



**वनसन्धान**

**Indian Council of  
Forestry Research & Education**





FROM LITTLE SEEDS

**ICFRE**  
1986-2019

GROW MIGHTY TREES



**INDIAN COUNCIL OF FORESTRY  
RESEARCH & EDUCATION, DEHRADUN**  
(An Autonomous body of Ministry of Environment,  
Forest and Climate Change)


**2019**



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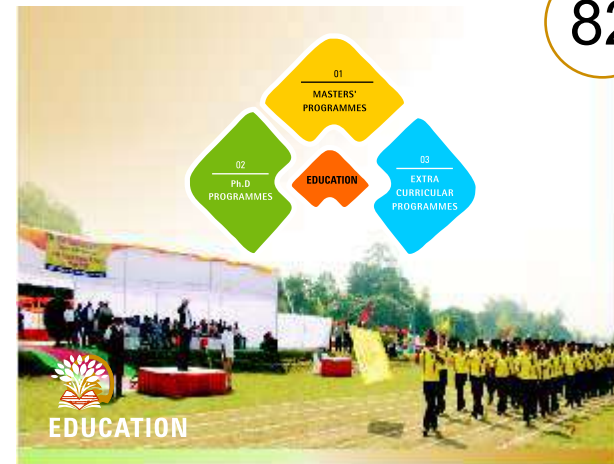
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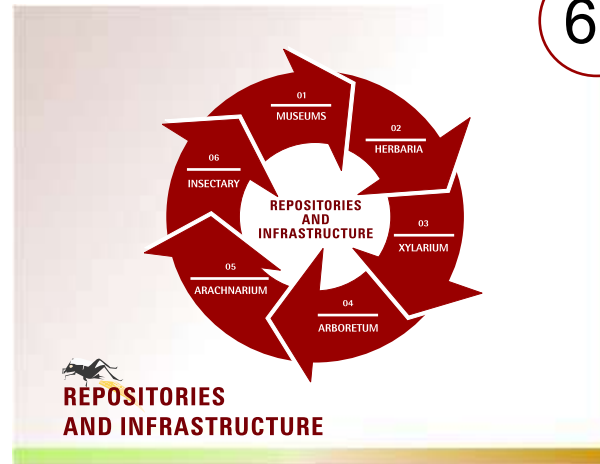
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# FOREWORD




सत्यमेव जयते



Commemorating the glorious years of the Indian Council of Forestry Research & Education (ICFRE), Dehradun, this Coffee Table Book unfolds its history and showcases recent actions, success, and ambitions that translated into reality. ICFRE's focus areas of ecology, environment and biodiversity conservation, tree improvement, climate change, forest productivity enhancement, products for livelihood generation, forest education and extension, and awareness creation have been brought forth.

The journey of over 33 years makes us feel proud and delighted and motivates us to move forward to achieve new heights / horizons. It all began in 1986 when ICFRE was set up as an umbrella organization for enhancement of forestry research, education and extension systems of the country and granted the status of the autonomous Council of the Ministry of Environment, Forests & Climate Change, Govt. of India on 1st June, 1991. We are not only present in Dehradun but across the country, represented by 9 regional research institutes and 5 centres.

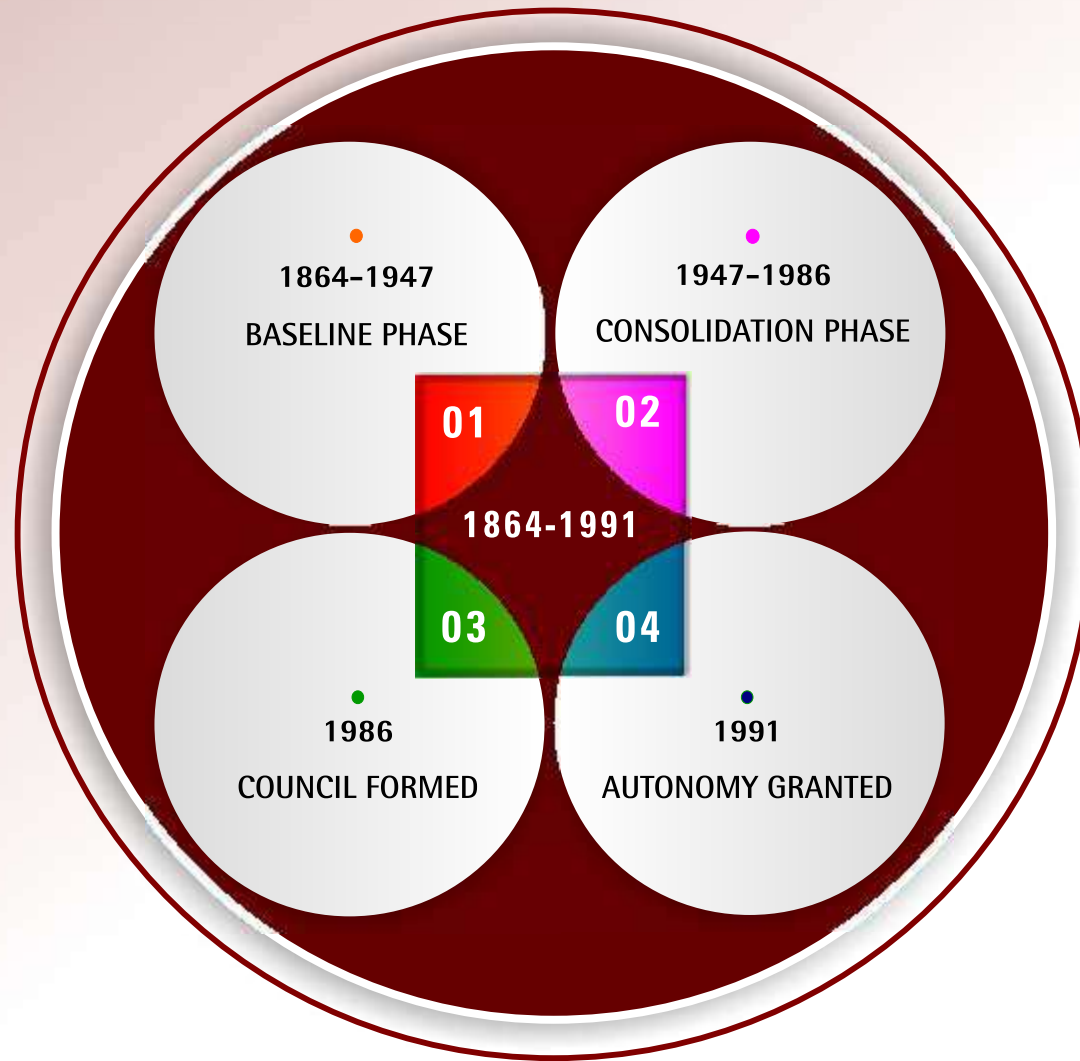
I am convinced that this Coffee Table Book with its lavish collection of photographs, and its clear and lively script is worth a read. I sincerely thank to all who spared their valuable time and contributed diligently in making this publication a success.

  
(Suresh Gairola)

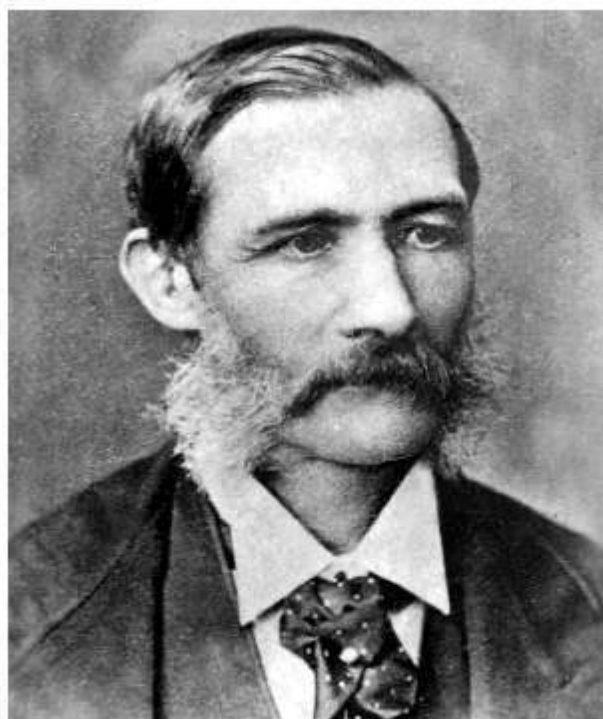


**Dr. Suresh Gairola, IFS**  
Director General

INDIAN COUNCIL OF FORESTRY RESEARCH AND EDUCATION,  
DEHRADUN







**Sir Dietrich Brandis, KCIE, FRS**

31 March, 1824 to 28 May, 1907

**Founder of scientific forestry in India**

In 1864, Dr. Brandis was appointed the first Inspector-General of Forests to the Government of India, a position he held with distinction for 19 years until his retirement. His monumental publications include *The Forest Flora of North-West and Central India* (1874) which earned him Fellow of Royal Society in 1875 and *Indian Trees* (1906) which was published after his retirement. He was awarded Knight Commandership in 1887 for his services in India.

## PROLOGUE

Forestry Research in India was initiated by the setting up of the Imperial Forest Research Institute in 1906. The increasing momentum of research led to a shift in the premises twice, first from the present-day Ranger's College to Chand Bagh, (now houses the famous Doon School) and then to the present campus, New Forest. With emergence of new disciplines and national needs in forestry research, the Indian Council of Forestry Research and Education was formed in 1986 by realigning the erstwhile research centres of the Forest Research Institute spread across the country. Granted autonomy in 1991, ICFRE presently has nine institutes and five centres spread across the country.



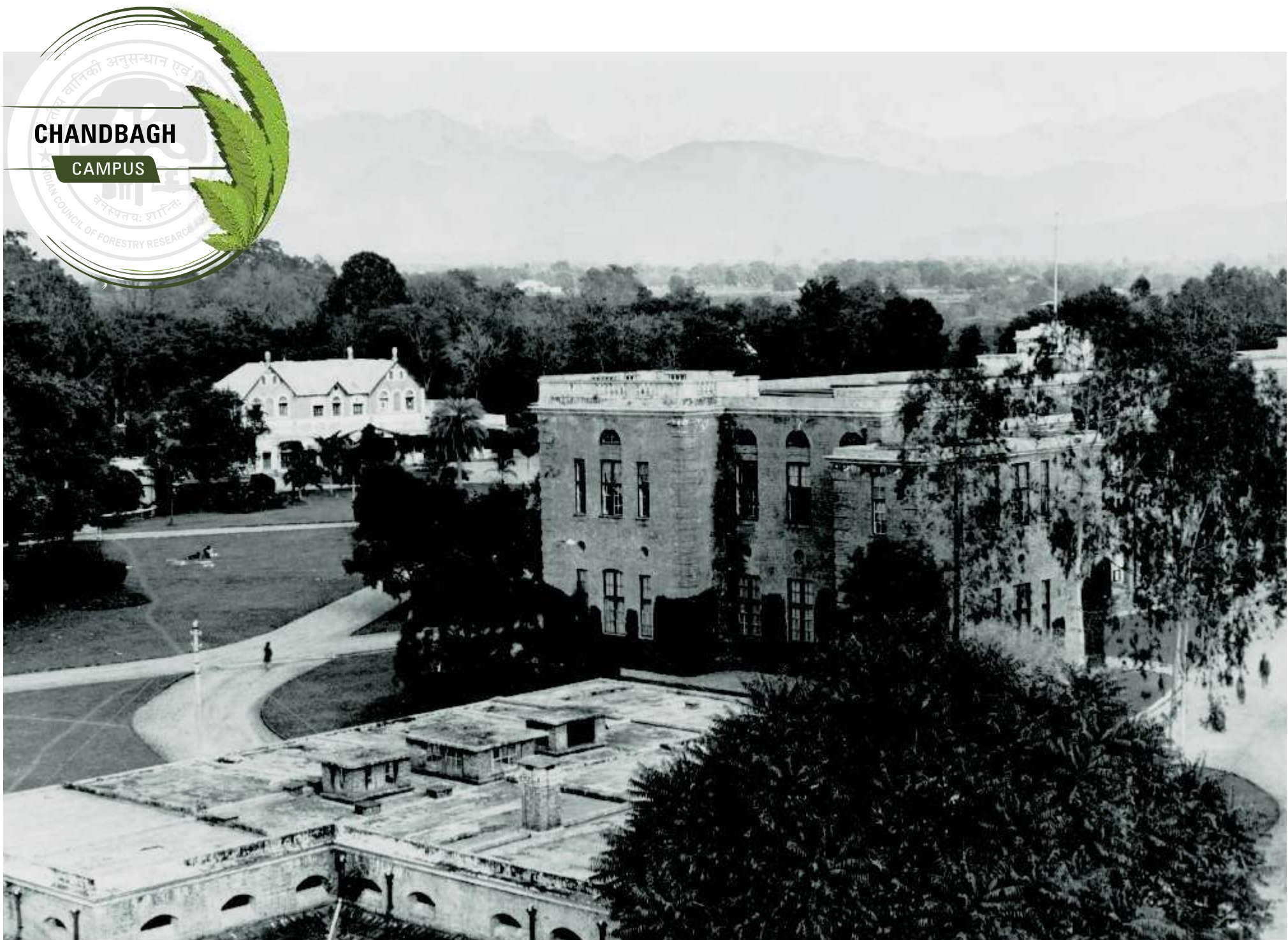
**CENTRAL FOREST  
SCHOOL**

IFRI



Birthplace of Forestry Research : Rangers College

The Rangers College is presently a regional office of the Ministry



The next destination: Chandbagh Campus | Photo: R.P. Dalley, 1922



*The journey of ICFRE was initiated way back towards the end of the nineteenth century with the advent of scientific forestry in India and the establishment of the Forest School in Dehradun in 1878. It was on 5 June 1906 subsequently that the Imperial Forest Research Institute was founded by Government of India for taking forward forestry research in the country. In 1986 the Indian Council of Forestry Research and Education or ICFRE was formed as an umbrella organisation for taking care of forestry research, education and extension needs of the country. Finally on 1st June 1991, the ICFRE was declared an autonomous Council under the then Ministry of Environment and Forests and registered as a Society under the Societies Registration Act, 1860.*

*Presently, ICFRE with its Headquarters at Dehradun is an apex body in the national forestry research system that promotes and undertakes need based forestry research extension.*



Styled in Greco Roman Architecture by C.G. Bloomfield, the main building was inaugurated in 1929 by then Viceroy Freeman Freeman-Thomas, 1st Marquess of Willingdon. It is now a National Heritage site.

