

Intreme Country Report- India
for United Nations Forum On Forest
(UNFF – II)

Formulated by
Ministry of Environment and Forests
Government of India

India is rich in flora and fauna with more than 45000 flowering plants and 81000 animal species found in 16 major forest types. Forests play an important role in day to day life of every Indian specially those who are living in and around forests and also in environmental sustainability and supports development of food production. It generates employment to the tribals and rural poor and can play a pivotal role in the rural poverty alleviation programmes. India is having 2.5 per cent of world's geographical area and only 1.8 per cent of world's forests and supports 17% of Planet's human population and 18% of livestock population.

India has fully supported the evolving international dialogue on forestry issues and is committed to the forestry principles evolved at UNCED and implementation of Chapter XI of Agenda 21. India believes that further deliberations on any future international arrangement or mechanism should be guided by and be in consonance with these principles and the elements for action identified in Agenda 21.

India also participated actively in the evolving international dialogue on forests, first in the Intergovernmental Panel on Forests (IPF) and subsequently in the Intergovernmental Forum on Forests (IFF). There is a need to build on this to evolve a consensus to address the issues identified through these processes. Much work still needs to be done in this regard especially in key areas such as finance, transfer of technology, traditional and indigenous knowledge, trade, etc. India believes that only after these have been addressed, and consensus solutions found to these issues, can meaningful discussions on future international arrangements or mechanisms be initiated on the basis of a firm consensual foundation. In view of above, India believes that the time is not yet ripe for an international legally binding instrument at this stage.

There is a need to bring synergy among various forums in which forestry related issues are already under discussion, including the Convention on Bio-diversity (CBD), Convention to Combat Desertification (UNCCD), the UN Framework Convention on Climate Change (UNFCCC), and the Kyoto Protocol, to cite only a few. Any further international dialogue in evolving new international institutional arrangements or mechanisms on forestry related issues should be guided by the need to avoid duplication of efforts. Enhanced coordination of existing arrangements on forests would be useful and options need to be explored to promote this.

Considerable progress has been achieved in promoting greater understanding of forestry related issues through the IPF and now the IFF process and the option of creating a new permanent Intergovernmental Forum for Forestry to promote dialogue on forestry policy may be explored. One of the major problem areas for most developing countries in addressing Sustainable Forest Management is that of financial resources. India believes that any discussion of a possible International Arrangement or Mechanism must address this issue within its mandate and ensure funding based on funding proposals and priorities outlined by the country concerned.

Specifically, this forum may address the issue of setting up a Global Forest Facility, along the lines of GEF, with due representation in its Board of Management from developing countries with high biotic pressures. The mandate of this Facility

could be to pursue consensus and formulate options for further action to combat desertification and forest degradation. It could meet annually or biennially at Ministerial level and also serve to channelise financial resources from different instruments to support forestry programme at the national level.

The sixteen proposals for action identified by the IFF as areas of priority concern are:

1. Formulation and implementation of NFPs
2. Promoting public participation
3. Combating deforestation and forest degradation
4. Traditional forest-related knowledge
5. Forest-related scientific knowledge
6. Forest health and productivity
7. Criteria and indications for SFM
8. Economic, social and cultural aspects of forests
9. Forest conservation and protection of unique types of forests and fragile ecosystems
10. Monitoring, assessment and reporting, and concepts, terminology and definitions
11. Rehabilitation and conservation strategies for countries with low forest cover
12. Rehabilitation and restoration of degraded lands and the promotion of natural and planted forests
13. Maintaining forest cover to meet present and future needs
14. Financial resources
15. International trade and SFM
16. International cooperation in capacity-building, and access to and transfer of environmentally sound technologies to support SFM

Status of implementation of the above elements is given below.

1. Formulation and implementation of National Forestry Action Programmes

The National Forestry Action Programme (NFAP) was initiated in India to translate the Tropical Forestry Action Plan adopted by the World Forestry Congress in 1985 into NFAP consistent with the national priorities. The NFAP has been designed to identify the issues and to address the programmes to be implemented for achieving sustainable forestry development in India by harmonising the activities of all stakeholders. The formulation of NFAP was undertaken by the Government of India with financial assistance from United Nations Development Programme (UNDP) and technical support from the Food and Agriculture Organisation (FAO). The Project was initiated in 1993 and completed in June 1999.

The process involved coordinated Centre-State strategic planning to promote and implement sustainable forest resource conservation, management and development, with well-defined inter-sectoral linkages that blend with the National Development Plans. A considerable amount of information was generated during the NFAP preparation process. Initially, documents included 24 State forest sector reviews, 16 special topic reports, 5 reports by international consultants, 5 regional synthesis reports and a 3 volume draft forest sector review. After preparation of these documents, the Ministry of Environment and Forests organised a two-day National Workshop in New Delhi in March, 1995, followed by 5 Regional Workshops during June-August 1995. These meetings considered the scope and content of State Forest Action Programmes (SFAPs) and the State Governments were asked to formulate SFAPs which were later compiled into a three volume NFAP report.

This National Forestry Action Programme is a comprehensive long term strategic plan for the next twenty years to achieve the goal of sustainable development of forests and also to increase the forest/tree cover in the country to the desired 33 per cent of the geographical area i.e. 1/3rd area of the country. This document is a compilation of the State Forest Action Programmes prepared by the States and also incorporates the recommendations of the Regional and National Workshop on NFAP. This document does not summarise the contents or reconcile differences in the various reports, but instead analyses and highlights major issues to facilitate urgent and meaningful action and decision making.

It takes into account the basic objectives of National Forestry Policy, 1988 which envisages the following:-

- Conserving the natural heritage;
- Increasing substantially the forest/tree cover through massive afforestation and social forestry programmes;
- Meeting the requirements of fuelwood, fodder, minor forest produce and small timber of the rural and tribal populations.

- Increasing the productivity of forests.
- Encouraging efficient utilisation of forest produce;
- Creating a massive people's movement.
- Maintenance of environmental stability.

The present document aims at sustainable development of 76.5 million ha. of forests which includes enriching tree cover over 31 million ha. forest land and bringing over 29 million ha. non-forest area under tree cover through agro-forestry, farm forestry, urban forestry etc.

Implementation of National Forestry Action Programme:

The programme will be implemented by the States/UTs. The implementation of NFAP requires huge financial resources and the total investment estimate for the State sector is Rs.1232321 millions and for the Central sector is Rs.106706 millions. Total requirement for the country is Rs.1339 billions (US\$32 billion) over the next twenty years.

The main components of the programme are:

I. Protect Existing Forest Resources :

It has three main-sub programmes of (I) forest protection, (ii) soil and water conservation, and (iii) protected areas and biodiversity conservation. These include forest survey, demarcation and mapping, protection of forest boundary, inventory of forest resources, prevention of illicit activities like thefts, pilferage and encroachment, control of deforestation, establishing system of legal deterrents, biodiversity conservation, protected area management, rationalisation of shifting cultivation, settlement of tenurial issues, preventing conversion of forests for non-forest use, protection of forests from grazing, pests and diseases, protection against poaching, and fire, control of desertification, watershed protection, protection of fragile ecosystems including mangroves, development of conservation strategy, ex situ and in situ conservation of genetic resources, joint forest management, eco-development, ecotourism, introduction of appropriate incentives, strengthening working plan and other related issues.

II. Improve Forest Productivity :

It has four main sub-programmes of (i) rehabilitation of degraded forests, (ii) research and technology development, (iii) development of NWFPs and (iv) assisting private initiatives with community participation. These involve mainly research, improvement in technology, enrichment planting, soil and water conservation, regeneration, rehabilitation and afforestation, bioprospecting, promoting better growth and yield through better management, integrated management for wood and NWFPs, other forms of multiple use management, increased use of lesser known and secondary species, improving density of stocking, valuation of forest derived services, and non-use values, domestication of species both flora and fauna, research on short rotation, high yielding and genetically improved varieties for plantations, provenance trials, nursery technology improvement, mixed cropping and multiple cropping, fuelwood and pasture development, establishment of GIS etc. .

III. Reduce Total Demand :

It has three main sub programmes for efficient use of (i) fuelwood and fodder, (ii) timber, and (iii) NWFPs. This includes the programmes for reduction of demand placed on forests through the technology of preservation, seasoning, substitutions, and other measures for the efficient utilisation of forest products and also through extensive biomass plantations, works of improved, waste-free and low-impact harvesting of forest products, pre-harvest and post harvest operations, improvement of processing technology providing high conversion factor and reduced wastage, chemical treatments, improved chullas, improved cooking practices and alternative fuels, rotational grazing and stall feeding, value added downstream processing to divert labour from primary processing, quality control, promote substitution of solid wood, reducing demand through market manipulation and pricing mechanism etc.

IV. Strengthen Policy and Institutional Framework:

It has three main sub programmes i.e. Strengthening of (i) central forestry administration, (ii) central forestry institutions, and (iii) State forestry administration and institutions. These include the development of infrastructure like buildings, communications, etc., and strengthening of staff including HRD. This issue also covers all aspects of capacity building, forest policy and legislation, public forest administration and organisational structure, research, planning and budgeting, rationalising the revenue system, safeguarding intellectual property rights relating to forestry, restructuring of sectoral institutions, sectoral and project planning, development of data systems, investment analysis, monitoring and evaluation, extension and public education, dissemination of information etc.

V. Expand Forest Area:

It has two main sub-programmes (I) tree plantation on forest and non-forest lands, and (ii) people's participation in plantations and its protection. It includes the programmes of creation of plantation forests through wasteland reclamation, afforestation and promotion of agro-forestry, desert reclamation, strip plantations along roads, railway lines, canals, farm forestry, urban forestry, shelterbelts, industrial plantations, greening and landscaping.

The availability of internal resources to this vital sector is inadequate. Efforts are being made to mobilise resources both from external and internal sources for implementation of the NFAP to achieve the desired objective of sustainable development of forests and environmental security of the future generations.

Consultations have already been initiated with donor agencies to secure funding for the NFAP. This Ministry has already organised the first conference of international donor agencies jointly with FAO and the UNDP on 27th September, 1999 in New Delhi. Another Conference is scheduled to be organised later this year. Bilateral discussions are being held with interested donors to secure external assistance.

State governments have been asked to step up allocation to forestry sector. Many of the State governments have formulated project profiles to secure funding from external agencies. Consultants have been appointed by UNDP/FAO in consultation with this ministry for preparation of project profiles for North Eastern States,

Sikkim and Jammu & Kashmir. **National Institutions in forestry sector** like Indian Council of Forestry Research and Education, Indira Gandhi National Forest Academy, Indian Institute of Forest Management, Forest Survey of India **have also formulated umbrella projects for external assistance** for research, Human Resource development, Survey and demarcation etc. A **Compendium of Project Profiles** has been formulated for presentation to international donors in the proposed donor's conference to be organised by at Rome.

2. Promoting public participation:

Poverty of people, pace of degradation and loss of productivity form a vicious circle, which leads to decline in natural resources. This affects life-sustaining capacities of individuals, families and communities. To protect environment and to meet people's needs, it is obvious that the Government policies and programs are reoriented towards sustainable pattern of development – a philosophy now globally accepted. Paradigm for development has changed now from commercial input – output to environment – development co-existence. Antagonistic relationships between people and the resource managers needs to be established on a new sound footing of sustainable human development in which villagers are associated with the government functionaries as a partner to uplift the socio-economic and environmental milieu of a particular area.

Lack of community participation and consequent lack of regulation of resource use has been a major cause for degradation of forests and adjoining lands. This shortcoming was sought to be removed in the National Forest Policy 1988 by seeking the involvement of people in the management of forests.

The philosophy of Joint Forest Management (JFM) is a development alternative wedded with socio-economic realities in a multiple cultural and ethnic set up to embark on a path of prosperity and productivity through the judicious use of limited natural resources on a sustainable basis. Its success depends on the endeavors of every collaborator more so on the part of already organized set up. It is now widely accepted that rural people living in and around protected forests must be brought into the management process in order for forest protection activities to succeed. The concept of JFM is a step in this direction. This strategy involves participatory planning, encompassing participatory objective setting to link conservation and development, strengthening of local institutional structures, management agreements, monitoring and review.

The first JFM resolution was issued by the Government of India in June 1990 for involving the villagers adjoining the forest areas in the rehabilitation of the degraded forests as per the National Forest Policy, 1988. These guidelines were further streamlined and strengthened through the Government of India's Notification No.22-8/2000-JFM (FPD) dated 21st February, 2000 (Copy enclosed). The new guidelines *inter alia* contain provisions for extending JFM in good forest areas, increased participation of the women and proper monitoring of the JFM Programme. As on 1.1.2002 around 63,000 JFM Committees are managing around 14.24 million ha. of forests in 27 States of the country. For monitoring the JFM programme in the country, a JFM Cell has been set up in the Ministry in the Forest Protection Division is working as Head of the cell. In order to obtain a permanent feedback from all the stakeholders, a JFM Network has been set up under the Chairmanship of the DGF&SS, Ministry of Environment and Forests, Government of India.

With the advent of community participation in forest management (Joint Forest Management) restoration and protection of forest cover has proved effective. Exciting beginnings have been made in joint forest management in a number of states. Local forest protection committees are proliferating, some spontaneously others with encouragement and assistance of forest department field staff and NGOs. Old attitudes are changing, as foresters begin to experience the remarkable regeneration of degraded forestlands following community protection, and the satisfaction of working with, rather than against these communities. NGOs and the forest departments, once distrustful of one another, are now working cooperatively in a number of regions. Villagers who have depended on forests for generations are now participating in their protection and management in partnership with their old adversaries, the Forest Department.

The JFM programme has now become the central point of future forest development projects funded by the Government of India and the donor agencies. With more imaginative policies and innovative silviculture, this area could be increased to 15 million ha, thus covering about 23 per cent of the total forest cover.

3. Combating deforestation and forest degradation:

Introduction:

In a predominantly agrarian economy like ours, forests provide both ecological and economic security. With the increase in population and limited land resources, forests act as an insurance cover against land degradation and agriculture unsustainability.

During the past five decades, the role of forests has been mainly a 'provider' of goods and services to forest dwellers and people at large and the forest based industry. The policy planning in forestry sector during the past has been mainly focussed on harnessing the services till the 7th Five Year Plan. From the 8th Five Year Plan onwards, the management of goods and services have been introduced in the forestry sector. With the National Forest Policy, 1988, the focus of forest has further shifted to beneficiaries and 'retainer' of capacity to renew its resources.

Keeping this in view, the last 8th and 9th Plan laid particular emphasis on sustainable management of forestry resources with people's participation. The result is that there has been a consciousness at the grass root level to protect and conserve the natural resources with suitable institutional mechanism. A large number of replicable holistic models of ecological rejuvenation to vegetate degraded areas to put them to productive use, have been evolved.

The Planning Commission, in its approach paper for the 10th Plan envisaged that the forest cover/tree cover of the country should be increased to 25% by 2007 and to 33% by 2012. This would mean bringing up extensive tracts of land under tree cover which would require a substantial investment both by the government and private sector.

