FOREST SECTOR REPORT INDIA 2010

जहाँ है हरियाली।
वहाँ है खुशहाली।।

Indian Council of Forestry Research and Education, Dehradun
(Ministry of Environment and Forests)
Government of India

Acknowledgements

This report was prepared in consultation with a team of experts and officers of the Statistics Division, Directorate of Extension, Indian Council of Forestry Research and Education. Dr. Devendra Pandey, IFS (Retired), was the Domain Expert for the task. The efforts of the Principal Chief Conservators of Forests, Chief Conservators of Forests and other forest officers of respective State Forest Departments, Officers of Forest Survey of India, Wildlife Institute of India, Directorate of Forest Education and Ministry of Environment & Forests are gratefully acknowledged. The help extended including the financial support by the Ministry of Environment and Forests is well appreciated.

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MESSAGE

Forests play a major role in supporting livelihood activities of the rural poor, contributing to the economy of India, mitigating the threat of Global Warming besides conserving the fertile soil and vulnerable wildlife. It is to be appreciated that despite the tremendous pressure of ever increasing human and cattle population, India has maintained a forest and tree cover of about 23 percent of the geographic area for the last two decades. With the advent of scientific forestry in India since, 1864, tremendous changes in the forestry sector at local, regional, national and international levels have taken place. At this juncture it has become imperative to bring out a document covering the state of forestry sector in India.

It gives me pleasure to learn that a comprehensive report on forestry sector of India entitled **"Forest Sector Report India-2010"** is being published by Indian Council of Forestry Research & Education, Dehradun with financial support from the Ministry of Environment and Forests. The report covers all the sub sectors associated with forestry like Human Resource, Natural Resource Management, Wildlife Management etc.

I would like to congratulate the DG, ICFRE and his team for bringing out this pioneering report. I am sure that the report will prove to be a handy reference for the planners, administrators, researchers and foresters for the sustainable management of forests.

(Jayanthi Natarajan)

डॉ. पी.जे. दिलीप कुमार
Dr. P.J. Dilip Kumar

वन महानिदेशक एवं विशेष सचिव
भारत सरकार
(पर्यावरण एवं वन मंत्रालय)
DIRECTOR GENERAL OF FOREST & SPL. SECY.
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FOREWORD

It is indeed a happy landmark to see the release of the India Forest Sector Report for the first time from the Ministry of Environment and Forests, Government of India. I heartily congratulate all those who have been instrumental in this task, especially the lead author, Dr. Devendra Pandey, the main coordinator at the Ministry Shri A.M. Singh, DIG (Forests), the DG ICFRE, Dr. V.K. Bahuguna and his team, particularly Shri Raman Nautiyal, Scientist - E and Shri S.D. Sharma, ADG (Statistics) at the ICFRE, Dehradun and their staff.

I am aware that strenuous efforts have been made to involve the widest range of stakeholders in this project, not least the Forest Departments of the States and UTs. Ultimately, the quality of the Report would rest on the quality of information supplied by the departments concerned. In this context, I would like to make the following suggestions for the future.

Firstly, this should become an annual feature, in order to encompass the whole gamut of activities of the Forestry Sector, both in Government and outside it. To this end, I would request both the Survey & Utilisation (SU) Division in the Ministry and the ICFRE to set up a mechanism to constantly collect information, formulate the draft of the Report, and make improvements in anticipation.

Secondly, the Report needs to cover many topics in more depth, and present good time series data in both financial and physical terms. The divisions in the Ministry themselves could yield much more data if closely examined.

Thirdly, each State or other stakeholders (e.g. chambers of industry) should see to it that information gaps are rapidly covered and a more complete picture presented in the next report. A choice had to be made this time between endlessly waiting for updates and closing this year's exercise, even if the product was not perfect in all respects. However, this at least provides a starting point and basic structure for further improvement and elucidation. No doubt colleagues all over the country will be able to come up with good suggestions and information to make the future Reports more complete and informative. I hope this will also act as an inspiration to all States and UTs to present more information for future volumes.

A few case studies could be included in boxes to highlight special achievements and feedback from the field. Ultimately, the general reader would be interested not just in inputs – what was spent – but also in outputs, and going further, in impacts in the broader economy, society and ecology.

Finally, I would hasten to record that the information is not claimed to be complete or final. Errors and clarifications, and suggestions for improvement, may kindly be sent to the main coordinators, i.e. DIG (SU) at the Ministry, or the ADG (Statistics) at ICFRE Dehradun.

(P.J. Dilip Kumar)

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PREFACE

With two per cent of the World's geographical area and supporting seventeen per cent of the world's human and cattle population the pressure on the forestry resources of India is extremely acute. Coupled with this is the fact that around 300 million people of India's over 1 billion people who inhabit the forests and fringe areas depend directly or indirectly on the forests resources for their livelihood. Today, with climate change activities on the rise the very existence of life is threatened. As such, the management of this scarce commodity is the biggest challenge for the managers and administrators of today.

Forestry sector encompasses a wide gamut of activities comprising ecosystem services, livelihood issues, Wildlife management, climate change activities, bio-diversity conservation, Non-wood Forest product management, trade, Green House Gas mitigation, to name just a few. Over a period of time forestry management in the country has changed from production oriented forestry to protection oriented and finally to conservation oriented forestry. Now forest management is people centric with benefits flowing directly to the communities managing the forests.

With the changing scenario in forestry management it was felt that there is an urgent need to publish a report documenting recent developments in the forestry sector of India consolidating data from various sources. It gives me great pleasure and pride that the Ministry of Environment & Forests has taken lead in this matter and assigned this important task to Indian Council of Forestry Research and Education (ICFRE). ICFRE accomplished this task by engaging Dr. Devendra Pandey IFS (Retd), former Director General, Forest Survey of India, who along with the core research team from the Division of Statistics, ICFRE and support from officials of various State Forest Departments (SFDs) has worked hard to bring out this publication. The financial support from MoEF in bringing out this publication is acknowledged. Shri A.M. Singh, DIG (SU) in the Ministry of Environment and Forests has been associated throughout and has coordinated the preparation of this publication at every stage. The keen interest taken by Dr. P.J. Dilipkumar, Director General of Forests & Special Secretary to Government of India, Ministry of Environment and Forests throughout the preparation is gratefully appreciated. I would also like to place on record my appreciation for all the officials of the different State Forest Departments, Forest Survey of India (FSI), Wildlife Institute of India (WII), and Directorate of Forest Education (DFE), Indian Institute of Forest Management (IIFM) who has contributed by providing data or by discussions in preparing the present publication. The technical input provided by the Division of Statistics, ICFRE is commendable. I would like to appreciate the contribution of Dr. Rabindra Kumar, former DDG (Extension), ICFRE, Shri Saibal Dasgupta, DDG (Extension), ICFRE, Shri S.D. Sharma, ADG (Statistics) and Shri Raman Nautiyal, Scientist – E, Division of Statistics, ICFRE in preparation of the report.

I am sure this publication shall prove to be a landmark in the history of forestry sector documentation and shall be referred time and again by administrators, researchers and planners in the field of forestry research and management. The gaps identified while preparing the report shall be taken care of in the future publications. However, suggestions to improve the later issues of this publication are welcome.

(Dr. V.K. Bahuguna)

THE EFFORTS .....

On the initiative and support of the Ministry of Environment and Forests, this study report was commissioned by the Indian Council of Forestry Research and Education (ICFRE). The Forest Sector Report may mean different to different people. The objective of this report has been to reflect the performance of the forestry sector. Given the time constraint of about six months it has been a very difficult task to cover all aspects of the sector comprehensively, especially when the information base as well as flow of information of the forestry sector in India at the State and Central level has not been very sound.

The report focuses on the limited aspects such as current set up of the sector, synoptic view of management status of forests and Protected Areas, various programmes and schemes including investments in forest protection, afforestation, conservation of forests, wildlife and biodiversity and their achievements, production and utilization of timber, fuel wood and few NTFPs, human resource involved in the main activity of the sector and their capacity building programmes and application of science and technology in the sector. Other areas like livelihood support, impact of JFM on forest resource and socio-economic status of stakeholders, eco-tourism, forest and wildlife offences, encroachments in forests, other human resource components, employment generation in forest sector etc., could not be covered.

It has been possible to prepare this report with great cooperation and support of the Ministry of Environment and Forests, Forest Survey of India, Wildlife Institute of India and State /UT Forest Departments. The role of ICFRE in collation and publication of this report has been very commendable. Apart from the reports and documents received from these agencies, a lot of information/data was downloaded from the respective websites of these agencies.

In addition, a large number of officials were contacted personally over phone, SMS and e-mail to procure the data. Forest Development Corporations of the State/UTs had to be separately contacted as their activities and data are often not included in the Annual Reports of the Forest Departments.

In particular I would like to thank Dr P.J. Dilip Kumar, Director General of Forests and Special Secretary to the Government of India, Ministry of Environment and Forests, Dr V.K. Bahuguna, Director General, ICFRE, Shri A.K. Bansal, Additional Director General of Forests, Ministry of Environment and Forests for the guidance and fruitful comments from time to time. Thanks are due to Mr R.K. Goel, Inspector General of Forests (EAP) Ministry of Environment and Forests, Mr A.M. Singh, DIG (SU) and Mr D.K. Sharma, DIG (NAEB) of Ministry and Mr Rabindra Kumar, former DDG (Extension), Mr Saibal Dasgupta, DDG (Extension) and Mr S.D. Sharma, ADG (Statistics), Directorate of extension, ICFRE for providing technical and administrative support.

Mr Rajesh Kumar, Sr Deputy Director and Mr Prakash Lakhchaura, Deputy Director FSI, Mr Ajay Kumar, Director Forest Education, Dr Vinod Mathur, Dean WII, Mr Anil Bhardwaj, Scientist F, Wildlife Institute of India, helped me with updated information deserves special thanks. Mr Raman Nautiyal, Scientist E, Statistics Division, ICFRE has helped me a lot in compiling, collating and presenting the data and is gratefully acknowledged.

I would like to thank some of the State/UTs officials who took personal interest by digging information from office records in respect of their State/UTs to provide the same to me like Mr V.K. Nautiyal, PCCF Meghalaya, Mr C. Madhukar Raj, PCCF Andhra Pradesh, Mr Pradeep Khanna, PCCF Gujarat, Mr S.S. Choudhury, PCCF Andman and Nicobar Islands, Mr Alok Joshi, PCCF Maharashtra, Mr V. R. Khare, PCCF (Retd.) Madhya Pradesh, Dr Parvez Ahmad, PCCF (retd.) Haryana, Mr R.K. Gupta, PCCF Himachal Pradesh, Dr Gopa Pandey, CCF (MP), Mr R. M. Dubey ,CCF Assam, Mr J.V. Sharma, CCF Uttar Pradesh, Dr N.S. Bisht, CCF Mizoram, Mr R.K Upadhyay, CCF Tamil Nadu, Mr D.M. Shukla, CCF NCT Delhi, Mr Deobrata Swain, CCF Odisha, Mr Debasish Chakraborty, CF Tripura, Mr Hebu Dole, DCF Arunachal Pradesh and many more.

Dr Devendra Pandey
Domain Expert
Forest Sector Report India 2010

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Executive Summary

India's forests face heavy pressure of human and livestock population. The total forest cover in the country is only about 69 million ha whereas human population is 1210 million, hence per capita forests is as low as 0.06 ha. About 69 per cent of India's population (833 million) live in rural areas and most of them have land based economy and use forest resources one way or the other. It is estimated that about 200 million people live in and around forests, and fully depend for their livelihood on forest resources. Further, of the 530 million livestock population in India, about 190 million fully depend on forests either by direct grazing or by harvesting of fodder causing additional burden on the forests. Despite this heavy pressure, the forest cover in the country has not declined, but rather improved in the last one and half decades.

(i) Forestry Administration and Management

Historically, India has a sound set up for forest administration and management. Scientific input to forest management was introduced about 150 years ago when the first working plan was prepared. Though the main responsibility for control and management of forests rests with State/ Union Territory (UT) Governments, the Central Government frames the policy and does overall monitoring of the forest sector. The total number of administrative units in the country as per the territorial set up is given in the following table (excluding wildlife divisions);

Unit	Circles	Territorial Forest Divisions	Ranges	Blocks	Beats
Number	197	788	4706	11,685	43,884

The Wildlife Wings of the State Forest Departments are responsible for management of National Parks, Wildlife Sanctuaries and Zoological Parks. In some States, Social Forestry works are part of territorial activities whereas in others there are separate Social Forestry divisions in most of the districts. Forest Development Corporations (FDC) exists in 21 States and one UT, of which 7 FDCs (Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, Uttar Pradesh, Uttarakhand and West Bengal) are engaged mainly in harvesting timber in respective States. FDCs in 4 States/UT (A&N Islands, Arunachal Pradesh, Bihar and Meghalaya) are sick units.

For scientific management of forests, valid working plans are in place for 535 forest divisions. Working plans for other divisions are either being revised or are yet to be prepared. Some SFDs have applied modern tools

mainly Geographical Information System (GIS) and in a few cases remote sensing is used in preparation of working plans, pioneers among them are Andhra Pradesh, Chhattisgarh, Maharashtra and Tamil Nadu. In addition about 1.84 million ha forests are under the management of 10 Autonomous District Councils (ADC) in Assam, Meghalaya, Mizoram and Tripura, which are traditionally owned and managed by tribal and local communities. Though there is no ADC in Nagaland, about 50,000 ha forest area is under the control of tribal communities and managed by them.

The Joint Forest Management (JFM) system has been in operation for about 20 years in India and has been adopted by all States. The total number of JFM Committees in the country now are 112, 896 and the forest area brought under their ambit is 24.6 million ha, till March 2010. Though there is overall increase in the number of Joint Forest Management Committees (JFMCs), the area covered under forests has decreased compared to 2006 status. There has been downward shift in number of JFMCs and forest area covered in the states of Andhra Pradesh, Himachal Pradesh, Mizoram and Punjab because many registered JFMCs were found non-functional.

(ii) Conservation of forests, wildlife and biodiversity

For conserving forests, wildlife and biodiversity India has put in place strong policies and legislation. Active judicial intervention since one and half decades has made the implementation of these legislations more effective. The Forest Conservation Act, 1980 has reduced the rate of diversion of forest land for non-forestry purposes. Prior to enactment of the Act the diversion of forest land for non-forestry purposes during 25 years (1951-1976) was 4.13 million ha, about 60 per cent of which was for agricultural purposes, whereas after the enactment 1.133 million ha forest land has been diverted during 30 years (1981 to October 2011) for developmental activities, rehabilitation of displaced families and regularization of encroachments.

The Wildlife Protection Act, 1972 has been effective in conservation and protection of wildlife and biodiversity. The amendments done from time to time have made this Act more stringent. Until September 2011, 668 Protected Areas (PAs) comprising of 102 National Parks (NP), 515 Wildlife Sanctuaries (WS), 47 Conservation Reserves and 4 Community Reserves have been constituted covering a total of 16.12 million ha of forest land. Special focus is on conservation of the flagship species '**tiger**'. 40 Tiger Reserves have been constituted encompassing an area of 4.64 million ha in 17 tiger states of India. A National Tiger Conservation Authority (NTCA) has been constituted since September 2006 for strengthening tiger conservation. The Wildlife Crime Control Bureau has been constituted by the Central Government since June 2007 to effectively

control illegal trade in wildlife. Latest tiger population estimate done in 2010, following a scientific and statistically robust approach, has estimated tiger population to be around 1706. Conservation projects have been launched by the Central Government for some critically endangered species like Snow Leopard, Gharial and Vultures through Centrally Sponsored Schemes.

Under the Man and Biosphere (MAB) Programme of UNESCO, India has constituted 18 Biosphere Reserves until August 2011 representing unique communities of biodiversity with natural and cultural landscapes wherein people are an integral component of the system. Similarly under Ramsar Convention, 25 sites have been designated as **'Ramsar Sites of International Importance'** having a total area of 0.67 million ha for the conservation and wise use of wetlands covering lakes and rivers, swamps and marshes, wet grasslands, estuaries, deltas and tidal flats, mangroves and coral reefs etc. harbouring rich biodiversity. The Central Government has also enacted the Biological Diversity Act, 2002 and established a National Biodiversity Authority in 2003 (headquarters at Chennai) for regulating activities as provided in the Biological Diversity Act. Subsequently, many State Governments have established State Biodiversity Boards to follow the guidelines of the Central Government and a good number of Biodiversity Management Committees have also been constituted by the local bodies for the implementation of the Act.

(iii) Investment in Forest Sector

Forest Sector receives budget allocations both from the State and Central Governments. In addition, there are State specific externally aided projects which are mostly in the form of soft loan from the donor country/agency. The major portion of the budget however comes from State Government's kitty consisting of committed expenditure (non-plan) and plan works. But overall allocation to the sector compared to total plan allocation of all sectors in the State Governments is meager compared with the area under forests and requirements. The allocation to Forest & Wildlife Sector during 10th Plan was only 1.29 per cent. The allocation of funds from the Central Government is on plan works against specific schemes such as National Afforestation Programme (NAP), Intensification of Forest Management (IFM), Wildlife Conservation etc. There has been an additional grant from the Finance Commission from 2005 onwards. The Compensatory Afforestation Fund lying with Compensatory Afforestation Management and Planning Authority (CAMPA) of the Ministry of Environment and Forests is also being released, since 2009. In addition, some of the SFDs involved in the implementation of the NREGA (National Rural Employment Guarantee Act) receive good funds for undertaking the activities which improve ecological stability and forest resource, besides enhancing livelihood security of the rural households. One of the main objectives of the budget allocation to the

sector is to enhance the area of forest cover of the country through afforestation and to improve the quality of the existing forests. Protection and conservation of forest and wildlife and its habitat is another major objective. Current annual allocation (in 2010-11) of funds by the Central Government to the states is approximately as under:

Schemes of Central government	**Current annual allocation (Rs. in crore)**
National Afforestation Programme	300.00
Intensification of Forest Management	80.00
Wildlife Conservation (all schemes)	265.00
Award of Finance Commission	1000.00
Compensatory Afforestation Fund	1000.00
TOTAL	**2645.00**

In addition, there are 11 externally aided State Sector Forestry Projects implemented in states, namely, Gujarat, Haryana, Himachal Pradesh, Karnataka, Odisha, Rajasthan, Tamil Nadu, Tripura, UP and Sikkim with a total budget of about Rs. 6,453 crore (to be spent in about 6 to 7 years), all of which are funded by Japan International Cooperation Agency (JICA), one project by the World Bank has just concluded in Andhra Pradesh and another project assisted by JICA has also concluded in Rajasthan. The project components in each case cover a wide range of issues of the forest sector, and broadly include livelihood promotion, afforestation, forest management, institutional strengthening, protection & conservation of biodiversity of forests. There is one more project under Central Sector titled "Capacity Building for frontline staff in Forestry Sector" with an outlay of Rs. 225 crores funded by JICA and implemented in 11 states.

(iv) Achievements in Forest Plantations

National Afforestation and Eco-development Board (NAEB) of the Ministry of Environment and Forests monitors tree plantation and afforestation activities within the forest land done by the SFD's including the achievements of National Afforestation Programme (NAP). Tree plantations outside the forest land are done by other Departments of the State Governments under 20-Point Programme (TPP). The overall physical target of tree plantation of a State under TPP is fixed by the Ministry of Environment and Forests in consultation with the States/UTs. The States/UTs are required to furnish progress report of tree plantations and

raising seedlings to the Ministry of Statistics and Programme Implementation (MSPI) who in turn compiles it on monthly basis and puts it on the website. As per the compilation by MSPI, tree plantations in the country under 20-point programme by all the departments including Forests during 2005-2010 was of the order of 1.5 to 1.6 million ha per year, and the average number of seedlings raised was about 120 million per year. The SFD's contribution was about 0.82 million ha or almost half of the TPP achievements, of which 0.2 million ha are under Assisted Natural Regeneration (ANR). The ANR enriches the existing forests by improving its quality but does not add to the increase in the area of forest or tree cover. However, reliable statistics about the total area or area under different species of successfully raised plantations are not available. There is also no proper monitoring mechanism in place to ascertain the area of tree plantations actually raised under 20-point programme. The total area under teak plantation is estimated to be about 1.673 million ha of which major contribution comes from Maharashtra, Madhya Pradesh, Andhra Pradesh, Karnataka, Chhattisgarh, Gujarat, Tripura and Mizoram.

(v) Application of Science and Technology in the Forest Sector

In the past application of science focused on forest plantations and the thrust was on productivity enhancement through tree improvement, site management, pest and disease management as well as afforestation and reforestation of difficult sites. This has been continued even now. The private sector has joined hand in mass multiplication of clonal seedlings for raising high yielding plantations specially, of Eucalyptus, Poplar and Su-babul.

Since last few decades the application of computer, remote sensing and GIS has been initiated in forest resource assessment by national agencies. Using this technology the Forest Survey of India has assessed the forest cover of the country 11 times and also conducted national forest inventory. Many SFDs have also started the use of these modern tools specially GIS and Global Positioning System (GPS) in forest management and in the preparation of working plans since about a decade. Application of Information & Communication Technology (ICT) and e-Governance has also been roped in by many SFDs in recent past. Web based Forest Management Information Systems (FMIS) have been launched where information on various forestry activities are quickly uploaded. Handy equipment like mobile phones, Personal Digital Assistant (PDA) and Global Positioning System (GPS) has been provided to field staff at least up range level, which facilitates fast data collection and reporting. Using Moderate Resolution Imaging Spectroradiometer (MODIS) satellite data near real time monitoring of

forest fires on daily basis is being done in which active fires points are detected by the thermal band. This has helped in alerting the forest field staff responsible for controlling the forest fire and taking timely actions.

Remote sensing and GIS are used even in the conservation of wildlife and biodiversity as it helps in identification and demarcation of such areas. For tiger census a more objective and scientific approach has been developed by the Wildlife Institute of India in association with National Tiger Conservation Authority where tigers are individually identified by camera traps in a capture-recapture statistical framework. The entire landscape where tigers are likely to occur are sampled treating forest beat as a sample unit. GPS is provided to field staff for data collection and the analysis is done in a GIS domain. Further, the information generated by DNA-based molecular tools on the genetics of extinct populations is used in designing conservation strategies and framing management policies. A Wildlife Forensic Cell established at Wildlife Institute of India, Dehradun has developed and standardized various techniques for identifying species from varied biological products reported in trade such as hair, bone, claws, teeth, skin, and meat.

Availability of modern mechanical, electrical and electronic tools has helped technology interventions with regard to wood-based industries in India. The technological interventions in plywood manufacture, veneering, storage and preservation, dying, gluing and preservative treatment have helped in manufacture of all grades of wood panels of international standards.

(vi) Production, import and utilization of timber and fuelwood

The timber production from government forests in India has declined over the years due to increasing emphasis on conservation of forests and biodiversity. The annual production at present is only about 2.4 million m^3 which is 5% of the total timber produced and consumed in the country. The major timber producing states are Madhya Pradesh, Uttarakhand, Uttar Pradesh and Himachal Pradesh each producing more than 2.5 lakh m^3. Chhattisgarh, Andhra Pradesh, Haryana and West Bengal produce between 1.5 to 1.75 lakh m^3. About 60% of the total timber is harvested by the State Forest Development Corporations.

Most of the timber produced in the country comes from Trees Outside Forests (TOF) grown in private lands under agro-forestry, along the roads, canal, homesteads etc. However, reliable data of timber produced from TOF is not available. Based on the growing stock of TOF and average rotation of the tree species, the annual production of timber from TOF has been estimated by the Forest Survey of India (FSI) to be 44.3 million m^3 in the country.

A substantial quantity of the wood and wood products is also imported into the country, the accurate account for which is maintained by the Directorate General of Commercial Intelligence and Statistics (DGCIS), Ministry of Commerce, Government of India. The quantity of imported wood has been rising over the years. The total quantity imported during 2009-10 was about 6 million m^3 costing about Rs. 7688 crores, of which round logs constituted more than 90%. Bulk of the import is from Malaysia, Myanmar, New Zealand, Ghana, Ivory Coast, and Gabon.

Using National Sample Survey Organization (NSSO) survey data on household expenditure of 2005, FSI has estimated the total fuelwood consumption in household sector as 248 million m^3 and about 13 million m^3 in hotels and restaurants, cottage industries and cremation of dead human bodies, giving a total annual consumption in 2010 of around 261 million m^3. Based on other studies, FSI has also estimated that production of fuelwood from forests was 52 million m^3, and remaining 209 million m^3 came from farmland, community land, homestead, roadside, canal side and other wastelands.

The timber produced in the country is consumed mainly by three categories of wood based industries, i.e. saw mills, paper mills, and plywood industries, all in private sector. Reliable data on consumption of timber by each category is lacking. Saw milling industry is the largest consumer of timber with estimated consumption of about 29 million m^3. The major percentage of sawn wood is consumed in construction, mainly in housing and partly in packing, furniture, etc. The total number of saw mills in seven states mostly from north India is about 26,000, consuming 8.1 million m^3 timber. In plywood, veneer and composite wood category, there are 62 large and medium-sized mills and over 2,500 small scale industries consuming about 19 million m^3 timber. The total number of paper and pulp mills in India is around 660, out of which only 25 mills are wood & bamboo based and the rest are agro & recycled fibre based. The demand of raw material for forest based paper mills in 2010 was estimated to be about 9 million tons. Many large wood based paper mills have entered into arrangement with local farmers for growing trees in their farm land to supply raw material for their mills. The farmers are provided financial and technical assistance. These plantations have excelled in productivity because of the use of genetically improved high yielding clonal planting materials.

Forest sector occupies an important place in India's economy in terms of its contribution to Gross Domestic Product (GDP), employment and livelihood of poor people. The share of the forest sector in GDP has declined over the years from 2.6% in 1950s to 0.67% in 2007-08 due to higher growth in other sectors and also due to under valuation of the forest products. The average annual growth

in GDP of forest sector during 1950-2006 was 0.9% against growth in overall GDP of 4.6%. Values of two important components; timber produced from trees outside forests and fodder of those livestock who fully depend on forests have been recently included. These two additions made a sharp rise in GDP estimates of the sector at 'current prices' to Rs. 88,000 crores for the year 2008-09, pushing the contribution to 1.70% of the total GDP of the country.

(vii) Harvesting and Marketing of Non-Timber Forest Products (NTFPs)

More than 800 types of Non-Timber Forest Products (NTFPs) are harvested in India, but reliable data on harvest of only a few are available which are often in the category of nationalized NTFPs. The harvest and collection of a large number of NTFPs by local people go unrecorded. After the enactment of Panchayats (Extension to Schedule Areas) Act, 1996 (PESA) there has been significant change in the management and trade of NTFPs, as the ownership right of NTFP has been bestowed to Gram Sabha. Some state governments like Bihar, Jharkhand have fully transferred the harvest/collection and trade activity of NTFP to Gram Sabha and do not keep any account of its production and sale value. In other states though the management and trade of NTFP remains in the public sector, the net profit is transferred to the Gram Sabha. The total annual production and the estimated value of three important NTFPs at national level in recent years have been as follows;

NTFP	Production in tons	Value (Rs. in crore)
Tendu leaf	4,08,00	1,000
Bamboo	8,21,000	420
Resin	28,000	110

In terms of value, almost 90% of the tendu leaf is produced by Madhya Pradesh, Chhattisgarh and Odisha. Andhra Pradesh, Gujarat, Jharkhand, Maharashtra, Rajasthan, Uttar Pradesh and West Bengal are other tendu leaf producing States. Resin is mainly produced by Himachal Pradesh, Uttarakhand and Jammu & Kashmir, and a small quantity by Arunachal Pradesh. However, bamboo occurs in most of the States/UTs of the country. FSI in its recent State of Forest Report has estimated that forests having bamboo clumps occupy an area of about 13 million ha with total growing stock of about 169 million tonnes. About 28 per cent of the total bamboo area with 66 per cent of growing stock is located in Northeastern India. Other States rich in bamboos are Madhya Pradesh,

Chhattisgarh, Maharashtra, Odisha, Andhra Pradesh, Karnataka, and the Union Territory of Andaman and Nicobar Islands. A lot of bamboo is given to the local people/tribals under NISTAR rights either free or on nominal royalty cost to meet their domestic/livelihood needs. Many states do not keep account of bamboo given free of cost, because local people collect it themselves, specially in the Northeastern States. Bamboos given on nominal cost to local people/ artisans in six States (Andhra Pradesh, Chhattisgarh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra) number about 19.5 million annually, equivalent to 2,34,000 tons. The price ranges between Rs. 5 to Rs. 15 according to length and quality, where as market price is more than five times of same. For promoting bamboo resource, capacity building of artisans and marketing of bamboo products, a 'National Bamboo Mission' has been launched by the Ministry of Agriculture in December 2006 which is implemented by SFDs in most of the states. The annual budget of the mission for the country is about Rs. 100 crores.

(viii) Human Resource and Capacity Building

Forest Sector has an organized and uniform hierarchical structure of human resource in states. The hierarchy consists of various levels of officers and field staff which form the professional and technician levels of the human resource. In addition there are supporting staff for technical and administrative activities like ministerial and accounts staff, surveyors, drivers etc. Indian Forest Service officers recruited by the Central Government form the highest line of command and occupy top positions. State Forest Service officers recruited by state governments form the second line of command. The Field Executive Staff (from Forest Ranger to Forest Guard) responsible for all field operations are recruited by the State Governments. Category-wise sanctioned strength, filled in positions and vacancy as in March 2010 are given in the following table:

Category	Sanctioned strength	In position in 2010	Vacancy in 2010
Indian Forest Service (IFS)	3,034	2,650	284
State Forest Service (SFS)	3,337	2,734	603
Field Executive Staffs	134,309	109,685	24,624
Forest Rangers	9,881	7,731	2,150
Deputy Rangers	7,118	6,052	1,066
Foresters	32,459	28,206	4,253
Forest Guards	84,851	67,696	17,155

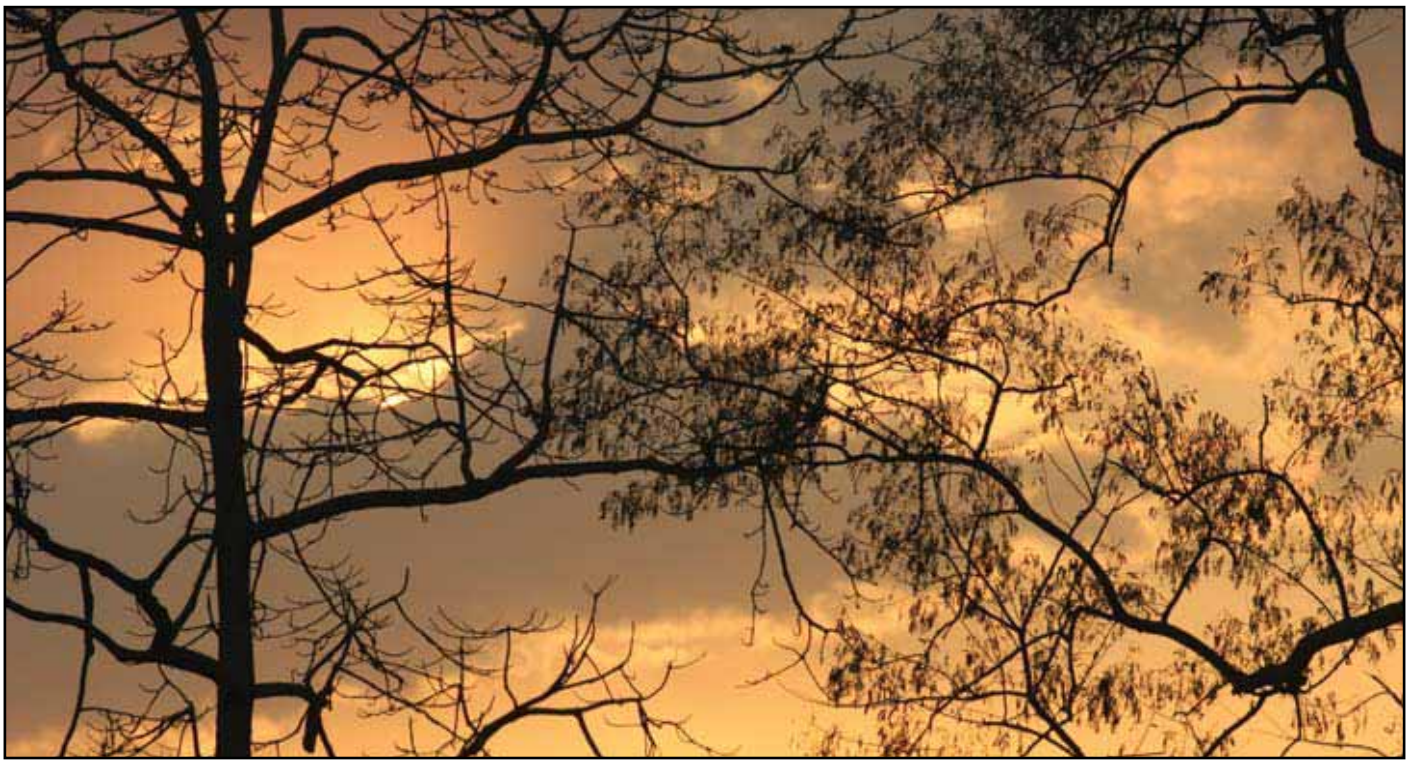
More than 18% posts are vacant at SFS and field executive staff levels. The vacancy position in respect of Forest Rangers and Forest Guards is critical where more than 20% posts are vacant. As reported by states there has been no direct recruitment of field staff in Bihar and Jharkhand for more than 20 years, and in Punjab since 1998. Further, the increase in strength of field executive staff over the last 40 years compared to 1972 is only about 30 per cent, although the roles and responsibility of the sector have increased manifold during this period due to increased population pressure, encroachments on forest lands, poaching of wild animals, increased accessibility to forests, enactment of new laws etc.

The induction training of Indian Forest Service (IFS), State Forest Service (SFS) and Forest Rangers is organized and controlled by the Central Government. A two years induction training of IFS officers is given at Indira Gandhi National Forest Academy (IGNFA), Dehradun and of State Forest Service (SFS) officers at Central Academy for State Forest Service, Dehradun and Coimbatore through Directorate of Forest Education (DFE). The induction training of the Forest Rangers of one and half year duration is also controlled by the DFE even if conducted in some of State-run Ranger's Colleges. The responsibility of imparting training to the lower field executive/front line staff, i.e., Deputy Rangers, Foresters and Forest Guards lies with the respective State/ UT Governments. For this purpose there are 65 State Forest Training Schools in 26 States/UTs.

There are other short-term mid-career training courses for different levels of officers. A Mid Career Training (MCT) programme has been launched for IFS officers since 2009, and is organized by Indira Gandhi National Forest Academy (IGNFA) where different level of officers are trained for 4 to 8 week duration. The DFE organizes short-term Refresher Courses of 2 week and Theme Based Workshops of 1 week duration for in-service SFS and Range Forest Officers. Central government supports SFDs for organizing Refresher course for other front line staff. There is also an externally aided JICA project for improving infrastructure, course curriculum and teaching methodologies in the State Forest Training Schools since 2008-09. In addition, a number of institutions under Ministry of Environment and Forests like Wildlife Institute of India (WII), Dehradun, Indian Institute of Forest Management (IIFM), Bhopal, Forest Survey of India (FSI), Dehradun, Forest Research Institute (FRI), Dehradun, Indian Plywood Industries Research and Training Institute (IPIRTI), Bengaluru, offer specialized courses of long and short durations for senior officers and staff upto Forest Rangers.

Chapter : 01

Introduction



1 Introduction

1.1 India's profile – Demography and Land use

India is a densely populated country with high pressure on land and forest resources. The total geographic area of the country is 32,87,240 km^2 (327.8 million ha) and the population is 1,210 million (census 2011) which gives population density of 382 persons per km^2 and 0.06 ha per capita forest. It is the 7th largest country comprising 2.4 per cent of the World's geographic area, and 1.8 per cent of its forests, but supports 17.5 per cent of its population. The population of India is almost equal to be combined population of USA, Brazil, Indonesia, Pakistan, Bangladesh and Japan. Comparing with USA, India's geographic area is almost 1/3rd of the area of USA whereas the population is 4 times, thus population density is 12 times of that of USA.

About 68.8 per cent of India's population (833 million) lives in rural areas, and most of them have land based economy which uses forest resources one way or the other. It is estimated that about 200 million people live in and around forests, and fully depend for their livelihood on forest resources. In addition, the livestock population of India is about 530 million as per the 18th Livestock Census, 2007 (MoA 2010) and has registered a growth of 9.2 per cent during 2003 to 2007. About 38% of livestock depend on fodder derived from forests by direct grazing or by

harvesting, causing additional burden on the forests, and is responsible for forest degradation.

Though India's major area falls in the tropical zone, due to large altitudinal variations and presence of high mountains there exist almost all the climatic conditions, from hot to cold deserts and from arid to wet areas. Topographically, the country is divided into 4 broad regions: (i) The Himalayan Mountains in the north contain the cold deserts and fertile valleys, (ii) The vast Indo-Gangetic Plains formed by the basin of three distinct river systems - the Indus, the Ganges and the Brahmaputra, the flat, fertile and most densely populated area, (iii) The region comprising the Great Thar Desert in the West comprising major part of Rajasthan and lower regions of Punjab and Haryana and Rann of Kutch in Gujarat and (iv) The Southern (Deccan) Peninsula bounded by the Western and Eastern Ghats and, the Coastal Plains and Islands which are also densely populated.

Of the total 327.8 million ha geographic area of the country, the land-use statistics of 23 million ha are not available, as approximately 12 million ha is under the occupation of Pakistan and China and about 11 million ha is under permanent snow or in inaccessible region. Further, about 42 million ha area has been used for constructing roads and railway tracks, stations and in habitation under cities and villages. The detailed land-use is given in Table 1.1. It can be seen that in addition to 69 million ha area under forest land-use, only about 183.5 million ha is cultivable. Though, net sown area under agriculture is only 141 million ha, other cultivable lands are also in one or other type of cultivation and encroachment.

Table 1.1: Land-use statistics of India in 2009 (million ha)

Geographical area of India	328.7
Reported area (excludes area under Pakistan & Chinese occupation and snow covered and inaccessible areas)	305.8
Forests	69.7
Not available for cultivation	42.2
Permanent pastures	10.5
Misc. tree crops and groves	3.4
Cultivable wasteland	13.2
Current fallow	14.8
Other fallow	11.2
Net sown area	140.9

India's economy is agriculture based with major per cent of people living in rural areas, and many millions of them are land-less. The distribution of size of land holdings is highly skewed. Though the average land holding per house hold (HH) is 1.33 ha, about 62 per cent house hold have less than 1 ha with an average of 0.40 ha land comprising only 18 per cent of the total operational holdings. On the other hand 18 per cent house hold own 63 per cent operational lands.

1.2 Historical Aspect of Forest Management

India had rich forest resource in the past due to favorable climatic and edaphic conditions, extending over major part of the country. Clearing of forests for cultivation, food, shelter and pasture and selective removal of valuable timber trees adversely affected the resources. The owners of the forests were interested only in collection of revenue. In the early days of

establishment of British rule in 1800s, the accessible forests suffered due to large scale felling of valuable timber trees. The forests of western coastal tract were heavily exploited for teak (*Tectona grandis*) and other timber required for the Navy. Later, Britishers began to realize that forests were not so inexhaustible and there was need for conservancy, leading to introduction of systematic working and regeneration measures. The earliest move in this direction was an appointment of an officer (Conservator of Forest) in 1806 in Madras, but only to organize timber exploitation and supplies from the West Coast (Anon 1961). The operations of cutting down of trees were extended to the whole country in public as well as private forests, and nothing was done to conserve and regenerate them. It was only in 1842, that action was taken by the Collector of Malabar Mr. Conolly to raise teak plantations near Nilambur to replenish those forests which had vanished due to careless exploitation. Subsequently, Dr. D. Brandis while working as Superintendent of Forests in Pegu, Burma (now Myanmar) since 1856, prepared the first Working Plan for a period of 5 years for the management of Pegu forests. For the first time he estimated the growing stock of forests size class-wise by introducing Linear Valuation Survey, and then the rates of growth of teak by extensive ring counting. This is considered as the beginning of scientific forestry in India. After appointment as the first Inspector General of Forests (IGF) in 1864, Dr. Brandis initiated the Working Plan preparation in other selected valuable forests. However, owing to scanty untrained staff, and heavy work load of survey, settlement, demarcation, fire protection, the progress till 1884 was very slow and only 282 km^2 forests owned by Government of India was brought under sanctioned Working Plan and practically nothing was done in Bombay and Madras Presidencies (Anon 1961).

In 1884, the control of preparation of Working Plans and management of government forest were centralized with Inspector General of Forest (IGF) by the Government of India. There was an immediate spurt in the preparation of working plan activities all over the country. During the next 15 years by 1899, Uttar Pradesh which was the first province to constitute a Working Plan division, and covered 8,700 km^2 under working plan, covered about 75 per cent of the forest area of the province. Similarly, other provinces like Central Provinces, Punjab, Bihar and Bengal also progressed well. The preparation of working plans by Bombay and Madras presidencies was controlled locally. They also covered about 6,400 km^2 and 321 km^2 of forests area respectively by year 1898 (Anon 1961). During the period of 1884 to 1914 not only did the area under working plans increase, but it was also written more systematically and in

a standardized form. The working plans were brief and simple and the forest areas were not cut up into compartments, and the stock mapping was not usually done, possibly for want of maps on suitable scales. There was a serious paucity of data and maps.

The out-break of First World War during 1914 to 1919 led to unsystematic large scale felling of trees. However, the scenario changed immediately after the war as there was a fresh and heavy recruitment of Indian Forest Service (IFS) Officers to prepare the working plans, and also good maps on suitable scale were obtainable from the Survey of India laying special emphasis on survey of forest areas. It was possible to divide the working plan areas into blocks and compartments and also make detailed stock maps. The Working Plan Officers had more definitive information about the areas, silvicultural characters of species, growth and yield statistics from the research output which came from Forest Research Institute (FRI) established in 1906. The quality of working plans prepared after 1919 was generally high. Some administrative changes again took place in 1935 adversely affecting the progress of working plans, when the recruitment of IFS officers was stopped and the central control on the preparation of working plans was lost. The Second World War during 1939-45 gave a further set-back to the working plans. The expired working plans could not be revived, and tree felling in forests was in total disregard of working plans, mainly to meet the requirements of the war (Anon 1961).

It is to be noted here that during the pre-independence era, the forests in India were owned by the public, princely states and individuals. Only those forests which were owned by the public (central and provincial governments and presidencies) were put under working plans for management. The recorded total area of forests available with British India was only 34.76 million ha, of which about 74 per cent area was covered under working plans by 1947. These working plans helped in managing the forests at local and divisional level effectively. The knowledge of the forest resource at the national or sub-national level was however lacking except for the area under forests.

After independence in 1947, revision of many major working plans was taken up in most of the states. The revised working plans were in general further improved as the technique of partial enumeration was standardized and additional data on growth and yield was collected. The preparation of stock maps became more detailed. After political integration and abolition of proprietary rights in forests of feudal states especially of Saurashtra, Mysore, Madhya Bharat, Kashmir and Vindhya Pradesh, a big addition to the forest areas took place. The recorded forest area almost doubled to 71.8 million ha in 1950-51, and upto 74.8 million ha in 1970-71. Most of the forests under feudal states had only primitive forms of working, with practically no working plans to regulate their management. It was therefore necessary to do the spade work first such as survey, demarcation, mapping and giving legal status to these forests. Thus, besides revising the existing working plans, preparation of working plans for the 'newly acquired' forests became an important responsibility

of the provincial governments. During the period of 8 years (1949 to 1957), an additional forest area of 5.52 million ha was brought under working plans (Anon 1961). The process of notifying additional forests under recorded forest category and bringing more forest areas under working plan continued. Preparations of working plan had remained under the control of provincial governments.

1.3 Forest Policies

The *First Forest Policy* was promulgated by the Government of India in 1894. The sole objective of the policy was the maintenance of adequate forests. The management was directed towards promoting the general well-being of the country, meeting the needs of local people and to maximize the revenue collection. The two World Wars resulted in over exploitation of the timber and consequent degradation of forests.

In the post independence period there were many political initiatives, and after acquisition of large forest areas from princely states and "Zamindaries", the Forest Policy of 1952 was enunciated. The policy recommended bringing 33 per cent of the total land area of the country under the forest cover. However, its focus remained on sustainable timber production to meet the increasing requirements of defence, communication and industry without much emphasis on management of non-commercial species and Non-Timber Forest Products (NTFPs). It provided control over all remaining forests in private ownership, containment of shifting cultivation, and creation of village forests. In addition, it recognized the multiple functions of forests and underlined the importance of their protection, and contribution in watershed management, wildlife conservation as well as their role in improving soil fertility and agricultural productivity.

The National Commission on Agriculture in its interim report in 1972 emphasized production forestry (man-made forests) and recommended creation of Forest Development Corporations for enhancing the investment through bank financing and raising of large scale plantations through social forestry. Further, by 42nd amendment of the constitution in 1976 the subject "Forest" was shifted to the concurrent list of the constitution from the state list. Subsequently, a Central Act "Forest Conservation Act, 1980" was enacted to control the diversion of forest land for non-forestry purpose. It became mandatory for the states to take approval of the Government of India before diversion of any forest land for non-forestry purpose with a provision for compensatory afforestation. In January 1985, the subject of Forestry and Wildlife was shifted from the Ministry of Agriculture to Ministry of Environment and Forests, the new ministry created in the Central Government to ensure focused attention for emerging forestry issues.

A new National Forest Policy was promulgated in 1988. It marked a major departure from the 1952 policy by laying prime emphasis on environmental stability and conservation of forests, while meeting the domestic requirements of fuelwood, fodder, minor forest produce and construction timber for rural and tribal population and their participation in

protection and management of forests. The derivation of economic benefits has been subordinated to this principal aim. The policy states that forest based industries should raise the raw material needed for meeting their own requirements as far as possible, preferably by establishing a direct relationship with individuals who can grow raw material. This policy has also maintained the national goal of having a minimum forest and tree cover of the total land area of the country to be 33 per cent. In hills and mountainous regions, the aim should be to maintain two-third of the area under such cover, to prevent erosion and land degradation as well as to ensure the stability of the fragile ecosystem. Conservation of natural heritage in the country by preserving natural forests with their vast variety of flora and fauna, which represents the remarkable biological diversity and genetic resource of the country, has been emphasized.

Till early 1970s, the forestry administration had followed the traditional system of management and had little interaction with the local people. Though local people and tribals living in and around forests were able to meet their sustenance needs from forests and from work labour with the department but they had no role in its management. Their increasing population resulted in increasing need of forest products and created conflicts with the forestry administration. It was therefore essential to have a change in approach of the forestry administration. As a follow-up of the new National Forest Policy 1988, the Ministry of Environment and Forests issued detailed guidelines in June 1990 for people's involvement in forest conservation and management mainly of degraded forests through an appropriate village level organization, often termed as "Joint Forest Management" (JFM) with the assistance of committed voluntary agencies/Non-Government Organization (NGOs) with proven track record. It also laid emphasis on the procedure of sharing of usufructs and a share of the net sale proceeds with local village communities. The voluntary agencies/NGOs working as interface between local village communities and the State Forest Department are not entitled to usufructory benefits. The Ministry issued supporting circulars in February 2000 and December 2002 for strengthening the JFM programme in the country. Most of the states accordingly issued government orders/resolutions facilitating participation of people in forest protection and management on the basis of the guidelines and circulars of the Ministry of Environment and Forests, and are implementing JFM in their respective areas. This has brought about a revolutionary reform in the forest sector of India.

1.4 Forest Resources

Because of the varying climatic conditions and topography, a large number of species of plants and animals occur in the country, giving rise to variety of forest types and rich biodiversity. The two famous foresters of India, Champion and Seth (1968) after traversing the country's forests and studying in depth, have classified India's forests into 16 broad categories (type groups) which were further divided into 200 types on the basis of climate, topography and soil which include tropical, sub-tropical, temperate, dry and moist deciduous as well as wet evergreen forests. Though the major area of the forest, specially in the post independence period, has been managed under the prescription of working plans, details of forest resource at state or national level were not estimated. The available information was the details of the notified forests (recorded forest area) irrespective of the fact whether the land bears trees or not. The actual forest cover of the country was assessed for the first time in 1987 by Forest Survey of India (FSI), a national organization under the Ministry of Environment and Forest, in association with National Remote Sensing Agency, Department of Space.

FSI has been mandated for assessing and monitoring the forest resource of the country periodically. The forest cover is being assessed using satellite images and following wall to wall approach every two years since 1980s. So far the forest cover has been assessed eleven times. As per the report of Forest Survey of India published in 2009 (FSI 2009), the total forest cover of the country has been assessed to be 69.09 million hectares, which constitutes about 21 per cent of the geographic area of the country. The forest and tree cover together constitute 78.37 million hectare. While assessing the forest cover through digital interpretation, they are classified into three canopy density classes which are as follows:

- Very dense forest (VDF) with canopy density more than 70 per cent.
- Moderately Dense Forest (MDF) with canopy density between 40-70 per cent and,
- Open Forest (OF) with canopy density between 10 - 40 per cent.

Scrub, which is degraded forest land with canopy density less than 10 per cent, is not considered a part of forest cover. The area under each of these density classes is shown in Table 1.2. State-wise forest cover is given in Appendix 1.1.

Further, a review of the past assessments shows that forest cover of India has shown an increasing trend in the last decade despite the ever increasing pressure on forests due to population growth (details

Table 1.2: Forest & Tree Cover of India in 2007

Class	Area (million ha)	% of Geographical Area (G.A.)
Forest Cover		
VDF	8.35	2.54
MDF	31.90	9.71
OF	28.84	8.77
Total Forest Cover	69.09	21.02
Tree Cover	9.28	2.82
Total Forest & Tree Cover	78.37	23.84
Non-forest		
Scrub	4.15	1.26
Non-forest	255.49	77.72
Total G.A.	**328.73**	**100.00**

in Appendix 1.2). The forest cover has increased from 65.96 million ha in 1999 assessment (satellite data pertaining to 1997) to 69.09 million ha according to the current assessment (satellite data pertaining to 2006-07) i.e. an increase of 3.13 million ha (4.75 per cent) in about 10 years. It is worth noting here that there have been significant changes in the resolution and quality of satellite data, methodology of interpretation, scale of mapping and classification scheme, and the decadal data of forest cover, therefore, may not be strictly comparable. In the above comparison normalization was done to reduce the effects of methodology and technology changes to some extent, so that an estimate of the real change in the forest cover can be elicited.

