INSTITUTE OF FOREST BIODIVERSITY
HYDERABAD

Indian Council of Forestry Research and Education

An autonomous body under

Ministry of Environment, Forest and Climate Change

Government of India

2018

FOREWORD

The Institute of Forest Biodiversity (IFB), Hyderabad was established on 7th December, 2012 by upgradation of the erstwhile Forest Research Centre, which was functioning since the year 1997. IFB is one of the nine institutes under the auspices of Indian Council of Forestry Research and Education (ICFRE), an autonomous Council under Ministry of Environment, Forest and Climate Change, Government of India.

Besides the main campus at Dulapally spread over 100 acres, the institute has one field station at Mulugu and one Forest Research Centre for Coastal Ecology at Visakhapatnam. The institute has excellent human resource consisting of scientific personnel and experienced field forest staff. IFB's research efforts are oriented towards developing strategies for conservation and sustainable utilization of forest biodiversity of Eastern Ghats. A number of research projects on assessment of biodiversity, biomass estimation, carbon sequestration, productivity enhancement through tree improvement, agroforestry and biotechnology have been completed. Some new projects on these aspects are being implemented.

The Institute is continuously striving to reach out to various stakeholders to ensure effective dissemination of knowledge and technologies. Through its extension outreach programmes over the years, the institute has strengthened its association with various stake holders *viz*., State Forest Departments, farmers, universities involved in forestry research, tree growers, NGO's and other user groups. The institute has successfully utilized the support of various International and National organizations like the World Bank, ICRISAT, NRSC, HUDA, EPTRI, CRIDA, CCMB, NMPB, MoEF&CC etc. to further its research and extension mandates in line with the vision of ICFRE Dehradun. This brochure presents an overview of the Institute and its current activities.

Director
Institute of Forest Biodiversity
Dulapally, Kompally S.O.,
Hyderabad – 500 100

INTRODUCTION:

INSTITUTE OF FOREST BIODIVERSITY (IFB) located at Dulapally, Hyderabad was initially started as "Advanced Centre for Biotechnology and Mangrove Forests" during July 1997 and later on renamed as "Forest Research Centre, Hyderabad" on 9th July, 1997. In 2012 the centre was upgraded to Institute and renamed as "Institute of Forest Biodiversity". The institute is sprawled over 100 acres campus with well-equipped research infrastructure. Besides the main campus, the institute has one field station at Mulugu and one Forest Research Centre for Coastal Ecology at Visakhapatnam.

VISION:

To attain excellence in conservation of Forest Biodiversity and sustainable utilization of Forest Genetic Resources for enhancing productivity and livelihood support

MISSION:

To pursue focussed research on forest biodiversity in order to develop strategies for conservation and sustainable utilization of forest genetic resources, eco-restoration of stressed sites, climate change mitigation and adaptation

MANDATE:

The Institute is mandated to carry out research on conservation and sustainable utilization of forest biodiversity of Eastern Ghats, Mangroves and Coastal Ecology

The scope *inter alia* includes:

