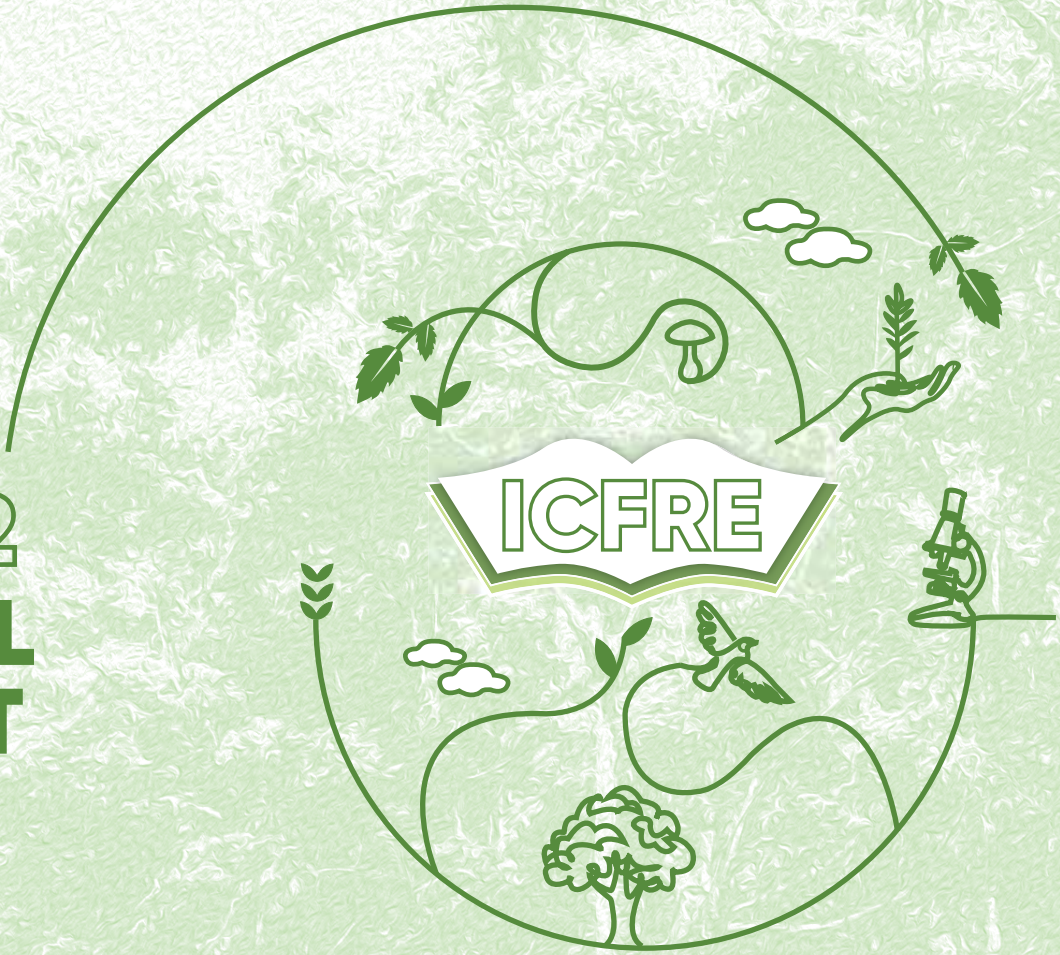
आज़ादी का
अमृत महोत्सव



2021-22
ANNUAL REPORT

INDIAN COUNCIL OF FORESTRY RESEARCH AND EDUCATION

(AN AUTONOMOUS COUNCIL OF MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE, GOVERNMENT OF INDIA)


2021-22
ANNUAL
REPORT

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Indian Council of Forestry Research and Education
Dehradun

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Inner Cover- A view of Troup Road, FRI, Dehradun
Photo Courtesy- Shri Agnish Kumar Das, Ph.D. Scholar, FRI, Dehradun

मंत्री
पर्यावरण, वन एवं जलवायु परिवर्तन,
और
श्रम एवं रोजगार
भारत सरकार

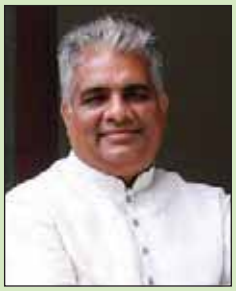
एक कदम स्वच्छता की ओर

सत्यमेव जयते

भूपेन्द्र यादव
BHUPENDER YADAV

MINISTER
ENVIRONMENT, FOREST AND CLIMATE CHANGE
AND
LABOUR AND EMPLOYMENT
GOVERNMENT OF INDIA

आज़ादी का अमृत महोत्सव



MESSAGE

Humanity's reliance on forests and their numerous services is greater and more widespread than previously thought. Forest conservation and sustainable use are now top priorities for meeting national development goals. Indian Council of Forestry Research and Education (ICFRE), Dehradun, an autonomous body under Ministry of Environment, Forest and Climate Change (MoEF&CC), New Delhi is the leading organization responsible for executing forestry research, education and extension.

The council is working arduously towards increasing the forest's productivity and also contributing towards the goal of Doubling farmers income. The council has released twenty two clones/varieties of commercially important tree species, has developed various financially sustainable agroforestry models producing quality planting materials of impotrant tree species like bamboos and medicinal plants from superior germplasms, and has made efforts to fortify farmer-industry linkages. Continuing in its endeavour to support the livelihoods of forest dependent communities, ICFRE has developed protocols for sustainable harvesting and processing of medicinal plants and value addition of forest based products and bamboo. The release of 'Sasi Inoculant' a fungal inoculum to artificially induce agarwood formation is a praiseworthy initiative towards augementing income of these communities.

In its pursuit to address climate change concerns in the forest sector and to fulfil the target of reducing emissions, ICFRE has built a REDD+ Safeguard Information System for UNFCCC and conducted capacity building programmes for state forest departments to augment state REDD+ action plans.

For dissemination of research results to diverse stakeholders, the council has followed multipronged approach. It has developed a versatile web portal and a mobile application 'Tree Genie' – which nurtures the convergence of multilayered stakeholdrs like Tree Growers, Tree Nurseries, Wood based industries, Research institutions, and SFDs into a single platform and simultaneously conducted Tree Growers Melas, Industry farmers meets, Trainings, Seminars, Workshops on various aspects pertaining to forestry, biodiversity and climate change. To enhance awareness and sensitize the youth and general public on forest and environment aspects, a number of programmes have been conducted under Azadi Ka Amrit Mahotsav and *Prakriti* .

I commend team ICFRE's efforts for the variety of accomplishments highlighted in this annual report for 2021–2022.

(Bhupender Yadav)

Date: 24.01.2023

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आज़ादी का अमृत महोत्सव

अश्विनी कुमार चौबे
Ashwini Kumar Choubey

सत्यमेव जयते
आहारशुद्धौ सत्त्वशुद्धिः

स्वच्छ भारत
एक कदम स्वच्छता की ओर

राज्य मंत्री
पर्यावरण, वन एवं जलवायु परिवर्तन
उपभोक्ता मामले, खाद्य और सार्वजनिक वितरण
भारत सरकार
MINISTER OF STATE
ENVIRONMENT, FOREST AND CLIMATE CHANGE
CONSUMER AFFAIRS, FOOD & PUBLIC DISTRIBUTION
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MESSAGE

Forests are essential for the survival of humankind, and our deep traditional culture is intricately incorporated in our venerated practices leading to forest conservation. The Indian Council of Forestry Research and Education (ICFRE), Dehradun, is an autonomous organisation under the Ministry of Environment, Forest and Climate Change (MoEF&CC), New Delhi, that diligently conducts scientific research on forests and the environment for sustainable management and utilization of its resources.

The Annual Report 2021-22 presents the latest accomplishments and important activities of ICFRE. Some of the remarkable achievements are the release of high yielding varieties/clones of different tree species, establishment of agroforestry trials in various bio-geographic zones, launching of new Van Vigyan Kendras, one each in Madhya Pradesh, Rajasthan and West Bengal and two new Demonstration Villages in Himachal Pradesh and Jharkhand. The council has developed several eco friendly bioproducts, such as biopesticides, nutraceuticals, natural dyes etc., and a mobile application for yield estimation of *Ailanthus excelsa* and *Gmelina arborea*, two commercially important indigenous fast growing species.

ICFRE has prepared REDD+ Safeguard Information System and conducted capacity building programmes for State Forest Departments and Joint Forest Management Committees to understand and appreciate the intricate aspects of estimating Forest Carbon Stock. Continuing its dedicated efforts, the council has conducted environmental awareness programmes across the country, for students and teachers from various institutions.

I am confident that the stakeholders will be largely benefitted from the information available in the Annual Report of 2021-2022. My sincere congratulations to the dedicated ICFRE team for their hardwork and commitment in bringing out this report.

I convey my best wishes to the Institute for all its future endeavours.

(Ashwini Kumar Choubey)

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लीना नन्दन
LEENA NANDAN

सचिव
भारत सरकार
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
SECRETARY
GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT, FOREST AND
CLIMATE CHANGE

MESSAGE

Indian Council of Forestry Research and Education (ICFRE), an autonomous council under MoEF&CC, GoI, is dedicated to conducting research into forestry issues and implementing related activities that are conducive to conservation of forests as well as increase in forest cover. An important area is providing alternates to forest produce, with focus on eco-friendly and sustainable products. A concise summary of the activities carried out during 2021-22 is presented in Annual Report.

It is noteworthy that after extensive research, the council released 22 varieties/clones of different high yielding plant species - Neem having double the oil and Azadirachtin content, *Calophyllum inophyllum* with high fruit yield and oil content, *Dalbergia sissoo* for high timber yield, Poplar for high productivity and short rotation period and *Eucalyptus* hybrids having growth superiority. Continuing the research work on Bamboos, ICFRE has established demonstration plantations in different parts of country and bamboo-based multipurpose wind break models in Tripura. The commissioning of Vacuum Impregnation Unit at Jorhat under Public-Private Partnership is a welcome move which will help in increasing people's participation and consequent livelihood enhancement.

The technologies developed by the scientists of ICFRE has resulted in three patents, a transparent wood composite; simple and rapid infra-red spectrum-based detection method for determination of pure sandalwood and essential oil; and management of fungal deterioration of stored Medicinal Plant Products. Six new patents have also been filed.