An analysis of funding in the forestry sector over successive Plans reveal that between the first and sixth Five Year Plans, the percentage share of outlay for forestry ranged from 0.32% to 0.71 % of the total Plan outlay. During the seventh Five Year Plan, the outlay was raised to a little above 1.00% which again went down to 0.94% in the Eighth Plan.

For the sustained development of forests in conformity with the provisions of the National Forest Policy, 1988 and to address the issues underlying major problems of the forestry sector within the framework of the national Five Year Plans, a National Forestry Action Programme was drawn up with the objective of enhancing the contribution of forestry and tree resources to ecological stability and people centred development through qualitative and quantitative improvement in the forest resources.

Forest cover

The forest cover of the country as per the State of Forest Report 1999, prepared by Forest Survey of India, is 63.73 million hectares which constitutes 19.39% of the

geographical area of the country. This is made up of dense, degraded/open forests and mangroves at a total of 63.73 million hectares as indicated below:-

• Dense forest cover (over 40% crown density)	37.73 mha	11.48%
• Open forest (10 – 40% Crown density)	25.51 mha	7.76%
• Mangroves	0.48 mha	0.15%
	Total	63.73 mha
Scrub	5.18 mha	19.39%

(This is against the legally recorded area of 76.52 mha.)

Of the total degraded forest land (less than 40% crown density), it has been estimated that about 15.5 million hectares have natural rootstocks, which may regenerate by proper protection and replenishment of gaps. According to the National Forestry Action Programme,, these are ideally suited for management under the JFM system. About 9.5 million ha is partially degraded with depleted natural rootstock and another 6 million ha are totally degraded and treeless. These together constitute another 15.5 million ha, which requires very careful treatment through technology based plantation of fuel, fodder and timber species with substantial investment and technological inputs.

• With natural rootstock	15.5 mha
• With depleted natural rootstock	9.5 mha
• Totally degraded and treeless	6.0 mha
	Total 31.00 mha

Causes and Effects:

It is difficult to separate the causes from the effects of deforestation and forest degradation. While deforestation is visible and conspicuous, forest degradation is less evident and somewhat hidden. It is difficult to recognise the early stages of forest degradation and that causes delay in technical interventions resulting in further deterioration of the forest resource.

Some direct causes of deforestation are land clearances for agriculture (including shifting cultivation), other land use changes and land transfers, different forms of encroachments, overgrazing, fire, uncontrolled and wasteful logging, illegal fellings, and excessive fuelwood collection.

The ill effects of deforestation and forest degradation are enormous, effecting the overall welfare of the people, and causing heavy social cost. Categorization of these negative impacts include:

- **Environmental impacts:** Loss of ecological stability, damages to the ecological foundations of agriculture; loss of bio-diversity; reduction in carbon sink capability; effects of climate change; floods, drought and related losses; damages to watershed; silting up of reservoirs; soil erosion; desertification; changes in hydrological regime.
- **Economic impacts:** Fall in agricultural productivity and crop yields; scarcity for forest products; closure/unused capacity of forest industries; continues and cumulative disinvestment of forest capital;
- **Social impacts:** Loss of employment; threat to food, health and livelihood security.

Rehabilitation Measures:

The measures taken so far, to address issues of forest degradation, deforestation and to improve supplies of forest products have not adequately achieved the desired results. The current strategies

include:

- (i) legal measures to control diversion of forest land and prevent illegal activities, and
- (ii) investment in reforestation.

Legal measures have not been able to prevent deforestation or forest degradation. During 1980 –90, deforestation in natural forests amounted to 3,39,000 ha annually. Of this, approved land transfers constituted only about 25,000 ha annually. At the same time, reforestation does not fully replace lost environmental and ecological values. In addition to large scale planting of trees, it is also essential to undertake measures to enhance existing natural forests.

Some improvements are taking place; nevertheless they are not commensurate with the magnitude of the problem.

Afforestation Programmes.

The National Forest Policy, 1988 envisages a massive need-based and time-bound programme of afforestation and tree planting with particular emphasis on fuelwood and fodder development on all degraded and denuded lands in the country, whether forest or non-forest. The Policy also makes it necessary to encourage the planting of trees alongside of roads, railway lines, rivers, streams and canals, and on other unutilised lands under State/corporate, village and community lands and institutional or private ownership. It also provides raising of green belts and woodlots in urban/industrial areas as well as in arid tracts to check erosion and desertification to improve the micro-climate.

The investments in the Forestry sector over successive Five Year Plans could not be given much priority over the requirement of food and shelter to millions of the people living in abject poverty. It was only during the Seventh Five Year Plan that for the first time the forestry sector was allocated 1.09 % of the Plan funds. This was again reduced to 0.94 % in the Eighth Five Year Plan. The Ninth Plan allocation is likely to be further reduced looking at the allocation trend during the last 4 years.

National Afforestation & Eco-development Board (NAEB)

The National Afforestation and Eco-Development Board (NAEB) was constituted in the Ministry of Environment and Forests in August, 1992. Prior to this the National Wastelands Development Board (NWDB) was functioning in the Ministry of Environment and Forests with the mandate of regeneration of forest as well as non-forest lands in the country. In 1992, NWDB was transferred to the newly created Department of Wastelands Development in the Ministry of Rural Development, with the revised mandate of regenerating degraded non-forest and private lands, while NAEB was given the task of promoting afforestation, tree planting, ecological restoration and eco-development activities in the country, with special attention to degraded forest areas and lands adjoining forest areas, national parks, sanctuaries and other protected areas, as well as ecologically fragile areas like the Western Himalaya, Aravallis, Western Ghats, etc

Ongoing Schemes of NAEB

A brief of the main afforestation schemes during the Eighth and Ninth Plans are given as follow:-

Integrated Afforestation and Eco-Development Project Scheme (IAEPS)

1. Started in 1988-89, the Scheme is intended to promote afforestation and development of degraded forests by adopting an integrated approach to the development of land and other related natural resources on watershed basis through the micro-planning process. The scheme is 100% Centrally Sponsored.

Short term objectives :-

- Regeneration and eco-development of degraded forests and adjoining areas on a watershed basis;
- Augmentation of the availability of wood and non-wood forest products especially fuelwood, fodder and small timber, honey, wax, fruits, nuts, etc. from the regenerated areas;
- Securing people's participation in planning and regeneration efforts to ensure their sustainability and equitable distribution of forest products from the regenerated lands;
- Development and extension of technologies for special problem lands like saline/alkaline soils, ravines, desert areas, mined areas, Himalayas, Aravallis and Western Ghats including the application of bio-technologies, tissue culture, mycorrhizal inoculation, etc.;
- Employment generation for the most needy sections of society particularly women, belonging to Scheduled Castes/Scheduled Tribes and landless rural labourers, inhabiting the forests and adjoining areas.

Long-term objectives :-

- Checking forest degradation and loss of bio-diversity;
- Ecological restoration and environmental conservation;
- Fulfilment of the broader objectives of productivity, equity and sustainability for the general good of the people.

Samanvit Gram Vanikaran Samirddhi Yojana (SGVSY) and Creation of Forest Development Agency (FDA) -being implemented from 2000-01 under theIAEPS.

The above approach is being implemented from 2000-01 onwards on pilot basis to establish convergence in flow of funds under the various schemes for development of rural areas for the purpose of maximising the impact of the schemes of this Ministry initially. MoEF is presently implementing four 100% Centrally Sponsored Schemes for promoting afforestation on degraded forests and adjoining lands including national parks and sanctuaries. It is planned to merge these schemes from the 10th Five Year Plan to establish inter-connectivity between rural development in the forest fringe villages, forest conservation and employment generation with smooth and timely flow of funds to the field level. This umbrella scheme, called Samanvit Gram Vanikaran Samirddhi Yojana, is being implemented on a pilot basis through a decentralised set up at the field level for forest fringe villages on the pattern of DRDAs, to be called Forest Development Agency (FDA). The FDAs would also take up rural development works in the forest fringe villages which are generally difficult of access by the normal rural development machinery, institutionalise monitoring of activities closer to the field and have greater

flexibility in project formulation, identification of funding sources, thereby meeting local requirements effectively.

Composition of FDAs

The FDAs consist of General Body (comprising chairpersons of all Village Forest Committees, Member Secretary of all Village Forest Committees, one designated woman member from each Forest Committee, Chairperson of District Panchayat Forest Committee, Range Forest Officers, ACFs/SDFs, and an Executive Body (comprising Chairperson - Conservator of Forests (territorial/wildlife), Member Secretary cum Chief Executive Officer -Divisional Forest Officer (territorial/wildlife), co-opted Members (without voting rights) -District Development Officer, District level Officers of Agriculture, Animal husbandry, Soil Conservation, Tribal Welfare, Industries, Panchayat, Public Health & Engineering and Education Departments, Chairperson of District Panchayat Forest Committee, 25 nominees from the VFCsIEDCs including minimum of 14 women.

Area Oriented Fuelwood and Fodder Projects Scheme (AOFFPS)

The scheme was started during 1988-89. It is implemented with a view to augment production of fuelwood and fodder in the 242 identified fuelwood deficient districts of the country to meet the needs of the communities. The scheme is implemented on 50:50 sharing basis with the State Governments.

The objectives are :-

- (i) Augmenting production of fuelwood and fodder through regeneration of degraded forests and adjoining lands;
- (ii) Promotion of devices / practices which conserve and promote efficient use of fuelwood;
- (iii) Encourage people's participation in planning, implementation and management of projects.

Conservation and Development of Non- Timber Forest Produce including Medicinal Plants Scheme (NTFP)

The scheme was initiated during 1988-89. It provides financial assistance to the State Governments for increasing production of Non- Timber Forest Produce (NTFP) including Medicinal Plants. It has a special focus on tribal population for whom NTFP is an important source of livelihood. It is a 100% Centrally Sponsored scheme.

The main objectives of the Scheme are :-

- (i) Conservation and improvement of the non-timber forest produce, including medicinal plants;
- (ii) Increasing the production of and replenishing the stock of non-timber forest produce and medicinal plants; and
- (iii) Providing additional income to the tribals and the rural poor living in and around forests.

Tree and Pasture Seed Development Scheme (TPSD)

This is a 100% Centrally Sponsored scheme. Till 1997-98, the basic objective of this scheme was to generate quality seeds, which would lead to the growth of healthy and better quality trees. Under this scheme, the State Governments were given financial assistance to develop facilities for collection, storage, testing, certification and distribution of quality seeds.

The main objectives of the scheme are :

- (i) Establishment, development and improvement of seed production areas;
- (ii) Creation of clonal seed orchards;
- (iii) Development of processing and testing facilities for the production of certified seeds;
- (iv) Prescription and enforcement of standards for certification of seeds of trees;
- (v) Storage, handling, distribution/marketing of the certified seeds;
- (vi) Training of personnel and creation of facilities to fulfill the above objectives.

With effect from 1998-99, the scheme is being implemented under the name of "Tree and Pasture Seed Development" to include fodder production which is an important component of afforestation programmes. Therefore, seed production of pasture grasses and legumes including selection of superior stands of endemic grasses, their collection, processing, storage and distribution has also been included in the revised scheme. A one-time central assistance is provided to the States to meet non-recurring expenses relating to infrastructure development, while State Governments will henceforth meet all recurring expenditure.

Grants-in Aid Scheme for Voluntary Agencies (GIA)

In tune with the philosophy of eliciting and nurturing people's participation, financial assistance is provided to Non-governmental organisations (NGOs) and Voluntary Agencies (V As) for afforestation and tree planting activities under this scheme.

Financial assistance is generally restricted to activities directly or indirectly connected with development of wastelands. These activities include:

- Raising of seedlings;
- Planting;
- Soil and moisture conservation works;
- Training and extension;
- Grass and fodder development including silvi-pasture; and,
- Regeneration of degraded forests

NGOs are expected to motivate people to form into groups at the grass-roots level (such as Yuvak Dals, Mahila Mandals, etc.), help them to formulate technically sound and viable wastelands development proposals, assist in periodically monitoring and reporting on their performance to the NAEB. It is expected that the projects will provide for some contribution from the proponents towards the project cost. This contribution could be financial or in the form of voluntary labour by the beneficiaries.

Eco-Task Forces:

Four Eco-Task Forces (ETFs) of ex-servicemen are being funded by NAEB. These ETFs comprise of ex-servicemen and are commanded by serving JCOs and Commissioned Officers. Forest Departments of the State Governments, in which the ETFs are located, provide technical support to the ETFs. The activities undertaken include afforestation, pasture development, soil and water conservation and other restorative works.

Convergent Approach in the Tenth Five Year Plan:

To overcome the bottlenecks and to facilitate a JFM network throughout the country during the 10th Plan, the following approach is proposed:-

- merger of existing afforestation schemes including schemes with a major plantation component under a unified, broad based scheme
- enhancing the quantum of funds under 'entry point activities' of all major afforestation schemes.
- constitution of Forest development Agency (FDA) at the Divisional level which will be a confederation of JFM Committees.
- empowering JFM Committees to –
 - prepare micro-plan
 - decide the choice of species for plantation
 - propose entry point activities
 - awareness programme and usufruct sharing mechanisms
 - fund creation activities

FDA will focus on

- management of common property resources
- implement afforestation schemes
- initiate steps for value addition and marketing of forest produce
- protection against poaching of wildlife and felling of timber
- management of existing captive water resources in the village
- monitoring of activities of local NGOs.
- Promote agro-forestry/farm forestry.

This approach was initiated primarily to ground the people-centred approach in afforestation programme and to provide a firm and sustainable mechanism for devolution of funds for activities.

Proposals for the Tenth Plan

In order to achieve the national goal of having 33% of land under tree/forest cover, a massive time-bound programme of afforestation and reforestation is required both within and outside forest areas. The following programmes are proposed for the Tenth Five Year Plan:-

NATIONAL AFFORESTATION SCHEME (MERGED SCHEME)

In order to address certain deficiencies discernible in the existing schemes, the Ministry felt an imperative need to reorient all the existing afforestation schemes. This objective can be sub-served by having one composite scheme of afforestation by convergence and merger of all the existing programmes of activity. The Planning

Commission has also advised dovetailing of the programmes to reduce multiplicity and to ensure better percolation of the benefits. Through the process of merger and coalescing of the programmes, the quality parameters would be enhanced and there would be better servicing of the programmes. All the existing schemes, viz., 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 (NTFPS) and Association of Scheduled Tribes and Rural Poor in Regeneration of Degraded Forests (ASTRP) would be merged and re-designated as the National Afforestation Scheme.

