations under sec.26 of Tamil Nadu Forest Act for effective protection

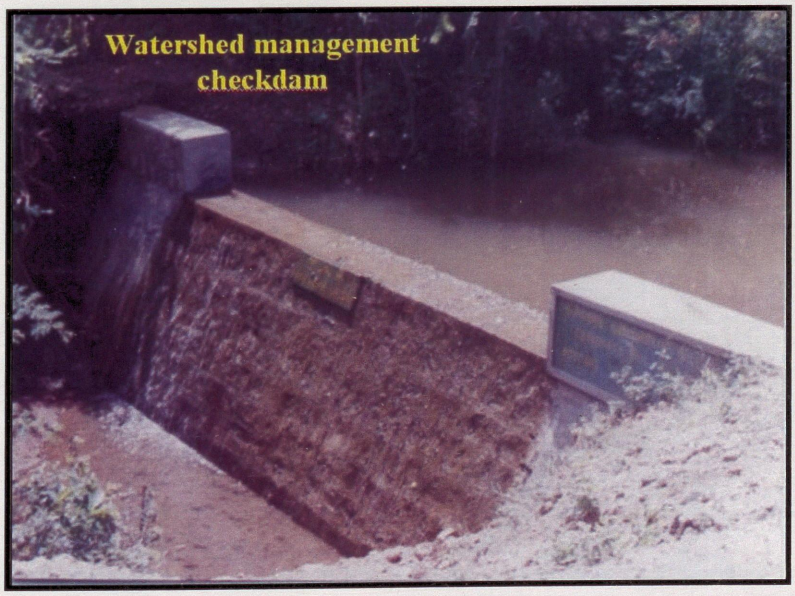




8.11. ADOPT WATERSHED MANAGEMENT AS A CORE STRATEGY

- Focus on water conservation to conserve biodiversity
- Consolidate the ongoing watershed based development under TAP / Western Ghat Development Programme / Hill Area Development Programme etc
- Continue the ongoing watershed based development in forest areas
- Extend the watershed based development and management to all the forest and protected areas to reduce soil erosion, and to augment water resources
- Tie up with the District Watershed Development Agency and Wasteland Development Programmes





8.12. AWARENESS CREATION AND SENSITIZATION

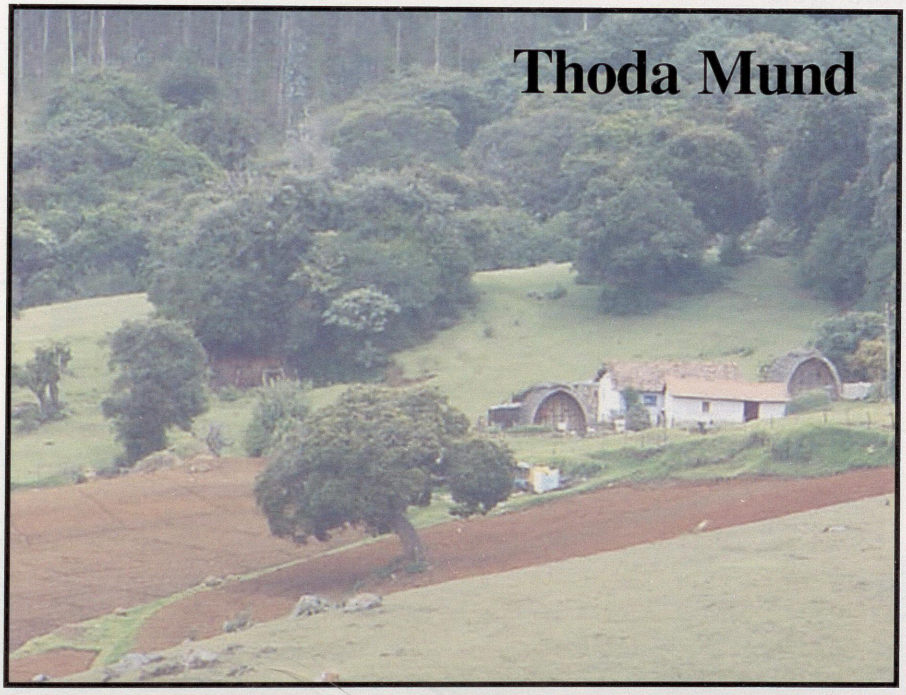
- Create awareness regarding the importance of the biodiversity conservation among the public
- Use the occasions of World Forestry day, World Water day, Wildlife Week Celebration, VFC day, Vana Mahotsava and periodical VFC meetings for awareness creation





8.13. STRENGTHEN SYMBIOTIC RELATIONSHIP BETWEEN TRIBALS AND FORESTS

- ❖ Recognize the cultural dependency of the tribals on forest bio diversity
- ❖ Continue the existing free access to MFP for the tribals
- ❖ Convert the tribals as Friends of Forests
- ❖ Evolve acceptable relocation packages for the tribals living in the enclaves inside the Protected Areas





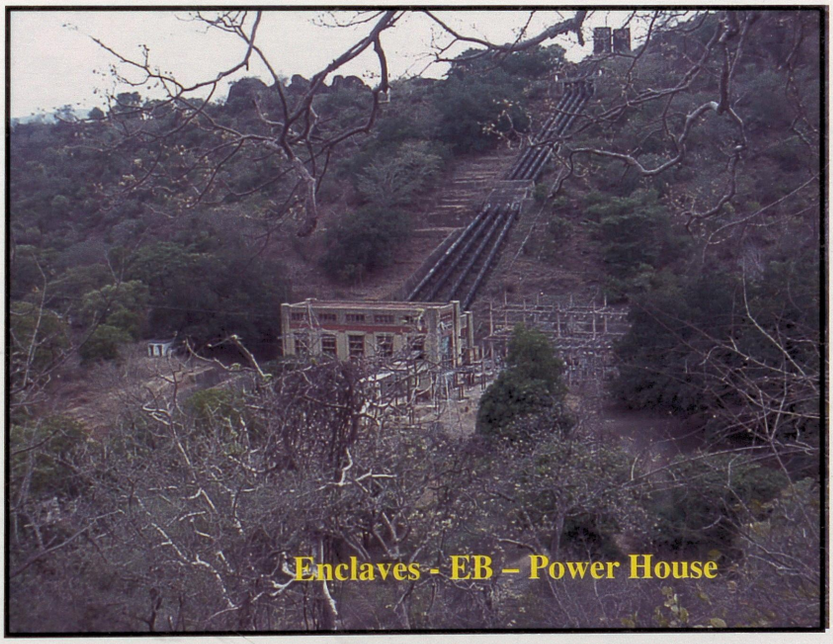
8.14. ACQUIRE PRIVATE FOREST ENCLAVES IN PROTECTED AREAS

- ❖ Acquire the Private forest enclaves in the protected areas
- ❖ Implement Private Forest Act strictly in private forest areas
- ❖ Regulate felling in plantation areas without affecting watershed



8.15. MINIMIZE THE PRESSURE FROM OTHER ENCLAVES

- ❖ People residing inside the enclaves like EB Colonies and other villages exert pressure daily on the biodiversity of the nearby forest/protected areas particularly for fuelwood, grazing and for shelter needs.
- ❖ Evolve effective strategies for reducing the population in the enclaves by settling them outside.
- ❖ Evolve relocation packages for settling them outside the PAs/forest areas



Enclaves - EB – Power House

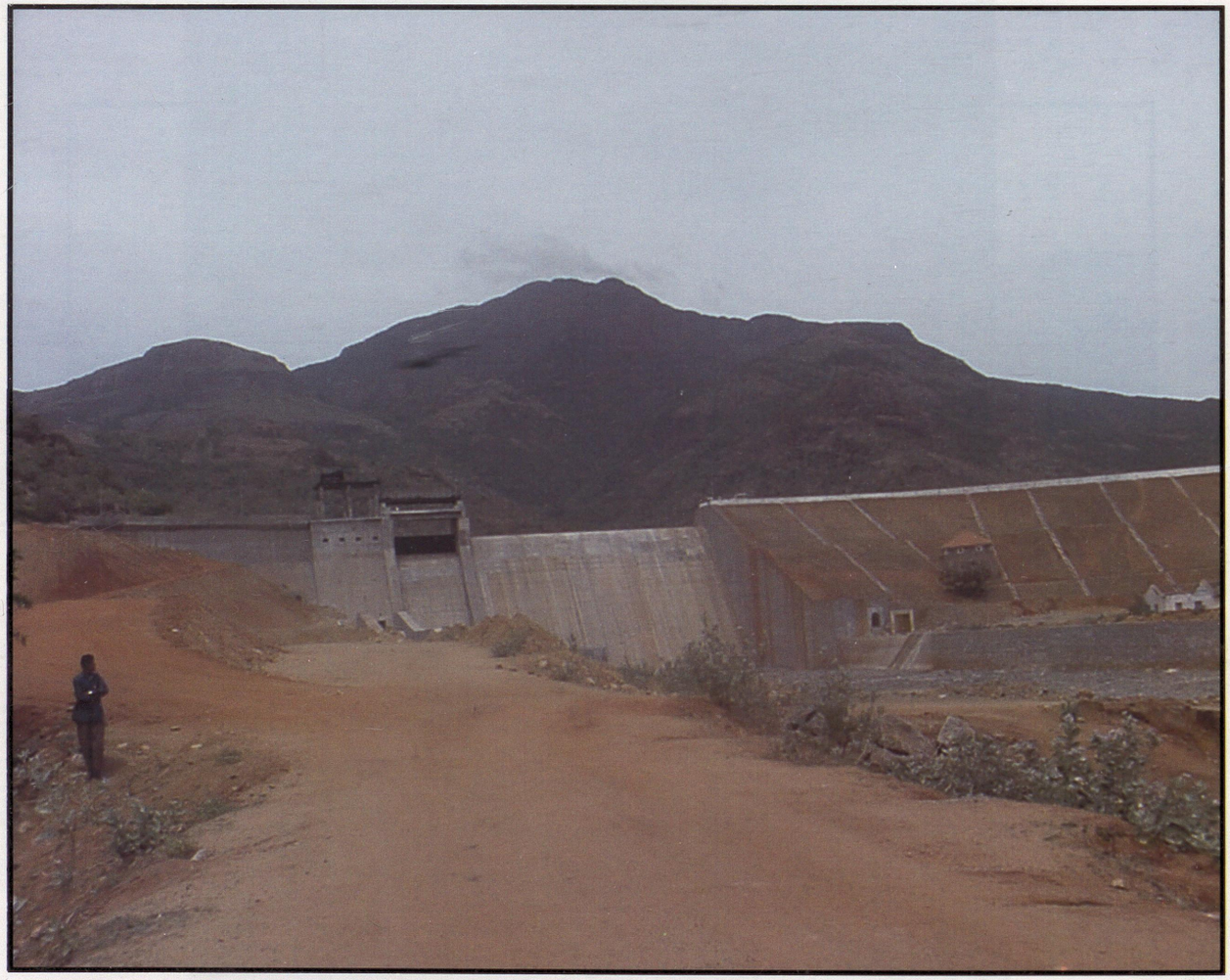


Enclaves – Servalar EB Colony

8.16. MINIMIZE DIVERSION OF FOREST LANDS

- ❖ Diversion of forestlands in the past has resulted in extreme loss of biodiversity. How many species and how much of genetic diversity have been lost is not known