The Council is consistently expanding its outreach through initiatives like Van Vigyan Kendras, Demo Villages, Technology Demonstration Centers, demonstration plots, agro forestry models etc. by conducting trainings and workshops, organizing Tree Growers Melas and awareness programmes and also by transferring technologies through licenses agreements. The transferring of technologies for Automated Mangrove Incubation Nursery Technology and extraction of fiber from pine needles to Tamil Nadu and Himachal Pradesh Forest Departments respectively is indeed commendable.

I congratulate the entire team of ICFRE for their outstanding work in forestry research, education and extension, as has been presented in this ICFRE Annual Report.

(Leena Nandan)

Dated: January 24, 2023

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चन्द्र प्रकाश गोयल
CHANDRA PRAKASH GOYAL

सत्यमेव जयते

वन महानिदेशक एवं विशेष सचिव
भारत सरकार
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
DIRECTOR GENERAL OF FOREST & SPL. SECY.
GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT, FOREST AND
CLIMATE CHANGE

MESSAGE

Forest are precious natural resource and are vital for addressing the environmental concerns. Since it is a living ecosystem, scientific approach and methodology are required to manage the forests. Indian Council of Forestry Research and Education (ICFRE), an autonomous council under MoEF&CC, New Delhi mandated to conduct research, education and extension activities in the field of forestry and environment is dealing with this challenge aptly. A brief account of its activities performed during the year is presented in the annual report 2021-22.

ICFRE is conducting research in different disciplines of forestry. As an outcome of research on Tree Improvement, twenty-two high yielding superior varieties/clones of Shisham, Eucalyptus, Neem, Poplar and *Calophyllum inophyllum* developed by ICFRE were released. Developed a bioreactor prototype for non-destructive natural guggulsterone production and non-destructive technology for commercial extraction of guggulsterone. With a view to popularize agroforestry and to support livelihood, established agroforestry trials of different plant species in 12 states and fodder banks with fodder trees and grass in Uttarakhand and Himachal Pradesh.

The council is meticulously extending its research outcomes through various modes of extension to wide array of stakeholders including SFDs, farmers, tribals, industries etc. The initiatives taken for popularization of clones and varieties by providing quality planting material as seed and seedlings to forest departments, plantation companies and farmers is a step-in right direction. The signing of License agreements for mass multiplication of QPM with wood based industries, nurseries and commercial labs is an appreciable initiative. Conducted over 200 trainings for stakeholders, 59 HRD trainings for scientists and staff of ICFRE and 10 training for IFS officers. Three new Van Vigyan Kendras were established and six Tree Growers Melas were organised - one each in Assam, Jharkhand, Madhya Pradesh and Tamil Nadu, and two in Uttar Pradesh. I am happy to know that under Azadi Ka Amrit Mahotsav (AKAM) more than 160 events including iconic weeks were conducted.

I am confident that this annual report of the council will provide an informative brief of its research, education and extension endeavors conducted during the year and will be useful to the policy makers as well as other stakeholders.

(Chandra Prakash Goyal)
23-01-2023

Place: New Delhi
Date: 23rd January, 2023

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आज़ादी का अमृत महोत्सव

सत्यमेव जयते

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Arun Singh Rawat, IFS

कुलाधिपति, व.अ.सं. विश्वविद्यालय
Chancellor, FRI University

महानिदेशक
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Director General
Indian Council of Forestry Research and Education
P.O. New Forest, Dehra Dun - 248006
(An ISO 9001 : 2008 Certified Organization)

FOREWORD

Indian Council of Forestry Research and Education (ICFRE), an autonomous council under Ministry of Environment Forest and Climate Change (MoEF&CC), Government of India (GoI) with its pan India presence has maintained a positive growth during the financial year to cater forestry and environment research and education needs of the country.

The year 2021-22 was momentous and ICFRE witnessed glorious activities organized throughout the length and breadth of the nation under '*Azadi ka Amrit Mahotsav'* and participated enthusiastically in a number of events including *Awareness to avoid use of single use plastic, Birsa Munda anniversary, Celebrating the rivers of India* and many more. The Detailed Project Report (DPR) prepared by ICFRE for rejuvenating thirteen major Indian rivers was released and appreciated by Hon'ble Minister, MoEF&CC, GoI. ICFRE is facilitating next generation farmers and tree growers towards enhancing the income by increasing the productivity of trees and released 22 improved varieties/clones of Neem, Shisham, Eucalyptus, Poplar and Callophyllum.

Forest tree improvement research have contributed to establishment of 35 Clonal trials of six species, 25 Progeny trials of eight species, a good number of germplasm banks and demonstration trials of different species including bamboo trials established at various places in the country. Significant efforts have been made to contribute in doubling of farmers income through establishment of agroforestry trials such as multipurpose block plantations and agroforestry models with Agarwood, Sandalwood, Prosopis, Tecomella, Cordia, Ziziphus, bamboo and Leucaena; fodder banks along the forest fringe villages in various parts of the country and signed MoU with wood based industry for buyback of Leucaena wood from farmers. An android mobile application *TreeGenie* was developed and released for Tamil Nadu based stakeholders such as researchers, farmers, tree growers, wood-based industry, nursery and State Forest Department, to network them at one platform and the same is being upgraded for Pan India application. ICFRE released '*Sasi Inoculant'* a fungal inoculam for artificial inoculation for agarwood in *Aquilaria malaccensis,* inoculated tree can be harvested after two years; organized workshops and trainings to popularize the product among farmers.

ICFRE has made a breakthrough in developing and popularizing technologies and products developed such as Automated Mangrove Inoculation Nursery Technology (AMINT); non-destructive natural guggulsterone production; and products such as herbal hair colourant from *Soymida febrifuga;* Energy bar, Cream and toothpaste from Mahu; Creams from *Cassia tora* and *Pterocarpus santilanius;* soaps from *Butea monosperma* and *P. santalinus.* Further, a promising nano biopesticide from nano encapsulated entomopathogenic endophytic fungi from the leaves of *Tectona grandis, Ailanthus excelsa, P. santalinus* and *Gmelina arborea* are under development stage.

Significant achievements have been made in development of technologies and obtained intellectual property rights in the form of three patents and applied for six patents. Applied for registration in Central Insecticide Board and Registration Committee for herbal biopesticide product Hy-Act, developed from seed oil of *Hydnocarpus pentandra* (Chalmugra).

In the Extension front, the technologies developed such as extraction of fibers from pine needles; *in-vitro* multiplication of teak clones; commercial propagation of *Eucalyptus camaldulensis*; wind break clones of *Casuarina junghuniana;* high yielding genotype of *Bambusa tulda;* mass multiplication of bacterial consortia and fungal culture were transferred to various stakeholders through License/Material transfer Agreements. Significant achievements were made to transfer research results through capacity building. Imparted training to Sri Lanka Forest Department on High-Tech Forest nurseries; conducted 234 trainings for 12082 participants; through Green Skill Development Programme trained 107 unemployed youth. As part of Ecosystem Services Project in Chhattisgarh and Madhya Pradesh conducted 16 capacity building programmes to measure forest carbon stocks to SFDs and JFMCs; 68 capacity building programmes on SLEM best practices, environment and social safeguards for 5263 numbers of local people, livelihood generation trainings on Lac cultivation to 1456 number of local people and distributed improved cook stoves and vermi-beds with earthworms to 5248 and 3822 number of local people respectively. As part of Swachh Bharat Mission, training provided to tribal women inhabiting forest fringe villages in Tamil Nadu on *Tree Rich Bobooster* technology for production of compost from vegetable, flower and other bio-waste.

The researchers of ICFRE have published 43 books, 388 research papers in international and national journals and produced seven documentaries. Established three new VVKs in West Bengal, Rajasthan and Madhya Pradesh and two new DVs in Himachal Pradesh and Jharkhand. Initiated establishment of bamboo processing units - Bamboo Common Facility Centre, Incense Stick making and Preservation Plant at IFP, Ranchi; Bamboo Shoot Processing unit at RFRI, Jorhat; and Bamboo Handicraft and Jewellery making at FRC-BR, Aizawl for entrepreneurship development. '*Banh Bithika*', a sales counter for bamboo handicraft was established at RFRI, Jorhat. As part of outreach programme, six Tree Grower Melas and three Industry-Farmers meets were organized in different parts of the country. To create awareness on environment and forest, educated 5000 school children under Prakriti- a scientist-student connect programme.

ICFRE has created a number of repositories including the *Marine Interpretation Unit* in Visakhapatnam, *Gustav Mann Herbarium* at RFRI, Jorhat, Technology Demonstration Centre at IFP, Ranchi and photo gallery at FRI, Dehradun. The Non-Timber Forest Products Museum at FRI, Dehradun was modernized.

The REDD+ Safeguard Information System prepared by ICFRE was approved by MoEFCC. Also, the country level second and third Biennial Update Reports to Address Climate Change Concerns in Forest Sector submitted to NATCOM Project Management Cell of MoEF&CC.

ICFRE extended scientific service to conserve the two Ficus- based Living Root Bridges (LRBs) with detailed Conservation and Development plan for UNESCO World Heritage Site nomination for Meghalaya Community – Led Landscape Management Project (MCCLMP).

The ICFRE is continuously making effort to develop innovative technologies through dedicated research not only for sustainable forestry, environment but also climate smart technologies for mitigation and adaptation; and extend the research findings to educate and build capacity of various stakeholders of the country. I hope that this ***Annual Report 2021-2022*** will render help to all the stakeholders and planning for future strategies for forestry research, extension and education in the country. I would like to thank the entire human capital of ICFRE for their invaluable contributions and bringing laurels to the council.

I express my appreciation to Dr. Sudhir Kumar, DDG (Extension), Dr. Geeta Joshi, ADG (Media and Extension), Shri R.K. Mishra, CTO and the entire team of Media and Extension Division, Directorate of Extension, ICFRE for synthesizing and timely bringing out comprehensive Annual Report of 2021-22.