**1864**  
Beginning of Scientific Forestry



## HIGHLIGHTS

1864-1947

DOCUMENTATION  
AND RESEARCH  
BASELINE PHASE

(Forest Floras, Timber  
Manuals, Wood  
Identification Keys,  
Volume & Yield  
Tables, Repositories)

1947-1986

CONSOLIDATION  
PHASE

(Wood Research,  
Pulping Techniques,  
Classification of  
Forest types,  
Plantation  
Techniques, NTFPs,  
Strengthening of  
Repositories)



**1906**

IFRI established with six research disciplines –  
Silviculture | Working Plans | Forest geology | Botany | Economics | Chemistry

**1929**

Imperial Forest Research Institute (IFRI) building inaugurated



# THE BIRTH



OF

ICFRE [1986]

## About

ICFRE is the largest organisation responsible for forestry research in India. ICFRE was created in 1986, under the Central Ministry of Environment and Forests (India), to direct and manage research and education in forestry sector in India. ...ICFRE became an autonomous council under the Ministry in 1991.

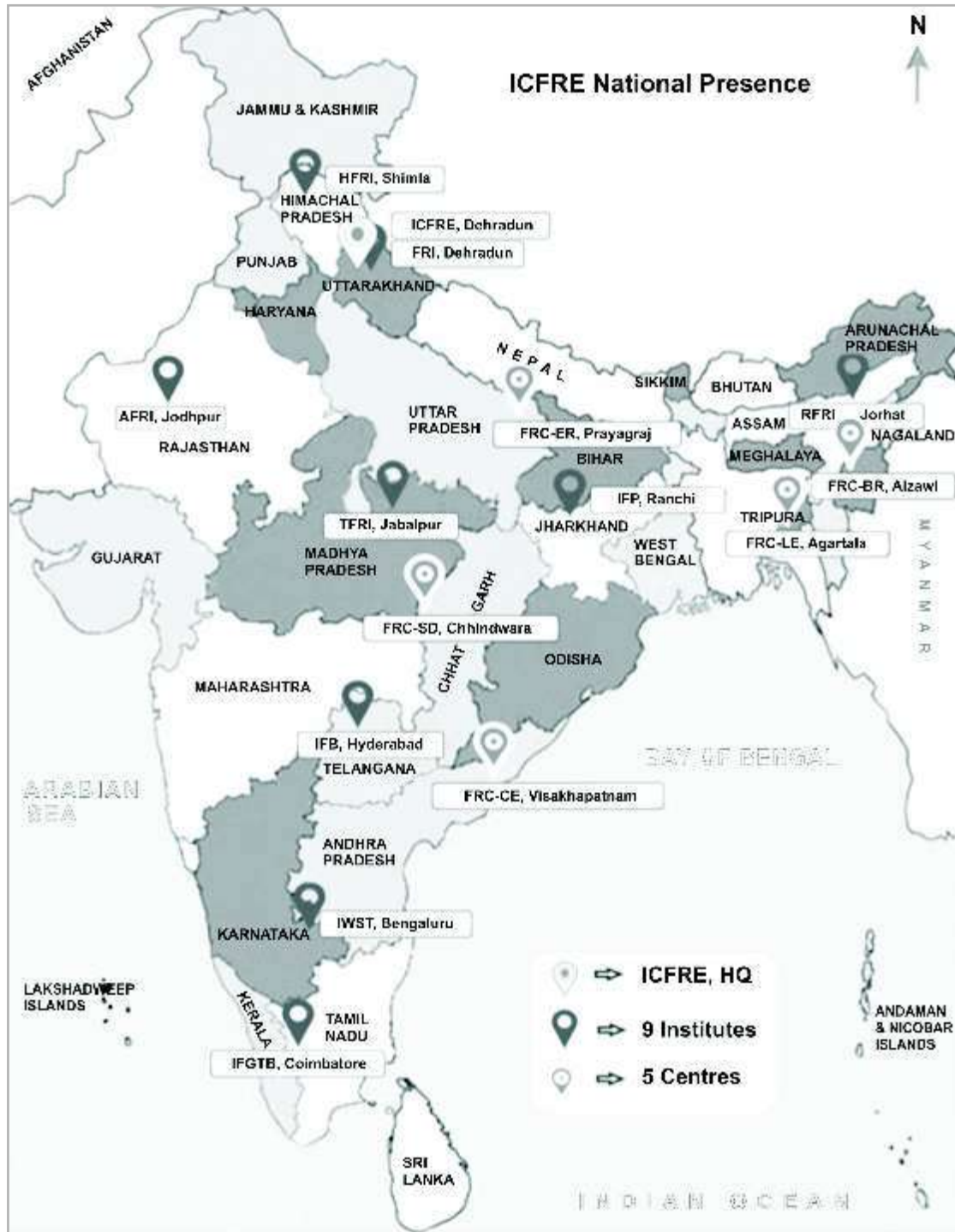
ICFRE is headed by a Director General with headquarters at Dehradun.

ICFRE ensures that all research projects taken up by ICFRE Institutes are need based and address the regional and national forestry research problem. The research prioritization is through participatory mechanism involving all the stakeholders and end users. For holistic approach to address the research problems and to avoid duplication of work, ICFRE has initiated an All India Coordinated Research Project (AICRPs) on some emerging themes and including important forestry species.

## Research

### KEY THEMATIC AREAS

1. **Research**
  - Managing Forests and Forest Products for Livelihood Support & Economic Growth
  - Biodiversity Conservation & Ecological Security
  - Forests & Climate Change
  - Forest Genetic Resource Management & Tree Improvement
2. **Education**
  - Forestry Education and Policy Research to Meet Emerging Challenges
3. **Extension**
  - Forestry Extension for taking Research to People



## VISION

To achieve long-term ecological stability, sustainable development and economic security through conservation and scientific management of forest ecosystems.

## MISSION

To generate, advance and disseminate scientific knowledge and technologies for ecological security, improved productivity, livelihoods enhancement and sustainable use of forest resources through forestry research and education.

## ICFRE CONSTITUTED UNDER MOEF [1986]

ICFRE set up as Department of MoEF on the foundation of the erstwhile FRI & Colleges to reposition forestry research & education

## ICFRE GRANTED AUTONOMY [1991]

ICFRE as an Autonomous Body of Ministry of Environment and Forest (now Ministry of Environment, Forest and Climate Change)



The Council has a pan India presence with its 9 Regional Research Institutes and 5 Centers in different regions of the country. Each Institute has a history of its own and under the umbrella of ICFRE are directing and managing research, extension and education in forestry sector in the states under their jurisdiction. The regional research Institutes are located at Jodhpur, Dehradun, Shimla, Hyderabad, Coimbatore, Ranchi, Bengaluru, Jorhat and Jabalpur, and the centres are at Agartala, Aizawl, Prayagraj, Chhindwara and Vishakhapatnam.







**CENTRES**  
in different  
REGIONS of the country

FOREST RESEARCH CENTRE  
for  
**ECO-REHABILITATION**  
(FRC-ER), PRAYAGRAJ

FOREST RESEARCH CENTRE  
for  
**SKILL DEVELOPMENT**  
(FRC-SD), CHHINDWARA

FOREST RESEARCH CENTRE  
for  
**BAMBOO & RATTAN**  
(FRC-BR), AIZAWL

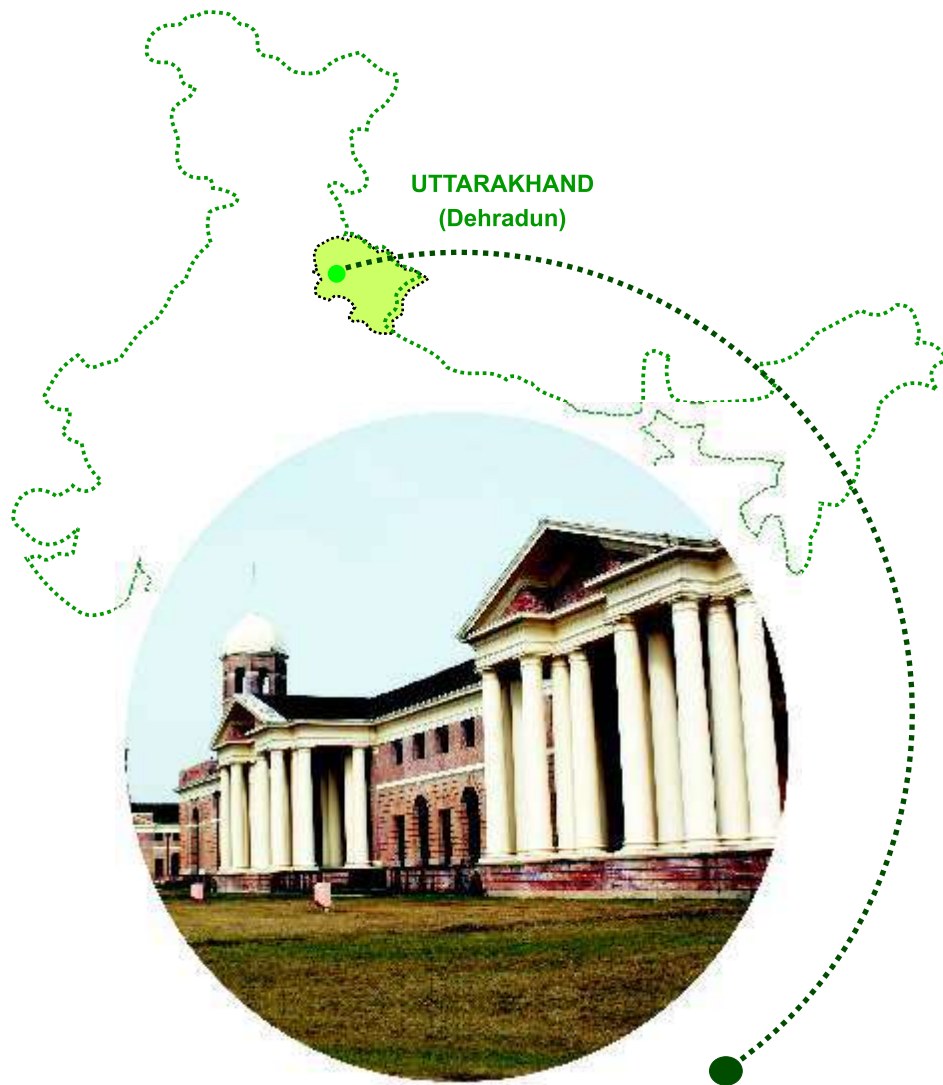
FOREST RESEARCH CENTRE  
for  
**LIVELIHOOD EXTENSION**  
(FRC-LE), AGARTALA

FOREST RESEARCH CENTRE  
for  
**COASTAL ECOSYSTEMS**  
(FRC-CE), VISHAKHAPATNAM

**9** REGIONAL RESEARCH INSTITUTES

**5** CENTRES





UTTARAKHAND  
(Dehradun)

### FOREST RESEARCH INSTITUTE

Forest Research Institute (FRI), Dehradun has its roots in the erstwhile Imperial Forest Research Institute established in 1906 to organize and lead forestry research in the country. Its history is synonymous with the evolution and development of scientific forestry not only in India but in the entire Indian subcontinent.

#### MANDATE

- To conduct need based research in core competence/thrust areas.
- To cater forestry research needs of the States of Punjab, Haryana, Chandigarh, Delhi, Uttar Pradesh and Uttarakhand.
- To impart quality education and conduct doctorate research in forestry & allied sciences.

### INSTITUTE OF FOREST GENETICS AND TREE BREEDING, COIMBATORE

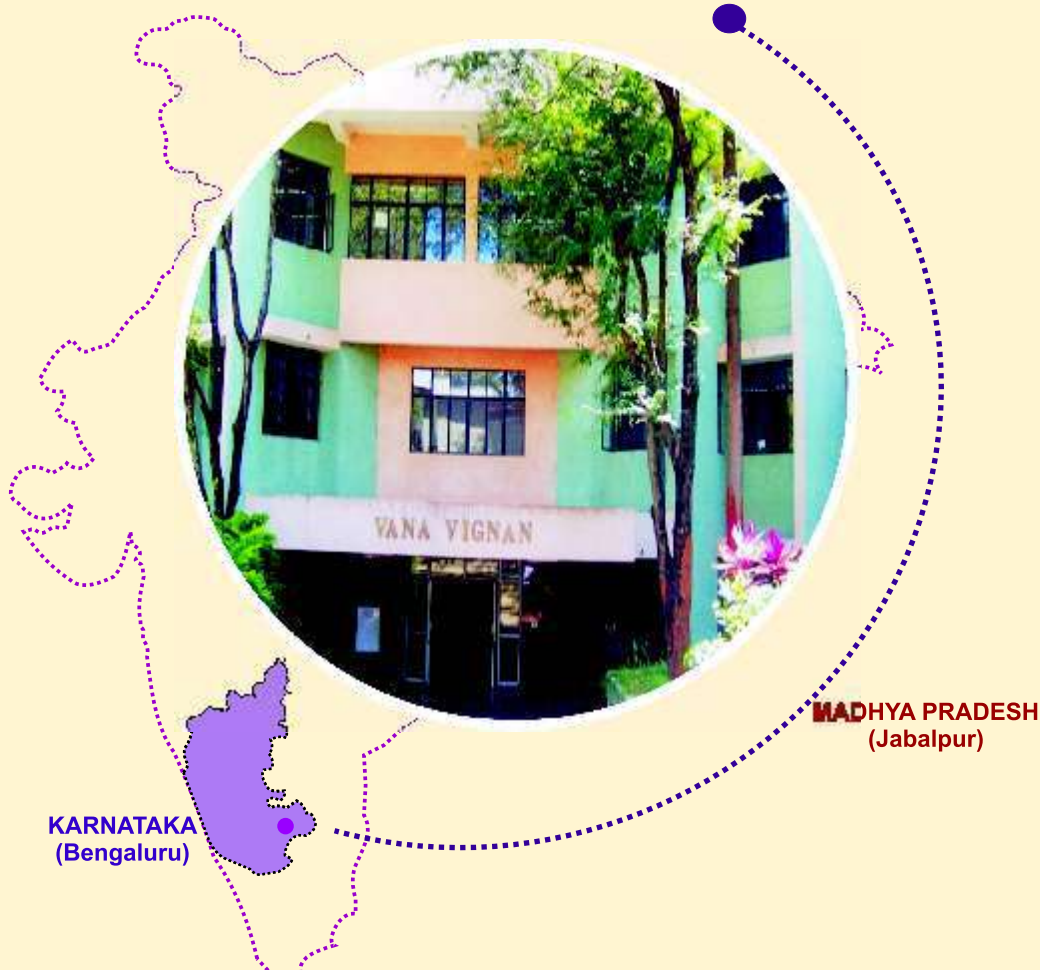
Institute of Forest Genetics and Tree Breeding (IFGTB), is working on genetic improvement of Eucalyptus, Casuarina, Acacias and fast growing native tree species. This targeted research is carried out in close collaboration with the Paper industries and farmers to meet the raw material demand and increase the farm income.