The salient features of the proposed scheme are:-

- (a) Micro-planning exercise would be a core element of the strategy;
- (b) Decision-making at the level of the community in respect of choice of species to be planted, the component of the scheme to be implemented;
- (c) That the programme would be 100% funded by the Government of India as a central sector scheme;
- (d) Increased allocation for 'entry-point activities' component to mobilize all stakeholders/the community and to compensate the community for the loss due to 'closure' (in particular to those enjoying traditional rights to forest produce).
- (e) That the programme would be extended to jhumlands by planting timber yielding trees to improve for sustainable management of the natural resource base for livelihood security, environment protection and development through the participatory process.

The restructured programme is proposed to be implemented through a two-tier set up comprising Forest Development Agencies (FDAs) and Joint Forest Management Committees (JFMCs). In case of jhumlands, the existing institutional set up would continue.

The recast National Afforestation Scheme (NAS) will have the following components:-

- (a) Afforestation and Re-afforestation
- (b) Research including innovative technologies for demonstration
- (c) Maintenance of old plantations

Under afforestation the following activities would be undertaken:

- natural regeneration
- management intervention
- bamboo plantation
- medicinal plants

- coastal shelterbelts (in coastal States)
- tree plantation in jhumlands (in States affected by Jhum)

For Research, emphasis would be on research in NTFPS, innovative technologies for making available quality planting material.

To ensure survival, maintenance of old plantation raised during the 9th Plan would also be a part of this scheme.

Forest Development Agency

FDA will be constituted at the territorial/wildlife forest division level in all 775 such divisions in the country by the end of the 10th Plan. FDA would be a registered society under the Societies Registration Act, 1860 and it is expected that this institutional framework would be grounded within a period of 7 to 8 months with the basic objective ensuring that precious natural resources of soil, forests, water, plant and animal life are exploited in a sustainable manner on the principles of an ecologically sound development.

Joint Forest Management Committees (JFMCs)

The JFMCs would be registered with the Conservator of Forests and would be the implementing agency at the grassroot level. Each JFMC is to cater a village and these committees would be in the vicinity of forest areas. As per estimate of FSI, there are 1,73,000 villages located within a distance of 5 kms from the forest areas. All these villages are proposed to be covered during the 10th Plan period. From the present level of about 63,000 JFMCs, 20,000 additional JFMCs would be organised each year during the 10th Plan. The proposed institutional framework would –

- Ensure effective participation of the community in terms of planning and implementation of the schemes of afforestation and also will be progressively involved in other programme of activities including dissemination of information about environment, wildlife activities, management of water resources, etc;
- Village would be reckoned as a unit of functioning of the JFM and all schemes would be conceptualised at the village level;
- Apart from building up capabilities at the grassroot level would empower the institution to participate in decision making process;
- An integrated approach would be developed for ensuring self-sufficiency in terms of availability of fuelwood, fodder and grasses;
- Would promote employment generation and ensure management of the surpluses through the process of value addition.

GREENING INDIA (NEW SCHEME)

In order to achieve the national goal of 33% of land under forest/tree cover, it is imperative to involve the public in tree planting activities outside forest areas. These could be along side roads, canals, river banks, railway lines including private lands. There is an urgent need to integrate watershed approach and agroforestry research for different agro-ecological regions to promote agroforestry during the 10th Plan. There is also a need for adopting *in situ* moisture conservation practices through planting of suitable grasses and trees to provide protection against soil and water erosion.

The issue of agroforestry including plantation in urban areas has to be perceived as a cross-sectoral issue and adequate financial provisions are proposed to be made for raising plantation. Agroforestry represents the integration of agriculture and forestry to increase the productivity or sustainability of farming system and to increase the farm income.

Keeping in view the objective, the focus has to be on :-

- reclamation of degraded and fallow land to optimise their productive use; and
- integrated and holistic development of rain-fed areas by conservation of rainwater by vegetative measures on a watershed basis and augmentation of biomass production and utilization of wastelands for agriculture and afforestation.

To supplement these efforts, the proposed activities are:-

- Establishment of high-tech nurseries for each district in all the States/UTs
- Establishment of at least one Tissue Culture Laboratory for each State.
- Support formation of Producer Societies, Institutional Development, establishment of Common Facility Centre for value addition including setting up of processing centres.
- Support for developing market information systems,
- Support for strengthening of Panchayati Raj Institutions/local bodies for forest produce production, processing and marketing,
- Support establishment of forest publicity and extension centre,
- Support for project formulation for institutional finance,
- Support for developing multi-tier forest plantation models through recognized institutions,
- Support capacity building of tree grower and allied institutions, co-operatives, forest based cottage industries,
- Support to evolving demonstration plots,
- Support to development of seed orchards, seed production centres.
- Support establishment of training and accreditation of Chartered Foresters to help design bankable projects and other technical services to farmers.

A suitable Centrally Sponsored Scheme of Greening India with 100% funding is proposed to be implemented covering the above mentioned activities during the 10th Plan. This would include tree planting in degraded non-forest lands over 1.25 mha and tree planting under agro-forestry/farm forestry over 0.20 mha per year amounting to a total of 1.45 mha per annum. Non-forest land under these will have to be brought under tree cover mainly by the private sector. While the government is not expected to provide budgetary support entirely, it is imperative for the government to create the necessary policy environment to enable large scale tree planting activity to be taken up in non-forest lands so that private tree growers are assured of remunerative prices. To achieve this, innovative technologies are being encouraged alongwith provision of quality planting material and demonstration projects.

This will not only enhance the green cover thereby improving the environment, but also provide employment opportunities to the rural poor for improving their livelihoods.

NATIONAL ACTION PROGRAMME TO COMBAT DESERTIFICATION (NEW SCHEME)

Land degradation and poverty go hand in hand. Areas of severe land degradation are also the areas where the majority of population is somehow eking out subsistence living under harsh ecological environment and socio-economic conditions. The Indian sub-continent harbours both the hot and cold deserts. Such areas are highly prone to erosion, and rain water management holds the key for rehabilitation of these lands. Through *in situ* moisture conservation and increasing water availability of the soil profile, the growth of ground flora, middle flora and top flora would be enhanced and the impact of wind erosion would be minimised. To meet the requirements of the expanding population it is imperative to bring these areas into productive use so as to meet the requirement for food, fuelwood and fodder. The major problem of bringing these areas to productive use has been non-availability of adequate financial resources.

The UN Convention to Combat Desertification (UNCCD) was adopted on 17th June 1994 and India is a party to the Convention. The MoEF is the nodal agency and a national focal point for the implementation of the UNCCD in the country. Accordingly, a National Action Programme (NAP) has been finalised which is planned to be implemented over a period of 20 years with the following objectives:-

- community based approach to development
- activities to improve the quality of life of the local communities
- awareness raising
- drought management preparedness and mitigation,
- R&D initiatives and interventions which are locally suited,
- Strengthening local self governance leading to empowerment to the local communities.

The first five years of the NAP will be experimental and include pilot projects and activities. For the Tenth Five Year Plan, an amount of Rs.100.00 crores is proposed to be allocated. Activities like assessment and mapping of land degradation, drought monitoring and early warning system groups, drought preparedness contingency plans, and on-farm research activities for development of indigenous technology, etc will be taken up. This would be a 100% Central Sector Scheme.

4. Traditional Forest Related Knowledge (TFRK):

Indigenous peoples are, proportionally, one of the largest stakeholders in the Convention on Biodiversity and on this basis the International Alliance (International Alliance of the Indigenous Peoples of the Tropical Rainforest) has requested the CBD Secretariat to consider the following points towards which India can contribute:

- 1.** The central point for implementing the Biodiversity Convention is the full recognition of indigenous peoples' rights. A constructive and useful interpretation of the Biodiversity Convention can only arise from the context of indigenous rights as a whole. The draft Universal Declaration on the Rights of Indigenous Peoples is the most useful document to date for the orientation. Particular note should be made of the rights of indigenous peoples to self-determination, collective rights, control of our territories, access to our resources, recognition of our political and legal institutions and control of traditional knowledge.
- 2.** No access to indigenous knowledge, innovation or practices should take place without the prior and informed consent of indigenous peoples. This consent clause is expressed in Article 8j as 'approval' and needs to be emphasized. State sovereignty expressed in this Convention must not override any indigenous rights.
- 3.** Any initiative or co-operation undertaken between states or business and indigenous peoples must involve an equitable sharing of benefits, but only after consent is obtained. Funding mechanisms involving incremental costs should be avoided.

It has been proposed to:

- 1.** Establish a National Working Group on Traditional Forest-Related Knowledge to suggest ways to promote equity of knowledge in policy and practice.
- 2.** Issue resolution regarding the respect for and application of local knowledge on forest management in all the forestry development interventions in India.
- 3.** Integrate knowledge systems to become the central tenet of sustainable development in policy, planning and practice.
- 4.** Incorporate institutional mechanisms that promote prudent resource use and guide the behavior of society towards the sustainable trajectories in forest management.
- 5.** Accord legal and political recognition of local village institutions, knowledge and skills relevant to sustainable forest management.
- 6.** Pursue vigorously the access, transmission and application of traditional forest-related knowledge with due safeguard to the intellectual property of local people.
- 7.** Raise public awareness about the value, significance and potential of the traditional forest-related knowledge to the sustainability.
- 8.** Support integration of local and formal systems of knowledge in forestry in academic and field work.
- 9.** Raise the capacity of foresters to recognise, access and apply the traditional forest-related knowledge in everyday work related to forestry.

5. Forest Related Scientific Knowledge:

INTRODUCTION

India has a forest area of about 64 million hectares (only 1.8% of the world's forest area) with an average forest productivity of 07 cum/ha/yr. as against the world's average of 2.1 cum/ha/yr. The distribution of forest cover is uneven with more than 50 percent in five states Madhya Pradesh, Arunachal Pradesh, Andhra Pradesh, Orissa and Maharashtra. Madhya Pradesh accounts for the largest forest cover of the country i.e. 20.68% followed by Arunachal Pradesh, 10.80% Orissa, 7.38%, Maharashtra-7.32% & Andhra Pradesh.

In general, the forests in India are characterized by low productivity and acute degradation. The direct causes of degradation are poverty, landlessness, derivation of livelihood from forests, lack of land use planning, biotic interferences inadequate institutional capacity etc. Social forestry activities and tree planting are not able to compensate fully the rate of degradation. The research support to issues of forest productivity, protection, and conservation, utilization and substitution of forest products, ecosystem management and newer dimensions of forestry are therefore, urgently required to reverse the trend of degradation and to make available forest produce at affordable prices.

Forestry in India critically needs research support to improve forest productivity reduce losses & wastage, maximize utilization, improve conservation of genetic resources and wildlife, increase country's forest cover etc. The research planning on the basis of prioritized problems will help to achieve the aforesaid target.

The need to boost research support for scientific management of forest lands accounting for nearly 22.8% of the geographical area of India was realized over the past decade. Recognizing forestry research as the weakest link in forest administration, Government of India directed that forestry research and education be brought under the umbrella of an apex body leading to the formulation of Indian Council of Forestry Research & Education (ICFRE) in December 1986 which subsequently was granted autonomy in June 1991. The council is now established as an autonomous society, ICFRE Society of which the Minister of Environment & Forests is President. A 21 member Board of Governors is responsible for direction and control of the affairs of the Society, overseeing the formulation of forest policy, the determination of research priorities, the coordination of research activities, and the administration and financing of the Council and its constituent institutes and centers.

ICFRE Research Institutes and Centres:

The eight research institutes under the Council are: the Forest Research Institute (FRI), Dehra Dun; the Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore; the Institute of Wood Science and Technology (IWS&T), Bangalore; the Tropical Forest Research Institute (TFRI), Jabalpur; the Arid Forest Research Institute (AFRI) Jodhpur; and the Rain Forest Research Institute (RFRI), Jorhat; Himalayan Forest Research Institute (HFRI), Shimla & Institute of Forest Productivity (IFP, Ranchi. Each is headed by a Director, assisted by senior staff responsible for research programs,

facilities and administration. The Director has administrative autonomy, though certain issues must be referred to the Director General, ICFRE. Research programs are determined in consultation with a Research Advisory Group (RAG) for each institute and are finalised by Research Policy Committee (RPC) at the council level.

At the ICFRE (H.Q.) there are 4 Directorates viz. Directorate of Administration, Directorate of Research, Directorate of Education and Directorate of Extension. ICFRE fills the vast gap of research needs to the states particularly in the disciplines of Forest Genetics, Forest Engg., Entomology, Pathology, Wood Anatomy, Systematic Botany, Wood Preservation, Forest Utilisation etc. The ICFRE also collaborates with the State Forest Departments for solutions to problems which are difficult for state research wings to handle. It provides support to State Research Institutes and involves in their research endeavours.

Other agencies addressing forestry research are:-

State Forest Departments: There are well developed State Forest Research Institutes in Kerala and Madhya Pradesh, whilst facilities are being developed in several other states. The number of staff and funding assigned to forestry research vary widely amongst the states. Budgetary support for research is limited in all states, whilst staff deputed to research activities seldom have specialist knowledge or training and are frequently transferred to other duties before research programs are well established or yield results. These factors have tended to lead to un-focused research programs and a dissipation of research effort. They also result in a lack of coordination between states and often to duplication.

Universities. There has been no systematic review of forestry related research in universities. Many undertake biological research programs that are of relevance to forestry, and others, in particular agricultural universities, participate in agro-forestry research sponsored by the Indian Council for Agricultural Research. In 1991-92, ICFRE sponsored research in 12 university departments, including both basic and applied research topics.

Private Sector Agencies: A number of private commercial companies, including the Western India Match Company (WIMCO), South India Viscose, ITC, Bhadrachalam, and BILT Tree Tech Pvt. Ltd. undertake research programs. These programs are closely focused on the specific requirements of each firm, but include species selection, vegetative propagation, and plant and wood quality. Several NGOs support research programs in agro forestry and participatory resource management.

Indian Council of Forestry Research and Education 's (IC FRE) :

“To generate, preserve, disseminate and advance knowledge, technologies and solutions for addressing issues arising out of interactions between people and forests and environment on sustained basis through research, education and extension”.

ICFRE's mission seeks to continually endeavor to develop and extend the knowledge needed to solve critical problems relating to sustainable forest management, use and

conservation of renewable natural resources at national level. In carrying out its mission, ICFRE has following basic functions:

- Coordinating effort to identify high priority research and its implementation.
- Facilitate organisations of interdisciplinary research groups to pool skills and resources for research.
- Developing both internal and external budgetary support for research, extension and education.
- Provide leadership in forestry research to the country.
- High quality and timely research on prioritised problem areas; responsiveness to clients; cost effective and eco-friendly solutions.
- Conduct innovative basic and applied research for solving critical regional, national and international problems.

Research vision

The research vision provides the direction to the research endeavors through the following developmental objectives:-

- Updating, developing and providing knowledge, skill, technology and experiences to support development in forestry sector in accordance with priorities of National Forestry Research Plan (NFRP) and National forest Policy for sustainable forest development.
- Developing ICFRE as model organisation to undertake, coordinate, promote and aid forestry research, extension and education.
- Developing packages of technology and practices according to the needs of different stakeholders so as contribute towards sustainability and promote these technologies through aggressive marketing.
- Focusing research efforts on priorities as identified in NFRP and attaining global leadership in few emerging strategic areas.
- Optimising the use of research resources e.g. financial, human and infrastructure through establishing and nurturing symbiotic networking, with ICFRE providing a core of such network at national and regional level.