(A.S. Rawat)

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    Director,
    Wildlife Institute of India
    Dehradun

16. **Dr. Bharat Jyoti, IFS**
    Director
    Indira Gandhi National Forest Academy
    Dehradun

17. **Shri A.S. Rawat, IFS**
    Director General
    ICFRE, Dehradun

Special Invitees

18. **Shri Subhash Chandra, IFS**
    ADG (CAMPA), MoEF&CC
    New Delhi

19. **Shri Neelesh Shah**
    JS(FE), MoEF&CC
    New Delhi

20. Ms. Suveena Thakur, IFS
AIGF (RT), MoEF&CC,
New Delhi

21. Shri S.D. Sharma, IFS
Deputy Director General (Research)
ICFRE, Dehradun

22. Shri Rakesh Kumar Dogra, IFS
Deputy Director General (Admin.)
ICFRE, Dehradun

23. Smt. Kanchan Devi, IFS
Deputy Director General (Education),
ICFRE, Dehradun

24. Shri Anurag Bhardwaj, IFS
Director (International Cooperation),
ICFRE, Dehradun

25. Dr. Geeta Joshi
Scientist-G & ADG (Media and Extension)
ICFRE, Dehradun

26. Shri Deepak Mishra, IFS
Secretary
ICFRE, Dehradun

CONTENTS

OVERVIEW

OVERVIEW

Indian Council of Forestry Research and Education (ICFRE), Dehradun, an autonomous council under Ministry of Environment, Forest and Climate Change (MoEF&CC), Government of India (GoI) is mandated to conduct holistic research and impart education on forestry and environment, and extend solutions on emerging issues to various stakeholders. The annual report for the year 2021-22 provides an insight on the activities undertaken by ICFRE institutes and are presented in five chapters namely Introduction, Research Highlights, Education Vistas, Extension Panorama and Administration & Information Technology.

Projects	Completed	Ongoing	Initiated
Physical targets			
Plan	41	80	51
Externally Aided	37	101	20
Budget (in Crore)			
Plan			
Allotment		Rs. 230.00 Crore	
Expenditure		Rs. 229.86 Crore	
External aided			
Allotment		Rs. 53.56 Crore	
Expenditure		Rs. 73.32 Crore	

The broad area of research includes forest productivity, genetic improvement, biodiversity conservation, silviculture, agroforestry, climate change, forest products, protection, combating desertification, sustainable development and ecology and environment. The significant outcomes in the form of technologies developed are extended from lab to land for the benefit of various stakeholders. Following are the overview of activities achieved during the fiscal year:

Clones/Varieties Released

Clones and varieties developed by ICFRE will not only increase the productivity of plantations but also result in substantial benefits to the farm income for the farmers and to secure wood raw material availability for the industry. The variety release committee has released following twenty-two varieties/clones during November 2021:

- Six varieties of Neem having double the oil and Azadirachtin content in comparison to base population.
- Six clones of *Calophyllum inophyllum* for its high fruit yield and oil content for commercial cultivation in southern states of India.
- Three clones of *Dalbergia sissoo* for high timber yield, suitable for Gujarat.
- Five clones of Poplar, for high productivity and short rotation period for cultivation in middle Gangetic plains especially in Bihar.
- Two clones of *Eucalyptus* hybrids having growth superiority.

Popularization of Clones and Varieties/ Germplasm

- Quality planting material of Melia, Neem, Bamboo, Shisham, Casuarina supplied to forest departments, universities, farmers, industries, NGOs.
- Established 1.0 Ha Demo plot comprising of clones of Eucalyptus in ICAR-KVK, MYRADA at Thalamalai, Tamil Nadu.
- IFGTB established Tamarind plantations with 5000 seedlings at selected lands at panchayat, temples, schools, avenues and village roads for the restocking of TGRs towards the livelihood improvement of the rural population in Tamil Nadu.
- **Transfer of Technology**-Signed License/ Material transfer Agreement with various stakeholders to transfer technologies such as *in-vitro* multiplication of teak clones, commercial propagation of *Eucalyptus camaldulensis*, wind break clones of *Casuarina junghuniana,* high yielding genotype of *Bambusa tulda,* mass multiplication of bacterial consortia and fungal culture.

Tree improvement

Establishment of clonal, progeny, demonstration trials and germplasm bank for different tree species were carried out to develop improved varieties / clones:

- **Established 35 Clonal trials of six species:** *Casuarina* – 15, *Eucalyptus* – 10, *Tamarindus indica* – 3, *Neolamarckia cadamba* – 1, *Eucalyptus camaldulensis* – 5, *Parkia timoriana-1-* in Tamil Nadu, Gujarat, Haryana, M.P., Jharkhand, Karnataka, Telangana, Kerela and Manipur.
- **Established 25 Progeny trials of eight species:** *Casuarina* – 7, *Gmeilna arborea*– 2, *Melia dubia* – 5, *Pterocarpus marsupium* – 2, *Toona ciliata- 1, Acacia nilotica*– 3, *Eucalyptus* – 3, *Acacia mangium – 2* – in Tamil Nadu, Haryana, M.P., Jharkhand, Karnataka, Telangana, Mahrashtra, Chattisgarh and Uttarakhand.
- **Established Germplasm Bank:** *Dalbergia latifolia* at FRI, *Toona ciliata* in Chamoli district, Uttarakhand and *Salix alba* at Giue & Sushna in Lahaul & Spiti, H.P.
- **Established Demonstration trials:** *E.tereticornis* x *E. grandis* established in Panampally and Neyveli, Tamil Nadu.

National Programme for Conservation and Development of Forest Genetic Resources

The Forest Research Institute **(**FRI), Dehradun has created a visual guide of 200 prioritised species for field workers for accurate species identification. The DNA isolation procedures have been standardized for 10 different species.

The Institute of Forest Genetics & Tree Breeding (*IFGTB*), Coimbatore has prepared the distribution maps for 134 FGR species.

For Uttarakhand FRI, Dehradun has documented the diversity, population structure and regeneration status of 250 species; Developed, eco-distribution maps of 50 priority species and comprehensive computerized database on FGRs.

Popularising Agroforestry

ICFRE institutes have established agroforestry trials in various biogeographic zones.

- Six Horti-silvi trials of Sandalwood at Tamil Nadu, Madhya Pradesh, Karnataka, Rajasthan and Punjab
- Five *Gmelina* based agri-silvi trials were established at Tamil Nadu, Kerala, Madhya Pradesh and Telangana.
- Agri-silvi model of *Prosopis cineraria*; *Tecomella undulata* and Agri-horti model of *Cordia myxa* and *Zizyphus mauritiana* in Rajasthan
- Medicinal plant *Fritillaria roylei* with Horticulture (apple) in Himanchal Pradesh

Agarwood

- Established a silvicultural trial for standardising spacing and fertilizer at Silapathar Science College Assam; Laid Agar-based agroforestry trials at Namti, Assam; Nongpoh, Meghalaya; FRCBR Campus of Aizawl, Mizoram and in RFRI campus with intercrops-. lemon, ginger and turmeric.
- Two provenances' trials were laid at Parbotjhora, Kokrajhar and Krishi Vigyan Kendra (KVK), Jorhat.
- A workshop on "Artificial Induction of Agarwood in *Aquilaria malaccensis*" was conducted for the agarwood farmers at Baghmara of South Garo Hills, Meghalaya.
- Relased fungal inoculum for artificial inoculation of agarwood in *A. malaccensis* for marketing in the brand name of product "Sasi Inoculant", available in two forms i.e. Liquid and Paste.

Fodder banks in Uttarakhand and Himachal Pradesh

Established plantations with 8000 trees of 10 fodder species along with fodder grass viz. hybrid Napier in five forest fringe villages, two in Uttarakhand and three in Himachal Pradesh.

Forest Protection

- Prepared insect pest database comprising of 128 species of Lepidoptera, 100 species of Coleoptera, 16 species of Hemiptera and one species of Diptera of Western Himalayan oaks.
- Identified stem Gall fly *Procecidocha resutilis* as an important biological control agent of Crofton weed.
- Developed an integrated approach of treatments comprising of Abamectin, Putranjeeva, Hingota and *Metarhizium* for effective management of Khejri flower galls.
- Found promising nano biopesticide for protection. Isolated nano encapsulated entomopathogenic endophytic fungi from the leaves of *Tectona grandis, Ailanthus excelsa, Pterocarpus santalinus* and *Gmelina arborea* which, is found to have a significant bio pesticidal efficacy against targeted pest with no toxicity against beneficial insect (Honey bees).
- Distributed, the product Bio bacilin to farmers for controlling root diseases in the nurseries.
- Supplied an anti-bacterial product Mona 20 through Tamil Nadu News Print Limited and Andhra Pradesh Paper Mills to *Casuarina* growers facing bacterial wilt disease.

Wood Science

- Trial on dispersion of zinc oxide (ZnO) nano particles PU coatings on Photo-degradation of wood polymers in radiata pine wood surfaces exhibited an excellent UV shielding, which is of great importance for developing environment friendly nano coatings.
- Standardised wood preservative combination of Neem oil with Cashew Nut Shell Liquid (CSNL) coat for rubber wood, which is very effective in increasing service life of the timber.

Bamboo

- Established a high-tech bamboo nursery at FRI, Dehradun and a small nursery at Nalagarh field station, Himachal Pradesh.
- Established 11 ha demonstration plantations in different agro-ecosystem in U.K., Jharkhand and Bihar.
- Established three Bamboo-based multi purpose wind break models in Tripura using *Thysostachus oliveri* and *Bambusa polymorpha*.
- Established 20 ha. demonstration plantations of Bamboo spread over 5 locations involving 12 species and 21 accessions at Agricultural Research Station - Tamil Nadu Agricultural University (ARS - TNAU), Bhavanisagar; Kumaraguru Institute of Agriculture (KIA), Sakthinagar, Erode district; Musiri Institute of Technology – College of Agriculture & Technology (MIT-CAT), Musiri; Tiruppur Corporation Land, Iduvai Village and in private farmer plots at Nanjundapuram, Coimbatore.
- For commercial production of quality planting material of bamboo species, selected genotypes of three bamboo species were mass multiplied and base cultures of *Bambusa balcooa* were provided to private tissue culture companies of Chhattisgarh and Maharashtra.
- Initiated establishment of bamboo processing units - Bamboo Common Facility Centre, Incense Stick Making and Preservation Plant at IFP, Ranchi; Bamboo Shoot Processing unit at RFRI, Jorhat; and Bamboo Handicraft and Jewellery making at FRC-BR Aizawl for Entrepreneurship Development.
- Inaugurated *'Banh Bithika'*, a sales counter for bamboo handicraft at RFRI, Jorhat.