- ❖ Implement Forest Conservation Act effectively
- ❖ Prevent further diversion of forest lands



8.17. PREVENT AND MANAGE FIRE

- ❖ Fire causes serious losses to biodiversity
- ❖ Millions of invertebrates and thousands of vertebrates perish in fire
- ❖ Evolve fire management plan for each forest division involving fire line clearance, engaging fire watcher and by controlling fire
- ❖ Provide cell phone and modern gadgets for communication and for fire control



8.18. REDUCE HEADLOADING

- ❖ Create sustainable alternative livelihood options for headloaders by adopting micro credit and micro financing (adopt KMTR model)
- ❖ Supply fuelwood on cost basis to the pilgrims inside the forest areas
- ❖ Supply energy saving devices and provide loans for acquiring LPG etc
- ❖ Promote Agro forestry in all the forest fringe villages
- ❖ Please refer the book on Eco Development in KMTR – Status Report 2004 by the Author for details



8.19. REDUCE GRAZING

- ❖ Prevent grazing in PAs
- ❖ Create sustainable livelihood options for forest dependent graziers by adopting micro credit and micro financing (adopt KMTR model)
- ❖ Promote stall fed milch cattle by arranging loans
- ❖ Create fodder resources outside the Forest areas
- ❖ Promote Agro forestry and silvipasture for meeting fodder needs



8.20. PREVENT DESTRUCTIVE METHODS OF MFP COLLECTION

- Sustain the benefit sharing in all the JFM areas in an equitable manner
- Prevent destructive methods of MFP collection
- Prevent MFP collection from Protected Areas by creating alternative livelihood options through micro credit for the dependents (adopt KMTR model)



8.21. MINIMIZE TRADE PRESSURE ON SANDALWOOD

- ❖ Genetic diversity of sandal has been completely eroded due to smuggling
- ❖ Strengthen law enforcement against the sandalwood smugglers
- ❖ Trade pressure caused by sandal wood based industries is the root cause for sandal smuggling
- ❖ Promote sandal plantations by farmers and private agencies
- ❖ Establish *ex-situ* conservation centers in Research Gardens for conserving the genetic diversity of the sandal



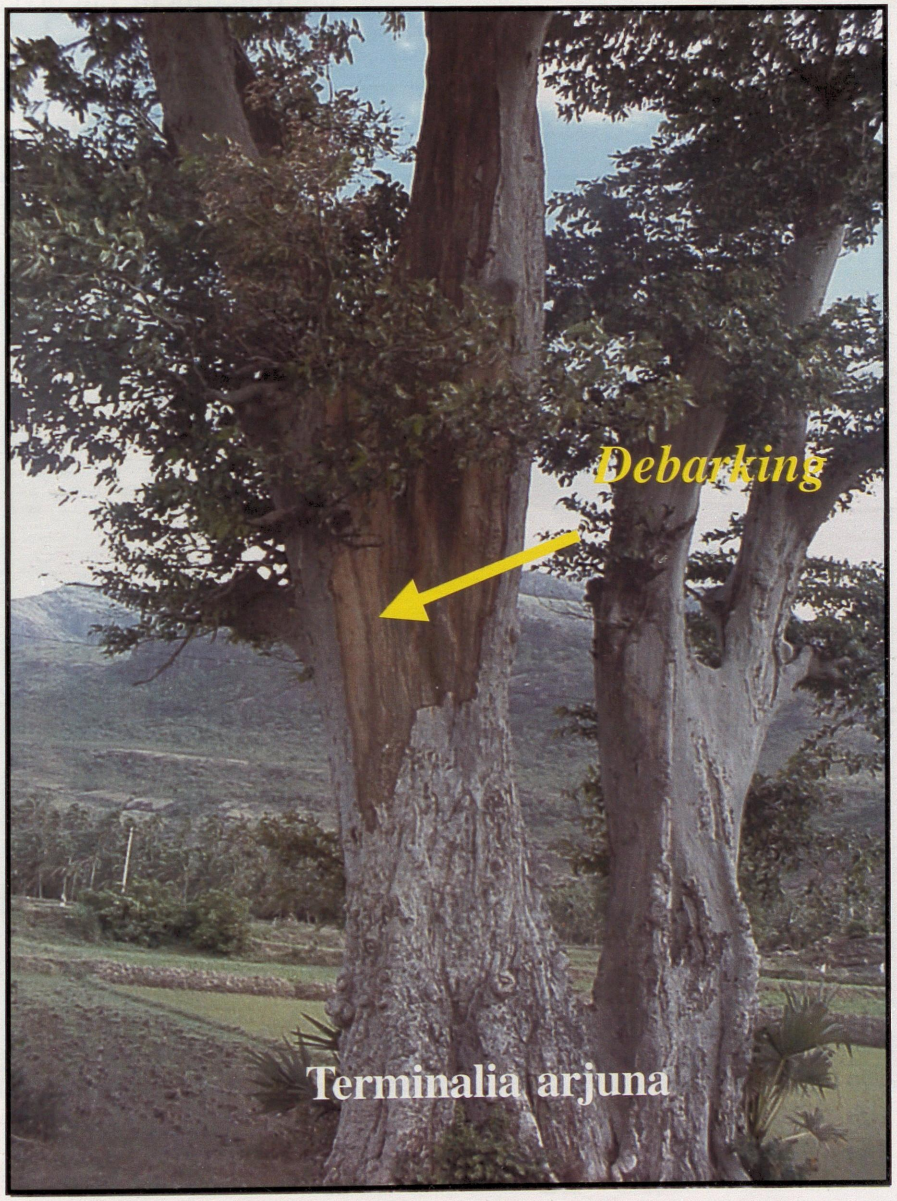
8.22. REDUCE TRADE PRESSURE ON MEDICINAL PLANTS

- Over 95 % of medicinal plants used in Industry comes from wild sources.
- Export on medicinal plants also heavily depends on wild sources.
- These pressures will destroy wild medicinal plant resources from forests.
- Promote cultivation of medicinal plants to meet the industrial and export demand.



8.23. PREVENT DESTRUCTIVE METHODS OF WILD PLANT COLLECTION

- Over 70 % of wild medicinal plants collection involves destructive harvesting because of use of plant parts like roots, bark, wood, stem and the whole part of the herb.
- Promote cultivation of all such plants and meet the demand from cultivated sources only.



8.24. PREVENT FURTHER ENCROACHMENT

- ❖ Encroachers dependence on forest biodiversity for every day needs is a matter of serious concern
- ❖ Evict existing encroachments
- ❖ Relocate encroachers outside the PAs and forests
- ❖ Prevent further encroachments by Periodical monitoring of the vulnerable areas and all the encroachment enclaves



8.25. SPEED UP SETTLEMENT PROCESS

- ❖ Delay in settlement leads to encroachment and loss of biodiversity
- ❖ Speed up the process of settlement
- ❖ Review each case of settlement and fix a time limit for concluding each case



8.26. REVIEW MINING POLICY

- ❖ Review the existing mining in the forest areas
- ❖ Prevent further fresh mining from the forest areas
- ❖ Constantly monitor the illegally mined areas in the past and prevent fresh illegal mining

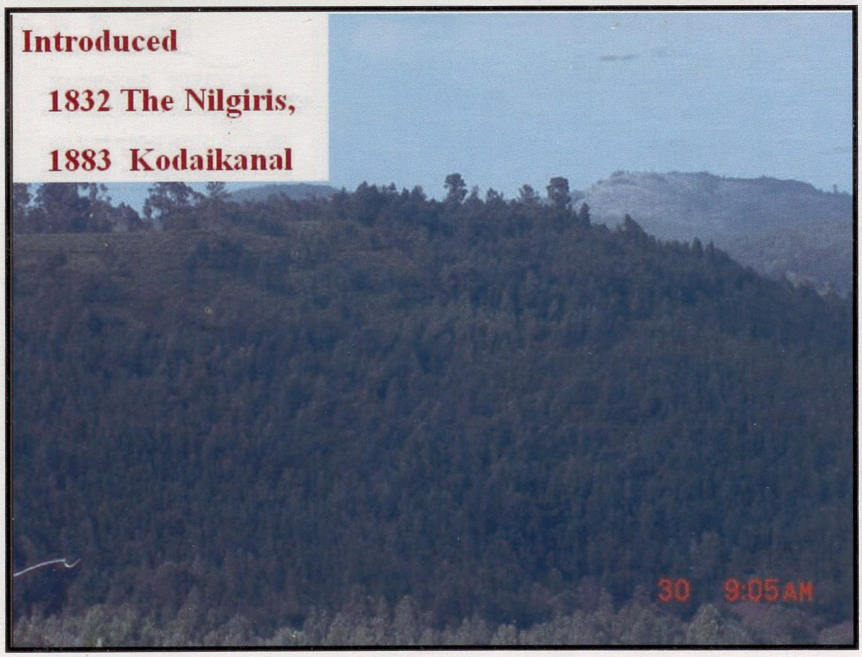




8.27. REDUCE EXOTIC PLANTATIONS

- ❖ Review the existing policy on retention of exotic plantations
- ❖ Convert exotic plantations to indigenous trees after analysing the location specific demand for fuel wood for domestic consumption and for tea industries
- ❖ Restore sholas in the exotic plantation areas wherever possible
- ❖ Explore the possibilities of sustainable management of existing exotic plantations wherever needed