ICFRE's responsibility in the present context is clearly stated in its mandate viz. "To formulate forestry research policy and to organise, direct and manage research and education in the forestry sector". Accordingly, ICFRE is mandated to provide research support equally to public or private, research government and non-governmental activities.

Ever since its inception, ICFRE has been focusing its activities on the basic, applied and developmental aspects of Forestry Research. Of late, the need has been, however, felt to redefine aims, objectives and goals of research, needed to develop forestry sector with the available scarce resources.

The ICFRE and SFDs could join hands in undertaking research activities, its implementation in providing extension services to farmers, village community, private entrepreneur etc. It would be ideal if all states work together with ICFRE in solving the

forestry developmental problems at the state level. The Govt. of India (GOI) research would be relevant to problems of the states, therefore, the SFDs must create an appropriate institutional environment for forestry research to be adaptive and applied in the local ecological and socio-economic context to produce optimal results. The present National Forestry situations require that the two groups work together in solving the urgent forestry problems.

Major Thrust Areas of Research

The following thrust areas for research have already been identified for which ICFRE institutes have to identify their potential and capability to develop technologies in these thrust research areas.

1. Eco restoration of degraded forests
2. Development of agroforestry/social forestry models
3. Planting stock improvement of important species (other than tissue culture)
4. Biodiversity conservation & utilisation
5. Soil and water conservation (Including integrated watershed management)
6. Participatory Forest management
7. Human Resource Management Problems of forest management
8. Sustainability of forest management/ joint forest management
9. Management of natural forest
10. Afforestation of stress site (User land, ravine etc.)
11. Nursery techniques of important species
12. Natural regeneration of important species
13. Biodiversity assessment and monitoring
14. Protection of endangered species
15. Seed collection, storage and treatment
16. Nursery techniques of NTFP (MFP & NWFP)
17. Protection of Wildlife
18. Management of plantation
19. Management of forest fires
20. Management of grazing (including grassland management)
21. Silviculture and management of NTFP (MFP & NWFP) & medicinal plants
22. Encroachment of forests
23. Development of alternatives of wood
24. Pollution control
25. Managing shifting cultivation
26. Marketing of NWFP (NTFP or MFP)
27. Environment impact assessment
28. Policy issues
29. Development of alternative fuel species
30. Tissue-culture of important species

National forestry Research Plan (NFRP)

The follow-up action started with the development of a comprehensive methodology for setting research priorities for ICFRE based on a transparent, participatory and competitive system. For achieving the objectives, the research problems and themes have been prioritised. The planning on the basis of prioritised problems and themes will help in optimum resource allocation, minimized resource utilisation and minimized duplication of efforts. Forestry research problems and themes have been prioritised at state, regional and National level. Every state has prepared a State Forestry Research Plan (SFRP), which identifies problems in forest management, prioritised research needs, and assesses the capability of State Forestry Research wing. All ICFRE institutes have also prepared a research plan of their institute, which analyses forest scenario in the region and identifies regional research needs.

National forestry Research Plan (NFRP) has been prepared for five years (April 2000 to March 2005) with a vision of 20 years, by integrating SFRPs and Institute Plans. This plan which has been launched in May' 2000 is closely linked with the National Forestry Action Plan (NFAP) of the MOEF and the five years plans of the country. The Plan is dynamic and based on results of field level diagnostic surveys of the users of forest resource, state forest departments, universities, NGOs, economists and research scientists. It is based on social and political factors as well as scientific considerations, which can meet the changing requirements and improved research capabilities of the country.

Implementation of NFRP initiated w.e.f. April 2000 and will continue up to March 2005. The Five Year Action Plan deals with 157 new and 109 ongoing research projects of ICFRE with the total budget of Rs.182 crores, over the period of 5 years. These projects are inclusive of collaborative project with SFDs and other research organisations. The plan also covers 280 research projects of various SFDs with total budget of Rs.43.4 crores and 42 research projects of universities, NGOs, Industries, etc. with the total amount of Rs.8.4 crores, over a period of 5 years. This is within the budget of Rs.679.30 crores provided for the forestry research for State and Central sector under National Forestry Action Programme (NFAP) of the Ministry of Environment & Forests, Government of India.

MoEF, GOI, has identified the following six thrust areas for forestry research:

- i. Watershed Management
- ii. Desert Development
- iii. Medicinal Plants
- iv. Coastal Areas
- v. Bamboos
- vi. Genetics, Agroforestry, Biodiversity, Silviculture, Ecology & Forest Products.

About 193 research projects prioritised by ICFRE Institutes addressing the above cited research areas are listed in NFRP.

SIGNIFICANT RESEARCH ACTIVITIES SINCE FORMATION OF ICFRE

Planting stock improvement

- Improved nursery techniques, vegetative propagation, tissue culture, plus trees, seed production areas, clonal seed orchards, seedling seed orchards, vegetative multiplication gardens.

Wood Technology

- Plasticisation of wood and bending technique
- Ammonio fumigation technique to give desired colour and grain to wood
- Techniques of utilization of poplars for doors and windows
- Sap displacement technique for treatment of small timber and bamboo
- Utilization of alternate timbers after treatment for catamarans
- Natural dyes (edible and for textile) from forest biomass
- Jigat substitute for agarbatti industry from *Cassia tora* seeds
- Process to remove toxic substance from *Jatropha* species seed oil
- Preparation of flocculants for industrial requirement
- Preparation of adhesive from biopolymers
- Process for preparation of compost from plant biomass
- Sawing, conversion and preservation techniques for eucalyptus

Seed technology

- Seed collection, processing, testing, storage.
- Seed testing rules for about 100 forest tree species.

Afforestation techniques for stress sites

- Shifting and dunes, cold desert, coastal land, laterite and lateritic soils.
- Reclamation of wastelands, mined lands and degraded sites
- Salt affected soils, ravines, water-logged areas.
- Development of biofertilizers for growth enhancement
- Technology for seedlings of Babool, Sisham, Khair, Bamboos.
- Effectiveness of rainwater harvesting in arid regions
- Cultivation and processing of selected medicinal plants of forest origin
- Development of improved tools for nursery and logging operations

Scientific Services

- **National Forest Library & Information Centre**
 - Books - Over 1.25 lakh
 - Journals International - Over 300
 - Journal National - About 200
 - Literature Search (CD-ROM) - Seven
- Networking
- E-mail
- Documentation & Grey Literature Search

Database and Information

- Rules for testing seeds of over 80 tree species
- Database on strength and other properties of over 400 timber species
- Survey and publication of timber prices of over 15 species in 12 markets
- Volume tables (76 tree spp.) and yield tables (26 tree spp.)
- Database on paper quality of different raw materials

Collection

- Herbarium with 3.3 lakh plant specimens
- Carpological collection
- Xylarium with 20,000 wood samples
- Entomological reference collection with over 23,000 insect species
- Culture collection of about 1000 isolates of forest fungi
- Germplasm collection of about 100 medicinal and aromatic plants
- Arboretum (400 spp.) bambusetum (30 spp.) and botanical garden

Other technical Services

- Consultancy and training to industries
- In situ advice on problems of factory process and diagnostic analysis
- Testing and quality control of timber and timber products
- Soil and wood testing
- Insect and disease control measures and diagnostic and advisory services
- Identification and reference service for insect, plant and wood samples
- Library and information services on internet.

RESEARCH PRIORITIES OF ICFRE

In view of the massive research support needed for the forestry sector and limited resources, there is a need to optimize the research outputs with the available scarce resources. For achieving the objectives, the research problems and themes have been prioritised. The planning on the basis of prioritised problems will help in optimum resource allocation, minimized sub-optimal utilization of resources, minimized duplication of efforts and minimized regional or sectoral imbalances in the research endeavours. The regional level priorities have been identified based on the state level priorities in the jurisdiction of various ICFRE institutes.

Regional Priorities of ICFRE

The main regional prioritized problems of FRI, which cover the states of Punjab, Haryana, UP & Delhi are:

- Development of Agroforestry/social forestry models.
- Planting stock improvement of important species (other than tissue culture).
- Afforestation of stress site (Usar land, ravine, etc.).
- Pollution control.
- Nursery techniques of important species.

- Human resource management problems of forest department.
- Eco restoration of degraded forests.
- Nursery techniques of NTFP.
- Management of natural forest.

Institute of Forest Genetic & Tree Breeding, Coimbatore

The main regional prioritized problems of the IFGTB, which covers the states of Tamilnadu and Kerala and the Union Territories of Andaman & Nicobar Islands, Luchadweep and Pondicherry, are :

- Biodiversity conservation & Utilization
- Eco restoration of degraded forests.
- Soil and water conservation (including integrated watershed management)
- Management of forest fires.
- Natural regeneration of important species
- Participatory forest management
- Management of plantation
- Development of alternatives of wood

Institute of Wood Science & Technology, Bangalore

The main regional prioritized problems of the IWST, which covers the states of Karnataka, Andhra Pradesh, Goa and Daman & Diu are:

- Planting stock improvement of important species
- Eco restoration of degraded forests
- Development of agro forestry social forestry models.
- Biodiversity conservation & utilization
- Soil and water conservation (including integrated watershed management)
- Management of natural forest
- Human resource management problems of forest department.
- Development of alternatives of wood
- Selection and conservation of germplasm
- Sustainability of forest management/joint forest management.

Tropical Forest Research Institute, Jabalpur

The main regional prioritized problems of the TFRI, which covers the states of Madhya Pradesh, Maharashtra and Orissa, are

- Development of agroforestry/social forestry models.
- Eco-restoration of degraded forests.
- Planting stock improvement of important species (other than issue culture).
- Sustainability of forest management/joint forest management.
- Human resources management problems of forest department.

- Bio-diversity conservation & Utilization.
- Participatory forest management
- Bio-diversity assessment and monitoring.

Rain Forest Research Institute, Jorhat

The main regional prioritized problems of the RFRI, which covers the states of Arunachal Pradesh, Assam, Meghalaya, Manipur, Tripura, Mizoram and Nagaland are :

- Managing shifting cultivation
- Biodiversity conservation & utilization
- Eco-restoration of degraded forests
- Protection of endangered species
- Natural regeneration of important species
- Sustainability of forest management/ joint forest management.
- Nursery techniques of important species

Arid Forest Research Institute, Jodhpur

The main regional prioritized problems of the AFRI, which covers the states of Rajasthan and Gujarat and Dadar & Nagar Hawali, are

- Development of agroforestry social forestry models
- Soil and water conservation
- Afforestation of stress site (Usar land, ravine, etc.)
- Eco-restoration of degraded forests.
- Planting stock improvement of important species (other than tissue culture).
- Management of grazing (including grassland management).
- Tissue-culture of important species.
- Participatory forest management.

Himalayan Forest Research institute, Shimla

The main regional prioritized problems of the HFRI, which covers the states of Jammu & Kashmir and Himachal Pradesh, are :

- Eco-restoration of degraded forests.
- Biodiversity conservation & utilization.
- Natural regeneration of important species.
- Planting Stock Improvement of important species
- Nursery techniques of important species.
- Seed collection, storage and treatment.
- Soil and water conservation (Including integrated watershed management).
- Protection of endangered species.

Institute of Forest Productivity, Ranchi

The main regional prioritized problems of the IFP, which covers the states of West Bengal, Bihar and Sikkim, are :

- Eco restoration of degraded forests.
- Development of agroforestry/social forestry models.
- Participatory forest management
- Soil and water conservation (including integrated watershed management).
- Biodiversity conservation & utilization.
- Silviculture and management of NTFP.
- Seed collection, storage and treatment.
- Nursery techniques of important species.

Technological Development of ICFRE

Technological innovation and development is strategically important dimension of forestry development and it is to be made possible by research. Much of the research done by ICFRE and its institutes remain unutilized or under utilized due to lack of proper extension practices and linkages. Therefore, there is an urgent need to develop new breakthrough technologies, to test and produce reports on successful adoption of the technologies and transfer of technologies to the user groups with professional approach and development of effective linkages with different implementing agencies and other departments involved in the process of development. Technologies developed by ICFRE which have been/are being disseminated among various user agencies are as follows:-

1. Sawing and conversion technique of Eucalyptus and Poplar.
2. Utilisation of Poplar for doors and windows.
3. Utilisation of juvenile wood of Poplar/Eucalyptus for furniture and joinery.
4. Preservative treatment of secondary species (especially Eucalyptus timber).
5. Seasoning of timber-Setting up of solar energy efficient desiccant based kilns.
6. Plasticisation of wood and bending techniques.
7. Coloring and Ammonia Fumigation of Wood.
8. Poplars and *Paulownia* sp. For pencil making.
9. Macropropagation of Bamboos.
10. Jigat substitute for Agarbatti making.
11. Natural dyes from forest biomass.
12. Preparation of flocculants for backwater treatment in paper making.
13. Process for detoxification of *Jatropha curcas* seed oil.
14. Preparation of Adhesive from Biopolymers.
15. Preparation and use of *Cassia* for a gum.
16. Process for preparation of Katha from *Uncaria gambier*.
17. Process for preparation of Compost from plant biomass.
18. Sap displacement technique.
19. Utilisation of alternative timber for Catamarans.
20. Jhingan Gum- a partial substitute for 'jigat' in agarbatti manufacture.
21. Portable distillation unit for oil distillation in the field.
22. Integrated pest management strategies involving different methods.
23. Biofertiliser application for growth enhancement of different tree species in nursery and field.

24. *Casuarina* sp. In Agroforestry.
25. Cost effective infrastructure development for mass multinational of desired planting stock through vegetative means.
26. Seed Technology.
27. Agroforestry models.
28. Low cost draught type drier for non-wood forest- produce.
29. Cultivation of medicinal plants.
30. Non-wood forest produce: collection and processing.
31. Tissue culture of Banboos.
32. Seed testing technologies.
33. Improved tools for nursery practices.
34. Vermiculture.
35. Silvicultural and chemical control of Bamboo Blight disease in *Bambusa nutans*.
36. Rain water harvesting and conservation technology.
37. Techniques for afforestation on stress sites.
38. Rehabilitation and ecorestoration of mind lands and overburden spoils.
39. Leaf skeletonizer resistant clones of Teak.
40. Clonal multiplication of *Eucalyptus*.