REDD+

- REDD+ Safeguard Information System prepared by ICFRE and approved by MoEFCC has been communicated to United Nations Framework Convention on Climate Change (UNFCCC).
- Capacity Building programmes for Developing State REDD+ Action Plans were organized for 24 State Forest Departments and UTs.
- Prepared and submitted second and third Biennial Update Reports to Address Climate Change Concerns in Forest Sector in India to the NATCOM Project Management Cell of Ministry of Environment, Forest and Climate Change.

Ecosystem Services Project (ESIP) in Chhattisgarh and Madhya Pradesh

- Conducted a series of 16 capacity building programmes for 790 participants of the State Forest Departments and Joint Forest Management Committees (JFMCs) to measure forest carbon stocks. Livelihood generation trainings on Lac cultivation to 1456 number of local communities; and 68 trainings on upscaling of SLEM best practices, environment and social safeguards for 5263 members of local communities were also organised.
- Distributed improved cook stoves and vermi-beds with earthworms to 5248 and 3822 members of local communities respectively.
- Developed a road map for institutional and policy mainstreaming of SLEM in India.
- Developed a portal "SLEM Knowledge Sharing and Reporting System" (https://nrdp.icfre.gov.in) for increasing national capacity for monitoring the land degradation and desertification and SLEM outcomes and national reporting to UNCCD.

Product Development

- Tested and developed a product *Soymida febrifuga* dye as hair colorant gel comparable with the commercial hair colorant available in the market.
- Developed herbal value-added products:
  - ✓ Energy Bars, cream and toothpaste from Mahua
  - ✓ Hand Wash & cream from *Cassia tora* leaves extract
  - ✓ Gel Soap from *Butea monosperma* flowers
  - ✓ Shampoo from the seed pulp of *Dillenia indica* and *Sapindus mukorossi*
  - ✓ Herbal tea from powder of *Taxus wallichiana*, *Thymus serpyllum*, *Viola* sp. and *Urtica dioica*
  - ✓ Prepared skin care cream from *Pterocarpus santalinus*
  - ✓ Developed Royal Seema – ICFRE Red Sander Soap
  - ✓ Developed natural dye for cotton fabric from extract of Eucalyptus leaves and bark along with natural mordants like Myrobalan, Aloe vera, Turmeric & Pomegranate peel
  - ✓ Developed Incense sticks using waste leaves and bark of Eucalyptus
  - ✓ Developed "Dhoopwell"a range of Dhoopbatti formulations with medicinal properties.
- Developed Hy-ACT – Biopesticide and applied for registration in Central Insecticide Board and Registration Committee.

Digital Initiatives

- IFGTB developed and released an Android Mobile Application "TreeGenie" and Web Portal on the theme "*Developing & Popularizing Digital Interactive Platform for Tree Growers & other Stakeholders of Tamil Nadu*"to bring the tree growers, planting stock suppliers, wood-based industries, research institutions and state forest departments at one platform for integrate information flow on research and markets for benefit of the tree growers.
- IFGTB developed mobile apps for Yield estimation in *Ailanthus excelsa* and *Gmelia arborea.*

Technologies Developed

- IFGTB developed Automated Mangrove Incubation Nursery Technology (AMINT), a potential tool for recovery, regeneration & restoration of mangroves and transferred to Tamil Nadu Forest Department.
- AFRI developed a non-destructive natural guggulsterone production technology with a successful development of fed batch culture prototype to grow contamination-free guggulsterone-rich callus of *Commiphora wightii* for 4-fold yield in callus. The bioreactor prototype developed for both liquid and solid cultures is a potential non-destructive commercial extraction technology for guggulsterone.

Scientific Service

- Scientific services provided in the form of consultancies on Environment, Forest, Mining and other related subjects. During the year 10 projects were completed and 15 new projects were awarded to ICFRE by various developmental agencies.
- Ten consultancy study reports and five observations on the R&R Plan Reports as per the guidelines of Central Empowered Committee (CEC) related to Bellary, Chitradurga and Tumkur districts of Karnataka were prepared and submitted to project authorities.

Capacity Building

- FRI imparted training to officials of Forest Department, Government of Sri Lanka on High-Tech Forest Nurseries.
- Conducted 234 trainings for 12082 participants for dissemination of research outcomes and 30 HRD trainings for 750 scientists and staff of ICFRE.

Patents

ICFRE has been granted three Patents, of which two to IWST on (i) A transparent wood composite and (ii) Simple and rapid infra-red spectrum-based detection method for discrimination of pure sandalwood and essential oil; and one to FRI on (iii) Management of fungal deterioration of stored medicinal plant products.

Technologies transferred

- A license agreement was signed between FRI, Dehradun, and Himachal Pradesh Forest Department, Nahan for transfer of technology on Extraction of fiber from Pine needles.
- IFGTB transferred technology on *in vitro* multiplication of selected teak clones to three commercial tissue culture laboratories, Labland Biotech, Mysore; HU Gugle Biotech, Bengaluru and Santhi Clonal Nursery, Cuddalore for commercial production of identified superior performers of teak through tissue culture.

Managing the Forests

- A team of experts from Forest Research Institute (FRI) examined two Ficus- based Living Root Bridge (LRB) at Wah Sohot and Wah Umlyngoh near Lait Shuthim Village and at Nohwet for developing a research- based Conservation and Development plan for UNESCO World Heritage Site nomination for Meghalaya Community – Led Landscape Management Project (MCCLMP). Further, recommended *in situ* and *ex situ* measures to conserve soil and water in the core areas of the LRBs for improvement of the trees health and to minimize anthropogenic disturbances.
- Monitoring and Evaluation of the plantations raised under Greening Delhi Mission (GDM) was undertaken by FRI for the Forest Department of Delhi.
- Monitoring and Evaluation in 11 Horticulture and 03 Biodiversity Parks of Delhi Development Authority were carried out by FRI.
- Monitoring and Evaluation of the restoration of orchid flora of Makum coalfield areas of Digboi Forest Division documented species diversity and observed that the *in vitro* raised plants of different *Dendrobium* species were maintained in the mined-out sites and forest site with adequate care.

Outreach Programmes

- Established three new Van Vigyan Kendras (VVK)s in Sukna (West Bengal) by IFP, Ranchi; Kalka Mata Nursery, Udaipur, by AFRI, Jodhpur; and in Jagdalpur (Chhattisgarh) by TFRI, Jabalpur.
- Established two new Demo Villages (DV). One each in Badagaon, HP by HFRI, Shimla and in Topra, Khunti, Jharkhand by IFP, Ranchi.
- Organized six Tree Growers Melas in, Erode (Tamil Nadu) by IFGTB; Prayagraj (Uttar Pradesh) by FRC-ER, Prayagraj; Ranchi (Jharkhand) by IFP, Ranchi; KVK Mandla (Madhya Pradesh) by TFRI, Jabalpur; Jorhat (Assam) by RFRI, Jorhat and Phoolpur, Uttar Pradesh (in association with IFFCO) by FRI, Dehradun.
- Organised three industry farmers meet on *Melia dubia* in Haryana and Uttar Pradesh by FRI in association with Wood Technologist Association.
- Produced seven documentaries on Estimation of heartwood in trees of sandalwood; Cold desert of North West Himalayas; Sandalwood Spike Disease; and Agroforestry, research, extension and education activities of FRC-ER, Prayagraj; "*Pesum Marangal*" Tamil version of documentary film on IFGTB and "*Rendezvous with Natural History*"for creating awareness.
- Published 43 books, 88 brochure/pamphlet, 114 popular articles, 92 chapters in books, 153 research papers in international and 235 in national journals.

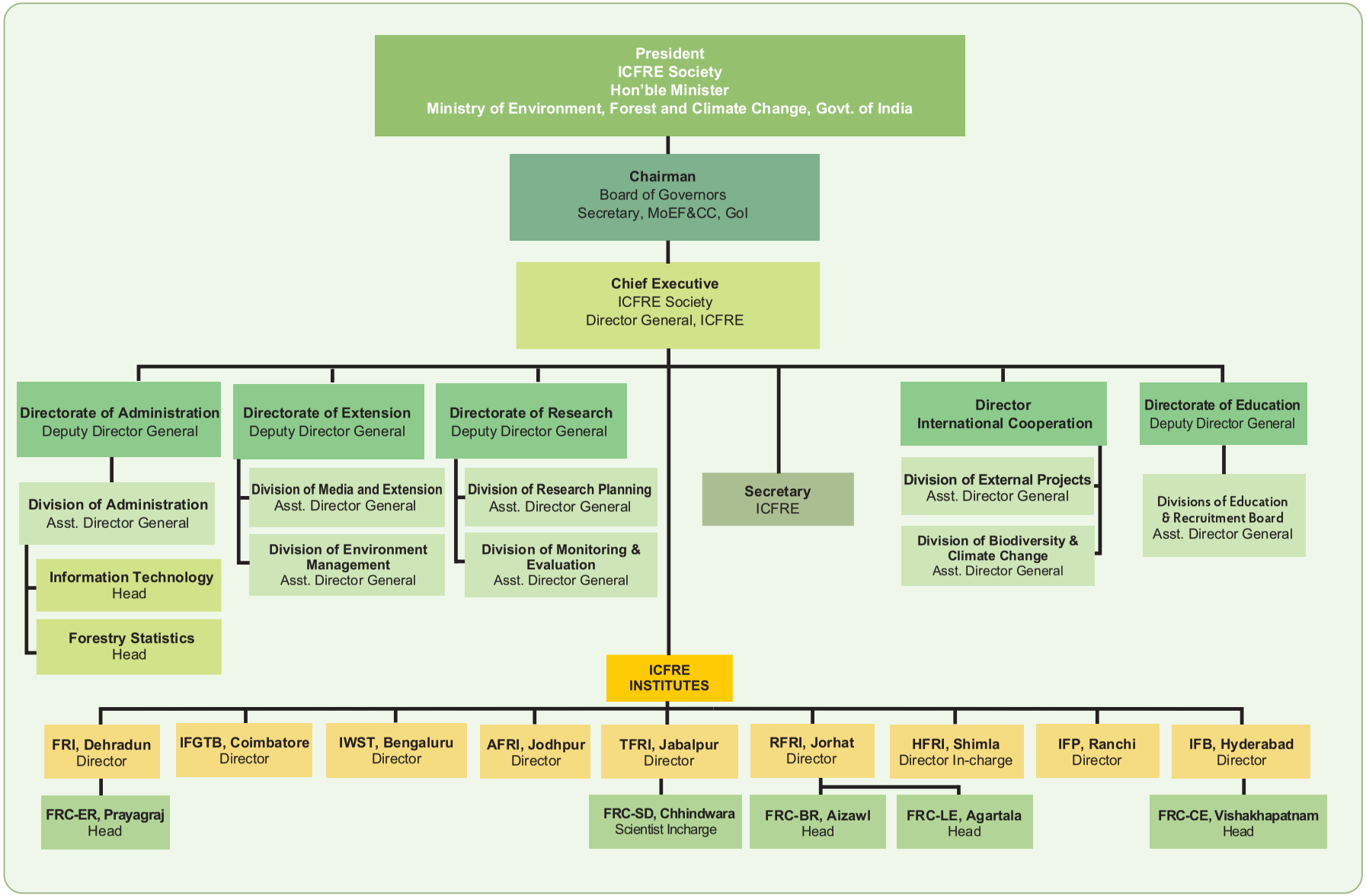
- Imparted seven trainings under Green Skill Development Programme (GSDP) of MoEF&CC to107 unemployed youth by IFGTB- ENVIS.
- Prakriti, a scientist – student connect programme: 5,000 students and teachers from various KVs, JNVs , other schools and colleges were educated on various aspects of environment and forest. Online knowledge series programme, lectures, plantations, screening of films, cleanliness drive and other awareness programmes were also conducted.