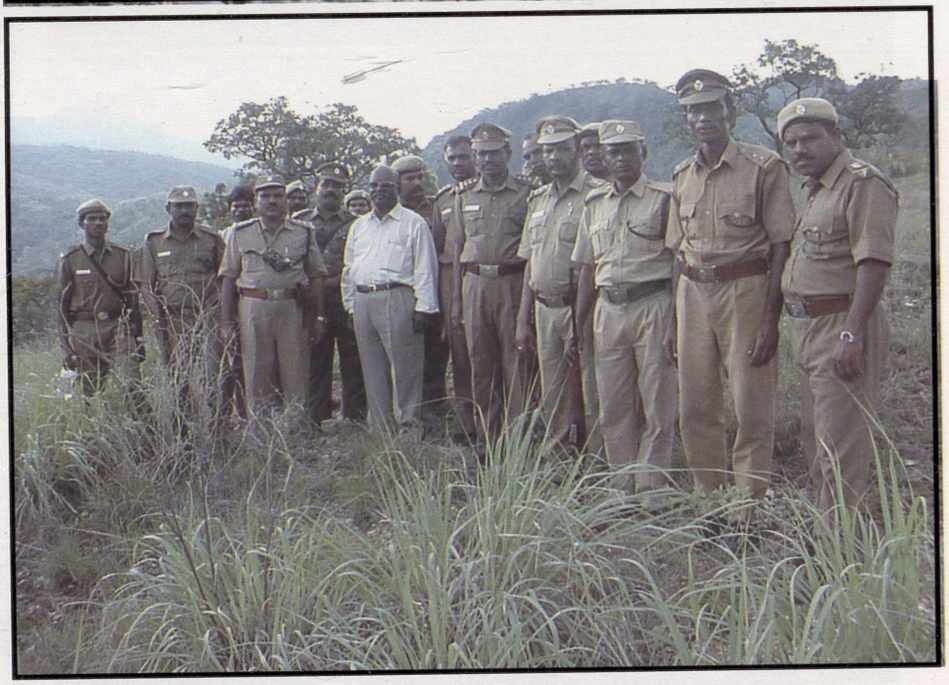




8.28. PREVENT POACHING

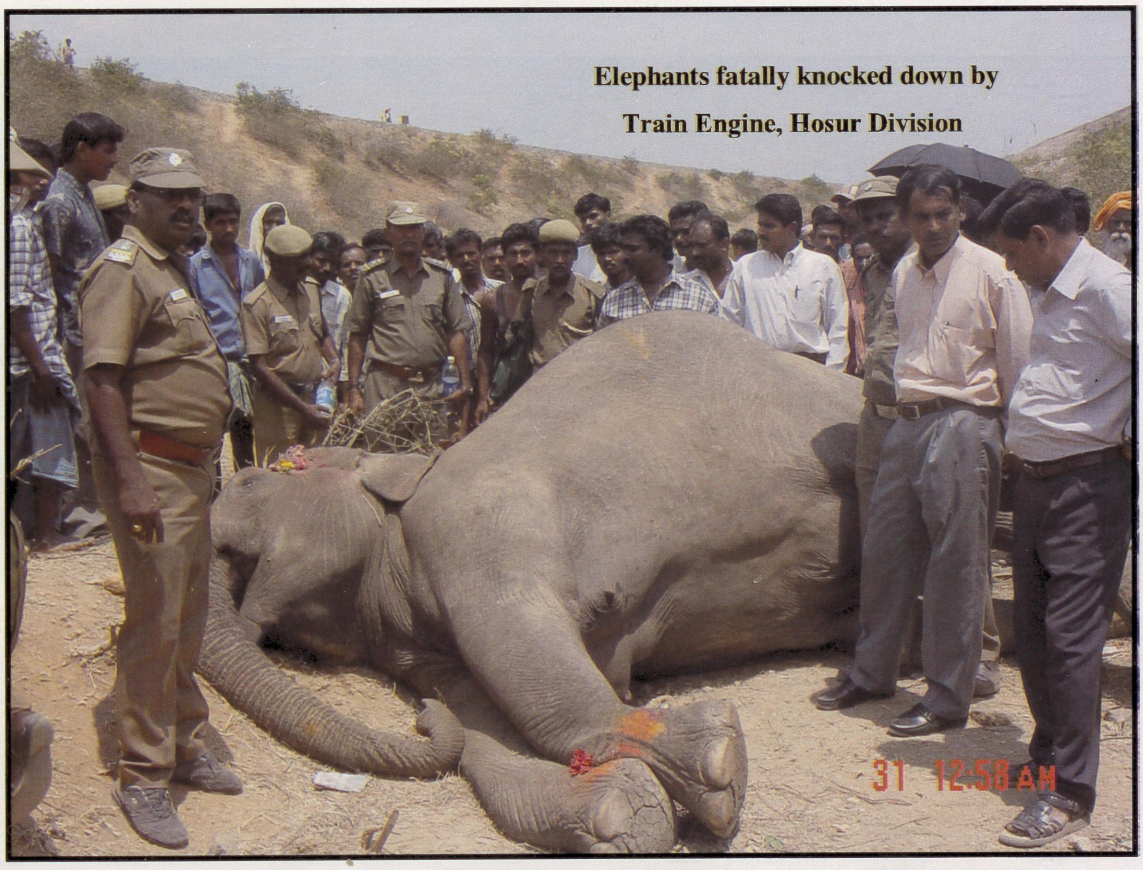
- ❖ Take proactive steps against poaching
- ❖ Track the elephant movement regularly by the antipoaching watchers
- ❖ Conduct permanent antipoaching camps in all protected areas
- ❖ Prosecute the poaching cases effectively


Monitor Lizard



8.29. MINIMIZE ACCIDENTAL DEATH OF WILD ANIMALS INCLUDING ELECTROCUTION

- ❖ Reduction in population of some of the wild animals like elephant is caused due to accidental death including electrocution
- ❖ Accidental deaths occurs due to passing vehicles inside the Sanctuary
- ❖ Preventive steps to be taken to minimize death due to accidents



Elephants fatally knocked down by Train Engine, Hosur Division

8.30. RESCUE AND RELEASE OF WILD ANIMALS

- Wild animals do not respect the forest boundary. They stray outside and this leads to poaching
- Keep a team for rescuing the wild animals straying outside the forest areas and protected areas
- And release the rescued animals back in to the forests and not in the Zoos.



8.31. MINIMIZE MAN – ANIMAL CONFLICT

- Forest fringe dwellers take a negative attitude towards wild animals because of crop raiding and due to death caused to human beings and cattle lifting by wild animals
- Compensation has to be paid at the earliest in all such cases



8.32. PREVENT POLLUTION

- ❖ Many herbivores die due to in take of polythene pollutants
- ❖ Ban entry of plastic and polythene pollutants inside the Forest and Protected areas
- ❖ Periodically Collect and dispose of the polythene pollutants by using VFC volunteers, NGO, Students etc



8.33. PREVENT SPREAD OF INVASIVE ALIEN SPECIES

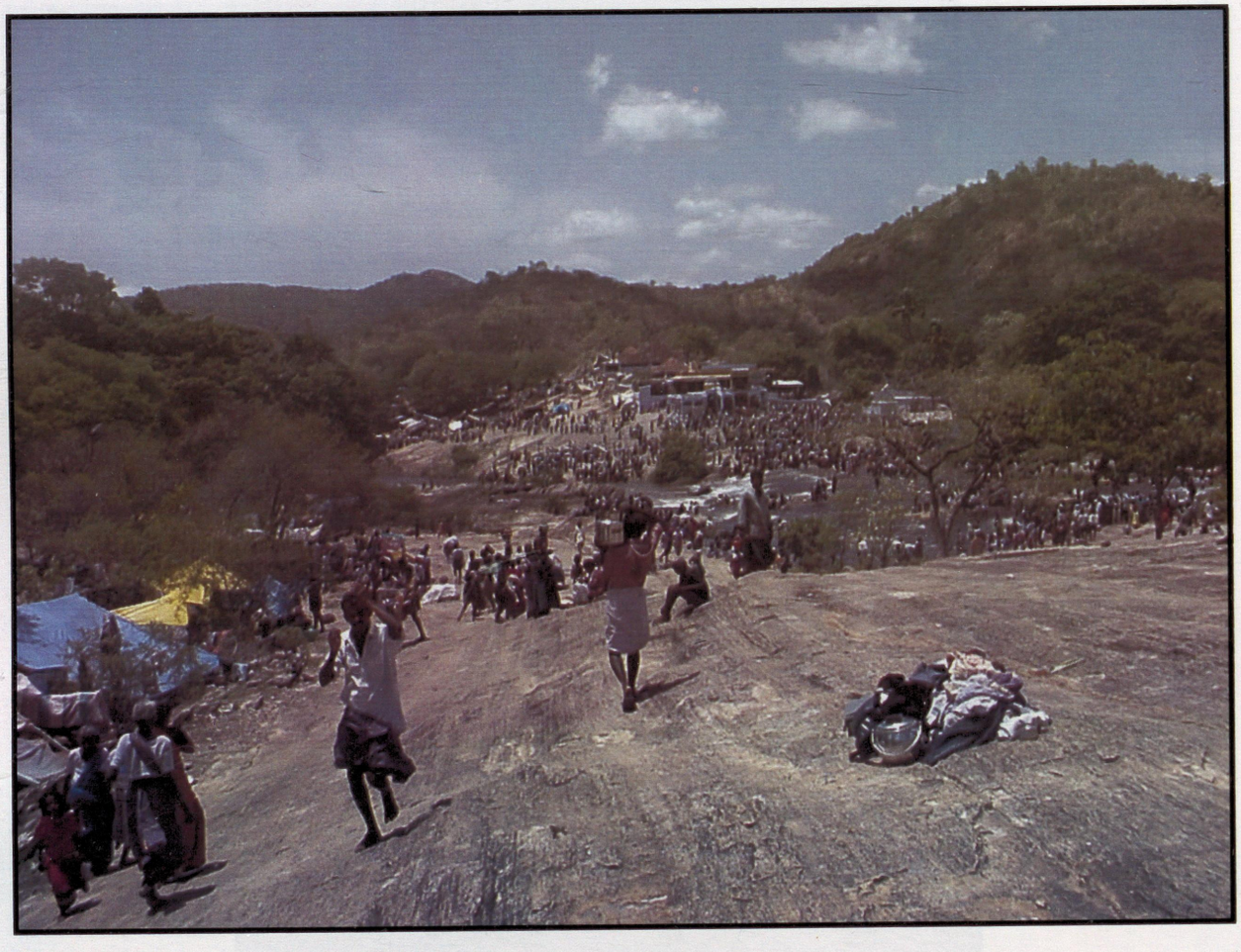
- Clearing or tree felling inside the forest areas creates gap which invites invasive alien species (like Lantana, Eupatorium, Prosopis, Parthenium etc) to occupy and colonize the area thereby displacing the native biodiversity
- Prevent felling and creation of gaps
- Fill the gap with native biodiversity
- Remove the invasive alien species from all the protected areas
- Remove the invasive alien species from the Mangrove areas
- Remove the invasive alien species from other forest areas wherever possible.