#### MANDATE

To identify and evolve varieties of species used in afforestation and social forestry that will contribute to the national goal of achieving a growth of 3 to 4 cubic meters of biomass per hectare per year within the ecological considerations applicable to the area.



TAMILNADU  
(Coimbatore)



### INSTITUTE OF WOOD SCIENCE AND TECHNOLOGY, BENGALURU

The Government of Mysore had set up a Forest Research Laboratory (FRL) at Bangalore in 1938. In 1988, the Forest Research Laboratory was upgraded and named as Institute of Wood Science and Technology (IWST) merging Sandal Research Centre and Minor Forest Products Unit. ICFRE has recognized IWST as centre for advanced studies in the area of improved utilization of wood, mangrove and coastal ecology, research on sandal and mining rehabilitation. In addition to this, the Institute has an Advanced Woodworking Training Center (AWTC), a Wood Museum cum Interpretation Centre (WMIC) and a library cum documentation centre.

#### MANDATE

- Conduct research on wood science and technology as a national objective
- Focus its research activities on important forestry research needs of the states of Andhra Pradesh, Karnataka and Goa.

### TROPICAL FOREST RESEARCH INSTITUTE, JABALPUR

The Tropical Forest Research Institute, Jabalpur came into existence in April 1988, although its origin goes back to 1973 when a Regional Centre of FRI, Dehradun was established at Jabalpur to provide research support to the problems of forest management in central India. Tropical Forest Research Institute is engaged with innovative research and technological advancement for improvement of productivity and quality of various forests of central Indian states viz., Chhattisgarh, Madhya Pradesh and Maharashtra. During its existence of more than two decades, the Institute has contributed immensely towards diverse aspects of forestry research and the successful implementation of several technologies.

#### MANDATE

- Eco-restoration and Rehabilitation of mined areas
- Development and demonstration in agroforestry models
- Forest protection
- Biofertilizers and biopesticides
- Non-wood forest products
- Planting stock improvement





### RAIN FOREST RESEARCH INSTITUTE, JORHAT

Rain Forest Research Institute (RFRI), Established in 1988 at Jorhat (Assam) caters to the forestry research needs of the eight North Eastern states. The Institute has a centre at Aizawl and another centre at Agartala.

#### MANDATE

- Conservation of forest ecosystem with emphasis on natural regeneration.
- Management of shifting cultivation areas.
- Management of community forests.
- Planting practices for eco-restoration.
- Conservation and sustainable management of bamboos and rattans.

### ARID FOREST RESEARCH INSTITUTE, JODHPUR

The Institute, established in 1987, is located on New Pali road, Jodhpur in the sprouting campus of 20 ha. The institute also has six experimental fields & a model nursery (34.41ha) in the vicinity.

#### MANDATE

Conduct forestry research for conservation of biodiversity and enhancement of bio-productivity in Rajasthan, Gujarat, Daman & Diu and Dadra & Nagar Haveli with special emphasis on arid and semi-arid regions.





### HIMALAYAN FOREST RESEARCH INSTITUTE, SHIMLA

The Institute came into being on the foundation of the erstwhile Conifers Research Centre (CRC), which was established in 1977 primarily to develop the technologies related to regeneration of Silver fir and Spruce – conifer species of western Himalayas. At the time of re-organizing forestry research in Indian Council of Forestry Research & Education (ICFRE) the centre developed into a full-fledged research Institute with an area of responsibility extending to the states of Himachal Pradesh and Jammu & Kashmir.

#### MANDATE

- Eco-rehabilitation of cold deserts, rehabilitation of mined out areas, regeneration of coniferous and broad-leaved forests, insect-pests and disease management including studies on medicinal plants, besides activities on management practices in temperate forests and in alpine areas.
- Popularization of agro-forestry and other related extension activities.

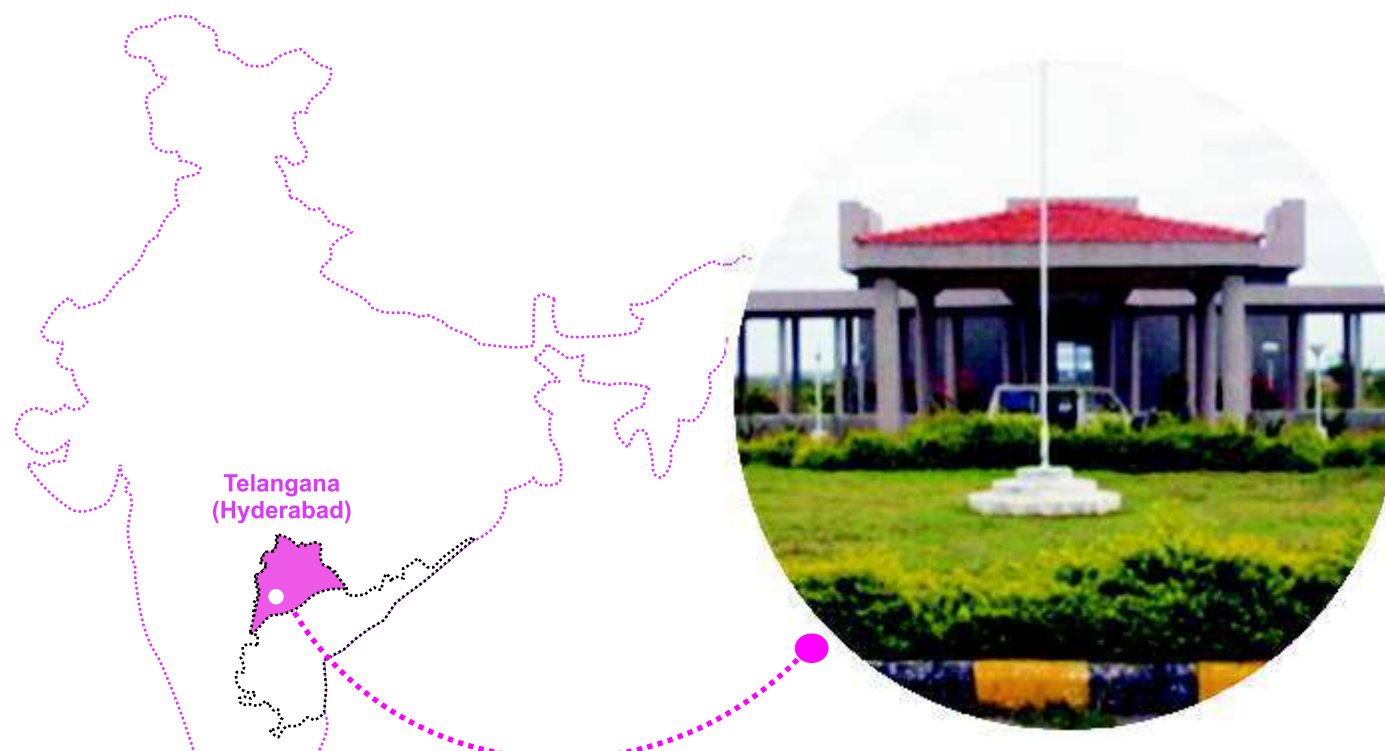
### INSTITUTE OF FOREST PRODUCTIVITY, RANCHI

IFP is a premier forestry research organization of eastern India created in 1993 with the objective to formulate, organize, direct, manage and carry out forestry research, education and extension in the states of Bihar, Jharkhand and West Bengal. The Institute has a legendary past being the successor of an organization called the Directorate of Lac Development (DLD), Ranchi which came into existence in 1966.

#### MANDATE

- Research on the dynamics of tree growth for superior yield in important forestry species of the region;
- Engagement in the development of micro and macro propagation protocols for important tree species, bamboos, medicinal plants and oil yielding trees
- Studies on development of propagation techniques and agro-silvicultural system for cultivation of important medicinal plants
- Conservation of biological waste including forest litter into compost and vermicompost to ameliorate degraded areas
- Improvement and production of non wood forest products, specially lac and bio fuel development of agroforestry models





### INSTITUTE OF FOREST BIODIVERSITY (IFB) HYDERABAD

The Conference of the parties is the governing body of convention on Biological Diversity and consequent to decision in its 11th meeting held during October 2012 at Hyderabad, FRC, Hyderabad working under IWST, Bengaluru was upgraded to institute level and renamed as Institute of Forest Biodiversity, Hyderabad in December 2012.

The institute is located at Dulapally, 23kms away from Secunderabad Railway station and it has a field station spread over sixty acres at Mulugu, 45kms from Hyderabad. The vision of institute is to attain excellence especially in conservation of forests and wild agri-genetic resources and forest biodiversity including microbial populations using *in situ* and *ex situ* methods, facilitate sustainable utilization of resources by value addition wherever desirable and generate products and services, in a way that sustains diversity and productivity in an eco-friendly manner. The institute is mandated to carry out research on conservation and sustainable utilization of forest biodiversity, with an emphasis on Eastern Ghats, Mangroves and Coastal Ecology.

### MANDATE

- 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* conservation of the RET and endemic species of Eastern Ghats by identifying conservation populations/stands within the protected area networks.
- *Ex situ* conservation of the RET and endemic species of the region through germplasm banks, seed storage, tissue culture and also through the involvement of farmers in their fields.
- Protection from endemic and introduced insects and pathogens.
- Environmental impact assessment especially of mining and other mega projects on biodiversity and their eco-rehabilitation



### COASTAL ECOSYSTEMS (FRC-CE) VISHAKHAPATNAM

Forest Research Centre for Coastal Ecosystem (FRC-CE) was formed by upgrading the Wood Biogradation Centre at Vishakhapatnam with a mandate to carry out focused research on biodiversity of Eastern Ghats and Forest Genetic Resource management of mangrove and coastal ecosystem.

It is also mandated to undertake research on marine wood biodegradation, disseminate available technologies/processes/tools to user groups for conservation and sustainable use of forest resources and support the lead institute in research education and extension in the area of jurisdiction.



## REGIONAL CENTRES



**SKILL DEVELOPMENT (FRC-SD)  
CHHINDWARA**

Forest Research Center for Skill Development (FRC-SD), Chhindwara came into existence on 30 March 1995. It was declared as a Satellite Center of Tropical Forest Research Institute, Jabalpur on 3 January 1996. It is mandated Green Skill Development of forest dependent communities and front line staff. To carry out research and training in NWFP, with focus on harvesting, primary processing, value addition and biodiversity assessment. To disseminate HRM available technologies/processes/tools to user groups for conservation and sustainable use of forest resources. To support the lead institute in research education and extension in the area of jurisdiction.



**BAMBOO & RATTAN (FRC-BR)  
AIZAWL**

The Forest Research Centre for Bamboo & Rattan (FRC-BR), Aizawl was established at Aizawl as a Center of the Rain Forest Research Institute, Jorhat on 29 Nov. 2004 and shifted to present building inaugurated on 26 March, 2012. The FRC-BR is mandated to carry out focused research on Bamboo and Rattans in North-eastern region. To disseminate available technologies/processes/tools to user groups for conservation and sustainable use of forest resources, particularly bamboo and rattan. To support the lead institute in research education and extension in the area of jurisdiction.



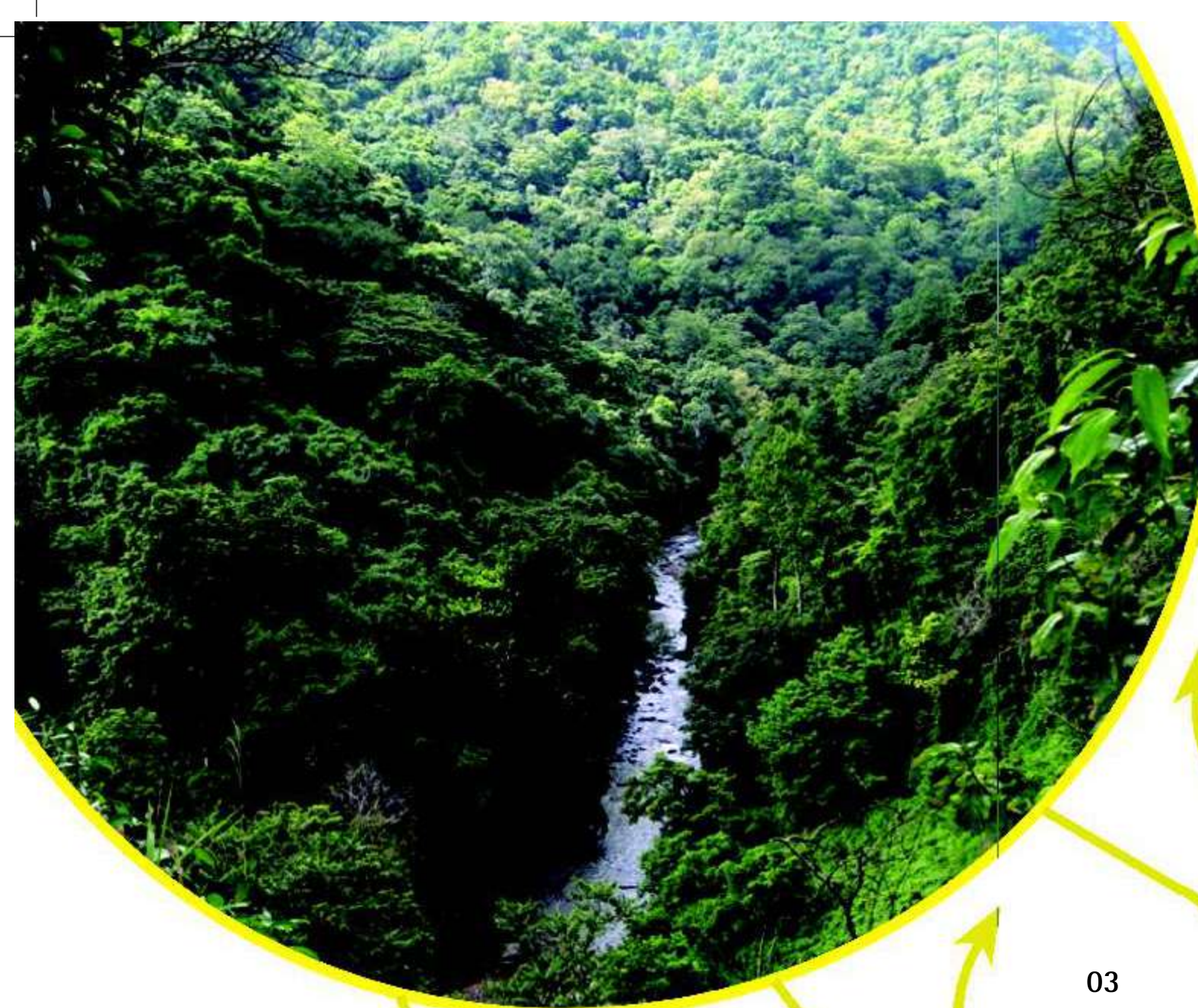
**LIVELIHOOD EXTENSION (FRC-LE)  
AGARTALA**

The center came into existence on 8 June 2012 subsequent to a tripartite MoU between the ICFRE & the Forest Department and Forest Corporation of Tripura. Initially Center for Forest based Livelihoods & Extension ', the center was renamed as Forest Research Center for Livelihood and Ecosystem (FRC-LE) on 20 December 2012. It is involved in securing sustainable livelihoods through forest based biodiversity and its documentation, bamboo research, human resource development for bamboo artisans and bamboo certification, study of watershed management on the issue of lowering of water table in reference to the catchment of Haora river, study on check dam/water bodies; ecosystem services; products and benefits thereof to stakeholders and training for capacity building and on-farm participatory research.