Repositories

- Established Technology Demonstration Centre (TDC) at IFP, Ranchi and Photo gallery at FRI, Dehradun.
- Renovated and modernized NTFP museum at FRI, Dehradun.
- Established 'Gustav Mann Herbarium' at RFRI, Jorhat.
- The Hon'ble Vice President of India, Shri M. Venkaiah Naidu inaugurated the Marine Interpretation Unit at FRC-CE, Visakhapatnam.

To celebrate and commemorate 75 years of independence, Government of India started an initiative known as "Azadi Ka Amrit Mahotsav" which reflects about India's socio-cultural, political and economic identity. In these 75 weeks of celebration ICFRE conducted around 160 events including iconic weeks like River rejuvenation programmes, Birsa Munda Jayanti, Awareness campaign on avoid the single use plastics and many more.

ORGANIZATIONAL STRUCTURE OF ICFRE SOCIETY



CHAPTER

01

INTRODUCTION

CHAPTER 01

INTRODUCTION

Indian Council of Forestry Research and Education (ICFRE) is an autonomous organization under the Ministry of Environment, Forest and Climate Change (MoEF & CC), Government of India (GoI) and is registered under the Societies Registration Act, 1860. The ICFRE Society, subject to guidelines as issued time to time by Government of India, has full authority to perform all acts and issues such directions as may be considered necessary incidental or conducive to the attainment of the objective of the Council. The General Body is the supreme authority of the ICFRE, headed by the Union Minister, MoEF&CC, GoI. The members consist of serving and retired officers from various state governments, educational institutes, NGOs and scientific organizations. The Director General, ICFRE is the Member Secretary of the BoG. Board of Governors of ICFRE constituted under Rule 17 of ICFRE Society Rules. The Board of Governors, with the approval of Government of India, has the power for the administration and management of the affairs and funds of the Society. Secretary, MoEF&CC is the Chairman of the BoG of ICFRE.

During the year Board of Governors meeting was held on 30 December 2021.

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.

59th Meeting of the Board of Governors

The 59th BoG meeting of ICFRE was held through virtual medium under the chairmanship of Shri R.P. Gupta, IAS, Secretary, EF&CC, MoEF&CC on 30 December 2021; Shri A.S. Rawat IFS, DG, ICFRE and the Member Secretary welcomed the secretary and other members.

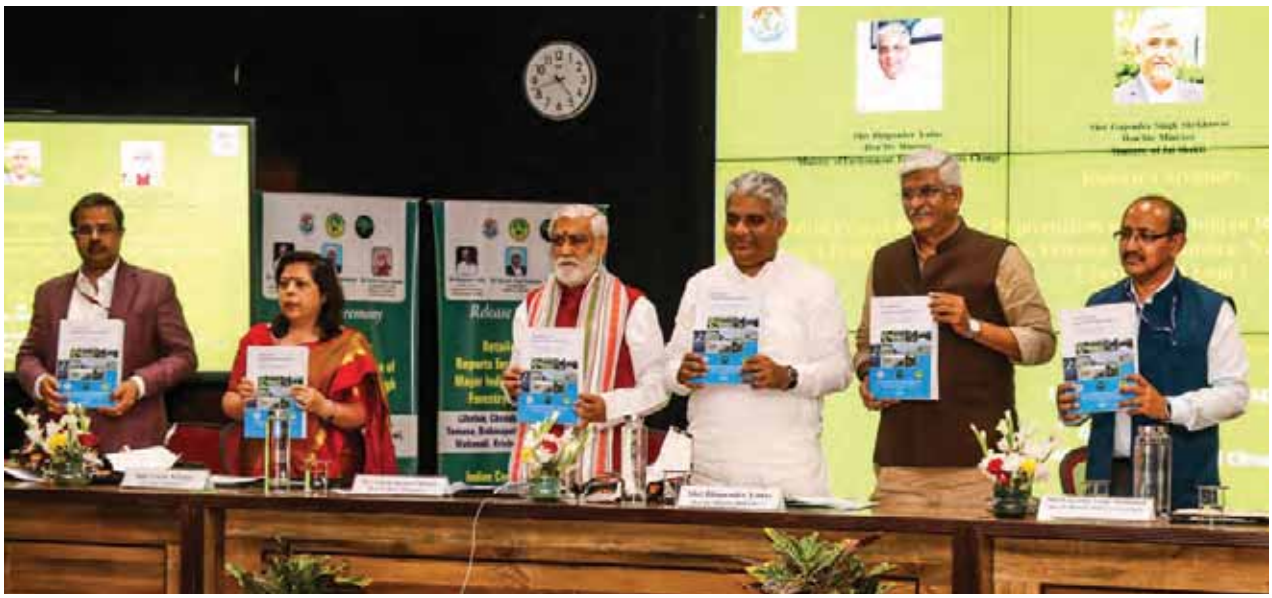
The Board confirmed the minutes of 59th meeting of BoG of ICFRE and the action taken on the decisions in the previous meeting of BoG. The Board recommended the Annual Report and annual Audited Accounts of ICFRE for the year 2020-21 for approval of ICFRE Society. The Board also approved Modification in ICFRE Group 'A' (Deputy Director Generals and Directors) Recruitment Rules 2010, Revamping of awards of excellence in forestry, Restructuring of ministerial staff cadre and Restructuring of stenographic cadre.

Members attending 59th BoG at ICFRE, Dehradun through virtual medium

ICFRE Annual Report 2020-21 was placed and approved by both the houses of Parliament i.e. Lok Sabha and Rajya Sabha.

Release of DPR of 13 major Indian rivers

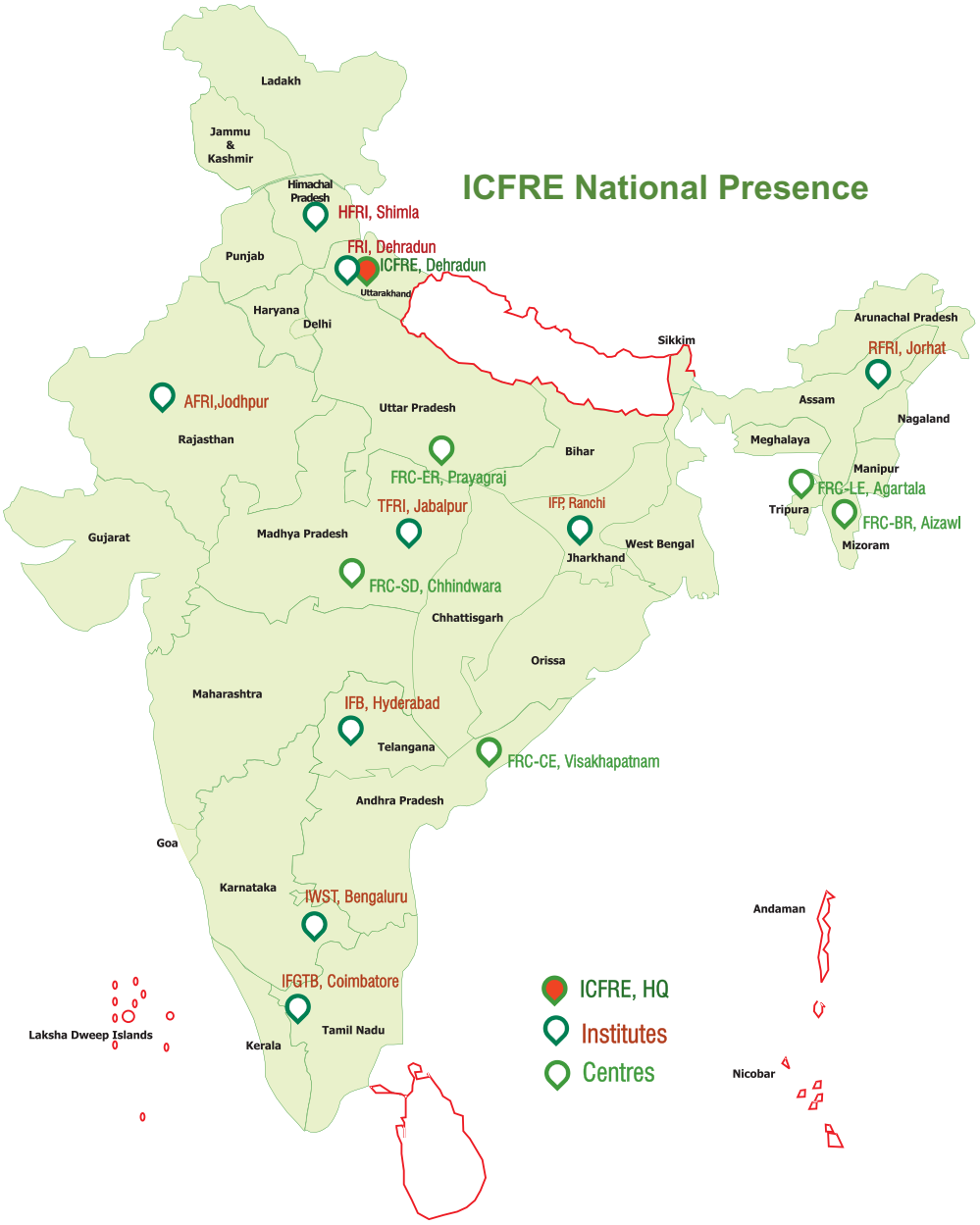
Shri Bhupender Yadav, Hon'ble Minister, Environment, Forest and Climate Change, GoI. released the DPRs of rejuvenation of thirteen major Indian rivers namely Jhelum, Chenab, Ravi, Beas, Sutlej, Yamuna, Brahmaputra, Luni, Narmada, Godavari, Mahanadi, Krishna, and Cauvery through forestry Interventions on 14 March 2022 .