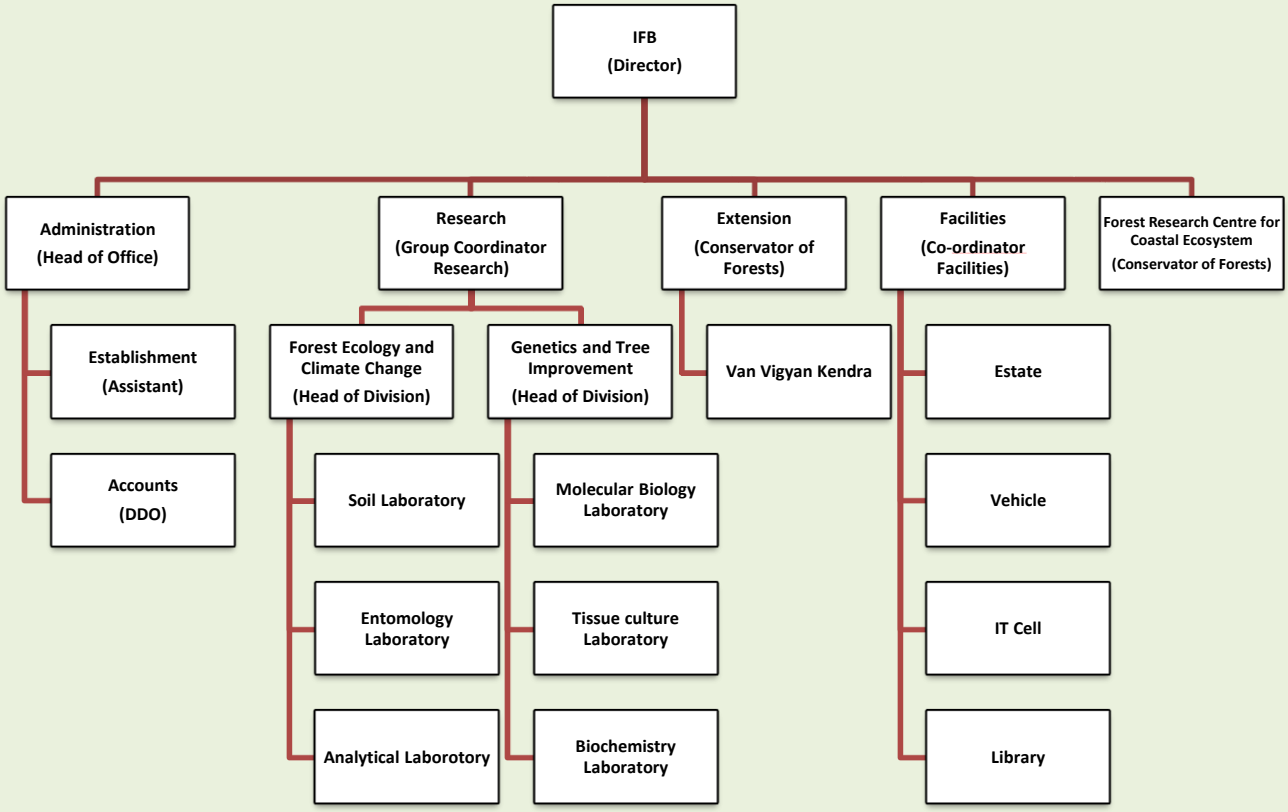
- **To undertake and promote forestry research, education and extension, leading to scientific and sustainable management of biodiversity, including marine and coastal resources**
- **To provide scientific advice to the central and state governments aiding informed decision making in matters of national and regional importance, international commitments and to address forestry research needs of mandated states**
- **To provide technical assistance and material support to states, forest dependent communities, forest based industries, tree & NTFP growers and other stakeholders in their forestry based programmes for conservation and sustainable use of forest resources**
- **To develop, upscale, disseminate and share of appropriate technologies to end-users through innovative extension strategies and capacity building programmes**
- **Quantitative ecological assessment and documentation of biodiversity of Eastern Ghats**
- **Genetic resource assessment of endemic and rare plants of Eastern Ghats for conservation planning**
- ***In situ* and *ex situ* conservation of the RET and endemic species of Eastern Ghats by identifying conservation populations/stands within the protected area networks and other approaches**
- **Sustainable utilization of Eastern Ghats biodiversity including marine and coastal biodiversity resources by applying the principles of genetic improvement, clonal propagation and agroforestry**
- **Biodiversity and climate change with emphasis on effects of climate change on the biodiversity of Eastern Ghats, mangrove forests and costal ecology and their mitigation**
- **Environmental impact assessment of mining and other mega projects on Biodiversity and eco-rehabilitation of stress sites**
- **To undertake research and knowledge management on various aspects of forests, viz., forest soils, invasive species, NTFPs, forest fires, insect pests and diseases**
- **To undertake all such activities as necessary, incidental and conducive to attainment of the objectives of the council**

ORGANISATION:

The Director, appointed by the Indian Council of Forestry Research and Education (ICFRE), is responsible for day-to-day administration and implementation of programmes.

At present, there are 7 scientists and 3 IFS officers engaged in active research and extension programmes. All scientific staffs have extensive research background and possess expertise in handling multi-disciplinary projects. In addition to the scientific personnel, there are 17 technical and 27 administrative support staffs.

ORGANIZATION CHART



Research and Extension endeavor of the institute is carried out under following three divisions:

- ✓ **FOREST ECOLOGY AND CLIMATE CHANGE DIVISION**
- ✓ **GENETICS AND TREE IMPROVEMENT DIVISION**
- ✓ **EXTENSION DIVISION**

RESEARCH DIVISIONS

FOREST ECOLOGY AND CLIMATE CHANGE

Nelapattu Birds Sanctuary

The division is engaged in projects focussing on conservation of biodiversity, ecology and climate change aspects which are very pertinent as far as addressing the issues related to conservation of ecosystem and environment and also implications of climate change are concerned.

The projects mainly deal with recording and monitoring of frequency, density and growth parameters of the trees, shrubs and herbs, and their regeneration status in all seasons in selected forests. It gives an idea on regeneration, carbon sequestration and productivity, basically a bench mark for the years under reference.

The Division has developed a number of agroforestry systems, which had better land equivalent ratios (LER ratios) in the range of 1.78 to 3.5, depending on tree and crop combinations. Taking lead from these systems, a pilot project on Paddy + Bach (*Acorus calamus*) with fish and trees, as an intensive organic farming system is underway. A project on development of agroforestry model with RET species as component is also being implemented.

D. strictus + Cotton Agroforestry models

Insect on *Sapindus trifoliatus*

Further Forests in general are vulnerable to insect pests, diseases, invasive weeds s, forest fires and anthropogenic activities. It is a known fact that considerable reduction in productivity occurs due to these infestations.

Traditional methods of protection against insect pests and diseases are very challenging. Keeping this in view, the Institute is implementing three projects focussing on IPDM approach, including plant based insecticides and biological control