The area of forests by forest types provides a basis for characterizing forests in terms of floristic composition and ecological value, and thus, is very useful for developing management regime of forests. Recently, FSI has done mapping of forests of India by forest types on 1:50,000 scale in GIS framework using relevant layers like soil, rainfall, temperature alongwith the remote sensing data, working plans details, thematic maps of FSI and inventory information etc. The classification of Champion & Seth (1968) has been followed. It has been found that broadly, about 12 per cent of the country's forests fall in the Tropical Evergreen category, 34 per cent in the Tropical Moist Deciduous, 30 per cent in the Tropical Dry Deciduous, 5 per cent Tropical Thorn, 6 per cent Subtropical Pine and about 11 per cent in Himalayan Temperate category.

Forest Survey of India also estimates the growing stock of woody volume of forests which is an important indicator of forest health and productivity. In the recent past, this information has gathered further importance due to its role in climate change in which biomass and carbon stock of forest are to be estimated. A statistically robust design is followed for

conducting National Forest Inventory (NFI), under which trees outside forests (TOF) are also sampled and their diameter distribution and volume estimated. As per India State of Forest Report 2009, the growing stock of forest as well as trees outside forest based on about 50,000 sample plots have been estimated to be about 6.1 billion m^3, the break up is mentioned in the following Table 1.3.

Table 1.3: Growing stocks of forests and Tree Outside Forest (TOF) of India in 2007.

Category	Growing Stock (million m^3)
Forests	4,499
TOF	1,599
Total	**6,098**

The National Forest Inventory (NFI) also provides the species details. Though there are more than 1,000 tree species reported in the country, about 700 have been recorded during NFI in various forest types, some of which occur more frequently and occupy substantial proportion of forests. The species occupying the major portion of the growing stock of the forest are *Shorea robusta* (8.53 per cent), *Tectona grandis* (4.59 per cent), *Pinus roxburghii* (3.10 per cent), *Terminalia crenulata* (3.06 per cent), *Anogeissus latifolia* (2.80 per cent), *Abies pindrow* (2.47 per cent), *Quercus semecarpifolia* (2.15 per cent), *Cedrus deodara* (2.05 per cent), *Pinus excelsa* (2.03 per cent), *Abies smithiana* (1.98 per cent). In case of the trees outside forest segment, *Mangifera indica* contributes the maximum volume of about 10.36 per cent in the total growing stock followed by *Cocos nucifera, Madhuca latifolia* and *Azadirachta indica* having a contribution of 5.71, 4.18 and 4.15 per cent, respectively.

Bamboo forms a very important component of the India's forest resource. Besides industrial use for making high quality paper, it serves as a 'ready to use' construction material for subsistence forest dwelling communities and other low income people and a lot of livelihood support for millions of rural Indian. It is a versatile raw material for a variety of products in the cottage industry. There are about 17 bamboo species that have been identified during NFI of which *Dendrocalamus spp, Melocanna spp* and *Bambusa spp* form the bulk. Though bamboo occurs in most of the states of the country as an understorey of the tree crop, there are also pure forests of bamboo (bamboo breaks) stretching to several hundred hectares in North-Eastern states and Andaman and Nicobar Islands. The occurrence of bamboo is more in Madhya Pradesh, Maharashtra, Chhattisgarh, Odisha, Andhra Pradesh and Karnataka. The forest area having bamboo clumps is about 13 million ha, and the estimated biomass of green bamboo is about 169 million tonnes (FSI 2011).

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Appendix 1.1

Forest cover in States/UTs in India in 2007

(area in km²)

State/UT	G. A.	Forest Cover				% of G.A.	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total		
Andhra Pradesh	2,75,069	820	24,757	19,525	45,102	16.40	10,372
Arunachal Pradesh	83,743	20,858	31,556	14,939	67,353	80.43	111
Assam	78,438	1,461	11,558	14,673	27,692	35.30	179
Bihar	94,163	231	3,248	3,325	6,804	7.23	134
Chhattisgarh	1,35,191	4,162	35,038	16,670	55,870	41.33	107
Goa	3,702	511	624	1,016	2,151	58.10	1
Gujarat	1,96,022	376	5,249	8,995	14,620	7.46	1,463
Haryana	44,212	27	463	1,104	1,594	3.61	145
Himachal Pradesh	55,673	3,224	6,383	5,061	14,668	26.35	327
Jammu & Kashmir	2,22,236	4,298	8,977	9,411	22,686	10.21	2,036
Jharkhand	79,714	2,590	9,899	10,405	22,894	28.72	683
Karnataka	1,91,791	1,777	20,181	14,232	36,190	18.87	3,176
Kerala	38,863	1,443	9,410	6,471	17,324	44.58	58
Madhya Pradesh	3,08,245	6,647	35,007	36,046	77,700	25.21	6,401
Maharashtra	3,07,713	8,739	20,834	21,077	50,650	16.46	4,157
Manipur	22,327	701	5,474	11,105	17,280	77.40	1

Contd...

Meghalaya	22,429	410	9,501	7,410	17,321	77.23	211
Mizoram	21,081	134	6,251	12,855	19,240	91.27	1
Nagaland	16,579	1,274	4,897	7,293	13,464	81.21	2
Odisha	1,55,707	7,073	21,394	20,388	48,855	31.38	4,852
Punjab	50,362	0	733	931	1,664	3.30	20
Rajasthan	3,42,239	72	4,450	11,514	16,036	4.69	4,347
Sikkim	7,096	500	2,161	696	3,357	47.31	356
Tamil Nadu	1,30,058	2,926	10,216	10,196	23,338	17.94	1,206
Tripura	10,486	111	4,770	3,192	8,073	76.95	75
Uttar Pradesh	2,40,928	1,626	4,563	8,152	14,341	5.95	745
Uttarakhand	53,483	4,762	14,165	5,568	24,495	45.80	271
West Bengal	88,752	2,987	4,644	5,363	12,994	14.64	29
A & N Islands	8,249	3,762	2,405	495	6,662	80.76	53
Chandigarh	114	1	10	6	17	14.91	1
Dadra & Nagar Haveli	491	0	114	97	211	42.97	1
Daman & Diu	112	0	1	5	6	5.04	3.0
Delhi	1,483	7	50	120	177	11.94	1
Lakshadweep	32	0	16	10	26	82.75	0
Puducherry	480	0	13	31	44	9.14	0
Grand Total	**32,87,263**	**83,510**	**3,19,012**	**2,88,377**	**6,90,899**	**21.02**	**41,525**

G.A. = Geographical Area
(*Source* FSI 2009)

Appendix 1.2

Time series of forest cover of India showing the transformation with respect to methodology changes for making the area figures comparable

(area in km^2)

State of Forest Report (SFR) year	Forest cover (as reported in SFR)	Smoothened forest cover (using moving average of three)	Forest cover corrected for change in scale	Forest cover corrected for change in scale and inclusion of small patches	Forest cover corrected for change in scale inclusion of small patches & vector approach
1	2	3	4	5	6
1987	6,40,819	**			
1989	6,38,804	6,39,662	6,23,031	6,50,444	6,62,803
1991	6,39,364	6,39,185	6,22,566	6,49,959	6,62,308
1993	6,39,386	6,39,210	6,22,590	6,49,984	6,62,334
1995	6,38,879	6,37,221	6,20,653	6,47,962	6,60,273
1997	6,33,397	6,36,523	6,19,973	6,47,252	6,59,550
1999	6,37,293	6,41,529	6,24,850	6,52,343	6,64,737
2001	6,53,898	6,56,336	*	*	6,68,806
2003	6,77,816	6,73,962	*	*	6,86,767
2005	6,90,171	6,86,297	*	*	6,90,171
2009	6,90,899	**	*	*	6,90,899

**not required*

***gap due to moving average*

(*Source* FSI 2009)

Chapter : 02

Forest Management & Community Participation

2 Forest Management & Community Participation

2.1 Governance and set up of the Forest Sector

The forest sector of the country is administered broadly at two levels: at the Union Government level by the Ministry of Environment and Forests, and at the State/UTs level by the Forest Departments (FD). The Union Ministry of Environment and Forests is responsible mainly for framing national policies and laws, providing partial financial support, undertaking research and national surveys, imparting training to senior officials and over all monitoring the sector whereas the major responsibility to protect, conserve, manage, administer and develop forests and wildlife lies with state governments/UTs for respective jurisdiction.

For the purpose of administration each State Forest Department has, in general, two main wings, territorial forests and wildlife, each headed by a Principal Chief Conservator of Forests. Many states have named the department as Forest and Wildlife or Environment and Forest Department. All the senior positions of the department are manned by Indian Forest Service (IFS) officers recruited by the central government. Depending upon the size, these wings are further divided into Circles and each Circle into Divisions. Forest Divisions form the basic unit of forest administration and management in the line of Civil Districts of the state administration. The territorial jurisdiction of the Forest Divisions are often coterminous with the Civil Districts, but where

the extent of forest area in a district is very large, there could be more than one division in the district, and in the reverse condition, a forest division may comprise of portions of more than one district. The divisions are divided into Ranges under the charge of Range Forest Officers, and each Range into Sections/ Blocks and Beats under Foresters/Forest Guards for undertaking all field operations. The structure from the top upto Range level is uniform in all the State Forest Departments (SFD), but below the Range level many SFDs do not have Sections/Blocks and have only Beats. State-wise details of number of Circles, Divisions, Ranges, Sections and Beats are mentioned in Appendix 2.1. Country level summarized information is presented in Table 2.1.

Table 2.1: Territorial Structure of the Forest Department

Unit of administration	Number
Circle	197
Division	788
Ranges	4,706
Blocks	11,685
Beats	43,884

NB: 1. The territorial structure excludes areas under National Parks (NP) & Wild Life (WL) sanctuaries and other Wild Life divisions.

2. Among 7 UTs only Andaman & Nicobar Islands and Dadra & Nagar Haveli have good forests and traditional forest working. Creation of administrative set up (Forest Department) and territorial divisions in other 5 UTs is of late 1990s mainly for taking up plantations, protection of trees and other environment related activities.

The wildlife wing is generally responsible for management and protection of National Parks, Wildlife Sanctuaries, Zoological Parks and other wildlife activities related to promotion. In many cases officers heading territorial divisions have the responsibility to take care of wildlife protection and management in their territory. The jurisdiction of territorial and wildlife wings sometimes overlaps. The range and beat type structure in the National Parks and Wildlife Sanctuaries are often not clearly defined.

Social Forestry Wing

Many states launched Social Forestry/Community Forestry Programmes during late 1970s and early 1980s under externally aided projects for undertaking afforestation in private and community owned barren and degraded lands with the active co-operation and involvement of local population, and created Social Forestry wings. The external aid to different States continued for different periods of time, but most of the projects ended by 1992, after which the social forestry programmes continued in a different form, on a lower scale, with the additional financial support of the state governments. In Uttar Pradesh, all social forestry activities are undertaken by territorial

divisions; in Meghalaya, Social Forestry Divisions have been created for autonomous district councils whose areas lie outside the jurisdiction of the Forest Department for rehabilitating degraded community areas and supporting forest management through Forest Department Agency (FDA) etc. In Andhra Pradesh, one Social Forestry Division has been created in each district to take care of planting works outside forest areas, and in Maharashtra, Social Forestry Directorate functions under Water Conservation Department and has a set up in each district headed by a Deputy Director. In Gujarat, the Social Forestry wing is very vibrant, and one Social Forestry Division exists in every district except in the forest rich district of Dangs. However, there are no Social Forestry Divisions in Odisha Forest Department. In Assam, one Social Forestry Division covers generally two districts. The Social Forestry wing is headed by a Chief Conservator of Forests and has 16 divisions. In addition, State Forest Departments have functional units for undertaking specialized works such as research, planning, and training to frontline staff as well as preparation of working plan etc.

Unique System of Forest Stations in Kerala

Kerala has a unique system of Forest Station, introduced by the department in 1988 on the model of Police Station. Forest Stations are in place of Beat/Sections in sensitive and vulnerable areas for effective protection of forests and wildlife. A group of field staff are posted and their collective strength helps in security to the forest protective staff. The group is headed by a Deputy Ranger, and comprises of about 4 to 5 Forester and 12 to 16 Forest Guards. One Jeep has been provided to each Forest Station for group patrolling, and each station is equipped with guns/rifles and revolvers. In total 116 Forest Stations have been created, spreaded over 16 forest divisions and also includes one or two sensitive wildlife divisions. Division- wise number of forest stations as on 31.03.2009 is given in Table 2.2.

Table 2.2 Set up of Forest Stations in Kerala Forest Department

Division	No. of Forest Station	Division	No. of Forest Station
Konni	7	Mannarkad	8
Ranni	9	Nilambur South	4
Kottayam	6	Nilambur North	7
Munnar	6	Wayanad North	5
Marayoor	4	Periyar East	22
Thrissur	10	Munnar WL	14
Vazhachal	8	Silent Valley	2
Malayattoor	14	**Total**	**126**

Many State Governments/UTs have created Forest Development Corporations for harvesting of timber, raising forestry plantations and undertaking other specialized activities by mobilizing institutional finance.

2.2 Infrastructure with the Forest Department

Availability and development of infrastructure has always been a challenge in the Forestry sector because most of the activities of the sector are in the remote areas of the country which are devoid of basic facilities for living. Forest Department, therefore, has to traditionally gear up to create basic infrastructure like camp office, temporary residential quarters, forest rest houses, roads etc essential for functioning of any organization. For this reason, the forestry professionals are trained and educated in the basics

of civil engineering. Many of the Forest Departments have an Engineering Unit. In addition, various kind of machineries, truck, tractors, water tankers, etc., are essential for undertaking forestry operations, and automobiles for the movement of official and field staff and protection works. The current situation of the infrastructure in some of the SFDs is given in Table 2.3.

Table 2.3: Infrastructure in Forest Department of selected State/UT as on 31st March, 2010

States/UTs	Vehicles				Buildings				Roads (km)
	Car	Jeep	Motor Cycle	Others	Office	Rest Houses	Residences	Other buildings	
Andhra Pradesh	29	205	101	164	248	204	2621	998	NA
Assam	32	186	42	88	428	25	2491		6072.00
Goa	5	33	73	18	51	8	124	22	NA
Kerala	77	326	218	60	266	68	1179	1266	4512.70
Maharashtra	50	268	19	490	377	191	6612	3936	11951.55
Manipur	10	27	4	16	120	6	5	1	NA
Meghalaya	7	115	7	18	102	19	798	54	674.26
Mizoram	6	17	60	13	126	38	631	109	497.757
Tamil Nadu	54	439	79	85	405	176	2274		2496.39
Uttar Pradesh	72	333			311	176	4289	654	9176.00
A & N Islands	9	26	27	111		8	NA	NA	NA
Delhi	3	5	16	7	23	0			50

Position of vehicles in some of the states like Uttar Pradesh is very poor compared to other states considering the strength of the Forest Department. As per the information provided by Uttar Pradesh Forest Department officials, no new vehicle was purchased during 2006-10 for the department.

2.3 Management of Territorial Forest Divisions - status of working plans/ schemes

For systematic and scientific management of forests, operational plans, known as 'Working Plans', are prepared at division level generally for a period of 10 years. The entire forest area of the division is surveyed, stock mapped, partially inventoried and existing status of each forest block in the divisions including blanks etc., mapped. In the plan, prescriptions are given for the future treatment of each area, which includes different kind of operations in different areas like aided natural regeneration, cultural operations, plantations, tree felling etc. This practice has been going on since more than 140 years with the introduction of scientific forestry in India with gradual refinement. Earlier, it used to take about 2 years to prepare such plans but now with the application of advance technology (remote sensing, GIS) the preparation is faster and could be done in less than a year. The Ministry of Environment and Forests also issued a new Working Plan Code in 2004 to help in the preparation on a uniform pattern in the country.

In order to enforce the provisions of the Forest Conservation Act 1980, the Supreme Court of India in 1996 passed an order making it mandatory to

prepare Working Plan/Management Plan or Working Scheme and get approval of the Central Government before taking up any felling of the trees in forests. There are 6 Regional Offices of the Ministry of Environment and Forests in the country each of whom have been allocated certain states. These Regional Offices have been authorized to scrutinize and approve the Working Plans of Forest Divisions submitted by the states.

There are many State Forest Departments that have traditionally followed the forestry management principles and have been regularly preparing the Working Plan of forest divisions. But there are some SFDs where, due to inaccessibility, remoteness and local factors, the same has not been done. Such situation exists mainly in states of Northeast region. Against 788 territorial forest divisions in the country only 535 divisions have valid working plans as on 31st March, 2010. The number of valid Working Plans (WPs) change with time as the period of some WPs expires whereas new or revised ones are added. The status of working plans against territorial divisions is given in Table 2.4.

Table 2.4: Number of valid Working Plans in different states in India as on 31st March, 2010

States/UTs	No. of Territorial Divisions	No. of Valid Working Plans (WP)	Remarks
Andhra Pradesh	47	46	Working Plan (WP) of Anantpur division under revision; GIS is used in preparation of all WPs and RS also in one case.
Arunachal Pradesh	24	5	WP of 9 divisions have expired and under revision; WP for other divisions yet to be prepared.
Assam	31	1	Draft of 10 WPs had been submitted for approval.
Bihar	17	nil	WP of 6 divisions getting ready; Entire area of 5 divisions fall in Protected Areas (PAs) and 6 divisions are without forest.
Chhattisgarh	32	32	Modern technology used in preparation in 27 divisions.
Goa	2	nil	WP prepared but not approved.
Gujarat	22	20	WP of 2 divisions being revised.
Haryana	21	21	3 WP revised expired on 31 March 2010.
Himachal Pradesh	37	14	WP of 19 divisions being revised, 4 under active revision.
Jammu & Kashmir	28	4	WP of 24 divisions expired many years ago and under revision.
Jharkhand	32	12	Draft of 3 WP already submitted to GOI for approval; rest are under revision.
Karnataka	40	40	Digitized boundaries of all the management units of the division are put on the web.
Kerala	24	22	2 WP expired on 31 March 2010; GIS applied in the preparation of 5 WP.

Contd...

States/UTs	No. of Territorial Divisions	No. of Valid Working Plans (WP)	Remarks
Madhya Pradesh	63	57	6 WP being revised; GIS applied in about 25 WP made recently.
Maharashtra	51	43	12 WP under revision; Modern technology used in preparation of 34 WPs.
Manipur	10	10	WP prepared by conventional methods.
Meghalaya	3	nil	All WPs are under revision.
Mizoram	10	1	First WP prepared and the rest under preparation.
Nagaland	9	1	
Odisha	37	25	12 WP under revision; GIS applied in 12 WPs prepared with the help of NRSC.
Punjab	17	14	3 WP expired in 2008-09 are under revision.
Rajasthan	42	5	Rest under revision.
Sikkim	4	3	1 WP being prepared first time.
Tamil Nadu	33	31	GIS applied in preparation of 26 WPs; 2 WP are under preparation.
Tripura	9	9	
Uttarakhand	29	26	3 WP are under preparation.
Uttar Pradesh	75	73	2 WP under revision; boundaries of 3 divisions are digitized.
West Bengal	26	14	Draft for 6 WP and 3 PWPR submitted to RCCF; 3 WP in preparation; GIS is used in preparation of 5 WP.
A & N Islands	6	6	All the boundaries of divisions had been digitized.
Total	**781**	**535**	

NB: *The newly established Forest Departments in 5 UTs have in all 7 territorial divisions, three in Delhi, one each in Chandigarh, Daman & Diu, Puducherry and Lakshadweep mainly for protection, hence no WP system exists in these territories. Only one division of Dadra & Nagar Haveli also has no WP system.*

For managing the unclassified forest areas traditionally controlled by tribal communities, Working Schemes are made which are valid for 5 years. In Nagaland there are 27 Working Schemes, the area under which varies between 700 ha to 3500 ha and the total area covered is 49,895 ha. In Arunachal Pradesh 16 Working Schemes were approved of which only 4 are valid at present and rest are under revision. Eight Special Working Schemes (7 for cane and 1 for resin) has also been approved which are valid at present.

2.4 Joint Forest Management and Eco-Development areas

There are many examples of successful participation by local community in managing forests in the country. Management of forests by Van Panchayats in Uttarakhand started in 1931 and now covers a large area of 5450 km^2. The participatory management regime involving the Government and local communities for regeneration of degraded forests through effective protection, sharing of produce and improving the livelihood opportunities of forest dependent communities, was however, initiated by the Forest Department as a pilot project in Arabari village of West Bengal during 1971-72. The programme covered an area of over 1,270 hectare of degraded forests involving 618 families in 11 villages, and was a great success. This joint initiative rehabilitated the forests and thus became an example to emulate. Similar successful programmes of community involvement came up from other states like Odisha, where it started in 1980s in Budhikhamari, Mayurbhanj district.

The Government of India, Ministry of Environment and Forests consolidated the intervention on participatory forest management through the National Forest Policy, 1988, and then through enabling guidelines in 1990 on Joint Forest Management (JFM). States followed their own guidelines on the JFM programme. As it happens with any change in the management regime, the progress of JFM was slow in the initial years as many policy, technical and institutional issues cropped up in the field. Only around 4 million ha of forests in 17 states were under JFM until 1998. The programme received a major boost when a JFM cell was created in August 1998 in the Ministry of Environment and Forests (MoEF), to monitor the progress of JFM and act as a clearing house for information on JFM. After wide ranging discussions among all the stakeholders through a committee of experts, the MoEF issued another set of guidelines in February 2000, which inter-alia included uniform nomenclature and legal back up to the Joint Forest Management Committees (JFMCs) across the country and extension of JFM to good forest areas with focus on management of Non-Timber Forest Produce (NTFPs). Further guidelines were issued in December 2002 on setting up conflict resolution mechanism with Panchayat Raj Institutions to ensure their support in forest management. The JFM programme

got further impetus when the JFM Cell and National Afforestation and Eco-Development Board (NAEB) evolved the concept of Forest Development Agencies (FDAs) as an autonomous federation of JFMCs registered under the Societies Act 1860, for empowerment of the local communities for the regeneration of the forests and for livelihood creation activities. This provided financial support to JFM programme by the Government of India and facilitated fund flow to the implementing agency (-FDA) to their bank account directly from NAEB. In addition, financial support to JFM activities came from other sources in different states such as World Food Programme (WFP), Hariyali Yojana, District Rural Development Agency (DRDA), Tribal Development Schemes, externally aided projects, etc. In some states like Arunachal Pradesh, Mizoram, Meghalaya and Nagaland, JFM activities are confined to forest plantation areas which are fully funded under FDA.

Joint Forest Management has been in operation for about 20 years in India and adopted by all States and UT of Andaman & Nicobar Islands. The status of JFM programme in the country as on 2010 is given in Table 2.5 and has been obtained by email and phone besides written official communication. The total number of JFMCs in the country are 112, 896 and the forest area brought under it is 24.6 million ha, till March 2010. Though there is over all increase in the number of JFMCs, the area covered under forests has decreased compared to 2006 status, there has been downward correction in number of JFMCs and forest area covered in the states of Andhra Pradesh, Himachal Pradesh, Mizoram and Punjab because many registered JFMCs were found non-functional. In Jammu & Kashmir, JFMCs of Integrated Watershed Development and Eco-restoration of Degraded Catchment have become non-functional because

Table 2.5: Number of JFM Committees & Area Covered (March 2010)

SI No.	State	JFM committees (no)	Area under JFM (Ha)
1	Andhra Pradesh	7,718	15,91,000
2	Arunachal Pradesh	362	21,416
3	Assam	700	1,00,000
4	Bihar	682	4,55,961
5	Chhattisgarh	7,887	33,19,000
6	Goa	26	10000
7	Gujarat	3,125	4,12,000
8	Haryana	2,487	70,000
9	Himachal Pradesh	1,023	2,05,056
10	Jammu & Kashmir	3,334	1,48,015
11	Jharkhand	8,779	29,36,462
12	Karnataka	3,848	8,08,020
13	Kerala	576	2,07,404
14	Madhya Pradesh	15,228	66,87,390
15	Maharashtra	12,054	24,03,300
16	Manipur	665	60,307
17	Meghalaya	288	20,417
18	Mizoram	613	50,270
19	Nagaland	771	50,976
20	Odisha	11,995	11,36,330
21	Punjab	1,224	1,78,333
22	Rajasthan	5,316	7,80,000
23	Sikkim	219	88,518
24	Tamil Nadu	3,487	7,56,446
25	Tripura	920	2,35,255
26	Uttar Pradesh	3,014	7,24,600
27	Uttarakhand	12,089	5,44,964
28	West Bengal	4,386	6,45,791
	Total	**1,12,816**	**2,46,47,231**
	Total (2006)	1,11,926	2,67,38,267
	Change	890	20,91,036

of closure of these projects, but some addition in JFMCs and in forest area took place in Social Forestry programmes.

The implementation of JFM programme aims to improve quality of forests besides improving the economic status of local people involved in the protection and management of forests. The national or state level studies on large scale are not available to know the impact on these two parameters. There are a few small- scale studies done at the state level. A study was conducted by the internal monitoring unit of the Tamil Nadu Afforestation Programme-JFM Project to assess the impact of the intervention on the ecological, hydrological and socio-economic status of the affected forests. An internal evaluation was undertaken during 1997-98 to 1999-2000 in 60 randomly selected JFM areas spread over the entire state. Ecological impact was assessed through indicators of tree density, diversity of species, status of wildlife and the degree of survival of artificial regeneration in forest areas. The changes observed in tree density are shown in Table 2.6.

It is evident from the table that tree density has increased. There was 60 per cent increase of tree density in 1997-98 regeneration areas, which proves that with the increase in years of protection there is proportional upgradation in the status of degraded forests. Similarly the average growth of height of trees recorded an increase of 37 per cent in 1997-98 in regeneration areas, which again proves the effect of protection in the growth of tree stock.

Table 2.6: Changes in Tree Density in JFM areas in Tamil Nadu

Year of Regeneration area	No. of sample plots observed	Tree density			Average Height			Period of Observation
		Prior to JFM intervention No. of trees	After JFM intervention No. of trees	Percentage of increase	Prior to JFM intervention (m)	After to JFM intervention (m)	Percentage of increase	
1997-1998	151	2,274	3,652	60	1.68	2.30	37	3 years
1998-1999	354	7,995	11,179	39	1.80	2.12	18	2 years
1999-2000	359	5,623	8,748	50	2.10	2.57	22	1 year

(*Source:* Government of Tamil Nadu (2006))

2.5 Management of forests under Autonomous District Councils

There are some areas in the country where forests are traditionally owned by the tribal communities. Generally such areas fall in the VI Schedule of the Constitution of India and are located in the States of Assam, Meghalaya, Mizoram and Tripura where management of forests rest with the Autonomous District Councils (ADC). Three such districts of Assam are the North Cachar Hills, Karbi Anglong, The Bodoland Territorial Areas. The Bodoland ADC covers four districts-Kokrajhar, Chirang, Buxa and Udalgiri where as other two ADCs are coterminous with respective districts. The total forest area in these councils is 6923 km^2 which constitute about 26 per cent of the recorded forest area of the state of Assam.

In Meghalaya, the provisions of the VI Schedule of the Constitution of India extend to almost the entire geographical territory of the State, having three district councils namely Khasi Hills, Jaintia Hills, and Garo Hills. Though forest constitutes more than 75 per cent of geographical area of the state, management of only about 11 per cent rest with State FDs.

In Mizoram, there are three autonomous district councils, namely the Chakma, the Mara and the Lai. The area of Chakma and Lai ADCs together constitute the area of Lawngtlai civil district. The area of Mara ADC is coterminous with the area of Saiha district. Of the total about 17,000 km^2 forests in the State, about 20 per cent falls in the ADCs. The forest area managed under ADCs in the country is mentioned in Table 2.7.

Table 2.7: Forests Managed by Autonomous Districts Councils

States	Name of the Autonomous District Councils (ADCs)	Forest area of the State (km^2)	Forest area under ADCs (km^2)	Remarks
Assam	1. The North Cachar Hills, 2. The Karbi Anglong, 3. The Bodoland Territorial Areas	26,832	6,329	
Meghalaya	1. The Khasi Hills, 2. The Jaintia Hills, 3. The Garo Hills	9,496	8,371	The area is losely managed
Mizoram	1. The Chakma, 2. The Mara 3. The Lai	16,717	3,676	Consists of some good forests in Mara and Lai districts
Tripura	Tripura Tribal Areas District*	6,294	NIL	No forest land is yet handed over to the ADC
Total			**18,376 km^2**	

*Although the area under the control of ADC is 7133 km^2, the management of forests falling within this area is still with Tripura Forest Department.

2.6 Forest Rights Act, 2006

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 popularly known as Forest Rights Act (FRA) came into being in India to correct the 'historic injustice done to forest-dwelling communities'. These communities were cultivating/occupying forest land and using forest produce since ages but had no tenurial security. Broadly, this Act (i) Recognizes and vests individual forest-dwellers with forest rights to hold & live in for habitation and cultivate forest land for livelihood that was occupied before 13 Dec 2005 and should be in possession on the day of implementation, (ii) Grants community forest rights to manage, protect, regenerate the forest as provided in the specific section of FRA and (iii) To collect, use, and dispose minor forest products and carry on grazing, fishing and other traditional rights from forests where they had traditional access. These rights extend outside the village boundaries and include Wildlife Sanctuaries and National Parks. Other Traditional Forest Dwellers (OTFD) – any non tribal member or community who has primarily resided in and depended on forest or forests land for bona-fide livelihood needs for at least three generations (75 years) prior to 13 Dec., 2005. The rights conferred are heritable to the next of kin but not alienable or transferable and actual area in no case to exceed 4 ha. The displaced forest dwelling communities due to state development activities without land compensation have also rights under this Act. The foundation of FRA is the assertion that only security of tenure and formalised recorded rights in favour of forest users would lead to its responsible management and sustainability. The Act and the Rules made under FRA therefore give details of institutional arrangements for the protection, management and regeneration of Community Forest Resources (CFR), defined in section 2(a) of FRA as customary common forest land where the communities had traditional access, or which could be construed to be customary boundaries of a village, in other words, those areas where communities can demonstrate their traditional access. The holders of right are empowered to protect wildlife, forest & biodiversity.

The Act is being implemented in the country since January 2008 through the Ministry of Tribal Affairs. The National Committee jointly constituted

by Ministry of Environment and Forests and Ministry of Tribal Affairs has reviewed the implementation of Forest Rights Act 2006. As per the report (Manthan 2010) most of the states have concentrated almost entirely on implementing the provisions for Individual Forest Rights (IFRs) and until 31 October 2010 about 29 lakh IFR claims were filed in the country. About 83 per cent of these claims were disposed of and 35 per cent (~10 lakh) claims were approved, with titles issued for most of them. The proportion of rejection is high and some of the rejections are reported to be of genuine claims. For establishing IFR many instances of fresh encroachments after the cut of date (13 December, 2005) have also been reported. The progress in respect of the granting Community Forest Rights (CFR) has been however very negligible despite the fact that the main intention of FRA was to promote community participation in the management of forests. There are a number of issues which the National Committee has pointed out in the report. These include lack of clarity in the FRA Rules on the relationship between the FRA, Indian Forest Act 1927 and Wildlife Protection Act 1972 in relation to community forest rights and the role of the Forest Department in management of CFR.

The statistics of the latest progress of implementation are available on the Ministry of Tribal Affairs website.

2.7 Forest Development Corporations

After the recommendation in the Interim Report of the National Commission on Agriculture (NCA 1972) on 'Production of Man-made Forests', many State Governments in India established Forest Development Corporations (FDCs) to work on

commercial lines by raising industrial plantations of teak, eucalyptus, bamboo etc., to enhance the production of forest produce, to restore the productivity of degraded forest areas, to harvest and undertake trade of timber and Non-Timber Forest Products (NTFPs), to own and run forest based industries, to provide support to farmers for marketing their forest produce, and to provide consultancy in raising bio-aesthetic plantations etc. Most of the FDC were created during 1970s. These FDCs can mobilize finance through banks etc. The FDCs are registered bodies under the Companies Act, or any such similar Act, with a memorandum and articles of association of the company. The powers of managing the FDC are vested with a board of directors which are constituted by the state government. The board consists of official and non-official directors. Such corporations exists in 22 States (except in Assam, Manipur, Mizoram, Nagaland, Rajasthan and Sikkim) and in the UT of Andaman & Nicobar Islands. The corporation created in Rajasthan in 1985 was subsequently closed. Most of the States have only one FDC but two states have

more than one forest related corporation, namely Karnataka (Karnataka FDC, Forest Industries Corporation, & Cashew Development Corporation) and Tamil Nadu (Tamil Nadu Forest Plantation Corporation, Arasu Rubber Corporation, Tea Plantation Corporation). In addition, there are two Federations, one in Madhya Pradesh, and the other in Chhattisgarh, for harvesting and marketing of NTFPs. These federations finally transfer the net profit to the primary societies of collection in the schedule areas.

The functioning of these corporations is different in each State. State-wise brief scenario of the current status is as follows:

1. **Andhra Pradesh:** Andhra Pradesh Forest Development Corporation (APFDC) established in 1975 has an annual turnover of about Rs. 60 crores at present. About 83,700 ha forest land has been leased to APFDC. Out of this 65,177 ha plantations have been raised mostly with high productive Eucalyptus clones and Bamboo, and in small areas with Cashew, Coffee, Teak, medicinal plants and other miscellaneous species too. The balance area of Eucalyptus of 18,492 ha was raised with seed origin plantations, which are gradually being replaced with clonal plantations. The corporation annually plants between 3000 and 6000 ha eucalyptus and produces round-wood/pulpwood between 100,000 to 200,000 m^3.

2. **Andaman & Nicobar Islands:** Forest Plantation and Development Corporation, a Government of India undertaking, was established in 1977 mainly to harvest timber, to manage the inaccessible forests and to undertake cultivation of red oil palm, rubber, spices, etc. The Corporation has three projects viz. Forestry project in Little and North Andaman Islands, Red Oil Palm Project in Little Andaman Island and Rubber project in Katchal Island. The annual timber harvesting had reached its peak to 49,000 m^3 during 1990s. With the change in policy to conserving natural forests and rich biodiversity, and due to judicial intervention the harvesting of timber as well as extension of red oil palm plantation has been stopped since 2002, and leased forest area returned to the Forest Department. The present turnover (about Rs. 8 crores) is mainly from red oil palm (1560 ha) and rubber plantations (600 ha), and it is not enough to meet even the salary of the staff.

3. **Arunachal Pradesh:** Arunachal Pradesh Forest Corporation was established in 1977 mainly to harvest and market timber in the leased forest area by the Forest Department in Tirap and Changlang districts of the state as well as to establish a few wood based industries. Plantations of rubber, tea and coffee were also raised in a few hundred ha area. The harvesting of the timber reached to 49,000 m^3. The felling operations were stopped in 1996 and two wood based industries were closed by the order of Supreme Court because of excessive felling of trees without Working Plans. There has been almost no activity since then and most of the staff has been gradually retrenched as there are not enough funds to pay the salary to the staff.

4. **Bihar:** Bihar Forest Development Corporation (FDC) was established in 1975 mainly for harvesting and marketing of NTFPs of which tendu leaf was the major product. After the bifurcation of the state in 2000, the harvesting

and marketing of NTFPs was transferred to village Panchayats in 2004. Bihar FDC is almost non functional since then, and even the staff is not able to get their salary.

5. **Chhattisgarh:** Though FDC was created in 1976, after bifurcation of the state from Madhya Pradesh in 2000 it was re-established in 2001, and the annual turnover is of about Rs. 45 crores at present. About 197,000 ha forest land has been leased to the Corporation. Raising of commercially important species like teak and bamboo and their harvest and trade as well environmental plantations in industrial areas on turnkey basis (deposit work) are the major activities. In the leased area, teak is planted between 2,000 to 3,000 ha annually and total area under teak at present is about 85,000 ha. About 8,000 ha has been covered under environmental plantations.

The State Minor Forest Produce (Trading & Development) Co-operative Federation functioning in the erstwhile Madhya Pradesh was split after the constitution of Chhattisgarh State, notified in October 2000. It is functioning on the same lines as in Madhya Pradesh. At present there are about 10,000 collection centers spread over the length and breadth of the state and approximately 9.78 lakhs forest produce gatherers. Since 2008, 80 per cent of profit is given as incentive wages to the collectors of tendu leaves, 15 per cent of profit is kept for collection, sale, storing in godowns and value addition of non-nationalized minor forest produce, and 5 per cent of profit for the temporary reimbursement of losses of societies.

6. **Gujarat:** The FDC was created in 1976 has an annual turnover of about Rs. 30 crores. Broadly there are 6 activities (i) Manufacturing of furniture mainly for Government institutions called Vanil Udyog, (ii) Harvest and marketing of non-timber forest produce of non-scheduled as well as scheduled area (major area) and sharing 100 per cent net profit of scheduled area to Panchayats (for about 5-6 years harvest and trading was done by Panchayats until 2004 but the system did not work), (iii) Raising commercial plantations mainly clonal Eucalyptus in 5,000 ha forest land allocated to FDC, (iv) collection and trading of charcoal manufactured by local people and Panchayats, (v) Raising plantations for public sector undertakings on contract basis, and (vi) Making herbal products from medicinal plants under the scheme Dhanvantri. At present, Vanil Udyog and NTFPs form the bulk of the commercial activity.

7. **Haryana:** Haryana Forest Development Corporation (HFDC) was established in December 1989 under the Companies Act, 1956. The annual turnover is of the order of Rs. 37 crores at present. HFDC was created mainly to assure reasonable support price to farmers for their standing trees and other forest produce, to raise nurseries and plantations, to promote tree plantation on non-forest lands, and to establish forest based industries. HFDC is also harvesting trees and marketing timber from earmarked areas of forest lands since 1995-96 and pays royalty to Forest Department in lieu. The farmers can also sell their standing trees to HFDC and generally, eucalyptus and poplar are grown under Agro-forestry and are marketed on the ground at a

support price fixed by the government from time to time. The harvesting of timber has increased in recent years due to widening of highways and is about 70,000 m^3 annually.

8. **Himachal Pradesh:** Himachal Pradesh State Forest Development Corporation was established in 1974. The turnover at present is about Rs. 150 crores with approximate profit of Rs. 15 crores. Initially, the working of Rosin and Turpentine Factories at Nahan and Bilaspur were taken over and subsequently Resin extraction operation was also taken over. In 1983, timber harvest and marketing including bamboo for whole state became the major activity of the corporation. Felling of schedule species from private areas was also included in 1982. The current annual timber harvest ranges between 250,000 to 300,000 m^3. The corporation also undertakes harvest and marketing of Katha and fuelwood. Of the total turnover about 60 per cent is from timber, 40 per cent from rosin and turpentine oil and rest from others. Corporation is diversifying its activities towards ecotourism also.

9. **Jammu and Kashmir:** The Jammu & Kashmir State Forest Corporation, a statutory body, was established under the Jammu & Kashmir State Forest Corporation Act, 1978 by merging the erstwhile Government Lumbering Undertaking (GLU), which used to carry out extraction and sale of timber in the state. The main objective of Corporation is to undertake removal and disposal of trees and exploitation of forest resources entrusted to it by the Government of Jammu & Kashmir. The current activity is confined to removal of dead and dying trees, which on an average is 50,000 m^3 annually. The annual turnover is about Rs. 60 crores with net profit of about Rs. 2 crores.

10. **Jharkhand:** Jharkhand Forest Development Corporation was re-established in 2002 after bifurcation of the state from Bihar to carry on the earlier activities of the Bihar Forest Corporation mainly to harvest NTFPs. During 2007, harvesting of all NTFPs except tendu leaf was handed over to Gram Sabha. Current turnover, mostly from tendu leaf trade, is about Rs. 45 crores.

11. **Karnataka:** (i) The Karnataka Forest Development Corporation (KFDC) was established in 1971 with the main objective to raise plantations of commercially viable species (rubber, pulpwood, teak and bamboo). Plantations of Eucalyptus, Acacia, Bamboo, Casuarina, Teak and Tamarind have been raised in a total of 44,792 ha forest land received on lease. In addition, forest land of 4,443 ha under rubber plantation is maintained and rubber latex is processed in its two factories. The pulpwood and rubber latex produced are sold to industries. The Corporation at present is giving an annual turnover of Rs. 42 crores.

    (ii) The Karnataka State Forest Industries Corporation was incorporated in the year 1973, under the Companies Act, 1956 with the main objective to harvest forest produce for supply to pulpwood and rayon industries, processing of wood, and manufacture of furniture and wood based construction material. The current activities include making of furniture, doors and windows, fuelwood supply to public and salvage timber

from forests and harvest of pulpwood. During 2009-10, corporation sold fuelwood worth Rs. 4.4 crore and harvested/salvaged 19,635 m^3 timber.

(iii) Karnataka Cashew Development Corporation was incorporated in 1978 under the Companies' Act 1956, with the main objective of taking over the existing cashew plantation for intensive development and to raise new cashew plantation in the state to attain increased productivity. The Corporation has maintained 12,738.5 ha of older cashew plantations transferred towards equity and another 12,919.6 ha of cashew plantation on lease from Forest Department. The corporation planted about 9030 ha within older plantations with high yielding variety grafts during 1992-2008 but still the yield from plantations is poor. The total revenue realized from the sale of cashew plantations during 2009-10 was about Rs. 3.43 crore and was sufficient to pay the salary of the staff.

12. **Kerala:** Kerala Forest Development Corporation was established in 1975 in Kottayam with specific purpose to raise industrial plantations, spices, cashew, tea, coffee, etc. and to process and trade. The Corporation has established pulpwood (Eucalyptus, Acacia, etc) in 6000 ha, teak & pulpwood in 1400 ha, coffee in 200 ha, cashew in 320 ha and tea in 100 ha. The annual turnover at present is about Rs. 20 crores, about 70 per cent of which comes from wood crop items.

13. **Madhya Pradesh:** Madhya Pradesh Rajya Van Vikash Nigam was established in 1975 with the main objective to replace low value and inferior forests with high value multi utility species. Commercial planting of teak and bamboo is the main activity. Current annual turnover is more than Rs. 110 crore with net profit of about Rs. 10 crore. The leased area to the corporation has gradually increased over the years. The current leased area is 425,000 ha, against which teak has been planted in 164,932 ha and bamboo in 20,768 ha until March 2010. Annual planting of teak ranges between 6,000 to 8,000 ha and average annual harvesting of timber from the leased area is about 100,000 m^3.

In order to give benefits to forest dwellers in collection and trade of forest produce, the Madhya Pradesh State Minor Forest Produce (Trading & Development) Co-operative Federation was formed in 1984. This Federation coordinates the collection and processing of Tendu leaves, Sal Seed and Kullu Gum through Primary Forest Produce Co-operative Societies at district level and organizes disposal of these produce. In addition, other non-nationalized Non Wood Forest Products (NWFPs) are also being collected and traded by these Co-operative Societies. It also processes and markets herbal products and honey. However, after 73rd Amendment to the constitution in 1996 providing devolution of power to the Panchayati Raj Institutions the net income from the trade of NWFP is being transferred to the Primary Forest Produce Societies, who in- turn distributes 60 per cent of the profits to the Primary Collectors. 20 per cent of the profit is kept for the development of NWFP and the rest for infrastructure development.

14. **Maharashtra:** The FDC created in 1974 has an annual turnover of about Rs. 130 crore at present. The broad objective is to raise plantations of species yielding high revenue in place of

low value miscellaneous forests and generate employment. Some new activities like raising of forest plantations in private lands of Public Sector Undertaking (PSU) on turnkey basis and promotion of eco-tourism has been added. At present, FDC has 393,051 ha forest area on lease from the Maharashtra State Government. Seed unit and nurseries of the FDC have been awarded IS/ISO 9001: 2008 certificate by Bureau of Indian Standards. Teak is a flagship species and about 139,000 ha area is under teak plantations. Majority of these plantations (about 124,000 ha) were raised during the period 1969 to 1987. The present plantation rate is 1200 to 1600 ha per annum, only.

15. **Meghalaya:** Meghalaya FDC was established in 1975 under Companies Act 1956 with authorized share capital of Rs. 2 crore mainly to harvest timber from government forests and to enter into timber trade. Two saw mills were opened. It worked under profit until 1991. Since area of government forests is very little (as 85 per cent of the Meghalaya forests are with autonomous district council) and focus has shifted on biodiversity conservation, the activity is confined to running of saw mills. The FDC has not been able to prepare the balance sheet for about 10 years and the annual turnover is of the order of Rs. 2 crores.

16. **Odisha:** Odisha FDC came into being in 1990 by merging all forest corporations of the state which include Odisha Forest Corporation (1962), its subsidiary Odisha Composite Board (1983), Similipahar Forest Development Corporation (1979) and Odisha Plantation Development Corporation Limited (1985). Annual turnover at present is about Rs.75 crores which excludes the sale proceeds of tendu leaf (approx Rs.300 crores) as it is returned to Forest Department after deducting 10 per cent commission. It presently undertakes (i) trade of salvage timber/firewood (ii) trade of processed and phal Kendu leaves (iii) collection and trade of Sal seed directly or through Raw Material Procurer (RMP) (iv) regulate the distribution of firewood, long Bamboo and other small timbers to local people (v) monitor Bamboo operation directly or through RMP (vi) trade of Cashewnut and Rubber harvested through plantations (vii) collection, processing and trade of honey and few NTFPs. Odisha is the 3rd largest producer of tendu (bidi) leaf next to Madhya Pradesh and Chhattisgarh. The annual production of tendu leaf in Odisha is around 4.5 to 5 lakhs quintal produced in all the 30 districts of the state, which is about 20 per cent of the country annual production.

17. **Punjab:** The Punjab State Forest Development Corporation was established in 1983 under the Companies Act, 1956 and the annual turnover is nearly Rs. 34 crore, at present. The main activity of the Corporation is to harvest and market timber from forests marked by the Forest Department and pay royalty in turn. The current timber production is to the tune of 72,000 m^3, 70 per cent of which comes from tree felling due to widening of national highways. In addition, Corporation also assists the farmers in production and marketing of their agro-forestry produce (mainly eucalyptus and poplar). The Corporation also runs saw mills and carpentry units and promotes use of eucalyptus and poplars, and nowadays it is venturing into ecotourism.

18. **Tamil Nadu:** (i) Tamil Nadu Forest Plantation Corporation Limited (TAFCORN) was incorporated under the provisions of the Companies Act, 1956 in 1974 with the main objective to raise, maintain and harvest pulpwood and cashew to meet the needs of industries and to supply firewood to meet the fuelwood needs of the public. The 74,984 ha of forest land has been leased out by the Forest Department to the Corporation. The main species grown are eucalyptus and cashew. Teak, casuarina, bamboo etc., are also grown in smaller extent and they are being maintained and harvested properly.

    (ii) Arasu Rubber Corporation is a Government of Tamil Nadu Company functioning under the Tamil Nadu Department of Environment and Forests since 20th August 1984. The Corporation is ISO 9001:2008 Certified and maintains 4,280 ha of rubber plantations located within Kanyakumari district, the only suitable district for the growth of rubber in the state. The objective of the Corporation is to safeguard the future of rubber plantation industry and to increase employment opportunities, particularly for surplus rubber plantation labourers, the repatriates from Sri Lanka. Around 2,200 tonnes of natural rubber is produced per year including Cenex having ISI standard. The annual turnover is around 23 crores.

    (iii) Tamil Nadu Tea Plantation Corporation Limited (TANTEA), an undertaking of the State Government of Tamilnadu, India was established in 1968, to rehabilitate Sri Lankan repatriates trained in the fine art of tea culture. The corporation raised tea plantation in an area of 4,432 ha and produces about 10,421 tonnes of high grown clonal tea in tea factories located within plantations.

19. **Tripura:** Tripura Forest Development and Plantation Corporation Limited (TFDPC) was established in the year 1976 under the Companies Act, 1956, and the present turnover is Rs. 45 crore with net profit of Rs. 16 crore. The main objective of the Corporation is to carry out business in rubber cultivation, its processing and promotion as well as of bamboo based industries and also to provide livelihood support to tribals. The corporation has raised 11,000 ha rubber plantation of which about 4,000 ha are in productive stage and annually yielding about 3,000 mt of raw/ processed latex. A Rubber Timber processing unit manufactures rubber wood furniture and solid Rubber wood board. The Corporation has provided settlement to more than 2,700 tribal families for their permanent settlement, who were practicing shifting cultivation, by providing each family one hectare of rubber plantation.

20. **Uttar Pradesh:** Uttar Pradesh Forest Corporation was established in 1974 under State's Local Bodies Act and not under Company's Act like other States FDCs. The annual turnover is of the order of Rs. 300 crore at present. Its main activity is to harvest and market the forest produce on a planned basis throughout the state. The trees and other produce (bamboo and tendu leaf) marked by the Forest Department are harvested and marketed by the Corporation after paying the royalty. At present the average annual production of round

timber by the corporation is about 300,000 m^3. The production of timber has increased due to widening of roads resulting into felling of large number of mature trees standing along national highways.

21. Uttarakhand: Till the creation as a separate state in November 2000 the activities of Uttar Pradesh Forest Corporation were extended in Uttarakhand. After the creation of a separate state, Uttarakhand Forest Corporation was established in 2001, and the activities identical to UP Forest Corporation have been continuing. The current turnover is about Rs.300 crore. The annual harvest of the timber is to the tune of 230,000 m^3 contributing to about 75 per cent commercial activity of the corporation. Ecotourism has been taken as a new activity of the corporation.

22. West Bengal: The West Bengal Forest Development Corporation (WBFDC) came into existence in 1974 and has an annual turnover of Rs. 90 crore and net profit of about Rs. 5 crores. The main activities of the corporation is harvesting and marketing of timber, poles, pulpwood and firewood on agency basis from all the territorial forest divisions of the state, to manage the 40,000 ha of forest area on lease, running of four saw mills, treating and marketing of sawn timber, and market bio-fertilizers through a joint venture and collect, processes and markets of Sunderban honey to the tune of 35-40 MT annually. About 20,000 to 25,000 m^3 round timber sold every year. Citronella oil from Citronella grass, of Java variety grown in the foot hills of North Bengal, is also produced in the distilleries of WBFDC Ltd.