Extension strategies for dissemination of information & technologies

- i. Dissemination of available information and technologies developed by ICFRE institutes to the willing entrepreneurs and motivated users through the traditional method of paper, media and personal contacts.
- ii. Dissemination of technology/information to identified users in their own surroundings through demonstrations, Seminar-cum exhibition, practical training and other means of informal education.
- iii. Creating a Media centre equipped with all the required electronic gazettes and other facilities necessary to develop in house capabilities for producing international standard, videos, films, audio-visual programmes for targeted audience.
- (iv) Creating satellite technology demonstration extension centres from among the few reputed and capable extension support fund grantee organisations.
- (v) Generating requisite funds for the desired level of development of infrastructure and, manpower for forestry extension.
- (vi) Strengthening library-cum-Information base through a fully operational modern electronic network system for operationalising local area network (LAN) and wide area network (WAN)
 - ICFRE has launched a fully operational modern electronic network system. However, efforts are needed for the availability of various technologies and information to such users who are capable of using electronic information
 - A perspective plan to consistently build necessary data base and communication language, user friendly software is required.

Perspective strategies for development of technologies

(i) Information, packages and technology for priorities identified in NFRP for Sustainable forest development with particular reference to India's forest:

- Availability of improved planting stock and site specific agro-forestry models with market information.
- Providing systems for assessment, monitoring, conservation and utilization of biodiversity.
- Methodology for incorporating socio-economic dynamic and environmental issues in forest management system.
- Recommendation for future policy, impact analysis of inter-sect oral and intra-sect oral policy change, policy analysis, etc.

(ii) Establishment of a dynamic and responsive forest research system in India with ICFRE providing global leadership to other national organisation.

- Institutionalizing participatory and transparent system.
- System based on modified bottom-up approach and participation of stakeholders at all stage viz. Planning, implementation, monitoring and evaluation.
- Development of effective policy and planning system.

(iii) Capacity building of national and regional research infrastructure in terms of

- Equipping ICFRE with appropriate research infrastructure in terms of researcher, equipment finance, etc. needed for effective implementation of NFRP and fulfilling its national responsibilities.
- Developing expertise needed for implementation of project portfolio.
- Equipping other sister organizations with necessary research infrastructure for their effective participation in NFRP and achieving their objectives.

(iv) Improvement of forestry education in research and academic institution:

- Updating curricula in accordance with changing forestry scenario and emerging priorities.
- Initiating and institutionalizing competence based education.
- Capacity building of institution engaged in forestry education and training.
- Research process reengineering with futuristic vision.

(v) Developing capacity of national, regional, state and non government organisations for effective extension with transfer of technology same time enhance conservation of forests environmentally and ecologically.

An increasing number of private companies and NGOs are funding their own research in areas such as tree breeding, medicinal plants and NWFPs. Some are being set-up solely for tree planting/agro-forestry. Increased involvement of private sector in forestry can help promote increased private sector efforts on research. It can also help promote contract research through private sector involvement. This trend is prominently seen in certain countries, especially where private sector involvement in forestry is significant.

6. FOREST HEALTH & PRODUCTIVITY

INTRODUCTION

The forests in India are characterized by low productivity and acute degradation. The average annual forest productivity of India is 0.7 cubic meter per ha as against world average of 2.1 cubic meter per ha. Satellitically analysed forest covers 6, 39, 600 sq. km. (14.47%) and only 3, 85, 756 sq. km (11.73%) has good forest cover of over 40% crown density. Nearly 60,000 sq km is blank area without any tree cover. The per capita availability of forest lands is one of the lowest in the world i.e. 0.08 ha against world's average of 0.64 ha. The natural forests are also depleting fast due to encroachments, over grazing, illegal felling, excessive fodder and fuelwood collection, land use changes, lack of adequate protection etc. The direct causes of degradation are poverty, landlessness, lack of land use planning, biotic interferences, inadequate institutional capacity etc. Social forestry activities and tree planting are not able to compensate fully the rate of degradation. The research support to issues of forest productivity, protection, and conservation, utilisation and substitution of forest products, ecosystem management and newer dimensions of forestry are therefore, urgently required to reverse the trend of degradation and to make available forest produce at affordable prices.

National Forest Policy & its Perspective Plan

The National Forest Policy (1988) has laid stress on scientific forestry research, necessitating adequate strengthening of research base as well as priorities for action. An important constraint to the operation of forestry research system has been the lack of a method based on the systematic application of agreed criteria to translate the requirement of the National Forest Policy into detailed research Programmes or to allocate resources to such priorities. This indicated that the present research system is not responsive to the needs of the users. To overcome these problems a perspective plan for the forestry research was prepared in 1993 to meet the requirements of National Forest Policy of 1988.

The perspective plan was based on the following priorities:

- i. Improvement of productivity
- ii. Conservation and Management of ecosystem
- iii. Utilisation of timber and NWFP
- iv. Socio-economic implication of policies

However, it was felt that this plan provided only an overview of research objectives without formal research proposals. There was no formal agreed criteria for deciding priorities. There was also no provision of regular reviews and updating, which were otherwise essential for a dynamic sector like forestry. Therefore a need was felt for a detailed research programme based on participatory and transparent system with modified bottom-up approach.

In order to overcome the above cited shortcomings, a comprehensive National Forestry Research Plan 9NFRP) based on National priorities in problems and thematic

perspective was conceived by ICFRE using participatory and transparent bottom up approach. Under this plan, the thrust is given to increasing productivity through genetic and silvicultural improvement, treatment of wastelands, conservation of forest ecosystem, wood substituting, trial development and social forestry. The projects relevant to the priorities established by ICFRE are in complimentary with the past and ongoing researches in India & abroad.

Forestry in India critically needs research support to improve forest productivity, reduce losses & wastage, maximize utilization, improve conservation of genetic resources and wildlife, increase country's forest cover etc. The research planning on the basis of prioritised problems will help to achieve the aforesaid target.

The research on the forest production must include social, economic and institutional aspects to secure adequate finance on a long-term basis. All these considerations indicate the need for multi-disciplinary team of researchers working in one or more institutions.

ICFRE Technologies developed for improving forest productivity

- Macropropagation of bamboo seedling in nurseries.
- Cost effective structure for planting stock propagation.
- Bio fertilizer application for growth enhancement in nurseries.
- Bio fertilizer culture preparation and field application.
- Improved tools for nursery practices.
- Tissue culture of Bamboo.
- Seed collection, processing, storage and pre-treatment for effective germination.
- Pest resistant clones of teak.
- Vermiculture
- Effective rain water harvesting in arid region
- Integrated pest management practices in *Acacia nilotica* and *Albizia lebbek*.

Extension Strategies for technologies for Improving Forest Productivity

The target group is village communities and agencies viz. Agriculture extension network, forest departments and M. Sc. Forestry students etc. The extension approaches to be followed will be:-

- i. PRA exercise leading to creation of village level action group or cooperative beside using mass media.
- ii. Training for one week to the "Contact person" of "village master trainers" through the agency (agriculture extension network, SFDs, NCC and NSS cadets, NGOs) involved on the particular technology by the Scientists using method demonstrations. Training material will be provided.
- iii. Training and visit system will be brought into practice.
- iv. A scheduled programme of Monitoring and Evaluation will be followed.

A World Bank review of India's forest sector endorses the need to improve forest protection and management as the most important forest policy goal for the next decades. The report highlights the need to improve the productivity of the sector, through improved planting materials and practices, a strengthened research system and an effective forestry extension service.

Planting Stock Improvement Programme (PSIP)

Recognizing that the poor quality of planting stock is the main contributing factor for poor and sporadic survival of about 1.5 billion tree planted annually in the country; production of high quality planting stock both seed as well as vegetative part has been taken up for SFDs for afforestation and reduction-afforestation purposes. ICFRE has taken up projects on Tree Improvement and Planting Stock Improvement under World Bank to ensure production of quality planting stock. The activities, which constitute the planting stock improvement programme are :

Seed Production Area (SPA):

ICFRE has evolved a process which involves laying out samples plots and they are evaluated quantitatively and qualitatively to identify best pockets within the species distribution for a given area and then trees were thinned out by removal of all such trees which falls below the average of sample plot for a given set of traits. This task will make the basis for future selection and further improvement in selection of new stands if required until each state establish their own seed orchards. Guidelines were framed and circulated to states for demarcating SPA's under the guidance of ICFRE Scientists based in different institutes. As against the target of 1290 ha, for the creation of SPA, 1225.62 ha have been achieved. The species used were : *Populus deltoides*, *Pinus roxburghii*, *Dalbergia sissoo*, *Pinus patula*, *Cassia siamiae*, *Bombax ceiba*, *Alnus nepalensis*, *Michelia champaca*, Eucalyptus, teak, casuarina, and Acacia spp.

Clonal Seed Orchards (CSO):

Seed orchards are specially designed plantations raised through grafted ramets of selected CPTs. Planning of seed orchards depends mostly on the floral biology of species, design used and number of clones to minimise inbreeding and finally management. All these aspects were fully kept in mind and established 1st generation clonal seed orchards.

This exercise has created awareness among states having such programme. Most of these activities were carried out in states in close collaboration of SFDs. ICFRE institute established CSOs cum Seed Collection Orchards of some priority species which will be used as demonstration orchards. The target for creation of CSO was 156 ha which was not only achieved but over achieved as 166.45 ha have been created. The species used were : *Gmelina arborea*, *Albizia procera*, *Dalbergia sissoo*, *Pinus roxburghii*, Eucalyptus, teak, casuarina, and Santalum.

Seedling Seed Orchards (SSO)

Seedling Seed Production Areas (SSPA) are specialized areas raised using seedlings of selected promising provenances or CPT's belonging to same agro climatic region or suitable to that area. Seeds of *Eucalyptus tereticornis* of known provenances have been procured from Australia to broaden the genetic base and to be used as infusion populations in future programme. *Eucalyptus tereticornis* as such is an exotic and grown in India for various industrial uses and has been taken up for afforestation in many states using seed/clonal material from existing sources of very narrow genetic base. A systematic programme of multilocational trials has been taken up to evaluate the promising provenances for the test sites. As against the total target of 320 ha of SSO; 344.40 ha have been achieved. *Gmelina arborea*, *Dalbergia sissoo*, Eucalyptus, teak, pine, Acacia, Sandal, *casuarina*, *Dipterocarpus* spp. were used for raising the SSOs.

Vegetative Multiplication Garden (VMG)

This is new activity initiated by ICFRE institute under W.B., FREE Project to develop protocol for mass multiplication of priority species which involves establishment of hedge gardens with clonal material, experimenting on hedging, production of multiple shoots, rooting and finally planting. Methods of rejuvenating the mature tissue (Plants) have been standardized for number of species undertaken in World Bank Project and in some cases consultancies have also been provided by Coimbatore Institutes. Some of the important species used were : *Gmelina arborea*, *Paulownia fortunei*, *Albizia procera*, *Dalbergia sissoo*, *Populus deltoides*, *Pinus roxburghii*, Eucalyptus, *casuarina*, teak and Bamboo spp. In case of *D. sissoo* technology for rooting juvenile shoots emanating from hedge garden has been perfected, while for pine it is underway. In case of *Pinus roxburghii* shoots emanating from 8 years old plants have been successfully rooted using vermiculite as rooting medium. This technique of rooting cuttings of various species is becoming useful in forestry and many States have shown interest in this activity. Now many states have already established vegetative multiplication gardens with misting facilities and have started clonal propagation.

Modern Nurseries:

Eight modern nurseries have been established at FRI, Dehradun; TFRI Jabalpur, AFRI Jodhpur, IWST Bangalore, IFP Ranchi, IFGTB Coimbatore, HFRI, Shimla and RFRI, Jorhat. They are fully operational and catering the regional needs, thus contributing towards production of quality planting stock.

The beginning has been made, but there is a need to sustain the assets, created with a serious follow up programme. The coordination at ICFRE level has to be maintained diligently, if the actual benefits are to be derived in the long run. Genetic gain and the productivity enhancement of the PSIP components is to be assessed. A common format has to be developed for collection of field data at national level. Periodical data has to be collected from ICFRE Institutes, which need to be computed and analysed. Since all the PSIP assets established under the World Bank Project (FREEP) are only 1st generation there is dire need to plan 2nd generation PSIP and Advance PSIP programme to produce the more superior quality seeds. PSIP is a LONG-TERM strategy and should be continued in future, otherwise the very purpose of creating PSIP by spending such a huge amount shall be defeated and all the efforts will go waste.

7. Criteria and indicators for Sustainable Forest Management (SFM)

The Government of India constituted National Task Force on SFM in November, 1999, with Dr. Ram Prasad, Director, IIFM, as the Convenor, for a term of six month from the date of its first meeting. The Task Force held two meetings on 18-19 February 2000, and 7-8 April, 2000 respectively at IIFM Bhopal. Special invitees and faculty members of IIFM also attended these meetings, besides the Task Force members. The draft set of Criteria and Indications developed under the Bhopal-India process was reviewed and its conformity with other international processes were examined. Ways and means for popularising and operationalising this methodology were also discussed. The Convenor also informally consulted other stakeholders of sustainable forest management from different parts of the country to arrive at a consensus on Criteria & Indicators for Sustainable Forest Management.

The eight criteria finalised by the task force are (1) increase in the extent of forest and tree cover, (2) maintenance, conservation and enhancement of Bio-diversity, (3) maintenance and enhancement of ecosystem function and vitality, (4) conservation and maintenance of soil and water resources, (5) maintenance and enhancement of forest productivity, (6) optimisation of forest resource utilisation, (7) maintenance and enhancement of social, cultural and spiritual benefits and (8) adequacy of policy, legal and institutional framework. Further, 43 indicators describing the above eight criteria were also finalised by the task force.

The task force recommended a two-pronged strategy for adoption and operationalising Criteria & Indicators for Sustainable Forest Management in India. The first at the national level is drafting of a National Strategy which would include among others.

- policy mandate for C & I use;
- the National Forestry Action Plan should use the C & I framework for monitoring and implementation of NFAP;
- creation of an SFM Cell in the MoEF;
- identification of nodal agencies for planning and co-ordinating SFM related activities, and
- generation of awareness through regional seminars/workshops.

The second strategy include action at the State and Local levels and this would include

- creation of SFM cells in every State,
- development of C & I implementation plans at the Forest Management Unit level,
- strengthening and motivation of local/JFM institutions,
- pilot studies in each State, and
- development of a Model forest in each State.

The task force also recognised the need to sensitise various stakeholders in forest management for their participation in SFM and recommended that

- Workshops be held with foresters, scientists, and participants from NGOs, forest based industries and environmentalists,
- Regional meetings involving Working Plan Officers, territorial DFOs and personnel from State Forest Research and Training Institutes be held regularly to bring the use of C & I in the normal working procedure of State Forest Departments,
- Meeting of PCCFs/Secretaries/Heads of forestry institutions should be held to adopt the C & I approach for SFM and also to finalise the methodology for collection of information for indicators at the national level.

Benchmark information on draft Criteria and related Indicators is either not available or is inadequate. For planning field level application of C & I for SFM, status of national forestry information systems and changes or additions that may significantly strengthen or improve the process of information gathering, analysis and dissemination would have to be developed. The task force has made emphatic recommendation for preparing the benchmark for different criteria and indicators. In order to establish appropriate and site-specific benchmarks or at least minimum acceptable standards for monitoring progress towards SFM, organisation/institutions to be made responsible for assessing/ measuring each specific Indicator of the 8 national level Criteria have also been identified by the task force.