GENETICS AND TREE IMPROVEMENT

Rooting in *Pterocarpus santalinus*

Tissue cultured *Pterocarpus santalinus*

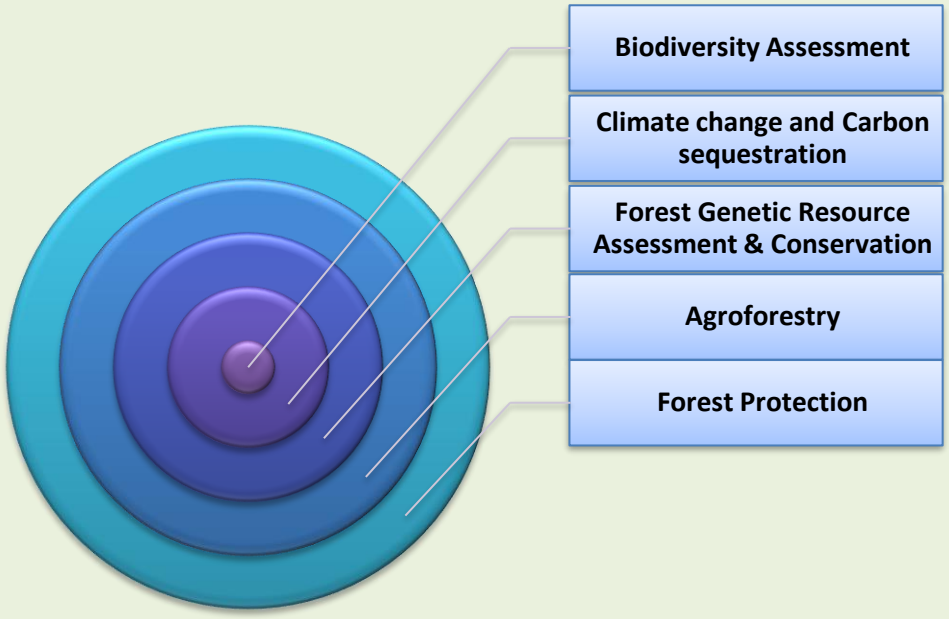
The division carries out research addressing the issues of forest genetic resource conservation, species recovery programme for a endangered species of Eastern Ghats such as *Pterocarpus santalinus, Syzygium alternifolium, Gloriosa superba, Andrographis paniculata, Rauwolfia serpentina* etc., and productivity enhancement of important and commercial species through mass selection and selective breeding which is imperative, considering the low productivity of our forests in general.

As a new initiative at national level in consonance with NFRP, an all India coordinated research project (AICRP) on 'Conservation and productivity improvement of Red sanders (*Pterocarpus santalinus* L.f.)' has been prepared in collaboration with six other research institutes. Apart from this, the productivity of medicinal plants in terms of active ingredients is also being implemented by the division.

Effect of natural biostimulants on biochemical content of endangered *Rauwolfia serpentina*

Natural biostimulants not only promote growth by increasing cell division but also influence the biochemical parameter. An ongoing project is trying to address growth and biochemical content enhancement, mainly the reserpine content of *Rauwolfia serpentina,* utilizing potential natural biostimulants as growth regulator.

BRIEF RESEARCH ACHIEVEMENTS IN THE FIELD OF



BIODIVERSITY ASSESSMENT

Phyto diversity

- Survey of north coastal AP
- Survey of 38 locations in Telangana /AP
- Phytosociological studies in Eastern Ghats of AP
- Survey of Mangroves of AP

Impact Studies

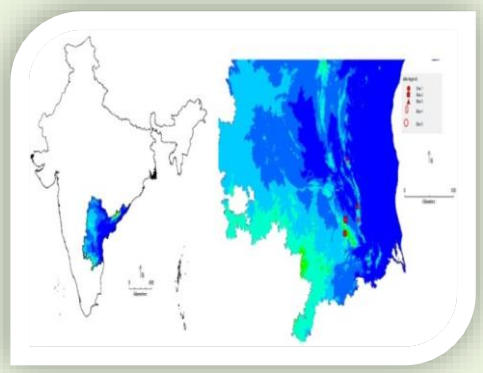
- Impact of fire on regeneration
- Impact of podu cultivation on regeneration

Quantitative assessment

- *Pterocarpus santalinus*
- *Syzygium alternifolium*
- *Melia dubia*
- *Santalum album*
- *Dalbergia latifolia*

ACHIEVEMENTS

- Surveyed and documented different plant communities of north Coastal Andhra Pradesh.
- Impact of podu cultivation on phytodiversity and soil factors in the Eastern Ghats of Andhra Pradesh investigated and information on the species diversity and regeneration potential of forest tree species (saplings and seedlings) in podu cultivation areas documented.
- Phytodiversity assessment, aimed at revision of forest types of India, undertaken at 38 locations of Andhra Pradesh and Telangana.

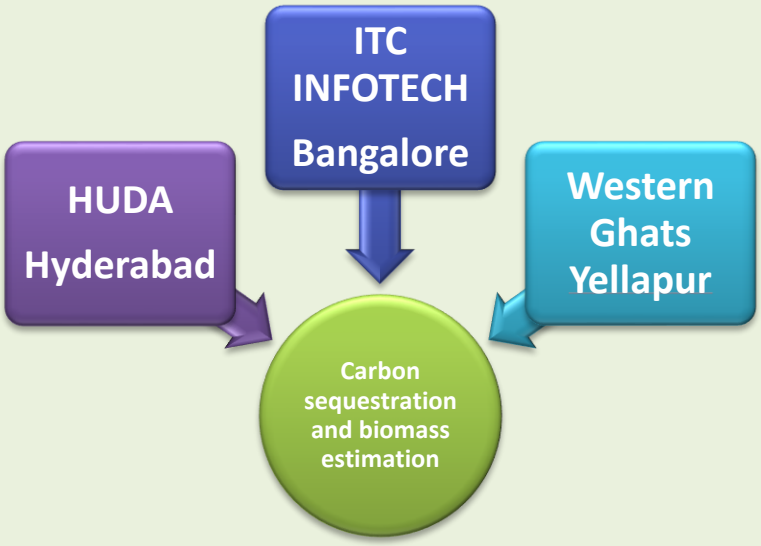


Biodiversity assessment of *Pterocarpus santalinus*

Biodiversity Assessment of Eastern Ghats

- **Quantitative assessment of biodiversity conducted in the dry Red sanders (*Pterocarpus santalinus L. f.*) bearing forest areas of Eastern Ghats, Andhra Pradesh.**
  - ***Syzygium alternifolium, Anogeissus latifolia* and *Chloroxylon swietenia* found to be the predominant species at the study locations.**
  - **In terms of IVI, the relative position of Red sanders in these communities found to be fifth and beyond.**