References

1. *Annual Administrative Reports of SFDs and of Forest Development Corporations for the period 2005 to 2010 as well as Statistical Reports.*
2. *Information available from the web sites of the SFDs.*
3. *Personal query on phone and email to Principle Chief Conservator of Forests(PCCFs) and other concerned officers of the State Forest Departments (SFDs), Forest Development Corporations (FDCs) and Chief Wildlife Warden(CWLW) as well as Deputy Conservator of Forest (DCF) (HQ), Conservator of Forest (CF) (HQ) and Chief Conservator of Forest (CCF) (HQ).*
4. *Figures about administrative set up of the Forest Department, JFMC, activities of the FDC including timber harvesting have mostly been re-checked on phone and email.*

Appendix 2.1

Administrative Units of State/UT Forest Departments in India

States/UTs	Territorial				
	Circles	Divisions	Ranges	Block/ section	Beats
Andhra Pradesh	10	47	204	930	2,611
Arunachal Pradesh	4	24	104	-	128
Assam	7	31	150	-	264
Bihar	6	17	81		311
Chhattisgarh	6	32	280	879	3,810
Gujarat	6	22	230	-	1,494
Goa	1	2	11	-	109
Haryana	4	21	64	294	1,042
Himachal Pradesh	12	37	193	564	2,035
Jammu & Kashmir	6	28	97	409	1,303
Jharkhand	6	31	131	393	1,965
Karnataka	13	40	223	1,009	2,819
Kerala	2	24	74		303
Madhya Pradesh	16	63	394	4,184	7,589
Maharashtra	11	51	369	1,464	5,514

Contd...

States/UTs	Territorial				
	Circles	Divisions	Ranges	Block/ section	Beats
Manipur	2	10	36		65
Meghalaya	1	3	17	-	43
Mizoram	3	10	60	-	210
Nagaland	2	9	43	-	27
Odisha	8	37	230	819	3,037
Punjab	4	17	76	205	681
Rajasthan	13	42	382	-	1,375
Sikkim	1	4	24	44	188
Tamil Nadu	12	33	195	484	1,344
Tripura	2	9	46	-	246
Uttar Pradesh	16	75	435	-	2,976
Uttarakhand	10	29	244		1,552
West Bengal	7	26	275		565
Union Territories					
Andaman & Nicobar Islands	2	6	22		208
Chandigarh	1	1	2	7	18

Contd...

States/UTs	Territorial				
	Circles	Divisions	Ranges	Block/ section	Beats
Dadra & Nagar Haveli	1	1	3		47
Daman & Diu	1	1	2		5
Delhi	1	3	9		
Lakshadweep	0	1			
Puducherry	0	1			
Total	**197**	**788**	**4,706**	**11,685**	**43,884**

(*Source:* State Forest Department)

Chapter : 03

Conservation of Forests, Wildlife and Biodiversity

3 Conservation of Forests, Wildlife and Biodiversity

3.1 India's Biodiversity and Conservation Strategy

India is one amongst the 17 countries in the world that together hold about 70 per cent of world's terrestrial biodiversity. The country is blessed with 26 recognized endemic centres for flowering plants in the world. It harbors about 30 per cent of the world's recorded flora and 7.31 per cent of the global fauna. So far, 45,968 species of plants and 91,364 species of animals have been documented. Richness of this diversity in India is because of its unique bio-geographical location at the confluence of 3 major realms (Eurasian, Afro Tropical and Indo-Malayan) of the world and range of latitudes, longitudes and altitudes shaping different types of vegetations and ecosystems. This variety of ecosystems has been further enriched due to long interactions of different socio-cultural traditions of people of our country with the natural ecosystems. The Wildlife Institute of India has classified the country's floral and faunal wealth into 10 bio-geographical zones. The name and the percentage of geographic area covered by these zones are: the trans- Himalayan zone (5.6 per cent), the Himalayan zone (6.4 per cent), the Indian Desert zone (6.5 per cent), the Semi-arid zone (16.6 per cent), the Western Ghats (4.0 per cent), the Deccan Peninsula (41.9 per cent), the Gangetic Plains (10.8 per cent), the country's extensive Coasts (2.6 per cent), the North-East zone (5.2 per cent) and the Island zone (0.3 per cent). The North East zone is perhaps the richest zone known for different communities, species as well as for endemic flora and fauna.

India has put in place strong policies and legislations required for effective biodiversity conservation. After enactment of the Indian Forest Act 1927 for protecting the Government forests,

the first National Park, now known as Corbett National Park, was established in 1936. In post independence period, the focus on conservation was brought in when Indian Board for Wildlife (IBWL) was constituted in the year 1952. Many steps were subsequently taken for biodiversity and wildlife conservation and 67 National Parks and Wildlife Sanctuaries were created by the year 1972 prior to enactment of Wildlife Protection Act, 1972. The Project Tiger, one of the most ambitious conservation projects was initiated in 1973. A unique and landmark legislation, the Forest Conservation Act was enacted in 1980 and subsequently Environmental Protection Act was enacted in 1986. The Man and Biosphere Reserve Programme was initiated in year 1986 and India became party to Convention on Biodiversity in 1992 and then enactment of Biodiversity Act was done in 2002. The Wildlife (Protection) Act 1972 has been amended many times to expand its scope and makes it more stringent, two new categories of Protected Areas, that is, Conservation Reserves and Community Reserves were added in 2002. Also a National Tiger Conservation Authority (NTCA) has been established in 2006 by amending the Act.

In order to strengthen and synergize global wildlife conservation efforts, India is a party to

major international conventions viz. Convention on International Trade in Endangered Species of wild fauna and flora (CITES), International Union for Conservation of Nature and Natural Resources (IUCN), International Convention for the Regulation of Whaling, UNESCO-World Heritage Committee and Convention on Migratory Species (CMS).

3.2 Forest Conservation Act, 1980

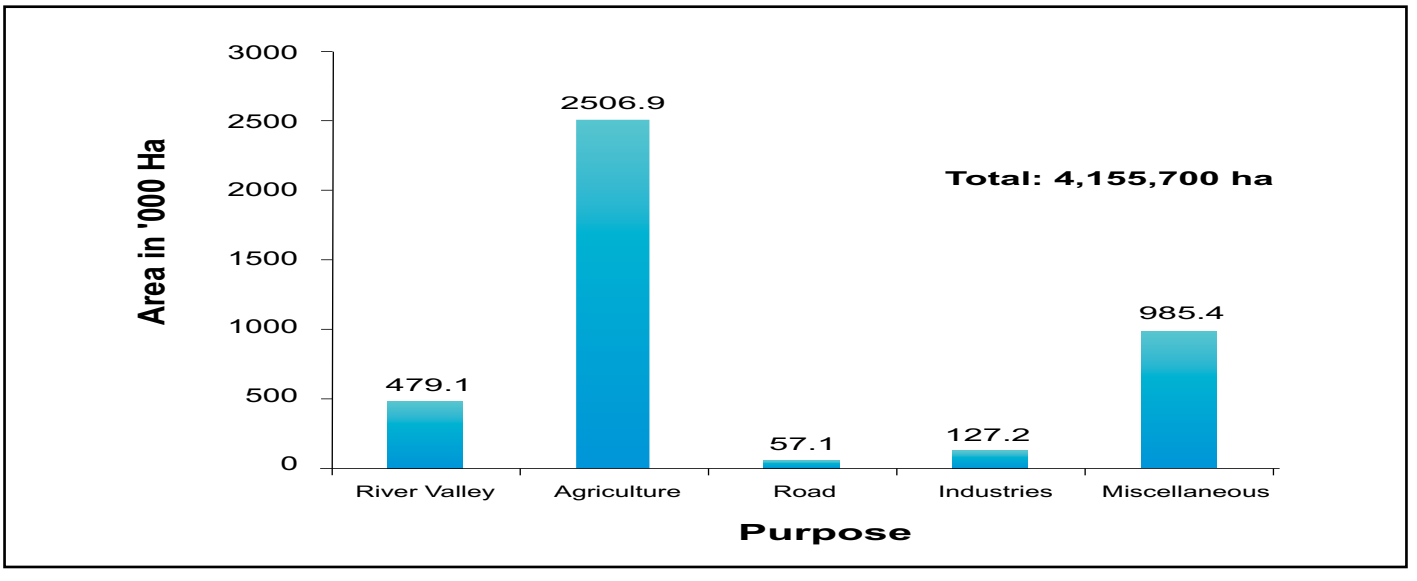
In order to exercise control on the diversion of forests by the State Governments, the Government of India enacted a Central Act called Forest (Conservation) Act, which came into force on the 25th October, 1980. Under the provisions of this Act, prior approval of the Central Government is essential for diversion of forestlands for non-forestry purposes like construction of roads and dams, mining, transmission lines, defence purposes, etc. The basic objective of the Act is to regulate the indiscriminate diversion of forest lands for non forestry uses and to maintain a balance between the developmental needs of the country and the conservation of natural heritage. After examining the feasibility the Central Government approves the proposal if found suitable and stipulates certain conditions to be fulfilled by the user agencies which includes Compensatory Afforestation, Catchment Area Treatment (CAT), Safety Zone

creation etc. The area of the compensatory afforestation is equal in extent of the non-forest land or over double degraded forest land as the case may be. The intervention of the Supreme Court of India over the years has made the implementation of the Act more stringent. By its order of 1996 the provision of the Forest Conservation Act (FCA), 1980 was extended to all forests irrespective of the ownership if the same was recorded as forest land in the Government records or if it conforms to the character for forest as per the dictionary meaning of the term. This brought even the private forests under the ambit of the Act. Further, in 2002 the Court ordered to realize Net Present Value (NPV) from the user agency and directed the Ministry of Environment and Forests (MoEF) to constitute a body for the management of the compensatory afforestation funds. Rules have been framed and various guidelines have been issued under the Act from time to time, to simplify the procedures, to cut down delays and to make the Act more user friendly.

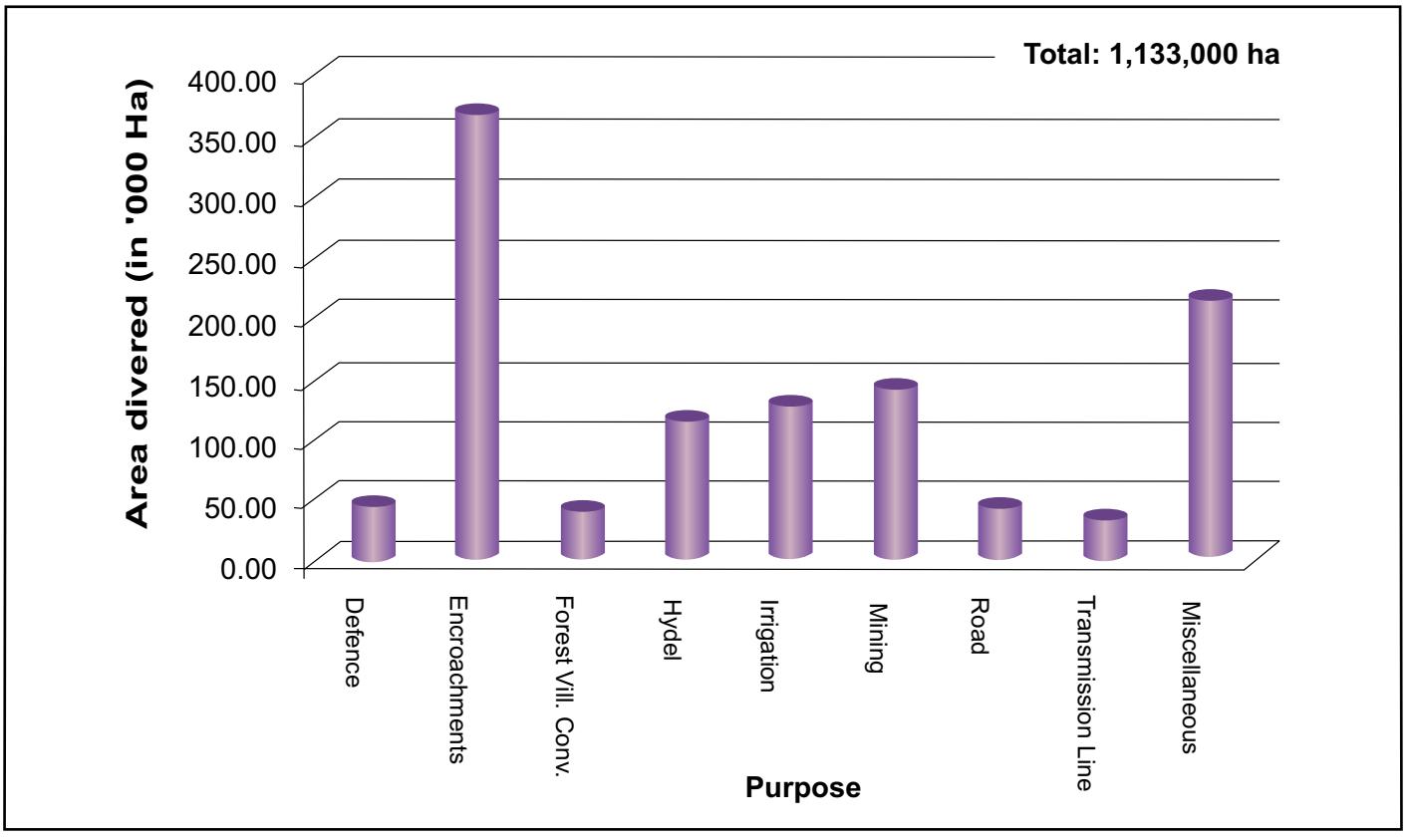
Since the Act came into force in 1980, 22,317 proposals related to developmental activities, rehabilitation of displaced families as well as encroachment have been approved by diverting 1.133 million ha forest land over the period (approximately 30 years) 1981 to October 2011. It is worth mentioning that prior to enactment of FC Act, 1980 the diversion of forest land for non-forestry purposes during 25 years (1951-1976) was 4.13 million ha, about 60 per cent of which was for agricultural purposes (MoEF 2011). The average annual diversion of forest land after the Act is about 36,560 ha where as prior to Act it was 165,200 ha. Purpose wise area of diverted forest land for both the periods is presented in the Figure 3.1. About 32.5% (368,432 ha) of the total diverted forest land in post Act period has been for the regularization of encroachment. Bulk of the regularization was in 1990 and 2001. If this area is excluded, the average annual diversion of forest land only for the development purposes would be about 24,700 ha.

Fig 3.1: Forest land diverted in India for different purposes Before (1) and After (2) the Forest Conservation Act 1980 (source: Ministry of Environment and Forests)

(1) Forest land diverted for different purposes during 1951-1976 (Before Forest Conservation Act)



(2) Forest land diverted for different purposes during 1980-2011 (After FC Act)



Note: *Miscellaneous purpose includes, Dispensary/Hospital, Disputed Settlement Claims, Drinking Water, Railway, Rehabilitation, School, Thermal, Village Electricity and Wind Power*

Of the total number of proposals approved under FC Act 1980, about 75% required small forest land (0 to 5 ha), on an average 1 ha per proposal and constitute about 1.6% of the total forest land diverted. Proposals requiring more than 40 ha forest land, though less in number (8.3%), constitute about 93% of the total land diverted. Area wise diversion of forest land is given in table 3.1.

Table 3.1: Size-wise diversion of forest land under Forest Conservation Act 1980

Size of area diverted (ha)	No. of cases	Forest land diverted (ha)	Percentage of total diverted forest land
0 to 5	17091	17,803.99	1.6%
5 to 10	1246	9,173.69	0.8%
10 to 20	1155	17,000.58	1.6%
20 to 40	957	27,902.45	2.5%
Above 40	1868	10,61,588.82	93.5%
Total	**22317**	**11,33,469.52**	**100%**

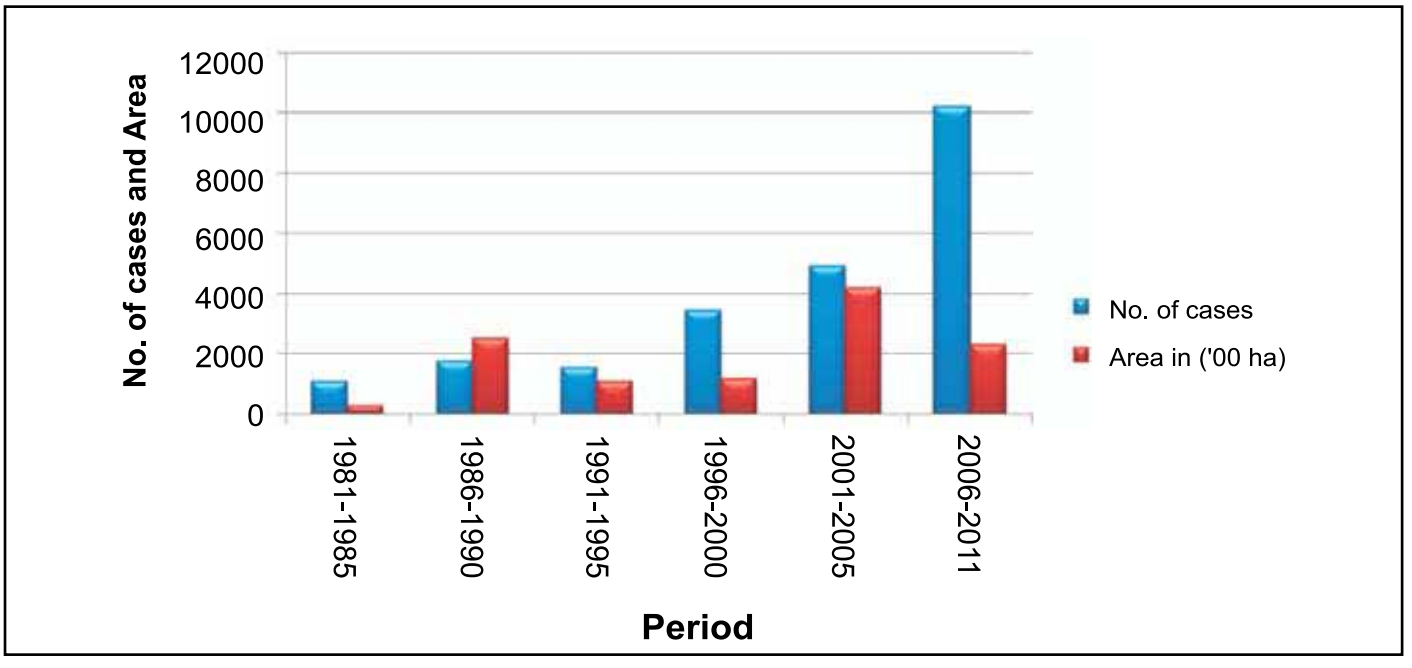
(*Source :* Ministry of Environment and Forests)

The number of approvals and area of forest land diverted in the last 31 years is given in Fig 3.2 on a five yearly basis. It is seen that in the first 20 years (1981-2000) the number of approvals as well as the area of forest land diverted is less than in last 11 years (2001-11).

3.3 Wildlife (Protection) Act 1972, and its Implementation

The Wildlife Protection Act 1972, a package of legislation enacted in 1972 by the Government of India provides protection to wild animals, birds and plants and for matters connected therewith or ancillary or incidental thereto with a view to ensure ecological and environmental security of the country. Among other reforms the Act established schedules of protected plants and animal species, hunting and harvesting was largely outlawed. The Act made provisions for appointment of regulatory authorities such as the Director of Wildlife Preservation with the Central Government and Chief Wildlife Warden and other officers with the State Governments for implementation of the Act. The National Board for Wildlife was constituted for framing the policies and

Fig 3.2: Number of approvals and forest land diverted in last 31 years under Forest Conservation Act 1980



advising the Central and State Governments on the ways and means of promoting wildlife conservation and effectively controlling poaching and illegal trade of wildlife and its products which in turn constituted Standing Committee of the National Board. At state level, the State Boards for Wildlife were constituted. Procedure has been laid down for declaring Wildlife Sanctuaries and National Parks. The Act prohibits hunting of specified wild animals provided in the schedules and picking, uprooting etc., of specified plants, trade or commerce in wild animals, animal articles and trophies. The powers have been delegated to the authorized officers (Director and Chief Wildlife Warden etc.) for the prevention and detection of the offences. The Act has helped in creation of a large number of National Parks and Sanctuaries in the country as well as in protection of wildlife and their habitats.

The Act has been amended many times since then. Some of important amendments are mentioned as follows. During the 3rd amendment in 1991, creation of a Central Zoo Authority became part of the Act. The Central Government constituted this authority

to set the standards for upkeep and veterinary care of animals in the zoos, to regulate the functioning and acquisition of animals by zoos, recognized or derecognized zoos, to coordinate training of zoo personnel and research in captive breeding. In the 5th amendment in 2002, the constitution of National Board of Wildlife and State Wildlife Board was restructured and new clauses were inserted to declare and manage any area owned by the Government adjacent to Protected Areas (PAs) as a 'Conservation Reserve' and an area owned by community or individual as a 'Community Reserve' to protect the landscape and seascapes, flora and fauna, traditional and cultural conservation values.

In the last amendment in 2006 two important institutions have been created. The National Tiger Conservation Authority (NTCA) has been constituted in place of Project Tiger for providing more effective support to Tiger Reserves. NTCA has been empowered to approve the Tiger Conservation Plan prepared by the State Government to evaluate and assess various aspects of sustainable ecology and disallow any ecologically unsustainable land-use such as mining, industry and other projects within the tiger reserves, to lay down normative standards for tourism activities in the buffer and core areas as well as to issue directions to any person, officer or authority for the protection of tigers and tiger reserves and ensure compliance. Establishment of a Wildlife Crime Control Bureau at Central Government with the Director of Wildlife Preservation as ex-officio Director of the Bureau has been the creation of the second institution. The Bureau has been mandated to collect and collate intelligence related to organized wildlife crime activities and to disseminate the same to the state and other

enforcement agencies for immediate action so as to apprehend the criminals and to establish a centralized wildlife crime data bank, coordinate actions by various officers and authorities in the enforcement of the Act, to implement obligations of international conventions and protocols and to assist authorities in foreign countries.

3.4 Management of Protected Areas (PAs)

For management and protection of wildlife and their habitat, Protected Area (PA) network consisting of National Parks (NP) and Wildlife Sanctuaries (WLS) has been created in India covering the forests with relatively large populations of the target species and associated ecological components. There are four categories of Protected Areas (PAs) based on level of protection and use of resources contained therein. As on 5th Sep 2011 India has a network of 668 PAs the breakup of which is given in the Table 3.2.

Table 3.2: Number and total area of Protected Areas in India

Sl. No.	Category	Nos.	Area (km^2)
1	National Parks	102	39,888
2	Wildlife Sanctuaries	515	1,19,930
3	Conservation Reserves	47	1,382
4	Community Reserves	4	21
	Total	**668**	**161221 or 16.12 mn ha**

These PAs cover about 20.6 per cent forest area or 4.9 per cent of total geographical area of the country. Even though the total number of PAs in the country seems to be very impressive, these are very small in size compared to size of PAs in other countries. Average size of PAs in India is less than 200 km^2. There are only two PAs more than 5,000 km^2 and 22 PAs larger than 1,000 km^2. More than 190 PAs are less than 10 km^2. Most of the PAs are burdened with biotic pressures and are inhabited by or surrounded by human settlements. State-wise number and area is given in Annexure 3.1 (*source* : WII Data Base 2011).

The top five states in terms of numbers of PAs are Jammu & Kashmir (53), Maharashtra (42), Himachal Pradesh (37) Madhya Pradesh (34) and Rajasthan (33). The top states in terms of Protected Area coverage are Gujarat (17,326 km^2), Maharashtra (15,430 km^2), Jammu and Kashmir (14,998 km^2), Andhra Pradesh (13,007 km^2) and Madhya Pradesh (10,815 km^2)

For managing the PAs, Management Plans are to be prepared which identify conservation objectives and prescribe management interventions to be undertaken during the plan period. These plans are different from the Working Plans (WP) of territorial forest divisions and have to focus on habitat improvement, protection and eco-development based on floral and faunal diversity. For preparing plan there is a need for detailed study/survey and account of animals and lower herbaceous plants found in the PA. However, boundary demarcation, survey and mapping of forest blocks are essential and common components like in Working Plans. As per the existing directions of the Central Government, these plans are to be approved by the Chief Wildlife Warden of the concerned State/UTs. Unlike Working Plans the preparation of Management Plan of PAs has not been yet standardized, neither detailed guidelines could be issued by the Central Government. Though the State Forest Departments have prepared plans for a good number of PAs in the country, the quality of the plans is variable. The status of the management plans of some of the States is given in the Table 3.3.

Table 3.3 Status of management plans of Protected Areas as on 31st March, 2010

States	Number of Protected Areas	Status of management plans
Andhra Pradesh	27	Management plans for 17 PAs are operational, plans for 2 PAs are being revised and 6 PAs being newly prepared.
Gujarat	26	Plans for 21 PAs are operational, and for 2 PAs being prepared. Only 23 plans are required as 3 PAs are included in others.
Karnataka	26	Plans for 20 PAs are operational and for 6 PAs under revision.
Jammu & Kashmir	18	14 plans are in place; 4 being prepared.
Madhya Pradesh	34	Plans for all 34 PAs are operational.
Odisha	18	Plans are in place for all the PAs.
Rajasthan	27	Plans for 21 PAs are operational and for remaining 6 PAs not yet prepared.
Tamil Nadu	29	Plans of 22 PAs are operational and for 4 bird sanctuaries and 3 WL sanctuaries are under preparation.
Uttarakhand	12	Plans for all 12 PAs are operational.
Uttar Pradesh	25	Plans for 23 PAs were operational till March 2010; now revised.
West Bengal	17	Plans for 13 PAs are in place; draft of plans of 4 PAs has been submitted for approval.

3.5 Tiger Conservation in India

Conserving the tiger in India is a national imperative because it saves not only a magnificent national animal, but also ends up protecting and regenerating the forest ecosystem and its rich wealth of biodiversity. Special efforts are, therefore, made in India to protect and conserve tigers. "Project Tiger", now ongoing as a Centrally Sponsored Scheme, was launched by the Government of India in 1973 in nine forest reserves of different States (Assam, Bihar, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Uttar Pradesh and West Bengal) over an area of approximately 14,000 km^2. Since then, the project coverage has expanded considerably to 40 Tiger Reserves (TR), encompassing an area of around 46,388.22 km^2 in 17 tiger States with 32,578.78 km^2 of notified core/critical tiger habitats in 16 tiger States. Further, in-principle approval has been accorded for creation of 6 new tiger reserves, besides advising the states for 6 additional areas which are important for tiger conservation. The Project has saved the tiger from the brink of extinction. Due to ongoing conservation efforts under the Project in designated tiger reserves, India has the maximum number of tigers along with its source areas amongst the 13 tiger range countries in the world. Project Tiger has a holistic, ecosystem approach. Its core–buffer strategy, protection and development initiatives gave a new perspective to the concept of wildlife management in our country and has been a role model for conservation.

Several milestone initiatives have been taken in the last few years to strengthen tiger conservation in the country. The urgent recommendations of the Tiger Task Force constituted by the National Board for Wildlife under the Chairmanship of the Prime Minister have been implemented. National Tiger Conservation Authority has been constituted since September 2006 for strengthening tiger conservation and ensuring normative standards in tiger reserve management. The Tiger and Other Endangered Species Crime Control Bureau (Wildlife Crime Control Bureau) has been constituted since June 2007 to effectively control illegal trade in wildlife. Independent Management Effectiveness Evaluation of Tiger Reserves is being carried out following IUCN criteria. The National Tiger Conservation Authority (NTCA) is helping State Governments with funds and guidance to raise special arm force called 'Special Tiger Protection Force' to protect tigers in tiger reserves and the local people like the Van Gujjars are also involved in the protection.

3.5.1 Latest Tiger Census in India

The all India Tiger estimation exercise is one of the most crucial components of national tiger conservation efforts. Though monitoring of tiger population in India is being done since many decades but since 2006, the exercise is undertaken with more scientific and statistically robust approach, every four years. The latest assessment of tiger population in 2010 is on a broader assessment of tiger landscapes. The study at national level was carried out between December 2009 and December 2010 with the joint effort of the National Tiger Conservation Authority and Wildlife Institute of India under the direction of the Ministry of Environment and Forests and support of the State and UT Forest Departments. The tiger estimation procedure included three phases. In phase 1, the field data was collected at the beat-level (i.e. the primary patrolling unit) by trained personnel using a standardized protocol. In phase 2, analysis of habitat status of tiger forests using satellite data was done. In phase 3, camera trapping as a primary method was used, where individual tigers were identified from photographs based on their unique stripe patterns. This information was analysed using a well established scientific framework. Camera trapping was carried out by teams of wildlife biologists and local forest personnel. Based on the tiger numbers recorded in sampled sites, an estimate for other contiguous tiger-occupied landscapes was made. For this, additional information such as tiger signs, prey availability, habitat conditions and human disturbance was used. Thus, the final estimates provide a comprehensive and statistically robust result for the whole country.

The census of tigers involved 4,76,000 man days of forest personnel in data collection, 27,300 man-days of researchers, sampling of 29,772 forest beats and use of 800 camera traps. Through cameras 550 individual tigers were camera trapped.

The methods used in year 2006 and 2010 were identical, consistent and scientifically robust. This enabled comparison of results from both estimation exercises and in understanding the trend in tiger numbers. The results were collated for large landscapes within which individual tiger reserves fall. Table 3.4 provides detailed information of the landscape complexes and the estimates of tiger population.

The 2010 National Tiger Assessment has several innovations over previous assessments. This study has involvement and partnerships with civil society organizations such as Wildlife Trust of India, Aaranyak, and World Wildlife Fund for Nature-India. Additional support of technical expertise from Centre for Cellular and Molecular Biology (CCMB) was taken. The local communities were involved in data collection and analysis. Genetic analysis

Table 3.4: Population Estimate of Tigers in India in year 2006 and 2010

Landscape Complex	Tiger Estimate (2006)			Tiger Estimate (2010)		
	Lower limit[1]	Population estimate	Upper limit[1]	Lower limit[1]	Population estimate	Upper limit[1]
Shivalik-Gangetic Plains	259	297	335	320	353	388
Central India & Eastern Ghats	486	601	718	569	601	651
Eastern Ghats	336	412	487	500	534	568
North East Hills & Brahmaputra Flood Plains	84	100	118	118	148[2]	178
Sunderbans	Not assessed			64	70	90
Total	**1,165**	**1,410**	**1,658**	**1,571**	**1,706**	**1,875**

[1]The numbers in the "Upper limit" and "Lower limit" column show the range of these estimates.
[2]Excluding the minimum population estimate of Buxa Tiger Reserve (12 tigers) based on genetic analysis conducted by the Centre for Cellular and Molecular Biology (CCMB).

was done to estimate tiger populations from faecal samples. Along with tigers, co-predators, prey and habitat quality was also assessed. Pioneering attempt was made to estimate tiger populations in Sunderbans Tiger Reserve (West Bengal) using satellite telemetry and sign surveys.

3.6 Conservation of Critically Endangered Species

3.6.1 Project Snow Leopard

The Snow Leopard is one of the most endangered species and is included in Schedule I of the Wildlife (Protection) Act, 1972. The total estimated population of Snow Leopard ranges between 400 to 700 and is found in five Himalayan States in India viz., Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir, Sikkim and Uttarakhand. The population of this species is decreasing due to intense conflict with rural communities, habitat degradation, depletion of prey base and poaching for its exquisite fur and valuable bones which are used in traditional Chinese medicine. The state of Jammu & Kashmir has the distinction of harboring a major portion of the existing Snow Leopard population in India.

The Ministry of Environment and Forests (MoEF), Government of India, had initiated work on Snow Leopard Conservation since 2006 where civil society viz, Nature Conservation Foundation (NCF), Mysore and the International Snow Leopard Trust are also involved. Financial assistance has been mainly provided to Jammu & Kashmir (Rs. 2.15 crores) and to Uttarakhand (Rs. 86 lakh) during 11th Five Year plan by MoEF for conservation.

3.6.2 Gharial Conservation

The Chambal River is a tributary of the Yamuna River in central India, and forms part of the greater Gangetic drainage system. Chambal river has 2 species of crocodilians – the mugger and gharial, 8 species of freshwater turtles, smooth-coated otters, gangetic river dolphins, skimmers, black-bellied terns, sarus cranes and black-necked storks, amongst others. The National Chambal River Sanctuary is a unique river Sanctuary in the entire country, which runs across three States namely Madhya Pradesh, Rajasthan and Uttar Pradesh providing habitat to the critically endangered gharial. For a better coordination amongst the three States as well as improved monitoring and guidance from the Centre MoEF has constituted the National Tri-State-Chambal Sanctuary Management and Coordination Committee for conservation of Gharial (NTRIS-CAS MACC). Besides Forest Departments of the States, Local Communities and Local Civil Society organizations aiming at recovery of the critically endangered species of gharial have been involved.

3.6.3 Vulture Conservation

Vultures are nature's most efficient scavengers. The Gyps vultures are specialized to feed on the soft tissue of the large ungulate carcasses. They play a vital role in the ecosystem by cleaning up the rotten carcasses left in the open. The population of Gyps vultures in the Indian subcontinent has crashed since 1990s onwards. The populations of Oriental Rumped Vulture, Slender-billed Vulture and Long billed Vulture had declined by around 97% during the last two decades. Use of the non-steroidal anti inflammatory drug 'Diclofenac' by veterinarians is the main cause attributed for this drastic population decline. The Ministry of Environment and Forests has also prepared an Action Plan for the conservation of vultures which is being implemented by the State Governments.

This species is included in Schedule I of the Wildlife (Protection) Act, 1972 and also one of the identified species for providing financial assistance under the component recovery programme for saving critically endangered species and habitats of CSS-Integrated Development of Wildlife Habitats. During the year 2008-09 financial assistance were provided to the State Government of Punjab, Haryana and Gujarat to the tune of Rs. 16 lakhs, Rs. 38 lakhs and Rs. 12.30 lakhs, respectively for the conservation and protection of the species. An amount of Rs. 2.40 lakh was released to the State Government of Punjab during 2010-11 for this species.

3.7 Biodiversity Act 2002, and its Implementation

Taking cognizance of the International Convention on Biological Diversity (1992) and to address the excessive pressure on biodiversity, the Government of India enacted Biological Diversity Act 2002 (BD Act) and Biological Diversity Rule 2004 after an extensive and intensive consultation process with stakeholders. The salient features of Act are: (i) To regulate access to biological resources of the country with the purpose of securing equitable share in benefits arising out of use of biological resources and associated knowledge relating to biological resources, (ii) To conserve and sustainably use biological diversity, (iii) To respect and protect knowledge of local communities relating to biodiversity, (iv) To secure sharing of benefits with local people as conservers of biological resources and holders of knowledge and information relating to the use of biological resources; (v) Conservation and development of areas of importance from the stand-point of biological diversity by declaring them as biological diversity heritage sites; (vi) Protection and rehabilitation of threatened species, and (vii) Involvement of institutions of State Governments in the broad scheme of implementation of the Biological Diversity Act through constitution of committees.

Following the enactment, a National Biodiversity Authority (NBA) was established in 2003 at the national level with headquarters at Chennai for regulating activities as provided in the Biodiversity Act, for issuing guidelines and advising the Central and State Governments. Subsequently, the State Biodiversity Boards (SBB) have also been established by many State Governments as provided in section 22 of the Act to advise them subject to any guidelines issued by the Central Government on matters relating to the conservation of biodiversity and their sustainable use etc. The Act under section 41 has also made provision for constitution of Biodiversity Management Committees (BMC) by every local body for the implementation of the Act. A decentralized regulation has been made through BMCs, SBBs and NBA each with well defined function within their respective jurisdiction. Accordingly, it is operated at local, state and national levels as a 3 tier system. NBA and SBB provide guidance and technical support to BMC for preparing People's Biodiversity Register (PBR). The BD Act provides legal mechanism for establishing sovereign rights over the Indian biodiversity and its conservation, protection against misappropriation, regulation of access and sustainable use of biodiversity.

Until March 2010, 24 states have established State Biodiversity Boards viz., Andhra Pradesh, Arunachal Pradesh, Chhattisgarh, Goa, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Punjab, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, and West Bengal (NBA 2010).

Further, 31,542 Biodiversity Management Committees (out of which formation of BMCs in 3,969 Gram Sabhas in Madhya Pradesh were in progress until March 2010) have been constituted by the local bodies so far in 14 States; Andhra Pradesh, Goa, Gujarat, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Manipur, Mizoram, Nagaland, Punjab, Tripura, Uttar Pradesh and West Bengal (NBA 2010). State-wise distribution of BMC and PBR prepared so far is given in Table 3.5 (NBA 2010).

Table 3.5: Progress of Biodiversity Management Committee (BMC) creation and preparation of People's Biodiversity Register (PBRs) in different States

S.No.	State	BMCs	BPRs
1	Andhra Pradesh	18	5
2	Goa	5	-
3	Gujarat	11	-
4	Himachal	2	-
5	Karnataka	3,287	89
6	Kerala	200	74
7	Madhya Pradesh	27,712	50
8	Manipur	06	-
9	Mizoram	234	-
10	Nagaland	10	-
11	Punjab	31	-
12	Tripura	04	-
13	Uttarakhand	-	139
14	Uttar Pradesh	01	-
15	West Bengal	21	13
	Total	**31,542**	**370**

NB: *In Madhya Pradesh, Biodiversity Management Committees have been constituted in 50 district panchayats, 313 Janpad Panchayat, 23,043 Gram Panchayat, 237 Nagar Panchayat, 14 Nagar Nigam and 86 Nagar Palika Parisad.*

Many states also give incentives to Panchayats for conserving forests and biodiversity.

3.7.1 Biodiversity Heritage Sites

The State Governments are required to frame rules for the management and conservation of all the heritage sites. The Government of Karnataka has notified three Biodiversity Heritage Sites (BHS) so far. The Nallur Tamarind Grove in Devanahalli Taluk, Bengaluru district is the first Biodiversity Heritage Site in the country. It is popularly believed to be a relic of the Chola Dynasty, that ruled nearly 800 years ago. This BHS spread over 21.5 ha comprising a population of nearly 300 trees, is a picture of dynamic pattern of plant diversity. The significant component of this site is a group of old tamarind trees standing like ageless sentinels, with their gigantic trunks, along with large picturesque crowns. The second one is Hogrekan in Chikmanglur district with unique Shola vegetation and grasslands with a number of unique floral species, many of which have lot of medicinal value, over an area of about 1000 ha. The third is the University of Agricultural Sciences, GKVK Campus, Bengaluru which spread over 167 ha. is considered one of the greenest areas in Bengaluru. The Biological diversity of this campus constitutes a critical repository of various forms of flora and fauna.

3.8 Biosphere Reserves

Biosphere Reserves (BR) in India have been created as a consequence of Man and Biosphere (MAB) Programme of UNESCO. They represent unique communities of biodiversity or areas with unusual natural features of exceptional interest with natural and cultural landscapes wherein

people are an integral component of the system. In India, the national Biosphere Reserve Programme was initiated in 1986 to serve as wider base for conservation of entire range of living resources and their ecological foundations in addition to already established Protected Area (PA) network system. They are also the protected areas extended over large areas. The Core Advisory Group of Experts of Man and Biosphere (MAB) had identified potential sites for creation of Biosphere Reserves. Biosphere Reserves are created at the initiative of the Central/ State Governments. Detailed study is carried out and a project report is prepared by the concerned state following the criteria adopted for designation of BRs. The land and forest being the state concerns, the respective state government has to agree to designate the identified area as Biosphere Reserve. The Central Government provides financial assistance for management and research activities in these reserves. The management of Biosphere Reserves is the responsibility of the concerned State/UT with necessary technical input and training facilities provided by the Central Government. Biosphere Reserves do not intend to replace existing protected areas but it widens the scope of conventional approach of protection and further strengthens the Protected Area Network. Existing legally protected areas (National Parks, Wildlife Sanctuary, Tiger Reserve and reserve/protected forests) may become part of the BR without any change in their legal status. On the other hand, inclusion of such areas in a 'Biosphere Reserve' enhances their national value. However this does not mean that Biosphere Reserves are to be established only around the National Parks and Wildlife Sanctuaries.

The Nilgiri Biosphere Reserve was the first to be notified as biosphere reserve in 1986 with total area of 5,520 km^2 covering areas of Karnataka, Kerala and Tamil Nadu. The details of biosphere reserves so far notified in India are provided in the Table 3.6.

Table 3.6: Detail of Biosphere Reserves notified up to August 2011

S. No.	Name of the Biosphere Reserves and total area (km^2)	Date of Notification	Location details
1	Nilgiri (5,520)	01.08.1986	Part of Wynad, Nagarhole, Bandipur and Madumalai, Nilambur, Silent Valley and Siruvani hills (Tamil Nadu, Kerala and Karnataka)
2	Nanda Devi (5,860.69)	18.01.1988	Part of Chamoli, Pithoragarh and Almora Districts (Uttarakhand)
3	Nokrek (820)	01.09.1988	Part of Garo Hills (Meghalaya)

Contd...

4	Manas (2,837)	14.03.1989	Part of Kokrajhar, Bongaigaon, Barpeta, Nalbari, Kamprup and Darang Districts (Assam)
5	Sunderbans (9,630)	29.03.1989	Part of delta of Ganges and Brahamaputra river system (West Bengal)
6	Gulf of Mannar (10,500)	18.02.1989	Indian part of Gulf of Mannar between India and Sri Lanka (Tamil Nadu)
7	Great Nicobar (885)	18.01.1989	Southern most islands of Andaman and Nicobar (A&N Islands)
8	Simplipal (4,374)	21.06.1994	Part of Mayurbhanj district (Odisha)
9	Dibru-Saikhowa (765)	28.07.1997	Part of Dibrugarh and Tinsukia districts (Assam)
10	Dehang-Debang (5,111.5)	02.09.1998	Part of Siang and Debang valley in (Arunachal Pradesh)
11	Pachmarhi (4,926.28)	03.03.1999	Parts of Betur, Hoshangabad and Chindwara district of Madhya Pradesh.
12	Kanchajunga (2,612.92)	07.02.2000	Parts of North and West Sikkim
13	Agasthyamalai (3,500.36)	12.11.2001	Parts of Thirunelveli and Kanya Kumari Districts in Tamil Nadu and Thiruvanthapuram, Kollam and Pathanmthitta in Kerala.
14	Achanakmar Amar-kantak	30.03.2005	Parts of Anuppur and Dindori District of M.P. and Bilaspur District of Chattisgarh.
15	Kachchh (12,454)	29.01.2008	Part of Kachchh, Rajkot, Surendra Nagar and Patan Civil Districts of Gujarat State
16	Cold Desert (7,770)	28.08.2009	Pin Valley National Park and surroundings; Chandratal and Sarchu and Kibber Wildlife Sancturary
17	Seshachalam (4,755.99)	20.09.2010	Seshachalam hill ranges in Eastern Ghats encompassing part of Chittoor and Kadapa districts in Andhra Pradesh.
18	Panna (2,998.98)	25.08.2011	Part of Panna and Chhattarpur districts in Madhya Pradesh

Four biosphere reserves namely Nilgiri, Nanda Devi, Sunderbans and Gulf of Mannar have been recognized by UNESCO on World Network of Biosphere Reserves.

3.9 Ramsar Convention

For the conservation and wise use of wetlands of international importance an intergovernmental treaty called 'Ramsar Convention' (after Ramsar city in Iran) was signed in 1971 to provide the framework for national action and international cooperation. The wetlands cover lakes and rivers, swamps and marshes, wet grasslands and peatlands, oases, estuaries, deltas and tidal flats, near-shore marine areas, mangroves and coral reefs, etc harbouring rich biodiversity. India is a signatory to this convention since 1981 and plays an important role in conservation and use of wetlands. The Chilika Lake (Odisha) and Keoladeo National Park (Rajasthan) were designated as the first two Ramsar sites in India. Four additional sites were designated in 1990: Sambhar Lake (Rajasthan), Loktak Lake (Manipur), Harike Lake (Punjab) and Wular Lake (Jammu & Kashmir). Subsequently more sites have been designated. So far, 25 sites have been designated as Ramsar Sites of International importance in India having a total area of 6,771.3 km^2.

The Ministry of Environment and Forests is the nodal agency for implementing the conservation programme on wetlands, mangroves and coral reefs. The programme is guided by a National Committee on Wetlands, Mangroves and Coral Reefs, constituted by the Ministry to advise the government on appropriate policies and programmes for the conservation of these ecosystems, to suggest specific sites for conservation action, and to identify research and training priorities. The National Committee also monitors the progress of activities under the scheme. An expert group on wetlands has also been constituted to examine management action plans. Several wetland sites have been selected on a priority basis for conservation and management action, the financial support for which is being extended by the Ministry of Environment and Forests.

3.10 Human-Wildlife Conflict

Human-wildlife conflicts have been in existence since ages as long as wild animals and people shared the same landscape and resources. However, in the past two-three decades the conflicts have increased and has become a cause of major concern in India. Increasing human population of the forest fringe settlements, encroachments in forests by humans, opening of forests by road construction and shrinkage of forest area are considered the main causes of conflicts. In a few cases there is an increase in the population of wild animals specially of Blue Bull (Nilgai) and monkeys which are not killed due to religious beliefs. Hindu population treats Nilgai as a 'holy cow' and similar is the case with monkeys.

Menace by such animals is as much a socio-cultural issue as a management issue. Every year there are numerous incidents of loss of human as well as cattle lives and damage to property due to human-wildlife conflicts. In reaction the wild-animals are also killed by the affected people.

Human deaths and injuries, though less common compared to crop damage, are the most severe manifestations of the conflict and are considered intolerable. Large feline predators such as lion, tiger, leopard and snow leopard and elephants are the principal sources of such conflicts. Instances of leopards straying away from forests, entering into urban areas, attacking human beings and creating terror have increased over the years. The second adverse effect of human-wildlife conflict is killing of domestic animals, generally the live stock. In this case also large carnivores like tiger, lion, leopard and hyenas are the main culprits. The third and the most prevalent category of the conflict across the country is of crop damage done by elephants, blue bull, wild-boar, monkeys etc. Of late monkey menace has become a serious issue in many urban centers and big cities creating a fear psychosis among large number of the inhabitants and causing injury to many of them when attacked by monkeys.

Killing and injuring the human life by wildlife leads to anger among the people. An angry mob of villagers lynched a leopard in July 2009 in Varanasi district in Uttar Pradesh that strayed in human habitation and injured many persons (Times of India 13 October, 2009). Such instances are quite common in India. In Goalpara and Udalgiri districts of Assam, the human-elephant conflict has reached an alarming proportion where villagers poisoned to death about 4 wild elephant during October 2009. Some toxic chemicals were mixed with country liquor or in jackfruit and sugarcane and other eatables, the elephant likes to eat, to avenge destruction of crop, tearing apart homes and killing of villagers by trampling of elephants (The Siasat Daily 25 October 2009). Further, death of two elephant calves due to poisoning was again reported at Diffolu tea garden close to Kaziranga National Park (Assam) on 7 October 2010 (The Navhind Times 15 October 2010).

Though reliable data are not available about the human deaths at the national level, according to one study (Indira Gandhi National Forest Academy 2007), in Uttarakhand about 217 people died due to the attack of wild animals during 1999 to 2006, in Tamil Nadu about 100 people lost their lives and 781 ha of crop was destroyed during 2001-2006. In Madhya Pradesh about 35 people are killed and another 1000 people are injured every year due to attack of wild animals. As per personal communication from PCCF (Wildlife) Gujarat, the number of human deaths and injuries and cattle deaths due to attack by lions and leopards during 2006-07 to 2010-11 are presented in Table 3.7. Compensation has been paid by the Gujarat Government for such losses.

Table 3.7: Human deaths, injuries and cattle deaths due to attack by lions and Leopards in Gujarat

Year	Human deaths	Human injuries	Cattle deaths
2006-07	10	100	1,537
2007-08	16	77	2,817
2008-09	9	150	3,030
2009-10	8	165	3,419
2010-11	16	114	3,520

The rate of compensation for the loss of human life fixed by many State Governments is Rs. 1 lakh. from Gujarat Government has increased the amount to Rs. 1.5 lakh from Rs. 1 lakh in May 2011. In Tamil Nadu, earlier it was Rs. 1.5 lakh, but in August 2011 it has been revised to Rs. 3 lakh. Other states are also revising the compentation amount. Compensation for livestock and crop damage is also made on the basis of market cost or as assessed by a committee appointed for the purpose.

3.11 Damages to Forests due to Forest Fire

In India, forest fire is a widespread and recurring phenomenon and causes extensive damage to forests. The fires are almost entirely attributed to burning by people. People light fire in forests for variety of reasons: like to encourage a fresh flush of fodder for grazing livestock, to facilitate collection of fuelwood and Non-Timber Forest Products (NTFP) like bidi leaf and to carry out shifting cultivation. Sometimes fires are set in the forests as a form of protest against restrictive policy of the government and also by accident and carelessness of the people. Fire scorches are often seen in the forests of Sal, Teak and Chir forests. The 'ground forest fires' are most common in India. It destroys the herb, shrub, lower vegetation as well as the organic matter in dry deciduous forests. The normal fire season in India is from January to mid June and the peak season lies in the months of March and April.

Reliable data on the extent of burnt forests area and value of the forest crop destroyed due to forest fire are not available. There is a no accurate assessment by the SFDs for such damages. There is also a tendency of under reporting the severity and extent of burnt areas. The Forest Survey of India (FSI) has been collecting data by recording the incidence of forest fires during National Forest Inventories (NFI). The NFI crew observes the incidence of forest fires 'ocularly' in an area of 2 ha around sample plots and places them in 3 categories. If more than 50 per cent area in 2 ha plot is affected it is recorded as Heavy, if between 10-50 per cent it is Moderate and if less than 10 per cent it is Mild. Based on the analysis of about 22,000 sample plot data collected during 2002 to 2008 from all over the country, FSI has estimated that about 2.94 million ha forests or 3.69 per cent of the recorded forest area, are annually affected by mild to heavy ground fire of which 1.64 million ha is affected by moderate to heavy fire. State-wise extent of forest area burnt due to fire annually is given in the Appendix 3.2 (FSI 2009a). The states of Andhra Pradesh, Himachal Pradesh, Karnataka, Odisha and Uttarakhand are most seriously affected and in Arunachal Pradesh, Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra, Odisha, Rajasthan and West Bengal the incidences of mild fires are more. Forest fires in Meghalaya, Manipur, Mizoram, Nagaland and Odisha are more on account of Jhum cultivation. Based on the recurrence of fire, it has been further estimated that about 1.29 per cent of the total forest area is prone to heavy, 6.25 per cent moderate and 45.27 per cent mild fires.