**ECO-REHABILITATION (FRC-ER)  
PRAYAGRAJ**

Forest Research Centre for Eco-Rehabilitation (FRC-ER), Prayagraj was established in 1922 as an advanced centre of Forest Research Institute, Dehradun. It caters to the research needs of Eastern U.P. Its main area of work is promotion of agro-forestry, eco-rehabilitation of degraded eco-systems and stress sites and dissemination of technologies for conservation and sustainable use of forest resources. It supports the lead institute, FRI, in research, education and extension in the eastern parts of Uttar Pradesh. The focus of the institute is also in the area of medicinal plants, social forestry, reclamation of wastelands, and planting stock improvement programme. The centre organizes extension, demonstration and training activities for various stakeholders like state forest departments, NGOs, students, farmers, tree growers, and teachers. The centre also conducts socio-economic surveys in the region to develop suitable models for poverty alleviation.



01

DEGRADED  
FOREST

02

SCIENTIFIC  
ASSESSMENT

03

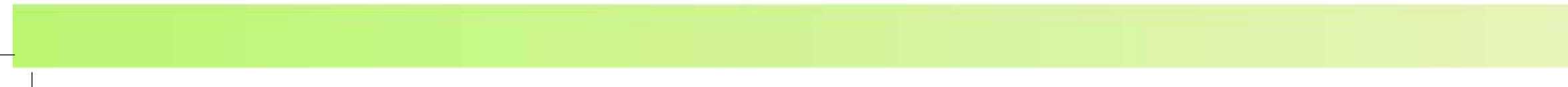
TECHNICAL  
INPUT

04

RESTORED  
FOREST

05

CONSERVATION OF  
FOREST GENETIC  
RESOURCES







Cold Desert-Himachal Pradesh



## CONSERVATION

With fast depleting forests and species facing near extinction, conservation requires mammoth efforts and scientific input. Conserving gene pool, producing planting stock for conservation of species, replenishing forests, recovering mined areas, turning barren land into green cover need resources. ICFRE, during the course of its research, has established germplasm banks, nurseries, laboratories for cryo-preservation apart from providing the much needed science for recovering barren and waste lands. As an international organization of repute it has been providing input to the various conventions on Climate Change, Conservation and Combating desertification.



## RESTORATION OF DEGRADED LANDS OF BHARAT COKING COAL LIMITED, DHANBAD.

Ecological restoration of coal mined overburden dumps .

- 1 Restoration Activities
- 2 Grasscover developed after 1 year
- 3 Restored area after 3 years







## ECO-RESTORATION OF DEGRADED HILLS IN ARAVALLI RANGES



◊ Degraded hill restoration after 3 years



◊ Degraded hill



*Prosopis cineraria* or Khejri is a species of Indian deserts and plays a vital role in preserving the ecosystem of arid and semi-arid areas. It is a symbol of socio-economic development of the arid regions. It is a State tree of Rajasthan and all parts of this tree are useful and is being used for centuries for human diet, fodder and fuel. Owing to its variety of uses the species is under threat. ICFRE works on the conservation aspects of this and other important species.



## IMPORTANT MEDICINAL PLANTS OF HIMALAYAS



*Saussurea obvallata* (Brahmkamal)



*Habenaria intermedia* D. Don Riddhi



*Ephedra gerardiana* (Somalata)



*Picrorhiza kurroa* (Kutki)



*Roscoeae purpurea* Sm. Kakoli



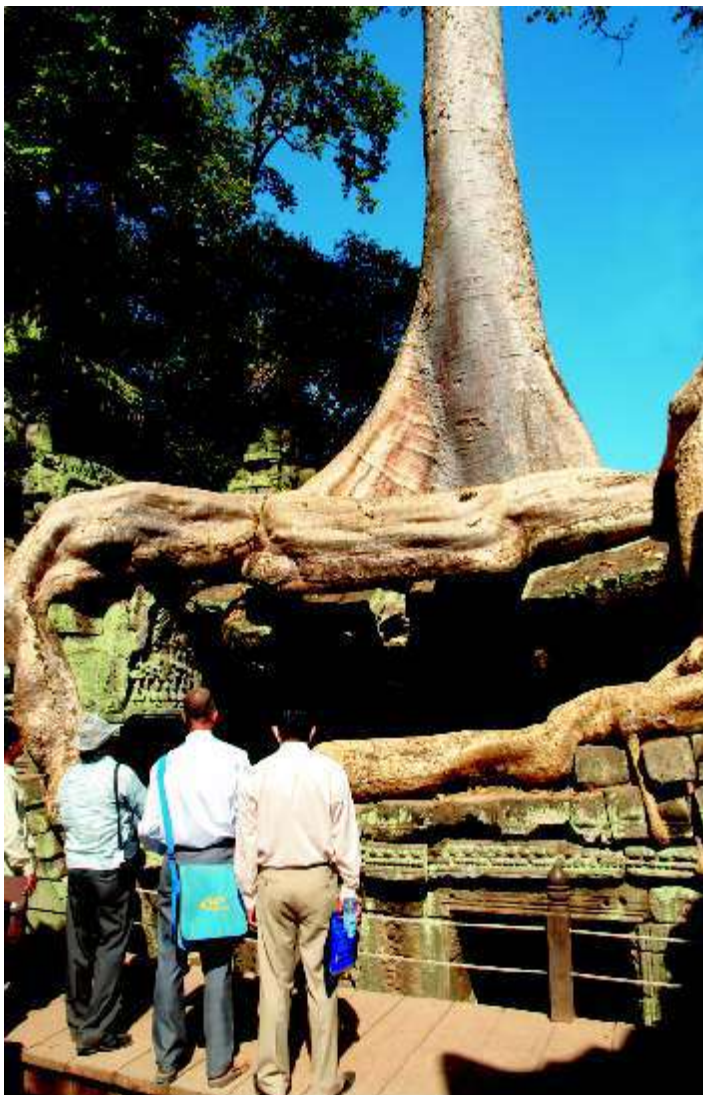
*Polygonatum verticillatum* (L.) All. Meda



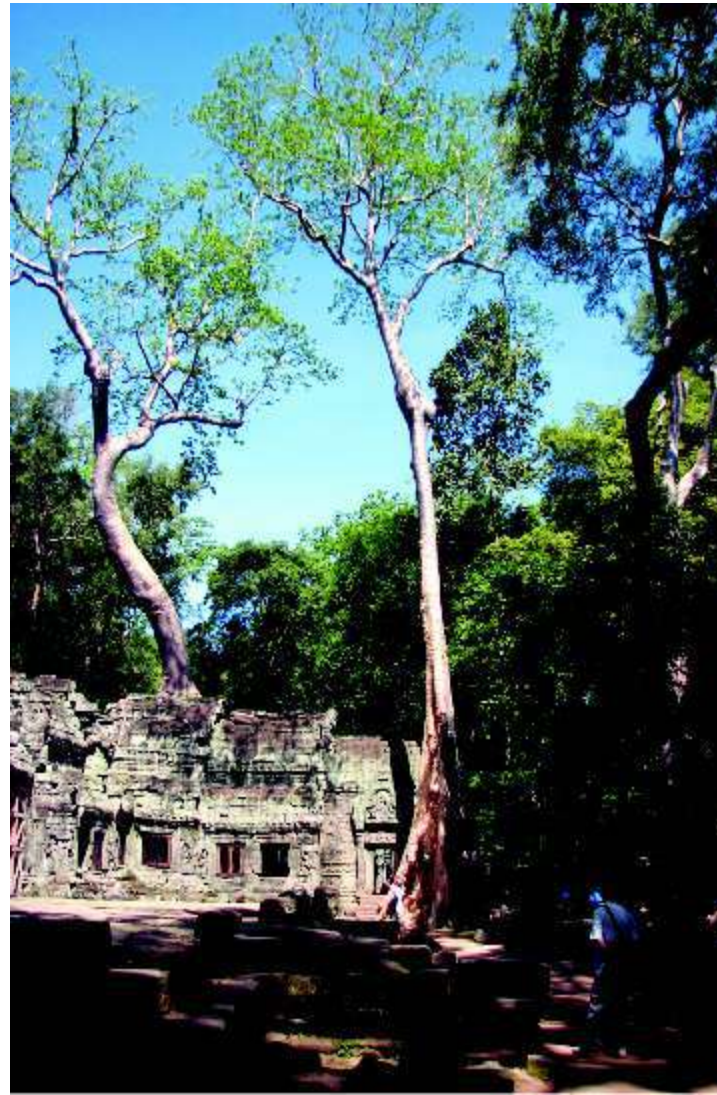
## SITE OF TA PROHM TEMPLE IN CAMBODIA

The work has brought laurels to the country and appreciated by archaeologists of different countries and experts of ICC panel of UNESCO.

### ECO-FRIENDLY TREATMENT PROVIDED BY ICFRE FOR PROTECTING AND CONSERVING



📍 Scaffolding to support collapsing wall on advice



📍 Tree growing with the monument



📍 Spreading roots and buttresses on the monument



Koteshwardham Temple





Protecting and Conserving the Holy Peepal Tree of Koteswar Dham, Gaya, Bihar.



📍 Vat Vriksh at Jyotishar, Kurkshetra

Preserving religious sentiments of people by protecting the holy trees from insect pests, pathogens and physiological stresses.