CLIMATE CHANGE AND CARBON SEQUESTRATION



ACHIEVEMENTS

- **The biomass prediction equations for Western Ghats of Karnataka were developed.**
  - **Above ground biomass(AGB, Kg) = 137.651 + 0.0002598 D^2H**
  - **Below ground biomass(BGB, Kg) = -152.782 + 0.02674 D + 8.320 H**

Yellapur Forest Division

- **Total AGB +BGB (Kg) = 170.756 + 0.000308D^2H**

Tectona grandis:

Total AGB + BGB (Kg) = 95.69 + 0.0004645 D^2H

Dalbergia latifolia:

AGB (Kg) = 349.546 + 0.687 D^2H

BGB (Kg) = 132.142 + 0.0007960 D^2H

- **The estimated total biomass of these forests is 255.4 tons per ha.**
  - **Stem biomass 150.3 tons/ha,**
  - **Understory biomass is 8.3 ton/ha,**
  - **Branch Biomass 54.466 ton/ha,**
  - **Total Below Ground Biomass 42.323 tons/ha.**
  - **The total Carbon in top one meter layer of soil 48.34 tons/ha.**

- **Biomass estimation and Carbon sequestration in Urban Forests raised by HUDA Hyderabad**
  - **Biomass was estimated and Carbon sequestered in 6591 ha urban plantation**
  - **Average biomass estimated = 65.43 ton/ha**
  - **Total biomass = 431,226 tons**
  - **Total carbon dioxide reduced = 711,523 tons**
  - **Soil organic carbon = 16.08 ton/ha**
  - **Total carbon stock = 105 983 tons of Carbon**
  - **Total CO2 = 388 604 tons**
  - **Grand total =1 099127 tons of CO2 or**

- **Carbon footprints for ITC Infotech, Bangalore**
  - **The total biomass was 3164 tons. Soil organic carbon was 44.4 ton/ha**
  - **Suggested 40 ha plantation to stay carbon neutral keeping future needs**

ACHIEVEMENTS IN GENETIC RESOURCES ASSESSMENT SPECIES WISE

PTEROCARPUS SANTALINUS

- ASSESSED GENETIC DIVERSITY IN *PTEROCARPUS SANTALINUS* USING CHLOROPLAST DNA MARKERS
- COLLECTED SEED GRMPLASM FROM GENETICALLY DIVERSE POPULATIONS
- ESTABLISHED GERMPLASM BANK AND VEGETATIVE MULTIPLICATION GARDEN
- DEVELOPED PLANTING TECHNIQUE USING COPPICE SHOOT

TECTONA GRANDIS

- ASSESSED MATING SYSTEM AND GENE FLOW IN A CLONAL SEED ORCHARD OF *TECTONA GRANDIS* USING MICROSATELLITE MARKERS

SYZYGIUM ALTERNIFOLIUM

- MAPPING OF *SYZYGIUM ALTERNIFOLIUM* POPULATIONS
- ASSESSMENT OF GENETIC DIVERSITY
- ESTABLISHMENT OF GENE CONSERVATION STAND

DALBERGIA LATIFOLIA

- IN VITRO PROPAGATION TECHNIQUE DEVELOPED IN *DALBERGIA LATIFOLIA*

MELIA DUBIA

- PLUS TREES SELECTED AND PROGENY TRIALS ESTABLISHED
- MACRO AND MICRO PROPAGATION PROTOCOLS DEVELOPED

MELIA AZADITACH

- PLUS TREES SELECTED AND PROGENY TRIALS ESTABLISHED

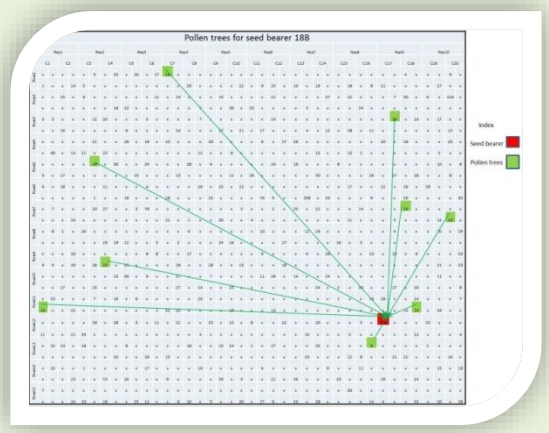
SANTALUM ALBUM

- EVALUATED PERFORMANCE OF 17 SANDAL CLONES
- DISTRIBUTED 5 LAKH SEEDLINGS TO FARMERS

FOREST GENETIC RESOURCE ASSESSMENT & CONSERVATION

- **Assessed Genetic Diversity in the natural populations of *Pterocarpus santalinus* using cpDNA markers.**
- **Established a 'Gene Conservation Stand' of *Pterocarpus santalinus* containing 500 germplasm from 8 different populations.**

VMG of Redsanders



Gene flow study within a Teak CSO

- **Developed an improved field planting technique of *Pterocarpus santalinus* using coppicing technique.**
- **Assessed mating system and gene flow within a clonal seed orchard of *Tectona grandis* using microsatellite markers.**
- **Identified problems and generated recommendations for better management of Teak clonal seed orchards.**

Protocol for *in vitro* propagation standardized for *Dalbergia latifolia*.