Since November 2004 FSI has started near real time monitoring of the forest fires in India through the active fire points detected by the thermal band of MODIS satellite. The algorithm has been developed for detecting threshold temperature of 42^0C. The active fire points are displayed through Web Fire Mapper and downloaded from the website www.maps.geog.umd.edu. After transferring the fire points on the forest cover map of India the geo-coordinates of the points wherever fire in the forest area has been detected are sent to the SFDs for taking actions to control the forest fires and also for

the feedback. The communication to the concerned SFDs is instant. The downloading and processing of the fire data is done twice daily and accordingly the SFDs are informed instantly. Annually about 20,000 fire points are detected during forest fire season. This has created great awareness and alertness in the SFDs in India. Some of the SFDs have also taken actions to prepare fire risk zonation maps using remote sensing and GIS technology and by integrating climate and land features (FSI 2009). At national level it is planned to assess the burnt area accurately through remote sensing technology by analyzing the satellite data of the period immediately after the forests fires.

3.12 India's Preparedness for REDD+

REDD+ (Reducing Emissions from Deforestation and Forest Degradation) is the global endeavour to create an incentive for developing countries to protect, better manage and save their forest resources, thus contributing to the global fight against climate change. REDD+ goes beyond merely checking deforestation and forest degradation and includes incentives for positive elements of conservation, sustainable management of forests and enhancement of forest carbon stock. REDD+ conceptualizes flow of positive incentives for demonstrated reduction in deforestation or for enhancing quality and expanse of forest cover. It works on the basis of creating a financial value for the carbon stored and enhanced in biomass and soil of standing forests ecosystem. Countries that reduce emissions and undertake sustainable management of forests will be entitled to receive funds and resources as incentives. REDD+ approach incorporates important benefits for livelihoods improvement, biodiversity conservation and food security services.

India stands to gain from the global REDD+ mechanism. There are a number of laws and policies in place in India which have impacted forest management positively, the details of which have been mentioned in the other chapters. In addition there are well established institutions such as the net work of Indian Council of Forestry Research and Education (ICFRE) institutes, Forest Survey of India (FSI), National Remote Sensing Centre (NRSC) and Indian Institute of Forest Management (IIFM) who work for monitoring and assessing the REDD+ related activities. The sustained efforts for conserving and expanding forest cover and tree resources results in increase of the forest carbon stocks. Thus, India has the possibility of being rewarded for providing carbon service to the international community in addition to providing traditional goods and services to the local communities. It is estimated that a REDD+ programme for India could lead to capture of more than 1 billion tonnes of additional CO_2 over the next 3 decades and provide more than USD 3 billion as carbon service incentives under REDD+ (MoEF, 2011). REDD+ will benefit local communities as it explicitly safeguards their

rights and those of indigenous peoples. India is committed that monetary benefits from REDD+ will flow to local, forest dependent, forest dwelling and tribal communities.

India is playing a pro-active role in international negotiations and has taken a firm stance in favour of a comprehensive REDD+ approach with the argument that a unit of carbon saved by checking deforestation should be treated the same as a unit of carbon added due to conservation and afforestation measures. A submission has been made to UNFCCC on "REDD+, Sustainable Management of Forest (SMF) and Afforestation and Reforestation (A&R)" in December 2008. Green India Mission has been launched to increase forest and tree cover upto 5 million hectare and to improve the quality of forest cover in another 5 million ha. Thus, the mission will help in improving the ecosystem services in 10 million hectare of land and can increase flow of forest based livelihood services.

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Appendix 3.1

Summary of Protected Area Statistics in India (as on 5th September 2011)

States/UTs	No of NPs	Area (Sq.km)	No. of WLS	Area (Sq.km)	No. of Con.R*	Area (Sq.km)	No. of Com.R**	Area (Sq.km)	No. of PAs	Area (Sq.km)
Andhra Pradesh	6	1388.39	21	11618.12					27	13006.51
Arunachal Pradesh	2	2290.82	11	7487.75					13	9778.57
Assam	5	1977.79	18	1932.01					23	3909.80
Bihar	1	335.65	12	2851.67					13	3187.32
Chhattisgarh	3	2899.08	11	3583.19					14	6482.27
Goa	1	107.00	6	647.91					7	754.91
Gujarat	4	479.67	23	16619.81	1	227.00			28	17326.48
Haryana	2	48.25	8	233.21	2	48.72			12	330.18
Himachal Pradesh	5	2271.38	32	7745.48					37	10016.86
Jammu & Kashmir	4	3925.00	15	10243.11	34	829.75			53	14997.86
Jharkhand	1	226.33	11	1955.82					12	2182.15
Karnataka	5	2472.18	22	4003.42	2	3.80	1	3.12	30	6482.52
Kerala	6	558.16	16	1822.86			1	1.50	23	2382.52
Madhya Pradesh	9	3656.36	25	7158.41					34	10814.77
Maharashtra	6	1273.60	35	14152.70	1	3.49			42	15429.79
Manipur	1	40.00	1	184.40					2	224.40
Meghalaya	2	267.48	3	34.20					5	301.68
Mizoram	2	150.00	8	1090.75					10	1240.75

Contd...

States/UTs	No of NPs	Area (Sq.km)	No. of WLS	Area (Sq.km)	No. of Con.R*	Area (Sq.km)	No. of Com.R**	Area (Sq.km)	No. of PAs	Area (Sq.km)
Nagaland	1	202.02	3	20.34					4	222.36
Odisha	2	990.70	18	6969.15					20	7959.85
Punjab	0	0.00	12	323.70	1	4.95	2	16.07	15	344.72
Rajasthan	5	3947.07	25	5379.26	3	222.27			33	9548.60
Sikkim	1	1784.00	7	399.10					8	2183.10
Tamil Nadu	5	307.85	21	3521.95	1	0.03			27	3829.83
Tripura	2	36.71	4	566.93					6	603.64
Uttar Pradesh	1	490.00	23	5221.88					24	5711.88
Uttarakhand	6	4915.44	6	2418.61	2	42.27			14	7376.32
West Bengal	5	1693.25	15	1203.28					20	2896.53
Andaman & Nicobar	9	1153.94	96	389.39					105	1543.33
Chandigarh	0	0.00	2	26.01					2	26.01
Dadra & Nagar Haveli	0	0.00	1	92.16					1	92.16
Daman & Diu	0	0.00	1	2.19					1	2.19
Delhi	0	0.00	1	27.82					1	27.82
Lakshadweep	0	0.00	1	0.01					1	0.01
Puducherry	0	0.00	1	3.90					1	3.90
India	**102**	**39888**	**515**	**119930**	**47**	**1382**	**4**	**21**	**668**	**161222**

Con.R - Conservation Reserve and Com.R**- community reserve*

Appendix 3.2

State-wise estimate of annually burnt forest area due to fires during 2002-2008

S. No.	States	Recorded Forest area (In km^2)	Moderate to heavy forest fires (In km^2)	Mild to heavy forest fires (In km^2)
1	Andhra Pradesh	63,821	4,294.88	5,765.52
2	Arunachal Pradesh	51,540	881.81	1,742.85
3	Assam	26,832	379.22	890.27
4	Bihar	6,473	12.90	149.34
5	Chhattisgarh	59,772	132.71	1,238.18
6	Goa	1,224	1.33	24.22
7	Gujarat	18,962	101.91	331.20
8	Haryana	1,559	53.53	81.18
9	Himachal Pradesh	37,033	1,165.27	1,599.38
10	Jammu & Kashmir	20,230	740.09	984.71
11	Jharkhand	23,605	46.76	535.90
12	Karnataka	38,284	1,319.92	2,086.66
13	Kerala	11,265	151.57	296.49
14	Madhya Pradesh	94,689	322.07	1,658.27
15	Maharashtra	61,939	437.52	1,210.10
16	Manipur	17,418	673.63	994.91
17	Meghalaya	9,496	373.13	549.16
18	Mizoram	16,717	665.65	980.29
19	Nagaland	9,222	352.31	521.98

Contd...

S. No.	States	Recorded Forest area (In km^2)	Moderate to heavy forest fires (In km^2)	Mild to heavy forest fires (In km^2)
20	Odisha	58,136	1,253.58	2,459.92
21	Punjab	3,084	24.22	73.53
22	Rajasthan	32,488	198.59	795.00
23	Sikkim	5,841	39.41	116.09
24	Tamil Nadu	22,877	824.75	1,300.27
25	Tripura	6,294	233.01	352.06
26	Uttar Pradesh	16,796	262.22	570.98
27	Uttarakhand	34,651	1,420.83	1,868.26
28	West Bengal	11,879	25.90	273.19
Union Territories				
1	Andaman & Nicobar Islands	7,171	0.00	0.00
2	Chandigarh	33	0.00	0.00
3	Dadra & Nagar Haveli	204	3.44	5.77
4	Daman & Diu	6	0.00	0.00
5	Delhi	85	0.00	0.00
6	Lakshadweep	0	0.00	0.00
7	Puducherry	0	0.00	0.00
	Grand Total	**769,626**	**16,392.16**	**29,455.70**

Chapter : 04

Development of Forest Resources: Schemes and Achievements

4. Development of Forest Resources: Schemes and Achievements

4.1 Funding to Forestry Sector

Forest Sector receives budget allocations both from State and Central Governments. In addition, there are state specific externally aided projects which are mostly in the form of soft loan from the donor country/agency. The major portion of the budget however comes from State Government's kitty consisting of committed expenditure (non-plan) and plan works. Even the plan allocations of the State Governments are quite high compared to Central Government. For example during 10th Five year plan (2002-07) the total allocation to Forest & Wildlife by the State Governments for plan works was Rs. 11,384 crore where as the Central Government grant was only Rs. 2,703 crore. But, when compared with total plan allocation of all sectors in the State Governments, the allocation to Forest & Wildlife Sector during 10th Plan was only 1.29 per cent.

The allocation of funds from the Central Government is on plan works against specific schemes such as National Afforestation Programme (NAP), Integrated Forest Protection Scheme, Wildlife Conservation etc. There has been an additional grant from the Finance Commission from 2005 onwards. The Compensatory Afforestation Fund lying with Compensatory Afforestation Management and Planning Authority (CAMPA) of the Ministry of Environment and Forests has also been released in

instalments since 2009. The expenditure on forest and wildlife which includes budget allocation of most of the Centrally Sponsored Schemes (CSS) is given in Table 4.1.

One of the main objectives of the budget allocation is to enhance the area of forest cover of the country through afforestation and improve the quality of the forests. Protection and conservation of forests and wildlife as well as its habitat is another major objective. In the following paragraphs the brief description of ongoing schemes along with budget allocation has been given.

4.2. National Afforestation Programme (NAP)

This is the flagship programme of the Central Government, aiming to enhance the forest cover of the country. This was launched in 2002 by merging 4 centrally sponsored afforestation schemes of the Ministry of Environment & Forests in 9th Five Year Plan, namely, Integrated Afforestation and Eco-Development Projects Scheme (IAEPS), Area Oriented Fuelwood and Fodder Projects Scheme (AOFFPS), Conservation and Development of Non-Timber Forest Produce including Medicinal Plants Scheme (NTFP) and Association of Scheduled Tribes and Rural Poor in Regeneration of Degraded Forests (ASTRP), to reduce multiplicity of schemes and to avoid delays in availability of funds to the field level, and also to institutionalise people's participation in project formulation and implementation. The Scheme is being implemented by the National Afforestation and Eco-Development Board (NAEB), Ministry of Environment and Forests as a 100 per cent Centrally Sponsored Scheme. The implementation is through a two-tier set up, namely the Forest Development Agencies (FDAs) generally at the forest division level, and Joint Forest Management Committees (JFMCs) at village level. FDA is an autonomous federation of

Table 4.1: Plan expenditure on Forestry and Wildlife of the Ministry of Environment and Forests (Rs. in crore)

Plan/Year	Forestry	Wildlife	Total
9th Plan (1997-02)	990.20	450.62	1440.82
10th Plan (2002-07)	1964.08	739.42	2703.50
11th Plan (2007-12) 2007-08	621.09	198.86	819.95
2008-09	612.05	321.06	933.11
2009-10	604.23	363.19	967.42
2010-11	622.38	357.56	979.94
Total	**2,459.75**	**1,240.67**	**3,700.42**

JFMCs registered under the Societies Act 1860, and there is a direct fund flow to the bank account of FDA from the NAEB, Government of India, to facilitate implementation. In addition to forestry development activities, there are provisions for entry point activities beneficial to village communities.

The operational guidelines of the National Afforestation Programme (NAP) were revised in 2009 with major modifications in institutional set up. The scheme is now being implemented by a three-tier set-up, namely State Forest Development Agency (SFDA) at the State/UT level, Forest Development Agencies (FDAs) at the forest division level, and Joint Forest Management Committees (JFMCs) or Eco-development Committees (EDCs) at the village level. Now the State Forest Development Agency (SFDA) is a registered society under the Societies Registration Act, and functions as a federation of Forest Development Agencies (FDAs) in the State/ UTs. The focus is to work towards regeneration and management of forest resources while strengthening the village level capacity, livelihood support activities in the villages, value addition and marketing of forest produce. There are also provisions for soil and moisture conservation, treatment of problematic lands and use of improved technology in forest plantations.

In the first year of launch of NAP only 47 FDA's were approved by NAEB for Rs. 47.53 crore, covering 18 states with major numbers coming from Haryana (7), Madhya Pradesh (7), Uttar Pradesh (5), Maharashtra (4), J&K (4). During 2002-03 and 2003-04, proposals for creation of 468 FDAs were approved covering most of the states, and fund of about Rs. 359 crore was released. By 2009-10, 800 FDAs and 42,535 JFMCs in all have been constituted under the programme, covering most of the forest divisions in the country. The total fund released until 2009-10 under NAP during 8 years is about Rs. 2,337 crore, achieving about 1.69 million ha afforestation. The components of afforestation works include Assisted Natural Regeneration (ANR), Artificial Regeneration, Mixed Plantation, Silvi-Pasture Development, Bamboo Plantation, Regeneration of Perennial Herbs and Shrubs and Cane Plantation. Of the total area of annual afforestation, between 40 to 45% is under ANR and between 35 to 40% under artificial regeneration and mixed plantation. Other components occupy the remaining 15 to 20% area of afforestation. Component wise areas of afforestation done in different states during 2007-08, 2008-09 and 2009-10 are given Appendix 4.3. The annual availability of fund from Planning Commission which has crossed Rs. 350 crore per year during 2007-09 has now declined to about Rs. 300 crore. The wage rate in afforestation activities, on the other hand has gradually increased (by about 50 per cent in last 8 years), adversely affecting the physical progress of annual afforestation. State-wise details of fund release and area afforested during different years are given in Appendix 4.1 and 4.2, respectively. The country level annual fund released and afforestation is depicted in Figure 4.1 and cumulative progress of FDA creation in Figure 4.2. In Figure 4.1 the afforested area of 2006-07 has been clubbed with the progress of 2007-08 because this was the end of the 10th Plan period which is why no physical progress is shown during 2006-07.

Figure 4.1: Annual progress of fund release & afforestation done under NAB

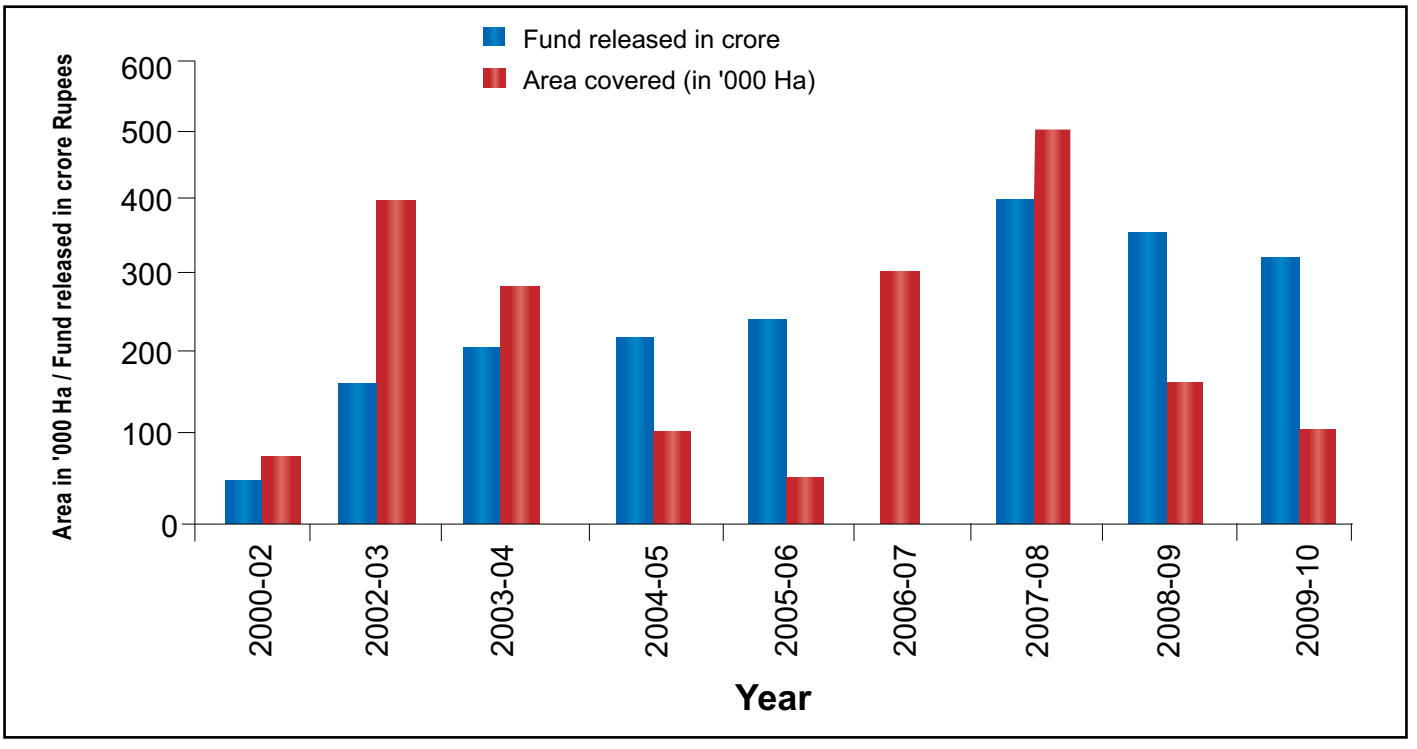
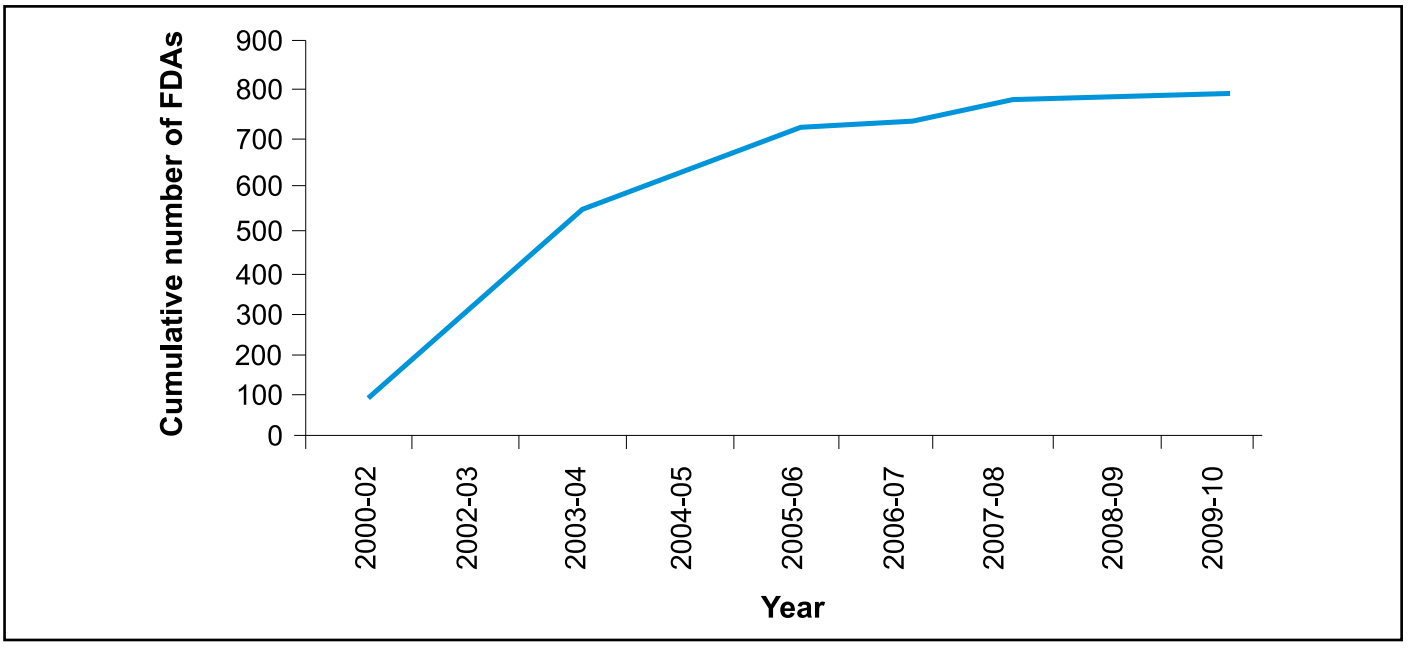


Figure 4.2: Cummulative progress of Forest Development Agency creation



4.3 Wild Life Conservation

The Ministry of Environment and Forests deals with policy and planning on wildlife conservation in India and in that context a National Wildlife Action Plan (2002-2016) was adopted. The Ministry also provides technical and financial support to the State/ UT Governments broadly under three Centrally Sponsored Schemes (CSS) at present namely (i) Integrated Development of Wildlife Habitat (ii) Project Tiger and (iii) Project Elephant. Funds are also provided for strengthening wildlife divisions and consultancies for special tasks and through grant-in-aid to the Central Zoo Authority and Wildlife Institute of India, Dehradun.

4.3.1 Integrated Development of Wildlife Habitats: This scheme provides financial and technical assistance to the states/UTs for improving the habitats of protected areas (102 National Parks, 515 Wildlife Sanctuaries, 47 Conservation Reserves and 4 Community Reserves), infrastructure development, eco-development activities, anti poaching activities, research, training, capacity building and wildlife census etc. Under this scheme 100 per cent grant is provided for identified items of non-recurring expenditure and 50 per cent assistance in respect of recurring items. For areas located in mountainous, coastal, desert regions and with identified endangered species 100 per cent financial support is provided for both recurring and non-recurring items of work. During December 2008, the scheme was modified to include 'protection of wildlife outside the protected areas and recovery programme for critically endangered species' for financial support. Out of the 15 short listed species recovery programme for Vulture, Snow Leopard, Hungul, Edible nest

Swiftlet and Manipur Brow Antlered Deer have been launched. Expenditure on this scheme in 9th, 10th and 11th five year plans is given in Table 4.2.

Table 4.2: Amount released in different Plans under this Wildlife scheme

Plan/Year	Amount Released (in crores)
9th Plan (1997-2002)	82.795
10th Plan (2002-07)	236.85
11th Plan **Total**	**291.429**
2007-08	64.00
2008-09	79.475
2009-10	73.574
2010-11	74.38

Annual allocation of fund during 11th Plan is of the order of Rs. 70 crores.

4.3.2 Project Tiger (National Tiger Conservation Authority): The Centrally sponsored 'Project Tiger' was launched in 1973 with the objective to ensure maintenance of a viable population of Tigers in India for scientific, economic, aesthetic, cultural and ecological values, and to preserve, for all times, areas of biological importance as a national heritage for the benefit, education and enjoyment of the people. Initially 9 Tiger Reserves were created and additional fund was provided to the States under this scheme. Gradually the number of Tiger Reserves increased in the States. Further, by amending the Wildlife (Protection) Act 1972, a National Tiger Conservation Authority was constituted with effect from 4th September 2006, for strengthening tiger conservation by ensuring normative standards in tiger reserves management. Since then 100 per cent central assistance is provided to 38 Tiger Reserves spread over in 17 states as an additionality for deployment of special Tiger Protection Force, comprising of ex-army personnel and local workforce and enhanced relocation package for people living in core or critical tiger habitat. The allocation of fund has increased in successive plans as the number of Tiger Reserves and coverage of forest area under it has expanded considerably. The details of the amount released since 8th Five Year Plan under this Centrally Sponsored Scheme is given in Table 4.3.

Table 4.3: Amount released in different 5 Year Plans under the Tiger Project

Plan/Year	Amount Released (in crores)
8th Plan (1992-97)	38.90
9th Plan (1997-02)	75.00
10th Plan (2002-07)	150.00
11th Plan **Total**	**597.67**
2007-08	62.70
2008-09	154.73
2009-10	201.52
2010-11	178.72

Annual allocation of funds during 11th Plan is of the order of Rs. 170 crore.

4.3.3 Project Elephant: Project Elephant was launched in 1991-92 to protect elephants and their habitat and corridors, to address issues of man-elephant conflict arising mainly because of damages caused to the crops etc and also to see the welfare of domesticated elephants. Under the scheme financial and technical support is provided to major elephant bearing states in the country and thus implemented in 16 states (Andha Pradesh, Arunachal Pradesh, Assam, Chhattisgarh, Jharkhand, Karnataka,

Kerala, Maharashtra, Meghalaya, Nagaland, Odisha, Tamil Nadu, Tripura, Uttarkhand, Uttar Pradesh and West Bengal). By now 27 Elephant Reserves has been notified by the states and permission to notify 5 more has been given by the Ministry of Environment and Forests. The expediture on this scheme in 9th, 10th and 11th five year plans is given in Table 4.4. The annual allocation of fund is about Rs. 20 crores.

Table 4.4: Amount released in different Plans under the Project Elephant

Plan/Year	Amount Released (in crores)
9th Plan (1997-02)	30.48
10th Plan (2002-07)	63.83
11th Plan	
2007-08	16.76
2008-09	21.48
2009-10	21.16
2010-11	22.48
Total 4yrs	**81.88**

4.3.4 Strengthening of Wildlife Division and Consultancies for Special Tasks: The Central Sector Scheme was launched in 1986 to strengthen Wildlife Division in the Ministry and regional offices of Wildlife Preservation for fulfilling the statutory obligation under Wildlife (Protection) Act 1972 and the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES). The Director (Wildlife Preservation) in the Ministry is the CITES Management Authority and monitors and regulate international trade in wildlife and its derivatives at the designated ports of exit and entry with the support of the Regional Offices. Consequent upon the creation of Wildlife Crime Control Bureau, these regional and sub-regional offices are now part of the bureau. The fund allocation to the scheme during 2009-10 and 2010-11 was about Rs. 4 crore and Rs. 6 crore, respectively.

4.4 Integrated Forest Protection Scheme (IFPS)

The Ministry of Environment and Forests launched an Integrated Forest Protection Scheme during 10th Five year plan (2002-2007) to provide holistic support to forest protection. The components provided for in the scheme were, Forest Fire Control and Management, Working Plan Preparation/Survey and Demarcation and Strengthening of Infrastructure for Forest Protection. The scheme has been implemented on sharing basis. In the North East and Special Category States it is 90 (Central):10 (States) and for other states, 75:25. The major focus was on (i) Introduction of modern tools and technologies in management and protection of forests like GPS and GIS in the preparation of working plans, (ii) Strengthening of infrastructure for field level functionaries which include vehicles for mobility and communication, and (iii) Use of remote sensing technology in detection of forest fires and physical measures to control them. Though an outlay of Rs. 445 crore was approved during 10th Five year plan, an amount of Rs. 302.65 crore only was sanctioned, and of this only Rs. 208.59 crore was released. The year-wise outlay and expenditure under the Scheme during 10th Plan period is given in Table 4.5.

Table 4.5: Year-wise outlay and expenditure during 10th Five year plan, Integrated Forest Protection Scheme

Year	Approved budget	Released/ Expenditure
2002-03	65.00	46.60
2003-04	66.00	25.40
2004-05	100.00	54.53
2005-06	Nil	33.42
2006-07	71.65	48.64
Total	**302.65**	**208.59**

An evaluation carried out by the Ministry shows that the scheme has helped in improving the infrastructure at front line level, residential quarters for field staff in remote areas, procurement of vehicles for their mobility, induction of modern technology such as GIS/GPS and establishment of GIS laboratory to support preparation of working plans, survey of forest boundaries and construction and fixing of boundary pillars etc.

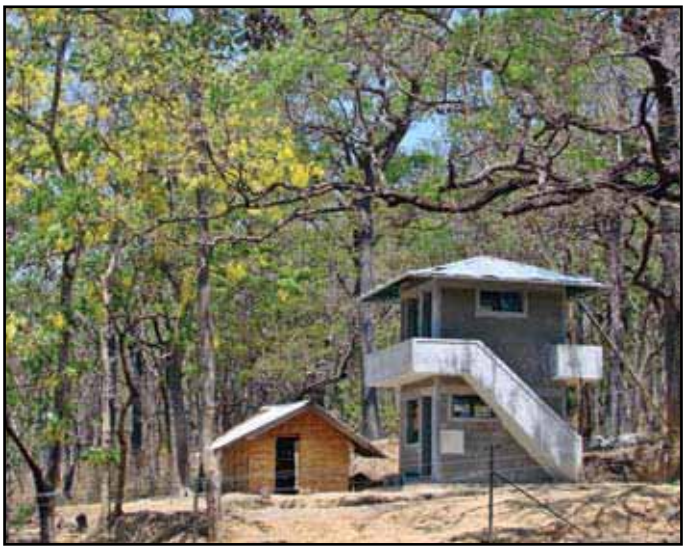
In the 11th Five year plan (2007-12), the scheme has been renamed as Intensification of Forest Management with additional components, broadening the scope of the scheme. The additional components include (i) Conservation and Restoration of Unique Vegetation & Ecosystems, (ii) Control and Eradication of Forest Invasive species (iii) Preparedness for Bamboo Flowering and (iv) Protection and Conservation of Sacred Groves. For all these additional components 100 per cent assistance is proposed for both recurring and nonrecurring items of expenditure. Inventory, awareness creation, cultural operations, fencing etc are common activity in these additional components. The total allocation of fund for the 11th Five year plan is Rs. 600 crore. However, a total of Rs. 291.42 crore only has been spent in the first four years of the plan. Year-wise actual expenditure during first four year of the plan is given in Table 4.6.

Table 4.6: Year-wise expenditure during 11th Five year plan, Intensification of Forest Development Scheme

Year	Expenditure (Rs. in crore)
2007-08	67.78
2008-09	75.57
2009-10	67.82
2010-11	80.26
2011-12 (proposed outlay)	183.65
Total	**475.08**

4.5 Externally Aided Projects

Externally Aided Projects in forestry sector on a substantially large scale started during late 1970s to augment the financial resource mainly for expanding the forest and tree resource through Social Forestry programmes. The projects were implemented in the states with funding from different donor agencies. The World Bank funded 7 projects, SIDA 5, USAID 1, ODA (now DFID) 1 and CIDA 1 project. Most of the Social Forestry projects ended in 1993 except in Tamil Nadu and Odisha where phase II projects funded by SIDA continued upto 1996. The total investment in the 14 projects implemented in 14 States (Andhra Pradesh, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Maharashtra, Odisha, Rajasthan, Tamil Nadu,



Uttar Pradesh and West Bengal) was Rs. 1,701 Crore. The fund was used to raise forest plantations of 2.572 million ha mostly in non-forest lands along road, rail and canal side, on barren common lands, panchayat land and institutional land (MoEF 2004). The fund was also used for raising nurseries for distributing seedlings to people, often free of cost, for planting in their own farm lands, bunds, homesteads, institutional areas etc. Project period, project cost and area of tree plantations raised are given in Appendix 4.5.

After the implementation of the social forestry programmes, there has been policy change in funding of forestry projects, both at the donor agency and recipient country level and they have moved to funding broad based forest sector projects. Most of the externally aided forestry projects cover a number of issues besides afforestation, like capacity building and human resource development, application of modern tools and technology, biodiversity conservation, strengthening of institutions, livelihood promotion, etc. During 1990 to 2004, 15 externally aided forest sector projects were implemented of which 7 projects were funded by the World Bank, 4 by Japanese Bank for International Cooperation (JBIC) and 1 each by the European Economic Commission (EEC), the Overseas Development Agency (ODA), OECF and GTZ. These projects have been implemented in Andhra Pradesh, Gujarat, Haryana in Aravali, HP, Kerala, Karnataka in Western Ghats, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand and West Bengal with a total investment of Rs. 3,215 crores. Details of the project cost, period and State of implementation is given in Appendix 4.5.

At present, eleven State Sector Forestry Projects are being implemented in states, namely, Gujarat, Haryana, Himachal Pradesh, Karnataka, Odisha, Rajasthan, Tamil Nadu (1 project in Exit phase and another commenced - in preliminary phase), Tripura, UP and Sikkim with a total budget of about Rs. 6,453 crore, all of which are funded by JICA, 1 project by the World Bank has concluded in Andhra Pradesh and another project assisted by JICA has also concluded recently in Rajasthan. The projects cover a wide range of issues of the forest sector, broadly including livelihood promotion, afforestation, forest management, institutional strengthening, protection & conservation of biodiversity of forests etc. There is one more project under Central Sector titled "Capacity Building for frontline staff in Forestry Sector" with an outlay of Rs. 225 crore funded by JICA. It is being implemented in 11 states with the flexibility to include more states. Funding details, project components and operation period of each project are given in Appendix 4.6.

4.6 Award of Finance Commission

The 12th Finance Commission realized the role of forests in sustainable development of the country, because forests constitute the first line of defence

against environmental degradation and pollution resulting from economic activity, whether of industrial or agricultural origin, and provided a grant of Rs. 1000 Crore for the first time to be distributed among the states during 2005-10 in accordance with the share accounted for by each state in the total forested acreage in the country.

The 13th Finance Commission has, *inter alia*, observed that there is a need to carry that grant forward because forests provide a variety of services like carbon sequestration, sediment control and soil conservation, ground water recharge, protection from extreme weather events and preservation of biodiversity. The Commission recommended aggregate grant of Rs. 5,000 crore for all the States which has been accepted by the Government, to be distributed during 2010-15 in five annual instalments. The state-wise and year-wise grant is given in Appendix 4.4. The fund flow is directly from the Finance Ministry to the State Governments. The grant is given on the basis of the share of national forest area falling in a State as well as the implicit economic disability on the basis of percentage of forested area in each state. The broad objective of the grant-in-aid is to provide wherewithal for preservation so as to halt and reverse past decline in the quantity and quality of area under forests, and to provide fiscal resource by which the state can enable alternate economic activities as a substitute for economic disability imposed by maintaining forest cover.

It has been stipulated that grants will be released without any condition in first two years 2010-11 and 2011-12, but states will have to develop working plans within this period which will provide a benchmark database to assess changes in forest cover over time. The instalments in the subsequent three years will be released after approval of more than 80 per cent of the working plans. Further, 75 per cent of the total release can be used for development purposes and the remaining for preservation of forest wealth as additionality to the state budget for development of forestry and wildlife in the last three years. A High Level Monitoring Committee headed by the Chief Secretary of the State Government shall be responsible for monitoring both physical and financial targets.

4.7 National Rural Employment Guarantee Act (NREGA)

The (Mahatma Gandhi) National Rural Employment Guarantee Act (NREGA) was notified in September 2005 by the Government of India to enhance livelihood security of households in rural areas of the country, by providing at least one hundred days of guaranteed wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work. The Act now covers all 619 rural districts of the country, and is being implemented through Ministry of Rural Development. It is a 100 per cent Central

Government funded scheme. Creation of durable assets and strengthening of livelihood resource base for rural poor is an important objective of the scheme. It is a mega programme of the Government of India and the annual allocation is of the order of Rs. 40,000 crore at present. The activities under the scheme *inter alia* include water conservation and water harvesting, drought proofing including afforestation and tree plantations, irrigation canals, renovation of traditional water bodies and land development. The implementation, control and fund management of the scheme rest with District Authorities. The District Authorities in turn may involve Forest Department at the division level for identifying the forestry related works in the district, preparing plans and executing the works. The payment for works is done through the banks/post offices by the District Collector's office after certification by the executing department. Forest Department generally undertakes works like rehabilitation of degraded areas, reforestation for fuelwood, soil and water conservation works. In some States, Forest Departments have been involved in a central role, and have received good funds for implementation of the NREGA where they are undertaking the activities which improve ecological stability and forest resource, besides enhancing livelihood security of the rural households. The progress of the implementation of the selected SFDs is as below:

In **Uttar Pradesh** the State Government has gradually increased the fund to the Forest Department in the last 3 years, as given in Table 4.7. During 2008-09 and 2009-10 the funds were utilized mainly on raising nursery and establishing tree plantations on 34,035 ha and 27,847 ha respectively, whereas during 2010-11 the fund was used for construction of check dams, ponds, water holes for wild animals and soil and water conservation in addition to tree plantations.

Table 4.7: Expenditure on NREGA by the Forest Department (FD) of Uttar Pradesh

Year	Expenditure by FD (Rs. crores)	Total NREGA fund to State (Rs. crores)	Total % spent by FD
2008-09	78.52		
2009-10	142.47	7,380.42	1.90 %
2010-11	216.62	7,800.00	2.78 %
2011-12	530.00 (planned)	8,787.20	6.03 %

In **Gujarat,** the expenditure booked by Forest Department for NREGA works during 2008-09, 2009-10, and 2010-11 was Rs. 23.14 crores, Rs. 60.09 crores and Rs. 81.73 crores, respectively, whereas the total allocation to Gujarat State during these years was Rs. 196.15 crore, Rs. 738.84 crore and Rs. 788.21 crore respectively. Thus, about 10 per cent of the budget has been utilized by the Forest Department. The NREGA works included weeding, pit digging, fencing, making of rubble-walls, trenches, nurseries. Many

a times the works have been dovetailed with routine departmental works. A sizeable number of small Soil and Moisture Conservation (SMC) structures called Terrace Talawadi or Contour Trenches have been made for water conservation. The department has also constructed roads in remote villages.

In **Andhra Pradesh** the contribution of the Forest Department is presented in Table 4.8. Besides soil and water conservation related works trees were planted in 1,593 ha land, 922 km along road and 19.78 crore seedlings were raised in 2010-11 and 1,420 ha, 533 row km and 17 crore seedlings in 2011-12.

Table 4.8: Expenditure on NREGA by the Forest Department of Andhra Pradesh

Year	Expenditure by FD (Rs. crore)	Total NREGA fund to State (Rs. crore)
2010-2011	78	6000
2011-2012	72	2500

In **Maharashtra** the Forest Department booked Rs. 27.6 crore in 2009-10 and Rs.18.70 crore in 2010-11 against budget allocation between Rs. 85 to 100 crore. About 20 per cent of the expenses are on plantation activity and the rest on creation of ponds and water conservation.

In **Jharkhand**, about Rs. 65 crore were spent by the Forest Department under NREGA during 2010-11 as the fund was made available by State Government. In **Punjab**, NREGA fund is used by the Forest Department for raising nursery and plantations and soil conservation works. In **Haryana**, only limited fund has been released to the Forest Department by State Government.

There is no fund allocation in NREGA to Forest Departments of **Arunachal Pradesh, Assam, Bihar, Mizoram** and **Nagaland** so far.

4.8 Compensatory Afforestation Fund

The Ministry of Environment and Forests notified a Compensatory Afforestation Management and Planning Authority (CAMPA) in April 2004 in pursuance to the Order of the Hon'ble Supreme Court of India dated 30.10.2002 in IA No. 566 in WP (Civil) No. 202/1995 in the matter of T.N. Godavarman versus Union of India. The Court directed to create a Compensatory Afforestation (CA) Fund to deposit all amounts received from the user agencies (to whom forest land has been diverted for non-forestry purpose by the competent authority) towards compensatory afforestation, additional CA, penal CA, Net Present Value (NPV) etc. A huge amount of money has been received under this, specially after inclusion of NPV, at a rate between Rs. 5.8 to 9.6 lakh per hectare. However, as the CAMPA could not become operational for various reasons, Supreme Court of India ordered for constitution of an ad-hoc CAPMA under the Chairmanship of Director General Forests in March 2006 to ensure that all funds received on behalf of CAMPA and lying with various officials of the State Government and others are transferred to a single bank account and utilized for development and protection of forests and wildlife. After creation of the state CAMPA's in 2009, the fund flow of money lying with *ad-hoc* CAMPA at the centre, has been streamlined.

The amount lying with *ad-hoc* CAMPA at present is to the tune of Rs. 18,506 crores which also includes accrued interest. Based on the proposals and annual plans of operation (APO), the funds are being released to the States to the tune of about Rs. 1000 crores per year. About Rs. 983 crore were released in 2009-10

and about Rs. 1000 crores in 2001-11 to the respective states against diversion of whose forest land from the money received. Besides compensatory afforestation and forest development activities, the fund is being used for infrastructure development. Shortage of vehicles in the Forest Departments has been always a serious constraint, affecting the movement of officers and field staff for discharging duties particularly in forest & wildlife protection. Many State Forest Departments have utilized CAMPA funds in purchasing vehicles to ease the situation. For example Arunachal Pradesh Forest Department purchased 20 vehicles, Bihar 25 vehicles, Chhattisgarh 60 vehicles, Maharashtra 92 vehicles including 12 tractors and 44 motor cycles during 2010-11.

4.9 Green India Mission

The Green India Mission (GIM) is one of the eight missions under the National Action Plan on Climate Change (NAPCC), the strategy for which has been finalised after an intensive process of public debate and participation by the Ministry of Environment and Forests. The Mission aims to respond to the likely climate change impacts by a combination of adaptation and mitigation measures that help enhance carbon sinks in forests and other ecosystems, adaptation of vulnerable species/ecosystems, and adaptation of forest-dependent communities. The overarching objective of GIM is to increase forest/ tree cover in 5 million ha of land, and improve quality of forest cover in another 5 million ha of lands, and thus together help in improving ecosystem services from 10 million ha of lands, and increase forest based livelihood income of about 3 million forest dependent households. The mission proposes to take a holistic view of greening by restoring ecosystems and habitat diversity, enhancing biodiversity, and not merely focusing on tree plantations to meet carbon sequestration targets, and realizing carbon benefits as co-benefits, and treating forest and non-forest lands simultaneously in a given bio-physical unit such as landscape/sub-landscape/sub-watershed, etc. and addressing the drivers of degradation through cross-cutting interventions and convergence with other programs.

The mission will be implemented through revamped Forest Development Agencies (FDAs) that will have link with the District Planning Committee. The Gram Sabha, and the various Committees set up by it including Village Forest Committees, Van Panchayats, etc. will be the key institutions for planning and implementation at the village level.

The total mission cost is estimated to be Rs. 46,000 crore over 10 years, with Rs. 32,000 crores for core mission interventions and Rs. 12,000 crore for support activities which includes research, outreach activities, livelihood enhancement, institutional development and administrative costs. For the year 2011-12, an amount of Rs. 200 crore has been proposed from the Clean Energy Fund for

preparatory activities. The implementation period of the mission will be spread over 10 years, coinciding with the 12th and 13th Five Year Plan periods.

4.10 Achievements in Forest Plantations

Establishment of forest plantations on a considerably large scale in India began after launching of numerous donor-assisted social forestry projects during late 1970s and early 1980s the details of which has been given in paragraph 4.5 in this chapter. Plantations were mostly established outside forest reserves in degraded forests, wastelands and on private farm lands. Creation of Forest Development Corporations in the same period also led to some expansion of plantation of industrially important species within forest reserves. In the 20-Point Programme which is a package of Social Sector Schemes in the development of the county, the Government of India declared tree planting a priority in 1982. Annual planting reached about 1 million ha during 1980-85. Creation of a National Wasteland Development Board in 1985 gave further impetus, and annual planting rate increased to about 1.78 million ha between 1985 and 1990. Since 1991 the rate slightly declined to 1.5 million ha due to termination of many externally funded projects and paucity of funds.

Since 1980, the progress of tree plantation raised in blocks was reported in hectares where as those planted in linear and scattered form or distributed to public, by number of seedlings, which were finally converted into 'notional' area using a norm of 2000 seedlings equal to one ha. After creation of the National Afforestation and Eco-development Board (NAEB) in 1992 under the Ministry of Environment and Forests, the reporting from plantation agencies (state/UTs) has two components, that is, area of block plantations and number of seedlings. It is to be noted that about 35 to 40 per cent of total area of annual plantations are actually ascribed to notional area equivalent of seedlings distributed. The current reporting of plantations in India continues to have these two components. After the creation of NAEB, the afforestation activities within the forest land have been done by the Forest Departments of States/ UT and are monitored by NAEB, whereas tree planting outside forest lands were done by other departments and monitored by Ministry of Rural Development under 20-Point Programme.

The 20-Point Programme (TPP) was restructured again in 2006 in conformity with the priorities of the government as contained in the National Common Minimum Programme (NCMP). The restructured Programme is called Twenty Point Programme – 2006 (TPP-2006). The physical target of tree plantation under 20-Point Programme (TPP) is fixed by the Ministry of Environment and Forests in consultation with the states/UTs. The states/UTs are required to furnish Progress Report to the Ministry of Statistics and Programme Implementation (MSPI) who in turn compiles the progress on monthly basis

and puts it on the website. The ministry also rates the performance of the State/UT on the basis of norms set by it. In addition to State Forest Departments, the physical achievements/contribution to the tree planting target comes from other departments like Rural Development, Urban Development, Horticulture, Public Works Department, Industries etc. However, the break up of plantations raised by different departments is not available on the web site of the MSPI. An example from Maharashtra Forest Department (nodal of 20-Point Programme) shows that about 60 per cent of the plantations are raised by other departments as in Table 4.9.

As per the compilation by the MSPI, tree plantations in the country under 20-point programme by all the Departments including forests during 2005-10 are in the order of 1.5 to 1.6 million ha per year. The state-wise progress is given in the Appendix 4.7. In addition to the area covered under block plantations, a large number of tree seedlings are also raised and planted in public/forest land in a scattered non block form where area determination is not possible. The average number of such seedlings raised is about 120 million per year. The state-wise number of seedlings raised is given in Appendix 4.8.

The progress of tree plantations under various schemes done by the Forest Departments of State/UTs has been compiled from the Annual Administrative Reports, Statistical Reports received and personal emails received from the PCCFs or concerned officer of the Forest Departments. Besides afforestation done with the Central Government funding under NAP there are State level plantation schemes in many States. Each State has different kind of schemes according to the situation and requirement and period. Consistent report about annual area of afforestation and corresponding fund is however not available in the SFDs Administration/Statistical reports. Scheme-wise area of the plantations for selected states is given in the Appendix 4.11.

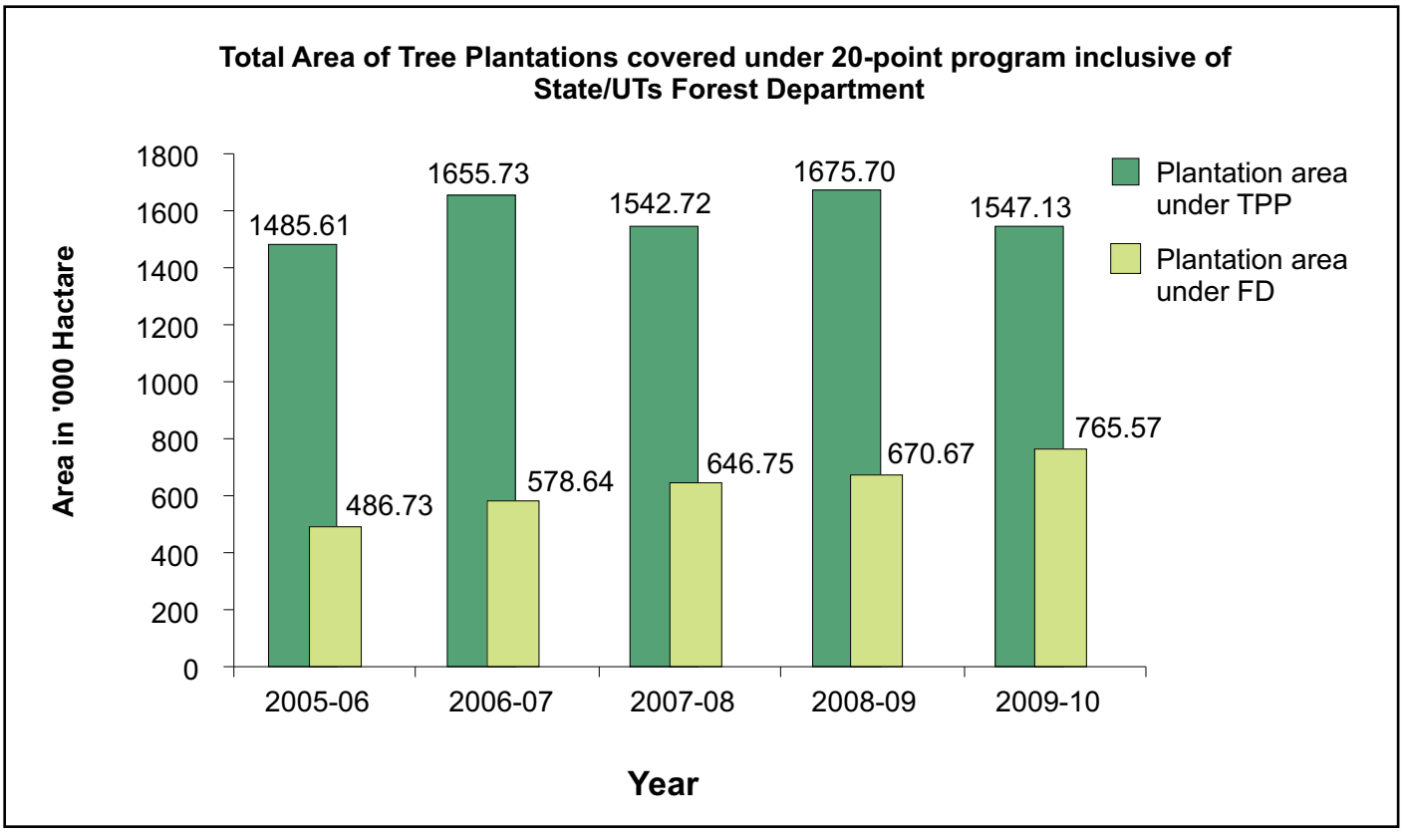
Table 4.9: Progress of 20 Point Programme for 2008-09 and 2009-10 in Maharashtra

Year	2008-09		2009-10	
Departments	**Area (In ha)**	**No. of Seedlings (lakh)**	**Area (In ha)**	**No. of Seedlings (lakh)**
Forest Department	55,967.23	532.91	48,099.43	525.36
Forest Dev Corporation	2,331.87	31.45	2,906.74	44.45
Social Forestry Department	11,154.81	272.61	6,540.31	257.27
Horticulture	91,530	245.66	77,029.55	209.09
Other	-	-	11,639.3	24.61
Total	**160,983.90**	**1,082.63**	**14,6215.33**	**1,060.78**

The average annual tree plantations/afforestation done by the Forest Departments during 2005-10 are about 0.82 million ha of which 0.2 million ha are under Assisted Natural Regeneration (ANR). The ANR enriches the existing forests by improving its quality but does not add to increase the forest or tree cover. State-wise afforestation area by SFDs only by plantations is given in the Appendix 4.9 and by ANR is in Appendix 4.10. The annual tree plantation under 20-Point Programme inclusive of by SFDs is depicted in the Figure 4.3. The plantation area established by Forest Departments mentioned in the figure excludes area covered by ANR.

