

## Registering Varieties of Forest Tree Species in India

The Institute has developed guidelines for DUS (Distinctness, Uniformity and Stability) testing of *Casuarina equisetifolia*, *C. junghuhniana*, *Eucalyptus tereticornis* and *E. camaldulensis* with financial support from Protection of Plant Varieties and Farmers' Rights Authority, Government of India for registration of varieties in forestry species. IFGTB is now the DUS testing centre for Casuarina and Eucalypts forestry species. Attempts are in progress for establishing protocols for *Melia dubia* and Teak.

## Seed Supply

IFGTB supplies quality seeds of Casuarinas, Eucalypts and Acacias to farmers, industries, and other user groups. Seeds of indigenous species such as Gmelina, Melia, Allanthus, Soapnut, Calophyllum, Neem, Pungam are also supplied.

## Release of Forest based value added products

The Institute has developed Biopesticides (Vilvekam, HyAct and Tree PAL) and Biofertilizers (N-Fixer, K-Mobiliser, VAM, Tree Rich Biobooster), and a natural colourant Tara Red.



Release of Natural colourant

## Extension

### Gass Forest Museum

The Gass Forest Museum was established by H.A.Gass, a British Forest Officer. In 1902, it was opened by Lord Amthill, the then Governor of Madras Presidency. It is one of the largest and oldest museum in our country. The museum houses a rich collection on various categories under forestry.



## Education

IFGTB is a centre of FRI Deemed University, Dehradun and Bharathiar University, Coimbatore - conducts Ph.D. programmes in forestry and allied fields

### Students Edu Centre

Students Edu Centre in Gass Forest Museum spreads awareness on Forest, Environment and Conservation issues. Periodical awareness campaigns are being conducted for School and College students. Documentaries / Film shows on natural conservation are screened for museum visitors. The visitors are orientated have prior to museum visit and theme based programs are organized on request.



## Tree Growers' Mela

Institute of Forest Genetics and Tree breeding, Coimbatore is a pioneer Forestry Institute in organizing Tree Growers' Mela in several strategic places in Tamil Nadu and Kerala since 2009 to spread awareness on tree cultivation using improved planting materials, including clones. Tree Growers' Mela served as an integration platform for Farmers, scientists, industrial partners and government agencies to serve forestry research and market inputs to the tree growers, for enhancement of productivity and income.



## Scientific Authority of CITES

MoEF & CC has designated IFGTB as CITES Scientific Authority for Plants along with Four other Institutes in India viz., BSI, ZSI, WII and CMFRI. IFGTB has completed NDF study for *Pterocarpus santalinus*, an endangered species of Eastern Ghats.

## Forest Genetic Resource Management Network (FGRMN)

MoEF & CC has identified the ICFRE as the nodal centre for establishing the FGRMN with its two regional stations, one in the South at the IFGTB, Coimbatore and the other in the North at FRI, Dehradun. Initiatives for activities in the FGRMN have commenced since 2011. The FGRMN acts as a nodal agency at national level for collection, conservation, characterization, documentation and sustainable utilization of indigenous and exotic Forest Genetic Resources. Thirty species have been prioritized for FGRMN in the country. IFGTB also prepared the Country Report on the State of Forest Genetic Resources through a national consultative process.

## ENVIS Centre

An ENVIS Centre on Forest Genetic Resources and Tree Improvement was established at IFGTB in 2014 with funding from MoEF & CC. It serves as a single window system to document the existing genetic resources and Tree improvement methods with various stakeholders across the country for the dissemination of information and create National and International Networking among the users.

## Clonal Releases

IFGTB has released 30 clones of Casuarina and Eucalyptus possessing superior characters like fast growth, drought and pest tolerance, wind resistance and adaptability to sodic soils. They are now widely planted throughout the country and are replacing the clones under cultivation so far. IFGTB clones yield an additional wood production on an average of 5 tonnes per hectare per year depending on the site conditions and cultivation practices. They can be procured either from IFGTB or nurseries licensed by the Institute for raising plantations.



Clonal plantation of IFGTB - CH - 1 (Age 1 Year)

# INSTITUTE OF FOREST GENETICS AND TREE BREEDING

(Indian Council of Forestry Research and Education)  
An Autonomous body of Ministry of Environment, Forest & Climate Change, Govt. of India



IFGTB is located in the Forest Campus, in the heart of Coimbatore city. It caters to the forestry research and development needs of Tamil Nadu, Kerala, Andaman & Nicobar Islands, Puducherry and Lakshadweep.