Multiple shoot initiation standardized in *Pterocarpus santalinus*.

Assessment of *Melia dubia* and *M. azedarach* plus trees:

- ***Melia dubia* plus tree, PDT- 15 was superior in height and diameter followed by PDK-1 and PDA-24 (21.6 cm DBH and 7.1 m height).**
- **Similarly in *M. azedarach*, PAK-6 exhibited maximum height and diameter followed by PAK-9 and PAK-3.**

Macro and micro propagation protocols developed for *M. dubia*.

Rooting behavior in *Melia dubia*

Tissue cultured *Melia dubia*

Melia dubia trials

CURRENT FOCUS

- **Identification and selection of superior germplasm (plus trees) in *Pterocarpus santalinus***
- **Establishment of progeny test area-cum-seedling seed orchard in *Pterocarpus santalinus*.**
- **Mapping natural populations of the endangered and endemic species – *Syzygium alternifolium*.**

Plus tree selection from plantation populations of Redsanders

Plus tree selection from natural populations of Redsanders

- **Assessment of genetic diversity and structure in *Syzygium alternifolium* for identifying genetically diverse populations.**
- **Establishment of gene conservation stand for *Syzygium alternifolium* as part of species recovery programme.**

AGROFORESTRY ACHIEVEMENTS

- **Several agroforestry models were tested in the semi-arid tropics of Telangana and Andhra Pradesh.**
- **Eight different models found suitable for the region.**
  - **Technologies were extended to more than 3000 farmers.**
  - **Sandal, Red sanders and *Melia dubia* have been planted in over 10,000 ha in both the states of A.P. and Telangana.**
  - **In one of the model predator-prey balance and significant higher yield of cotton could be achieved when cotton was grown as intercrop with ten other tree, bamboo and horticulture species.**

***Annona squamosa* + Cotton**

***D. strictus* + Cotton**

AGROFORESTRY MODELS

Gambhar + Sorghum
Gmelina arborea* + *Sorghum vulgare

Rosewood+ Sandal + Green gram

Teak + Tulsi

Irrigated AF Model

Eucalyptus + Cotton

Sandal based model

Current Focus

- Presently the Institute is working on an intensive organic farming system with *Acorus calamus* + Rice + fish + Trees
- The model has been successfully established in 20 acres and being extended to another 50 acres area.
- The initial result demonstrated promising yields – 12.5 quintals per acre yield of *Acorus* (Rs 1.5 lakh for propagules) and 7.0 quintals fish per acre (Rs 50,000/).

A. calamus crop, rooted propagule and Paddy in bearing

INTEGRATED PEST MANAGEMENT ACHIEVEMENTS

- IPM practices have been developed for important pests of *Emblica officinalis e.g.* Aonla aphid, Stem gall insect, and Bark eating caterpillar.

Infestation of Aonla by gall insect

CURRENT FOCUS

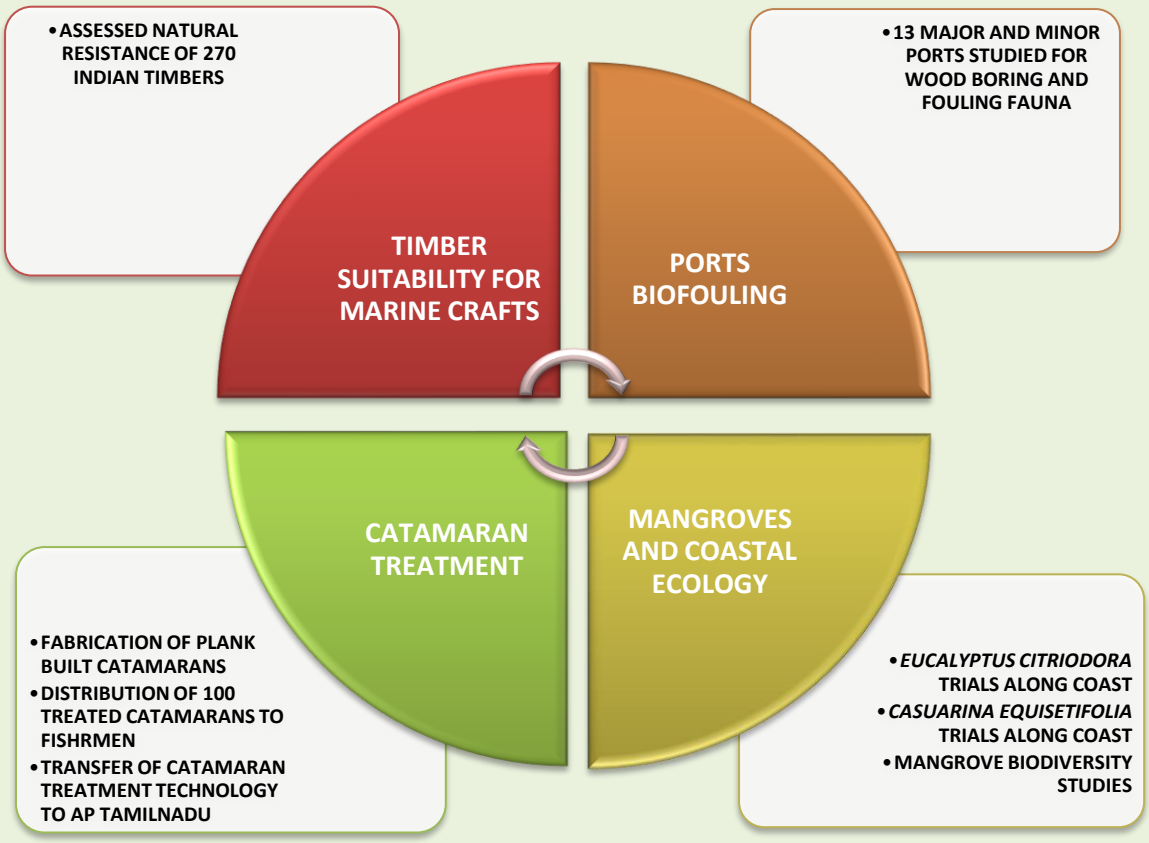
- Development of IPM practices for nursery & plantation insect pests of *Sapindus trifoliatus*.
- Identification of alternative ecofriendly method for control of forest insect pests through ethno-insecticidal plants.
- Biological control of Teak Defoliator and Teak Skeletonizer with local strains of *Trichogramma sp.*