There is a lot of uncertainty about the area of successfully raised plantations as 100% plantations do not survive and there is also the factor of harvesting on short rotation (both officially and unofficially). No reliable monitoring mechanism by an independent agency is in place to ascertain the area of tree plantations actually raised under 20-Point Programme. There is also no proper account of area under different species raised in plantations. The afforestation, done by the Forest Departments of state/UTs specially, by FDA are however evaluated in the field by an independent agency, therefore better reliance can be placed on such plantations. Because of

Figure 4.3: Tree plantations raised under 20-Point Programme inclusive of plantations by State Forest Departments



the poor funding some states, specially, of the North East, depend on FDA funds only.

It has been difficult to get species-wise areas of forest plantations because current trend is to raise mixed plantations. Special effort was made to collect information about the planted area of teak which has been mentioned in the next section. Major species raised in the plantations by some selected SFDs are presented in the Table 4.10. The per cent given in the brackets are only indicative and has to be quoted with caution because some states have estimated the area on the basis of number of seedlings raised in the nurseries.

4.10.1 Teak Plantation

Historically, indigenous Teak (*Tectona grandis*) species, has been the most favoured species in forestry plantations in India because of its high timber value and ease of establishment. It has been most widely planted within its natural zone and outside. A good record about the area of its plantations was also maintained in the past. The Forest Development Corporations, particularly of Madhya Pradesh and

Table 4.10: Major species raised in plantations in selected States by the Forest Department

S. No.	Name of State	Av. annual plantation (in '000 Ha)	Major species in the plantations (figures in the bracket are indicative per cent of the species)
1	Chhattisgarh	15.24	Teak (28%), Gamar (3.4%), *Eucalyptus* (3%) and other spp (65.6%).
2	Gujarat	90.46	*Acacia catechu* (6%), *Tectona grandis* (6%), *Eucalyptus spp.* (5%), *Acacia nilotica* (4%) *Dendrocalamus spp* (7%), Neem (2%) and other spp.(68%)
3	Haryana	17.80	*Eucalyptus spp, Ailanthus excelsa, Dalbergia sisoo, Acacia nilotica*
4	Karnataka	63.24	Teak, Eucalyptus, Bamboo, firewood species and others
5	Madhya Pradesh	33.76	Teak, Bamboo, Gamar, Mahuwa, etc
6	Maharashtra	50.35	Teak (5%), Bamboo (6%), others (89%)
7	Rajasthan	70.21	*Acacia catechu* (22%), *A. tortilis* (17%), bamboo (11%), Neem (9%) Amla (7%), *Zizyphus spp* (5%) and other spp (29%)
8	Uttarakhand	26.58	Chir, oak, Sal and other spp
9	Uttar Pradesh	62.95	Shisham, Teak, Sal, Bamboo, Eucalyptus, Arjun, Kanju etc

Maharashtra had specific aim to grow pure teak forests after clear felling of commercially less valued forests leased to them. Since teak is planted in a large number of countries across the world in tropical zone, an international network on teak has been created called TEAKNET to exchange information for its promotion in plantations and marketing of timber.

Due to restrictions on clear felling of natural forests in India and emphasis on conserving biodiversity, the scale of planting of pure teak in many states have been scaled down since about a decade. However, in new areas like in Mizoram and Tripura states it is being extensively planted even now. Special effort was made to compile data at national level under existing teak plantations (old & new). Many SFDs had to cull out the information from their working plans as separate record of plantation area by species is often not maintained. The total cumulative area estimated at present is about 1.693 million ha. State-wise area of planted teak forests is given in the Table 4.11.

Table 4.11 Total area under teak plantations in India as in 2010

(Source: mostly personal communication from State Forest Departments & a few published in Administration Reports)

State	Area (In ha)	State	Area (In ha)
Andhra Pradesh	147,910	Mizoram	129,000
Assam	29,872	Nagaland	6,500
Chhattisgarh	105,968	Odisha	45,500
Goa	9,757	Tamil Nadu	64,177
Gujarat	109,900	Tripura	156,850
Jharkhand	1000	Uttarakhand	20,209
Karnataka	153,297	Uttar Pradesh	95,216
Kerala	77,788	West Bengal	7,675
Madhya Pradesh	261,914	Andaman & Nicobar Islands	11,838
Maharashtra	265,173	Dadra & Nagar Haveli	2,500
Manipur	150		
Total area of teak plantations in India			**1,693,094 ha**

NB: There is a general slowdown in the annual plantations of teak in last few years in the country. In last one decade no new area has been brought under teak plantations in Assam, Goa, Jharkhand, Uttarakhand, Uttar Pradesh, Andaman & Nicobar Islands, and Dadra & Nagar Haveli.

Appendix 4.1

Funds released to States under National Afforestation Programme (In crore)

State	2000-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	Total
Andhra Pradesh	0.99	8.35	10.44	14.21	7.08	11.06	9.97	11.54	11.03	84.67
Arunachal Pradesh	1.40	2.76	4.49	0.76	2.89	2.93	4.85	3.25	2.37	25.69
Assam	0	0	5.58	7.99	5.50	13.60	8.58	9.78	14.48	65.51
Bihar	0	0	1.88	2.74	3.42	4.94	6.92	6.48	7.74	34.12
Chhattisgarh	0.77	5.89	10.20	17.50	17.63	13.05	42.69	25.66	25.12	158.51
Goa	0	0	0.64	0	0	0	0	0	0	0.64
Gujarat	0.85	3.87	3.20	8.77	12.05	17.52	30.93	25.75	24.44	127.38
Haryana	9.23	10.58	7.76	7.46	4.35	9.20	12.93	20.14	20.57	102.22
Himachal Pradesh	2.20	.60	6.95	10.60	9.08	11.56	7.43	6.72	3.59	58.73
Jammu & Kashmir	1.54	5.45	7.21	3.56	5.28	5.83	8.13	8.47	9.81	55.28
Jharkhand	0	1.34	9.27	8.66	7.85	19.03	24.56	26.32	21.06	118.09
Karnataka	0.43	15.70	15.54	21.17	23.03	23.54	31.02	15.46	11.95	157.84
Kerala	0	1.06	3.47	1.04	4.99	12.75	8.81	9.45	4.02	45.58
Madhya Pradesh	13.71	13.81	10.92	17.18	12.61	15.83	13.84	22.55	22.53	142.98
Maharashtra	1.85	4.87	11.91	13.12	14.69	15.93	29.92	21.87	20.53	134.69

Contd...

State	2000-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	Total
Manipur	0	2.40	5.08	5.43	6.30	7.78	12.37	9.51	5.93	54.80
Meghalaya	0	0	0	2.45	5.18	5.44	5.94	4.69	2.21	25.91
Mizoram	0	8.86	15.85	11.20	10.06	13.09	16.75	13.61	17.27	106.70
Nagaland	2.08	8.51	8.94	5.60	5.37	7.22	7.75	6.64	10.67	62.78
Odisha	0.05	13.14	5.96	11.26	12.05	14.07	19.01	21.63	8.82	105.99
Punjab	0.25	0.25	1.74	0.14	3.97	3.36	5.88	3.30	3.01	21.91
Rajasthan	1.29	4.45	5.56	4.80	7.26	5.62	2.50	7.32	10.67	49.46
Sikkim	2.43	3.76	4.06	3.94	6.23	7.41	11.28	6.63	8.86	54.60
Tamil Nadu	0.76	7.82	14.66	14.06	20.92	17.22	9.46	8.86	7.98	101.73
Tripura	0.26	3.18	3.97	4.63	4.27	4.37	5.02	.89	3.20	29.79
Uttar Pradesh	7.04	20.01	21.34	18.16	17.04	11.88	36.77	30.80	30.20	193.23
Uttarakhand	0.40	2.34	5.81	10.54	13.10	11.52	12.39	9.24	7	72.34
West Bengal	0	2.26	5.55	6.03	5.92	7	7.23	9.06	3.11	46.16
Total	**47.53**	**151.26**	**207.98**	**233.00**	**248.12**	**292.75**	**392.93**	**345.62**	**318.17**	**2237.33**

(*Source:* National Afforestation and Eco-development Board, Ministry of Environment and Forests).

Appendix 4.2

Creation of annual plantation under National Afforestation Programme (Area in ha)

State	2000-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	Total
Andhra Pradesh	2,000	21,090	13,040	7,780	2,690	PROGRESS REFLECTED IN YEAR 2007 - 08	13,859	8,182	4,182	72,823
Arunachal Pradesh	3,846	11,030	4,600	0	1,940		5,705	1,450	1,750	30,321
Assam	0	0	19,665	4,350	2,940		15,660	6,365	3,625	52,605
Bihar	0	0	7,750	2,400	2,165		9,016	3,675	3,475	28,481
Chhattisgarh	1,950	15,670	19,869	2,800	2,225		40,990	14,706	8,450	1,06,660
Goa	0	0	1,250	0	0		0	0	0	1,250
Gujarat	1,500	12,415	6,600	4,930	5,000		32,545	14,620	4,920	82,530
Haryana	9,400	3,405	7,250	1,000	1,050		8,298	8,260	5,526	44,189
Himachal Pradesh	2,950	1,520	20,434	7,474	0		10,028	1,222	1,255	44,883
Jammu & Kashmir	4,580	28,204	15,055	0	0		7,735	6,370	3,550	65,494
Jharkhand	0	5,700	25,400	7,500	1,250		31,990	14,680	9,980	96,500
Karnataka	625	42,770	6,450	4,790	2,650		32,905	3,765	2,200	96,155
Kerala	0	6,600	5,890	805	2,955		10,518	4,118	1,095	31,981
Madhya Pradesh	20,300	32,650	5,700	14,700	3,170		28,707	13,367	6,188	1,24,782
Maharashtra	4,003	17,925	31,580	8,605	3,175		41,538	5,182	7,219	1,19,227
Manipur	0	11,674	5,600	600	500		12,295	2,950	1,525	35,144
Meghalaya	0	0	0	7,400	0		8,075	1,970	800	18,245
Mizoram	0	26,170	600	0	0		16,150	4,500	2,700	50,120
Nagaland	4,130	19,000	2,398	0	0		10,640	3,500	4,050	43,718
Odisha	820	39,636	6,228	2,313	6,025		59,140	7,400	1,745	1,23,307
Punjab	650	0	3,300	900	3,385		7,687	1,640	547	18,109
Rajasthan	1,250	12,550	6,800	2,500	5,090		1,000	9,500	6,800	45,490
Sikkim	1,600	11,783	1,000	0	0		6,045	3,350	2,225	26,003
Tamil Nadu	2,500	21,400	19,577	7,450	1,340		6,230	5,670	4,025	68,192
Tripura	805	16,400	0	2,200	0		8,350	335	1,380	29,470
Uttar Pradesh	7,344	33,615	19,028	2,000	1,017		39,104	18,355	9,664	1,30,127
Uttarakhand	815	4,122	18,186	10,346	5,665		18,867	3,510	4,065	65,576
West Bengal	0	9,470	9,286	3,900	200		9,984	4,793	615	38,248
Total	**71,068**	**4,04,799**	**2,82,536**	**1,06,743**	**54,432**	**0**	**4,93,061**	**1,73,435**	**1,03,556**	**16,89,630**

Appendix 4.3

(a) Component-wise area of afforestation (ha) under National Afforestation Programme during 2007-08									
S.N.	**Name of FDA**	**ANR**	**AR**	**MP**	**SPD**	**BP**	**PHS**	**CP**	**Total**
1	Andhra Pradesh	2409	824	120	81	3	0	0	3437
2	Arunachal Pradesh	299	1542	213	0	293	177	128	2652
3	Assam	3654	3440	1015	0	1480	320	90	9999
4	Bihar	950	1050	850	0	350	0	0	3200
5	Chhattisgarh	5030	4185	530	1260	2817	1880	0	15702
6	Goa	0	0	0	0	0	0	0	0
7	Gujarat	2820	3130	4145	3085	1565	420	0	15165
8	Haryana	540	1760	100	0	0	0	0	2400
9	Himachal Pradesh	378	642	310	169	57	74	0	1630
10	Jammu & Kashmir	890	1078	0	305	0	50	0	2323
11	Jharkhand	7970	3125	1855	200	1075	0	0	14225
12	Karnataka	5730	7540	3215	590	890	255	680	18900
13	Kerala	2878	258	134	10	501	132	695	4608
14	Madhya Pradesh	2170	350	0	1240	350	0	0	4110
15	Maharashtra	996	2042	460	125	210	0	0	3833
16	Manipur	1900	2000	1325	100	0	0	0	5325
17	Meghalaya	1750	800	300	100	475	130	200	3755
18	Mizoram	1450	4075	475	0	0	0	0	6000
19	Nagaland	450	1250	0	0	0	0	0	1700
20	Odisha	9975	923	30	27	75	50	0	11080
21	Punjab	0	389	336	10	0	10	0	745
22	Rajasthan	200	0	0	65	0	0	0	265
23	Sikkim	692	658	458	526	380	148	210	3072
24	Tamil Nadu	0	0	0	0	0	0	0	0
25	Tripura	1145	815	632	290	785	165	50	3882
26	Uttar Pradesh	9903	6326	420	820	135	590	85	18279
27	Uttarakhand	1794	2248	1090	930	0	1195	295	7552
28	West Bengal	107	2608	175	0	73	0	0	2963
	Total	**66080**	**53058**	**18188**	**9933**	**11514**	**5596**	**2433**	**166802**

(b) Component-wise area of afforestation (ha) under National Afforestation Programme during 2008-09									
S.N.	**Name of FDA**	**ANR**	**AR**	**MP**	**SPD**	**BP**	**PHS**	**CP**	**Total**
1	Andhra Pradesh	2712	1124	128	125	0	0	0	4089
2	Arunachal Pradesh	350	2034	100	0	0	50	0	2534
3	Assam	1960	2420	425	0	600	250	70	5725
4	Bihar	950	950	800	0	300	0	0	3000
5	Chhattisgarh	8070	5225	1000	1190	4625	1580	0	21690
6	Goa	0	0	0	0	0	0	0	0
7	Gujarat	1840	3250	3250	3485	1415	295	0	13535
8	Haryana	825	3718	655	0	0	0	0	5198
9	Himachal Pradesh	613	800	643	300	146	368	0	2870
10	Jammu & Kashmir	1860	1680	50	990	0	630	0	5210
11	Jharkhand	8100	3365	2030	200	1255	0	0	14950
12	Karnataka	880	655	390	120	145	20	50	2260
13	Kerala	1825	69	117	0	253	121	398	2783
14	Madhya Pradesh	7250	950	200	2610	1360	445	0	12815
15	Maharashtra	7556	5537	940	267	1925	548	0	16773
16	Manipur	1500	2620	1150	100	0	0	0	5370
17	Meghalaya	700	950	250	150	400	170	100	2720
18	Mizoram	2100	4680	220	0	0	0	0	7000
19	Nagaland	500	2300	0	100	335	65	0	3300
20	Odisha	27742	1305	540	0	190	0	0	29777
21	Punjab	400	2289	1585	45	100	100	0	4519
22	Rajasthan	200	0	0	0	0	0	0	200
23	Sikkim	670	690	525	505	515	260	130	3295
24	Tamil Nadu	3755	580	175	0	250	0	0	4760
25	Tripura	50	0	0	0	0	0	0	50
26	Uttar Pradesh	5206	5407	984	125	25	901	20	12668
27	Uttarakhand	1075	1210	830	680	0	770	450	5015
28	West Bengal	1244	2554	244	0	178	0	0	4220
	Total	**89933**	**56362**	**17231**	**10992**	**14017**	**6573**	**1218**	**196326**

(c) Component-wise area of afforestation (ha) under National Afforestation Programme during 2009-10									
S.N.	**Name of FDA**	**ANR**	**AR**	**MP**	**SPD**	**BP**	**PHS**	**CP**	**Total**
1	Andhra Pradesh	3918	1803	434	92	187	49	0	6482
2	Arunachal Pradesh	0	0	0	0	0	0	0	0
3	Assam	1905	1855	525	25	625	50	20	5005
4	Bihar	1050	1050	850	0	325	0	0	3275
5	Chhattisgarh	4850	2475	1600	540	2851	225	0	12541
6	Goa	0	0	0	0	0	0	0	0
7	Gujarat	1265	2535	2950	1770	1000	200	0	9720
8	Haryana	1339	4836	860	400	0	8	0	7443
9	Himachal Pradesh	290	253	165	165	0	10	0	883
10	Jammu & Kashmir	1686	2105	0	928	0	315	0	5034
11	Jharkhand	9122	3375	2095	100	1250	0	0	15942
12	Karnataka	1255	605	295	45	95	25	475	2795
13	Kerala	16604	2122	1345	90	3524	1116	3862	28662
14	Madhya Pradesh	9820	1547	1070	3805	2060	400	0	18702
15	Maharashtra	1919	3455	2303	75	801	450	0	9003
16	Manipur	500	1150	375	25	0	0	0	2050
17	Meghalaya	300	550	50	50	50	100	50	1150
18	Mizoram	2950	3400	650	0	0	0	0	7000
19	Nagaland	300	3800	50	100	435	115	0	4800
20	Odisha	8739	1892	307	55	200	0	0	11193
21	Punjab	200	1000	402	50	130	250	0	2032
22	Rajasthan	6365	600	0	1150	0	300	0	8415
23	Sikkim	890	695	430	415	325	225	150	3130
24	Tamil Nadu	2955	580	0	0	250	0	0	3785
25	Tripura	585	670	357	185	663	195	0	2655
26	Uttar Pradesh	10625	6725	785	110	140	410	55	18850
27	Uttarakhand	725	812	695	475	550	25	275	3557
28	West Bengal	955	1531	240	0	16.19	0	0	2742
	Total	**91112**	**51421**	**18833**	**10650**	**15477**	**4468**	**4887**	**196846**

FDA *Forest Development Agency*
ANR *Assisted Natural Regeneration*
AR *Artificial Regeneration*
MP *Mixed Plantation*
SPD *Silvi Pastoral Development*
BP *Bamboo Plantation*
PHS *Regeneration of Perennial Herbs and Shrubs*
CP *Cane Plantation*

Appendix 4.4

Grants-in-Aid for Forests by Thirteenth Finance Commission

(Rs. In crore)

S.N.	State	2010-11	2011-12	2012-13	2013-14	2014-15	2010-15
1	Andhra Pradesh	33.58	33.58	67.16	67.16	67.16	268.64
2	Arunachal Pradesh	90.98	90.98	181.96	181.96	181.96	727.84
3	Assam	23.08	23.08	46.16	46.16	46.16	184.64
4	Bihar	4.80	4.80	9.60	9.60	9.60	38.40
5	Chhattisgarh	51.39	51.39	102.78	102.78	102.78	411.12
6	Goa	4.61	4.61	9.22	9.22	9.22	36.88
7	Gujarat	10.24	10.24	20.48	20.48	20.48	81.92
8	Haryana	1.10	1.10	2.20	2.20	2.20	8.80
9	Himachal Pradesh	12.58	12.58	25.16	25.16	25.16	100.64
10	Jammu & Kashmir	16.63	16.63	33.26	33.26	33.26	133.04
11	Jharkhand	18.93	18.93	37.86	37.86	37.86	151.44
12	Karnataka	27.63	27.63	55.26	55.26	55.26	221.04
13	Kerala	16.94	16.94	33.88	33.88	33.88	135.52
14	Madhya Pradesh	61.29	61.29	122.58	122.58	122.58	490.32
15	Maharashtra	38.70	38.70	77.40	77.40	77.40	309.60
16	Manipur	18.79	18.79	37.58	37.58	37.58	150.32
17	Meghalaya	21.01	21.01	42.02	42.02	42.02	168.08
18	Mizoram	21.40	21.40	42.80	42.80	42.80	171.20
19	Nagaland	17.32	17.32	34.64	34.64	34.64	138.56
20	Odisha	41.37	41.37	82.74	82.74	82.74	330.96
21	Punjab	1.15	1.15	2.30	2.30	2.30	9.20
22	Rajasthan	11.04	11.04	22.08	22.08	22.08	88.32
23	Sikkim	5.07	5.07	10.14	10.14	10.14	40.56
24	Tamil Nadu	17.81	17.81	35.62	35.62	35.62	142.48
25	Tripura	11.94	11.94	23.88	23.88	23.88	95.52
26	Uttar Pradesh	10.06	10.06	20.12	20.12	20.12	80.48
27	Uttarakhand	25.68	25.68	51.36	51.36	51.36	205.44
28	West Bengal	9.88	9.88	19.76	19.76	19.76	79.04
	Total	**625.00**	**625.00**	**1,250.00**	**1,250.00**	**1,250.00**	**5,000.00**

Appendix 4.5

Completed externally aided forestry projects in India

S. No.	Name of project	Donor agency	Period of implementation	Projected cost (crore)	Actual expenditure (crores)	Physical (ha)
	Social Forestry Projects					
1	UP Social Forestry	W. Bank	1979-84	40.00	50.00	76,000
2	Gujarat Community Forestry	W. Bank	1980-85	66.65	67.74	1,08,355
3	Maharashtra Social Forestry	USAID	1982-90	56.40	72.80	75,726
4	Andhra Social Forestry	CIDA	1983-91	38.38	42.76	45,217
5	Bihar Social Forestry	SIDA	1985-92	53.85	48.66	53,375
6	J/K & Haryana Social Forestry	W. Bank	1982-91	57.07	106.19	1,86,281
7	West Bengal Social Forestry	W. Bank	1981-91	34.75	64.00	2,42,578
8	Karnataka Social Forestry	W.Bank/ ODA	1983-92	124.55	85.21	53,351
9	Kerala Social Forestry	W. Bank	1984-93	59.51	89.68	1,31,000
10	National SF (UP, HP, Raj.,Guj.)	W.Bank/ USAID	1985-93	387.29	698.18	11,98,742
11	Odisha Social Forestry ph I	SIDA	1983-88	28.17	27.06	33,592
12	Tamil Nadu Social Forestry I	SIDA	1981-89	65.68	56.96	1,40,363
13	Odisha Social Forestry ph II	SIDA	1988-96	78.34	136.80	1,19,450
14	Tamil Nadu Social Forestry II	SIDA	1988-96	85.40	154.86	1,08,176
	Total			**1,176.04**	**1,700.90**	**25,72,206**
	Forest Sector Projects					
1	West Bengal Forestry Project	W. Bank	1992-98	114.00	136.79	2,05,711
2	Aravali Haryana	EEC	1990-00	93.73	79.54	NA

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S. No.	Name of project	Donor agency	Period of implementation	Projected cost (crore)	Actual expenditure (crores)	Physical (ha)
3	Maharashtra Forestry Project	W. Bank	1992-00	431.51	353.44	NA
4	Andhra Pradesh Forestry Project	W. Bank	1994-00	353.92	313.38	NA
5	Madhya Pradesh Forestry	W. Bank	1995-00	245.94	215.51	NA
6	Arawali Rajasthan	OECF	1992-00	287.69	285.50	NA
7	Western Ghats Dev	ODA	1992-99	111.04	107.40	NA
8	Himachal Eco-development Phase I	GTZ	1994-00	18.70	16.40	NA
9	IG Canal Afforestation Raj.	JBIC	1990-02	269.17	152.44	NA
10	Gujarat Integrated Forestry Development	JBIC	1995-02	608.00	534.36	2,65,753
11	Rajasthan Forestry Development	JBIC	1995-02	150.92	148.03	55
12	Uttar Pradesh- Uttarakhand Forestry Project	W. Bank	1997-04	272.00	272.00	NA
13	Kerala Forestry Project	W. Bank	1997-2004	182.39	167.42	NA
14	Punjab Afforestation Project I	JBIC	1997-2003	408.10	250.81	NA
15	FREEP	W. Bank	1994-2001	197.47	181.81	NA
	Total			**3,744.57**	**3,214.83**	**4,71,519**
	All completed Projects Total			**4,920.61**	**4,915.73**	**30,43,725**

CIDA *: The Canadian International Development Agency*
EEC *: The European Economic Commission*
GTZ *: The Deutsche Gesellschaft fur Technische Zusammernarbeit*
JBIC *: The Japan Bank for International Cooperation*
ODA *: The Overseas Development Agency*
OECF *: The Overseas Economic Cooperation Fund of Japan*
SIDA *: The Swedish International Development Agency*
USAID *: The United States Agency for International Development*
W.Bank *: The World Bank*

Appendix 4.6

Details of recently concluded and ongoing externally aided forestry projects in India until 2011-12

S. No.	State	Project name	Donor	Project components	Project duration	Budget (In crores)
1	Andhra Pradesh	Andhra Pradesh Community Forests Management	World Bank	1. Livelihood promotion. 2. Forest Management 3. Institutional strengthening 4. Project Management support, etc.	2002-03 to 2009-10	654.0
2	Rajasthan	Rajasthan Forestry & Biodiversity	JICA	1. Plantation 2. JFM consolidation activities 3. Biodiversity conservation 4. Equipment & monitoring facilities 5. Research, extension & training activities	2003-04 to 31st July, 2010	442.0
3	Haryana	Integrated Natural Resources Management & Poverty Reduction	JICA	1. Soil & water conservation 2. Plantation model & nursery development 3. Poverty reduction & Institution building 4. Technical assistance 5. Supporting activities 6. Administration staff	2004-05 to 2010-11	286.0
4	Tamil Nadu	Tamil Nadu Afforestation: Phase-II	JICA	1. Integrated watershed development 2. Integrated tribal development 3. Forestry extension 4. Urban forestry 5. Capacity building & research support 6. Human resources development 7. Establishment of modern nurseries 8. Improving infrastructural facilities 9. Administration 10. Monitoring & evaluation	2005-06 to 2012-13	567.0

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S. No.	State	Project name	Donor	Project components	Project duration	Budget (In crores)
5	Karnataka	Karnataka Sustainable Forests Management & Bio-diversity Conservation	JICA	1. Afforestation 2. Income generation activities for poverty alleviation 3. Biodiversity conservation 4. Provision of basic infrastructure support for field work 5. Supporting activities for forest management (research, training, consultancy, & enhancement of GIS & MIS	2005-06 to 2012-13	745.0
6	Odisha	Odisha Forestry Sector Development	JICA	1. Protection & conservation of biodiversity of forests 2. Improving productivity of natural forests providing livelihood options for the people 3. Eco-development & ecotourism activities 4. Catering to commercial & Industrial demands. 5. Capacity building of Forest Department	2006-07 to 2012-13	660.0
7	Himachal Pradesh	Swan River Integrated Watershed Management	JICA	1. Afforestation 2. Civil work for soil & river Management 3. Soil protection & land reclamation 4. Livelihood improvement 5. Institutional development	2006-07 to 2013-14	162.0

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S. No.	State	Project name	Donor	Project components	Project duration	Budget (In crores)
8	Tripura	Tripura Forest Environmental & Poverty Alleviation	JICA	1. Rehabilitation of degraded land 2. Rehabilitation of degraded & available non-forestland 3. Farm forestry in private holding 4. Eco-development. 5. Service support. 6. Rehabilitation of families engaged in shifting cultivation. 7. Interface forestry development 8. Supporting work	2007-08 to 2014-15	460.0
9	Gujarat	Gujarat Forestry Development: Phase II	JICA	1. Forest development & management 2. JFM development & management 3. Social forestry development & management 4. Forest research 5. Communication & publication 6. Wildlife conservation & management 7. Monitoring & evaluation 8. Consulting services including price & physical	2007-08 to 2015-16	830.0
10	Uttar Pradesh	Uttar Pradesh Participatory Forest Management & Poverty Alleviation	JICA	1. Plantations, regeneration of forests, etc. 2. Institutional strengthening of PMU/ DMU/FMU 3. Rehabilitation of Forest Training Institute, Lucknow 4. Communication & publication 5. Monitoring & evaluation 6. Physical contingency 7. Consulting services	2008-09 to 2015-16	575.0

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S. No.	State	Project name	Donor	Project components	Project duration	Budget (In crores)
11	Ministry of Environment & Forests/ Directorate of Forest Education, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Jharkhand, Kerala, Madhya Pradesh, Maharashtra, Mizoram, Uttarakhand & W. Bengal	Capacity Development for Forest Management &Training of Personnel	JICA	1. Training environment improvement for frontline staff 2. Strengthening human resource through capacity building of frontline forestry staff with emphasis on JFM, 3. Development for sustainable forest management	2008-09 to 2013-14	225.0
12	Sikkim	Biodiversity Conservation and Forest Management Project	JICA	1. Forest and biodiversity conservation 2. Eco –tourism 3. Joint Forests Management 4. Supporting Activities 5. Consulting Services	2010-11 To 2019-20	330.0
13	Tamil Nadu	Biodiversity Conservation and Greening Project	JICA	1. Biodiversity Conservation 2. Increasing the Natural Resources base 3. Institutional Capacity Development 4. Consulting Services	2011-12 To 2018-19	686.0

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S. No.	State	Project name	Donor	Project components	Project duration	Budget (In crores)
14	Rajasthan	Forestry and Biodiversity Project (Phase-II)	JICA	1. Afforestation 2. Agro Forestry 3. Water Conservation Structures 4. Biodiversity Conservation 5. Community Mobilization 6. Poverty Alleviation and Livelihood Improvement 7. Capacity Building, Training & Research 8. Monitoring and Evaluation Consulting Services	2011-12 To 2018-19	1152.0

JICA: Japan International Cooperation Agency.

Appendix 4.7

Area of tree plantations raised under Twenty-Point Programme in India

Name of State/UTs	Area covered under public & forest lands (in '000ha)				
	2005-06	2006-07	2007-08	2008-09	2009-10
Andhra Pradesh	310.22	418.48	264.99	340.56	243.93
Arunachal Pradesh	3.33	10.12	0.55	10.27	7.12
Assam	11.71	9.66	13.36	7.11	6.63
Bihar	4.69	8.76	25.37	22.75	21.36
Chhattisgarh	90.79	131.21	90.10	66.76	55.51
Goa	0.58	0.48	0.50	0.49	0.37
Gujarat	87.93	109.45	92.16	112.24	169.35
Haryana	18.65	17.55	14.78	29.99	20.77
Himachal Pradesh	25.08	30.07	21.16	20.10	20.17
Jammu & Kashmir	13.29	12.53	30.42	19.75	25.43
Jharkhand	87.07	33.23	35.12	25.18	28.95
Karnataka	42.41	59.76	79.47	74.64	83.64
Kerala	14.93	4.35	9.04	5.38	9.94
Madhya Pradesh	225.50	233.10	250.00	153.75	135.14
Maharashtra	34.41	39.84	47.02	239.65	216.89
Manipur	6.85	5.37	9.43	8.47	23.67
Meghalaya	4.06	0.11	2.07	2.55	1.10
Mizoram	4.49	5.12	9.49	1.05	2.98

Contd...

Name of State/UTs	Area covered under public & forest lands (in '000ha)				
	2005-06	2006-07	2007-08	2008-09	2009-10
Nagaland	12.71	5.55	8.78	0.87	0
Odisha	45.46	48.02	123.65	98.79	132.13
Punjab	1.47	3.06	3.86	8.12	11.55
Rajasthan	59.91	83.86	87.43	44.36	102.21
Sikkim	8.01	3.55	3.45	3.86	8.01
Tamil Nadu	179.88	148.81	101.79	153.73	66.45
Tripura	7.93	7.59	8.42	12.60	13.23
Uttarakhand	40.65	149.70	146.43	120.85	27.16
Uttar Pradesh	129.38	59.22	48.91	70.22	96.07
West Bengal	13.14	15.38	13.39	18.63	15.04
A & N Islands	0.48	1.08	0.91	1.21	1.74
Chandigarh	0.32	0.18	0.24	0.38	0.18
Dadra & Nagar Haveli	0.18	0.22	.20	0.28	0.20
Daman & Diu	0.01	0.01	0.03	0.03	0.02
Delhi	0.00	0.00	0.08	0.08	0.12
Lakshadweep	0.01	0.00	0.00	0.02	0.02
Puducherry	0.15	0.19	0.08	0.05	0.05
Total	**1485.68**	**1655.61**	**1542.68**	**1675.70**	**1547.13**

(*Source:* Ministry of Statistics and Programme Implementation)

Appendix 4.8

Number of seedlings raised/planted under 20 Point Programme

Name of State/UT	Number of seedlings raised/planted on public and forestland (in lakh)				
	2005-06	2006-07	2007-08	2008-09	2009-10
Andhra Pradesh	2788.38	4190.00	3241.65	3197.54	1568
Arunachal Pradesh	6.76	7.28	4.43	78.68	51.79
Assam	13.51	30.00	81.50	40.00	75
Bihar	93.75	175.16	169.33	147.85	138.88
Chhattisgarh	186.29	328.75	345.24	491.75	337.39
Goa	6.80	7.41	9.04	9.60	6.74
Gujarat	1958.66	2251.00	3177.24	899.07	1784.58
Haryana	293.19	290.04	276.98	287.62	352.43
Himachal Pradesh	30.78	50.00	152.00	136.00	131.07
Jammu & Kashmir	88.04	106.19	68.00	124.91	76.52
Jharkhand	24.63	12.94	562.07	238.72	271.8
Karnataka	141.30	421.83	710.00	619.97	636.84
Kerala	11.20	13.34	57.49	55.77	118.74
Madhya Pradesh	451.50	904.32	1278.27	950.00	706.41
Maharashtra	330.66	363.01	810.32	1227.11	1271.45
Manipur	10.48	5.63	107.73	95.06	163.88
Meghalaya	8.20	16.80	26.02	18.99	14.12
Mizoram	20.06	8.66	44.73	17.63	12.05

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Name of State/UT	Number of seedlings raised/planted on public and forestland (in lakh)				
	2005-06	2006-07	2007-08	2008-09	2009-10
Nagaland	59.40	61.50	0.00	10.00	0
Odisha	207.99	46.79	103.15	446.29	492.44
Punjab	9.78	20.33	29.25	47.86	71.23
Rajasthan	121.01	142.93	518.71	239.66	468.83
Sikkim	6.13	9.75	30.84	23.05	84.61
Tamil Nadu	205.67	326.03	222.57	512.03	217.53
Tripura	27.60	18.00	95.13	130.22	116.83
Uttarakhand	2702.00	255.63	1090.36	818.25	261.54
Uttar Pradesh	367.45	3078.88	365.64	771.65	913.2
West Bengal	170.21	51.00	214.36	298.15	240.69
A & N Islands	0.99	0.36	5.24	9.16	7.64
Chandigarh	0.63	0.35	1.43	2.27	1.25
Dadra & Nagar Haveli	11.16	11.20	2.90	4.08	4.21
Daman & Diu	0.00	0.00	0.13	0.56	0.55
Delhi	10.17	11.74	12.60	11.33	13.58
Lakshadweep	0.07	0.00	0.18	0.13	0.13
Puducherry	1.00	1.63	1.63	1.55	1.51
Total	**10365.45**	**13218.48**	**13816.16**	**11962.51**	**10613.46**

(*Source:* Ministry of Statistics and Programme Implementation)

Appendix 4.9

Area of forest plantations established by State/Union Territory Forest Departments ('000 ha)

States	2005-06	2006-07	2007-08	2008-09	2009-10	Average
Andhra Pradesh	8.95	10.95	4.00	2.73	3.70	6.07
Arunachal Pradesh	6.09	7.70	7.77	9.04	4.17	6.95
Assam	12.91	12.81	13.94	12.86	4.80	11.46
Bihar	1.97	11.85	10.18	10.45	6.69	8.23
Chhattisgarh	12.51	12.77	17.34	18.85	14.70	15.24
Gujarat	50.84	83.13	78.02	104.87	135.43	90.46
Haryana	18.52	17.01	14.74	28.92	9.80	17.80
Himachal Pradesh	19.15	24.74	19.66	20.45	20.16	20.83
Jammu & Kashmir	26.23	26.19	28.11	(26.19)	24.23	26.19
Jharkhand	42.69	24.19	29.38	(27.46)	13.57	27.46
Karnataka	36.48	64.19	66.43	68.66	80.41	63.24
Kerala	2.02	2.84	1.32	1.99	2.50	2.14
Madhya Pradesh	10.19	6.45	16.46	10.05	125.62	33.76
Maharashtra	36.77	41.22	46.77	69.45	57.55	50.35
Manipur	1.79	1.18	11.00	10.21	6.40	6.12
Meghalaya	4.08	5.45	6.76	5.59	4.35	5.25
Mizoram	4.95	4.15	6.60	8.85	5.35	5.98
Nagaland	10.22	14.01	3.99	3.80	3.65	7.13
Odisha	18.79	1.17	62.61	20.48	18.07	24.23
Punjab	2.67	3.12	3.97	5.35	5.46	4.11
Rajasthan	59.90	83.90	87.43	44.36	75.47	70.21
Sikkim	8.01	3.55	3.45	3.86	8.01	5.38

Contd...

States	2005-06	2006-07	2007-08	2008-09	2009-10	Average
Tripura	6.12	7.80	10.77	11.21	13.21	9.82
Uttar Pradesh	36.97	56.96	47.20	94.43	79.18	62.95
Uttarakhand	28.48	28.93	28.83	25.73	20.94	26.58
West Bengal	13.35	15.38	13.38	18.71	15.04	15.17
A & N Islands	0.66	0.87	0	0	0	0.30
Chandigarh	0.22	0.18	0.24	0.38	0.18	0.24
Delhi	5.14	5.96	6.35	5.72	6.90	6.01
Total	**486.67**	**578.65**	**646.70**	**670.75**	**765.54**	**629.66**

(*Source:* Annual Administrative/Statistical Reports of the Forest Departments and personal communication)

Appendix 4.10

Area of Assisted Natural Regeneration established by State/Union Territory Forest Departments ('000 Ha)

States	2005-06	2006-07	2007-08	2008-09	2009-10	Average
Andhra Pradesh	40.43	16.18	4.31	6.34	7.30	14.91
Arunachal Pradesh	0.17	3.40	3.40	3.39	3.39	2.75
Goa	0.58	0.48	0.50	0.49	0.38	0.48
Odisha	2.04	17.56	62.61	78.26	74.52	46.10
Tamil Nadu	41.05	60.82	51.50	57.66	6.01	43.41
Uttarakhand	98.07	116.97	116.94	95.12	(106.78)	106.77
A & N Islands	0.12	0.10	0.47	1.04	(0.43)	0.43
Total	**182.47**	**215.50**	**239.73**	**242.29**	**198.80**	**214.85**

(*Source:* Annual Administrative/Statistical Reports of the Forest Departments and personal communication)

Appendix 4.11

Afforestation under different schemes by Forest Departments in selected states

Scheme	Plantation (ha)				
	2005-06	2006-07	2007-08	2008-09	2009-10
Andhra Pradesh					
Semi Mechanical Method (SMM) Bamboo	2	0	497	0	0
SMM Eucalyptus	3266	3733	1376		
Barren Hill Afforestation	1699	1008	265		
Barren Hill Afforestation (Pongamia)	572	263	36		
IPP and IPP Extn	17555	16181			
APEP-Euc	17945	17279			
MEPP RR and MEPP RR - Suppl.	1071	970			
MEPP Medak and MEPP N&C	7354	7074			
Nallamali	1927	1912			
AP Forestry Project	12760	13517	Project ended	0	0
Arunachal Pradesh					
Social Forestry	91	150	100	0	0
Apna Van	0	1185	1071	650	0
Artificial Plantation	2691	4313	3964	4334	3390
Bihar					
Rehabilitation of degraded forests	0	2598	3645	3730	1725
RSVY (RDF)	0	6103	6420	3719	1745
RSVY (Agroforestry)	0	0	2	28	30
National Bamboo Mission	0	0	0	300	1090
Canal Side Plantation	550	488	358	395	60

Contd...

Scheme	Plantation (ha)				
	2005-06	2006-07	2007-08	2008-09	2009-10
Goa					
Rehabilitation of degraded forests	102	61	107	105	50
Forest Plantation under WGDP	164	151	272	186	150
Social Forestry	53	56	75	44	28
Compensatory Afforestation	101	100			
12th Finance Commission grants		30	45	22	22
Gujarat					
Community Forestry Project	11611	15986	10654		
Border Area Development Project	1744	108	211		
Special Area Programme	--	--	1980		
Plantation Scheme GFDP	9224	2523	--	34056	
Special Component Plan	--			2769	
Coastal Border Plantation	100	--			
RDFL Tree Farming	2020	1700	1700		
Community Forestry Project	4187	4187	4333		
Haryana					
Haryana Community Forestry Project	4965	2618	71		
Integrated NRM and Poverty Reduction Project	4769	5603	5750	9819	
Rehabilitation of degraded forests	200	220	220	326	961
Social and Farm Forestry	650	720			
Compensatory Afforestation	27	38	6	50	
Desert Control	100	100	100	50	105

Contd...

Scheme	Plantation (ha)				
	2005-06	2006-07	2007-08	2008-09	2009-10
Integrated Forest Protection	82		100		
DRDA and other agencies	2671	3369	3337	6341	8076
Himachal Pradesh					
Pasture and grazing	458	553	334	419	504
Afforestation in blank areas	3444	3984	1946	3323	5474
Enrichment Plantation	2950	3208	1372	2747	1434
Re-afforestation in scrub area	981	1107	604	1066	1300
Sanjhi Van Yojna	613	481	291	63	51
Backward Area Sub Plan	870	631	2758	780	1152
Compensatory Plantation	1161	752	1045	325	622
IWDP/MHWDP	118	2082	2497	1920	2245
Re-generation of forests	21	80	257	30	6
Plantation under CAT Plan	970	1824	4058	2831	1108
DFID Project	640	1153			
Other schemes	940	1179	416	1104	
Jammu & Kashmir					
Rehabilitation of degraded forests	1962	301	816	1176	1137
Eco Task force	165	0	50	73	235
Stabilization of slip areas	30	30	52	46	59
Urban Forestry	12	49	74	61	0
River valley projects	3916	4030	3436		
Eco-restoration	18157	19111	0	0	0

Contd...

Scheme	Plantation (ha)				
	2005-06	2006-07	2007-08	2008-09	2009-10
CM's Participatory afforestation	940	906	941	793	768
Jharkhand					
Rehabilitation of degraded forests	25031	16641	11037		
Plantation of quick growing species	6891	2049	2831		
Soil conservation and afforestation	2537	733	4666		
Karnataka					
Development of degraded forests	1210	689	572	607	
Greening of urban areas	537	669	490	360	
Kerala					
Regeneration of denuded forests	1524	0	0		
Improving productivity of plantations	1605	951	799		
Maharashtra					
Non Plan	3022	5339	4980	9210	6450
Plan	17611	10311	10611	16615	17381
River Valley Projects	0		275	814	
Joint Forest Management			3704	925	2795
DPAP		125	147	21	
Western Ghats		786	759	0	0
Comp Afforestation	817	1093	1666	2878	1431
Employment Guarantee Scheme	6369	3959	2011	2152	967
Other Schemes	1116	13706	1354	5428	6182

Contd...

Scheme	Plantation (ha)				
	2005-06	2006-07	2007-08	2008-09	2009-10
Meghalaya					
Quick Growing Species	21	34	19	52	87
Economic Plantation	60	273	77	102	71
Social Forestry	4000	3400	3755	4320	2430
Odisha					
Revised Long Term Action Plan			695		3491
Economic Plantation		3700	4200	4100	3902
12th Finance Commission Grants			3345		
Rajasthan					
Combating Desertification Programme	18952	19078	28645	13278	7753
Indira Gandhi Nahar Project			3348		
Rajasthan Forestry and Biodiversity Project		38627			
Sikkim					
20 Point programme	8013	3550	3457	3862	8007
NBM		756	756	1413	23
RVP	394	394	1950	715	
Tamil Nadu					
Tamil Nadu Afforestation Project	29250	45250	51500	51500	0
Tripura					
Forest Village			50	49	65
Horti Mission			36	56	62
IWDP			211	964	547

Contd...

Scheme	Plantation (ha)				
	2005-06	2006-07	2007-08	2008-09	2009-10
MPBT				32	47
NREGA		207	345	45	90
North East Council	1409	60		0	751
NBM			491	2085	1180
NOVOD			132	92	50
RVP	225	275	174	392	284
State Plan	587	863	2492	1602	2899
TFPDC Fund		523	54	65	
Uttar Pradesh					
Planting of industrial pulpwood species	1918	2032	1372		
Social Forestry	13932	21942	10297		
Urban Forestry	74	149	129		
Tree planting for increase in forest cover	10	19723	6385		
Restoration of degraded forests		451			
Uttarakhand					
Eco Task force			0	1500	1700
Plantation in catchment of Ramganga	170	1160	510	355	480
WM - Sindhuganga	495	-	711	485	237
Estab. Of Nandadevi Biosphere Reserve		40	30	30	30
Plantation in catchment of Tehri Dam	403	200	0	694	143
Dev of reserve and Civil Soyam projects	8975	10843	9900	9567	9620

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Scheme	Plantation (ha)				
	2005-06	2006-07	2007-08	2008-09	2009-10
Rojgarparak Bvriksharopan Yojana			343	1080	2055
Plantation of bamboo species			250	1404	1192
West Bengal					
Protective Afforestation	48	233	200	129	100
Eco Conservation	115	42	55	97	100
Economic Plantation	35	30	150	551	846
Coastal shelterbelt	105	120	120		150
Quick growing spp.	485	775	800	1850	3962
Strip Plantation (Deptt.)	820	559	661	150	429
Wildlife Schemes	180	240	260	295	155
Rural Infrastructure Dev Fund	96	110	756	2247	2565
RVP Teesta/DVC	110	405	769	627	210
Project elephant	0	240	240	315	104
Comp Afforestation		266	180	163	19
Rastriya SamVikash Yojana	2635	1866	146	3	80
NREGS		880	1511	1727	1048
Rashtriya KrishiVikas Yojana				2809	1593
Forestry treatment	300	275	440	549	
Sampurn Gramin Rojgar Yojana	586	164	5	-	

Chapter : 05

Application of Science and Technology in Management

5 Application of Science and Technology in Management

5.1 Use of Computers, Remote Sensing, Geographical Information System (GIS) and Global Positioning System (GPS)

Accurate surveys, mapping and assessment of the forest resources are essential steps for efficient forest management. The traditional methods have been time consuming and laborious with more chances of error. Though use of computers and aerial photographs started in forest inventory and data processing in India almost four decades ago, their use was limited to institutions like Pre-Investment Survey of Forest Resources (now Forest Survey of India). With further advancement of computer and satellite technology, Remote Sensing (RS) combined with Geographic Information System (GIS) has developed as a very efficient tool for surveying and mapping the forest resources accurately in the last two decades. The satellite imagery provides a clear and synoptic view of the land cover, giving details of forests by canopy density, degraded lands and blanks, water bodies etc., of any given area. High resolution imagery provides more detailed features of forests including its type, and when GIS is applied the area estimation of land cover in detail becomes very quick. This facilitates forest stock map preparation, stratification and forest inventory and thus expedites the preparation of Working Plans. In addition, identification of areas for afforestation, raising nursery, tree felling, soil and

moisture conservation, constructing water harvesting structure, fire protection etc., are easily done. At national level the Forest Survey of India (FSI) is the main organization responsible for using the remote sensing technology for assessing the forest cover regularly on a two years cycle. The progress of the technology over the years is indicated in Table 5.1 (FSI, 2009).

At State level, use of computers picked up during the last one and half decades, and by now most of the State Forest Departments (SFDs) use computers in day-to-day office functions for word processing, account keeping and storage of other forestry information, and have provided computers down to the Range level. After the development of 'on the screen' (computer) digitization technology of geo-referenced maps about a decade ago and availability of Global Positioning System (GPS) for verifying geo-coordinates of forest boundaries and area assessment, the application of GIS in the SFDs has become popular. GIS cell has been established in most of the SFDs of the country with funding from Central

Table 5.1: Progress of remote sensing technology in forest cover mapping over the years

Assessment Year	Sensor	Resolution	Scale	Minimum Mappable Area (ha)	Mode of Interpretation
1987	LANDSAT-MSS	80 m	1:1 million	400	Visual
1989	LANDSAT-TM	30 m	1:250,000	25	Visual
1991	LANDSAT-TM	30 m	1:250,000	25	Visual
1993	LANDSAT-TM	30 m	1:250,000	25	Visual
1995	IRS-1B LISSII	36.25 m	1:250,000	25	Visual & Digital
1997	IRS-1B LISSII	36.25 m	1:250,000	25	Visual & Digital
1999	IRS-1C/1D LISS III	23.5 m	1:250,000	25	Visual & Digital
2001	IRS-1C/1D LISS III	23.5 m	1: 50,000	1	Digital
2003	IRS-1D LISS III	23.5 m	1: 50,000	1	Digital
2005	IRS-P6 –LISS III	23.5 m	1: 50,000	1	Digital
2007	IRS-P6- LISS III	23.5 m	1: 50,000	1	Digital

Government and from other sources, and about half the SFDs have been able to utilize the potential of this technology to a greater benefit.