The Neem Tree, structures removed after intervention

📍 Neem at Shirdi





## NEW SPECIES OF LICHENS AND FUNGI REPORTED BY ICFRE



*Cookeina tricholoma* from Mizoram



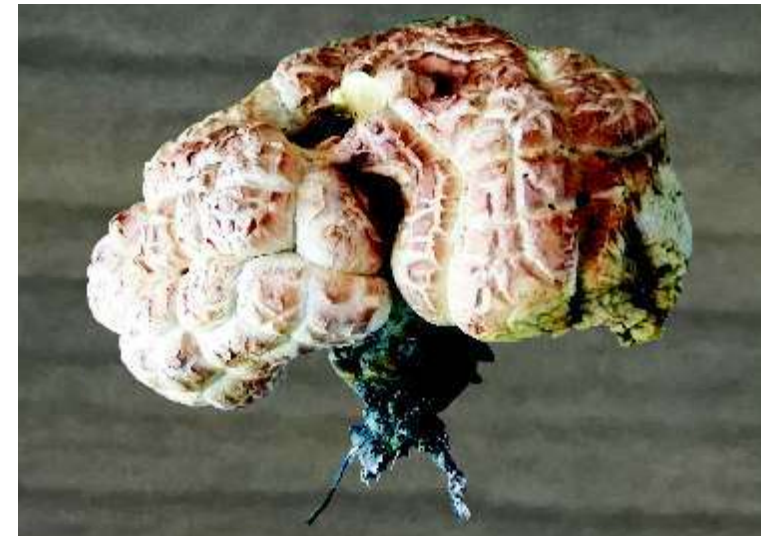
*Albatrellus confluens* from Mizoram



*Lysurus habungianus*, fungi from Assam



*Cortinarius caninus* from Meghalaya



*Calvatia booniana* from Mizoram



Leotia lubrica from Mizoram



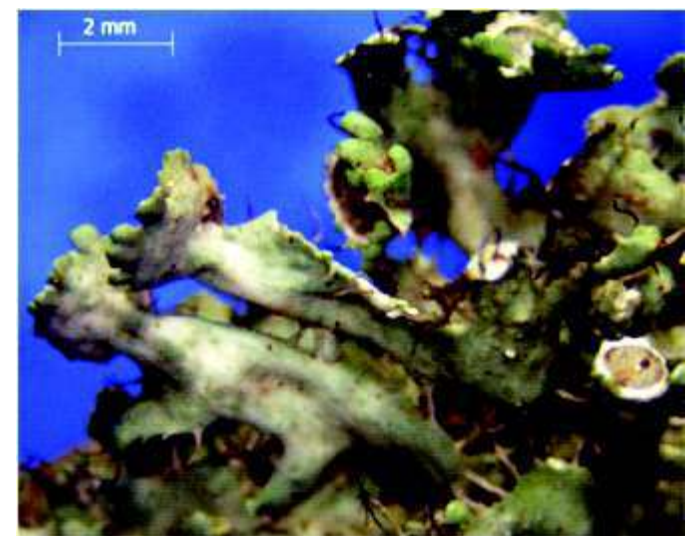
Lnochybe lapponica from Mizoram



Amanita bisporigera from Meghalaya



Amanita magniverrucata from Meghalaya



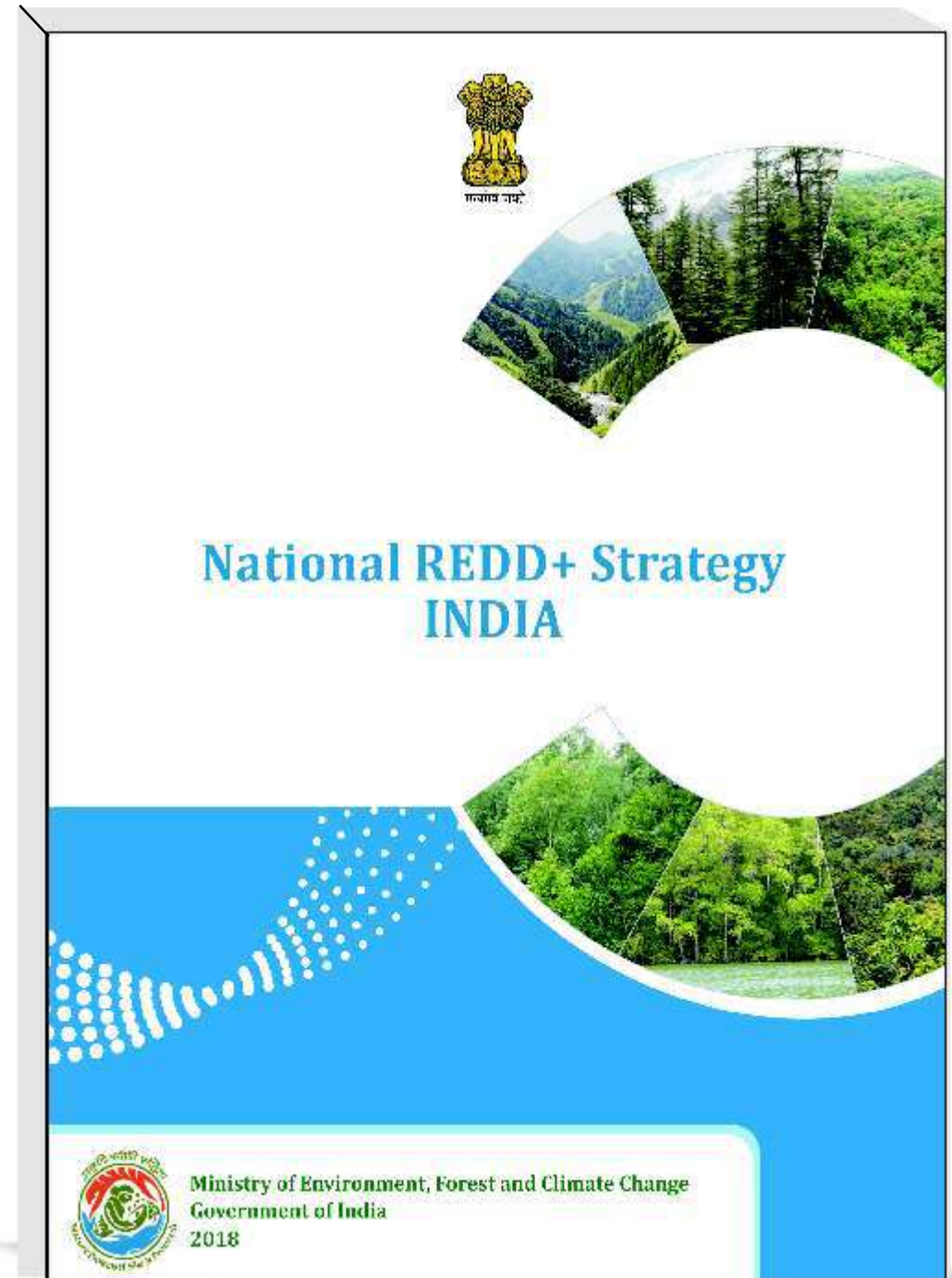
Lichen sp. (*Heterodermia echinata*) from Mizoram



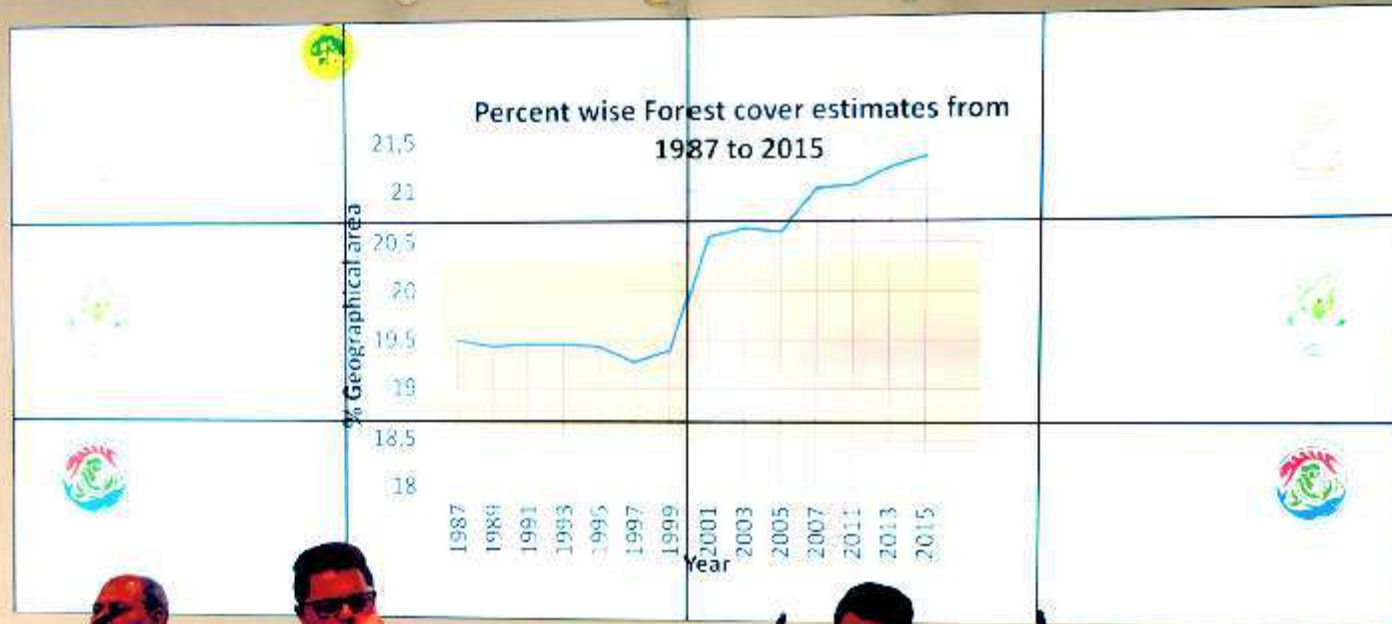
ICFRE is contributing to the activities under REDD+, an incentivizing mechanism for reducing emission from deforestation, forest degradation, conservation and sustainable management of forests and enhancement of carbon stocks. ICFRE provides inputs on mitigation aspects, constraints, gaps and related financial, technical and capacity needs to address climate change concerns in forestry sector. Research is also conducted in the area of carbon sequestration by forests and soil organic carbon stocks of forests.



- Permanent plots at timber line in collaboration with HPFD to monitor impacts of climate change



- Protocols for Measurement, Reporting and Verification (MRV) and Safeguards Information Systems (SIS) for operationalising REDD+ (Uttarakhand & Transboundary-ICIMOD Projects)



**INDIA**  
**CONSERVING NOW, PRESERVING FUTURE**

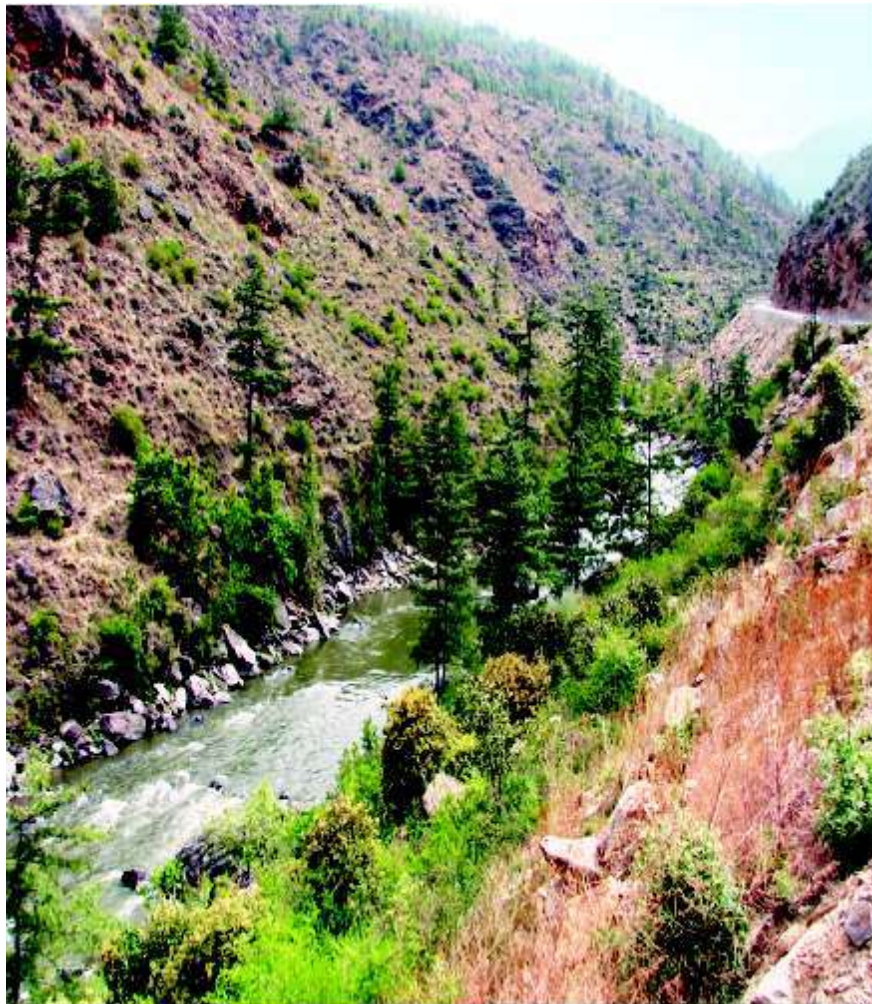


Representatives of ICFRE, Derhadun attended the ICFRE side event of India Pavilion of MoEF & CC, Govt. of India at COP 23 of UNFCCC on 16-17 November 2017, Bonn, Germany

Ministry of Environment, Forest and Climate Change, Government of India had assigned the task regarding 'Institutionalization of technical aspects of REDD+ in India'. Accordingly, ICFRE prepared and published National REDD+ Strategy 2018. National REDD+ Strategy has been further submitted by the Ministry to the United Nations Framework Convention on Climate Change (UNFCCC).



ICFRE conducts environmental impact assessment of various activities like mining, mega projects like construction of dams and also prepares plans for effective management of such areas. It also monitors the plantations established under the CAMPA of MoEF & CC.



♦ Bunakha Hydroelectric project site at Wang Chhu river, Bhutan



♦ Reclamation and Rehabilitation Plan- Swamymalai Iron Ore Mine, Sandur, Bellary





📍 Afforestation in Ankua Iron & Manganese Ore Mine, Saranda- Jharkhand



📍 Monitoring of NTPC Accelerated Afforestation, Kakoi land Parcel, Assam



Activities being carried out on the river beds for technical evaluation of the extent of sand mining on the directions of the National Green Tribunal (NGT).







*Capparis decidua* (Kair)-Jodhpur, Rajasthan



## **FOREST PRODUCTS**

Forests provide several products that can be used directly or as raw material in developing other products. Wood is one of the most sought after material because of its aesthetic value. Species like Teak and Sheesham have been used since ages and are now very expensive because of limited supply and imports. Alternatives to these species have been used to produce products with equal aesthetics and strength. Products based on forest produce like Non Timber Forest Products have also been produced and value added. These have been helpful in providing sustainable livelihoods to forest dependent communities.



## NTFP

Non-Timber Forest Products play a key role in providing subsistence to the livelihood of the Forest dependent communities. ICFRE has played a key role in identifying and developing the products after adding value to NTFPs. These products have been instrumental in enhancing the income of Forest Dependent Communities.



♦ *Momordica dioica* (Kankeda)



♦ Selling of NTFP in Local market (Koteshwer)



♦ Collection of NTFP at village level (Artha Jamboori village)



♦ Jungle Jalebi - Khirni



◆ *Azadirachta indica* (Neem)



◆ Table neem wood



◆ Book shelf neem wood



◆ Almirah neem wood

### AZADIRACHTA INDICA (NEEM) AN ALTERNATIVE TIMBER SPECIES FOR HANDICRAFTS

#### Neem Wood

Jodhpur handcraft industry in Rajasthan, well known for its wood-work, is one of the most prominent industry and with the rise of handcraft export, Jodhpur has emerged as a mega crafts cluster within three decades. The industry is using woods of *Acacia nilotica* (Babool), *Dalbergia sissoo* (Shisham), *Tectona grandis* (Teak), *Mangifera indica* (Mango), and other miscellaneous species. For sustainability

of these industries, there is need to search lesser known, under exploited, locally available timber species. However, these woods may be more susceptible to insect-pest and other deteriorating agents. In a study conducted in AFRI, Jodhpur on lesser known timber species *Azadirachta indica*. Combination of Coppersulphate: potassium dichromate and bark extract of *P. juliflora* was used

as preservatives. Treated *Acacia indica* wood converted to Coffee table as value added product and Display boards (Rohida like carving), Book shelf, Small almirah were also prepared. Products with good shelf life from all these tree species indicate their potential for use in handcraft industry







## Kair

### *CAPPARIS DECIDUA* (KAIR) AN IMPORTANT NTFP SPECIES OF WESTERN RAJASTHAN

*C. decidua* (Kair) is much branched spiny shrub or small tree may grow up to 4-5 m. Kair can survive in various habitats under extreme condition of temperature of arid region & is found in whole of the Rajasthan, except the high rainfall zone of Kota, Banswara, and Jhalawad.

The shrub, bereft of leaves, looks quite conspicuous when covered with red flowers. It bears fruit 1.3-1.8 cm diameter, round, fleshy, pink or red when ripe. Even though, it produces leaves, flowers and fruits 2-3 times in year, the peak flowering occurs in the summer months. It is the most important indigenous NTFP yielding shrub species, its fruit yield supplementary income to the rural people as pickles as value added product with very high demand. The market rates collected from Jodhpur market during 1995-2011, are continuously raising from 80-100 Rs/Kg in 1995 to Rs 300-350/Kg in 2011 and Rs 800-1000/Kg in 2017 respectively. The rate increases with decrease in size of fruits.

However, they are mainly collected from the wild with no effort for its domestication.

To enhance the productivity of Kair fruit a research trial was taken by Arid Forest Research Institute Jodhpur in collaboration with SFD Rajasthan in the naturally occurring Kair shrubs in Gogelao beed forest area Nagaur, Rajasthan. It is found that in forest soils integrated use of organic and inorganic fertilizers is helpful in enhancing the no. of fruiting shrubs and per shrub yield for Kair fruit.