Egg parasitoid - *Trichogramma*

Potential ethno-medicinal plant- *Sphaeranthus indicus*

Soapnut internode borer

ACHIEVEMENTS IN WOOD BIODETERIORATION STUDIES



BIOFOULING IN PORTS/HARBOURS

Achievements

- Assessed natural resistance of 270 species of Indian timbers against marine organisms attack and enlarged the choice of timbers for marine craft, especially traditional flotilla and seafront structures
- Screened several chemicals and compounds for their efficacy in protecting timber from marine borer attack

- ✓ Copper chrome arsenic (CCA) and copper chrome boric (CCB) found best for fishing craft
- ✓ Creosote fuel oil for stationary structures
- ✓ Appropriate use of wood preservatives usually imparts at least four-fold increase in the durability of timber under marine conditions

- **Characterized wood boring and fouling fauna in thirteen major and minor ports for the first time in the country. New introductions to the communities recorded and notified to the concerned authorities**

Developed

- **a simple device for filtering and aerating water used in breeding experiments**
- **a simple device for determination of oxygen consumption of marine animals**
- **an *in situ* technique for measuring oxygen uptake of wood boring teredinids**

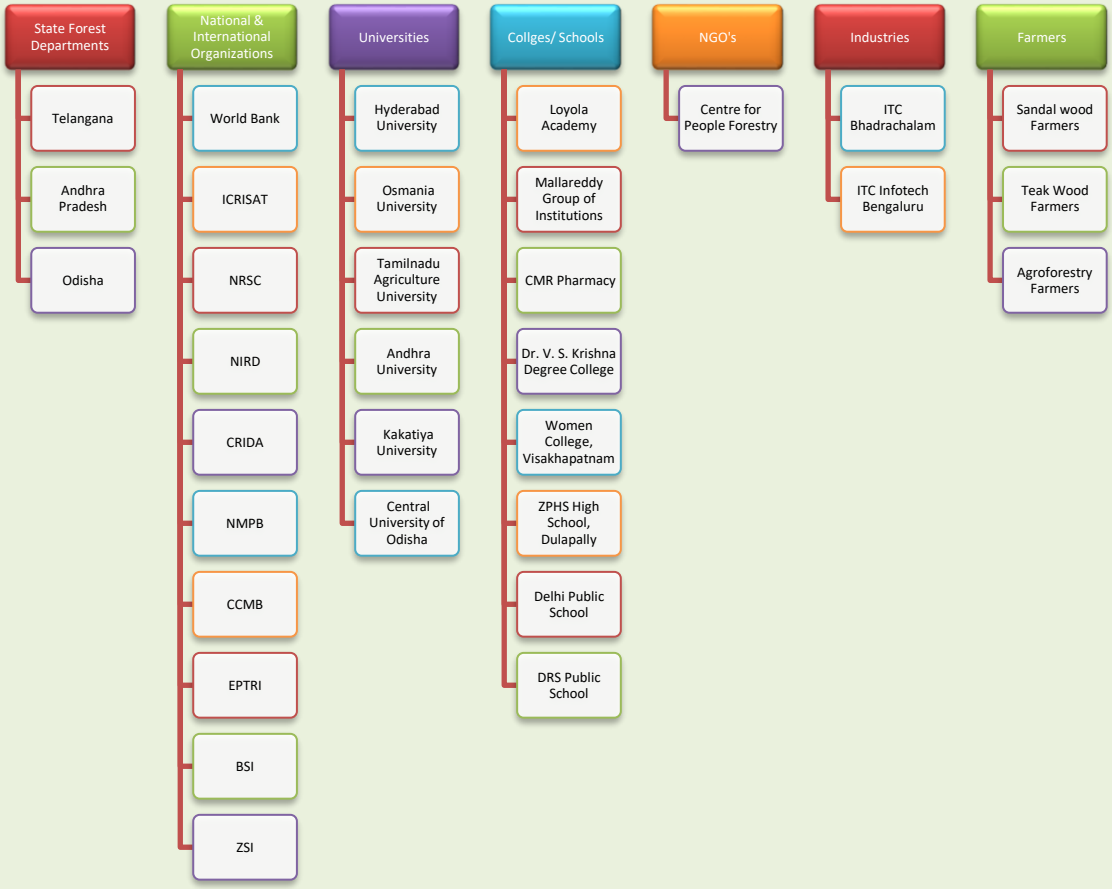
TRANSFER OF TECHNOLOGY ON TREATED WOODEN STRUCTURES

- **Installed treated stationary timber structures in few harbours to promote the use of preservative treated wood in marine constructions**
- **Documented fabrication particulars along with computerized drawings of plank-built catamarans of recent origin**