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# Mandate

To develop new varieties, management and silvicultural techniques to maximize productivity of natural and planted forests under different ecological considerations and changing environment.

## Thrust Areas

1. Increasing productivity and evolving new varieties for farmlands / plantations by scientific breeding programmes, biotechnological interventions and silvicultural applications.
2. Forest Genetic Resources Management (FGRM) for conservation, sustainable utilization and development of Forest Genetic Resources (FGR).
3. To develop mitigation and adaptation strategies in forestry to meet the challenges of climate change.
4. Biodiversity documentation, conservation and restoration of fragile and degraded forest ecosystems.
5. Research and knowledge management of forest soils, invasive species, forest fires, insect pests and diseases.
6. Bioprospecting of forest resources for eco-friendly product development.
7. Dissemination and sharing of technologies through innovative extension strategies.
8. Market research for tree products, economic valuation and socio-economic studies.

## Long-Term Goals

1. Increasing tree biomass productivity in farmlands / plantations / homesteads through scientific breeding programmes and biotechnological interventions.
2. Making available quality planting stock by establishment of orchards, SPAs and micro and macro propagation units.
3. Forest Genetic Resources Networking for conservation, management and sustainable utilization.
4. Support agroforestry, trees outside forests, plantation forestry for supply of wood resources to wood based industries.
5. Identify lesser known timber species from forests, to support production forestry and germplasm conservation.
6. Adaptation and mitigation research on Forests and Climate Change.
7. Emphasis on plantation health monitoring and productivity enhancement through species specific approaches involving use of biofertilisers and biocontrol agents.
8. Strengthen forests and plantation health through research inputs including precision silviculture practices.
9. Bioprospecting and innovative product development from renewable forest resources.

10. Provide forestry solutions to State Forest Departments, Farmers and other stake holders for productivity enhancement and conservation gains.
11. Promoting Consortia Based Research.
12. Forestry education and Intensive Extension programmes to mandated states and stake holders.
13. Green Skill Development programme.



Kanimara Teak

FACILITIES	LABORATORIES
<ul style="list-style-type: none"> <li>• Forest Nurseries</li> <li>• Vegetative Propagation Complex</li> <li>• Seed Processing Centre and Seed bank</li> <li>• Herbarium (Since 1911)</li> <li>• Botanical Garden</li> <li>• VAM Production Unit</li> <li>• Functional Genomics</li> <li>• Insectary</li> <li>• Microscopy and Image analysis</li> <li>• Open Top Chambers</li> <li>• Library</li> <li>• Scientist Hostel/Rest House</li> </ul>	<ul style="list-style-type: none"> <li>• Soil and water testing</li> <li>• Seed testing</li> <li>• Phytochemistry</li> <li>• Tissue culture</li> <li>• Molecular Genetics</li> <li>• Cytoogenetics</li> <li>• Genetic transformation</li> <li>• Genomics</li> <li>• Molecular Physiology and Biochemistry</li> <li>• Entomology</li> <li>• Pathology</li> <li>• Geomatics</li> </ul>

## Projects and Programmes

The Institute handles in-house projects with support from the National Forestry Research Plan. The Institute also undertakes clientele based research with funding support from external agencies including wood based industries. Collaborative projects (National and International), technical consultancies and Networking Projects. All India Co-ordinated Projects on Casuarina, Eucalyptus tree species are also being undertaken.



Mist Chamber



Functional Genetics Experimental Facility

## Major research areas in focus

### Genetic Improvement

The Institute is implementing long term breeding programmes for Acacia, Casuarina, Eucalyptus and Teak. Seed orchards and vegetative multiplication gardens have been established to produce genetically improved seeds and clones. The improved planting material deployed in large scale commercial plantations resulted in increased wood production. Systematic genetic improvement programmes are under progress for Ailanthus (matchwood),

Gmelina, Melia (plywood), Cadamba (pencil wood), Pongamia, Calophyllum, Sapindus (oil and biofuel), Leucaena (pulp wood and fodder), Tamarind (fruit and natural pigment) and Thespesia (secondary timber). High yielding clones of these species are under various stages of development.