Ripened fruit



Kair Curry Raw fruit



Kair pickle



From plastic to wood : Crockery



Composite Wood



Items of household utility made out of wood composite



Display board of Rohida

## NUMEROUS PRODUCTS

The Institutes of ICFRE have developed numerous products ranging from cloth hangers and plates to furniture and automobile parts.

Table made of *Melia dubia*



Automobile parts made of wood polymer composites





Organic growth enhancer



Organic growth enhancer

A new feed for Silkworm has been developed from weeds which has improved the quality of Silk thread, reduced cocoon spinning time and reduced costs.

Effective insecticides have been developed who controlled insect pests of Forest trees. Breakthrough has been achieved in developing environmentally safe Jigat for making Agarbattis. Eco-friendly Et cost effective Organic growth enhancers-Tree Rich Bio-booster has been formulated.

Feed for Silkworm

Agarbattis made of Jigat



Green Insecticide : Crawl Clean



## PATENTS

- An eco-friendly, economical and non hazardous wood preservative (ZiBOC)
- An Apparatus for treatment of green bamboo
- A process for preparation of copper lignin complex
- An apparatus for post harvest treatment and preservation of bamboo
- A protocol for micro-propagation of bamboo from explants



# ARBOREASY® DNA ISOLATION

(Based on IFGTB-DBT Patented Technology)



## TECHNOLOGY

ArborEasy® DNA Isolation Kit provides an indigenous, non-biohazardous, low cost spin column based system for isolation of plant genomic DNA from wide range of tissue types, specifically challenging tissues from tree species. The protocol quenches polyphenols, polysaccharides and other bio-contaminants to facilitate high recovery of un-degraded genomic DNA. This technology was developed based on IFGTB-DBT joint patent. ArborEasy® is a registered trademark of IFGTB, Coimbatore, India.

## PRODUCT SPECIFICATION

**Starting Material:** Any plant tissue (up to 150mg)  
**Extraction Time:** 1 hour 30 minutes  
**Storage:** All solutions should be kept tightly sealed and stored at 40C.  
**Product stability:** Supplied solutions remain stable for at least 3 months in their unopened containers.  
**Validation:** Independent validation and QC conducted in different plants and tissue types across national R&D laboratories.

## FIELD OF APPLICATIONS

- Routine PCR analysis (RAPD/ISSR/AFLP assays)
- High-throughput marker assays (SSR/)
- InDel/SNP genotyping)
- Next generation sequencing (WGS/Amplicon sequencing/ Target capture)
- SNaPshot analysis

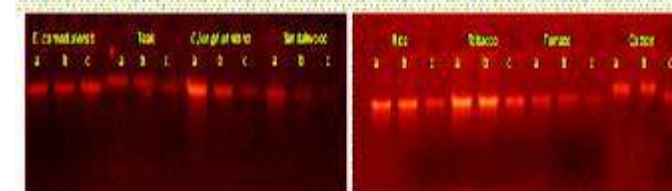
## COMPETITIVE ADVANTAGES

- Rapid procedure with ease of handling
- Free from hazardous chemicals
- High recovery of un-degraded DNA from challenging tissues
- Comparatively cheaper than similar commercially available kits

Pack Size	Price	Packing Transportation
10 reactions	Rs. 950.00	Rs. 150.00
20 reactions	Rs. 1900.00	Rs. 200.00
50 reactions	Rs. 4750.00	Rs. 350.00



DNA isolated using ArborEasy™ DNA Isolation kit

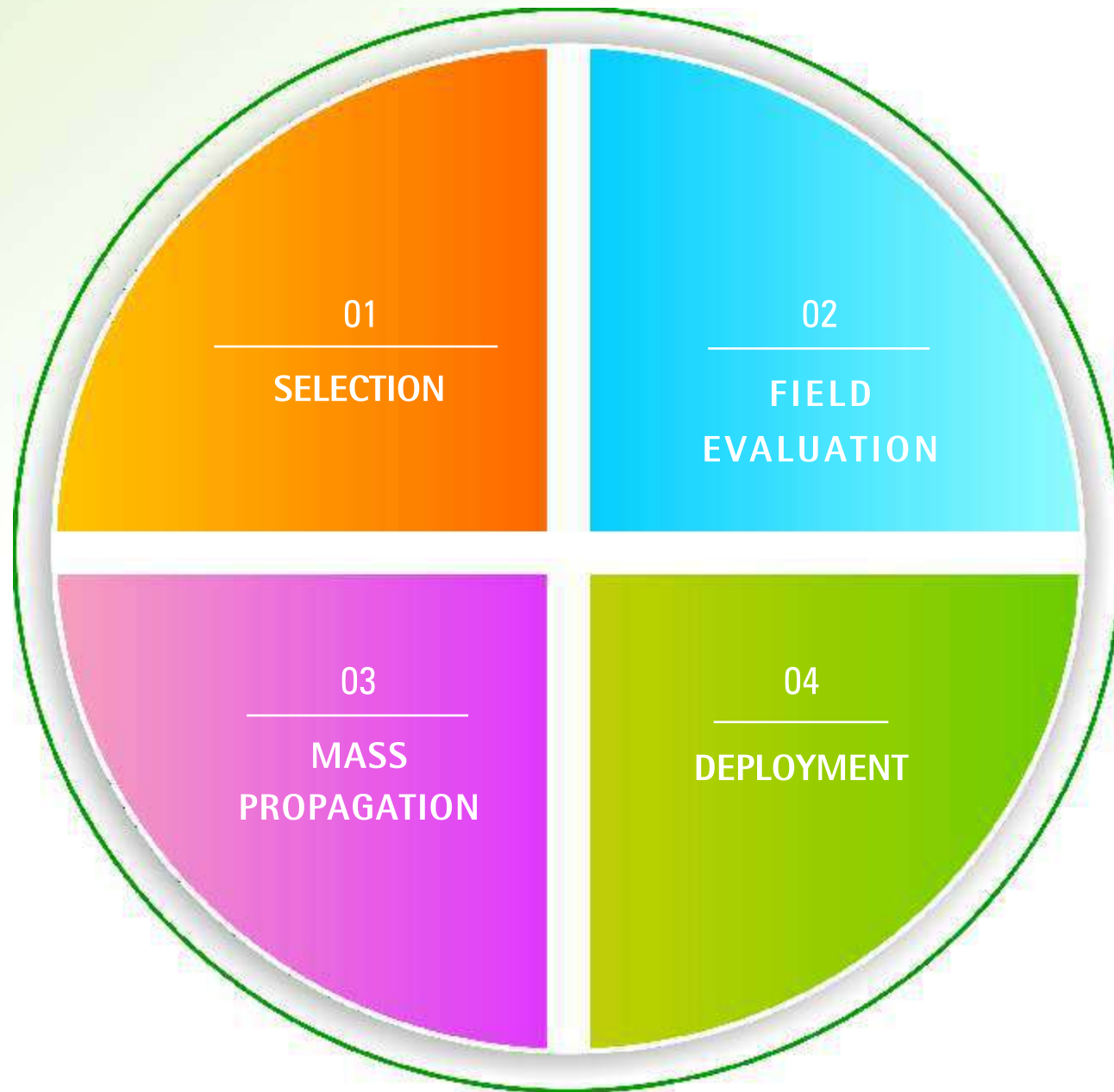




A customized DNA isolation kit was provided for breaking the Guinness World Record on "Most people conducting a DNA isolation experiment simultaneously" at 4th India International Science Festival held at Lucknow from 5-8 October 2018.

A total of 550 students in age group of 12-17 years isolated DNA from banana on 6 October 2018 and broke the existing record of 302 students established by Seattle Children's Research Institute, USA.







Genetically Improved Plantation, Tamil Nadu



## TREE IMPROVEMENT

Special plantations are raised for providing wood for various end-uses. It is imperative that the trees bred for a certain use fulfill the criteria for that particular use. Trees are improved for various uses like biomass, timber, seeds, etc. Various techniques like tree breeding, genetic improvement of trees, tissue culture, and genetic transformation have been used to achieve the target of improving trees. It is imperative that the trees bred for a certain use fulfill the criteria for that particular use. Trees are improved for various uses like biomass, timber, seeds, etc. Various techniques like tree breeding, genetic improvement of trees, tissue culture, and genetic transformation have been used to achieve the target of improving trees. The genetics and tree propagation discipline in the various institutes contribute to tree and planting stock improvement programmes.



◆ Mother clump of *Schizostachyum dullooa* (AFRI)



◆ *In vitro* shoot multiplication in liquid MS



◆ Shoots proliferated from nodes

ICFRE has initiated and successfully implemented tree improvement programmes on Casuarinas, Melia, Eucalypts, Poplar, Shisham, Bamboo, Teak, Gmelina, Acacia, Tamarind, *Prosopis cineraria*, *Tecomella undulata* across the country

Varieties/clones of Casuarina - (5 hybrid clones), *Rawvolfia serpentina* (2 varieties), *Eucalyptus tereticornis* (3 Clones), *Melia dubia*: (10 varieties) have been released



◆ Offsets established at AFRI Nursery



◆ Shoots proliferated from nodes



◆ *In vitro* shoot multiplication in liquid MS





📍 Sandal plantation in Anand-Gujarat at farmers field



📍 Macro-proliferated Propagules of *Valeriana jatamansi*



❖ A 2.5 year old plantation of Casuarina clone IFGTB-CJ-9 at Nallalam village - Villupuram District, Tamil Nadu

❖ Vegetative multiplication garden of *Pterocarpus santalinus* showing fresh coppice shoots



❖ Intercropping of medicinal plants with apple





Selected CPTs of *Gmelina* - Kodakkannal, TN



Air layering experiment in *Pterocarpus santalinus*

Teak Nursery in Vegetative Multiplicaiton Garden - IFGTB, Coimbatore





01

IDENTIFICATION  
OF PESTS  
AND DISEASES

02

QUANTIFICATION  
OF DAMAGE

03

CONTROL  
MEASURES

04

PREVENTION &  
CURE



Destruction by Sal borer



## FOREST PROTECTION

The forestry species are prone to various types of insect pest and disease problems which can destroy large tracts of valuable forests and lead to forest degradation. Forest tree nurseries are also affected thereby severely affecting the availability of quality planting stock for important programmes related to afforestation and reforestation. ICFRE carries research in the direction of solving such problems by developing environmentally friendly techniques and products for managing entomological and pathological issues faced in the field and nurseries.



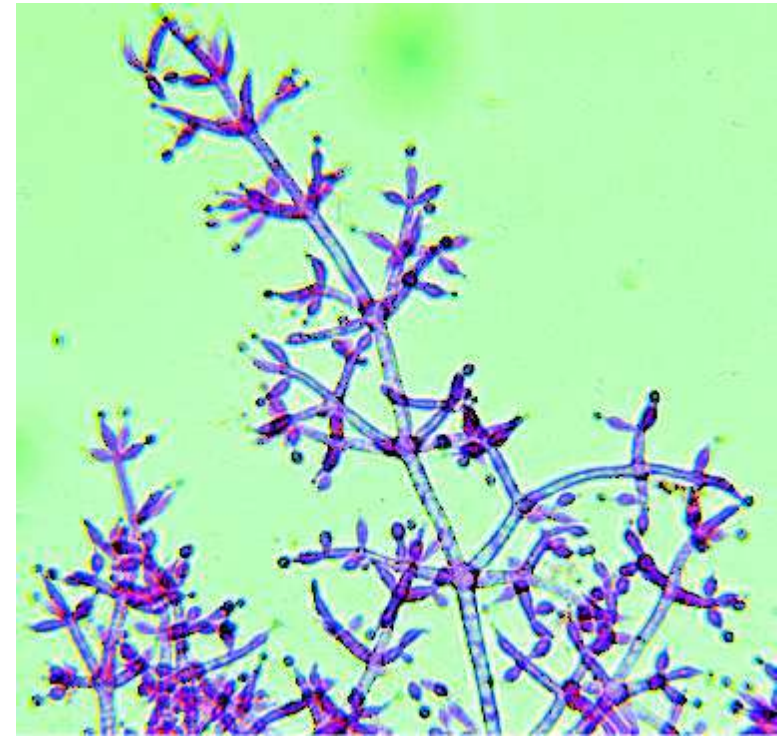
Blister bark disease caused by *Trichosporium vesiculosum* on *Casuarina equisetifolia*



Heart rot disease caused by *Phellinus* sp. on *Casuarina equisetifolia*



Sal root rot caused by *Inonotus shoreae*



*Trichoderma harzianum* is used against diseases for biocontrol



Eucalyptus leaf and twig blight caused by *Cylindrocladium quinqueseptatum*



Germination in Trichoderma treated Eucalyptus seeds



● *Quadrastichus mendeli*



◆ *Leptocybe invasa*



◆ *Megastigmus viggianii*

Biological control operations were successfully conducted for control of the Eucalyptus gall wasp, *Leptocybe invasa* (Eulophidae) in Punjab using two larval parasitoids, *Megastigmus viggianii* (Torymidae) and *Quadrastichus mendeli* (Eulophidae).





## INSECTS PESTS OF STANDING BAMBOOS AND THEIR MANAGEMENT

Green standing bamboo borer, *Estigmena chinensis* Hope (Coleoptera: Chrysomelidae)



Infested culm



Larva in gallery



Beetles



Green standing bamboo borer, *Phloeobius crassicollis* Jord. (Coleoptera : Anthribidae)



Infested bamboo with galleries



Internal damage of bamboo culms done by *Phloeobius crassicollis*



Grubs



Beetle



## INSECT PEST OF POPLARS & THEIR MANAGEMENT

Poplar Stem Borer,  
*Apriona cinerea* Chevrolat,  
(Coleoptera: Cerambycidae)



Larvae of *Eupterote undata* (Lepidoptera: Eupterotidae) feeding on poplar





# REPOSITORIES AND INFRASTRUCTURE

Research carried out in the council has helped create repositories of scientific material in the form of herbaria, museums, collections of specimens, etc. There are museums dedicated to Forest Products, Silviculture, Entomology, Social Forestry, Pathology at FRI, Dehradun and the famous Gass Forest Museum in IFGTB, Coimbatore. The herbarium, National Type Culture Collection (of fungi), Arachnarium (spiders), Xylarium, etc. have made a place for themselves in the arena of forestry research. These also attract a large number of visitors and students and researchers of life sciences.

The research conducted by ICFRE has led to development of a strong and robust infrastructure of laboratories all over the country. The institutes of ICFRE are providing various services to the end-users like testing, wood identification, identification of insects, fungi, etc. The infrastructure is state of the art and comparable to the best in the country.