Many states have gradually incorporated this technology in preparation of working plans as well as in planning and monitoring various activities of the department. The SFDs of Andhra Pradesh, Chhattisgarh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Tamil Nadu and West Bengal are leading states. Other states like Sikkim, Odisha, Gujarat, Uttar Pradesh and Uttarakhand have also made substantial progress. In Sikkim the boundaries of all the divisions, ranges, blocks and beats have been digitized and are now available on GIS platform. Similarly, Uttarakhand has also digitized the boundaries of the major forest areas and in Uttar Pradesh, boundaries of 3 divisions have been digitized.

Current status of selected States is briefly mentioned below:

Andhra Pradesh Forest Department started the use of remote sensing technology in 1996 and is a pioneer in its application. It has had a well established Geomatics Center since about 10 years managed by trained hands, where short term courses are also conducted for building capacity of field staff of the forest as well as other line departments of the state. This state is also doing analysis of forest cover of the state annually through remote sensing, to prepare the State of Forest Report of Andhra Pradesh. Remote sensing is also applied in identifying plantation sites on the basis of vegetation, slope and soil as well as sites for water harvesting structures. Different layers of the forest management units (division, range, block & beat) and other ground features themes have been digitized. Working plans of all the 42 forest divisions have been prepared using RS and GIS technology, which helped in stratification of the forests and designing efficient forest inventory and generation of maps at different levels. The Department has prepared fire risk zonation maps of forest areas at the state level, using different layers of information through RS and GIS technology.

Chhattisgarh Forest Department has been one of the leading state departments in the application of GIS in forestry management. Of the 32 forest divisions in the state, GIS has been applied in working plan of 27 forests divisions. Now high resolution remote sensing data (LISS IV- 5.8 m) is being used to prepare the stock maps for the working plan. The Forest Management Information System (FMIS) unit houses the Geomatics center, which is well equipped with 21 Server/Workstation/Desktop systems and 8 licenses for GIS software as well as 3 licenses for image processing. There are more than 700 functional GPS devices in the state, and at least two GPS devices are available at the range level. Using Web Fire Mapper, forest fire locations are tracked through satellite, and action is taken to control the fires.

Maharashtra Forest Department established a GIS cell in 1997 in the Working Plan Circle, and subsequently GIS cells were created in all the Working Plan Divisions of the Forest Department.

As at present, the digitization work of 37 Forest Divisions/sub-Divisions (against 51 Forest Divisions/ Sub-Divisions in the state) has been completed, and in the rest the progress is fast. GIS has been used in preparing working plans of 34 forest divisions, for generating maps and classification and measurement of areas. In settling the land title to forest dwelling communities under Forest Rights Act 2006, the state had made extensive use of RS, GPS and GIS technology.

Tamil Nadu Forest Department uses GIS and RS in monitoring the afforestation areas and preparation of working plans. Using GIS, the working plan of 26 territorial divisions has been prepared. GIS based software has been provided to all the divisions for monitoring activities. Remote sensing is extensively applied in the habitat management of National Parks and other protected areas and also in wildlife census. Monitoring of forest fires is done using Web Fire Mapper which displays active fire locations based on MODIS Rapid Response System developed by NASA, and estimation of the burnt area through AWiFS data IRS P6.

Madhya Pradesh Forest Department has recently completed the digitization of the boundaries of all the forest management units and GIS is being applied in all the new Working Plans under preparation.

5.2 Application of Information and Communication Technology (ICT) and E-Governance

Timely and accurate flow of information in the

forestry sector has always been a challenge because of its geographically remote locations and poor infrastructure and communication. However, in the present age of satellite based communication technology, availability of handy equipment like mobile phones, Personal Digital Assistant (PDA) and Global Positioning System (GPS), and email services, it has been possible to make the forest information readily accessible to all stakeholders, and forestry administration responsive and transparent, with the help of computer based communication network and integration of management information system with geo-spatial data. Many SFDs have already provided mobile phones to lowest field level staff, and others are in the process. GPS has also been provided to at least forest range level in most of the SFDs. Providing PDA for multi-utility services to field staff has started recently. It is going to help in implementation and monitoring of the various activities.

Some SFDs in India have launched web based FMIS where various modules of forest management

including forest protection, monitoring of various forestry activities, forest service related issues and so on can be directly accessed. Madhya Pradesh is a leading State in application of this technology. PDA's have been provided to the lowest level field officer (Forest Beat Officer) who moves on foot in his area for protecting forests and implementing different activities. It has been possible to communicate with them fast, to provide directions on various issues and get real time information on different activities of their area automatically. The automation of services includes forest fire alert messaging system, forest offences (theft of forest products) reporting system, wildlife alert messaging system, tree marking system etc. In addition, a lot of information about activities of the Forest Department have been uploaded on the website such as Wild Life Management System, Financial Management System, Forest Land Diversion Management System, Forest Land Record Management System, Plantation Monitoring System, Water Bodies Monitoring System, Vegetation & Land Use Monitoring System, Forest Planning and Geo-mapping System, Bio-diversity Management System, etc. Similarly, Andhra Pradesh has excelled in application of geomatics and ability to integrate GIS with FMIS. The geo-spatial data on 1:50,000 scale for the entire state is available on the web and is being updated with additional features.

5.3 Technology to Combat Forest Fires

Forest fires are calamitous events that destroy vegetal resources, deplete soil and animal resources and also indirectly affect the water cycle. Satellite/ monitoring technology linked with local sites provides crucial information which can be continually updated. There are satellites specially designed for monitoring fires which cover every part of the earth twice daily, and therefore have the potential to provide information about forest fires once in every 12 hours. One such satellite is **Moderate Resolution Imaging Spectro Radiometer** (MODIS) which provides information on a daily basis for the whole globe. It is now possible to do near real time monitoring of forest fires. Rapid Response System has been developed by NASA in collaboration with the University of Maryland of USA, in which active fire points detected by the thermal band of MODIS for all the fires across the world are displayed through Web Fire Mapper. This mapper, being GIS based, provides geo-coordinates of all the fire points giving specific location. The data from the website (**www.maps.geog.umd.edu**) is freely downloadable. After downloading these fire points they are put on the forest cover map of the country/ state to know if the fire is in forest area or outside. Then the geo-coordinates of the fire points falling within forest area are transferred on to the maps of the forest divisions everyday, and are distributed to the agencies (concerned field officers) dealing with forest fires, and also to the monitoring agency supporting fire control. Downloading, processing and distribution of the fire occurrence to all the State Forest Departments is being centrally done by the Forest Survey of India, Dehradun and also by National Remote Sensing Centre (NRSC), Hyderabad on daily basis, using different modes of communication, that is, by fax, email, uploading on website as well as on

mobile phones through sms. Many SFDs have also established systems for downloading the data and processing them at the state level.

Mapping of forest fire locations and the extent of area damaged every year provides information about the extent of fires that have occurred in a particular forest. Mapping of such hotspots when repeated in subsequent years helps to map fire prone areas. After having collected forest fire data over a period, it is possible to do modelling in a GIS environment, and classify the forests into highly vulnerable, moderately vulnerable and least vulnerable areas. Such information is provided to the Divisional Forest Officers so that proper planning and management can be undertaken in the forest divisions to minimize the damage due to fire.

Some of the Forest Departments such as Andhra Pradesh, Chhattisgarh and Tamil Nadu have started using different types of satellite data to map the burnt areas in the reserved and government owned forests of the state. Satellite scenes (IRS ID LIII data of 23.5 M resolution) pertaining to the fire season in the state are procured from the National Remote Sensing Center (NRSC), Hyderabad and are interpreted to identify and delineate forest areas ravaged by fires. Reports giving division-wise, range-wise, beat-wise and forest-wise information on the extent of fires are sent along with maps to the forest divisions for planning and executing preventive measures. Thus, beat and range staff has nowadays becoming more vigilant. At the global level, NASA with the help of Maryland University in USA has also recently started

assessing burnt area using mid-resolution satellite data. Assessment of fire risk based on dryness assessment using temporal analysis of satellite data and GIS is also being done at local level in some of the states. Forest Fire Danger Rating has been developed at local level.

The technology has helped in alerting the agencies responsible for forest protection to various damages due to forest fire, and controlling them by timely and planned actions. Studies are on to make assessment of the biological and economic damages/losses to forest ecosystem due to forest fires, which will go a long

way in implementing the concept of Integrated Forest Fire Management (IFFM) involving local people for studying controlling the pre-fire stage as well as for fire detection and fire suppression.

5.4 Productivity Enhancement Through Tissue Culture and Clonal Technology

Enhancement of productivity of forests in general and of forest plantations in particular has been one of the basic objectives of the forest management and forest resource development programmes. Forest Research Institute (FRI), Dehradun, a pioneer institute of India in forestry research, has been working on this subject for long time. The Indian Council of Forestry Research & Education (ICFRE) was created as an apex body with Government of India in 1987, and has taken under its hold the existing forestry research institutes, and new institutes have also been established to achieve these objectives. In addition, many State Governments have established their own forestry research institutes.

The efforts of previous research on productivity enhancement focused on indigenous species like teak, where provenance trials, selection of plus trees and raising of seed orchards were main areas. Later the focus and priority shifted to fast growing short rotation exotic species like eucalyptus, poplar etc. Spacing trials were one of the initial steps to enhance productivity. The three species of eucalyptus which have been popular in forestry plantations in India are *Eucalyptus tereticornis, E. grandis* and *E. camaldulensis*, and were raised mainly through seedlings. During early 1970s, FRI Dehradun developed inter-specific hybrids between *E. tereticornis* and *E. camaldulensis,* and named them FRI-4 and FRI-5 hybrids. These varieties were field tested on large scale, but yield did not improve as expected. Later on, clonal propagation in eucalyptus through the shoot-cutting method (macro propagation technique) was launched. A genetic improvement programme was initiated in the late 1970s by introducing fresh germ-plasm of a wide genetic base

of eucalyptus from Australia. Both long-term and short-term strategies were used for improving the yield from plantations. Rapid genetic improvements in eucalyptus were made through macro and micro propagation methods. In plantations raised through seeds, the variability was high resulting in low yields, while in clonal plantations the yield was much higher. The mean recorded yield of eucalyptus plantation per ha on a rotation of 7 years increased to about 20 tonnes, more than twice that of the seedling raised crops.

Besides research institutes of ICFRE, private players have also played a key role in promoting clonal forestry in India. In mass multiplication of clonal forestry, excellent work has been done in the private sector, where captive plantations are being raised to meet their requirement of industrial wood, especially by ITC Bhadrachalam, J.K. Paper Mills, Ballapur Industries Ltd. and Mysore Paper Mills. The largest production at present is by ITC Bhadrachalam, which raises about 15 million clonal seedlings of Eucalyptus, about 2.5 million of Su-babul and 2.5 million of Casuarina per year. About 10 million clonal seedlings are supplied to farmers for raising high yielding plantations. Andhra Pradesh Forest Development Corporation also buys clonal seedlings from ITC Bhadrachalam for their high yielding plantations. This technology ensures equally high yield in the second rotation crop also and does not require replanting and fresh investment other than protection management.

5.5 Application of Modern Technology in Wild Life Management

Remote sensing and GIS is used for conserving biodiversity in India. In a two-pronged strategy, patterns of distribution of biodiversity at the regional and local scales have been studied to assess the adequacy of protected area coverage in relation to distribution of biodiversity at regional scales, and to develop meaningful correlates and surrogates of biodiversity values which can be used by remote sensing and GIS at local scales. Such a programme was initiated in 1995 with the goal of assessing the adequacy of the protected area network in the Indian Himalayas to provide coverage to the rich biodiversity, to identify potential areas for conservation and to develop biodiversity action plans. It relied on use of remote sensing and GIS technique in combination with field surveys. Satellite Imagery LISS III (digital data) was used in conjunction with Survey of India maps as well as soil maps. Information on boundaries

of area compatible with target biodiversity models was recorded through GPS technology. The maps were digitized and incorporated in GIS domain. A total of 21 districts, 152 tehsils and 167 blocks over 32,450 sq. km have been included in the socio-economic database to produce thematic layers for using and developing an integrated conservation protocol for the Western Himalayas.

Tiger Census: Tiger is the flag bearer of conservation and an umbrella species for the majority of the eco-regions in the Indian sub-continent. In India, the monitoring of the tiger population has been traditionally undertaken by total count (census) of the tiger population country wide every four years. The census was based on intensive monitoring of the tigers within protected areas and outside, identifying tigers by visual inspection of pug mark tracings/ plaster casts, mapping tiger distribution at the local level and inferring total number from the above information. This methodology has been the subject of criticism because there is a lot of subjectivity in the identification of pugmarks of tigers. The pugmarks are likely to vary with substrate, tracing/casts and tiger's gait. Moreover, it is not possible to obtain pugmarks from all tiger occupied landscapes (Jhala *et al.,* 2008).

The Wildlife Institute of India in association with National Tiger Conservation Authority, under the over all guidance of the Ministry of Environment and Forests, applied a more objective and scientific approach to estimate the population of tigers in India for the first time during 2005-06. Tigers were individually identified by camera traps in a capture-recapture statistical framework. The entire landscape where tigers are likely to occur were sampled, treating the forest beat (an administrative unit of 15-20 km^2) as a sample unit. The sample units were systematically distributed over the entire tiger potential occupied forests. The field staff responsible for data collection were trained. Except where beat boundaries were digitized, hand held GPS were provided to the field staff for determining beat locations in most of the states. Team of researchers was deployed in each landscape complex for estimating tiger and ungulate densities within stratified sampling units. The landscapes were stratified on tiger sign abundance classes of high, medium, low and tiger at beat and larger spatial resolution. Since the data were analyzed in a GIS domain, several spatial and attribute data like human density, livestock density, road network, topographical features, forest type and cover, poaching pressures etc., were used as covariates to

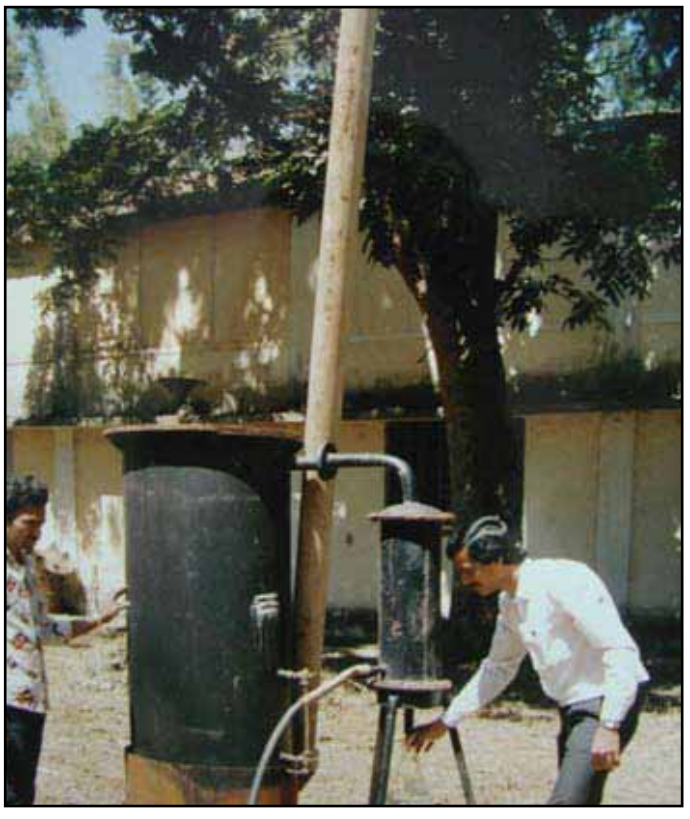
model tiger occupancy and relative abundance. The tiger population was then estimated by analyzing the data with lower and upper limits (Jhala *et al*., 2008). Radio collaring is another technique used in estimating tiger density. In core areas of reserves, tiger densities range from 6 to 8 tigers per hundred sq. km.

Conservation genetics is used for conservation of marine turtles and tigers. India has five of the seven known species of marine turtles and several of these populations are endangered due to exploitation, habitat destruction and incidental mortality in trawler nets. In recent years the development and integration of molecular techniques in genetic studies have opened up new vistas to seek answers to questions of ecological interest. The information generated by DNA-based molecular tools on the genetics of extinct populations has been found to be immensely useful in designing conservation strategies and framing management policies. To identify evolutionarily significant units of tigers (ESU) that exist within India, tiger scats are obtained from various parts of the country and the conservation genetics laboratory extracts DNA and amplifies specific micro-satellites. A Project Tiger Directorate (now National Tiger Conservation Authority) study has examined whether ESU exist in the country within different isolated tigers conservation units, to assist in prioritizing tiger conservation efforts.

Separate software has been developed for use in Global Positioning System (GPS) equipment for various purposes like sighting location of animals, counting, movements, fire detection, survey of land, etc. It could be very effectively used for census and population studies of animals in wild habitats. As a practical application and technology transfer of GPS methodology, a census of giant grizzled squirrels was carried out in March 2006 in the Saptoor forest area of Rajapalayam by the Tamil Nadu State Wildlife Board. The staff was trained in this methodology and a census was conducted on March 13, wherein 2001, squirrels were sighted and 370 nests were located in four forest ranges.

5.6 Wildlife Forensic Science in Forest Protection

A Wildlife Forensic Cell was established at Wildlife Institute of India, Dehradun in 1995 to develop and standardize various techniques for identifying species from varied biological products reported in trade such as hair, bone, claws, teeth, skin, and meat. Such identification of species is



based on external morphological characteristics, light microscopy, scanned electron microscopy, crystallography, double diffusion and iso-electric focusing.

One of the important tasks undertaken by the Forensic cell has been the development of protocols for identifying mongoose species based on hair characteristics (cuticular and medullary patterns) as mongoose hair is widely used in brushes. Of the five mongoose species found in India, protocols have been developed for identifying four species: *Herpestes edwardsi* (common Mongoose), *H. smithi* (ruddy mongoose), *H. palustris* (Bengal mongoose) and *H. urva* (crab-eating mongoose). Discriminant Functional Analysis (DFA) using hairband lengths of four apical bands for all four species has been successful in identifying species with 95 per cent accuracy. Medullar characteristics of these species clearly reveal differences among the species. A manual was prepared for identifying 40 different species of Indian wild animals with microphotographs of cuticle, medulla and cross-section of hair. This manual has been updated, improved and replaced with the collaboration of USFWS (United States Fish and Wildlife Service).

Protocols have also been standardized for identifying plucked and shed feathers of peafowl (*Pavo cristatus*) based on root morphology. Work has been initiated for standardising protocols for extracting DNA from highly degraded wildlife forensic materials sent to the forensic cell by various enforcement agencies. Different methods (phenols/ chloroform, Qaigen, Chelex-100) have been tried and standardized to extract good quality DNA from various forensic samples, such as formalin-preserved meat, hair, musk pod, bear bile, antler, blood, scats, cooked/boiled meat and feathers received in wildlife offence cases. The Forensic Cell has also standardised Random Amplified Polymorphic DNA (RAPD) and Polymerase Chain Reaction-Restriction Fragment Length Polymorphism (PCR-RFLP) methods for wildlife parts and products. Morphometric, crystallographic and DNA based techniques have also been developed to characterize species from bones of major animals such as tigers, leopards, chitals, sambars, etc. Wildlife forensic knowledge has been disseminated to various law enforcement agencies for implementing the Indian Wildlife (Protection) Act, 1972.

5.7 Wood Processing Technology

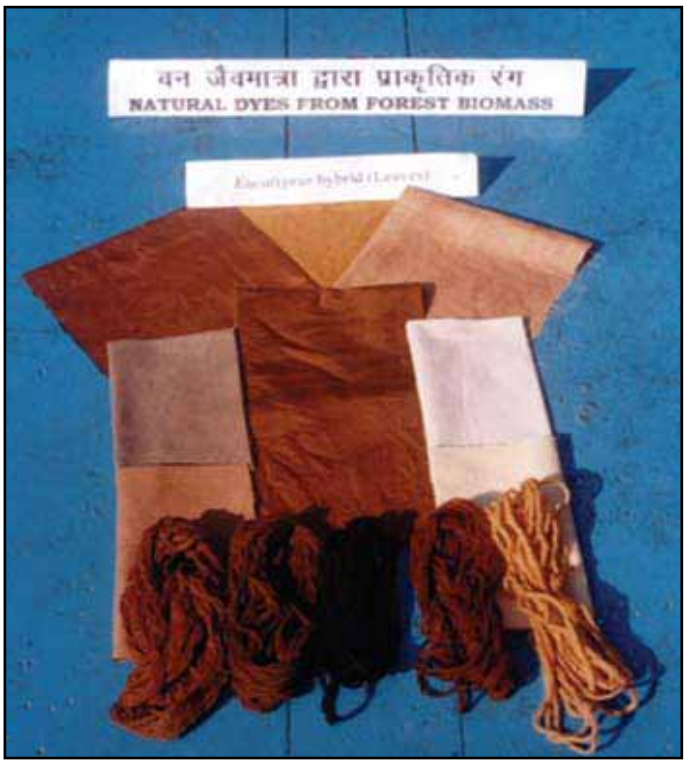
Availability of modern mechanical, electrical and electronic tools has helped technology interventions with regard to wood-based industries in India. Though most of the wood-based industries are in the private sector, innovative process technologies have been often developed by research institutes in the public sector. Besides earlier contribution from Forest Research Institute (FRI), Dehradun, the recent contribution has come from the Indian Plywood Industries Research and Training Institute (IPIRTI), Bengaluru specially on bamboo and other non-wood products, and Institute of Wood Science and Technology, Bengaluru. Cost effective solar kilns for seasoning timber, development of natural dyes from plant materials of forest origin, wood bending through ammonia plasticisation technique are some of the technologies earlier developed by the national research institutes.

Various process technologies developed by the wood based panel industries have become technically sound in manufacturing all grades of wood panels to international standards. These technological interventions include total processing technology for plywood manufacture, storage and preservation, veneering, dyeing, gluing and preservative treatment and adhesive manufacturing technology for all grades of plywood and wood joints processing units. This has led to manufacturing of world class wood panel products in India.

Some interesting examples of FRI's efforts to save forests are the production of *jigat* and *katha*. Jigat is

Natural Dye Pilot Plant

the powdered bark of the tree, *Myristica macrantha*. It is used as an adhesive or binder in agarbathi manufacture. With the expansion of the agarbathi industry there has been indiscriminate felling of this tree. FRI has been able to find a substitute, an agro-based biopolymer, for jigat. Laboratory trials with the substitute indicate that the new binder is better than jigat. Similarly, production of katha from khair (*Acacia catechu*) tree is an important forest-based traditional industry in India. Katha is used in paan and in preparations of ayurvedic medicines. Cutch is a by-product of katha and is used as tanning material as well as an additive and preservative by many industries. In order to restrict the felling of khair



trees, FRI has found and developed other suitable sources for making katha. One such source is *Uncaria gambier*.

5.8 Contribution of Forestry Sector in Gross Domestic Product (GDP)

Forestry sector occupies an important place in India's economy in terms of its contribution to Gross Domestic Product (GDP), employment and livelihood of poor people. Besides, it plays an important role in meeting the requirements of forest dependent communities for food, fuel, fodder, timber and other forest produce.

The System of National Accounts (SNA) forms the basis of national income accounts in India. The Central Statistical Organisation (CSO), Ministry of Statistics and Programme Implementation, Government of India prepares the National Accounts Statistics regularly for the country of which GDP is one aggregate. In this role, the CSO releases annual national accounts statistics. The first official estimate of national income was prepared by CSO in 1953 with the base year 1948-49 for estimates at constant and current prices. With gradual improvement in the availability of basic data over the years, comprehensive review of methodology for National Accounts Statistics (NAS) has been regularly undertaken with a view to updating the database and shifting the base year to the more recent year. The reason for periodically changing the base year of the national accounts is to take into account the structural changes which have taken place in the economy and to depict the true picture of economy through macro aggregates like GDP, consumption expenditure, capital formation, etc.

The entire economy is divided into various sectors and sub-sectors. The 'Agriculture, Forestry and Fishing' sector concerns forests and includes sub-sectors: (i) Agriculture, (ii) Forestry and Logging, and (iii) Fishing. In GDP estimation, the economic activities of 'forestry and logging' sub-sector include (i) Forestry (e.g. planting and conservation of forests, gathering of forest products, charcoal burning carried out in the forests), (ii) Logging (e.g., felling and rough cutting of trees, hewing or rough shaping of poles, blocks etc.) and transportation of forest products to the sale depots/assembly centres, and (iii) Farmyard wood (industrial wood and fuel wood collected by the

primary producers from trees outside regular forests). The forest products are classified into two broad groups viz., (a) Major products comprising industrial wood (timber, round wood, match and pulpwood) and fuel wood (firewood and charcoal wood) and (b) Minor products comprising a large number of wild growing forest material such as bamboo, fodder, lac, sandalwood, honey, resin, gum, tendu leaves, cork, balsams, vegetable fibre, eelgrass, acorns, horse chestnuts, mosses, lichens etc. Production of field crops (Jhum cultivation etc) and extraction of minor and major minerals from forests are included in agriculture and mining sectors respectively (CSO 2007). Thus value of industrial wood, fuelwood and minor forest produce are used for income estimation of forestry sector.

The data on production and prices of industrial wood and that on Minor Forest Products (MFPs), are provided by the State Forest Departments (SFDs). The data on production of industrial wood generally relates to the quantities sold/auctioned or given on royalty by the SFDs. In the case of minor forest products some information on production is obtained from Forest Development Corporations. The value of minor forest products could be often the economic value derived from the royalty figures which are much lower than the market value. The production and price of fuelwood are prepared from the side of consumption of firewood by the households, on the basis of quinquennial survey on consumer expenditure of NSSO (Singh 2011). In addition to total consumption of firewood, the survey also records consumption from market purchases and own sources. The share of forestry sector in the GDP during different period of time is given in Table 5.2.

Table 5.2: Share of Forestry Sector in GDP over years

Period	Share of Forestry Sector in Total GDP (%)
1950-51	2.6 %
1960-61	1.9 %
1970-71	1.8 %
1980-81	2.2 %
1990-91	1.6 %
2000-01	1.0 %
2005-06	0.7 %

Rapid decline in share of forestry sector in GDP has been due to higher growth in other sectors. The average annual growth in GDP of forestry sector during 1950-2006 was 0.9 per cent against growth in overall GDP of 4.6 per cent.

The GDP estimates for the forestry sector was Rs. 29,069 crores for the year 2007-08, which was 0.67 per cent of the total GDP of the country. The main share (about 83 per cent) was attributed to fuelwood which was properly estimated by NSSO for household sector, industrial wood accounted for about 9 per cent and NTFPs about 8 per cent. While estimating GDP for 2008-09, the CSO included the estimated production of timber from 'Trees Outside Forests' (TOF) as estimated by the Forest Survey of India. The value of the timber was determined after getting the price data from SFDs. The contribution of TOF was about Rs. 34,000 crores. Further, CSO

also included the 'input for livestock feed' derived from forests on the basis of study report of FSI. It was estimated by FSI that 15.5 per cent of adult cattle units of the country are totally dependent on forest for their feed. CSO estimated the fodder value from forests and added to GDP of forests under MFP which was about Rs. 12,500 crores. These two additions made a sharp rise in GDP estimates of the sector at 'current prices' as Rs. 88,000 crores for the year 2008-09 which was 1.70 per cent of the total GDP of the country.

In forestry sector there are still many products specially the MFPs which are undervalued or not accounted for inclusion into the sector's contribution to GPD. For example lot of bamboo is given to right holders/local people either free of cost or on nominal royalty basis. Rationalization of the price of such forest products will help rationalize the contribution of forestry in the GDP.

Natural Resource Accounting is a revaluation of the National Income Accounts of a country, adjusting for the values of natural resources used in various economic activities during the past fiscal year. Natural resources, as they appear in nature, get degraded in quality and depleted in stock due to economic and human activities. They also go through natural decay and regeneration. They may also have been enhanced due to planned intervention. There is a need to understand the extent of such losses or gains and to work out their "use values" and generate accounts of such resource deletions and additions. Natural resources being a part of the wealth of a nation, initiatives have to be taken to integrate the natural resource accounting along with the System of National Accounts (SNA).

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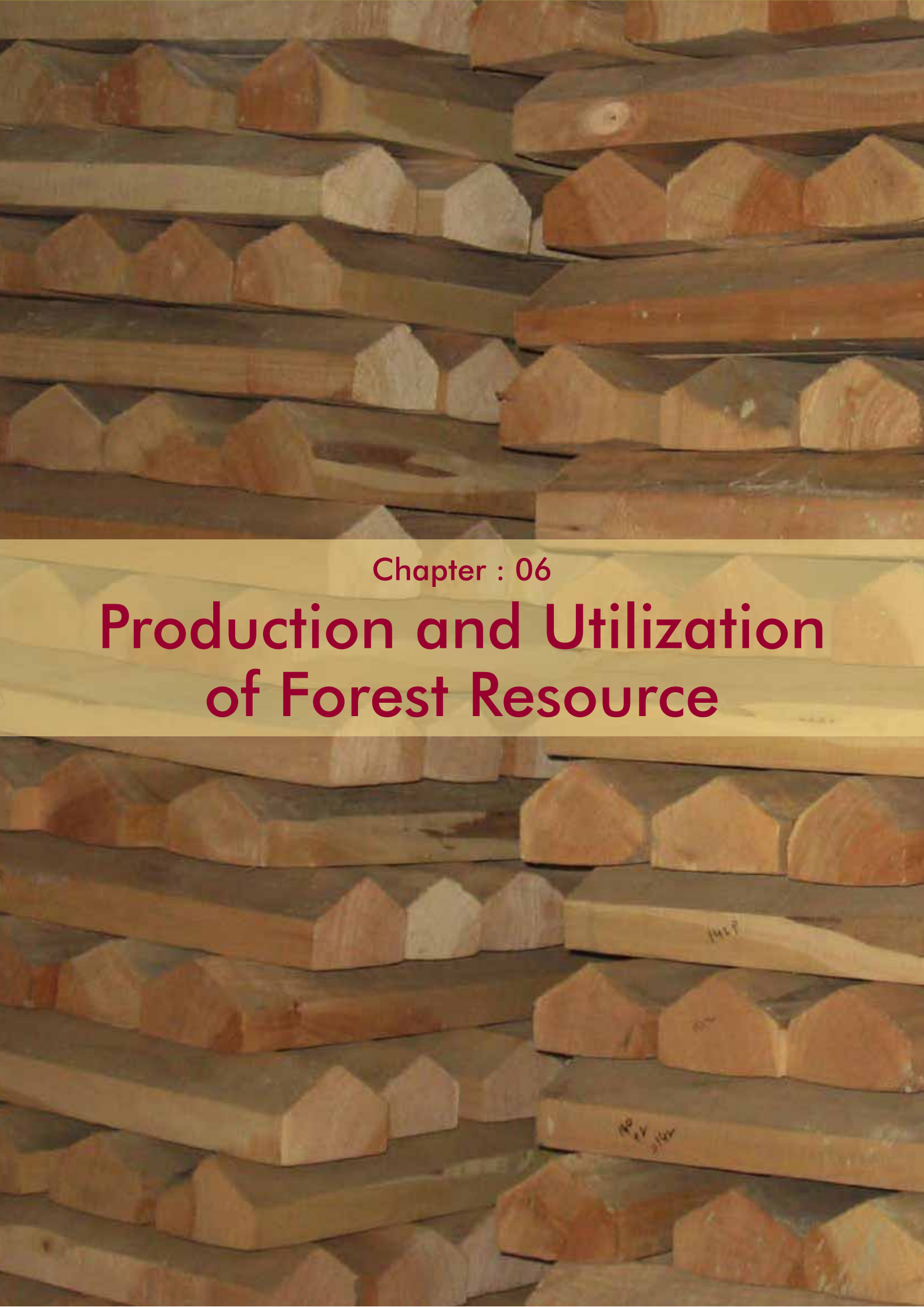


Chapter : 06

Production and Utilization of Forest Resource

6 Production and Utilization of Forest Resource

Traditionally, timber has been the most important and valuable product of the forests. Other forest products like bamboo, cane, fibers and flosses, leaves (tendu), oil seeds, gum, resins, essential oils, drug and spices etc though important, were categorized as "minor". But since the last three decades or so, the focus has shifted to non-timber forest products, specially after the 1988 National Forest Policy. The timber production from the forest has declined due to increased emphasis on forest conservation. To meet their increasing requirements, the wood-based industries have to augment supply by importing wood and promote plantations outside forests in farmer's land of high yielding genetically improved variety of tree species as well as raise their own captive plantations.

6.1 Production of Timber in India

6.1.1 From Natural Forests

In India, until 1970s the natural forests remained the main source of timber. The total production of timber from forests was about 10 million m^3 per year although the country's requirement was estimated to be about 15 million m^3 (NCA 1972). Part of the requirement was met by harvesting trees from private lands outside forests though accurate account was not available.

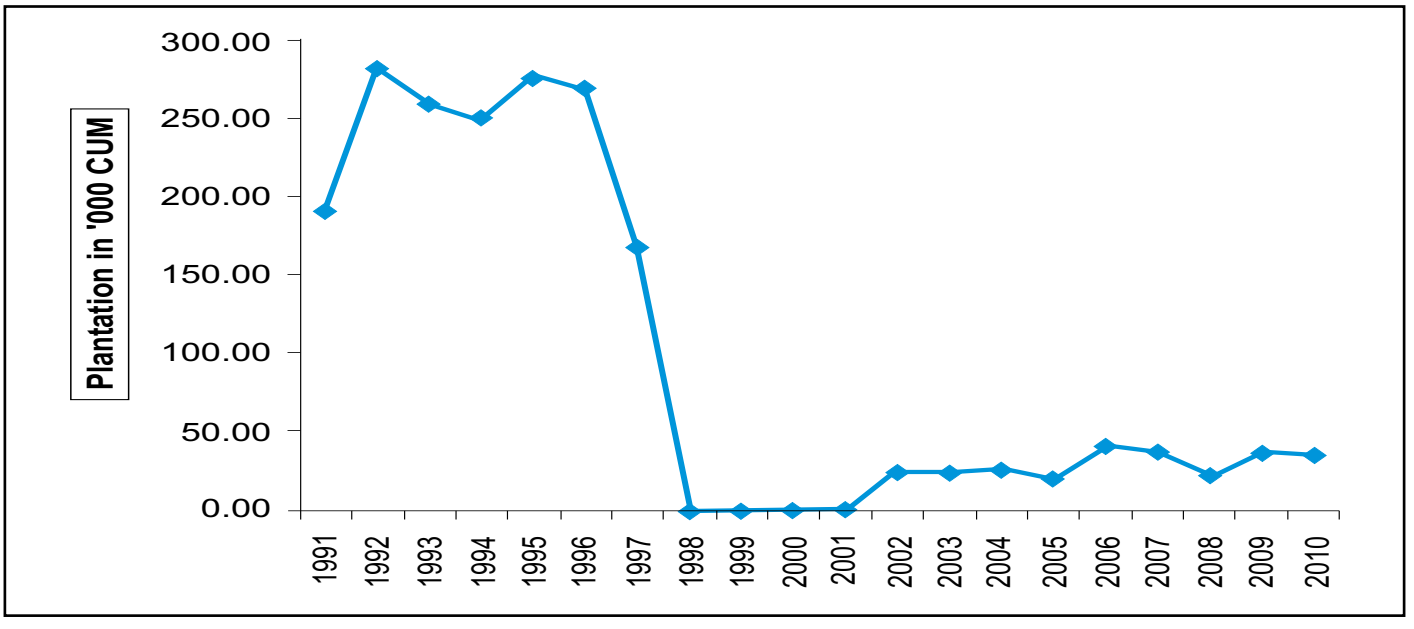
On the basis of the Interim Report of the National Commission on Agriculture (NCA 1972) on 'Production of Man-made Forests', many State Governments established Forest Development Corporations (FDCs) to work on commercial basis. In a few states (Himachal, Jammu & Kashmir,

Uttar Pradesh, Uttarakhand), the FDC was mainly to harvest and market the timber of the states to eliminate the contractor system. In Arunachal Pradesh and Andaman & Nicobar Island, the FDC was to supplement forest departments in harvesting and marketing of timber. In Haryana and Punjab, FDC's were created to support farmers growing trees by providing reasonable price for their trees, besides supporting forest department in harvesting and marketing of timber. In Andhra Pradesh, Chhattisgarh, Madhya Pradesh and Maharashtra, the FDCs are harvesting and marketing timber only in the limited forest area leased to them where they are raising commercially valuable tree species.

Timber production from government forests gradually declined with increasing restriction imposed by Central Government on felling of trees during 1980s for biodiversity conservation and bringing more areas under Protected Area network. Ban was imposed on clear felling of forests and as well as green felling of trees above 1000 m in hills. The new National Forest Policy 1988 also laid emphasis on conservation of forests and biodiversity, and discouraged production of timber for industries. The annual production of timber from forests had declined to about 4 million m^3 by 1990.

The Supreme Court of India (SCI) in its interim order stopped all activities in the forests in some states in December 1996, and banned felling of trees in two areas of Arunachal Pradesh viz Tirap and Changlang. In a subsequent final order of 15 January 1998 applicable throughout the country, the SC ordered that without prior approval of the Central Government, felling of trees will not take place except in accordance with the Working Plans of the area prepared by the State Government and approved by the Central Government. Some of the states which were harvesting timber without Working Plans specially those of Northeast, were worst hit. The trend of production of timber in Arunachal Pradesh as shown in Figure 6.1 is quite revealing. There was virtually no production of timber in Arunachal Pradesh for about 4 years till the Working Plans of a few divisions were approved by the Central Government.

Figure 6.1: Annual production of timber in Arunachal Pradesh during last 20 years



The production of timber in other states was also adversely affected and by 1998 the total annual production of timber from government forests declined to about 2 million m^3. The annual production during 2005-2010 is presented in Table 6.1, which shows that the average annual production of timber from forests during last 5 years was about 2.38 million m^3.

State-wise production of timber is shown at Appendix 6.1. On the basis of average of 5 years, it is found that of the total timber produced from government forests, about 85 per cent comes from Andhra Pradesh, Chhattisgarh, Haryana, Himachal Pradesh, Madhya Pradesh, Maharashtra, Punjab, Uttar Pradesh, Uttarakhand and West Bengal as shown in Figure 6.2. Forest Development Corporations (FDC) in Himachal Pradesh, Jammu & Kashmir, Uttar Pradesh, Uttarakhand and West Bengal harvest almost all timbers from forests on agency basis where as in Andhra Pradesh, Chhattisgarh, Haryana, Madhya Pradesh, Maharashtra, and Punjab it is partly by Forest Department and partly by FDCs. In total approximately 60 per cent of the timber produced from natural forests in the country is by FDC's.

A good percentage of the total timber produced in case of Haryana, Punjab and Uttar Pradesh is on account of tree felling due to road widening. In case of Bihar, there is no production of timber from forests and about 7,000 m^3 is produced due to road widening activity. The timber produced in Rajasthan is measured and disposed in quintals, which has been converted into m^3.

6.1.2 From trees outside forests including Agro-forestry

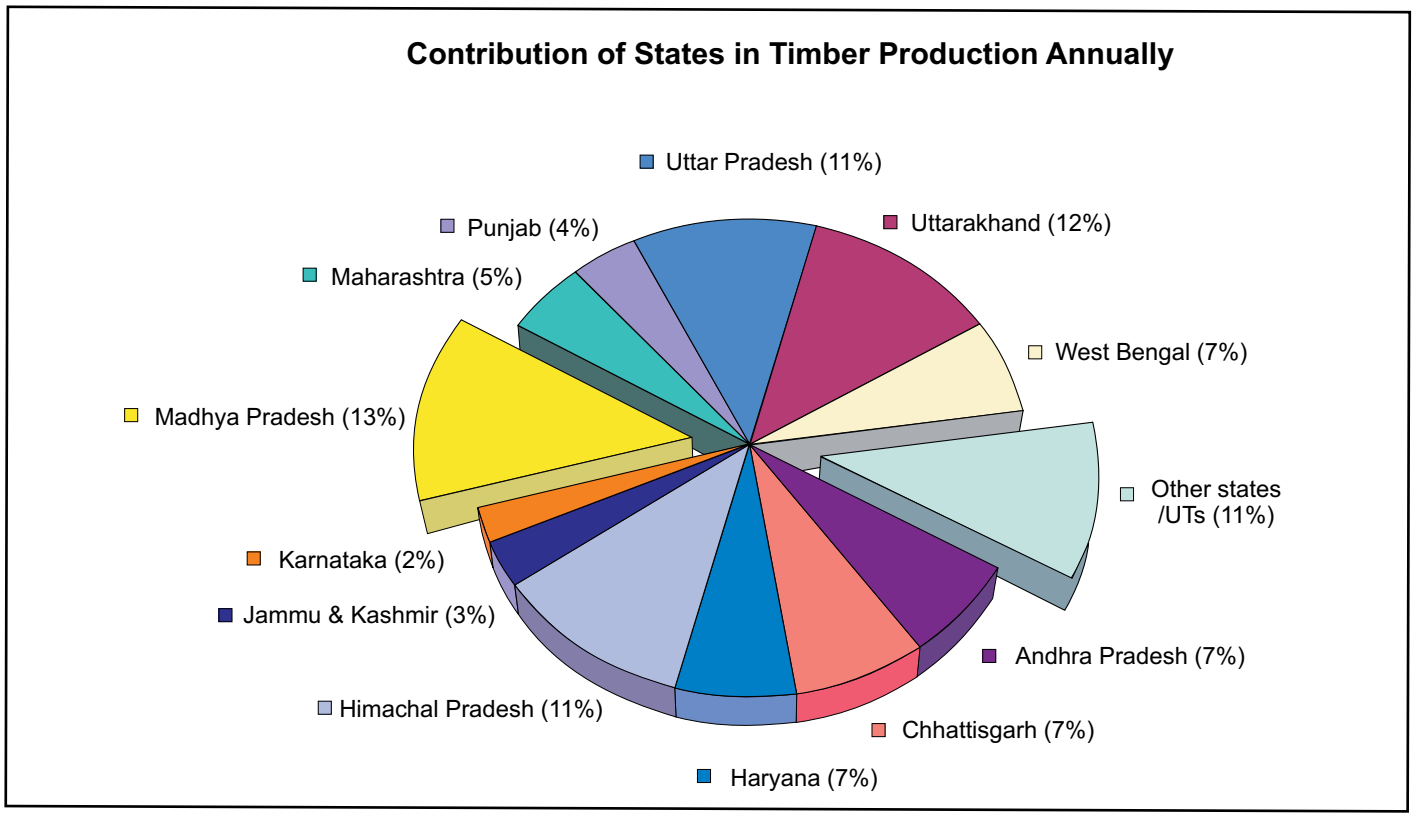
Tree grown outside forests in homesteads, private lands, farmlands and other non forest lands have contributed significantly to the total timber and fuelwood production in the past. The production from such areas increased manifold after the implementation of Social/Community forestry programmes in the country. Further, increased emphasis on forest and biodiversity conservation since 1980s and restrictions on felling of trees from forests has compounding effect in promoting tree growing outside forests for industrial wood. The National Forest Policy 1988 made it clear that forest based industries should raise their own plantations for meeting their raw material needs. As a result even states like Haryana and Punjab which have very little forests have been producing large quantity of timber for industries, in farm lands through short rotation species (Eucalyptus and Poplar). The estimated production from these two poorly forested states is about 4 million m^3.

The Supreme Court of India in its order of 30th October 2002 directed that no new licenses for wood based industries in any state in the country will be issued or expansion of the existing ones will be done till the timber availability from all sources (forest, non-forests or imported) is assessed,

Table 6.1 : Annual production of timber from government forests in India

Year	2005-06	2006-07	2007-08	2008-09	2009-10
Volume in million m^3	2.33	2.39	2.60	2.31	2.18

Figure 6.2: Average annual production of timber from different States in India during 2005-10



examined and permitted by the Central Empowered Committee (CEC). Thus the States proposing to give new licenses had to make assessment of timber availability from trees outside forests by conducting inventory or otherwise. Considering the important role of trees outside forests in the production of industrial timber, the Forest Survey of India has started assessing this resource at the state and national levels since 2002. With the available inventory of trees outside forests, FSI also supported CEC and States in estimating the growing stock of timber in trees outside forests and also the annual availability. State-wise details of the available growing stock and annual availability of timber based on about 30,000 sample plots laid across the country is presented in Table 6.2. In this table, the figures in column (2) indicate growing stock (GS)/wood volume of all the tree species above 10 cm diameter measured during national forest inventory and figures in column (3) indicate growing stock of only those trees species which are harvested for timber production/industrial use as other species may be used only for environmental and aesthetic purpose. The figures in column (4) have been calculated by dividing the growing stock of a particular species of column (3) with its average rotation age as per practice in the State and adding them for all species. The total estimated production of timber from trees outside forests in the country is about 44.3 million m^3.

Table 6.2 : Growing Stock (GS) of all species of trees outside Forest and Annual availability of timber

States	GS of all Tree spp. (Million m^3)	GS of tree spp. used as timber (Million m^3)	Annual availability of timber (Million m^3)
Andhra Pradesh	122.76	52.78	2.36
Arunachal Pradesh	79.20	10.32	0.81
Assam	42.44	15.65	0.81
Bihar	45.13	26.19	2.18
Chhattisgarh	72.64	59.28	2.06
Delhi	1.15	1.08	0.00
Goa	4.00	2.29	0.02
Gujarat	122.12	75.61	4.92
Haryana	15.58	14.60	1.90
Himachal Pradesh	21.23	17.33	0.67
Jammu & Kashmir	149.46	105.46	0.84
Jharkhand	53.32	43.52	1.51
Karnataka	105.26	52.01	2.09
Kerala	50.05	27.59	1.01
Madhya Pradesh	86.49	70.32	2.68
Maharashtra	151.40	97.37	3.53
Manipur	9.61	3.12	0.20
Nagaland	13.93	4.65	0.29
Meghalaya	23.47	7.62	0.49
Mizoram	9.51	4.32	0.31
Odisha	77.21	48.66	1.71
Punjab	19.39	12.84	2.12

Contd...

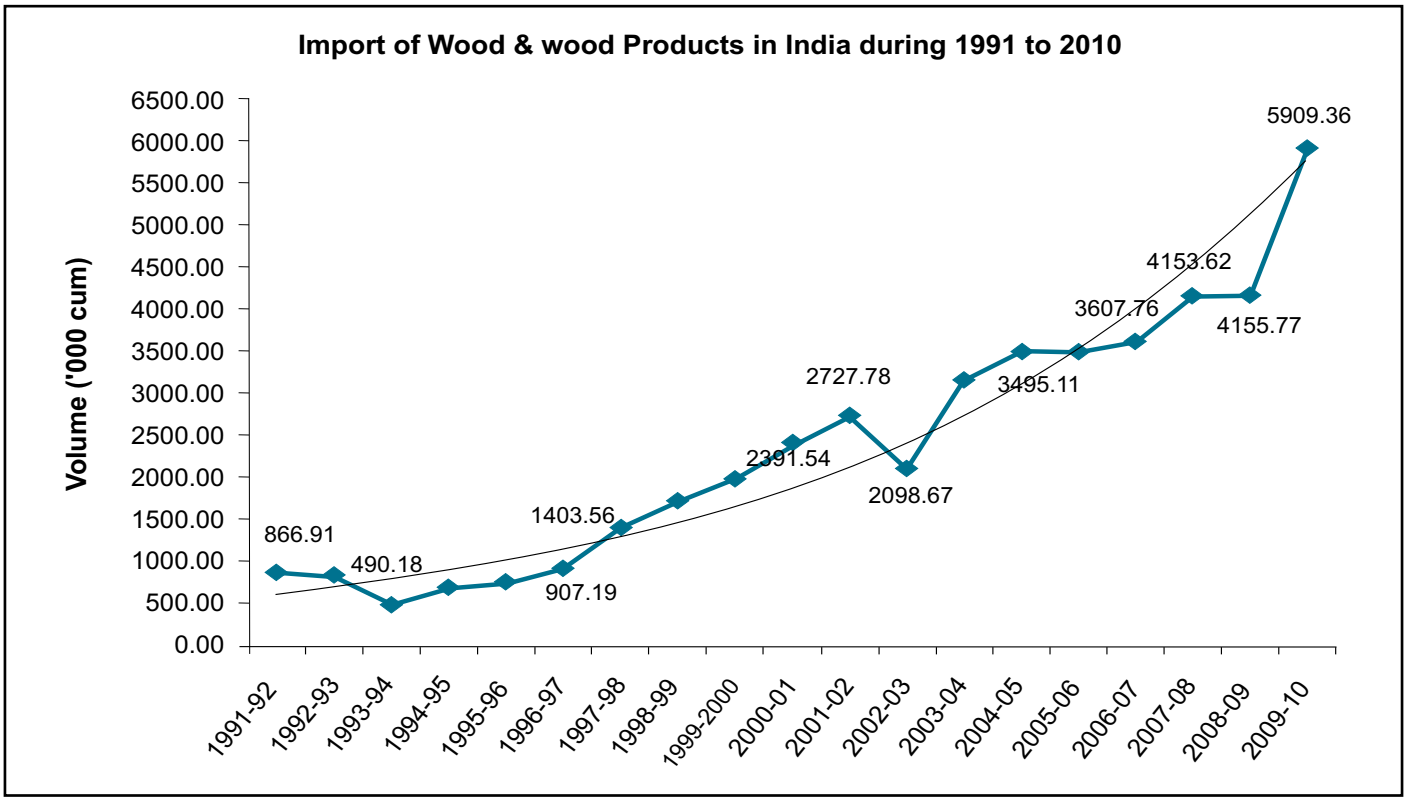
States	GS of all Tree spp. (Million m^3)	GS of tree spp. used as timber (Million m^3)	Annual availability of timber (Million m^3)
Rajasthan	90.46	69.56	3.55
Sikkim	2.53	0.66	0.03
Tamil Nadu	73.36	23.80	0.87
Tripura	8.04	3.65	0.26
Uttar Pradesh	83.44	74.68	5.19
Uttarakhand	19.34	14.63	0.68
West Bengal	44.85	26.74	1.22
A & N	0.73	0.18	0.01
Chandigarh	0.10	0.09	0.00
Dadra & Nagar Haveli	0.85	0.40	0.01
Daman & Diu	0.11	0.07	0.00
Lakshadweep	0.05	0.03	0.00
Puducherry	0.33	0.15	0.01
Total	**1599.54**	**967.25**	**44.34**

6.2 Import of Wood

In view of increasing emphasis on conservation of forest, the Government of India took a policy initiative and liberalized the import of wood and wood products in 1996 to reduce the demand supply gap by bringing them under Open General License (OGL) category. Since then the import of wood and wood products has been steadily increasing. The Directorate General of Commercial Intelligence and Statistics (DGCIS) under the Ministry of Commerce, Government of India maintains the data bank of export and import of commodities. The data are based on authentic official records, the daily trade reports and custom clearance records of import and export of forest products, collated by Department of Customs and Central Excise and are therefore quite reliable. The units of some of the wood products like plywood, veneer and particle board in kg were converted into m^3 by using suitable conversion factors.