- **Distributed 100 preservative (CCA) treated catamarans made of perishable timber (*Bombax ceiba)* to fishermen in Andhra Pradesh and Tamil Nadu to popularize technology transfer for poverty alleviation**
- **Conducted several technology demonstration programmes on timber treatment, benefits of utilization of treated catamarans in Andhra Pradesh and Tamil Nadu**

COLLABORATIVE RESEARCH:

The Institute has research/extension linkages with



EXTENSION:

Training plays an important role in faster dissemination and in enhancing the capability of end users of research. IFB under its dedicated Extension division is organizing regular training programmes on wide ranging topics like Agroforestry, Forest Genetic Resource Conservation & Management, Integrated Insect Pest Management, Nurseries and Plantations Techniques of Trees and Medicinal Plants etc.

- **Several training programmes sponsored by NMPB, NTPC, MoEF&CC etc., conducted for farmers, college teaching staffs and students, staffs of NTPC and other stakeholders**
- **Till last year 5000 farmers received training in agroforestry and cultivation of medicinal plants**

Inception Training for assessment of Forest Resources with AP Forest

Interactive meeting with a team of ITC Bhadrachalam

Circle level Training for assessment of Forest Resources with Telangana Forest

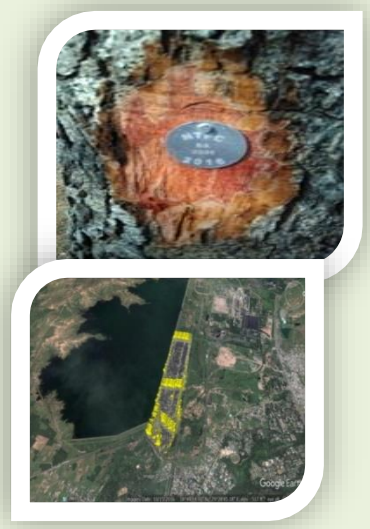
Training programme on Forest Genetic Resource, Conversion and Management for other stakeholders

CONSULTANCIES:

- **25 consultancies completed on Environmental Impact Assessment studies for organizations like NTPC, AP Irrigation Department, AP Tourism Department, NMDC, AP Forest Department, Telangana Forest Department**
- **Monitoring Evaluation studies – NMPB, FDA of APFD.**

Ongoing consultancies include

- **Consultancy project entitled "Enumeration, geotagging and inventorization of tree-biodiversity at NTPC-RSTPS" implemented for NTPC**
- **All together 2, 93, 983 tree belonging to 169 species enumerated**
- **IFB created an Excel database containing data for all the trees enumerated**
- **IFB created shape files for blocks using geotagging data**
- **These shape files can be used to visualize geographic location of blocks and trees on Google Earth**



Tagging and Geotagging of trees at NTPC, Ramagundam

Training of Forest officials on sample plot laying and data acquisition

- **Working plan consultancy for Telangana and Andhra Pradesh Forest Departments**
- **IFB extended technical know-how for 'Assessment of Forest Resources for Preparation of Working Plans', for 14 Forest Divisions Telangana and 7 Forest Divisions of Andhra Pradesh.**
- **Consultancy for monitoring of NTPC plantations implemented in Krishna, Guntur and Paderu forest divisions in Andhra Pradesh, and Mahabubnagar division under Telangana state**

Monitoring and evaluation of 10 million trees of NTPC

- **Consultancy for Monitoring and Evaluation of the 27000 ha plantations raised under CAMPA in Andhra Pradesh from 2009 to 2016 being implemented**

SERVICES:

Institute of Forest Biodiversity, Hyderabad provides following services

- **Carbon analysis**
- **Soil analysis**

EDUCATION:

The Institute is now recognized as a centre of Forest Research Institute Deemed to be University.

- **Entrance examination for enrollment to Ph.D. being conducted at the Institute every year**
- **Research infrastructure at the Institute being used by M.Sc. students for dissertation works.**

INFRASTRUCTURE AND FACILITIES:

Over the 18 years of Institute's existence necessary infrastructural facilities have been strengthened which includes laboratories, nursery facilities like green house, shade house, field trial plots, library, information technology and other facilities. The Institute is having full-fledged laboratories which are well equipped with all modern facilities to undertake multi-disciplinary research.