# REPOSITORIES



## ARACHNARIUM-Spider Interpretation Centre

An Arachnarium is developed at TFRI, Jabalpur which is a rearing unit of spiders in laboratory conditions, maintaining a similar natural environment allowing spiders to live and breed. The whole unit is comprised of three indoor and outdoor components. The Arachnarium, along with outdoor microhabitats for spiders are raised for the first time in India.

### ARACHNARIUM Spider Interpretation Centre TFRI, Jabalpur



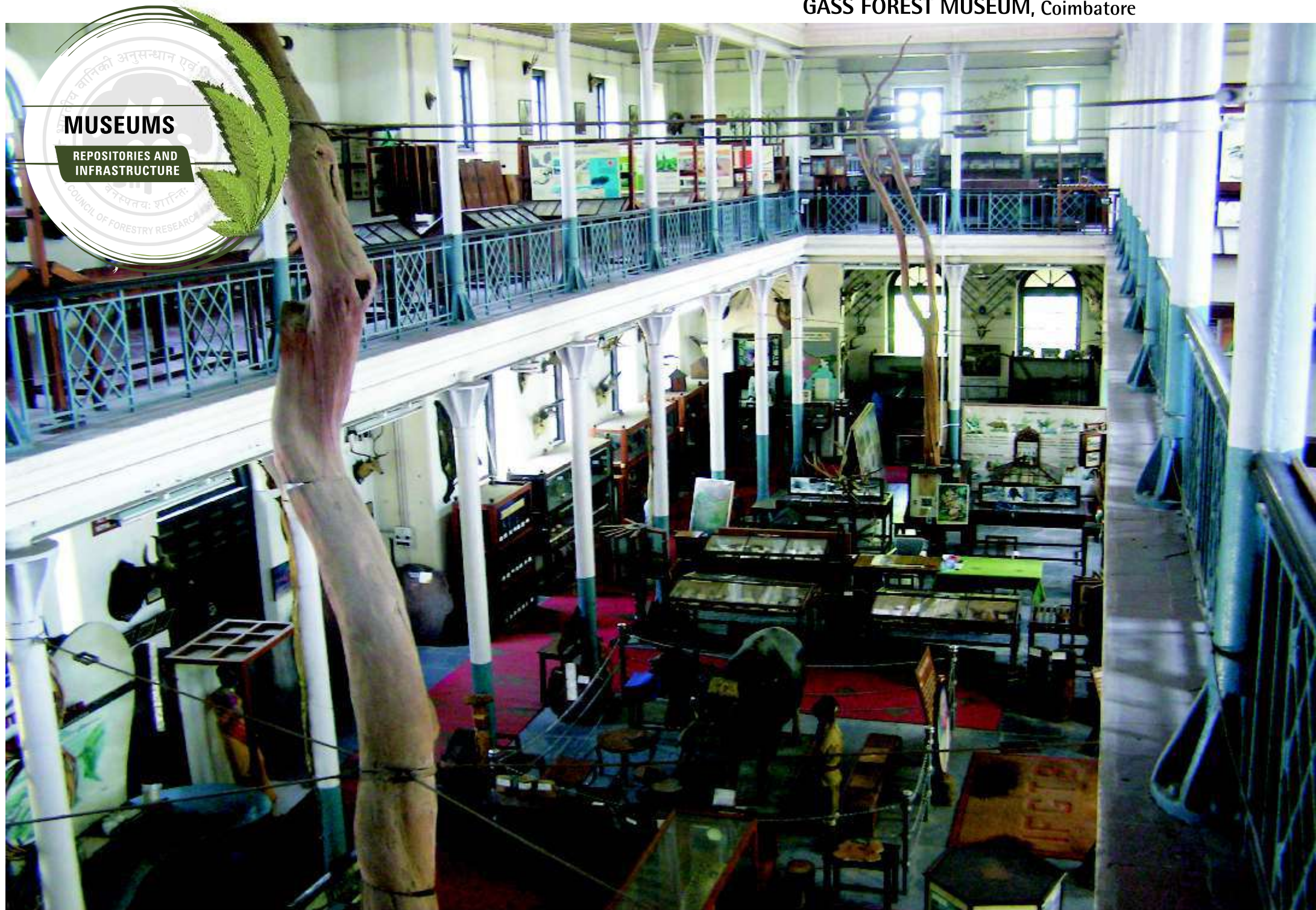


## DIFFERENT SPIDERS





### GASS FOREST MUSEUM, Coimbatore



#### MUSEUMS

REPOSITORIES AND  
INFRASTRUCTURE

वनस्पतयः शान्तिः  
COUNCIL OF FORESTRY RESEARCH





Wood Product



Wood Fossil



Bark of Trees



Wood Specimen



Artefacts





TIMBER MUSEUM, Dehradun



## FOREST ENTOMOLOGY MUSEUM, Dehradun

It contains the largest collection of about 3,000 exhibits representing the various stages of insect pests and the nature of damage caused by them.



Exhibits on different orders of insects important in forestry



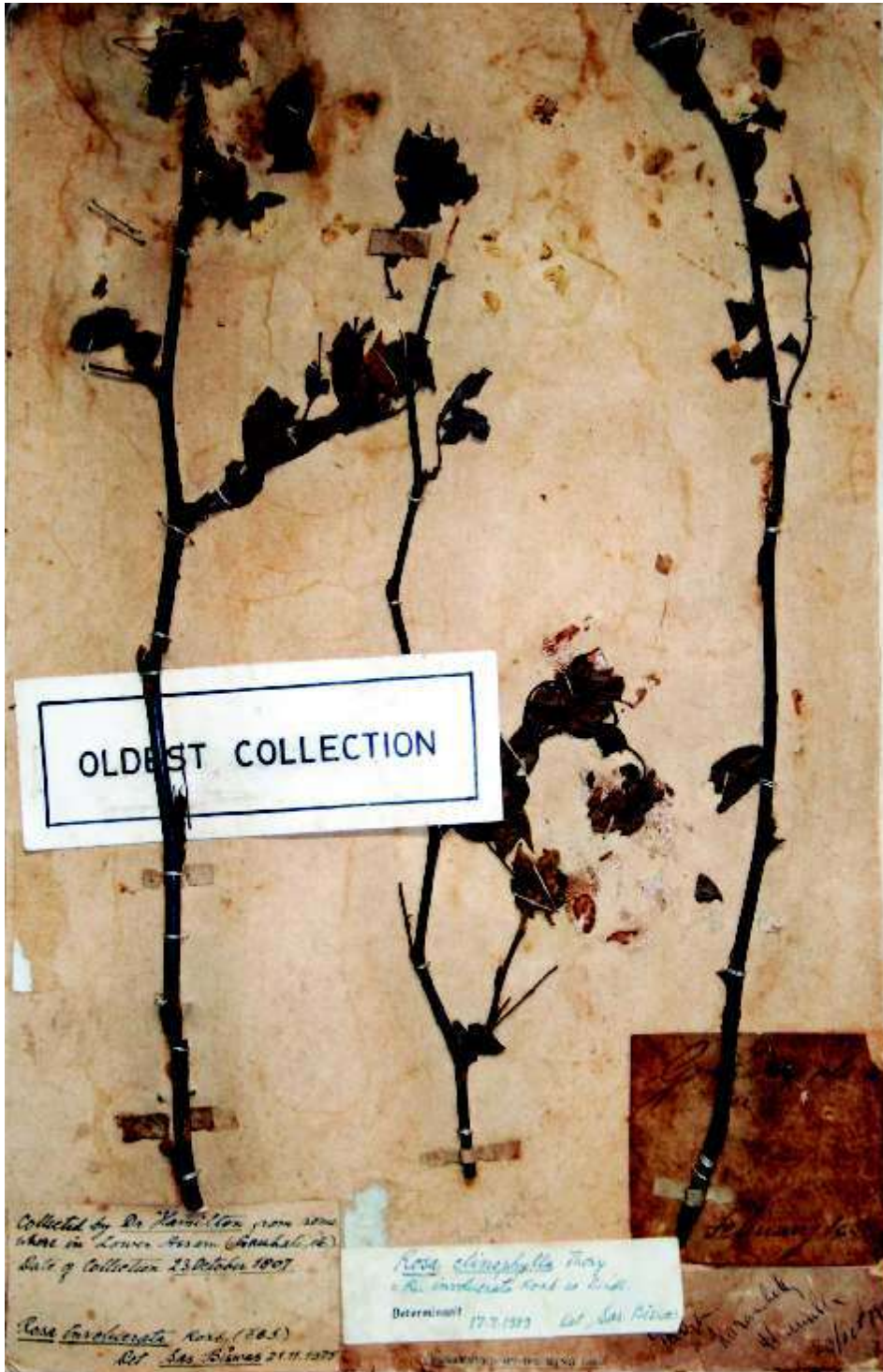
**NON WOOD FOREST  
PRODUCTS (NWFP) MUSEUM, Dehradun**



SILVICULTURE MUSEUM , Dehradun



Herbarium at FRI Dehradun



The herbarium of the Forest Research Institute internationally known as the Dehra Dun Herbarium (DD) was established in 1908 by the amalgamation of the Forest School Herbarium founded by James Gamble in 1890 and the Saharanpur Herbarium started by John Firminger Duthie in 1876. It is the second largest herbarium in the country and contains about 3, 30,000 authenticated specimens and about 1280 valuable type materials.




Study on chemical composition of plants



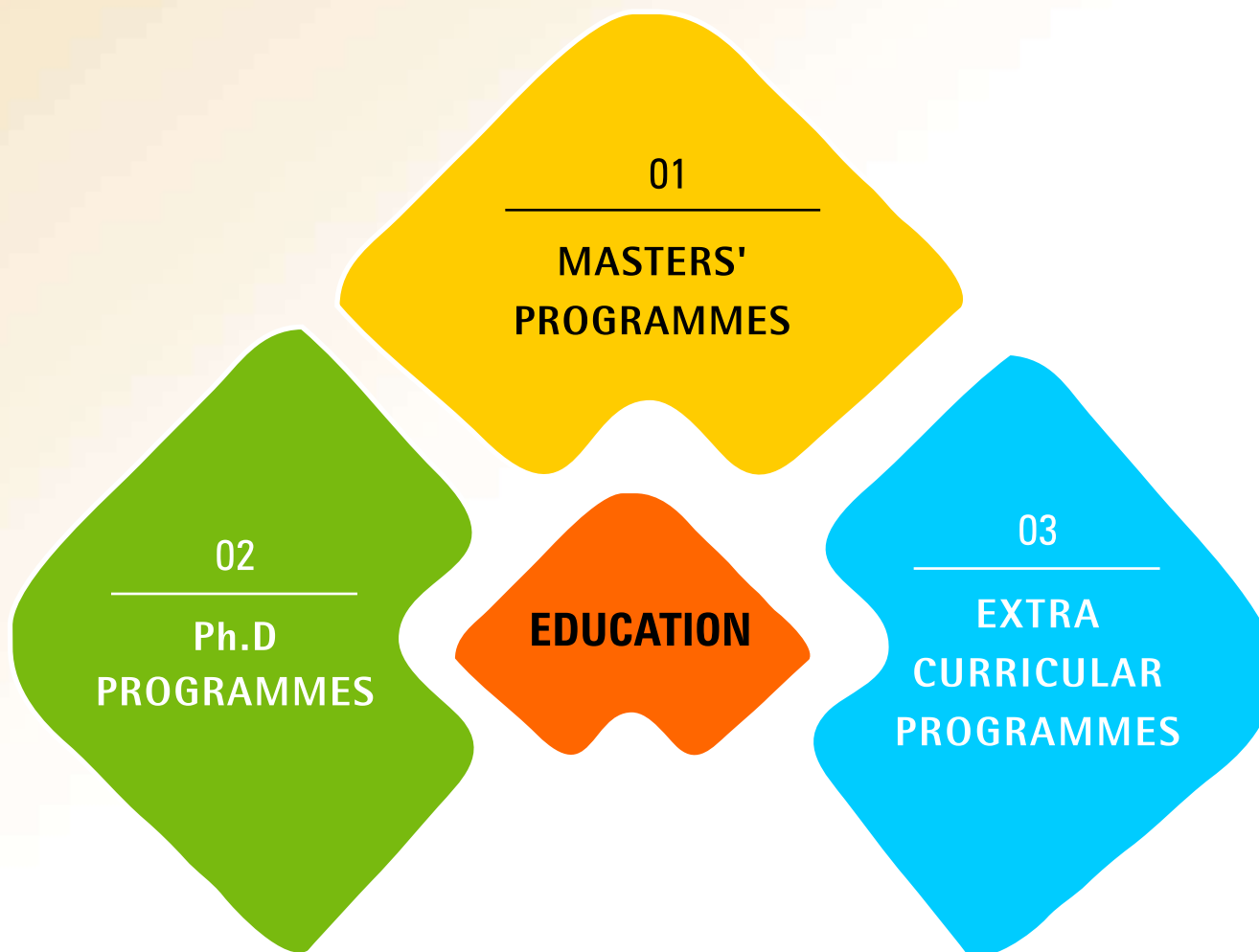
The National Forest Library and Information Centre (NFLIC) is the richest in document collection on forestry and allied sciences in South and Southeast Asia. There are above 2 lakh books and a vast collection of Journals, Reference books, Periodicals, Reports etc.



 National Forest Library and Information Centre









## EDUCATION

ICFRE is also entrusted with the task of providing quality education in forestry and allied sciences. Apart from accrediting various universities for forestry education, the Forest Research Institute has been granted a status of deemed to be university. At present It runs four post-graduate programmes In Forestry, Environmental Management, Wood Science and Technology and Cellulose and Paper Technology. Programmes leading to Ph.D degree in Forestry are also offered in 23 disciplines.









*"We have integrated objectives of Skill India in environment sector and launched the schemes including Green Skill Development Program for skilling about 7 million youth in environment, forestry, wildlife and climate change sectors by 2021. This will go a long way creating numerous opportunities for skilled jobs and entrepreneurships in environment sector."*

NARENDRA MODI  
Hon'ble Prime Minister of India.



## EXTENSION AND EVENTS

The research carried out by ICFRE is extended to the stakeholders, both industrial and communities dependent on forests. Advanced technologies are commercialized with various industrial houses while output needed by small and poor stakeholders is provided through farmers' fairs and other outreach programmes. A network of Van Vigyan Kendras has also been put in place to disseminate the technologies and research output to state forest departments and other stakeholders. ICFRE takes a lead in celebrating various programmes like Earth Day, Ozone Day, International Day of Forests, etc. to bring about awareness in the community regarding environmental issues.