DPRs were released by the Hon'ble Minister, EF&CC, GoI.

RRCs Organized in 2021-22

S.No.	Date	Conference	Venue	Organizing Institute
1.	13 and 14 December 2021	Vocal for local: Sustainable development of Non-timber Forest Produce for Livelihood generation	Jabalpur	TFRI, Jabalpur
2.	15 February 2022	Biofertilizer and Biocontrol agents; success, challenges and future	Coimbatore	IFGTB, Coimbatore



Variety Releasing Committee (VRC) Meeting of ICFRE was held on 18 November 2021 under the chairmanship of Director General Forests & Special Secretary (MoEF&CC) and Co-chairmanship of Director General (ICFRE). 22 varieties/clones of Neem, Shisham, Eucalyptus, Poplar and Calophyllum were released.

Parliamentary Standing Committee on Science & Technology, Environment & Forest & Climate Change under the chairmanship of Hon'ble Shri Jairam Ramesh visited FRI, Dehradun on 23 November 2021. DG, ICFRE welcomed the PSC and apprised about the activities of the Council.

Parliamentary Standing Committee visited FRI, Dehradun

New Initiatives

MoUs with National and International Organization

MoUs Signed

- International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal.
- CSIR-Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow .
- Amity Universities and Institutions, Noida.

MoUs in Progress

- National Cooperative Development Corporation (NCDC), New Delhi,
- The Nature Conservancy Centre, New Delhi
- USDA, Forest Service
- Beijing Forestry University (BFU), Beijing with (FRI Deemed To be University)
- Forestry and Environment Research, Development and Innovation Agency (FOERDIA), Indonesia
- Brazilian Forest Services (BFS), Brazil
- Kasetsart University (KU), Thailand
- Chinese Academy of Forestry (CAF), China (Extension for another five years)
- Swedish Forest Agency (SFA), Sweden

Repositories

Marine Interpretation Unit at FRC-CE, Visakhapatnam

The Vice President, Shri M. Venkaiah Naidu, inaugurated the Marine Interpretation Unit of the Forest Research Centre-Coastal Ecosystem (FRC-CE) in Visakhapatnam on 23 November 2021.

Inauguration of Marine Interpretation Unit of the FRC-CE, Visakhapatnam

Non Timber Forest Products (NTFP) Museum

A modernized NTFP museum was inaugurated on 29 October 2021 at FRI, Dehradun. The Museum holds around 2000 specimen of raw materials from different species including medicinal, fibers, dyes, lac, gum, resin, edible produce, bamboos and its products. It also showcases *Mahua* and *Broom Grass* as life line of poor tribes, sustainable harvesting techniques of Pine and marketing channels of NTFPs, through creatively designed informative relief murals.

Inauguration of NTFP museum at FRI, Dehradun

Gustav Mann Herbarium at RFRI, Jorhat

Rain Forest Research Institute, Jorhat (Assam) established a Herbarium which was inaugurated by Hon'ble Deputy Chief Minister of Arunachal Pradesh, Shri Chowna Mein on 4 March 2022. The Herbarium, named after great German Botanist, Gustav Mann, contains around six thousand Herbarium Sheets. Most of the collections of the Herbarium were brought from erstwhile Research Centre of Forest Research Centre, Burnihat, Guwahati (Assam).

Inauguration of Gustav Mann Herbarium at RFRI Jorhat

CHAPTER

02

RESEARCH HIGHLIGHTS

CHAPTER 02

2.1 ECOSYSTEM CONSERVATION AND MANAGEMENT

A. PLAN

- Completed 11
- Ongoing 19
- New 10

B. EXTERNALLY AIDED

- Completed 06
- Ongoing 22
- New 03

2.1.1. Climate Change

Biomass and soil carbon sequestration in important plantation species of clonal and seedling origin in Tamil Nadu (IFGTB)

The study provided valuable information on the soil organic carbon (SOC) pool and carbon sequestration potential of Casuarina, Teak, Melia and *Eucalyptus* plantations in Tamil Nadu. SOC analysis revealed a decreasing trend with the increase of soil depth across all age classes. SOC content was higher in plantations of Casuarina (0.76 %) and Teak (0.68 %) and was lowest in agricultural lands (0.34 %). Carbon storage potential of the plantations varied with age and was higher when compared to agriculture land use. Carbon stored in tree biomass recorded highest (1.46 Mg ha^{-1}) in *Casuarina* species and lowest (0.38 Mg ha^{-1}) in *Melia dubia*. Baseline data on soil carbon sequestration in clonal and seedling origin plantation were generated (Casuarina clone-23.3Mg ha^{-1}, Casuarina seedling -22.0 Mg ha^{-1}, Eucalyptus clone-19.8 Mg ha^{-1}, Eucalyptus seedling -16.1 Mg ha^{-1}, Melia seedling -15.5 Mg ha^{-1} and Teak seedling - 22.1Mg ha^{-1}). Enhanced carbon sequestration potential to mitigate carbon emissions were observed and recorded in Casuarina (619.2 t C ha^{-1}) and Eucalyptus (331.8 t C ha^{-1}) clonal plantations.

Spatial and temporal dynamics of greenhouse gas emission from two wetland ecosystems in Himalayan Foothill (FRI)

In this study, *in-situ* flux monitoring of greenhouse gases, i.e., CO_2, CH_4, N_2O, and H_2O vapour was made at different habitats within, Rishikesh, and Nakraunda wetland, Dehradun wetlands using a portable GHGs analyzer system. Results demonstrated highest GHGs flux during the summer (May-July) followed by spring (Feb-Apr), autumn (Aug-Oct), and winter (Nov-Jan) season. The CO_2, CH_4, and H_2O vapours fluxes varied significantly within the wetland. However, N_2O flux didn't show much variability within the study sites.

Effect of elevated CO_2 with the varying nutrient regime on carbon sequestration and resource use efficiency of *Lagerstroemia speciosa* L. (FRI)

L. speciosa potted seedlings were maintained in open top chambers (OTCs) with treatments of elevated CO_2concentration of approx. 800±20 µmol CO_2 mol-1 and three levels of nutrient regimes (low nitrogen - 200 Kg N ha^{-1}, 10 Kg P ha^{-1}, and 250 Kg K ha^{-1}, medium nitrogen - 300 Kg N ha^{-1}, 20 Kg P ha^{-1} and 350 Kg K ha-1, and high nitrogen - 500 Kg N ha^{-1}, 30 Kg P ha^{-1} and 500 Kg K ha^{-1}). Biophysical and growth dynamics related parameters, physiological response of plants in terms of CO_2 assimilation rate, stomatal conductance, and transpiration rate of plants, night plant respiration and day soil respiration were monitored. Elevated CO_2 concentration and nutrients significantly influenced growth and biophysical traits of the selected species. Carbon assimilation, night plant respiration, water use efficiency, leaf protein significantly increased which demonstrated that this species has potential to adapt and mitigate the climate change.

Spatial mapping and assessment of phenological responses of teak to changing climate (IFGTB)

Information on teak plantations, clonal seed orchard and seedling seed orchard in Tamil Nadu and Kerala was collected from working plans and other secondary sources. Field survey was conducted in Coimbatore, Wayanad, Nilambur and Nilgiris areas. MODIS satellite data for a period of 19 years (2001-2020) were downloaded and clipped for the Parambikulam and Malappuram study areas to generate MODIS NDVI time series data using TIMESAT. Rainfall and Temperature data were downloaded from IMD website for 19 years and used for correlation analysis with the corresponding MODIS NDVI data. Among the three sites, Start of the Season (SOS) was mostly recorded during July to August in Parambikulam and Malappuram sites while in Wayanad it was mostly during August to September. However, End of Season (EOS) was recorded mostly during May to June in all the three sites. Further, the average Length of Season (LOS) was highest in Parambikulam (269 days) followed by Wayanad (230 days) and Malappuram (228 days). During the study period, the LOS was less in all the three sites during the year 2003-2004, that received less cumulative rainfall.

Mitigation actions, constraints, gaps and related financial, technical, and capacity needs to address climate change concerns in the forest sector in India (ICFRE)

The broad scope of the project includes methodologies, assumptions, and other reporting elements for Second Biennial Update Report (BUR II), Third Biennial Update Report (BUR III), Third National Communication (TNC) *w.r.t.* mitigation actions, constraints, gaps and related financial, technical and capacity needs to address climate change concerns in forest sector in India. BUR II and BUR III already submitted to the NATCOM Project Management Cell of Ministry of Environment, Forest and Climate Change.

Predicting climatically suitable future habitats for the range-restricted Himalayan bird using species distribution modeling approach (FRI)

Evaluated the potential suitable future habitats of a Himalayan range-restricted and vulnerable bird species -the cheer pheasant (*Catreus wallichii*) in future climate change scenarios, i.e., different representative concentrations pathways (RCPs) viz. RCP 4.5, RCP 6.0, and RCP 8.5 using the ensemble modeling approach for improving the future conservation strategy in the Indian Western Himalayas. Six selected habitat suitability models based on AUC>0.75 for ensemble modeling were generalized, it showed an increase of climatically suitable habitat of the species and species shifting towards the higher elevations in the wake of future climate change scenarios. It was inferred that the climatically suitable habitat distribution area of the species in the Indian Himalaya is envisaged to become more disintegrated in the future climate change. Besides, it was revealed that future climate change would likely change the cheer pheasant's distribution pattern and suitable habitats, therefore there is need to formulate an effective conservation plan/ strategy for protecting the species in the future.