The trend of import of wood and wood products is shown in the Figure 6.3. The import data from 1991-92 to 2001-02 was taken from Bansal (2004) which is based on DGCIS data bank and the rest by extracting from DGCIS data bank. Detailed quantity of import

Figure 6.3 : Import of Wood and Wood Products in India in last two decades



of wood in different form (round log, sawn wood, plywood and veneer) is given in Appendix 6.2.

It can be seen that import of wood has continuously increased in the last two decades except for a slight dip in 2002-03. There was a sudden increase in the import by 60 per cent in 1997-98 after liberalization policy. The current level of import of wood is about 6 million m^3 of which round logs alone constitute more than 93 per cent. Though wood is imported from about 100 countries, six countries namely Malaysia, Myanmar, New Zealand, Ghana, Ivory Coast, and Gabon constitute bulk of the import. About 80% of the imported wood during 2006-10, was from these countries. Teak constitutes an important timber species and forms about 15 per cent of the total annual imported volume. Most of the import of teak is from Myanmar, Ivory Coast, Ghana, Ecuador, Costa Rica and Benin. The value of the imported wood and wood products has gradually increased from Rs. 3,322 crore in 2003-04 to Rs. 7,688 crore in 2009-10 and details of which are given in Appendix 6.3.

6.3 Production and Consumption of Fuel-Wood

Though the largest use of wood in India is in the form of fuels its production, supply, distribution, and consumption have mainly remained in the informal sector. Studies done on this subject have focused on the consumption part by estimating per capita consumption for different segment of the population and of different regions of the

country mainly on household energy, the sources of supply have been often assumed. Uncertainty exists about its actual production from forest and other sources. The National Sample Survey Organization (NSSO) of Ministry of Statistics and Programme Implementation, Government of India dedicated for socio-economic survey of the country estimates fuel wood consumption while assessing variety of household energy used for cooking and lighting, every five years, as a part of consumer expenditure survey. Since the survey is based on sample of several lakh households it is considered the best source of data on fuelwood consumption. The Forest Survey of India (FSI) used the data of latest study of 2005 (NSSO 2007) to estimate the consumption of fuelwood. This study has found that 75 per cent of the rural and 21.7 per cent of the urban households still use fuelwood and chips for domestic energy. The percentage of households using different forms of energy needs in rural and urban areas is given in Table 6.3.

Table 6.3: Percentage of household using different forms of energy in India in 2005

Form of Energy	Rural (%)	Urban (%)	Combined (%)
Fuelwood & chips	75	21.7	60.0
Dung Cake	9.1	0	6
Kerosene	0	10.2	2.9
LPG	8.6	57.1	23.0
Agriculture residue, coal, coke & others	6.0	6.1	6.0
No Cooking	1.3	4.9	2.0
Total	**100**	**100**	**100**

The per capita consumption of rural and urban areas for different regions as obtained from NSSO were first converted into consumption per households and then multiplied with number of households of each stratum. The average per capita consumption of only fuelwood per month at the national level in rural areas is about 17.7 kg and in urban areas 6.3 kg. State-wise details are given in Appendix 6.4. The total fuelwood consumption estimated in household sector is 248 million m^3. FSI (2009) has also estimated that about 13 million m^3 additional fuelwood is consumed in hotels and restaurants, cottage industries and cremation of dead human bodies. This makes the total annual consumption of fuelwood to be 261 million m^3 which comes from different sources.

Few wood fuel studies indicate that forests supply a limited quantity of wood fuel. NCAER (1985) study found that during 1978-80 only 26 per cent wood fuel directly came from forests, 17 per cent from road side trees, 27 per cent from market (which could be either from forests or own trees or others) and 26 per cent from own source and remaining 4 per cent from other unknown source. Further, on the basis of analysis of data on free collection of fuelwood of NSSO, Dr. Neelkanthan (1999) found that only 20 per cent of the total fuelwood produced in India comes from forests and rest from different sources. Treating this estimate as the best, the production of fuelwood from forests has been estimated to be 52 million m^3 (FSI 2009) and remaining 209 million m^3 from farmland, community land, homestead, roadside, canal side and other wastelands.

6.4 Wood Based Industries

Wood-based industries are key industrial contributors to income and employment generation, particularly in the rural and underdeveloped areas

in India. Wood-based industries in India produce a range of processed wood and non-wood products including sawn wood, composite panel products and pulp & paper. Broadly, there are three categories of wood based industries, i.e., the saw mills, paper mills, and plywood & panel industries and almost all are in private sector. The wood supply to these industries is from government forests, trees growing in private and non forest lands and from import, the details of which have already been discussed in the previous Sub-sections 6.1 to 6.3. The market for wood and wood products in India is predominantly domestic in nature. The export of wood – logs, timber, stumps, roots, barks, chips, powder, flakes, dust, and charcoal – has been totally banned and that of the wood products restricted.

6.4.1 Saw Mills

Saw milling industry in India falls mostly in the small sector but is the largest consumer of timber with estimated consumption to be about 29 million m^3 in 2005 (Pandey and Rangaraju, 2008). As per one estimate, percentage-wise end use of sawn-wood includes construction mainly in housing (62%), sleepers (8%), packing (6%), furniture (7%), vehicle industry (7%), ship building (4%), mining (2%) and other miscellaneous uses like pencils, sports goods and toys, textile industries, textile accessories, handles, battery separators, etc. (4%) (Pandey and Rangaraju, 2008). Primary sawing of round logs at the felling sites by hand saws is still done in substantial quantity, especially in the mountainous forests in Himachal Pradesh, Jammu & Kashmir and in Uttarakhand. However, hand sawing has completely disappeared from reconversion industries in large cities. The timber comes to the saw mills either in the log form or in slab form in non-standard sizes, pre-sawn by hand in the forests. There is no integrated all-India market for sawn timber partly because of the structure of the industry. Most of the saw mills do piece meal-work, with the bigger plants acquiring and stocking wood in log or slab form for re-sawing according to customer requirements. The utilisation of sawn wood is strongly influenced by local resources, customs and utilisation.

Saw milling industry in India is not fully in formal sector and a good number of saw mills still run without licence to cater to local needs and without technological back up. In 1978, Forest Survey of India conducted a survey of sawmills in the country and the total number of saw mills estimated were 23,220 (FSI 1979). Since then the industry has grown and the exact number of saw mills in the country at present is not known. The Central Empowered Committee of

the Supreme Court of India, while considering grant of licence to new wood-based industries in some States, has got the number of saw mills and veneer and plywood units compiled by the State Level Committees and estimated their timber requirements. The timber requirement in sawmills of the selected States is given in Table 6.4.

Table 6.4: Number of sawmills and their timber requirement in selected States during 2006 to 2008

State	Number of registered saw mills	Timber requirement (In lakh m^3)
Gujarat	3621	17.499
Haryana	4319	6.5080
Himachal Pradesh	2930	3.4725
Punjab	4631	15.0620
Uttarakhand	394	2.2410
Uttar Pradesh	5727	27.3024
West Bengal	1531 (4458*)	8.8632
Total	**26,080**	**80.9481 or 8.1 million m^3**

*total number of saw mills including 2927 unlicensed.

In Gujarat, 191 saw mills, located in imported timber conversion zone in Kutch, annually consume about 6.4 lakh m^3 imported timber landing at Kandla port.

6.4.2 Plywood, veneer and composite wood

Use of wood in form of plywood & panels, has become very popular because of its ease in application, and is the third most important contributor to the housing sector. According to the Federation of Indian Plywood and Panel Industries (FIPPI), there are about 62 large and medium-sized plywood mills and over 2,500 Small-Scale Industry (SSI) units in India. More than 1000 are located in Haryana, Punjab, Uttarakhand, and Western Uttar Pradesh. Because supply of timber from the natural/ government forests has shrunk, the dependence on trees growing outside forests (ToF) in farmlands etc., and on imported wood, has increased. This has changed the scenario of Indian wood-based industry. These industries now mostly use plantation timber like Poplar and Eucalyptus grown by the farmers under the agro-forestry system.

Technological development and research in the field of wood utilization including use of high quality adhesive is undertaken by research institutes like the Indian Plywood Industries Research and Training Institute (IPIRTI), Bengaluru and others. The plywood and composite wood industries are now in a position to produce value-added panel products such as shuttering, pre-laminated particle board and Medium-Density Fibre Board (MDF), laminated veneer lumber, moulded skin doors, bamboo composites, finger-jointed and edge-laminated timber, in addition to general-purpose plywood, block board

and flush doors of a very high quality. This has further improved the market for plywood and panel industry products. As per one study the projected demand of panel wood in India in 2010 was about 18.8 million cum, in which the share of particle board was about 6% and of MDF only 4%. Timber requirement of plywood and veneer industries for selected states as estimated by Central Empowered Committee (CEC) during grant of permission is given in Table 6.5.

Table 6.5: Number of Plywood & veneer industries and their timber requirement in selected States during 2006 to 2010

State	Number of registered Plywood & veneer industries	Timber requirements (lakh m^3)
Haryana	542	10.83
Himachal Pradesh	2	0.03
Punjab	281	6.655
Uttarakhand	27	0.94
Uttar Pradesh	230	6.91
Total	**1,082**	**25.365**

6.4.3 Pulp and Paper

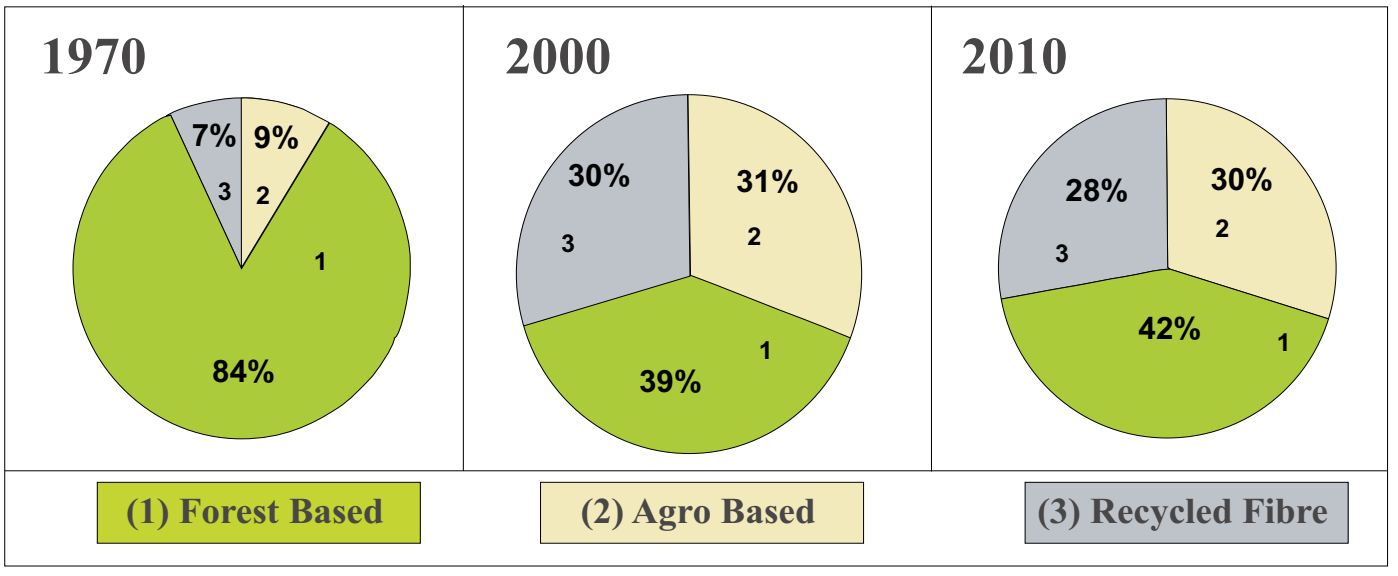
The pulp and paper industry is considered as one of the high consumers of forest based raw material. A good quality fibrous wood and bamboo are said to be the best raw material. In addition, non-wood agro-based residue and waste paper are also used. This industry in India, over the years, has undergone tremendous change in the raw material consumption scenario. With change in Government policy to focus on conservation of forest resource and reducing the production of wood and bamboo from natural forests, the wood based segment of the paper industry has considerably shrunk from 84 per cent in year 1970 to 39 per cent in year 2000. Figure 6.4 shows the trend of using different raw materials for paper making in last three decades (Kulkarni *et al.,* 2006). There has been some increase in the use of forest based raw material in 2010 because of production of pulpwood by some major paper mills through their captive plantations, and arrangement with farmers to grow trees on buy back system.

The total number of pulp & paper mills in India today stands at about 660, out of which only 25 mills are wood & bamboo based and rest are agro & recycled fibre (RCF) based mills. The demand for forest based raw material in 2010 is estimated to be about 9 million tonnes (Kulkarni *et. al.* 2006). The agro & recycled fibre based mills also need virgin wood fibre because to produce quality paper it is essential. The paper produced only from agro residue and recycled fibre face a severe competition in the market due to its inferior quality.

Many large wood based paper mills have entered into arrangement with local farmers for growing trees in their farm land to meet the raw material requirement of their mills on a sustained basis. The farmers are provided financial and technical assistance. Some such mills are as follows:

J. K. Paper Mills Ltd. Raygarh, Odisha

Figure 6.4: Trend in use of different raw material for paper making



Ballarpur Industries Ltd., Balharshah, Maharashtra

Orient Paper Mills Ltd., Amlai, MP

Star Paper Mills Ltd., Saharanpur, UP

Andhra Pradesh Paper Mills Ltd., Rajamundary, AP

ITC Bhadrachalam, Andhra Pradesh

Mysore Paper Mills, Bhadravati, Karnataka.

Farmers are assured of the purchase of their pulp wood at market price. Due to large scale efforts of pulp and paper mills, the farming community is increasing wood plantation on farm land. Table 6.6 shows a gradual increase in plantations on farm land in four years as an effort of paper industry (Kulkarni *et al.,* 2006).

Table 6.6: Tree Plantations on farmer's land due to initiatives of Paper Mills

Year	Area in ha
2001-02	25,432
2002-03	30,343
2003-04	39,019
2004-05	45,449

These industries have also excelled in producing genetically improved high yielding clonal varieties of planting material, as a result of which the productivity of the plantations has increased two to three fold. Eucalyptus, poplar, casuarina, acacias and subabul are the main species which are being promoted in these plantations, and harvested on short rotation

of 4 to 6 years. Though the area under such high productive plantations is low compared to the raw material requirement, such areas are expected to increase in future.

6.5 Harvesting and Marketing of Non-Timber Forest Products (NTFPs)

Traditionally Non-Timber Forest Products (NTFP) or Non-Wood Forest Products (NWFP) have been known as 'minor forest produce' (MFP) because their volume and value compared to timber was recognized as minor in the national economy, although they have significance in local incomes and livelihoods. Therefore the development of management models of MFPs in general, barring a few exceptions like tendu leaf, resin, bamboo, etc., was not given priority in the past. Though there are more than 800 types of NTFPs harvested in India, reliable harvest data of only a few are available, which are often in the category of NTFPs nationalized by the State Governments, because harvest/collection of a large number of NTFPs by local people go unrecorded.


Sale of herbal plant products of forest origin at Van Mela at Chhindwara (M

State-wise production and value of tendu leaf, bamboo and resin is presented in this section. Other NTFPs which are most commonly harvested in many states are fodder grass, Citronella Grass, Bhabhar Grass, cane, thatch leaf, seeds of Sal, Karanj, Mahua, fruits of Aonla, Tamarind, Harra, Bahera, gum, lac, wax, honey, cinnamon, broom, Agarbati stick and a large number of medicinal plants. The consistent data about these NTFPs on annual production and sale value is not available, however, data as available is presented in Appendix 6.7.

The Enactment of Panchayats (Extension to Schedule Areas) Act, 1996 commonly known as PESA, has brought significant changes in policy relating to management and trade of NTFP as the ownership right of NTFP has been bestowed to Gram Sabha. Some states like Bihar, Jharkhand have transferred fully the harvest/collection and trade activity of NTFP to Gram Sabha, and do not keep any account of its production or sale value. Gujarat state has also transferred the harvest and trade to the Panchayats after PESA but it did not work well, and the Government had to take it back after 5-6 years in 2004.

Now Gujarat Forest Corporation is doing harvest/ collection and trade of NTFP since then, and the net profit is transferred to Panchayats after deducting the overhead charges and taxes. In Madhya Pradesh and Chhattisgarh, harvest/collection, processing and trade is done by the State Federations involving local people through primary Forest Produce Societies, and the Federation additionally transfers the net profit to the Primary Forest Produce Societies, retaining a small proportion for overheads, development of NWFP and infrastructure. The Societies finally distribute the profits to the Primary Collectors.

6.5.1 Tendu Leaf

The leaves obtained from Tendu tree (*Diospyros melanoxylon* Roxb.) are considered the most suitable for Bidi industry (country made cigarettes) on account of their ease of rolling as bidi wrapper, texture, flavour and workability. The wide-scale use of *Diospyros melanoxylon* leaves in Bidi industry is mainly based on their profuse production, agreeable flavour, flexibility, resistance to decay and capacity to retain fire. The tree species is found in dry deciduous forests covering almost the entire Indian peninsula, and is harvested on commercial scale in many States. The procedure for collection and processing of tendu leaves has more or less been standardized. The tendu plants are pruned in the months of February and March and the mature leaves are collected after about 45 days, in bundles of 50 to 100 leaves, which are dried in sunlight for about a week. The dried leaves are sprinkled with water to soften them and then filled tightly in jute bags and exposed to direct sunlight for 2 days. The bags, thus packed and cured, can be stored till their use in bidi manufacture. Great care is needed while plucking, curing and storage of tendu leaves, as it is a sensitive product, and with the slightest mistake or oversight during any of these processes, the quality deteriorates, rendering it unfit for making bidis.

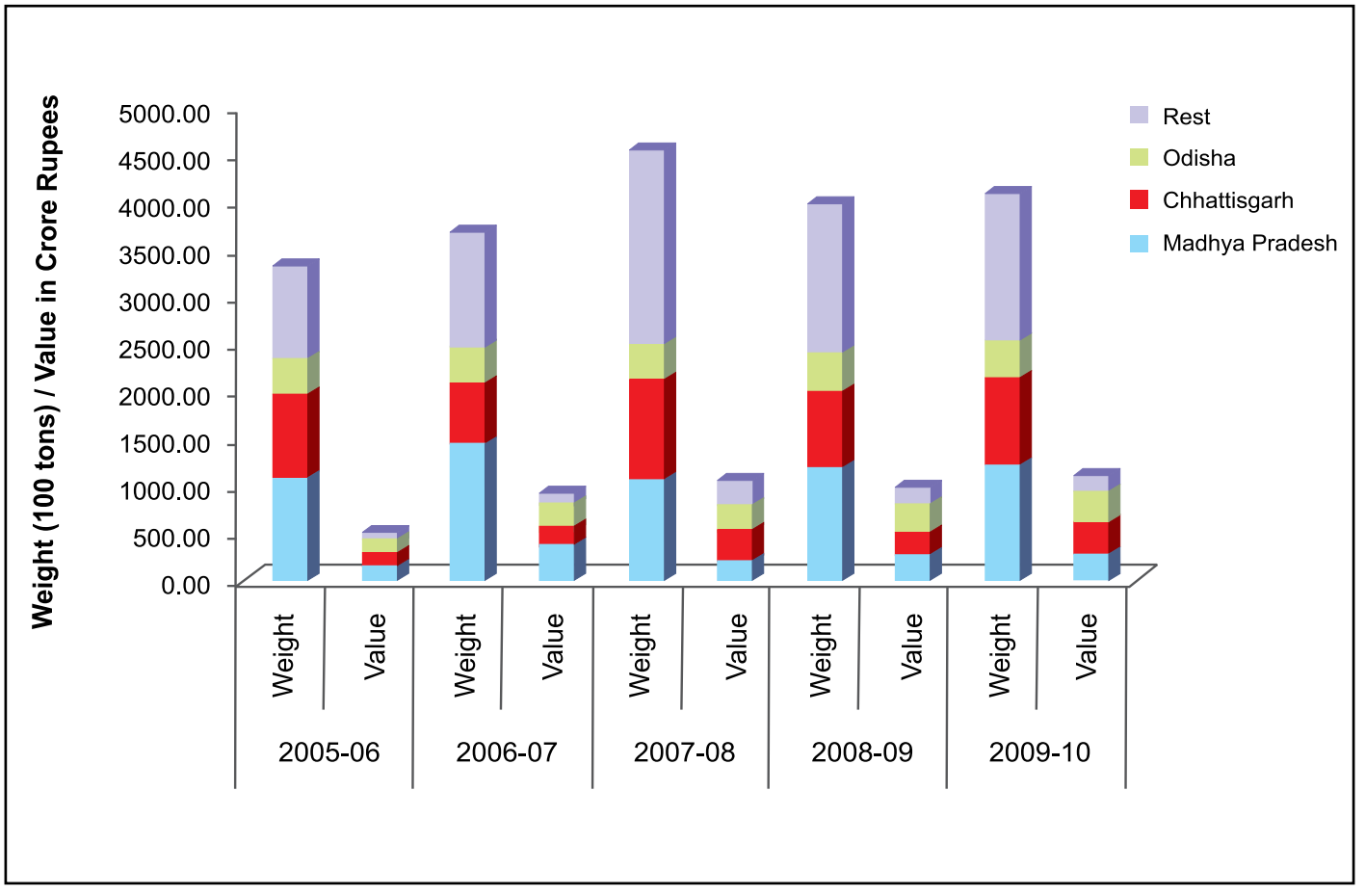
The data on annual production of tendu leaf and its value as available from eight major tendu producing states (Andhra Pradesh, Chhattisgarh, Gujarat, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Uttar Pradesh and West Bengal) for the period

2005-06 to 2009-10 are presented in Appendix 6.5. The total production of tendu leaf varies between 3.3 lakh tonnes to 4.5 lakh tonnes per year with a market value of about Rs. 1,000 crores per annum. The three States producing the bulk of the tendu leaf are Chhattisgarh, Madhya Pradesh and Odisha as depicted in the Figure 6.5.

6.5.2 Resin

Crude resin is a thick, sticky fluid obtained by tapping the living pine tree. When the outer portion of stem wood or the xylem is cut (or otherwise injured), resin exudes from the cut. Resin is the source for producing rosin and turpentine which have wide utility in making soap, paper, paint, varnish, pharmaceuticals etc. In India the principal species tapped for resin production is *Pinus roxburghii* known as Chir or Chil which grows in the northern hilly region, mainly in Himachal Pradesh, Jammu and Kashmir, Uttarakhand and Arunachal Pradesh. A small quantity of resin is also produced from blue pine (*Pinus wallichiana*), which grows at higher elevations in these states. The tapping of the pine

Figure 6.5: Annual production and value of tendu leaf in India



tree begins when it attains the diameter of about 30 cm at 50-60 years age. Earlier method of tapping the resin was by giving deep blaze, called Cup & Lip method. A new technique called Rill method was subsequently researched by Forest Research Institute (FRI) Dehradun, which causes minimum damage to the trees and gives optimum exudation. Average production of resin per blaze in a year is about 4 kg. The production of the resin harvested in India during 2009-10 was about 28,000 tonnes having market value Rs. 108 crore. Details of production and value of five years 2005-10 are given in Table 6.7. It is observed that the total annual production has gradually declined because of the policy to reduce the number of trees being tapped, the trees have become over matured, and also because young plantations have not reached the age of harvest. On the other hand, the price of the resin has increased. It is to be noted that major portion (more than 70 per cent) of the total resin consumed in India is being imported, mostly from China.

6.6 Bamboo Production and its Utilization: Bamboo Mission

Bamboo is a versatile natural resource and extensively used in cottage industry for making lots

Table 6.7: Annual Production and value of Resins in India during 2005 to 2010

States	2005-06		2006-07		2007-08		2008-09		2009-10	
	Weight (100 Tonnes)	Value (Crore Rupees)	Weight (100 Tonnes)	Value (Crore Rupees)	Weight (100 Tonnes)	Value (Crore Rupees)	Weight (100 Tonnes)	Value (Crore Rupees)	Weight (100 Tonnes)	Value (Crore Rupees)
Arunachal Pradesh	1.35	0.31	4.43	0.19	4.09	0.23	4.06	0.27	1.60	(0.10)
Himachal Pradesh	85.08	25.52	85.91	45.10	85.14	44.70	75.96	39.88	65.00	45.5
Jammu & Kashmir	67.48	(16.69)	49.69	17.12	38.60	7.09	24.42	13.29	16.93	8.31
Uttarakhand	183.49	45.38	198.19	46.33	192.98	29.97	187.52	30.81	196.08	54.57
Total	**337.40**	**87.90**	**338.22**	**108.74**	**320.81**	**81.99**	**291.96**	**84.24**	**279.61**	**108.48**

of household products, besides house construction. It has been an important source of raw material and income for millions of rural Indians for sustaining their livelihoods. The major quantity of bamboos is utilized as raw material by paper and pulp industries, for housing, rural and agricultural applications, packing industry, etc. Besides forests, it also grows in private farms, lands and in homesteads. The Forest Survey of India (FSI), while conducting the national forest inventory, makes assessment of the bamboo resource in forests. FSI in its recent report (FSI 2011) has estimated that forests having bamboo clumps occupy an area of approximately 13 million ha, which constitute about 19 per cent of the total forest area of the country. The total bamboo growing stock of green bamboo is about 169 million tonnes. About 28 per cent of the total bamboo area with around two third of the growing stock is located in North-East India, bearing 58 species belonging to 10 genera. The other areas rich in bamboos include the states of Madhya Pradesh, Chhattisgarh, Maharashtra, Odisha, Andhra Pradesh, Karnataka, and the Union Territory of Andaman and Nicobar Islands. The principal bamboo genera occurring in India include *Bambusa, Dendrocalamus, Melocanna, Oxytenanthera,* and *Pseudostachys*. Apart from its natural occurrence in most of the regions of the country, it is cultivated on common lands, river banks, canal bunds and in mixed plantations by the State Forest Departments (SFDs). People also grow bamboos in their farms and homesteads which provide them extra income. Nearly all bamboo species have their individual life cycle, which could be 30-40 years, and they die after flowering. The flowering could be 'gregarious', spread over a vast tract, or 'sporadic', wherein only a few clumps are involved.

Harvesting of bamboo is done on a 3-4 years felling cycle. A lot of bamboo is given to the local people/tribals under *NISTAR* rights, either free or on nominal cost, to meet their domestic/livelihood needs. Many states do not keep account of bamboo given free of cost, because local people collect it on their own especially in the northeastern states. The number of bamboos given free or on nominal cost to local people in selected States is given in Table 6.8. In Andhra Pradesh the current (2010-11) concessional

rates of bamboo (at depots) fixed by the government for local people/artisans through Burood Society are; special class- Rs. 17.55, 1st class- Rs. 12.15, 2nd class- Rs. 7.65 and 3rd class- Rs. 3.20 (Personal Communication[1]). These rates are mainly to cover the harvesting and transportation charges from the forests. The society members only accept special class and 1st class bamboo, the market price for which is quite high. In Chhattisgarh rates of bamboo are fixed according to length. The current rates are; 7.5 m long - Rs. 10.50, 6.5 m long -Rs. 9.50, 5.5 m long - Rs. 8.00, 4.6 m long – Rs. 6.50 and 3.7 m long- Rs. 5.50 for supply to local artisans, which includes about Rs. 2.00 towards the royalty cost. The supply to Basod (Scheduled Caste community traditionally doing bamboo handicraft) is royalty free (Personal Communication[2]).

Generally commercial bamboo meant for construction/cottage industry is disposed of in numbers, where as industrial bamboo (for paper mills) is in tonnes. The reporting unit of bamboo production is quite variable in the states and is based on local practices. In Madhya Pradesh and Chhattisgarh, bamboo production is reported in Notional Tonnes (NT), one NT equal to 2,400 running meters. Gujarat, Maharashtra, and Odisha report in Metric Tonne (MT) and Karnataka in cubic meters (cum). Tripura reports in MT as well as in numbers, and all other states in numbers. The valuation/sale price of the bamboo is also quite variable. In Assam, the company (Hindustan Paper Corporation Ltd.) harvests bamboo from the forest area allotted on lease on payment of royalty (Rs. 118 per tonne). In Andhra Pradesh, Madhya Pradesh and Chhattisgarh the harvesting is done departmentally, and about 50 per cent of the total harvest which is of industrial quality (short, thin and damaged) is supplied to the papers mills at a present cost of around Rs. 2,000 per tonne. It is apparent that the major part of the landed cost is actually for extraction and transportation. The rest of the good quality bamboo is sold to traders for commercial purpose on per piece basis, which would work

Table 6.8: Quantity of bamboo supplied under NISTAR/Royalty free in selected States

State	2005-06	2006-07	2007-08	2008-09	2009-10	Avg Annual Supply (Nos.)	Avg Annual Supply '00 MT
Andhra Pradesh	31,17,637	39,39,053	56,73,632	33,29,682	16,38,726	35,39,746	424.77
Chhattisgarh	50,98,696	74,84,057	42,97,941	47,37,800	-	54,04,624	648.55
Gujarat	5,18,075	2,44,672	1,30,611	-	-	2,97,786	35.73
Karnataka	20,08,791	24,03,657	20,58,045	1,55,109	8,54,108	14,95,942	179.51
Madhya Pradesh	-	86,35,000	71,62,000	66,05,000	67,21,000	72,80,750	873.69
Maharashtra	19,41,670	10,47,746	13,08,839	15,16,546	14,38,487	14,50,658	174.08

Conversion factor - 1bamboo =12 kg (Dendrocalamus spp found in these States)

out to about Rs. 8,000 per tonne. In Odisha, the harvesting is done by RMP (Raw Material Procurer) through the Forest Corporation, and more than 95 per cent of the bamboo harvested is supplied to the paper mills. To work out a national figure, all the reporting units of production have been converted to a uniform unit of metric tonne (MT) using suitable conversion factors. Further, for estimating the market value of bamboo, the current price of Rs. 2,000 per Notional Tonne (NT) or Rs. 2,660 per MT for supply to paper mills and Rs. 9,000 per NT or Rs. 12,000 per MT for commercial bamboo as received from Madhya Pradesh/Chhattisgarh/Andhra Pradesh Forest Departments has been assumed. In case of Madhya Pradesh and Chhattisgarh, about 60 per cent bamboo is supplied to paper mills and the rest good quality bamboo is auctioned for commercial purpose. In Andhra Pradesh the ratio is 50:50, and in Odisha about 95 per cent goes to paper mills and the rest is auctioned as commercial bamboo. In Assam and Meghalaya about 80 per cent goes to paper mill, and the rest for other purposes. Similarly almost all bamboo from Manipur, Mizoram and Tripura goes to paper mills, and market rates have been accordingly applied for estimating the market value. The average annual production based on 5 years (2005-10) data and estimated market value of bamboo from the major states is presented in Table 6.9. The detailed data on year wise production in different units reported by SFDs is presented in Appendix 6.6.

Bamboo Mission : Recognizing the potential of bamboos in the socio-economic development of rural India, a number of initiatives have been taken for development of this sector by the Central Government. The National Mission on Bamboo Applications (NMBA) was established by the Ministry of Science and Technology in 2004. NMBA was given the task of supporting technological upgradation, developing indigenous capacities and enterprise, providing linkages with markets, functioning as a platform for exchange of knowledge and technology, and encouraging cooperation among sectoral constituents and the stakeholders. A 'National Bamboo Mission' was launched by the Ministry of Agriculture as a centrally sponsored scheme in December 2006, for bringing extensive forest and non-forest areas under bamboo, promoting scientific harvesting from bamboo stands to avoid over-congestion, and for improving yield from existing and future plantations, capacity building and human resource development of farmers, skill development of artisans and development of bamboo marketing including export. The annual budget of the scheme ranges between Rs. 50 to 100 crore. In most of the states, Forest Department is the nodal agency for the implementation of the scheme and a senior official of the department has been designated as a Mission Director, Bamboo Development Authority. In few states the Horticulture or Industry Departments are the nodal agency. On receipt of proposals from the State Nodal officers, the National Bamboo Mission releases funds on annual

Table 6.9: Average annual production of bamboo in India and their market value

State	Annual Production (100 MT)	Market Value (Rs. in crore)
Andhra Pradesh	1400.50	102.66
Arunachal Pradesh	5.30	0.64
Assam	729.87	33.05
Chhattisgarh	359.40	22.99
Gujarat	171.42	12.57
Goa	12.73	1.53
Karnataka	161.00	11.80
Madhya Pradesh	902.07	57.70
Maharashtra	991.72	63.43
Manipur	78.90	2.10
Meghalaya	33.70	1.53
Mizoram	556.45	14.80
Odisha	1268.00	39.65
Rajasthan	126.39	9.26
Tamil Nadu	9.62	0.71
Tripura	1201.01	31.95
Uttar Pradesh	169.31	12.41
Andaman & Nicobar Islands	36.24	1.09
Total	**8,213.63**	**419.87**

Conversion factors:
1 bamboo = 6 kg (Malocanna spp of Tripura, Mizoram, etc)
1 bamboo =12 kg (Dendrocalamus spp found in many States)
1 Notional Tonne = 0.75 MT

basis. In Assam, fund released was Rs. 9.87 crore, Rs. 5.57 crore Rs. 6.44 crores and Rs. 5.19 during 2006-07, 2007-08 2008-09 and 2009-10, respectively. Annual release of funds to different states is given in Appendix 6.8.

The MoEF is encouraging raising of bamboo plantations and establishment of hi-tech nurseries – under various centrally sponsored schemes like National Afforestation Programme, Grants-in-Aid for Greening India, Western Ghats Development Programme etc. through joint forest management programme, for providing livelihood support and

economic security to rural artisans, promoting development of new products and designs, and simultaneously ensuring ecological security and rehabilitation of degraded lands. The IPIRTI, Bengaluru and Indian Council of Forestry Research and Education (ICFRE), Dehradun have been providing major research inputs for value addition to bamboo products.

6.7 Medicinal Plants - Harvesting and Marketing

India has the unique distinction of possessing a rich variety of medicinal plant species, which cater to the needs of about 80 per cent of Ayurvedic, 46 per cent of Unani and 33 per cent of Allopathic medicines. About 3000 plants species are reported to be used in the codified Indian Systems of medicines like Ayurveda (900 species), Siddha (800 species), Unani (700 species) and Amchi (300 species). The rest of the species are used in local health traditions. Medicinal plants thus serve as an important component of the plant resource wealth of our country. The collection and trade in medicinal plants constitute a major share of the livelihood activities of the forest dwellers, forest dependent people and other people trading in medicinal plants. The domestic trade in ayurvedic and herbal products in India is estimated to be around Rs. 2,300 crore. The system of scientific harvesting, processing and trade has always been a challenge. Introducing transparent marketing, proper quality control and standardization has been a difficult task. A large quantity of processed or semi-processed medicinal plants and their products are also exported. In India most of the medicinal herbs available in the market are reported to originate from the wild, and material extracted illegally in a destructive way because of the use of plant parts like roots, bark, wood, stem and the whole plant in case of herbs. This has led to many medicinal plant species facing extinction or severe genetic loss. There is also lack of complete and reliable inventory of medicinal plants

Keeping in view the vast potential of this resource through comprehensive development by conservation, cultivation, collection, processing, marketing, research and extension support system, a National Medicinal Plants Board (NMPB) under Department of AYUSH, Ministry of Health & Family Welfare, Government of India was established in the year 2000 as an apex body to coordinate all matters relating to medicinal plants in the country. Currently the NMPB is implementing two schemes, namely;

(a) Central Sector Scheme for Conservation, Development and Sustainable Management of Medicinal Plants: This scheme has a total outlay of Rs. 321.30 crore during the 11th Five year plan (2007-12) to provide support for Survey, Inventorisation and *in-situ* conservation, *ex-situ* conservation/ herbal garden, linkage with JFMCs, Research and Development, establishing quality standards and certification, capacity building, promotional activities and management support.

(b) Centrally Sponsored Scheme of National Mission on Medicinal Plants: This scheme has a total outlay of Rs. 630 crore for implementation during the 11th Five Year Plan and primarily aims at supporting market driven medicinal plants cultivation on private land with backward linkages for establishment of nurseries, for supply of quality planting material and forward linkages for post-harvest management, marketing infrastructure, certification and crop-insurance in a Mission mode (*source*: NMPB 2011)

These schemes of NMPB have supported cultivation of medicinal plants in 72,909 hectares during 2008 to 2010, reforestation/conservation of medicinal plants in 33,975 hectares in forest areas, 14,662 hectares under resource augmentation and

8,025 hectares under Medicinal Plants Conservation Areas. A vast network of *ex-situ* conservation spots through herbal gardens, school herbal gardens and home herbal gardens has also been established.

As per data available from Directorate General of Commercial Intelligence and Statistics (DGCIS) and Pharmexcil Research, India's exports of Ayurvedic, Siddha, Unani, Homeopathy Medicaments and Herbal exports are estimated at Rs.1335 crore during the year 2009-10 growing at CAGR of 23 per cent during the three year period from 2007-08 to 2009-10.

Table 6.10 : Export of Ayush and Herbal products from India's during 2005 to 2010 (Rs. in crores)

Category	2005-06	2006-07	2007-08	2008-09	2009-10
Ayush	311.57	350.93	416.82	700.57	764.25
Herbals	306.30	375.60	470.12	594.87	570.76
Grand Total	**617.87**	**726.53**	**886.94**	**1295.44**	**1335.01**

(*Source: NMPB)*

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Appendix 6.1

State-wise Production of Timber in India during 2005-10. (in '000 m^3)

States/UTs	2005-06	2006-07	2007-08	2008-09	2009-10	Total	Average
Andhra Pradesh	111.38	293.11	191.85	88.64	116.05	801.03	160.21
Arunachal Pradesh	40.66	40.50	30.78	35.05	31.37	178.35	35.67
Assam	11.97	27.49	13.63	13.93	7.33	74.35	14.87
Bihar	15.62	7.23	7.23	6.87	5.99	42.94	8.59
Chhattisgarh	113.61	176.45	209.32	173.49	199.32	872.20	174.44
Gujarat	25.05	29.10	48.81	42.51	32.44	177.90	35.58
Goa	0.45	0.42	0.51	0.17	0.18	1.73	0.35
Haryana	151.16	165.73	140.76	166.66	164.12	788.42	157.68
Himachal Pradesh	356.91	220.82	246.97	227.98	272.00	1324.68	264.94
Jammu & Kashmir	86.40	80.85	68.49	71.55	61.32	368.61	73.72
Jharkhand	3.38	0.56	10.76	11.62	4.67	30.99	6.20
Karnataka	77.53	65.69	44.84	44.91	45.28	278.24	55.65
Kerala	43.41	26.79	48.65	50.60	50.60	220.05	44.01
Madhya Pradesh	345.45	313.42	372.06	336.95	143.74	1511.62	302.32
Maharashtra	88.05	119.12	132.61	141.00	125.47	606.26	121.25
Manipur	9.07	9.11	8.58	2.67	6.41	35.85	7.17
Meghalaya	0.08	0.98	1.02	0.88	0.52	3.49	0.70
Mizoram	2.32	4.41	11.62	11.71	3.13	33.19	6.64
Nagaland	25.00	25.00	25.00	25.00	25.00	125.00	25.00
Odisha	19.03	22.61	21.84	27.80	20.79	112.07	22.41
Punjab	134.63	129.06	72.33	69.76	79.58	485.36	97.07
Rajasthan	37.90	35.40	38.50	36.30	36.30	184.40	36.88
Sikkim	0.09	0.05	0.03	0.07	0.05	0.30	0.06
Tamil Nadu	4.90	5.50	4.78	4.01	4.12	23.31	4.66
Tripura	2.10	2.10	2.10	2.10	2.10	10.50	2.10
Uttar Pradesh	218.73	200.58	310.67	300.08	313.13	1343.20	268.64
Uttarakhand	331.32	283.08	310.58	271.62	242.62	1439.22	287.84
West Bengal	85.99	114.59	231.58	151.12	183.40	766.68	153.34
Union Territories							
A & N Islands	6.91	5.29	9.28	8.97	8.06	38.50	7.70
Total	**2349.10**	**2405.04**	**2615.18**	**2324.02**	**2185.09**	**11878.44**	**2375.69**

Appendix 6.2

Import of Wood and Wood Products in India during 1991-92 to 2009-10 (In '000 m^3)

Year	Wood in logs	Sawn Wood	Plywood	Veneer sheets	Total
1991-92	853.36	9.14	3.61	0.80	866.91
1992-93	808.66	19.33	4.40	1.46	833.85
1993-94	478.40	6.60	4.90	0.28	490.18
1994-95	667.21	9.80	9.56	1.14	687.71
1995-96	733.53	7.23	9.01	3.73	753.50
1996-97	868.80	9.65	23.63	5.11	907.19
1997-98	1362.27	6.57	24.53	10.19	1403.56
1998-99	1614.71	60.96	24.04	12.64	1712.35
1999-00	1941.94	8.25	21.80	3.51	1975.50
2000-01	2097.85	153.30	138.10	2.29	2391.54
2001-02	2605.21	73.76	44.81	4.00	2727.78
2002-03	1592.30	378.84	122.51	5.02	2098.67
2003-04	2995.23	102.45	51.98	6.98	3156.64
2004-05	3331.65	69.52	83.76	10.18	3495.11
2005-06	3301.95	59.80	109.08	16.60	3487.43
2006-07	3494.79	62.80	34.28	15.89	3607.76
2007-08	3936.93	59.95	136.80	19.94	4153.62
2008-09	3878.71	85.34	165.47	26.25	4155.77
2009-10	5530.71	173.10	175.14	30.41	5909.36

Appendix 6.3

Value of Import of Wood and other Major Wood Products (in crore Rs.) in India during 2002-10

Year	Wood in logs	Sawn Wood	Plywood	Veneer & plywood sheets	Particle/ Fibre Board	Total wood & wood products
2002-03	1805.42	37.00	14.35	15.99	83.40	1994.58
2003-04	3068.41	56.62	19.32	16.56	120.92	3322.08
2004-05	3737.10	60.92	23.36	22.62	158.06	4075.84
2005-06	3682.63	92.42	36.51	49.24	241.65	4178.25
2006-07	4114.99	103.29	57.59	64.25	308.51	4844.23
2007-08	4717.83	103.20	114.48	74.33	416.49	5685.87
2008-09	5144.41	144.96	129.89	92.46	398.39	6264.90
2009-10	6431.33	220.27	156.42	103.56	409.76	7688.23

Appendix 6.4

State-wise per capita consumption and total consumption of fuelwood in India

States/UTs	Per capita consumption in kg in 2004-05		Population in million as per 2011 census		Fuelwood in '000 m^3
	Rural	Urban	Rural	Urban	
Andhra Pradesh	21.16	7.31	56.31	28.35	18161.94
Andaman & Nicobar Islands	18.82	2.00	0.24	0.14	124.16
Arunachal Pradesh	61.30	17.30	1.07	0.31	812.33
Assam	30.64	9.53	26.78	4.39	9779.34
Bihar	8.99	3.34	92.08	11.73	17815.91
Chandigarh	2.46	0.60	0.03	1.03	18.36
Chhattisgarh	24.08	9.47	19.60	5.94	6171.85
D&N Haveli	21.13	5.26	0.18	0.16	70.18
Daman & Diu	3.41	0.60	0.06	0.18	12.98
Delhi	0.32	0.34	0.42	16.33	75.04
Goa	8.45	4.87	0.55	0.91	106.20
Gujarat	15.95	2.74	34.67	25.71	8971.18
Haryana	17.34	4.31	16.53	8.82	3963.69
Himachal Pradesh	37.18	5.97	6.17	0.69	2933.72
Jammu & Kashmir	24.57	6.29	9.13	3.41	5022.67
Jharkhand	23.21	5.88	25.04	7.93	7116.02
Karnataka	33.39	10.71	37.55	23.58	16724.78
Kerala	32.18	18.96	17.46	15.93	10970.43
Lakshadweep	31.81	18.21	0.01	0.05	23.56
Madhya Pradesh	18.80	7.64	52.54	20.06	16768.62
Maharashtra	22.08	3.70	61.55	50.83	14622.87

Contd...

States/UTs	Per capita consumption in kg in 2004-05		Population in million as per 2011 census		Fuelwood in '000 m^3
	Rural	Urban	Rural	Urban	
Manipur	25.36	8.71	1.90	0.82	932.71
Meghalaya	47.08	7.57	2.37	0.60	1590.17
Mizoram	46.10	11.57	0.53	0.56	496.58
Nagaland	80.31	28.29	1.41	0.57	1418.81
Odisha	26.38	12.08	34.95	7.00	14859.61
Puducherry	24.85	6.81	0.39	0.85	123.75
Punjab	15.16	5.93	17.32	10.39	3570.50
Rajasthan	30.95	10.49	51.54	17.08	24644.99
Sikkim	26.82	0.32	0.46	0.15	234.06
Tamil Nadu	25.39	6.76	37.19	34.95	13440.18
Tripura	32.46	13.91	2.71	0.96	1490.47
Uttar Pradesh	16.10	5.80	155.11	44.47	36474.87
Uttarakhand	43.96	10.12	7.03	3.09	3231.36
West Bengal	20.38	3.95	62.21	29.13	17978.10
ALL INDIA	**21.44**	**6.29**	**833.09**	**377.11**	**260752.00**

Appendix 6.5

Annual Production and Value of Tendu Leaves in India

States/UTs	2005-06		2006-07		2007-08		2008-09		2009-10	
	Weight (100 Tonnes)	Value (Crore Rs.)	Weight (100 Tonnes)	Value (Crore Rs.)	Weight (100 Tonnes)	Value (Crore Rs.)	Weight (100 Tonnes)	Value (Crore Rs.)	Weight (100 Tonnes)	Value (Crore Rs.)
Andhra Pradesh	179.52	12.13	271.80	36.36	368.58	73.42	310.80	56.18	327.00	54.41
Chhattisgarh	883.20	140.02	643.80	191.60	1,030.80	325.59	801.00	235.56	927.00	335.30
Gujarat	160.16	3.12	77.12	3.17	191.75	7.09	(143.01)	(5.26)	(143.01)	(5.26)
Jharkhand	208.80	21.31	183.60	21.51	450.00	50.61	339.00	43.44	340.80	15.26
Karnataka	3.57	(0.24)	4.59	(0.61)	6.87	(1.37)	3.86	(0.70)	3.42	(0.57)
Madhya Pradesh	1,078.20	151.33	1,452.60	373.64	1,089.00	201.86	1,197.00	262.99	(1,204.2)	(264.57)
Maharashtra	167.15	16.71	337.75	25.27	460.17	93.95	424.34	45.32	397.94	66.34
Odisha	373.68	142.00	387.65	247.71	445.70	264.30	415.12	301.79	403.07	326.49
Rajasthan	94.20	2.10	139.80	3.75	315.60	16.36	206.40	8.56	(189)	(7.84)
Uttar Pradesh	154.22	4.46	173.66	4.81	163.16	4.68	130.40	(3.74)	(132.7)	(3.8)
West Bengal	11.05	(4.20)	11.64	(7.44)	8.49	(5.03)	8.03	(5.84)	9.07	(7.35)
Total	**3,313.75**	**497.62**	**3,684.01**	**915.87**	**4,530.12**	**1,044.26**	**3,978.96**	**969.38**	**4,077.22**	**1,087.19**

NB:

- *Figures in parentheses are estimated.*
- *Reporting of tendu leaf production by States is in standard bag unit (one standard bag = 1000 bundles; one bundle=50 tendu leaf).*
- *Conversion factor 1 standard bag = 60 kg has been used to arrive production figures in tonnes.*

Appendix 6.6

Data on Production of Bamboos as Furnished by State Forest Departments

States	Unit	2005-06	2006-07	2007-08	2008-09	2009-10
Andhra Pradesh	NOS	11517637	14212911	8657137	11084212	12882173
Arunachal Pradesh	NOS	104342	28461	34368	21706	31806
Assam	ADMT	337500	9456	8400	8580	1000
Chhattisgarh	NT	29456	64832	48006.09	59067.53	38235.62
Gujarat	MT	47360.46	1736.34	2329.43		
Goa	NOS	71933	85674	238670	76675	57513
Karnataka	CUM	110330.99	192256.42	95659.48	1517153 (no.)	187763.91
Madhya Pradesh	NT	104010	265794	117684	101882	12013
Maharashtra	MT	175084	130191	135047	28529	27010
Manipur	NOS	887470	1334385	1709290	1514570	1128978
Meghalaya	NOS		408375	312975	181125	220950
Mizoram	NOS		23208100	3729301	3284022	6875179
Odisha	MT	140776.61	112824.19			
Rajasthan	NOS	1062000	1014000	1193000	1758000	239183
Tamil Nadu	NOS	205048	3.7	129.665 (MT)	0	1254.30(MT)
Tripura	NOS	28987708	26855200	16136	24284695	842258
	MT	31845.97	20257.94	48299.39	14188	
Uttar Pradesh	NOS	268580	945700	2080100	1970700	1789400
A & N Islands	NOS	493950	666625	701600	553870	

NB:

(a) It has been reported that in Nagaland during the last 5 years all the muli and kaku bamboo has flowered and perished. New regeneration is started and will take around 3 to 5 years to restock.

(b) The deviation from normal reporting units is given in parentheses.

(c) The production increases suddenly due to bamboo flowering in a year and declines drastically in the following year.

Appendix 6.7

Production and sale value (Rs. in lakh) of Non Wood Forest Products (NWFP) other than bamboo, tendu leaf and resin in selected States/Union Territories (Value in lakh Rs.)