8.34. REDUCE PILGRIMS AND TOURISTS PRESSURE

- ❖ Evolve location specific strategies for preventing negative impacts on biodiversity by the pilgrims and tourists
- ❖ Pollution in tourism zone of PAs is a serious issue affecting biodiversity
- ❖ Pilgrims and tourists also set unintentional fire



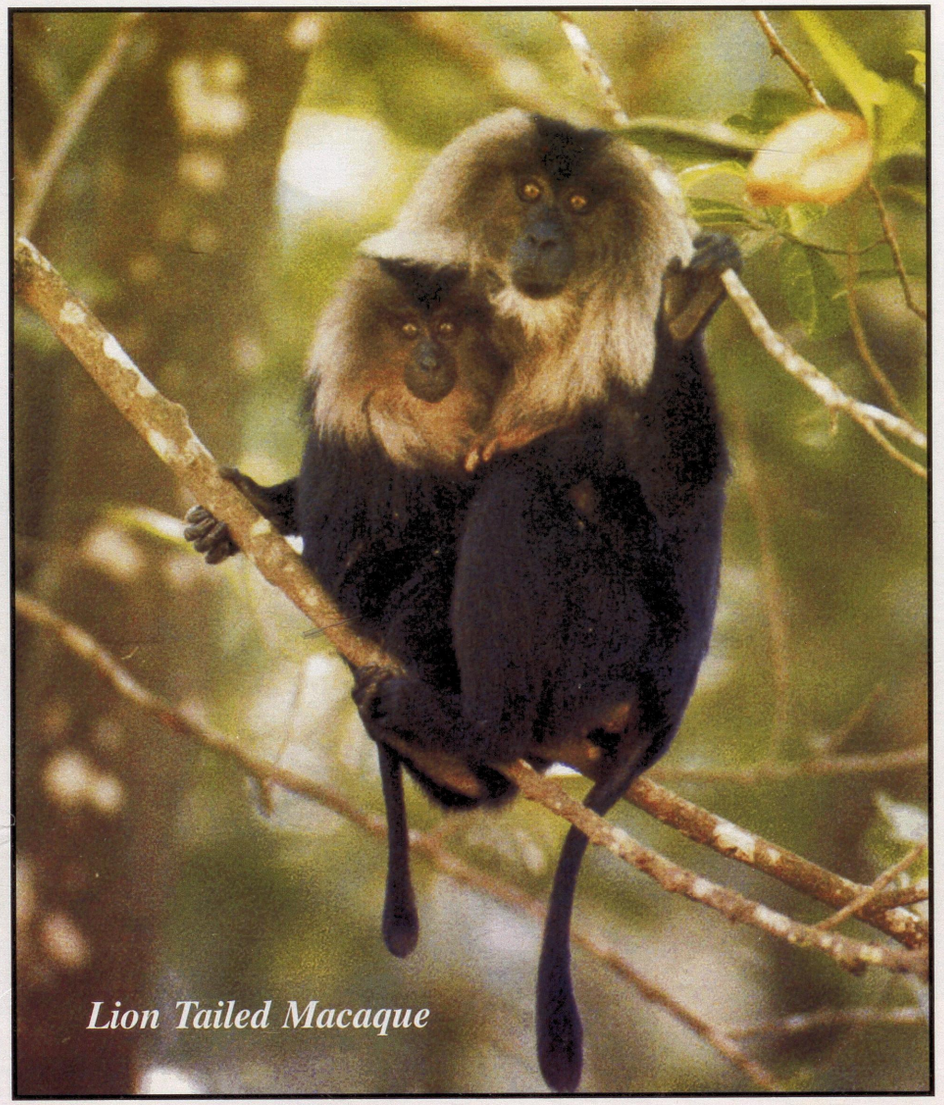
8.35. PREVENT HABITAT FRAGMENTATION

- ❖ Ensure safe passage for elephants in the corridor
- ❖ Prevent intentional death by electrocution in the corridor
- ❖ Strive for people's participation for the safety of the elephants in the corridor region
- ❖ Ban further constructions in the corridor region



8.36. EVOLVE SPECIES SPECIFIC CONSERVATION PLANS

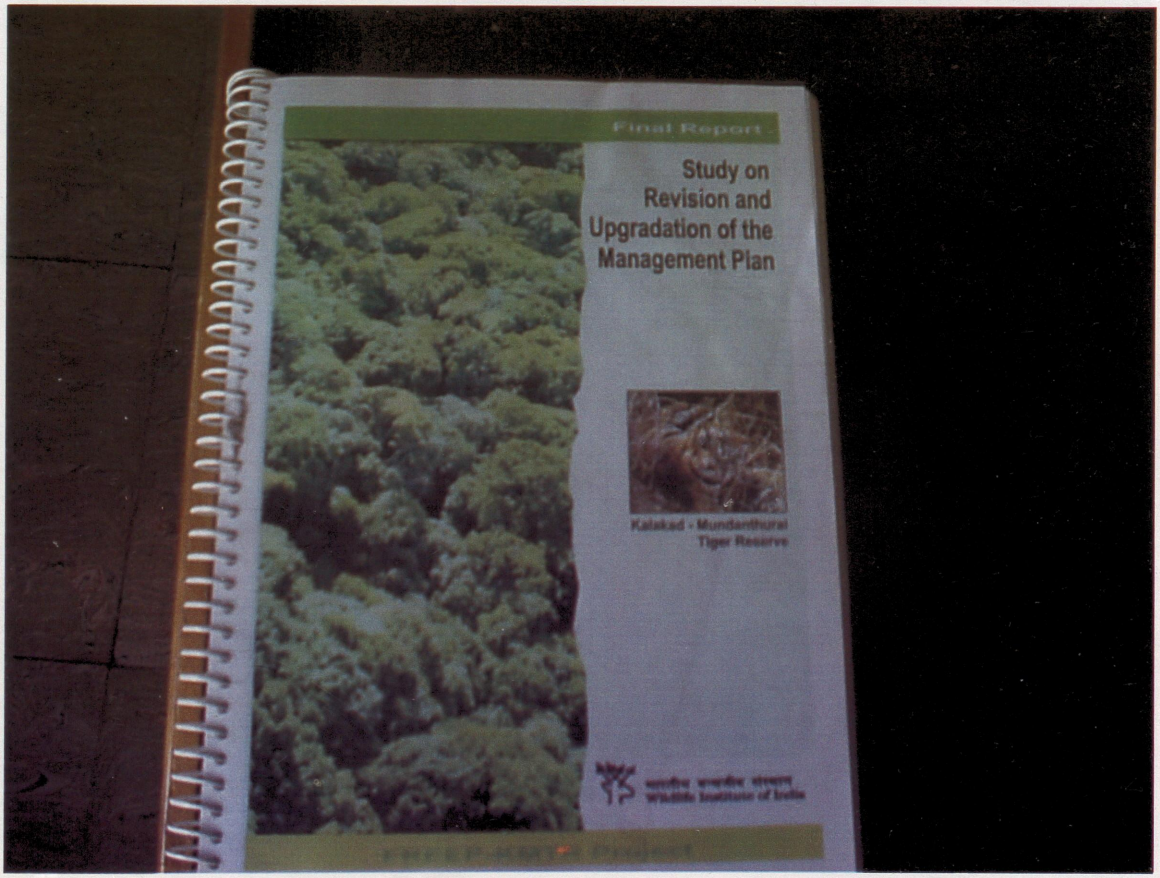
- Species specific conservation plans are to be evolved for each location particularly for flagship species, redlisted species, endemic species and keystone species etc.
- Species specific/location specific strategies are needed for effective conseration



Lion Tailed Macaque

8.37. INTEGRATE BIODIVERSITY CONSERVATION IN FOREST PLANNING

- ❖ Prepare protected area management plans clearly focusing on total biodiversity conservation
- ❖ Include a chapter in Forest Working Plan regarding biodiversity conservation
- ❖ Prepare biodiversity status report for each division indicating the checklist of fauna and flora (refer a book on the Biodiversity of KMTR by the Author)
- ❖ Continuously update the information regarding the checklist



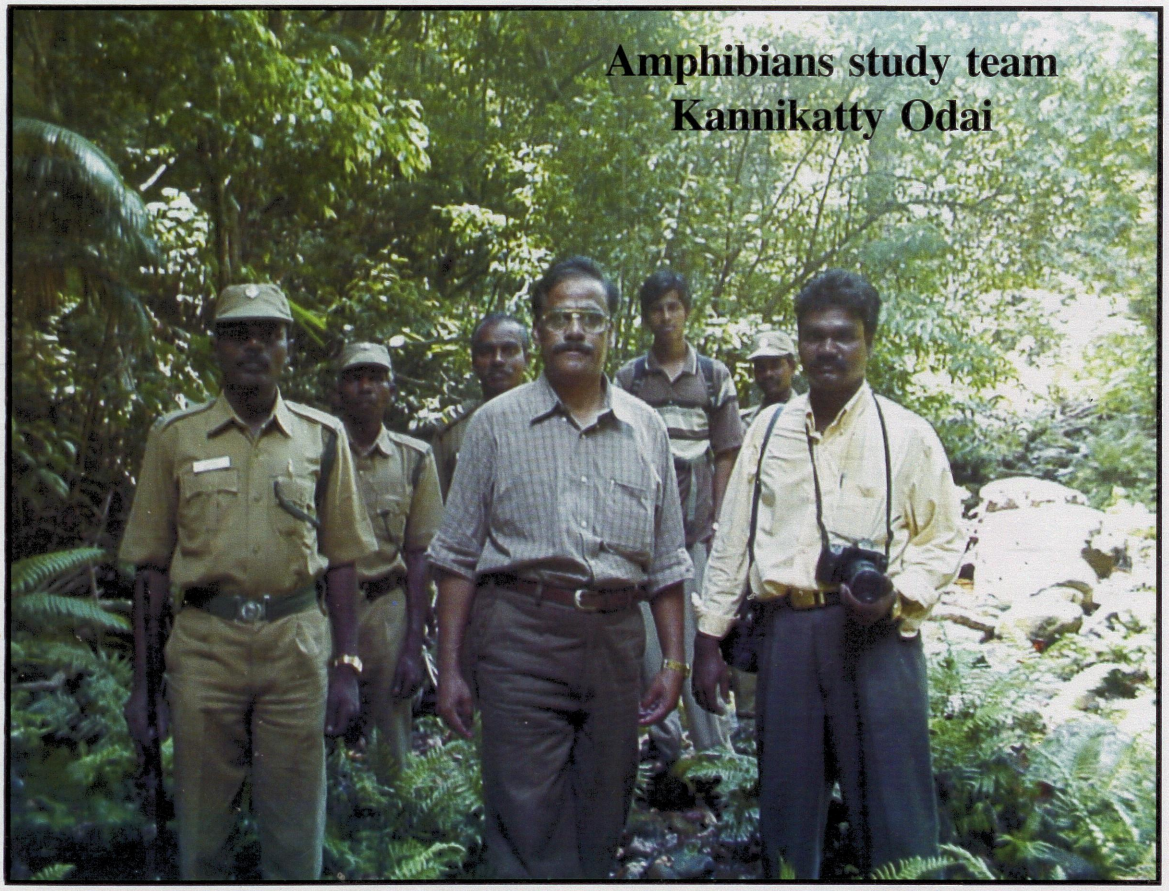
8.38. TRAINING AND CAPACITY BUILDING

- ❖ Train all categories of forest officials on biodiversity conservation
- ❖ Establish a system for periodical updating of knowledge on biodiversity