Implementation of C & I in India will require a lot of ground work ranging from activities concerning sensitisation of Government personnel, foresters, NGOs, communities, and many other stakeholders. This will involve considerable financial outlays which may not be possible within the normal plan expenditure. The task force therefore recommended that a Sustainable Forest Management project be prepared and submitted through the MoEF to international donor agencies like the FAO for technical facilitation and sourcing of funds for taking the process forward.

In order to develop criteria and indicators for Sustainable Forest Management in the country, a SFM Cell has been created in the Ministry of Environment and Forests.

8. Economic, social and cultural aspects of forests:

Importance of Forest Resources

Forests form a natural resource base which provides timber, fuelwood, pulpwood, fodder and fibre grasses, an non-wood forest produce and support industrial and commercial activities but also maintain the ecological balance and life-support systems essential for food production, health, and all-round human development. The wide range of economic and environmental services and products that forests provide can be classified as follows.

- Service of consumptive direct-use-value, e.g., timber, fuelwood, fodder and fibre grasses, and wide range of non-timber products derived from plants and animals.
- Services of option values, e.g., a natural habitat for biodiversity and a repository of genetic wealth
- Services of non-consumptive direct-use values, e.g., recreation and eco-tourism.
- Services of local indirect-use values, e.g., carbon sequestration

As demand for forest products increase with population and with increasingly consumptive lifestyles, it is no longer possible to meet them out of the annual incremental growth. Supplies are also affected because of the diversion of forestlands to other uses.

The pressures on India's forests.

- Sustainably extractable quantity of fuelwood from India's forests is far below the requirement of the population.
- Livestock population in India is greater than that can be sustainably supported by the available land and forest resources.
- The demand for industrial wood and other wood, part of which is currently being met by imports, will continue to rise with industrial and economic growth.
- Unregulated and increased harvesting of non-wood forest produce will result in loss of biodiversity and gene wealth.
- Expansion of protected area networks will result in increasing pressures on existing productive forests.

Multiple Uses of Forest Resources

The Indian population has crossed the one billion mark and its livestock population shall be reaching half a billion. A significant proportion of human and livestock population is dependent on forests of subsistence. Most of the forest produce

moves through informal non-market mechanisms. Further systematically collected data on biomass removals and supplies are not available. The high ratio of requirement to sustainable supply of fuelwood (5.8:1) indicates severe pressure on growing stock, and suggests that the deficit is being met by unsustainable levels of extraction. In the case of industrial timber, the ratio is 2.4:1, which, though considerably narrower than that for fuelwood, nevertheless indicates how large the deficit is. Due to heavy dependence of communities on forest resources, the sector is subject to severe pressure. Various economic uses and their pressures on forests are listed below.

Fuelwood extraction

India, usually characterized as an agrarian economy, is in transition, moving towards industrialization and commercialization. It supports one-sixth of the world's total population with barely 1% of the world's conventional energy resources with which to fulfil the growing needs of its ever-increasing population. A UN estimate of 1992 puts the share of biomass in India's total energy consumption at 33% and that in the domestic sector at 78% (Wood Energy News 1996). Data on fuelwood are notoriously inadequate and unreliable for several reasons. Wood is collected, utilized, and traded on highly localized basis: most of it does not pass through a market.

Industrial Wood

Of the 27.6 million cubic meters of industrial wood required in 1987, the packaging industry was the single largest consumer with a demand of 6.81 million cubic meters (24.7%), followed closely by paper and pulp industry, with a demand of 6.57 million cubic meters (23.8%). The paper, paperboard and pulpwood industry together account for 30.8% of the total industrial wood requirement. Other important consumers include agriculture and housing. All other uses together constitute 15.6% of the total wood requirement (Forest Survey of India 1988)

Livestock Grazing

Though India accounts for more than 13% of the world's livestock population, identified and managed pastures are virtually non-existent. The extent of non-forest area used for grazing cattle, includes (1) permanent pastures and other grazing lands, (2) land under miscellaneous trees crops and groves not included in net sown area, and (3) culturable waste. Livestock population increased from 292 million to 445 million between 1950/51 and 1987. Cattle population alone grew by 28.6%, from 155 million in 1951 to 200 million in 1991. Goat population also increased phenomenally, from 47 million in 1951 to 110 million in 1991 (Indian Council of Forestry Research and Education 1995) in spite of the fact that 36% of the goat population is slaughtered annually.

Impact of degradation of Forests

On Rural Population

To achieve food security, maintenance of good forest cover is essential. Forests protect soil, conserve water, and improve the; microclimate. In general, forests are renewable source of materials, energy, and other services (Tewari 1991). The declining forest resources have put extreme pressure on common property resources with adverse effects on the standard of living of the poorer sections. A study by Jodha (1990) of 82 common property holdings in 7 states reveals the contrasting situation between 1950 and 1980 during which the number of people dependent on 1 hectare of common property resources land increased from 4.9 to 137. The study also recorded that poor families derived 21% of their income and 77% of their fuel and fodder from such lands whereas the corresponding figures are 2% and 23% for the upper income groups. The number of different kinds of forest products collected declined from 34 to 13, while the density of trees and shrubs declined from 582 to 139 per hectare.

On Natural Environment

Deforestation directly contributes to the build up of carbon dioxide. It has been estimated that every hectare of woodlands absorbs 3.7 tonnes of carbon dioxide and produces 2.5 tonnes of oxygen (Pokhriyal and Natiyal 1991).

On Biodiversity

Biological diversity, described as "wealth of life on earth", the millions of plants, animals and micro-organisms, the genes they contain and the intricate ecosystem they help build into the living environment' is under a constant threat of extinction from exploitation of forest ecosystem and destruction of habitat, imposing incalculable risks to the future humanity.

On Climate Change and Desertification

Forests are veritable sinks of carbon, and continue to sequester atmospheric carbon until maturity, after which the rate of sequestration declines. The estimates of annual carbon emissions due to deforestation for India are 41-42 million tonnes. Carbon emissions from combustion of wood alone, in 1986, were estimated to be about 32 million tonnes (Ravindranath and other 1992). Clearing of forests also exposes the soil to direct sun, wind, and water-induced erosion.

Need to understand Inter-linkage of Forests and Total Economic Valuation of forests

The interlinkages between these cross-cutting sectoral issues need to be understood and analysed carefully for formulating effective inter-sectoral policies, particularly policies with respect to rural energy, livestock rearing, and timber logging. A world Bank policy paper (1994) maintains that market and policy failures combine in the forest sector to undervalue the resource base severely, leading to excessive rates of depletion and inadequate investment in tree planting. Distortions in pricing and valuation of forest resources are reflected in the low allocations made for the development and management of the forestry sector. Since most of the harvesting and extractions are through non-market mechanisms, the contribution of the forestry sector remains outside

the ambit of national planning, growth and development. Our planning process and the National accounting system give testimony to this fact. The plan allocation to Forestry sector has been in the range of 1-25 of the total allocation and the contribution showed against the forestry sector has also been in almost the same range. The reason being gross underestimation of forestry sector values and non use of proper valuation and accounting process.

Inadequate forest management leads to many social costs such as loss of employment, less return on capital investment in forest based industries, siltation of reservoirs, dams, loss in crop production due to insufficiency of irrigation and land degradation, loss of productivity etc.

Total Economic Value

As mentioned earlier, intangible benefits like ecological, biological, aesthetic values from forests are totally ignored in the physical accounting. The economic valuation of intangible benefits is found to be very difficult & in certain cases like biological diversity is abstract and difficult to express in monetary terms, but is widely accepted as being extremely important. Other benefits are less abstract and sometimes concrete, but still difficult to measure due to data collection problems such as forest products used for self consumption by local communities & not traded in the market, or the down stream benefits of water regulation & water quality secured by sectors input in maintenance of forest cover in the catchments/watershed area or the scenic value on account of forest landscape.

Economic valuation of Forests in India Context - An Overview

Few attempts have been made in India recently to estimate economic value of intangible benefits of forests like eco-tourism, recreation, water supply, watershed value, carbon & biodiversity. An overview of such studies is given in the following table:

Table: Economic values of intangible benefits of forests derived from India case studies:

Intangible benefit	Annual value	Location	Methodology used	Source
Recreation/ Eco-tourism	Rs. 427.04 per Indian visitor Rs. 432.04 per foreign visitor (Rs. 16197 per ha)	Keoladeo National Park, Bharatput	Travel Cost Method	Chopra (1998)
Recreation/ Eco-tourism	Rs. 516 per Indian visitor and Rs. 495 per foreign visitor (Rs. 20944 per ha)	Keoladeo National Park	Contingent Valuation Method	Murthy & Menkhuas (1994)
Recreation/	Rs. 90 per	Boriveli	Contingent	Hadker et. Al

Eco-tourism & other benefits	household per year (Rs. 23300 per ha)	National Park, Mumbai	Valuation Method	(1995)
Eco-tourism	Rs. 9.5 per local (Kerala) visitor Rs. 676 per ha	Periyar Tiger Reserve	Contingent Valuation Method, Travel cost method	Manoharan (1996)
Water supply	Annual rental= Rs. 4745 per ha	Almore forests	Indirect methods	Chaturvedi 1992
Soil conservation	Cost of soil erosion Rs. 21583 per ha	Doon Valley	Replacement cost approach	Kumar P (forthcoming)
Ecological functions (use value) for local residents	Rs. 624 per hectare	Yamuna Basin	Contingent valuation method	Chopra and Kadekodi 1997
Carbon store	Rs. 1292 billion (total forests) Rs. 20125 per ha	Indian Forests	Species wise forest inventory data	HariPriya (1999)
Carbon store	1.2 lakh per ha	All India	Indirect estimates	Kadekodi & Ravindranath (1997)
Total Economic value of Forest	Rs. 2.89	Himachal Forest	Multiple valuation Techniques	Verma Madhu (2000)
Watershed values (soil conservation)	Rs. 2.0 lakh per ha meter soil	Lower Siwalikh (Yamuna Basin)	Indirect method (reduced cost of alternate technology)	Chopra and Kadekodi 1997

Source : Amended table from Manoharan, 2000

Table: Annual values of selected benefits of forests in India

S. No.	Economic benefit	Nature of benefit	Value of annual flow of goods & Services per hectare (Rs.)	
			Minimum	Maximum
1	Timber	Tangible	2701	9270
2	Non timber forest products	Tangible	538	2957
3	Ecological functions (watershed)	Intangible	624	2.0 lakh
4	Eco tourism	Intangible	676	20,444

5	Carbon store	Intangible	20125	1.2 lakh
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Source : Manoharan, 2000.

Table : Economic values of various kinds of land in India

S. No.	Nature of Forest land	Selected economic benefit	Value of annual flow of goods & Services per hectare (Rs.)		Present value* of goods & Services per hectare (Rs.)	
			Mini.	Max.	Mini.	Max.
1.	Plantation/Single species forest (teak, sal forests, etc.) (Crown density < 40%)	Timber	2701	9270	33660	115525
2	Multi-species plantation/open forests (crown density 10-40%)	Timber+N TFP	3239	12227	40365	152375
3	Dense forests (crown density > 40%)	NTFP+ Ecological functions+ Carbon store	21287	322957	265283	4024758
4	Protected Areas	Eco tourism+ ecological functions+ carbon store	21425	340444	267003	4242685

* At 5% rate for a period of 20 years

Source : Manoharan, 2000.

The following study shows the magnitude of under-estimation and under-reporting of forest benefits in India, by providing approximate minimum values for the benefits.

Box: Distortion of Forests-Case of India

The magnitude of under-estimation and under-reporting of forest benefits, is illustrated by taking India as a case, by providing approximate minimum values for the benefits.

Forest grazing: some 270 million cattle are estimated to Use forest grazing Grounds. Grazing value is estimated Putting a minimal value of Rs. 1512 per Year for providing alternate source per animal

Rs. (million)

408240

Green fodder: an average annual collection of 400 million Tons is estimated. Fodder value is estimated at US\$ 5 per Ton of fodder Rs. 210	84,000
Medicinal plants: nearly 70% of the people use indigenous Herbal medicine. As a means of primary health, bulk of it Originating in forests. Value of Medicinal plants estimated At 10 per person for 630 million	264600
Non-wood construction materials (thatching materials, Bamboo, grass, fibres, etc.): it is assumed that 250 million People living below the poverty Line only use non-wood Construction materials from forest, valued at Rs. 420 per Year	105000
Food : 67.8 million tribal people who depend on forest for their Livelihood a food value of Rs. 4200 per year for food derived From forest is assumed	284760
Wood product, fuelwood and charcoal: estimated figure reported By FAO	694806
TOTAL	18,14,406
<p>The above estimation does not consider the values of products such as gums, resins, essential oils, flavours, edible nuts, dyes, colorants, fibers, flosses, plaiting materials and a host of others, nor of the benefits from biodiversity conservation, wildlife and nature tourism, watershed protection, sequestration of carbon and other use and non-use values.</p> <p style="text-align: center;">Rs. 12,1800 million (6.6%)</p> <p>Against these the amount of reported GNP share of forestry for 1993 was equivalent to 1.3% of the GNP of India and Government allocation of funds under the country's Five Year Plans for the forest sector was only 0.80% of total plan allocation.</p>	

9. Forest conservation and protection of unique types of forests and fragile ecosystems

As has been mentioned previously, forests continue to be under serious biotic pressure stemming out of heavy dependence of people on the forest resources for their sustenance and livelihood. Despite obvious odds, India has been at the forefront of living resource conservation movement. Establishment of a large number of protected areas is an ample testimony of the country's commitment towards safeguarding its rich and diverse biological resources. The latest compilation on protected area for *in-situ* conservation of biodiversity shows that there are 87 National Parks and 485 Wildlife Sanctuaries with a total area of 4.06 million ha and 11.54 million ha, respectively. These together constitute 15.60 million ha and form 4.75% of the geographic area of the country. In addition, 11 Biosphere Reserves have also been created with a geographic area of 4.76 million ha, whose areas partly overlap protected areas. The task of conservation has become profound and challenging owing to high aspirations underscored by lack of resources both human as well as financial. For effective biodiversity conservation, the focus of protected area management is on:

- Strengthening of PA management through appropriate infrastructure development, improvement of habitat, and provision of vehicles, establishment of wireless network and various types of equipment to field staff. The process also includes writing up a long-term scientific management plan for all protected areas.
- Ecodevelopment in and around the PA to mitigate dependence of local people on park resources and seek their cooperation and support for conservation.

Eco-development:

Eco-development is an important area of the bio-diversity conservation. It is a strategy for protecting ecologically valuable areas from unsustainable or otherwise unacceptable pressures resulting from the needs and activities of people living in and around such areas. Eco-development programme is restricted to areas peripheral to protected areas. The most novel and essential component of the project is involvement of people in conservation programme. In a country like India, where a large number of villages are located within and around protected area, success of any conservation programme is largely dependent on participation and involvement of local people.