NWFP		2005-06		2006-07		2007-08		2008-09	
	Unit	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
Andhra Pradesh									
Gums		6953.67	588.05	6738.27	561.14	4156.63	342.93	2619.82	244.54
Nuxvomica		1416.48	23.78	8387.02	133.36	1103.31	17.01	4513	71.91
Seeded Tamarind		56769	470	50113.4	440.63	37816.86	289.45	47783.29	382.22
Mohwa Seed		6189	65.24	9441.87	104.49	3063.44	33.7	2437.75	28.85
Mohwa Flower		13706	84.08	15519.83	93.74	6183.32	43.28	5621.99	36.74
Honey		2335	186.47	3523.28	281.53	3088	246.96	2731.89	217.11
Adda Leaf		8866	37.95	9140.67	46.7	6820.95	32.82	2819.93	13.3
Others			542.11		415.07		390.53		307.59
Total			**1455.57**		**1661.59**		**1006.15**		**994.67**
Arunachal Pradesh									
Cane	Kap (72m)	56590	8.42	62260	8.25	153368	8.47		
Assam									
Thatch	Bls	1888000		96000		1000000		1571676	
Cane	RMT	8570		8953		8750		7790	
Others									
Chhattisgarh									
Sal Seeds		92400		4880		60600		8990	

Contd...

NWFP		2005-06		2006-07		2007-08		2008-09	
	Unit	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
Harada		4412		5990		4254		4965	
Gums		82.2295		57.74		138.2596		142.419	
Gujarat									
Grass	MT	14475.65	426.76	13233.96	395.9	14933.52	429.25		
Gum	MT	72.33	8.78	53.09	9.43	128.54	4.66		
Mahuda Fruits	MT	109.4	9.6	65.82	7.43	589.96	16.04		
Mahuda Flowers	MT	1243.18	107.59	376.13	68.77	2452.4	116.16		
Honey	MT	111.88	1.29	14.59	1.54	1291.15	145.1		
Others			32.79		79.95		104.98		
Total			586.81		563.02		816.19		
Himachal Pradesh									
Charcoal	MT					111	10.7	84	7.36
Grass	MT					62	2.27	1113	1.67
Fodder	MT						10.03		10.7
Medicinal Herbs	MT					951	302.72	376	265.75
Others							15.81		32.44
Jammu & Kashmir									
Anardana *(Punica granatum)*	MT	151.18		83.63				131.4	
Tethwan *(Artimesia maritima)*	MT			8					

Contd...

NWFP		2005-06		2006-07		2007-08		2008-09	
	Unit	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
Guchies *(Morchella Esculenta)*	MT	5.17		145.96				4.76	
Others	MT	7.75		3.86				37.22	
Karnataka									
Charcoal	MT	7425		0.5					
Honey	MT	55.84		1043.67		1181.32		66.94	
Tamarind	MT	1742.4		9081.4		185.02		1255.53	
Seegekai	MT	746.16		506.31		805.28		594.89	
Cashewnut	MT	123.85		538.2		31.51		87.11	
Alalekai	MT	714.92		418.94		391.4		320.3	
Gum	MT	171.98		9.8		2			
Canes	Nos.	136540		121700					
Uppige	MT	1469.1		2447.23		591.63		988.74	
Dalchinni	MT	2475.81		884.99		1032.34		678.33	
Citradora	MT	747.7		502.76					
Others									
Kerala									
Charcoal	MT			239.99		0			
Ayurvedic Herbs	MT					863.64986		1116.1245	
Fibre	MT					23.5245		46.76	
Grass (other than fodder)	MT					22.859		83.438	

Contd...

NWFP		2005-06		2006-07		2007-08		2008-09	
	Unit	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
Incensive plants	MT					67.424		60.517	
Vegetable Oilseeds	MT					17.8608		20.015	
Honey	MT					97.01145		79.081	
Parts of medicinal trees	MT					21.987		8.3725	
Others									
Madhya Pradesh									
Kullu Gum	MT	33.39	23.08	56.725	51.27	23.489	19.82	231.97	24.71
Sal Seeds	MT							8.922	1.13
Maharashtra									
Grass & Grazing	MT	6599	33	6395	31	6729	25	3036	15.25
Hirda	MT	253.2	1	563.5	4	749.5	58	183.7	9.08
Gum	MT	1100.4	25	2185.5	28	502.6	151	591.1	156.09
Mahua	MT	213.7	2	1911.2	82	2009.1	67	692.9	13.31
Lac	MT	1657.8	8	3346.1	13	2493.8	7	684.6	309.15
									502.88
Manipur									
Cane	RMT	157000	0.47	196000	0.53	116200	0.692		1067800
Thatching Grass	Bundles	5625	0.02	9500	0.02	5400	0.015		9500
Charcoal	MT	77.7	0.55	52.55	0.39	53	0.306		62.95

Contd...

NWFP		2005-06		2006-07		2007-08		2008-09	
	Unit	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
Others			53.31		25.35		27.733		
Nagaland									
Broom	MT							350	
Cinnamon	MT							65	
Punjab									
Fodder & Grazing			30.82599		23.18125		15.74965		
Plants			13.91276		10.48759		26.58375		
Fruits			0.8232		1.05845		1.7905		
Others			15.1095		0.06985		4.90356		
Tamilnadu									
Cashew		173.571		163.763		34.191		1551.893	
Tamarind		243.15		1890.27		588.694		16033.321	
Others		1022.78		584.26		1202.584		19854.81	
Tripura									
Thatch	Bundles	43075	0.47991					59753	1.83562
	MT	40.29	0.05761	18902.805	0.38095	390.325	1.18359		
Umbrella Handle	Nos	7457200	6.05378	6675200	5.80184	5222900	4.35885	5136500	2.52528
	MT	10	0.0076						
Agarbati Stick	MT	16219.52	33.4457	21855.9	43.8716	29166.71	112.341	32455.19	180.98

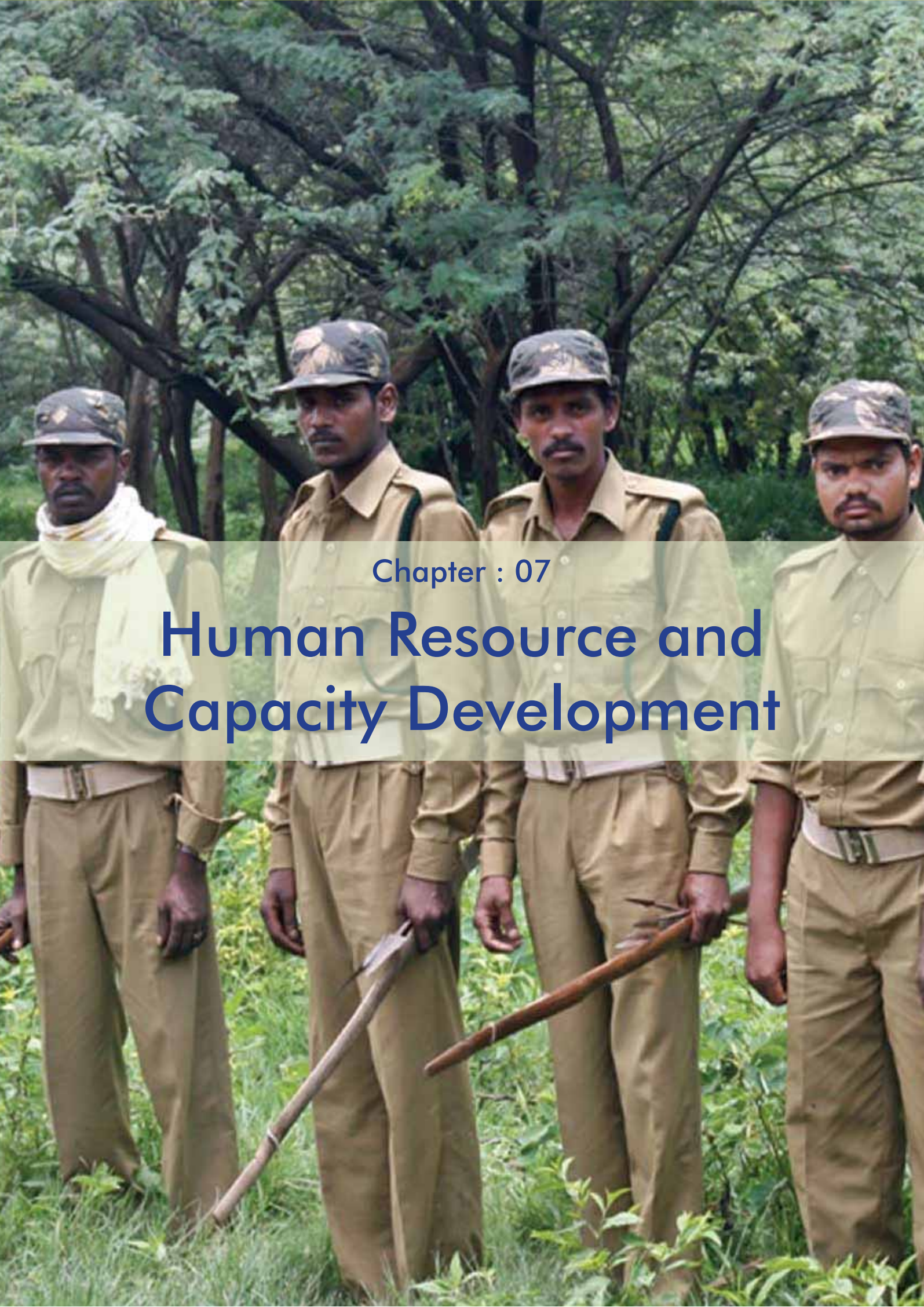
Contd...

NWFP		2005-06		2006-07		2007-08		2008-09	
	Unit	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
Uttar Pradesh									
Bhabhar Grass	MT	271	9.49	45	5.82	16	2.53		
Medicinal Plants	MT	630.6	13.48	186.5	14.22	357.9	13.76		
Honey and Wax	MT	41.1	2.43	35.3	2.96	33.1	4.68		
Fodder	MT	202.3	4.93	1932.7	15.26	570	7.16		
Cane	Bundle	7782	5.94	3808	3.21	121	0.28		
Others			558.85		66.33		92.68		
West Bengal									
Honey	MT	30.552		38.207		25.128		24.565	
Wax	MT	1.559		1.402		1.396		0.889	
Sal Seeds	MT	117.67		120.58		1408.13		75.53	
Citronella Grass	MT	861.3		710.121		322.714		209.4	
Andaman & Nicobar Islands									
Cane	RMT	276322		705945		384970		650958	
Thatching Leaves	Nos.	785650		968457		965165		948920	
Post	Nos.	45779		11277		14356		13207	
Ballies	Nos.	204901		26645		44577		21619	

Appendix 6.8

Fund Released under National Bamboo Mission during 2006-07 to 2009-10 (Rs. in Lakh)
(Source: National Bamboo Mission)

S.No	States	2006-07	2007-08	2008-09	2009-10
1	Andhra Pradesh	0.00	112.80	117.65	0.00
2	Bihar	0.00	543.87	0.00	0.00
3	Chhattisgarh	275.34	786.98	548.96	427.46
4	Goa	0.00	31.00	0.00	0.00
5	Gujarat	0.00	194.83	450.23	370.00
6	Himachal Pradesh	0.00	127.25	188.08	0.00
7	Jammu & Kashmir	0.00	0.00	110.20	20.00
8	Jharkhand	0.00	100.00	276.56	109.14
9	Karnataka	0.00	212.17	324.25	323.07
10	Kerala	0.00	151.00	48.59	30.00
11	Madhya Pradesh	0.00	601.59	0.00	0.00
12	Maharashtra	0.00	109.78	483.59	190.74
13	Odisha	329.97	736.72	140.94	184.68
14	Punjab	0.00	395.71	79.48	0.00
15	Rajasthan	92.85	0.00	270.00	200.00
16	Tamil Nadu	0.00	258.32	149.59	0.00
17	Uttar Pradesh	0.00	391.16	188.88	62.79
18	Uttarakhand	261.87	387.00	285.47	79.50
19	West Bengal	31.85	0.00	129.15	0.00
	SUB-TOTAL	**991.88**	**5140.18**	**3791.62**	**1997.38**
	NE STATES				
20	Arunachal Pradesh	1510.35	873.60	196.00	50.00
21	Assam	1080.31	601.36	755.16	338.44
22	Manipur	647.17	371.21	497.77	130.00
23	Meghalaya	508.31	332.54	355.28	338.67
24	Mizoram	865.45	1001.97	825.27	900.00
25	Nagaland	1315.96	1484.17	1370.44	965.34
26	Sikkim	429.32	450.44	213.84	155.50
27	Tripura	122.16	646.63	137.67	40.00
	SUB-TOTAL (N.E.)	**6479.03**	**5761.92**	**4351.43**	**2917.95**
	GRAND TOTAL	**7470.91**	**10902.10**	**8143.05**	**4915.33**



Chapter : 07

Human Resource and Capacity Development

7 Human Resource and Capacity Development

7.1 Staff at Various Levels

For the management, administration, protection and development of the Forest Sector there is an organized and uniform hierarchical structure with well defined jurisdiction in most of the states in India. The hierarchy consists of various levels of officers and field staff which form the professional and technical level bulk of the sector strength and play a key role in the implementation of all the programmes. The broad category of the staff is as follows:

a. Indian Forest Service (IFS)

b. State Forest Service (SFS)

c. Field Executive Staff (uniformed staff)

In addition there are supporting staff for technical and administrative activities which includes ministerial and accounts staff, statisticians, surveyors, computer operators, forest protection force, animal attendants, technicians, drivers, peons etc.

The Indian Forest Service Officers are annually recruited by the Central Government by holding a national competitive examination through Union Public Service Commission (UPSC). These officers

are then allotted to different states (cadre) to serve State Governments and to the Central Government on deputation. The cadre management of the IFS officers rests with the Central Government. The annual direct recruitment of IFS officers at present is around 80 and their total sanctioned strength as on 1.1.2010 is 3,034 of which 2,115 are direct recruit posts and 919 promotion posts. The filled positions of direct recruit IFS are 1964 thus leaving a vacancy of 151. Cadre-wise sanctioned strength and filled in posts are given in Appendix 7.1.

The State Forest Service officers form the second line of command in the Forest Department who in due course of time (minimum 8 years), are inducted into IFS. These officers are recruited by State Governments. The total number of SFS officers in the country is almost equal to that of IFS. The annual vacancies of SFS officers at State level are not many, therefore the State Governments do not recruit them annually like IFS. The sanctioned strength of the SFS officers in the country as on 31 March, 2010 is 3,337 against which only 2,734 posts are filled up. State-wise position of SFS officers including vacancies is given in Appendix 7.2. The States having major vacancies are Andhra Pradesh, Jharkhand, Maharashtra, Odisha, Tamil Nadu and West Bengal. Vacancies wise position is quite critical even in Jammu & Kashmir, Manipur, Mizoram and Punjab where more than one-third post are lying vacant. In all 603 posts of SFS officers are lying vacant.

The field executive staff as well as all other supporting staff are also recruited by the state/UTs Governments according to their job requirements and vacancies. The recruitments by the State Governments to different positions are, however, not regular. The total number of filled positions and vacancies of the Field Executive Staff in the Forest Departments in the country are presented in the Table 7.1 below. The status as it existed in 1972 (reported in NCA 1976) is also given in the table for comparison. State-wise position is given in Appendix 7.3. The sanctioned and filled strength of Field Executive Staff in the Forest Departments in the country is depicted in Figure 7.1.

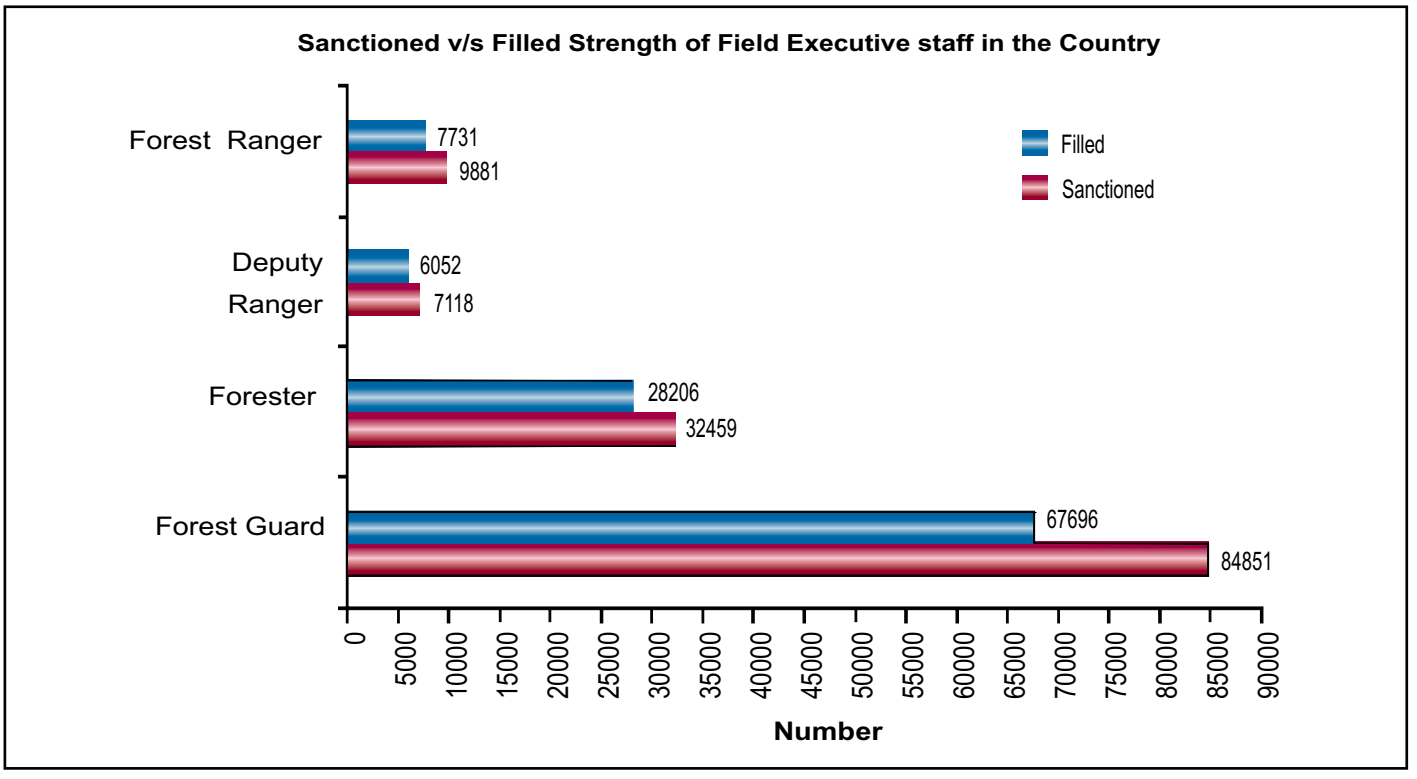
Table 7.1: Position of the Field Executive Staff in the country as on 31th March, 2010

Category	In position in 2010	Vacancy in 2010	In position in 1972
Forest Rangers	7,731	2,150	6,958*
Deputy Rangers	6,052	1,066	
Foresters	28,206	4,253	18,189
Forest Guards	67,696	17,155	53,943
Total	**109,685**	**24,624**	**79,090#**

* *Includes the position of Deputy Ranger also.*

 # In addition there were 12,444 game keepers etc.

Figure 7.1: Sanctioned and filled strength of Forest Field Executive staff in India



In comparison to 1972 the increase in the strength of staff by 2010 (in 40 years) is only about 30 per cent. During this period the roles and responsibility of the sector has increased manifold. The protection activities have multiplied due to increased population pressure, encroachments on forest lands, poaching of wild animals, accessibility to forests, and enforcement of new laws enacted (Wildlife Protection Act 1972, Forest Conservation Act 1980, Tree Protection Act enacted by States to regulate tree felling even in private and other non-forest lands, Environment Protection Act 1986, Right to Information Act, and Forest Rights Act 1980). The scale of activities of raising seedlings, tree planting outside forests and in urban areas, participation in rural development programmes, ecotourism etc., has increased.

Rajasthan and Jammu & Kashmir have two categories of Forest Rangers I & II. In this compilation they have been clubbed into one. Assam has two grades of Foresters I & II, they have also been clubbed into one. Some states have positions of Head Forest Guard and Game Watchers which has been included into Forest Guard category. Andhra Pradesh has 1250 Assistant Beat Officers. In 8 states there are no posts of Deputy Rangers whereas in 3 states there is no post of Forester. The 6 posts of Wildlife Inspectors in Delhi and 6 posts of Agriculture Inspectors in Lakshadweep with equivalent grade to Forest Rangers, have been included in the Forest Rangers strength.

A review of the vacancy position of Field Executive Staff shows that the situation in Bihar

and Jharkhand is very critical. As informed by State officials, there has been no direct recruitment of the staff for more than 20 years. Similarly, in Punjab there is no recruitment since 1998, and neither has the sanctioned strength been reviewed or increased. In Jharkhand more than 60 per cent posts are vacant. In Bihar, Uttarakhand and West Bengal, more than one-third posts are vacant.

7.2 Training Institutions with Central and State Governments

Two main institutions of the Central Government under the Ministry of Environment and Forests, viz. Indira Gandhi National Forest Academy (IGNFA), at Dehradun and Central Academy for State Forest Services (CASFOS) at two locations under the Directorate of Forest Education (DFE), Dehradun,

Box 7.1: Assam Forest Protection Force (AFPF)

The Government of Assam notified a very unique and special Act in 1987 called Assam Forest Protection Act, 1986. This Act provides for the constitution and regulation of a force called the 'Assam Forest Protection Force' (AFPF) for the better security of the Forests, Forest Produce and Wildlife in Assam, which works under a Commandant. This has been created mainly because of the increased activities of the insurgent groups in the forest areas. In addition, the force also acts against the miscreants, timber mafia and poachers who use sophisticated weapons in their activities. It had become difficult for the forest staff to move inside forests for patrolling without the special force. The force enjoys powers under Criminal Procedure Code and comprises of Company Commander/Inspector, Platoon Commander/Sub-Inspector, Havaldar and Constable, the current strength is 1496. The senior positions are filled in by deputation from Assam Police/Home Department. Constable and other supporting staff are appointed directly by the Forest Department. There was only one Battalion with cadre strength of 972 until 2008. The 2nd Battalion has been raised in 2008-09 mainly for the protection of wildlife with an additional sanctioned strength of 998. The AFPF is also trained in 'commando' combating techniques. The combatant force personnel are deployed in sensitive locations through the State which are about 55 in number. But their deployment is based on the requisition of the Divisional Forest Officers. Since 2008-09, AFPF is being provided with basic needs like rations, uniforms, utensils and other logistic support.

There has been a special effort to fill the vacancies of frontline staff (Forest Guard, Forester and Deputy Ranger) of the Assam Forest Department in the last 2-3 years. About 664 Forest Guards (FG) were recruited during 2009-10 and 469 FG/Game Watchers in 2010-2011. Frontline staff has been given powers to use arms and a fixed travelling allowance @ 600/- per month. The young frontline staff are given special combat training for three months.

are responsible for imparting training to senior, professional and sub professional level officers. A two year induction training of IFS officers is given at IGNFA, and State Forest Service (SFS) officers are trained at Central Academy for State Forest Service, Dehradun and Coimbatore through DFE. Currently about 80 SFS officers are undergoing induction training annually. The induction training of the Forest Rangers is of one and half year duration and also controlled by the DFE and done at Central Academy for State Forest Service, Burnihat and three Rangers Colleges run by State Governments at Ranger College, Balaghat, Madhya Pradesh; Uttarakhand Forest Academy, Haldwani, Uttarakhand and Andhra Pradesh Forest Academy, Dulapally, Hyderabad. At present about 95 Forest Rangers are undergoing training at different Ranger's colleges.

The responsibility of imparting training to the front line staff, that is, Deputy Rangers, Foresters and Forest Guards lies with the respective state/ UT, Governments. For this purpose, there about 60 State Forest Training Schools (SFTS) and Academies spreaded over in 26 states/UTs in India, which impart induction training of six month to one year duration as well as short term refresher courses. In some states, the infrastructure of the SFTSs/Academies is utilized for conducting short-term courses for the officers of other departments (the list of SFTS is in Appendix 7.4).

There are other training institutions under MoEF which offer specialized courses of long and short durations. The Wildlife Institute of India (WII), Dehradun offers post-graduate Diploma Course in Wildlife Management of 9 month duration which is also open to candidates from foreign countries, besides a two-year post-graduate course on wildlife management. It also organizes 3 months Certificate course on Wildlife Management and a number of short duration courses for the officers of Forest Department and others dealing with wildlife crime etc.

The Indian Institute of Forest Management (IIFM), Bhopal organises a 2-year post graduate course in Forest Management, 1-year post-graduate course in Natural Resource Management (NRM), and management development programme in general management, sectoral and functional management.

The Forest Survey of India (FSI), Dehradun conducts many short-term training courses of one to three week duration in application of modern technology such as remote sensing, GIS and GPS in forest surveys and field inventory and working plan preparation, to different levels of officials of the State Forest Departments.

The Forest Research Institute (FRI), Dehradun, the premier institute of Indian Council of Forestry Research and Education (ICFRE), has been granted a status of a Deemed University by the University Grants Commission (UGC). It runs post-graduate degree and diploma courses in forestry related subjects, apart from awarding degree of doctorate in forestry. FRI and other institutes of

ICFRE also organize short-term courses on specific themes of forestry.

The Indian Plywood Industries Research and Training Institute (IPIRTI), Bengaluru, an autonomous body under the Ministry of Environment and Forests organizes one year Post Graduate Diploma course in Wood and Panel Products Technology for young science and engineering graduates and short term training courses on wood utilisation technology and adhesives for technical persons from wood based industries, to upgrade their skill as well as to the Forest Officers of the states.

7.3 Capacity Building Programmes

Besides induction training of the professional, sub-professional and technician level forestry staff, there are other short-term mid-career training courses for different level of officers.

7.3.1 Mid Career Training (MCT) Programme for IFS Officers

As a part of capacity building programme, the Indira Gandhi National Forest Academy (IGNFA) of the Central Government has been organizing short term Advance Forest Management (AFM) courses for in-service IFS Officers of different levels since 2000. These courses were linked to different levels of promotion in the IFS. The course durations were 3-weeks for officers with 10 years of service who were due for promotion to 'selection grade', 2-weeks for officers with 17 years' of service who were due to become 'Conservator of Forests' and again 2-weeks for officers with 21 years of service who were due to become Chief Conservator of Forests. The entire course was conducted at IGNFA by inviting the experts/specialists in the relevant subjects. The Rules of the IFS were also accordingly amended to make the training an essential condition for promotion.

There has been further refinement in the in-service training of IFS officers since December 2009. A Mid Career Training (MCT) programmes has been launched in place of AFM course to broaden the horizon of the officers with greater exposure. This programme is also being organized by the IGNFA under the overall direction of Ministry of Environment & Forests. In this programme too IFS officers of three levels with

service length 7 to 9, 16 to 18 and 26 to 28 years are drafted for undergoing training course of 8 weeks and 4 weeks duration, respectively. The orientation of the course for young officers is on 'skill development', for middle level officers on 'control and monitoring' and senior level officers on 'policy formulation and evaluation'. All these three courses are not limited to IGNFA but best training institutions in the country and abroad have been roped in. One week course in a reputed management institute (Indian Institutes of Management) and two week course in a renowned foreign university is common in all the three courses. The officers attending the programme get the chance to listen to the experts in their respective fields and also get exposure to best management practices of natural resources in the foreign countries. The specialized institutions like ICFRE, WII, FSI and The Energy and Resources Institute (TERI) are actively involved in the implementation of the training modules to give modern management perspective of the forestry sector. Like AFM, the MCT programmes are mandatory and have to be completed successfully by IFS officers before getting promotion and IFS Rules are accordingly amended. About 60 officers participate in each course.

7.3.2 In-service Training of SFS and Range Forest Officers

The Directorate of Forest Education has been organizing short-term General Refresher Courses and Theme Based Workshops for in-service SFS and Range Forest Officers from 1992 onwards with the objective of updating the skills and imparting new knowledge in view of the changing scenario of the forest sector in the country. On an average 24 Short-Term Refresher Courses and Theme Based Workshops are organized per annum in the constituent Academies

and College. Approximately 300 to 350 in-service Officers participate every year from all the States/ UTs of the country. The duration of the Refresher Course is 2-weeks and of Theme Based Workshops is 1-week. SFS Officers and Range Forest Officers, who have been in service in minimum for 3 years, and are not more than 54 years of age only are eligible to participate in these courses. While the Refresher course provides exposure to all the important and contemporary issues in forestry at the given point of time, the theme based workshops include Policy and Legal Issues, Wildlife Management, Human Resource Management, Training of Trainers, Community Forestry and JFM, Eco-tourism, Bio-diversity Conservation etc.

7.3.3 In-Service Training to the Frontline Field Executive Staff

The Frontline Field Executive Staff of the Forest Departments includes Deputy Rangers, Foresters, and Forest Guards. The quality, skill and performance of these functionaries have direct bearing on quality of the output of the Forest Departments. Hence, it is

necessary that these functionaries are made aware of the latest policies and programmes of the Government and at the same time their knowledge and skills in various aspects of forestry also get sharpened on a regular basis. The responsibility to provide induction as well as in-service training to these officers lies with the State Forests Departments. However, there have been issues of infrastructure, officials with right aptitude to work in the State Forest Training Institutes and fund with the SFDs.

To supplement the efforts of the SFDs, the Central Government, through the Directorate of Forest Education, has started providing financial support to the tune of Rs. 1.5 crores per annum since 2004-05, to organize short-term refresher courses for these functionaries. These refresher courses are organized at the Training Institutions of the State Forest Departments and overseen by the DFE (DFE 2011). On an average 105 such refresher courses of 2-weeks duration are being conducted every year in which approximately 3500-4000 frontline staff participates. The important topics covered include Seed Technology, Forest Protection, Forest Law, Non Wood Forest Products, Community Participation and Forest Development Agency, Watershed Management, Wildlife Management, Disaster Management, etc.

7.3.4 Externally aided JICA Project for Capacity Building of SFS Colleges

An externally supported 5 year project on "Capacity Building of State Forest Training Institutions and SFS Colleges" is being implemented in the Directorate of Forest Education with the assistance of Japan International Cooperation Agency (JICA) since 2009. The support is technical in nature with no direct cost to the Government of India. The basic aim of the project is to improve the quality of *in-service training of SFS Officers* given at the Central Academy for State Forest Service (CASFOS), Dehradun and Coimbatore. JICA has deputed experts from Japan on its cost to work, in collaboration with the Indian counterparts, for the implementation of the project. The project includes studying the existing courses on forestry in CASFOS, Dehradun, identifying the training needs and challenges of the SFS officers by conducting survey throughout country, developing new modules of in-service training, conducting intensive monitoring in some of the trainee's states and generating training designs & materials for "Master Training." The final output includes modules for Training of Trainers, Human Resource Management, Wildlife Management, Legal Issues in Forestry & Wildlife, Community Forestry & JFM and General Refresher Courses (DFE 2011).

7.3.5 Externally aided JICA Project for Capacity Building of State Forest Training Institutes

The externally aided 5 years project entitled "Capacity for Forest Management & Training of

Personnel" is being implemented by the Ministry of Environment of Forests with the assistance from JICA, since 2008-09. The objectives of the project are improvement of infrastructure, course curriculum and teaching methodologies in the State Forest Training Schools/Institutes meant for training of Forest Guards and Foresters in all the participating states. The total cost of the project is approximately Rs. 225.00 Crore, out of which Rs. 206.30 crore is loan from JICA and remaining administrative cost and taxes are born by respective State Governments and Central Government. While the Government of India has taken loan from JICA, the funds will be provided to the States as grant. The project is being implemented in eleven participating states; Assam, Bihar, Chhattisgarh, Jharkhand, Kerala, Madhya Pradesh, Maharashtra, Uttarakhand, West Bengal, Arunachal Pradesh and Mizoram. The components of the project includes revision of training guidelines, preparation of sample course material and teaching notes, and monitoring, evaluation, renovation and upgradation of existing infrastructure as well as creating new facilities and developing curriculum for Master Trainer Training. The Central Project Management Unit set up at the MoEF has to see to the existing Training Guidelines and preparation of model teaching notes and materials for training of frontline staff.

References

1. *Annual Administrative Reports of the State/UTs Forest Departments.*
2. *Personal communication and from web sites of WII, Dehradun (www.wii.gov.in), IGNFA, Dehradun (www.ignfa.gov.in), IIFM, Bhopal (www.iifm.ac.in), FRI, Dehradun (http//:fri.icfre.gov.in), FSI Dehradun (www.fsi.nic.in), IPIRTI (www.ipirti.gov.in) about training programmes.*
3. *Personal communication on phone and email from the SFDs/UT FDs on existing and sanctioned strength of State Forest Service Officers and Field Executive Staff of the Forest Departments.*
4. *DFE 2011. Notes received from the Director Forest Education, Dehradun on in-service training of SFS officers and Field Executive Staff, JICA project for capacity building and list of Forest Training Schools/Institutes.*
5. *MoEF 2011. Note received from the Director, IFS Section, on cadre strength of IFS officers, Ministry of Environment and Forests, Government of India, New Delhi.*

Appendix 7.1

Cadre wise Position of Indian Forest Servic officers in India as on 1st January, 2010
(Source: Ministry of Environment & Forest, IFS section)

S.No.	Cadre	Total Sanctioned strength			In position		
		Direct Recruit Posts	Promotion Posts	Total Strength	Direct Recruit Posts	Promotion Posts	Total Strength
1.	AGMUT	128	55	183	99	34	133
2.	Andhra Pradesh	105	44	149	104	38	142
3.	Assam-Meghalaya	83	35	118	79	29	108
4.	Bihar	41	17	58	38	7	45
5.	Chhattisgarh	92	39	131	90	35	125
6.	Gujarat	84	35	119	75	31	106
7.	Haryana	49	20	69	52	10	62
8.	Himachal Pradesh	74	32	106	74	32	106
9.	Jammu & Kashmir	58	48	106	52	39	91
10.	Jharkhand	91	39	130	92	37	129
11.	Karnataka	115	49	164	118	44	162
12.	Kerala	72	30	102	68	22	90
13.	Madhya Pradesh	208	89	297	199	78	277
14.	Maharashtra	130	55	185	130	53	183
15.	Manipur-Tripura	81	34	115	62	25	87
16.	Nagaland	30	12	42	22	9	31
17.	Odisha	99	42	141	88	29	117
18.	Punjab	41	17	58	38	13	51
19.	Rajasthan	102	43	145	80	23	103
20.	Sikkim	21	9	30	21	5	26
21.	Tamil Nadu	103	44	147	105	33	138
22.	Uttar Pradesh	152	65	217	139	19	158
23.	Uttarakhand	75	32	107	62	9	71
24.	West Bengal	81	34	115	77	32	109
	Total	**2,115**	**919**	**3,034**	**1,964**	**686**	**2,650**

Appendix 7.2

Position of State Forest Service Officers as on 31st March, 2010 (Source: State Forest Departments)

States/UTs	Number of SFS Officers		
	Sanctizoned posts	In position	Vacancies
Andhra Pradesh	173	110	63
Arunachal Pradesh	64	54	10
Assam	202	181	21
Bihar	49	49	0
Chhattisgarh	182	164	18
Goa	15	9	6
Gujarat	145	137	8
Haryana	54	45	9
Himachal Pradesh	160	149	11
Jammu & Kashmir	81	51	30
Jharkhand	156	55	101
Karnataka	234	234	0
Kerala	101	96	5
Madhya Pradesh	358	358	0
Maharashtra	276	230	46
Manipur	27	12	15
Meghalaya	20	19	1

Contd...

States/UTs	Number of SFS Officers		
	Sanctizoned posts	In position	Vacancies
Mizoram	29	17	12
Nagaland	19	19	0
Odisha	163	74	89
Punjab	19	9	10
Rajasthan	149	137	12
Sikkim	87	79	8
Tamil Nadu	75	26	49
Tripura	84	60	24
Uttar Pradesh	158	155	3
Uttarakhand	93	92	1
West Bengal	126	83	43
Andaman & Nicobar Islands	33	27	6
Chandigarh	2	0	2
Dadra & Nagar Haveli	2	2	0
Daman & Diu	0	0	0
Delhi	1	1	0
Lakshadweep	0	0	0
Puducherry	0	0	0
Total	**3,337**	**2,734**	**603**

Appendix 7.3

Position of Field Executive Staff in Forest Sector as on 31.03.2010 in India (Source: SFDs)

States/UTs	Field Staff In Position				Vacancies				Total Vacancies
	F Ranger	Dy R	Forester	FG	F Ranger	Dy R	Forester	FG	
Andhra Pradesh	320	391	1,221	2,781	106	0	77	135	318
Arunachal Pradesh	158	61	432	857	14	28	114	62	218
Assam	338	226	2,004	2,973	42	7	124	889	1,062
Bihar	106	0	275	706	8	0	85	321	414
Chhattisgarh	329	643	1,547	4,367	156	7	121	408	692
Gujarat	399	0	1,698	3,346	146	0	303	358	807
Goa	41	20	90	363	10	0	0	32	42
Haryana	87	110	509	1,332	19	13	18	215	265
Himachal Pradesh	206	794		2,474	90	7	0	107	204
Jammu & Kashmir	109	0	1,321	2,948	182	0	271	827	1,280
Jharkhand	253	0	526	1,283	129	0	516	2,600	3,245
Karnataka	630	0	2,103	3,624	0	0	140	1,430	1,570
Kerala	178	133	864	1858	26	6	40	546	618
Madhya Pradesh	927	1178	3,927	11,502	300	442	297	2,495	3,534
Maharashtra	924	0	2,723	8,294	129	0	298	726	1153
Manipur	63	91	119	445	11	0	0	133	144
Meghalaya	65	14	247	404	15	0	0	40	55
Mizoram	62	36	176	299	16	3	63	118	200
Nagaland	36	45	248	418	16	3	7	4	30

Contd...

States/UTs	Field Staff In Position				Vacancies				Total Vacancies
	F Ranger	Dy R	Forester	FG	F Ranger	Dy R	Forester	FG	
Odisha	253	61	1,296	2,938	135	71	418	1,021	1,645
Punjab	45	47	191	533	29	0	0	345	374
Rajasthan	238	153	1,703	2,735	26	32	216	1,267	1,541
Sikkim	75	113	0	251	0	55	0	31	86
Tamil Nadu	476	0	1,050	2,301	114	0	270	120	504
Tripura	102	0	342	699	45	0	137	121	303
Uttar Pradesh	688	549	2,043	3,031	22	15	295	829	1,161
Uttarakhand	132	374	1,312	2,611	176	34	415	1,039	1,664
West Bengal	402	939	0	1792	178	338	0	883	1,399
Union Territories									
A & N Islands	69	63	205	378	7	1	22	13	43
Chandigarh	2	1	8	9	0	0	4	6	10
Dadra & Nagar Haveli	5	2	16	82	0	0	2	3	5
Daman & Diu	2	0	0	21	0	0	0	5	5
Delhi	5	8	10	41	3	4	0	26	33
Lakshadweep	6	0	0	0	0	0	0	0	0
Puducherry	0	0	0	0	0	0	0	0	0
Total	**7,731**	**6,052**	**28,206**	**67,696**	**2,150**	**1,066**	**4,253**	**17,155**	**24,624**

Appendix 7.4

List of Forestry Training Schools/Institutes and Academies in India

Training Institutes	
Principal, Forest Training School, Wimberlygunj, Andaman & Nicobar Islands – 744 207 Ph: 03192 - 255916 255475	Director, Andhra Pradesh Forest Academy, Dulapally, Hyderabad, Andhra Pradesh - 500 014. Ph: 040-23094970/23097163 (F)
The Principal, Andhra Pradesh School of Forestry, Yellandu, Dist Khammam, Andhra Pradesh.	Principal, Arunachal Pradesh Forest Training Institute, Roing, Lower Dibang Valley, Arunachal Pradesh. Ph: 03803-222468 (O) 222249(F)
The Director, Assam Forest School, Jhalukbari, Guwahati, Assam - 781 014. Ph: 0361-2700292 (O) 2700293 (F)	The Incharge, Assam Forest Guards School, Makum, Tinsukia, Assam Ph: 0374-2345685
The Director, Forest Guards Training School, Mahasamund, District Mahasamund, Chattisgarh	The Director, Forest Guards Training School, Shakti, District Janjagir Champa, Chattisgarh Ph : 07819 - 245622/245110(F)
The Director, Forest School, Jagadalpur, Chattisgarh -494001 Ph: 07782-222345/224188 (F)	The Principal, Forest Training School, Valpoi, Goa.
The Principal, Gujarat Forest Rangers College, Wadia Palace, Rajpipla, District Narmada Gujarat - 393 145. Ph: 02640-220011	The Director, Forestry Training Centre, Kakrapar, T. Mandvi, District Surat, Gujarat -394 160. Ph: 02626-231285
The Incharge, Natural Resource Management Center, Sohna, Haryana	The Director, Forest Training School, Pinjore, Haryana. Ph: 0172-2563862

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Training Institutes	
The Director, Forest Training Institute, Chail, Distt. Solan, Himachal Pradesh. Ph: 01792-248160	The Director, Forest Training Institute, Sundernagar, Dist. Mandi, Himachal Pradesh – 174 402. Ph: 01907-264114
The Incharge, Forest Guard Training School, Doomi, Jammu Jammu and Kashmir.	The Incharge, SG School, Miransahib, Jammu Jammu and Kashmir.
The Director, Forester cum Forest Guard Training School, Hazaribagh, Jharkhand.	The Director, Forester Training School, Mahilong, Van Bhawan, Doranda, Ranchi, Jharkhand –834002. Ph: 0651-2480880
The Incharge, Foresters' Training School (FTS), Chaibasa, Jharkhand	
The Principal, Forest Training Institute, Gungarghatti, P.O. Mummi Gatti, Near Dharwar, Karnataka – 580 009 Ph: 0836-2448501/248667	The Incharge, Forest Training Centre, Thattihala, North Kanara District, Karnataka.
The Principal, Kerala Forest School, Walayar, Walayar Dam P.O., Palakkad District, Kerala-678624. Ph: 0491-2862260	The Principal, Kerala Forest School, Arippa, P.O. Chozhiakodu, Kerala-691317. Ph: 0474-2442354.
The Principal, Forest Rangers College, Balaghat Madhya Pradesh-481001. Ph: 07632-240149	The Director, Rajiv Gandhi Participatory Forestry Training Institute, Lakhnadon, District Sivini, Madhya Pradesh Ph: 07690 - 240601
The Incharge, Forest Training School, Jhabua Madhya Pradesh	The Incharge, Forest Training School, Pachmari Madhya Pradesh
The Incharge, Forest Training School, Amarkantak, District Anup Pur, Madhya Pradesh Ph: 07629-269342	The Incharge, Forest Training School, Reeva Madhya Pradesh

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Training Institutes	
The Incharge, Forest Training School, Betul District Madhya Pradesh-460002. Ph: 07141-234386	The Incharge, Forest Training School, Shivpuri, Madhya Pradesh Ph: 07492-223337/223610, 220580 (F)
The Incharge, Bandhavgarh National Park Training School, Tala, Umaria, Madhya Pradesh	
Director, Dada Saheb Forest Training School, Pal, District Jalagaon - Maharashtra Ph. 02584-288480	The Director, Forest Guard Training School, Shahpur, District Thane, Maharashtra-421601. Ph: 02527-272086
The Principal, Maharashtra Forest Rangers College, Chikhaldara, Dist Amrawati, Maharashtra - 444 807. Ph: 07220-230230	The Principal, Central Forest Rangers College, Chandrapur, Mul Road, District Chandrapur, Maharashtra Ph: 07172-255519.
The Director, Forest Guards Training School, Jalna, Dist. Jalna., Maharashtra - 431 203 Ph: 02482-231527	The Director, Forestry Training School, Shillong, Meghalaya.
The Director, Manipur Forest Training School, Langol Hills, Koirengei, Manipur. Ph: 0385-24363982/24502504	The Principal, Forest Training School, Aizawl, Bethlemveng, Mizoram - 796 001. Ph: 0389-2326108
The Director, State Environment and Forestry Training Institute, Signal Basti, Dimapur, Nagaland-797112. Ph: 0373-2245289	The Director, Odisha Forest Rangers College, Angul, Odisha Ph: 06764-233652
The Principal, Foresters Training School, Udayagiri, Distt. Kandhamal, Odisha - 762 001 Ph : 06842-253617	The Principal, Foresters Training School, Ghatikia Near Khandagiri, Bhubaneshwar Odisha

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Training Institutes	
The Deputy Conservator of Forest, Incharge, Nicholson Foresters Training School, Champua, Distt. Keonijhar, Odisha.	
The Incharge, Training Center, Research & Training Circle, Hoshiarpur, Punjab.	The Director, Forestry Training Institute, J.L.N. Marg, Bajaj Nagar Turn, Jaipur, Rajasthan – 302 015 Ph: 0141-2710034
The Principal, Rajasthan Forest Training Centre, Alwar, Rajasthan	The Principal, Maru Van Prashikshan Kendra, Pali Road, Jodhpur, Rajasthan
The Additional Principal Chief Conservator of Forests and Director, Tamil Nadu Forest Academy, R.S. Puram, Coimbatore–641002	The Principal, Tamil Nadu Forest School, Vaigaidam, Madurai, Tamil Nadu.
The Principal, Sepahijala Forest Training School, Sepahijala, Agartala, West Tripura.	The Principal, Forest Training Institute, Hatipara, Tripura
The Director, Forestry Training Institute, H-2 Block, Kidwai Nagar, Kanpur, Uttar Pradesh - 208 011. Ph: 0512-2604259/2641342	The Principal, Forest Guard Training Centre, Hastinapur, Meerut, Uttar Pradesh.
The Principal, Forest Guard Training Centre, Pratapgarh, Uttar Pradesh.	The Principal, Forest Guard Training Centre, Bay Port, Agra, Uttar Pradesh.

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Training Institutes	
The Principal, Forest Guard Training Centre, Vandevi, Mau Uttar Pradesh.	The Director/In-charge and Coordinator, CFD Sub-unit Corbett Wildlife Training Centre, Kalagarh, Garhwal Uttarakhand - 246142
The Director, Uttarakhand Forestry Training Academy, Rampur Road, Haldwani, Nainital, Uttarakhand Ph: 05946-234091	The Incharge, Forest Guards Training School, Rampurmandi near Herbertpur, Dehradun, Uttarakhand Ph : 01360-275078
The Director, Forestry Training Centre, Rajabhatkhawa West Bengal.	The Director, Forest Training Centre, North, Dow Hills, Darjeeling, West Bengal. Ph: 0354 -23-32198.

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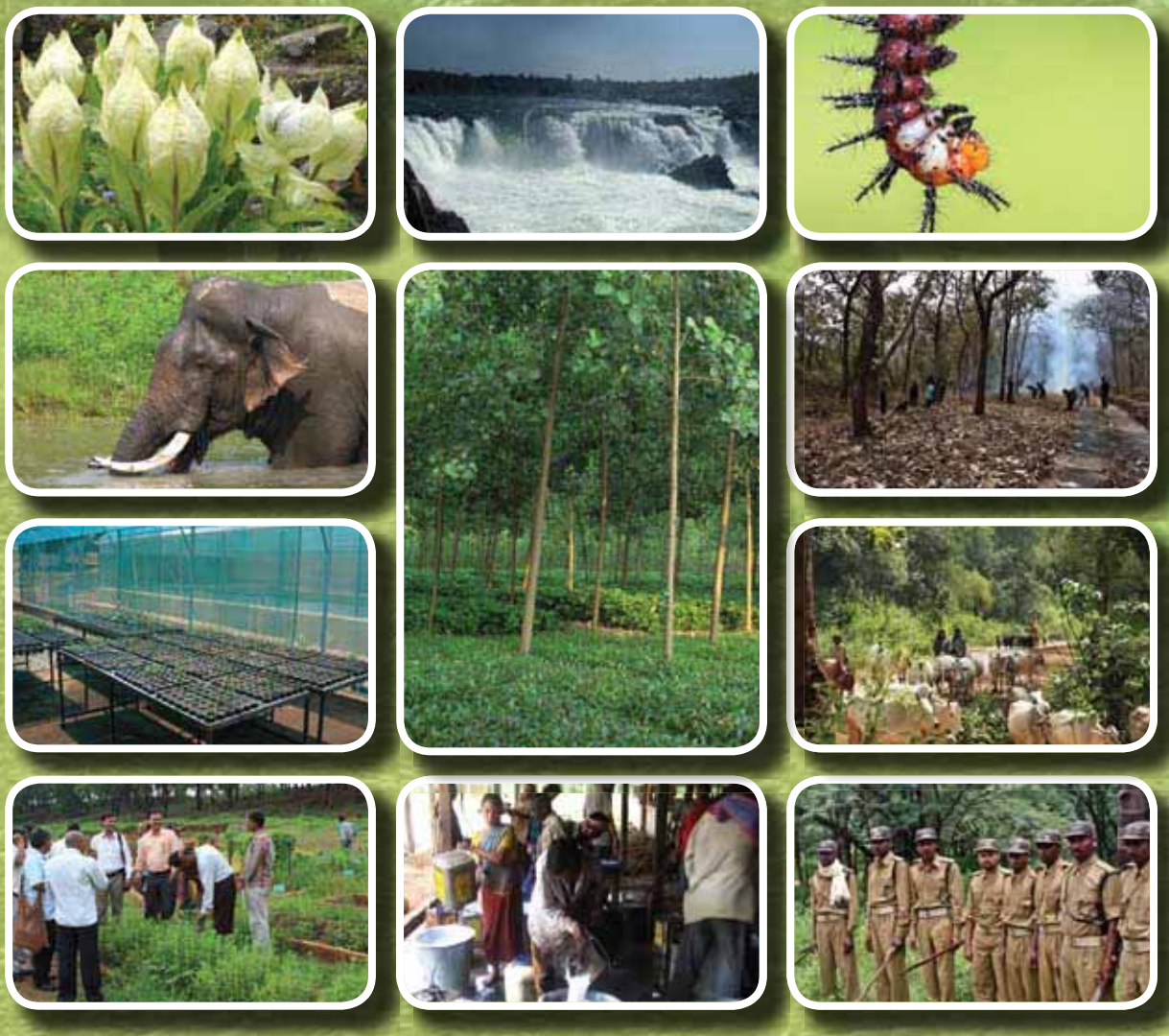

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