8.39. PROMOTE RESEARCH ON SURVEY OF BIODIVERSTIY

- Survey of flora and fauna has to be carried out in each forest division for proper documentation and for evolving location specific conservation packages



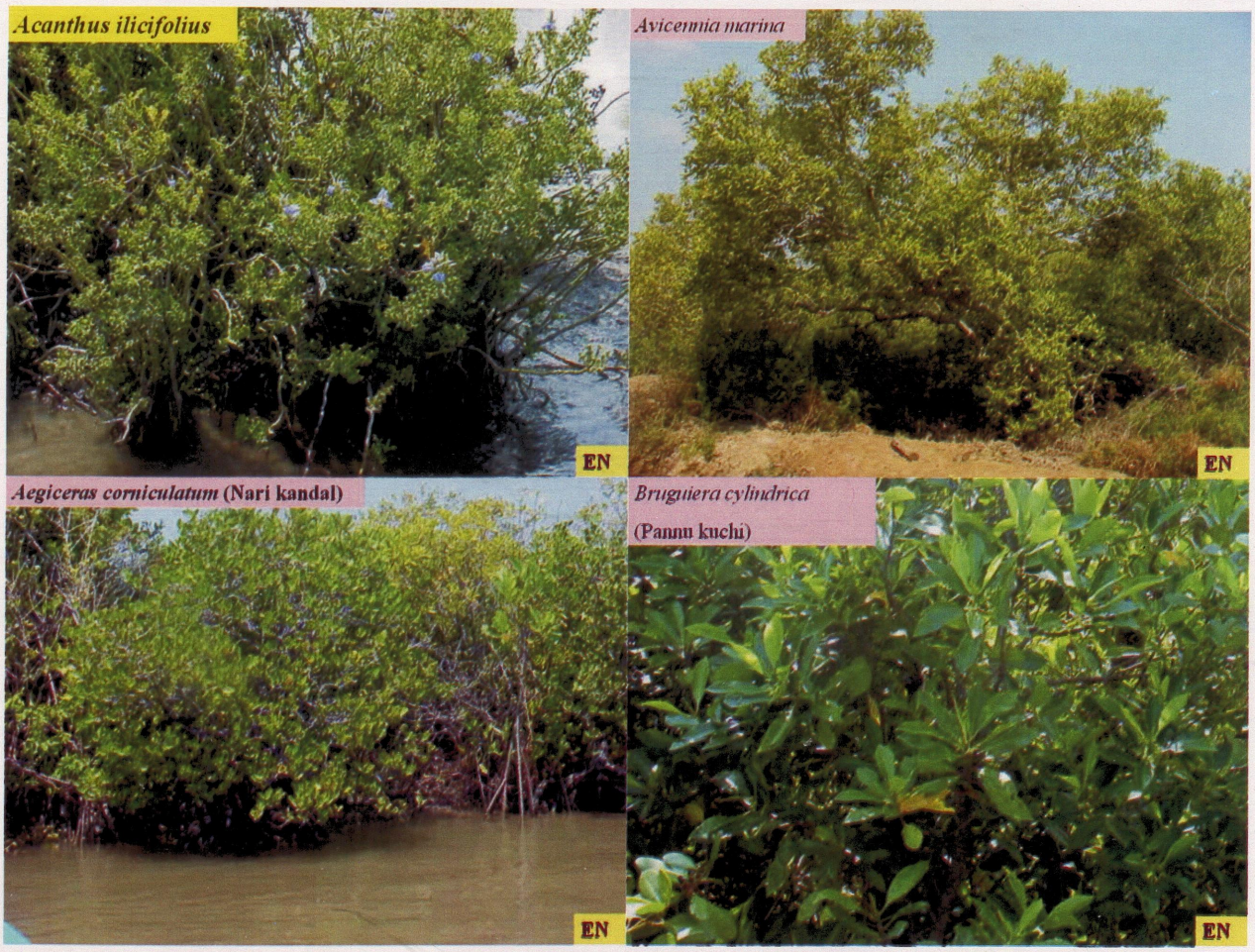
8.40. EVOLVE MONITORING STRATEGIES FOR RED LISTED AND OTHER IMPORTANT SPECIES

- List out the flora and fauna that are to be continuously or periodically monitor in each forest division
- These species may include redlisted, over exploited, endemic are those that are less than 100 in number in any division



8.41. EVOLVE RECOVERY STRATEGIES FOR RED LISTED SPECIES

- Increase the number of individuals/population of each redlisted species to a safe level in each location for recovery



9. TROPICAL DECIDUOUS AND THORN FORESTS CONSERVATION

Dr. T.SEKAR, I.F.S.,
Conservator of Forests,
Coimbatore Circle,
Coimbatore – 18.

9. TROPICAL DECIDUOUS AND THORN FORESTS CONSERVATION

T.SEKAR

1. STATUS:

On the basis of climatic variations, temperature being chief among them, 16 major groups of forests totally encompassing over 200 types have been recognised in India by Sir Champion and Seth. The major groups fall in one of the following categories viz., tropical, sub-tropical, montane temperate, sub alpine and alpine which are governed by the latitude and longitude positions of the geographic locations. Tamil Nadu is endowed with the first three categories and is home to 9 out of 16 forest groups. The state also boasts of three bio geographic zones – Western Ghats, Deccan peninsula and coasts that are among the 10 major zones of the country. In view of these distinctions, bio diversity – particularly floristic diversity - is rich in Tamil Nadu. It has 5640 taxa of plants accounting for 33.2% of those recorded in the country.

The tropical moist / dry deciduous and thorn forests constitute the chief forest types of the state, the three of them aggregating to 19954 km^2 thus representing 88.5% of the recorded forest area of 22748 km^2.

While nearly a dozen or more sub types of deciduous forests are met with in different ghats of the state, at least 2 or 3 sub types are encountered in respect of tropical thorn forests. The occurrence and distribution of several sub types of deciduous or thorn forests are decided by the climatic and edaphic factors even as their condition and health are greatly modified by various biotic factors that are operating in the respective areas. The major types under the categories of deciduous and thorn forests, the edaphic, climatic conditions obtained in those areas their occurrence in the state and the chief species are described here under (Anonymous, 1990) :

Southern Moist Mixed Deciduous Forest:

This type occurs as climax formation in regions with elevations ranging from 450 m to 1000 m combined with an average annual rainfall ranging between 1500 and 2000 mm received from both monsoons. Teak forms the most dominant species of this forest though it forms only 10 to 15 percent of the stocking.

Also known as 'closed high forests', canopy of the plant communities in this forest is closed and trees have rounded crown with tall cylindrical boles. Trees tend to grow more than 30 m in height in the type of plant communities that are found in the forests in moist, but well drained soils while the quality falls off in shallow bouldery soils.

The evergreen component is usually larger than in the case of teak bearing forest except for the very moist sub type. Main tree species found are – *Terminalia paniculata, T.tomentosa, Dalbergia latifolia, Pterocarpus marsupium, Anogeissus latifolia, Careya arborea, Buchanania lanzan, Emblica officinalis, Dillenia pentagyna, Salmalia insignis, Sterculia villosa, Albizzia odoratissima, Cassia fistula, Gmelina arborea, Bauhinia malabarica, Wrightia tinctoria.*

Southern Dry Mixed Deciduous Forest:

This type of forest is found in Western Ghats throughout Peninsular India. Considered

as one of the economically most valuable forests, this type is more or less synonymous to dry teak forests of Western Ghats. This type of forest occurs as a climax formation where the areas are endowed with rainfall of 1000 to 1500 mm, at elevation ranging between 300 m and 900 m. Most of the species occurring in this type are common in moist deciduous forest. But the trees in this tract attain a height nor more than 20 to 22 meters. All the trees in top storey remain leafless for most part of the year corresponding to the dry months.

Bamboos are usually absent. Grass is conspicuous till it is grazed down or burnt. Climbers are generally few. The most characteristic tree is *Anogeissus latifolia* with *Terminalia tomentosa* as a typical associate. Other tree species found *Diospyros tomentosa, Chloroxylon swietenia, Hardwickia binata* and *Boswellia serrata.*

In Salem district, this type of forest is found with slightly different floristic. Chief tree species found here are *Shorea talura, Dalbergia latifolia, Terminalia tomentosa, T.chebula, T.paniculata, Pterocarpus marsupium, Albizzia odoratissima, Anogeissus latifolia, Cassia fistula, Hardwickia binata* and *Santalum album.*

Hardwickia forest as a subgroup confirms to the main group in general appearance and contents but the predominance of *Hardwickia binata* gives it a near evergreen character of its own. This type occurs in scattered blocks and patches in Salem and Dharmapuri districts. Floristic include *Hardwickia binata (70%), Boswellia serrata, Lannea coromandelica, Anogeissus latifolia, Albizzia lebbek, Lagersteormia parviflora, Diospyros tomentosa* and *Tectona grandis.*

Southern Thorn Forest:

This type of forests is confined to foothills and the outer slopes upto 600 m in the Western Ghats and certain pockets of the Eastern Ghats in Salem, Tiruchi, Vellore, Thiruvannamalai, Villupuram, Sivagangai districts. Rainfall received in this tract is the lowest, the average being about 500 mm. It is generally benefited by northeast monsoon followed by a spell of long dry period. The climate is hot and dry with temperature raising upto 40^0 C during summer. Species found are a variety of *Acacias*, *Zizyphus* and fleshy *Euphorbias.* Other usual species are *Chloroxylon swietenia, Albizzia amara, Acacia sundra, A.ferruginea, Azadirachta indica, Canthium dicoccum, Zizyphus mauritiana, Z. xylopyrus, Cleistanthus collinus, Dichrostachys cinerea, Atalantia monophylla.*

Carnatic Umbrella Thorn Forest:

This is a typical forest type confined mostly to Tamil Nadu found distributed in the southern districts of Dindigul, Madurai, Sivagangai, Ramanathapuram and Tirunelveli. The main tree species is *Acacia planifrons* with its conspicuous umbrella shaped crown. Thickets of other species of *Acacia* and many xerophytic evergreen species are also to be seen. Chief floristic include *Acacia planifrons, Albizzia amara, Acacia latronum, Dichrostachys cinerea, Chloroxylon swietenia.*

If one considers the bio diversity abundance, species diversity and richness and degree of endemism among various forest types, it would be seen that tropical wet evergreen and montane temperate sholas occupy the premium position while those parameters, particularly endemism is of lower order in deciduous and thorn/scrub forests. A study of distribution of endemic plants in various forest types of Nilgiri Biosphere Reserve (NBR) would illustrate this point.