10. Monitoring, assessment and reporting and concepts, terminology and definitions

Ecologically sustainable forest management is not a fixed target: it involves a process of continual improvement. Processes, which lead to review and improvement, are therefore important for advancing ecologically sustainable forest management.

Forest management strategies require adaptation to changing circumstances and better knowledge of their impacts. Forest management presents unusual challenges because of the long periods forests need to reach mature form, the complexity of forest plant and animal communities, and the difficulty of detecting change in ecosystem structure and function. Therefore, monitoring, assessment and reporting are essential for improving management outcomes.

Monitoring and assessment inevitably rests on a review of past and present programs, of their capacity to address policy, strategic and operational issues and to be put into effect through transfer of the resulting technology or knowledge.

Monitoring of Forest Cover:

Although monitoring of forest resources involves periodic measurement of growing stock, annual increment, species composition, biodiversity, NTFP etc., in the absence of adequate resources, Forest Survey of India (FSI) is only able to monitor the forest cover biennially at the national level. The assessment is published biennially in the form of a report – State of Forest Report, that provides comprehensive assessment of the latest forest cover and forest resources in the country and monitor changes in these.

Forest Cover Assessment:

Periodic assessment of forest cover provides a quantitative measure of the extent of land area under forest/tree cover along with the density. It helps in monitoring the changes in the cover. Forest cover information serves useful purpose for national and state policy planning. The National Forest Policy, 1988 envisages bringing one-third of the geographic area of the country under forest/tree cover for maintaining ecological balance and environment stability.

Comprehensive assessment of the forest resource involves measurement of numerous parameters such as forest cover, growing stock, annual increment, species composition, bio-diversity, non-timber forest products etc. However, the FSI is able to assess only the forest cover biennially and the assessment of other parameters is done only for the specific areas.

State of Forest Report (SFR):

The first report on the forest cover of the country was published in 1987, using Landsat data of US satellite through visual interpretation technique on 1:1 million scale. The resolution of the sensor was 80 m. From the second assessment, the resolution of the sensor improved to 30 m and the scale of interpretation to 1:250,000. The Indian Remote Sensing (IRS) satellite data having a resolution of 36.25 m has been used since fifth assessment. The digital image processing was also simultaneously introduced in Madhya Pradesh and Maharashtra.

In the last assessment, further refinement has been brought in the methodology. Digital method of interpretation has been extended to 13 states comprising 7 states of North-East, Sikkim, Himachal Pradesh, Andhra Pradesh and Delhi in addition to earlier two states. This method could not be applied to the entire country due to inadequate infrastructure. The eleven states where digital interpretation has been done for the first time, IRS 1C/1D data of October-December 1998, having resolution of 23.5 m, have been used. The data of other states are of IRS 1B having resolution 36.25 m and period 1996-97. The introduction of advanced digital image processing systems has helped in reducing the time lag between the presentation of the report and that of satellite data. It is envisaged that the 2001 report will have digital method of interpretation for the entire country.

In addition to inventory of forest areas, inventory of trees in the non-forest areas (i.e. Trees Outside Forests or TOF) is of great importance in planning as this, together with forest inventory, provides a complete picture of wood/forest resources. The assessment of growing stock of trees outside forest was completed in Haryana and is underway in the states of Andhra Pradesh, Bihar, Gujarat, Rajasthan and West Bengal.

It is envisaged that in the future along with field inventory, efforts will be made to assess regeneration status, biodiversity indices and soil carbon in forest areas. During assessment of trees outside forests in rural and urban areas, estimation of wood consumption in selected villages and urban centers will also be made.

Discrepancy in Forest Cover Reports of FAO and FSI

For the assessment of forest resources, FAO mainly depends on the information furnished by the countries concerned as the organization does not have any independent mechanism of assessment. In cases where countries are not able to provide data, the data are compiled by referring to other reliable sources. In respect of our country, the FSI acts as a nodal agency for furnishing the information on forest resources of the country.

The consistency of the data obtained from the countries is checked by FAO professionals and brought into their common system of classification and definition. Because of the difference in the classification and definition, the figures published by FAO, sometime do not tally with the figures reported by the countries. Such a situation occurred in 1990 in respect of forest cover assessment of India by the FAO. The FAO used the data of SFR 1989, where the total reported forest cover was 63.880 million ha. As per FAO's classification, forest areas affected by shifting cultivation even once in the

past are recorded under the category of “forest fallow” even if such areas presently support forest vegetation (close or open), whereas in the FSI’s classification, the present status of the forest cover is taken into account. The latest data of the existing forest area affected by the shifting cultivation was not available in 1990. Using old estimates of 1975, 1981 and 1984, FAO worked out the total area affected by shifting cultivation as 11.515 million ha and classified it as “forest fallow”. As a result, the forest area of the country reflected in 1990 report of FAO was reduced to 52.365 million ha (63.880 m ha – 11.515 m ha). This has been the basic reason for the difference in the area of forest cover as assessed by the FSI and FAO. Such differences may appear in the future FAO assessment reports also.

11. Rehabilitation and conservation strategies for countries with low forest cover

Introduction:

The Food and Agriculture Organization of the United Nations (FAO) assesses the forest cover of the world regularly. There are no laid down international standards about the percentage of the forest cover to the geographic area of a country.

A comparative account of percentage of forest cover and per capita availability in different regions and countries of the world, as per the last assessment of the FAO, is given in the table below. It shows that per capita forest in India is very low as compared to world's average.

Table: Forest cover and per capita availability in different regions/countries

Region/Country	Percentage of forest cover to land area (1995)	Per capita forest (ha)
World	26.6	0.64
Asia	16.4	0.1
Africa	17.7	0.7
Europe	41.3	1.3
China	14.3	0.1
Pakistan	2.3	0.01
Nepal	33.7	0.2
Bangladesh	7.8	0.02
Sri Lanka	27.8	0.1
Indonesia	60.6	0.6
Malaysia	47.1	0.8
Philippines	22.7	0.1
Japan	66.8	0.2
USA	23.2	0.8
India	15.7	0.06

Source: State of World Forests, FAO, 1999

Forest Cover in India:

The Forest Survey of India (FSI) has been conducting field inventory for estimating the growing stock (volume) and other parameters of the forests by laying out systematic sample plots since PISFR project began in 1965. So far about 80% of the country's forest areas have been inventoried including some areas more than once and about 130 reports have been published. About 25,000 sq.km of forest area is being inventoried every year.

Officially designated forest lands in India cover 76.52 million ha. (23% of the total land area although actual forest cover as per the assessment of Forest Survey of India in 1999 is 63.73 million ha. (19.39% of total land area) out of which 37.74 million ha (11.48%) is dense forest, 25.50 million ha (7.76%) open forest and 0.49 million ha (0.15%) mangroves. Madhya Pradesh accounts for the largest forest cover of the country i.e. 20.68% followed by Arunachal Pradesh (10.80%), Orissa (7.38%), Maharashtra (7.32%) and Andhra Pradesh (6.94%). The seven North-Eastern states together comprise 25.70% of the total forest cover.

A table depicting FSI estimated forest cover from 1987-1999 is shown below:

(Area in sq.km)

Assessment Year	Period	Forest Cover	Percentage of Total geographical area
1987	1981-83	642041	19.52
1989	1985-87	640134	19.47
1991	1987-89	639182	19.44
1993	1989-91	640107	19.47
1995	1991-93	639600	19.46
1997	1993-95	633397	19.27
1999	1995-97	637297	19.39

Scope of Increasing the Forest Cover:

It is necessary to examine the present land use of the country so as to explore the possibility of finding out land which can be brought under forest cover to achieve the stipulated objective. The total geographical area of the country is 328.73 million ha. Agriculture is the most dominant land use followed by forest. To meet the requirements of food production, beside enhancing the productivity, the area under agriculture has increased from 118 million ha in 1951 to 142 million ha at present. It is, therefore, unlikely that the agriculture land will be available for expansion of forest cover. It is only the "culturable wastelands", covering 13.94 million ha and part of the "fallow land and other than current fallows", covering 9.89 million ha, which seem to be potential areas on which forest cover can be expanded through afforestation. In addition, efforts are being made to raise trees outside conventional forest areas through innovative agroforestry programmes.

12. Rehabilitation and restoration of degraded lands and the promotion of natural and planted forests:

Forestry is the second largest land use after agriculture. Approximately 300 million of the rural poor in India depend on forest lands to varying degrees. For approximately 100 million people, forests (fuelwood non-timber forest products, construction materials, etc.) are the main source for sustaining livelihoods and generating cash income. Half of India's 70 million are tribal people, the most disadvantaged section of society who subsist on forests. Seventy per cent of India's rural population depend on fuelwood to meet domestic energy needs. 450 million livestock use forests as grazing grounds. Degradation and deforestation are especially sensitive issues for India as they negatively affect not only the environmental functions of forests (e.g. wildlife refuge, watershed protection, prevention of soil and water run-off, and groundwater recharge) but also the subsistence functions of providing fuelwood, food, fodder, and cash income.

Forest fires are another cause of degradation of forests. Around 300 million ha of forests are annually affected by forest fires causing a loss of Rs.4400 million (moderately estimated as only the replacement cost of seedlings. The environmental and other losses have not been calculated in this).

Rehabilitation of Degraded Forests:

Forest degradation is a matter of serious concern. While there has been improvement in controlling deforestation, forest degradation or qualitative loss of forests is continuing. The biomass and growing stock of wood in the natural forests of India is 93 ton/ha and 47 cu.m/ha respectively, as against an average of 169 ton/ha and 113 cum/ha for developing countries. This indicates that availability of forest biomass per capita in the natural forests of India is only about 6.0 ton as against an average of 82 ton in the Developed world.

Rehabilitation and conservation strategies that need to be adopted in a country like India needs bold initiative from the top to the grass root level. In this regard, India has already taken a number of initiatives at the policy, institutional and management levels. There has been a radical shift in the policy issues over the years from production to conservation issues. The enactment of the Forest Conservation Act, 1980, Wildlife Protection Act, 1972 and the National Forest Policy, 1988 paving the way for peoples' participation in the protection and management of forests would go a long way in sustaining the natural resources. This along with improved and scientific management of forests, introduction of modern nurseries and plant propagation techniques, biodiversity conservation, interaction with local NGOs and with other departments involved in rural development activities, building trust and improving communication with different state holders would definitely help our country in rehabilitation and conservation of its natural resources.

The Government of India had reviewed the forest protection strategies and have enhanced the allocation under the forest fire scheme and taken steps for the involvement of village communities in forest fire prevention and control. The forest infrastructure in the field need to be upgraded and reinforced in order to meet the emerging challenges. The Government of India had therefore proposed to implement a new scheme known as Integrated Forest Protection Scheme with an outlay of Rs.7000 million during the 10th Plan period. The components of this scheme are forest fire prevention and control, working plan preparation including development of management and geographic information systems, creation of remote sensing cell and infrastructure for communication, building etc.

Private Forestry Initiatives:

Though forestry activities are mainly with the government, rural people have been practicing tree planting in their farms and homesteads, to meet household requirements for fuel, poles, timber, and medicinal plants. This also adds to the tree cover of our country. Tree plantation on community lands is also executed by the government. With the advent of social forestry, a promotional drive was launched for tree planting in wastelands, institutional lands, and non-forest public and private lands. Currently the area of private tree planting (under agroforestry, farm forestry in block and line plantations) covers an area of over six million hectares. The other non-forest sources of wood are rubber, coconut, cashew, and mango plantations. The non-forest sources together provide about 50 per cent of total wood supply in the country; and probably an equal or larger share of NWFPs. There are also a large number of small private nurseries, meeting the local demand for seedlings.

These private initiatives are supported by the government through relevant research, extension, technological packages, input delivery, market information and credit facilities. In the interest of sustainable forestry development, it is necessary to encourage the small operators to keep up their interest and to ensure that their needs are adequately understood and addressed.

Trees Outside Forests:

Trees outside the forest (TOF) include trees in cities, on farms, along roads, canals, railway tracks and in many other locations which are by definition not a forest. All trees make a contribution to the environment and to the social and economic well-being of humankind.

Trees outside the forest are increasingly recognized by policy makers, planners and managers as an essential component of sustainable development. This ancient resource has been part of the daily context and culture of rural populations and in many cases TOF resources are critical to food security. Trees outside forests (TOF) have been making major contribution in meeting the needs of timber, small timber and fuelwood in our country. FSI started assessment of growing stock of TOF since 1991 and is at present engaged in assessment of TOF throughout the country.

Extension:

The purpose of extension, is to extend, reach out or spread knowledge, technology for the benefit of communities. Depending on circumstances, extension as a vehicle of rural development involves: information dissemination; technology transfer (linking lab to land); packaging research results into implementable systems; delivery of inputs (seeds, seedlings, fertilizer); provision of advice regarding marketing and price information. A forestry extension programme normally covers: forest protection, land and water conservation, agro-forestry, rationalization of shifting cultivation, greening campaigns, and forestry information. Since an important target of extension is to expand tree planting, information being sought by farmers would cover a broad range – choice of species, information on best species, their uses, how to plant and nurture, possible inter-crops, expected yields, marketing options, potential for value adding and so on. This would require backup research for different agro-ecological zones. Along with technology transfer, communication and conflict resolution are important aspects of extension. Involvement of media networks, exhibitions, competitions and other promotional activities can assist in making extension more effective

Carbon Sequestration:

The adoption of the Kyoto Protocol in 1997 triggered a strong increase in investment in plantations as carbon sinks, globally, although the legal and policy instruments and guidelines for management are still debated. A number of countries have already prepared themselves for the additional funding for the establishment of human-made forests.

The recognition of afforestation and reforestation as the only eligible land use, land use change and forestry activities under the Clean Development Mechanism of the Kyoto Protocol, as agreed in Bonn during the second part of the Sixth Conference of the Parties to UNFCCC in July 2001, will lead to a steep increase in forest plantation establishment in developing countries thereby enhancing the forest cover. The decision of the Bonn Agreement is expected to funnel additional funds into forest activities in developing countries and thus to strengthen the international efforts in this field. However, it will also require a monitoring and verification system to ensure that these plantations will not be established at the expense of efforts to conserve biological diversity. Thus the decisions taken in Bonn to make the Kyoto Protocol ratifiable will also bear new challenges for forest plantation development.

State legislation relating to the protection and management of forests provides a basis for the maintenance and enhancement of the sink capacity of India's public forests. This will be complemented by the likely expansion of the TOF areas. On private lands, encouragement of the maintenance of productive tree cover by farmers is beneficial. The principal concern is whether the establishment of plantations will outstrip the negative effect on carbon budgets from clearing of private land in the absence of restrictions and incentives. Little work has been done on the contribution of forests to global carbon cycles in India. The global contribution of Indian forests will be appreciable, its

contribution to the national carbon budget needs to be known. A nationally co-ordinated program is needed.