Fast growing Teak clone

### Forest Genetic Resources



Selected Teak plantation for conservation at Nilambur, Kerala

Forest Genetic Resources (FGR) are the genetic variation in trees that has potential economic, environmental and societal value and present benefit to the humans. Exploration, collection, conservation, characterization, documentation and sustainable utilization are the major activities of FGR management.

The genetic resources of Teak in Tamil Nadu and Kerala have been evaluated and selected 53 desirable populations and plantations for *in situ* conservation. Evaluated and documented the *ex situ* genetic resources of important tree species, and identified the potential seed Orchards and SPA for effective utilization. Characterization of germplasm and establishment of field gene bank as *ex situ* conservation were also carried out.

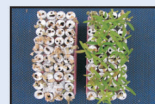
### Genomics and DNA Markers

Molecular characterization of species, provenances and clones of Casuarina, Eucalypts, Teak, Jatropha, Swietenia and Pterocarpus using various dominant (RAPD, ISSR, AFLP) and co-dominant markers (SSR) were carried out. Genetic linkage maps in eucalypts is developed with SSR and SNP markers for tagging of QTLs/Genes for the economically important traits like wood properties, salinity and adventitious rooting. Draft genome of teak and sandal was assembled and annotated. It would propel research in population diversity conservation and accelerated breeding.



GeneBio analyzer

### Genetic Engineering



Methods for functional analysis of genes by combining gene silencing approaches and composite plant strategy has been

developed, and used to identify a key sodium transporter gene determining salt tolerance in Eucalyptus. The gene silencing construct developed is being used for generating transgenic Eucalyptus for enhancing salt tolerance. For incorporating tolerance to the Eucalyptus gall pest, *Leptocybe invasa*, a multigene targeting RNAi construct specific to the pest has been developed after sequencing and analysis of the insect's transcriptome sequence. The construct is being used for generating transgenic Eucalyptus.

### Tissue Culture



Tissue culture plants of teak

Difficult to root eucalypts and acacia clones were rejuvenated through tissue culture and juvenile stock plants developed for mass propagation through microcuttings. Various bamboo species were micropropagated from selected phenotypes and evaluated for their field performance. Large-scale micropropagation of selected superior performers of teak is conducted and supplied to farmers. Selected medicinal trees, which are destructively harvested from forests, are multiplied to supply planting stock.



Different seed lots of teak

### Seed Handling and Seed Testing

Seed handling and testing procedures have been developed for major plantation species such as Teak, Casuarinas, Eucalypts and Acacias; Tree Borne Oilseeds like Neem, Pungam, Calophyllum; and for commercially important medicinal species, Rare Endangered & Threatened species and Shola species.

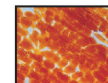
### Agroforestry Systems

Teak, Casuarinas and Acacias based agroforestry systems have been developed and demonstrated for higher economic returns. A Casuarina based windbreak agroforestry system has also been developed for crop protection and enhanced productivity. Agroforestry models using fast growing indigenous species are being developed for different agroclimatic zones.



Conal Windbreak Agroforestry Systems

### Forest Health



The Institute undertakes identification of key insect pests and disease problems of selected economically important tree species, development of Pest Calendar depicting period of occurrence of key nursery pests and their integrated methods of management involving surveillance, cultural practices, conservation and augmentation of natural enemies, use of plant based extracts and need based application of pesticides.

Identification of potential beneficial microbes and developing biofertilizer products for production of quality planting stock of commercially and environmentally important tree species is also carried out.

Besides above, impact of different levels of elevated CO<sub>2</sub> on the activity of microbial symbionts (Arbuscular mycorrhizal fungi, *Rhizobium* and *Frankia*) in *Acacia auriculiformis*, *Casuarina equisetifolia* and *Eucalyptus camaludensis* are also being studied to understand the relationship between these tree crops and CO<sub>2</sub> for assessing climate change impacts.

### Conservation

Species recovery research on selected RET medicinal plants in Silent Valley and Koll hills Medicinal Plant Conservation Areas (MPCAs) carried out for developing *in situ* conservation strategies. A bambusetum containing 17 species is also being maintained in the Forest campus. IFGTB maintains a Botanical Garden recognized by the Botanical Garden Conservation International, UK and the Indian Botanical Garden Network, Lucknow.

Documentation of butterfly diversity in Walaray and Orthopteran diversity in the Nilgiri Biosphere Reserve have also been carried out.



Papilio polymnestor