Table 9.1

Distribution of endemic plants in different habitats of Nilgiri Biosphere Reserve

Habitat	Undisturbed				Disturbed			
	Trees	Shrubs	Herbs	Total	Trees	Shrubs	Herbs	Total
Evergreen	10	6	7	23	4	3	6	13
Shola	9	3	7	19	8	7	4	19
Moist Deciduous	1	1	3	5	1	2	3	6
Dry Deciduous	1	1	2	4	..	2	6	8
Scrub forest	..	1	1	2	..	..	2	2

After: Lalitha Vijayan *et al.,* 1988

As in case of other forest types, deciduous and thorn forests too were subjected to extreme ecological disturbances caused by human induced activities, thus leading to the decline of many plant and animal species at an alarming rate. In such a process, some of the plant and animal species have become rare, threatened and /or extinct, which account is published in the form of IUCN Red Data book. Some of the notable losses that have been recorded by Nayar and Sastry (1990) are enumerated in Table 9.2.

Tabel 9.2

RET species listed in Red data book of Indian plants

Name of Species	Habit	Locality	Status*
Capparis diversifolia	Shrub	Dry scrub, Deciduous	V
Capparis rheedei	Shrub	Moist deciduous, Tirunelveli	R
Crotalaria kodaiensis	Shrub	Kodai hills, 360 m	E
Crotalaria clavata	Shrub	Dry thorn upto 600 m	E
Indigoferra barberi	Shrub	Eastern Ghats	R
Hedyotis albonervia	Herb	Forest floors at 200 m	E
Smilax wightii	Shrub	Moist deciduous forests	R
Santapaua madurensis	Herb	Scrub jungles (SE of TN)	E
Salacia beddomei	Shrub	Moist deciduous - WG	R
Hedyotis cyanantha	Herb	Open deciduous forest floor	R
Psychotria globicephala	Shrub	Endemic to Courtallam	R
Lindsaea malabarica	Creeper	Moist deciduous forest floor	R
Lepidagathis daffusa	Shrub let	Scrub jungle in plains	I
Albizia thompsonii	Tree	Deciduous and open scrub	R
Tephrosia barberi	Shrub	Hill slopes at 75 m above msl	R
Madhuca deplostemon	Tree	Deciduous forests	IK
Madhuca insignis	Tree	Lower hills of WG	PE
Hildegardia populifolia	Tree	Deciduous forest of Kalrayans	E

Source: Nayar & Sastry, 1990

* *V-Vulnerable, R-Rare, E-Endangered, I-Indeterminate, IK-Insufficiently Known, PE-Possibly Extinct.*

By virtue of their proximate location and the accessibility to biotic factors, deciduous and thorn forests are exposed the most to threats from human pressure. Few species of commercial importance and significant medicinal value that are endangered or lost from these forest types of the state are furnished in Table 9.3.

Tabel 9.3.

Species lost or endangered

Forest Type	Species
Dry Deciduous	Santalum album
Dry thorn / Dry Deciduous	Chloroxylon swietenia
Dry thorn / Dry Deciduous	Hardwickia binata
Dry thorn	Acacia sundra
Dry Deciduous	Strychnos nux-vomica
Dry Deciduous	Strychnos potatorum
Dry thorn	Capparis spp (more than five)
Dry thorn / Deciduous	Tinospora cordifolia
Dry thorn / Deciduous	Tinospora sinensis
Dry thorn	Gymnema sylvestre
Dry thorn / Dry Deciduous	Decalepis hamiltonii

2. STATEMENT OF ISSUES:

The escalating interference from man may be due to the operation of one or more of the following factors: illicit cutting of trees, illegal removal of NTFP, grazing of domestic livestock, hunting and poaching, human – induced fire, encroachment, diversion of forest lands for developmental activities etc. Certain other activities like tourism, functioning of settlements and private holdings from within the forests may also cause substantial indirect impacts on the flora and fauna the region. In view of the above reasons, cumulative threat is found to be generally high in the areas supporting deciduous and thorn/scrub forest types as against those under evergreen or shola forests. A study of human disturbance levels in various Reserve Forests of NBR indicates that the same is high in scrub or thorn forests.

Tabel 9.4.

Major forest localities, forest types and disturbance levels in NBR (Tamil Nadu part)

Locality	Major Vegetation Types	Human Disturbance
Mudumalai WLS*	Moist, dry deciduous and scrub	Moderate – Low
Sigur RF	Scrub forest	High – Moderate
Talamalai RF	Dry/Moist Deciduous	Moderate
Moyar Valley RF	Dry Thorn Forest	High
Nilgiri SE slope RF	Mixed deciduous, Scrub	Moderate – High
Siruvani Hills RF	Moist deciduous, Wet semi Ever green	Moderate
Upper Nilgiris, Mukurthi N.P	Montane temperate (Shola-grassland)	Low

After: Ajit Kumar et al., 1988

** WLS – Wildlife Sanctuary, RF – Reserve Forest, NP – National Park*

An enumeration of the policies and actions that worked against the interests of forest conservation, particularly with reference to deciduous and thorn forests reveals that prevalence of a mistaken notion that vegetation resources of these forests are inexhaustible combined with over a century of exploration and exploitation upto the third quarter of 20th century were the root causes for the decimation of these forest resources. The activities typical to the British era and the period immediately following the independence would elaborate this point.

Policies & Actions that went against the deciduous & thorn forests

PRE INDEPENDENCE:

(i) Replacing moist deciduous forests with commercial plantations (eg. Teak in Anamalais, Kanyakumari)

(ii) Selection felling of commercial timber species (eg. Teak, Rosewood, Vengai, Terminalias and Bamboos)

POST INDEPENDENCE:

(i) Diversion of forests for agricultural, hydroelectric and irrigation projects at lower and middle elevations

(ii) Large scale conversion of deciduous and thorn forests into commercial & industrial mono culture (eg: Eucalyptus, Cashew in plains (71013 ha by Tamil Nadu Forest Plantation Corporation), Rubber in lower hills (4785 ha by Arasu Rubber Corporation) (Anonymous, 1999 b) Eucalyptus in lower to moderate elevation (Anamalais)

(iii) Working of fuel coupes in regular felling cycles in dry thorn/deciduous forests

Thus it would be seen that the management priorities of that period determined the nature of activities in these forests, which left considerable impacts in the biodiversity. The results of those activities were evident in form of a) monoculture dominance b) invasion of obnoxious weeds c) alteration of original composition d) loss of species e) shrinkage of biodiversity.

Conservation - centered forest management took precedence over commercial harvest - oriented forestry by 1970s in the state. As more forest areas well brought under protected area network which incidentally were the timber bearing deciduous forests subsequent to the promulgation of Wildlife Protection Act in 1972, exploitation of these forests for timber and fuel came to a halt. A decade afterwards when Forest Conservation Act was enacted similar shifts in forest management policy occurred around with regard to clear felling of fuel forests, planting of monoculture exotic trees in natural forests etc. Some of the notable changes that took place in the forestry scenario in the state between 1970 and 2000 are summarised as below:

Action	Relevant Government Orders
Declaration of more forest areas into high level conservation units viz., Sanctuaries and National Parks	More sanctuaries and national parks notified after 1972. Few more under consideration.
Ban on clear felling of fuel forests	Govt. Lr. No. 13010/FRV/77-1 Forests and Fisheries Department dated 22.3.1977; G.O.Ms.No. 1375 Forests and Fisheries Department dated 23.10.1980
Cessation of Timber extraction	Selection felling of timber trees stopped in 1977 through administrative instructions.
Stoppage of clear felling of deciduous forests for monoculture plantation of teak and Eucalyptus	Brought into effect by 1979 and 1990s, respectively
Discontinuance of leasing of NTFP units in Protected Areas	By certain guidelines inserted on 10.8.1999 under the Forest (Conservation) Act, 1980.

Many of the above actions reduced the level of human induced pressure on the deciduous and thorn forests and allowed for the recuperation of the areas. The exclusion of the activities detrimental to the floral and faunal diversity finds expression in the form of resurgence of the original composition of such forests.

Further to this, Joint Forest Management (JFM) programme being implemented in about 1100 water sheds encompassing open/degraded forests of the state along with the abutting villages since last five years have been showing considerable impact by way of improvement of the biotic composition of treated water sheds. In addition, the Tamil Nadu Forest Department in association with FRLHT, Bangalore under a DANIDA assisted project had initiated effective field level action in 1993 to conserve the medicinal plant bio diversity by forming 11 MPCAs and three MPDAs across the state (Anonymous, 1999 c). Of the 11 MPCAs representing various forest types spread over different agro climatic zones, seven are located either in a moist deciduous or dry deciduous forest.

Sl. No	Forest Type	District	Division	Location	Altitude (m)
1	Southern Moist Mixed Deciduous	Kanyakumari	Kanyakumari	Petchiparai	80-840
2		Tirunelveli	Tirunelveli	Courtallam	180-1140
3	Southern Dry Mixed Deciduous	Tirunelveli	Kalakkadu Mundanthurai Tiger Reserve	Mundanthurai	200-250
4		Virudhunagar	Grizzled squirrel Sanctuary, Srivilliputhur	Thaniparai	350-536
5		Madurai	Madurai	Alagarkoil	350-830
6		Salem	Salem	Kolli hills	300-1190
7		Tiruvannamalai	Thiruppatur	Thenmalai	900-1050

* There are totally 11 MPCA sites in the state.

4. KEY ACTORS:

In aiming at conservation and improvement of bio diversity in deciduous and thorn forests, people from the villages abutting those forests and the indigenous people inhabiting the forest villages representing various user groups constitute the primary stakeholders. The village level institutions like Village Forest Councils or Eco development Committees (wherever the Joint Forest Management / Eco development programmes are in operation) and the village panchayats (where no such programmes are under implementation) will have to serve as key actors in bio diversity conservation while the Forest Department will be performing the role of a facilitator. The Non Governmental Organisations (NGO) functioning in the jurisdiction of respective forest divisions will help promoting the linkage between the Forest Department and village level institutions/ user groups.