**PRAKRITI**

EXTENSION AND EVENTS

COUNCIL OF FORESTRY RESEARCH

वनस्पतयः शान्तिः





The MoUs between Kendriya Vidyalaya Sangathan and Navodaya Vidyalaya Samiti has resulted in the *Prakriti* programme that is being run across the country through ICFRE institutes. Activities like visits of students and teachers to ICFRE institutes, exposure to the laboratories, models and exhibits, plantations and nurseries, interactive programmes are organized. Talks are delivered on various aspects of forestry and environment. The programme is aimed at creating awareness in the young citizens of our country towards building a greener India.



In line with the Skill India Mission of Hon'ble Prime Minister, Ministry of Environment, Forest & Climate Change (MoEF&CC) has taken up an initiative for skill development in the environment and forest sector to enable India's youth to get gainful employment and/or self-employment, called the Green Skill Development Programme (GSDP). The programme endeavours to develop green skilled workers having technical knowledge and commitment to sustainable development, which will help in the attainment of the Nationally Determined Contributions (NDCs), Sustainable Development Goals (SDGs), National Biodiversity Targets (NBTs), as well as Waste Management Rules (2016).

The GSDP training programmes are tailored to suit the specific needs with more emphasis on practical skills. The purpose was to have various GSDP course modules targeting school and collage dropouts across the country through expertise available at ICFRE institutions irrespective of age or profession. ICFRE has conducted 20 trainings programmes on GSDP through ENVIS, MoEF&CC. Total 374 candidates have successfully completed the different courses under Green Skill.





**अच्छी खबर** आईसीएफआरआई के सभी नौ केंद्रों में 18 प्रशिक्षण कार्यक्रम शुरू

## ‘ग्रीन स्किल’ के जरिए मिलेगा युवाओं को रोजगार

**अजय राजपाल बयरो**

युवाओं को तैयार करने के लिए नौ केंद्रों में 18 प्रशिक्षण कार्यक्रम शुरू किए गए हैं। इन कार्यक्रमों के माध्यम से युवाओं को रोजगार के अवसर मिलेंगे।

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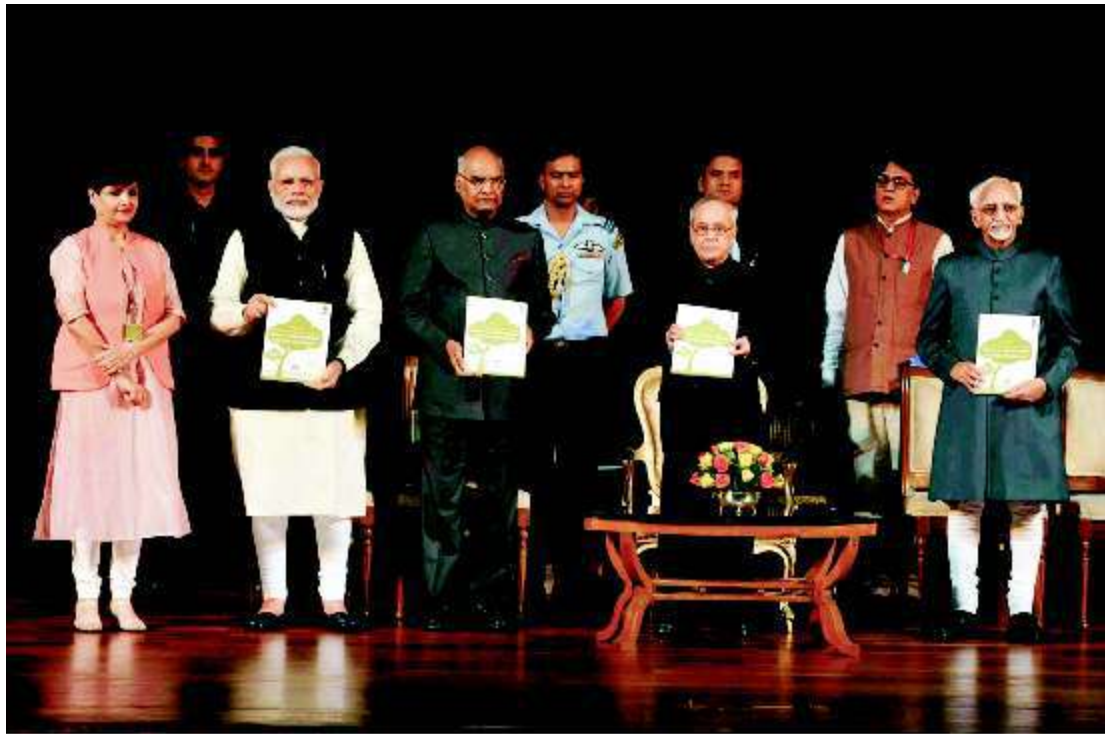
### FRI to organize certificate course on 'Management of Small Botanical Gardens'

**Dr. Anil Kumar**

The programme will be organized under the leadership of Dr. Anil Kumar, Director, FRI. The course will be held at FRI, Shimla. The course will be held for 10 days. The course will be held from 1st to 10th of the month. The course will be held from 1st to 10th of the month. The course will be held from 1st to 10th of the month.



◆ Hon'ble Governor Uttarakhand on address during XIX CFC-2017



Release of Report on Tree health by Ho'ble President and Prime Minister



Ganga Cleaning Mission -Uma Bharti Hon'ble Minister planting a seedling



Planting of bamboo by Hon. president of India at Rastrapati Bhawan



Forestry Chopal 21March 2018



Krishi Unnati Mela at ICAR, New Delhi



Training for KVK Scientist in IFGTB on Agroforestry



Farmers Visiting Stalls in Tree Growers Mela at Dharmapuri



Students visiting Gass Forest Museum, IFGTB, Coimbatore



Stakeholders interaction on Medicinal Plants Cultivation and Practices



Involvement of ICFRE in outreach program to take the fruits of research to the stakeholders through organising sensitizing programmes, trainings and exhibitions. The process of field demonstration involves preparation of land, providing planting material, training in nursery techniques and manufacturing of products from forest based raw materials.



Training on bamboo handicraft and bamboo products



Memorandum of Understanding have been signed with various organisations like The Energy and Resources Institute (TERI), Navodaya Vidhyalaya, Indian Council of Agricultural Research, University of British Columbia, etc. for carrying out collaborative research, education and extension.







TERI



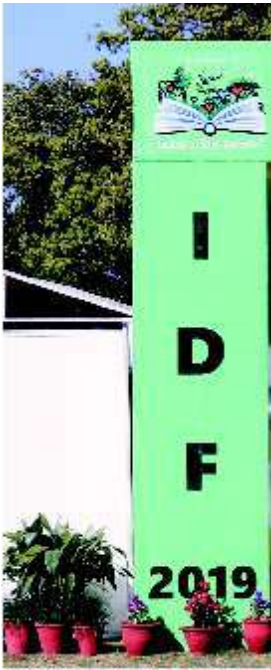
TIFAC



NVS and KVS



Yoga Day



World Environment Day Celebration



Run for Unity on Sardar Vallabh Bhai Patel Jayanti



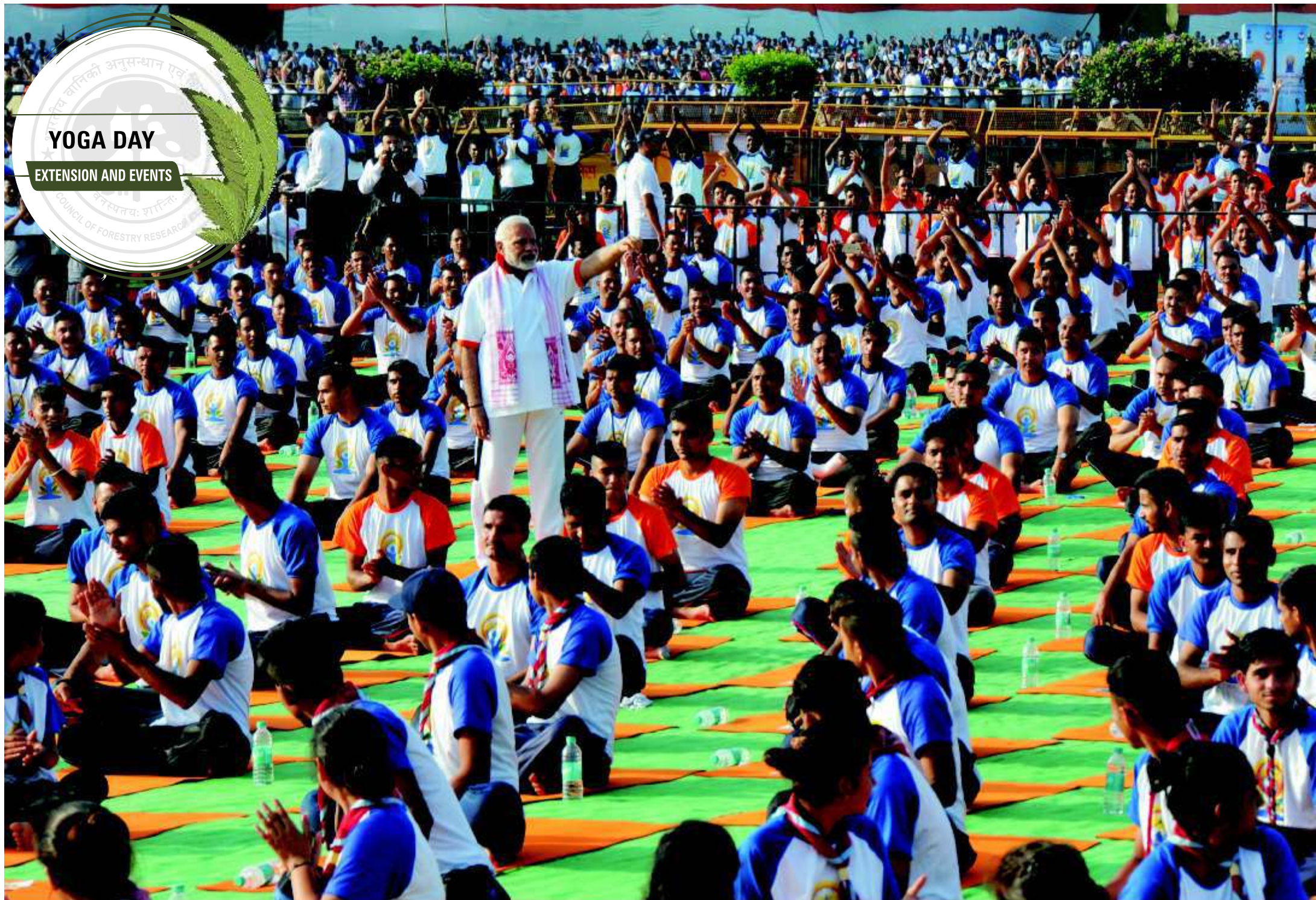
International Day of Forests



Van Mahotsava

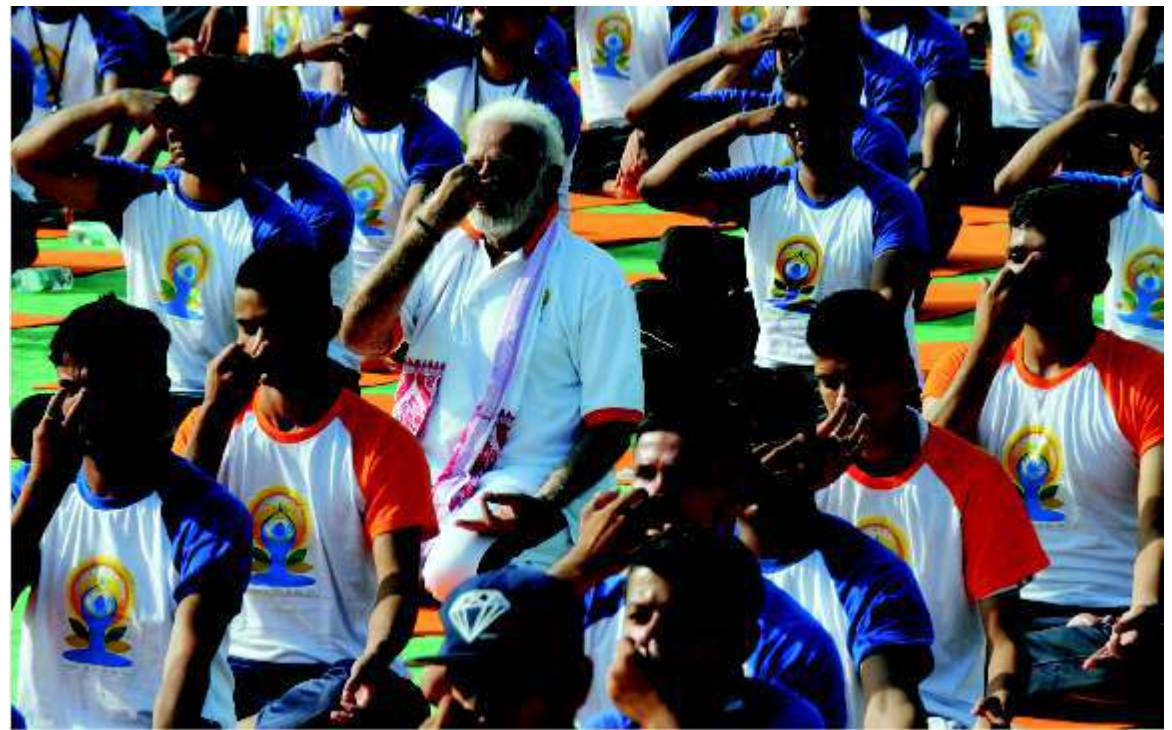


Cleanliness Drive in campus



योग दिवस  
अनुसन्धान एवं  
विस्तार  
वनस्पतयः शान्तिः  
COUNCIL OF FORESTRY RESEARCH

**YOGA DAY**  
EXTENSION AND EVENTS





## Key Contributors

- Dr. Suresh Gairola, IFS  
Director General, ICFRE
- Dr. Vipin Chaudhary, IFS  
Deputy Director General (Extension), ICFRE

## Acknowledgments

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- Dr. Santan Barthwal  
Scientist 'F', FRI Dehradun
- Raman Nautiyal  
Scientist 'E', ICFRE Dehradun
- Ramakant Mishra  
CTO, ICFRE Dehradun

AND ALL DIRECTORS AND SCIENTISTS OF ICFRE INSTITUTES.





**INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN**

(An Autonomous body of Ministry of Environment, Forests and Climate Change)

Government of India

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