- Molecular Biology Laboratory
- Soil Laboratory
- Tissue Culture Laboratory
- Entomology Laboratory
- Biochemistry Laboratory
- Analytical Laboratory

Some of the equipments available at the Institute listed below:

- BOD Incubator
- C H N Auto Analyzer
- Electrophoresis apparatus
- Seed germinator
- Spectrophotometer
- Thermal Cycler
- Flame Photometer
- Tissue Homogenizer
- Photosynthetic meter
- Gel documentation system
- Stereo zoom microscope with mounted camera
- Centrifuges

Other infrastructural facilities:

- Library
- Conference Hall
- Training-cum-Extension Centre
- IT Cell
- Nursery, Shade House & Mist Chamber

LIBRARY:

- IFB has one scientific library with about 1000 books, 242 bounded journals, 29 CD /Cassette & Journals covering all disciplines related to forestry. The library has access to NFLIC, Dehradun and online database.

PUBLICATIONS:

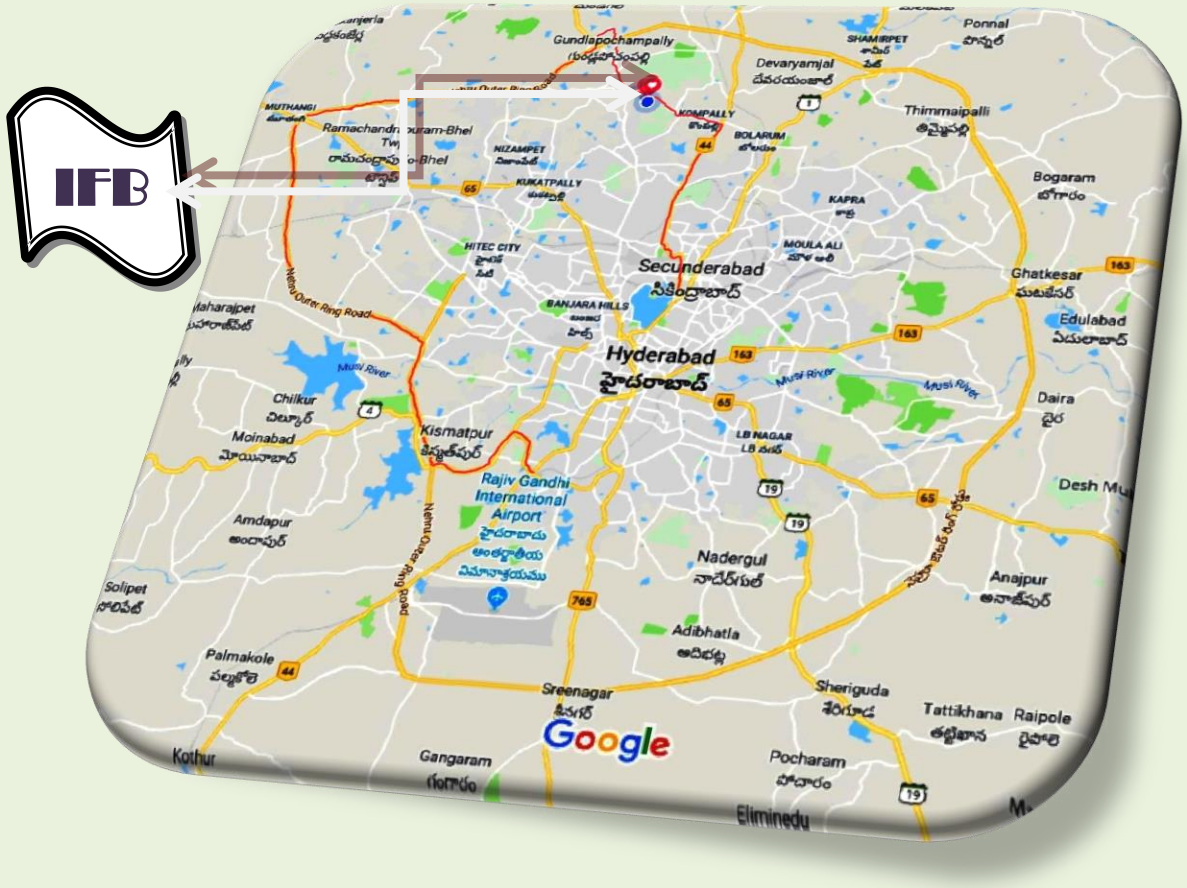
IFB since 2016 has disseminated their research achievements in the form of various publications including 2 in International Journals, 14 in National Journals, 11 Books Chapters/Proceedings, 01 Manual, 26 Abstracts and 1 Popular Article.

ROAD AHEAD

- To take up species recovery programme in endangered, endemic and medicinally important species of Eastern Ghats, like *Shorea tumbuggaia*, *Terminalia pallida, Boswellia ovalifoliolata*, *Shorea roxburghii*, *Cycas beddomei*, and Mangrove species *etc*.
- To co-ordinate with other ICFRE Institutes for implementation of species recovery programme for other endangered species specific to their region
- To validate the benefits of Agro forestry land use, by laying on-farm trials
- To extend tested and promising agroforestry models to more farmlands to enhance the economic returns for the farming communities
- To develop cost effective techniques for mass production of bio-control agents
- To develop techniques for behavioral management of forest insect pests
- To utilize beneficial insects for tree improvement
- To develop protocols for development of virulent strains of bio-agents
- To take up selection, collection and evaluation of germplasm and investigation on inheritance pattern of tree and medicinal plant species
- To excel as the best research, training and extension institute in the states of Telangana, Odisha and Andhra Pradesh

ROUTE MAP:

This institute is 23 Km away from Secunderabad Railway station, and 70 Kms from Rajiv Gandhi International Airport, Shamshabad.



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