5. MAJOR GAPS IN COVERAGE:

The following are identified are the major gaps in bio diversity conservation in respect of deciduous and thorn forests.

- Resources are found to be in short supply, whereas the present and future demand levels for forest goods and services from communities are phenomenally high in view of huge dependent community.
- The present status of the eco system complex is not so much healthy and with the escalating human pressure owing to the increasing dependence, the situation will only turn worse.
- The ecological functions of these forest types, as 'head reservoirs' for the plains are not emphasised as much as the evergreen or semi evergreen forests. Consequently focus on forest preservation is lost sight of.
- These forest types are considered comparatively less significant in terms of 'biodiversity conservation concern' as compared to evergreen or montane shola forests in view of less diverse assemblage of vegetation and fauna.

6. STRATEGIES NEEDED:

Following strategies are required to be adopted for ensuring better bio diversity conservation status.

- Reduce dependence levels among communities of fringe village and Forest Village
- Eliminate or minimize all factors like grazing, fire etc that are inimical to forest bio diversity.
- Promote research investigations on the restoration of degraded forests supporting monoculture of exotics by native vegetation.
- Put in place an institutional mechanism to achieve the above

7. SHORT AND LONG TERM MEASURES:

(i) Short Term Measures:-

- Provide opportunities to develop tree/ vegetation assets on lands other than forests
- Evolve alternate livelihood systems for dependent communities based on resources that are available on the lands outside forest areas through appropriate inter - sectoral linkages
- Facilitate resurrection of local and indigenous bio diversity by gradual

elimination of exotic vegetation like *Eucalyptus* etc either by afforestation or by aiding natural regeneration

- ✦ Identification of sensitive forest pockets supporting isolated populations of RET listed species and taking up conservation activities
- ✦ Delineation of forest patches of higher endemism, document their bio diversity and initiate action for protection against all kinds of biotic factors.

(ii) Long Term Measures:-

- ✦ Back up the short term initiatives by adequate policy support both from Government and the Department
- ✦ Conservation education among all partners viz., the stake holding communities, NGOs and the forest personnel.
- ✦ Develop local level institutions including strengthening panchayatraj institutions to undertake tasks relating to bio diversity conservation

8. STRATEGIES AND ACTION FOR IN SITU CONSERVATION:

- ✦ Identify representative locations for each of the sub type of deciduous and thorn forests supporting higher level of bio diversity, including significant presence of RET species, form them into 'biodiversity parks' and preserve them as higher level *in situ* conservation units.
- ✦ Undertake population and distribution studies of prioritized species, which require immediate attention in such *in situ* preservation sites
- ✦ Carryout research on propagation techniques of the selected RET species on priority
- ✦ Mobilise collection of planting propagules (seeds/seedlings/vegetative propagation material) of prioritized species for further use in species recovery or enrichment planting programme
- ✦ Design and develop suitable demonstration garden, nature trails, interpretation centre close to *in situ* conservation sites so as to promote conservation consciousness among the local public
- ✦ Organise Local Management Committees (LMC) from among the members of the village community, which will facilitate community participation in conservation.

9. STRATEGIES AND ACTION FOR *EX SITU* CONSERVATION:

- ✦ Inventorise the locations of critical population of rare, endangered or threatened species.
- ✦ Acquire knowledge on the regeneration status of selected species in wilderness and their establishment potential.
- ✦ Standardise nursery techniques for prioritized species intended for species recovery or enrichment planting programme
- ✦ Transplant in the field and follow up for the successful establishment of RET species.

10. STRATEGIES AND ACTIONS FOR SUSTAINABLE USE AND SUSTAINABLE LIVELIHOODS:

The resource needs of the primary stakeholders viz., the dependent populations from the abuttant and forest dwelling communities have to be sustainably met from the forests

without jeopardizing the production potential and health of the forest areas. This can be achieved by taking up activities both on the 'principle of exclusion' and 'proactive measures'. Principle of exclusion calls for cessation of all those practices that are presently detrimental to the conservation of forest bio diversity. Illicit removal of forest produce far in excess of increment potential and unauthorized grazing over and above the carrying capacity of the forests are considered as factors chiefly responsible for habitat degradation, poor regrowth and consequently diminution of bio diversity. Therefore, alternative resources will have to be established in areas outside/adjacent to the forests so as to provide the required materials and services from them. Likewise, the user groups who are dependent on forests for their livelihood have to be identified and alternate livelihood security developed outside the forest areas. Various on going forestry programme make certain provision for such activities in the buffer areas, which need to be strengthened.

11. STRATIGIES AND ACTIONS FOR DATA BASE MANAGEMENT ON WILD PLANT DIVERSITY

The information available on hand with regard to plant biodiversity of deciduous and thorn forests and their sub types in the state will have to be first assembled. Using the information as bench mark basic bio diversity register for each of the representative forest blocks in different agro climatic regions of the state will have to be built up. The data thus pooled may be grouped as rare, endangered or threatened species and their relative natural distribution, status of population of certain prioritized species which need focused attention, their present use levels, availability of nursery technology and seed storage for propagation of such species etc. Inputs from established survey organizations like Botanical Survey of India, Tropical Botanical Gardens Institute, National Botanical Research Institute besides the research departments of various universities can be availed so as to obtain and manage a comprehensive data base on plant diversity.

12. STRATEGIES AND ACTIONS FOR CAPACITY BUILDING:

- Though certain capacity exists within the department, it is not upto the desired level in case of all categories of staff. Building up capacity, particularly among the field level functionaries through regular training and workshop programmes will have to be attended. Their skills on identification of RET species, their present threat status, the propagation protocols of certain prioritized species etc need to be enhanced.
- Local people, dependent on forests also need to be oriented towards the above skills. Traditional knowledge systems existing in the hill people need to be documented and utilised effectively in promoting bio diversity conservation

13. STRATEGIES AND ACTION FOR RESEARCH:

Regular long term and short term research experiments will have to be laid in the representative forest sub types belonging to deciduous or thorn groups of forests. The objectives and expected outputs from such research programmes have been outlined in para 7 to 9

14. SPECIFIC PROJECT PROPOSALS:

The following projects are identified to be of priority nature for restoration of the bio diversity of deciduous or thorn forest blocks.

- *In situ* conservation programmes for some of the economically important but threatened tree species like *Santalum album, Dalbergia latifolia*

by identifying focal conservation areas, declare them as special protection areas, safeguard them against biotic interferences and promote their regeneration status.

- ✦ Assist the individuals and local communities in preserving the existing bio diversity complexes in form of sacred groves, community forests and private forests
- ✦ Identify last known preserves of the isolated populations of certain prioritized endangered species and conserve them *in situ* besides take up *ex situ* propagation programmes
- ✦ Medicinal Plant Development Programme outside forests for well known medicinal plant species to prevent unauthorized/unaccounted removal of wild species.

In addition to specific projects, the on-going programmes under various centrally sponsored, state plan and externally aided schemes can be dovetailed to achieve to overall conservation goal.

15. TIME FRAME FOR IMPLEMENTATION:

The project period can be five years for short-term measures and 10 years for long-term programmes. They can be planned to coincide with five-year plans. In all programmes however, post project sustainability will be aimed at for which suitable institutional mechanisms will be developed.

16. ANNUAL MONOTORING OF RED LISTED PLANTS:

Appropriate number of sample plots of adequate size representing each of the forest type and sub type for various agro climatic regions will be laid. The bench mark data on Red listed species will be collected at the commencement of project and thereafter, monitored on an annual basis following standard sampling techniques and assessment methods.

17. IDENTIFICATION OF KEY ELEMENTS:

- ✦ Policy Support: Bio diversity Act 2002 and other acts of the State/Union
- ✦ Partners: Forest Department, User groups, Village institutions and NGOs.
- ✦ Funding Source: External donors, Government of India, State Government
- ✦ Research Input: Research institutions and laboratories

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10. SHOLA FORESTS CONSEVATION

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10. SHOLA FORESTS CONSERVATION

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1. Status

The high altitude montane forests of the Western ghats in the Nilgiris plateau and upper palanis are of special interest. Two distinct plant communities, evergreen *shola* forest and grassland, which are usually mutually hostile, co-exist on the plateau in close juxtaposition and apparent equilibrium. It consists of vast stretches of grassland interrupted by numerous, isolated, compact, sharply defined woodland composed of stunted evergreen trees commonly referred as *sholas*. The plateau vegetation consists roughly of 80 per cent of grassland and 20 per cent of *shola* forest (Ranganathan, 1938).

Shola (Indian etym: Wooded, cool, grove) refers to the moist evergreen, montane forests of the South Indian hills, a very ancient form of primary vegetation. It is a home of wildlife and genetic diversity and basis of food chain. They are indispensable for maintaining the watershed of the hills and consequently for the well being of the surrounding plains. The sholas are essentially edaphic formations, on rich soils and are relatively humid throughout the year. The tree species of the sholas are confined to valleys, hollows and depressions occurring as gallery forests along watercourses. Outside this habitat their regeneration is very difficult.

2. Statement of issues

In the tropical hill ranges of the Nilgiris and upper Palanis, since the forest trees are evergreen, the damage done by the winter cold to the seedlings in the open grassland area is in fact a physiological drought effect rather than one of direct frost. The variation in night and day temperatures is high, of the order of 12°C, especially during winter. During winter, the night temperature comes down as low as –9°C in the open grassy area and whatever seeds of shola species that may have germinated in the open are destroyed by frost. At the same time, under the forest canopy, the temperature remains above 0°C (Legris & Blasco, 1969). Sholas mostly occupy the slopes protected from the morning sun, as under this condition, they will not be exposed to excessive transpiration immediately after the freezing cold of the night.

Frost is not the only adverse factor here. There are rainless periods during which the relative humidity in the grasslands drops very low favouring the spread of fires. Seedlings of shola species in the open are eliminated by fire. The shola forest enjoys comparatively higher value of relative humidity, about 80%. Thus eco-climatic conditions are totally different under a shola forest and within grassland, though both may occur side by side. The extension of the shola forest is prevented by frost, dry spells and fire that wipe out the seedlings of shola species. The successful establishment of the seedlings of shola species only under the forest cover may be explained by the fact that the forests stand on sites with higher moisture content.