13. Maintaining forest cover to meet present and future needs

Resource management and maintaining forest cover in a country like India is beset with problems of population explosion, poverty, divisive social trends and resultant conflicts for resource use. Unfortunately, in the past many groups in the society exploited forest resources by snatching away the interests of weaker sections. The 'common property resource psychology' of people built over years of free use, however, never allowed enforcement of laws enacted to protect and preserve the forests. In this process a few powerful groups of industries, local timber merchants, contractors, rural landlords and feudal classes pocketed the benefits. Undeniably, however, a larger share also went to local people who could meet their and their cattle's energy needs from the adjoining forest areas through uncontrolled fuelwood collection and overgrazing. In this process, the forests became victim of both human greed and need. The regeneration suffered and forests became degraded. The poor people of rural areas had to bear the maximum brunt of forest loss.

As is evident, the root cause of environmental problems is poverty and to overcome poverty, two things are essential. First, the development must continue which means judicious and equitable exploitation of, natural resources. Secondly, there must be a check in human and cattle population in order to prevent collapse of life support system. Both require pragmatic approaches in thinking and calls for sustainable consumption so that the exploitation by the present generation does not jeopardise the future of generations yet unborn. Wisdom demands, that the resources should be handed over to the next generation in enhanced and improved conditions by taking advantage of modern scientific technology and by resorting to sound resource management principles.

The Ministry of Environment and Forests along with State Forest Departments (SFDs) are responsible for development, control and delivery of forest policy and sustainable forest management.

Forest Policy:

During the early five-year Plan periods, priority was given to survey and demarcation, preparation of working plans, plantation establishment and forest utilization. Subsequently, the policy was to maximize timber production and enforce forest protection. In 1972, the National Commission on Agriculture recommended that "there should be a change over from conservation oriented forestry to more dynamic program of production forestry". By the Sixth five-year Plan period (1980-85) ecological balance, economic stability for the poor and greater forest protection were being given emphasis. The failure to control unauthorized exploitation and a growing realization of forests as a biological necessity and major part of the nation's natural resource heritage led to the formulation of the National Forest Policy in 1988.

The National Forestry Policy of 1988 defines the primary goals of forest management as first, to conserve the natural environment, second, to meet the

requirements of local people (particularly tribal population and the poor), for forest produce, and third, as a source of wood and other products for industries and other non-local users. The policy envisages participation of communities in the management of forest resources as a means of achieving these objectives.

The National Forest Policy, 1988 stipulates to have a minimum of 1/3 of the land area of the country under forest/tree cover. It also envisages a need based and time bound massive afforestation programme on all denuded, degraded and unproductive lands. Though a cumulative area of 23.96 million ha has been planted since 1950, yet much of this is unproductive and the rate of afforestation is not adequate due to insufficient outlays for the forestry sector. At the present rate of afforestation, it may take more than 30 years to bring all degraded forest areas under adequate tree cover, even if the present well stocked forests are fully protected.

In the recent past efforts were concentrated mostly on social forestry activities neglecting the natural forests. Immediate action is needed for rehabilitation and intensive protection of natural forests. Periodic inventory of forest resources to establish bench marks and treatment regimes, implementation of working plans, scientific management needs are being given special emphasis.

Forest area to the tune of 43.28 lakh ha was diverted for non-forestry purposes during the period 1951 to 1980, which works out to 1.5 lakh ha per year. However, the pace of diversion has been checked with the enactment of the Forest (Conservation) Act, 1980 and reduced to 6,500 ha per annum with State Governments providing equivalent non forest area for compensatory afforestation in most of the cases. Though with conservation efforts and afforestation programmes, the extent of forest cover could be stabilized around 64 million hectare, the forest areas still continue to degrade in extent and quality. Intense and unsustainable biotic pressure is mounting on the balance 38 million ha. of relatively well stocked forest area. The absence of policies for land use, non commercial energy and grazing have brought the country to the brink of an ecological disaster, with half of its land area categorized as wastelands. It is estimated that 6000 million tones of soil is being lost every year. The situation is alarming and calls for urgent pragmatic measures for conservation and development of forests.

The alarming rate at which degradation of natural resources has been occurring in India is responsible for the recent paradigm shift in the management of natural resources, towards a more decentralized and community based system of management. Past experiences have shown that centralized management of natural resources, based on a culture of exclusion and rules, has not contributed to the sustainable management of natural resources. This important realization has led to a series of policy changes in the recent past that provides an ever-widening democratic space to the local communities for articulating their needs and managing natural resources.

The country has begun to appreciate the need for integrating development initiatives with conservation efforts. Against this backdrop of decentralized and multi-objective natural resource management, conflicts between governments, their agencies, civil society organizations, private sectors and local communities as well as within and among communities are likely to increase in number and severity without adequate

institutional strengthening. Whereas traditional systems of management have tremendous value in community based natural resource management, these systems have been eroded over time. Strengthening these systems while ensuring that they meet the development and conservation needs of their communities is an important part of resolving the conflicts that are rampant within this sector. Similarly, as the authoritative role of government agencies responsible for natural resource management changes, they too must learn new skills of participating, communication and should become open for an increased level of dialogue and accountability.

Need for State Forest Policy (SFP):

For a country as large and diverse as India having diverse forestry situations, there cannot be a unified single development strategy for forestry sector development. NFAP process and analysis have demonstrated the need for careful selection of mixture of strategies at both national and state levels appropriate for specific economic, political, social and resource conditions. It is therefore, necessary that state Govts. promulgate state forest policies to properly translate the broad policy objectives and measure contained in the NFP as relevant to their state specific situation and reorder priorities to meet the specific needs of the states.

Forest Legislation:

India has a long tradition of professional forestry with a history of forest legislation since 1865 when most of the forests became State property. Indian Forest Act, drafted first in 1865, was revised in 1878 and was consolidated again in 1927 to regulate laws relating to forests managed for production. Subsequently, several amendments of the Act were made and some of the States have promulgated their own Forest Acts. After the adoption of the National Forest Policy, 1988, it was proposed to update and consolidate all forest laws and amendments made by the States from time to time to bring about a uniform law throughout the country in conformity with the provisions of the new forest policy.

Forest (Conservation) Act, 1980 is another forest legislation amended in 1988. It stipulates concurrence of the Union Government for diversion of forest lands for non-forestry purposes with provisions of compensatory afforestation. Other related legislations are the Wildlife (Protection) Act, 1972 amended in 1991 and the Environment (Protection) Act, 1986.

MoEF, in conjunction with SFDs and ICFRE & other research organisations, has been active in research and monitoring of threats from pests and diseases in forests and plantations. In view of the major issues concerning the role of fire in the maintenance of particular species and ecosystems, and its widespread use for hazard reduction, considerably more effort is needed in this area. The limiting factor at present appears to be resources rather than recognition or willingness to address issues.

The Moef and SFDs have the statutory responsibility to manage the State's forests. Mechanisms are in place to identify particular places and conserve them as Sites of Special Significance.

14. Financial resources:

India has been participating in the IPF/IFF meetings and in consonance with the recommendations of IPF, India has prepared the National Forestry Action Programme(NFAP) in the year 1999 with technical assistance from FAO and financial assistance from UNDP. NFAP incorporates the agreed commitments relating to National Forestry Action Programme, criteria and indicators for sustainable forest management, traditional forest related knowledge and underline causes of deforestation, degradation etc.

The implementation of NFAP requires huge financial resources and it is estimated that about \$31 billions would be required in the next twenty years. The availability of internal resources for implementation of NFAP is inadequate. Though it is expected to mobilise some resources internally, it may be appreciated that an action programme of this magnitude cannot be implemented without support from the external agencies.

It is necessary that bilateral / multilateral funding agencies contribute maximum funds for implementation of the NFAP to achieve the desired objectives of sustainable development of forests in particular and environmental security of the future generations in general. NFAPs may be recognised as framework for funding in forestry sector by international agencies including World Bank which is a member of Collaborative Partnership on forests.

In the past, India has taken a view that there has to be a mechanism to coordinate the efforts of various international instruments and institutions. Accordingly, India has moved for creation of a permanent forum like Global Forest Facility on the lines of the Global Environmental Facility (GEF), to further carry out the dialogue and discussions on the contentious and unresolved issues. India has also taken a view that financial resources/funding is one of the major problem areas and therefore, it is necessary to assign this exclusive function to one of the International Arrangements and Mechanisms (IAMs).

15. International Trade and Sustainable Forest Management

It is estimated that total annual removals from the forest amount to US\$7 billion which includes approximately 270 million tones of fuelwood, 280 million tones of fodder over 12 million cubic meters of timber, and several thousand tons of non-timber forest products (NTFP). This does not include the value of environmental services provided by the forests, which are estimated at US\$19 billion per year. It should be noted once again that no reliable information is available on production and consumption of wood. The total annual demand for wood is between 324-434 million cum. The total sustainable availability of wood from all sources, public and private, is only about 127 million cum per year. The huge demand and supply gap, bridged today by importing large quantities of wood and pulp and unauthorized felling, will inevitably increase.

The existing international economic system is regarded as weighted heavily in favor of the North and against the South. Indian opinion regards it as essential that market processes should be allowed to take into account the true costs of products, in order for the liberalization of trade to benefit developing countries. Because of inequitable pricing, developing countries are driven to over-exploitation of their natural resources. Liberalization of trade without corrections in the pricing system will, it is feared, accentuate the degree of over- exploitation. To reform the pricing system, it has been suggested that environment-related costs be reflected in international market prices.

There is serious apprehension that developed countries will continue to covertly pursue protectionist policies and will do so by invoking the very environmental considerations which are opposed to protectionism. For instance, trade restrictions may be imposed as non-tariff barriers by specifying standards for manufactured products or for processes which are beyond the capability of developing countries such as ecolabeling, ISO 14000 certification etc. As a result, a developing country would be compelled, at a high cost, to employ the technology of the importing country, instead of placing reliance on its own environmentally friendly technology.

Indian opinion maintains further that while harmonization of product standards is desirable, the adoption of a single standard on a global basis is illogical. Instead, product standards should be harmonized in relation to groups of producing countries enjoying a comparatively common structure of environmental conditions and socio-economic imperatives.

It will be necessary to have a long-term perspective plan for preparing our economic activities to be environment friendly and also consistent with international standards like ISO 14000

Ecolabeling

Voluntary "ecolabelling" schemes now exist in several countries, as official governmental policy or promoted by non-governmental organizations, and

internationally. As trade expands, international cooperation amongst ecolabelling schemes is required. By definition, ecolabelling imparts preferential access to markets for producers complying with certain processing and production methods. When ecolabelling and certification bodies, or other decisionmaking institutions, are captured by powerful interests, the implementation of an effective ecolabelling policy may be impossible.

In the present period of international institutional evolution, broad and balanced participation is essential to ensure both the design and the implementation of effective policies to achieve sustainable forest management. Ecolabelling could exacerbate current global trends by which developing countries' shares of international markets shrink and, within all countries, small businesses' shares of both national and international markets shrink unless ecolabelling schemes are accompanied by aggressive affirmative policies to facilitate the participation of small firms and developing country exporters.

ISO 14000 Certification

During the 'eighties the environmental community focussed international attention on the destruction of tropical forests. This broadened into a critique of industrial forestry generally, in both developing and developed nations. Campaigning took the form of bans and boycotts of timber mostly from tropical rainforests. This has now expanded into a campaign that generally covers old growth and high conservation value forests across the climate zones. In addition, environmental groups appealed directly to consumers by advocating forest products which could be demonstrated to be managed sustainably.

Timber certification must be voluntary and may apply to all types of timber and timber products. Voluntary certification will avoid trade distortions as it is the consumer who decides what to buy.

While there is growing consumer awareness and preference for environmental-friendly products/technologies worldwide including Indian consumers(in a globalised economy) , there is very less (negligible) effort on the part of both industry and the government to invest in R&D for environment-friendly technologies/processes or products. This will result into increased market share for foreign companies and products at the cost of Indian companies

India's economic and trade policies which have a bearing on forest and forest products are being progressively fine-tuned to facilitate the conservation and sustainable use of forests. This is reflected in liberal imports of forest products to relieve pressures on forests, nationalization of trade of certain forest products, incentives for wood substitution, subsidies for the use of fuel-saving devices and alternative sources of energy supply such as biogas and solar energy, and financial incentives to supply seedlings free of cost or at subsidized rates.

Recently, the Government of India has sponsored a national symposium to study the implications of WTO agreements on forestry sector. This initiated the process of

consultation with different stakeholders to formalise Indian position for various international instruments having impact on forests.

The Government of India also recently supported a workshop on Intellectual property rights in forestry issues to sensitise various stakeholders about the TRIPS, Copyrights, Geographical indications, design registration, trade marks, trade secrets etc.

16. International cooperation in capacity building, and access to and transfer of environmentally sound technologies to support SFM

Keeping in mind the changing scenario in forestry sector, it is of utmost importance that the forest department successfully re-orient itself to the needs of the ever-changing environment and this would primarily depend on the capabilities and attitudes of the staff of the department. In that sense, the HRD efforts would prove to be the cutting edge. Obviously, no organization can implement major policy, attitudinal and technological changes without the wholesale orientation and training of its staff and clients.

Switching over from control to support system of management, treating forests as part of the resources of the rural communities, modernization of its nursery, plantation and seed technology, promoting bio-diversity conservation through eco-development, and introduction of information technology as a management tool are some of the major initiatives that have been taken in the recent past. Personnel of the forest departments are trained in more than one subjects such as computer appreciation, advanced MIS and GIS applications, watershed management, soil and water conservation techniques, modern nursery and plantation techniques, participatory rural appraisal (PRA) etc.

A systematic introduction of Human Resource Management and Development processes in organizations to help in harnessing human energies and potential for personnel development and organizational effectiveness has been attempted. Human Resource Development can play a pivotal role in the continuous and sustained development of the forestry sector because ultimately the ability of the sector to reorient itself to the needs of the ever-changing environment would largely depend on the capabilities and attitudes of the staff of the Department.

The Government of India is taking all steps for capacity building of its various institutions. The Ministry of Environment and Forests would provide assistance to the States under the new Plan scheme i.e. Integrated Forest Protection Scheme during the 10th Five Year Plan and special emphasis will be given for extending environmentally sound technologies to the States.

The Ministry of Environment and Forests has implemented a World Bank aided Forestry Research, Education and Extension Project during the last five years and the project has helped in improving the capacity of the forestry sector in some of the critical areas.

Institutional Development:

Institutional Development aims to improve the management of the sector through changing the approach of the forestry personnel from a predominantly regulatory role to one in which communities are treated as partners in the management of forest resources;

increasing policy analysis capabilities; and improving the management skills of senior staff, supported by the introduction of improved management systems, for planning, implementation, monitoring and evaluation procedures, together with improved management information and geographical information systems.

There should be regional and international cooperation in training, capacity building, institutional strengthening and transfer of appropriate technologies.

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