Quantifying resilience patterns in *Rhizophora* with reference to hypersalinity: Solutions to mitigation (IFGTB)

Rhizophora mucronata is found adapted to hyper and hypo-saline zones, while *R. apiculate* is largely restrictive to hypo-saline zone. While *R. annamalayana* a putative hybrid is found more adapted to hyper salinity. Around 1000 cuttings of *R. annamalayana* were propagated in polytunnels at Pichavaram Mangrove Field Station.

Development of *Rhizophora* hybrids to tackle hyper salinity: Solutions to climate change resilience, mitigation and improved productivity (IFGTB)

Field surveys were conducted in Pichavaram, Killai Reserve Forest and Pazhaiyar estuaries; tagged around 150 putative hybrids of *Rhizophora*; collected soil, leaf and flower samples for further lab studies. Morphotyping of *Rhizophora* species complex has been initiated. Control pollination techniques were conducted in *R. apiculata* and *R. mucronata*. Standardized Automated Mangrove Incubation Nursery technology (AMINT) for producing seedlings of Rhizophora and technology transferred to Tamil Nadu Forest Department. Around 700 propagules were planted in the AMINT system.

Automated Mangrove Incubation Nursery technology (AMINT)

Phenological studies in Rhizhophora and controlled pollination

Assessment of adaptive genetic diversity in teak and sandalwood to guide conservation and genetic improvement efforts (IFGTB)

The leaf functional traits were documented across 19 natural populations of sandalwood spanning in five states. A significant positive correlation for chlorophyll content index, nitrogen and potassium content in leaf was recorded. Transcriptome analysis from nine genotypes documented differential expression of 1517 transcripts across climatic zones. In teak, 35 samples from 20 different locations of Assam, Chhattisgarh, Kerala, Gujarat, Jammu and Kashmir, Karnataka, Maharashtra, Madhya Pradesh, Mizoram, Odisha, Tamil Nadu and Tripura were processed for single nucleotide polymorphisms genotyping to identify molecular signatures of local adaptation to enhance the climate change resilience. The project will generate information on environmental, phenotypic and genotypic parameters that control the adaptive ability of teak and sandalwood.

Genome wide and geospatial approaches for enhancing the adaptive potential of threatened rattan resources in India (IFGTB)

The project focuses on developing gender specific markers, cataloging adaptive potential and identifying viable ecological niches for threatened rattan species. In-depth analysis of *Korthalsia laciniosa* genome was conducted and genome-wide identification of MADS-Box transcription factors revealed loss of Mβ, and Mγ genes belonging to Type I subclass in the rattan lineage. The chloroplast genome was re-constructed and its analysis revealed that the phylogenetic relatedness of this genus to *Eugeissona*, in contrast with its present taxonomic position. This genomic resource will accelerate population structure analysis, genetic resource conservation and phylogenomics in rattans.

Assessment of soil carbon pools under different land uses and carbon stock simulation under climate change scenario (RFRI)

Collection of soil samples by revisiting sampled sites of 2010 has been initiated and sampling has been completed in Jorhat, Sivasagar, Dibrugarh and Tinsukia districts of Assam. A total of 357 soil samples were collected from different rubber, coffee, tea gardens and reserved forests areas and were analyzed for pH, bulk density (BD), moisture content and also analyzed for different labile pools of soil C and total soil C. The mean values of analyzed samples for BD was 1.38 (± 0.18), soil pH was 4.69 (± 0.67) and Soil Organic Carbon (SOC) content was 0.77 percent. The daily temperature (maximum and minimum) and precipitation data from surface weather stations were obtained from India Meteorological Department (IMD) and it will be used to prepare climate change scenarios, using the climate change predictions as given in state climate change action plan for Assam.

Carbon sequestration potential of existing land-use systems in Lahaul Valley, Himachal Pradesh (HFRI)

Study was conducted for *Juniperus polycarpos* forest, *Salix alba* plantation, pure agriculture system, pure Horticulture system, Agri-Horticulture system, Agri-Silviculture system and degraded area of Lahaul valley. Estimated dry biomass, biomass carbon stock and total soil carbon stock of different land-use systems in Lahaul Valley, Himachal Pradesh and these parameters were minimum indegraded areas and maximum in agri-silvicultural system.

Dry biomass, biomass and total Soil Carbon Stock in different land use systems

S. No.	Component	*Juniperus polycarpos*	*Salix alba*	Pure Agriculture	Pure Horticulture	Agri-Horticulture	Agri-Silviculture	Degraded Area
1	Dry Biomass (t/ha)	130.62	123.08	8.44	55.92	65.35	254.16	8.86
2	Biomass Carbon Stock (tC/ha)	70.26	65.42	4.09	29.46	34.29	135.57	4.35
3	Total Soil Carbon Stock (t/ha) (0-30cm)	53.03	48.86	67.67	49.60	62.98	77.49	26.14

2.1.2. Ecology and Environment

Evaluation of carbon regulating services and soil health of restored limestone mine overburden areas (FRI)

The annual litter production at Lambidhar varied widely, with highest (3796.63 kg ha^{-1}) in Site A followed by Site C (3411.35 kg ha^{-1}) and Site B (2777 kg ha^{-1}). This may be attributed to the higher Total Basal Cover (TBC) of shrub species in Site A and Site C. Shrubs generally produce more foliage, which in turn is responsible for producing more organic matter. Compared to the reclaimed sites, annual litter production was higher (4231 kg ha^{-1}) in the natural forest. However, at Chunakhala higher litterfall production (3443 kg ha^{-1}) was recorded in the reclaimed site compared to the adjoining natural forest (3357 kg ha^{-1}).

Seasonal variation of major nutrient and carbon content in leaf litter from Lambidhar, Chunakhala reclaimed sites and adjoining natural forests were recorded and analyzed. The percent carbon, nitrogen, and calcium were low in the summer months compared to the Spring, Monsoon, and Winter months whereas, potassium content in the leaf litter was high in the summer months.

The soil respiration rate of the reclaimed mine sites was observed to be similar with that of natural forest indicating the significant level of organic matter and detritus availability in the top soils of the reclaimed sites. Soil Microbial Biomass Carbon (MBC) of the reclaimed mine area is similar to the MBC of natural forest.

Photosynthetic rate was higher in reclaimed mine areas as compared to natural vegetation of Chunakhala and Lambidhar.

Photosynthetic rate (µmol CO_2 m^{-2} s^{-1}) of the vegetation in reclaimed mine areas and natural vegetation

		Max	Min	Average
Chunakhala	Reclaimed	4.68	10.62	8.56
	Natural	0.79	8.64	5.30
Lambidhar	Reclaimed	9.01	15.64	11.86
	Natural	9.23	14.51	11.52

Recording carbon assimilation rate, transpiration rate and stomatal conductance

Seasonal variation in carbon and major nutrients (%) in litter samples

Sites	Spring (Feb, Mar, April)				Summer (May, Jun, July)				Monsoon (Aug, Sept, Oct)				Winter (Nov, Dec, Jan)			
	C	N	K	Ca	C	N	K	Ca	C	N	K	Ca	C	N	K	Ca
Lambidhar																
Site-A	46.34	0.91	0.18	1.09	38.74	0.61	1.01	0.97	46.46	1.26	0.73	1.51	45.26	1.19	0.18	1.12
Site-B	46.56	1.04	0.16	1.08	38.32	0.70	1.03	0.97	45.54	1.4	0.78	1.48	45.53	1.34	0.16	1.19
Site-C	46.51	1.03	0.13	1.06	38.23	0.85	1.03	0.91	45.16	1.21	0.69	1.40	45.42	1.19	0.20	1.11
Natural	46.51	1.03	0.6	1.07	39.16	1.01	0.99	0.85	45.38	1.17	0.69	1.41	43.66	1.14	0.20	1.16
Chunakhala																
Reclaimed	46.51	1.11	0.16	1.08	23.74	0.76	1.74	0.73	43.63	1.20	0.73	1.27	43.10	1.32	0.23	1.17
Natural	46.59	1.01	0.17	1.09	45.19	1.33	1.60	0.69	42.40	1.33	0.61	1.33	43.68	1.16	0.17	1.11

Carbon sequestration and carbon dioxide emission from the soils under different forest covers in Uttarakhand (FRI)

CO_2 emissions from different vegetation covers were recorded higher in *Shorea robusta* (Sal) and lower in *Pinus roxburghii* (Chirpine) emitting about 2.98 and 2.70 µmol CO_2 m^{-2} sec^{-1} respectively. According to the total recorded forest area, the total CO_2 emission from vegetation in Uttarakhand state was about 10.58 m t from Sal and 12.17 m t from Chir Pine. Soil temperature and soil moisture were positively correlated with seasonal pattern of CO_2 emission rates in all the vegetation cover. CO_2 emission rate was recorded minimum (0.678±0.187 µmol CO_2 m^{-2} sec^{-1}) for January and were not significantly different ($p>0.05$) for the rates recorded from February to June and November to December. Higher soil temperature during summer season and increased soil moisture content during rainy season, increased CO_2 emission rate up to a certain level. However, soil organic carbon and environmental parameters were not significantly correlated. Differences in CO_2 emission from vegetation cover is mainly due to differences in substrate quality of vegetation. Higher biomass was recorded in sal vegetation sites as compared to chirpine vegetations. Similarly, understorey carbon was higher in sal vegetation than chirpine.

Assessment of hydrological services imparted by forests of Kempty watershed (Mussoorie) (FRI)

Meteorological parameters of the watershed, physico-chemical analysis of water and soil parameters recorded periodically. The maximum discharge of 6.8 m^3/s was measured during August and a minimum of 0.4 m^3/s observed during March. Stream discharge indicates the water yield of the watershed. All water quality parameters showed the ideal condition of water from the watershed as per BIS and WHO standards. Data for meteorological parameters was monitored daily. The total annual rainfall was observed 3041 mm. During monsoon, the maximum rainfall of 2131 mm, accounts for 70 % of the annual rainfall, and the minimum rainfall of 440 mm during summer, accounts for 14% of the annual rainfall. Evaporation was recorded highest in May (96 mm) and lowest in February (8 mm). The highest average temperature (21°C) was recorded during July and August. The highest suspended sediment concentration (SSC) (217 mg/l) was measured during monsoon when maximum rainfall was measured. Highest biomass (220 g/m^2) and carbon (87 g/m^2) was recorded during summer season. Soil moisture content at seven observation sites during the year varied from 22.7% to 47.5%. The infiltration rate was maximum (11.67 cm/hr) during dry period and minimum (1.98 cm/hr) during wet period.