These are subjected to environmental conditions, which are not very favourable to an evergreen formation. They are in a state of narrow equilibrium with their environment. Intense exploitation of these forests will cause the disappearance of the more sensitive species and also destroy the local microclimate within the forest. Under these

conditions, a return to the climax stage will be rather difficult.

These tropical montane forests of the hilltops of South Indian mountains have a certain affinity with the flora of the Naga hills, Manipur, Khasya and the Eastern Himalayas. The following species are shared with the eastern Himalayas.

Hypericum hookerianum, H. nepalense,Ternstomia japonica, Eurya japonica, Rhamnus dahuricus, Photinia notoniana, Rubus ellipticus, Rubus lasiocarpus, Gaultheria fragratissima, Berberis tinctoria and species of Rhododendron, Mahonia, Pittosporum, Elaeocarpus, Euonymus, Meliosma.

Meher-Homji (1967) recognized two eco-phytographic groups. (1) Species of extra-tropical (temperate or Himalayan) stock like Rhododendron, Mahonia, Gaultheria occupying open areas like shrub-savanna or margins of sholas but never occurring in the forest. (2) Species of tropical stock forming the montane forest proper, which belong to ancient families and are delicate. Their regeneration is very difficult in open areas subject to winter frost, occasional droughts and fire.

None of the species of Apodytes, Lasiosiphon, Mappia and Melicope occurs in the Himalayas. The rate of endemism may be said to be relatively high in the South Indian montane forest flora. The absence of the Himalayan conifers, members of the Fagaceae, Betulaceae, Hamamelidaceae etc. from the South Indian hill tops may be explained by the differences in the temperature and photo-period regimes due to the latitude factor. Their absence may also be explained by the dry nature of the climate during the Pleistocene glaciations, which did not permit these relatively humid elements to migrate southwards.

Nayar (1977) suggests that the temperate elements like *Ternstroemia japonica, Rhododendron arboreum, Hypericum hookerianum,Cotoneaster buxifolia, Lonicera ligustrina, Gaultheria fragratissima, Symplocos lauriana* of the South Indian hills are part of high altitude hilltop flora of South and Southeast Asia and their origin is quite independent of the forward or backward movements of the Pleistocene glaciers and their relationships with Himalayan elements are probably due to convergence. The disfunction is caused by climatic and Physiographic changes in the intermediate areas.

Blasco (1971) described an average type of sholas in structure and physiognomy between 1900 and 2220 m. These develop under very rainy conditions. They are low evergreen with two or three strata of ligneous elements, rich in epiphytes with a continuous ground cover.

The upper storey may exceed 20 m. *Syzygium arnottianum, Cinnamomum wightii, Elaeocarpus oblongus,* have a diameter of over 1metre. Their foliage is dense and generally microphyllous. Other species are *Pygeum gardneri, Schefflera racemosa,Linociera ramiflora, Litsea wightiana.*

The second storey contains small, twisted trees 7 to12 m high. It is very rich epiphytes. *Ilex wightiana, Rapanea wightiana,Ternstroemia gymnanthera, Symplocos spp.,Microtropis spp.* The shrubby layer is very dense, when it is undisturbed, formed of the young individuals of upper strata along with 5 species of *Strobilanthes, Psychlotria spp. And Lasianthus spp., Eurya japonica, Polygola arillata, Viburrum erubescens* are confined to the depressions. *Cyathea latebrosa* is the only tree fern in the montane stage.

Herbaceous cover is more or less continuous and is rarely dense. Floristically, it is rich in urticaceae *(Elatostemma lineolatum, E. sessila par. Pubescens, E. surculosum,Pilea spp., Laportea terminalis) Orchidaceae, Lamiaceae, Balsaminaceae* and ferns. All these species with the exception of *Viburrnum habanthum* do not tolerate waterlogged soils. The forest disappears at the borders of swamps dominated by *Cyperaceae*. Only one tree *Salix tetrasperma,* survives under marshy conditions.

Meher-Homji (1967) recognized a group of species that are confined to the margins of the sholas and catagorised them as shrub savannah.

Species of Montane Forest (Shola)	
*Acronychia laurifolia (E, B)***	*Glochidion pauciflorum (E, B)*
Actephila excelsa (E,B)	*Glochidion velutinum (E, B)*
Actinodaphne bourneae (E,B)	*Gordonia obtusa (W)*
Apodytes benthamiana (E,B, A)	*Ilex denticulata (E,B)*
Ardisia rhomboidea (E, B)	*Lasianthus acurninatus (E,B)*
Beilchimiedia wightii (E, B)	*Lasianthus coffeoides (E,B)*
Bhesa indica (Bedd.) (B)	*Lasio iphon eriocephalus (E,B)*
Cinnamomum stocksii (E,B)	*Ligu trum roxburghii (E,A, B, V)*
Cinnamomum wightii (E,B)	*Linociera intermedia (E,B)*
Elaeocarpus munroii (E, D, TG, M1, A)	*Litsaea ligu trina (E,B)*
Elaeocarpus oblongus (E, B, T,M1, A)	*Litsaea oleoides (E,B)*
Elaeocarpus serratus (E,B, T,M1, A)	*Litsaea wightiana (E,B)*
Elaeocarpus tuberculatus (E, B, T, M1, A)	*Lonicera ligu triana (E,B)*
Euonymus crenulatus (E,B)	*Mappia tomentosa (E,B)*
Evodia lunu-ankenda (M)	*Meliosma wightii (E,B)*
Michelia nilagirica (E,B)	*Psychotria elongata (E,B)*
Microtropis microcarpa (E,B)	*Pygenum gardneri (E,B)*
Mi-rotropisramiflora (E,B)	*Rapanea thwaitesii (E,B)*
Phoebe wightii (E,B, A)	*Sch fflera racemosa (E,B)*
Photinia lindleyana (E,B)	*Symplocos foliosa (E,B, T)*
Pittosporum nilghirence (E,B, A)	*Symplocos pendula (E,B, T)*
Pittosporum tetraspermum (E, P, B, A)	*Syzygium arnottianum (E, B, T, M1, A)*
Pouteria tomentosa (E, B, A, P)	*Toddalia asiatica (E, B)*
Psychotria congesta (E,B)	*Vaccinium neilgherrence (E,B, A)*

Species common to Shola and Shola margin	
Arundinaria wightiana (W)	*Ilex wightiana (E,B)*
Celtis tetrandra (E,B)	*Neolitsaea zeylanica (E,B)*
Elaeocarpus ferrugineus (E,B, T, M1, A)	*Persea macrantha (E,B)*
Eurya japonica (E,B)	*Rapanea wightiana (E,B)*
	Vaccinium neilgherrence (E,B, A)
Species of Shola margins	
Berberis tinctoria (E,B, A)	*Rhamnus wightii (E,B)*
Daphniphyllum neilgherrense (E,B)	*Tarenna asiatica (E,B)*
Debregeasia velutiona (E,B)	*Ternstroemia japonica (E,B, A, M1)*
Dodonaea viscosa (W)	*Turpinia cochinchinensis (E,B)*
Elaeagnus kologa (E,B, A)	*Viburnum ocuminatum (E,B)*
Glochidion neilgherrense (E,B)	*Viburnum coriaceum (E,B)*
Osbeckia reticulata (E,B)	
Ligneous species of Shrub-Savanna	
Anaphalisbournei (W)	*Pteridium aquilinum (W, A)*
Cyathea latebrosa (W)	*Rhamnus virgatus (E,B)*
Cytisus scoparium (E, W, M)	*Rosa leschenaultiaea (E,B, A)*
Eupatorium glandulosum (W)	*Rubus fairholmianus (E,B)*
Fragaria neilgherrensis (E,B)	*Rubus ellipticus (E,B)*
Lobelia excelsa (E,B)	*Strobilanthes kunthianus (P, A)*
Oldenlandia articularis (M, R)	*Strobilanthes sessillis (P, A)*
Oldenlandia stylosa (M, R)	*Strobilanthes sessilis (P, A)*
Osbeckia wightiana (E, B)	*Vernonia bourneana (W)*
Osyris arborea (E,B)	
Species common to Shola margin and shrub-savanna	
Gaultheria fragrantissima (E,B)	*Rhododendron nilagiricum (W, B)*
Hypericum mysorense (W, B)	*Rhodomyrtus tomentosa (E,B)*
Ligustrum perrottetii (E, A, B, W)	*Symplocos spicata (E, B, T)*
Mahonia leschenaultii (B)	*Vaccinium leschenaultii (E, B, A)*
Photinia notoniana (E,B)	*Wendlandia notoniana (W)*

Source : After Meher-Homji,1975

** Means of dispersal

A = Other animals; B = Birds; E = Endozoic; M = Mechanical dispersal;
M1 = Monkeys; P = Epizoic; R = Rain wash; T = Bats;
W = Wind dispersal

8. Strategies for *insitu* conservation

The strategies and actions as in Para 7 will ensure insitu conservation.

9. Strategies and actions for *exsitu* conservation

Seed storage in recognized Institutions like NBPGR.

10. Strategies and actions for sustainable use and sustainable livelihoods

The local public are dependent on woody biomass for providing warmth due to the extreme cold conditions. This can be easily met by the fast growing monoculture plantations of Eucalyptus and wattle in the grasslands. Changing the mind set of the forest department personnel in protecting the endangered shola forests and earmarking monocultures as fuel woodlots for sustained supply of fuel wood needs to be initiated. This will only same the endangered shola community from further degradation.

11. Strategies and actions for data base management on wild plant diversity

There are many studies on the plant diversity of the shola forests. These need to be compiled and disseminated for wide information among all stakeholders. B.S.I. Coimbatore unit may be entrusted with this responsibility.

12. Strategies and actions for capacity building

Capacity already exists in the organisation

13. Strategies and actions for research

Mentioned in earlier Paras

14. Specific project proposals

Mentioned in earlier Paras

15. Time frame for implementation

5 years for short term measures and 10 years for long term measures

16. Strategies and actions for annual monitoring of Red listed plants

Regular research monitoring studies by permanent sample plots will have to be undertaken.

17. Identification of key elements needed for implementation

Enumerated in earlier paras

18. Any other issues: Nil

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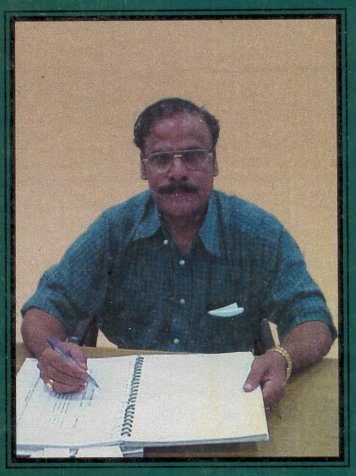

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Conserve Biodiversity