Replenishment study of river bed material for Yamuna River at Yamunanagar (FRI)

The study was conducted during pre-and post-monsoon (May and September 2021) period to investigate the deposition of river bed material (RBM) for the study area. Cross-sections were made at an interval of 25m along the river stretch of over 2 km. Observation points were made at each cross-section of the river at a distance of 5m. Elevation difference of river bed at 6,818 points was recorded pre-monsoon and post-monsoon to estimate RBM deposition in the river. Each cross-section of the river was divided into three sections (right, middle and left) all along the study area for the measurement of average deposition. The right section of each segment of the riverbed showed higher deposition of RBM except the 1st segment. The total riverbed material 786770.66m^3 was estimated after observing the deposition after the monsoon season. The volume of extractable RBM after excavation was estimated by multiplying with total RBM deposited in the reverbed and the average expansion ratio (1.55) and it was 1219494.53m^3. The weight of extractable RBM was estimated by multiplying the volume of RBM and average bulk density (1.66 g/cc) and it was 2024360.92 tons for 2021.

Elevation difference of riverbed in pre and post monsoon at different cross section along the river

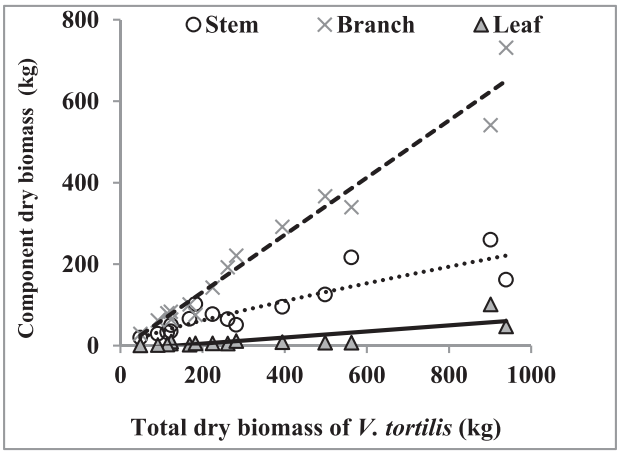
Quantitative assessment of land degradation in forests of three western districts of Madhya Pradesh and suggest mitigation measures (TFRI)

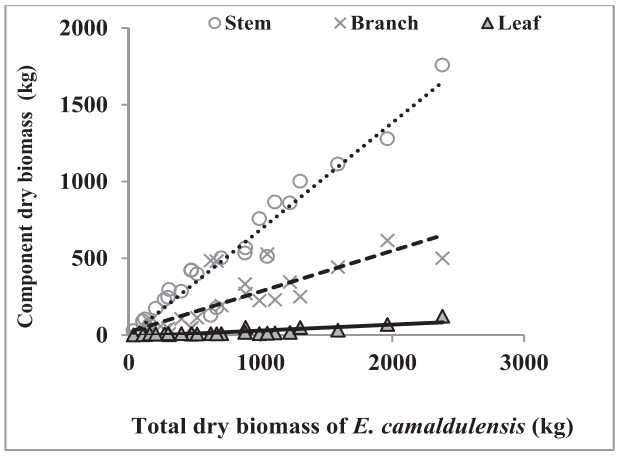
Status of forest land degradation were quantified in three western districts, Dhar, Jhabua and Mandsaur of Madhya Pradesh using Carbon stock in soil and vegetation as indicators. Collected data on vegetation in ten 0.1 ha quadrats in each of the Beat/Compartment. Within each district, land use types were grouped into three categories: (i) vegetation cover with forest; (ii) vegetation cover with grasses and (iii) degraded non-forest lands. Initial analysis on the effect of these three categories on the soil organic carbon showed that in the surface soil layer (i. e. 0–15 cm), the concentration of SOC was significantly ($p<0.05$) different among the assessed land uses. The SOC in category (iii) degraded non-forest lands was lower (4.76 Mg ha^{-1}) than both (i) (23.2 Mg ha^{-1}) and (ii) (16.6 Mg ha^{-1}) categories.

Vegetation studies and collection of soil samples in Mandsaur Forest Division

Impact of harvesting on soil nutrients and carbon stock in canal side plantations of Indira Gandhi Nahar Pariyojana (AFRI)

Experimental plots for *Eucalyptus camaldulensis* and *Vachellia tortilis* were laid (10 plots) and 5 trees of different girth classes were harvested from each plot after enumerating and categorizing trees into different girth classes. Harvested trees were measured for diameter at breast height and total height and fresh biomasses of stem, branches and leaves were recorded. Status of Soil Organic Carbon (SOC) and nutrients were low to moderate, but plantation of these species showed positive impact on soil conditions by enhancing SOC, NH_4-N, NO_3-N and PO_4-P and decrease in soil pH as compared to those in control plots. Soil nutrient status was high under *E. camaldulensis* as compared to the soil under *V. tortilis*. Coppice of *E. camaldulensis* produced only 23.1% of the biomass of the main crop, but rate of carbon sequestration in these coppices were 12.65 Mg C ha^{-1} $year^{-1}$ in 39 months old and 10.41 Mg C ha^{-1} year-1in 28 months old coppice, that was significantly higher than rate of carbon sequestration in main crop (5.36 MgC ha^{-1} $year^{-1}$) indicating the importance of maintaining *E. camaldulensis* regeneration through coppice.





Biomass allocation in stem, branches and leaves in relation to total biomass in *V. tortilis* and *E. camaldulensis*

Characterization and utilization of fatty liver curing medicinal plants and its assemblage (IFGTB)

Survey and collection of *Phyllanthus reticulatus, Ficus racemosa, Entada scandens, Securinega virosa* and *Breynia retusa* were carried out in 25 different locations of Tamil Nadu. These plants were vegetatively propagated through stem cuttings and raised the germplasm bank of *Phyllanthus reticulatus* (50 No's), *Ficus racemosa* (46 No's), *Brynia retusa* (10 No's), *Securinega virusa* (10 No's) at 3m x 3.6 m spacing in row column design. The compounds alphaamyrin, sistosterol were identified from the fruits of *Ficus racemosa* using GCMS.

Reclamation of coal mined land of North Eastern Coalfields, Assam through soil amendment and revegetation with native plant species using integrated biological approach (RFRI)

Soil stabilization works was done by growing herb species i.e. *Arundo* sp.,*Crotalaria striata, Mimosa pudica*, *Thysanolaena maxima,Vetiveria zizanioides,* through seed ball technology and by planting *Cymbopogon nardus* and bamboo species (*Bambusa multiplex*, *Melocanna baccifera* etc.). Established 3.07 hectares demo plantation on coalmine outlands with 41 native plant species suitable for plantation on the OBDs at Tikak Colliery, Margherita. Seedlings were raised with the inoculation of arbuscular mycorrhizal fungi (AMF) and plant growth promoting rhizobacteria (PGPR) in nursery conditions and planted in the coalmine outland at Tikak Colliery Margherita. Best performing treatment was AMF + PGPR + Lime + FYM. Best performing tree species were *Albizia lucidor, Alstonia scholaris, Carallia brachiata, Terminalia myriocarpa, Terminalia arjuna, Dillenia indica, Pongamia pinnata, Dysoxylum excelsum, Ficus hispida, Schima wallichii* and *Melocanna baccifera* with 60% plant survival.

2.1.3. Biodiversity

Improvement of urban greenery, sustainable tree plantation and enhancing the biodiversity at Singanallur Lake, Coimbatore (IFGTB)

Plant species suitable for urban greenery, tree plantations and enhancing the biodiversity of Singanallur Lake, Coimbatore were shortlisted. Field survey conducted and cuttings of *Ficus* species were collected for vegetative propagation to establish Ficutorium. Survey for fruit yielding native species was under progress. *Acacia nilotica* seedlings were raised in nursery for plantation in the Lake.

Assessment of species diversity of heterocera (moths) across the Shiwalik Landscape of northern India and development of a database (FRI)

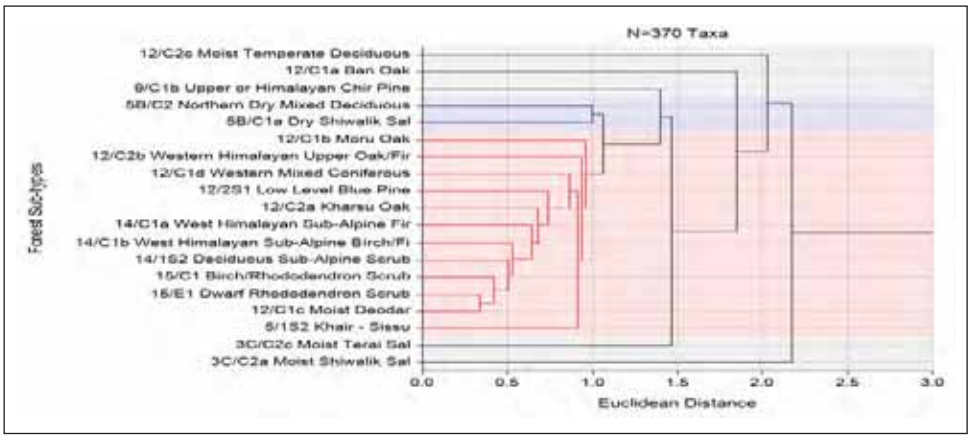
Preparation of database for moths of Shiwaliks was carried out and so far 251 species of moths belonging to 10 families was sampled across Shiwalik in four states (Uttarakhand, Uttar Pradesh, Haryana and Himachal Pradesh) in three forest types (3C/C2a Moist Shiwalik Sal Forest; 5B/C1a Dry Shiwalik Sal Forest & 5B/C2 Northern Dry Mixed Deciduous).

Characterization of grassland types of Uttarakhand and eco-distribution studies (FRI)

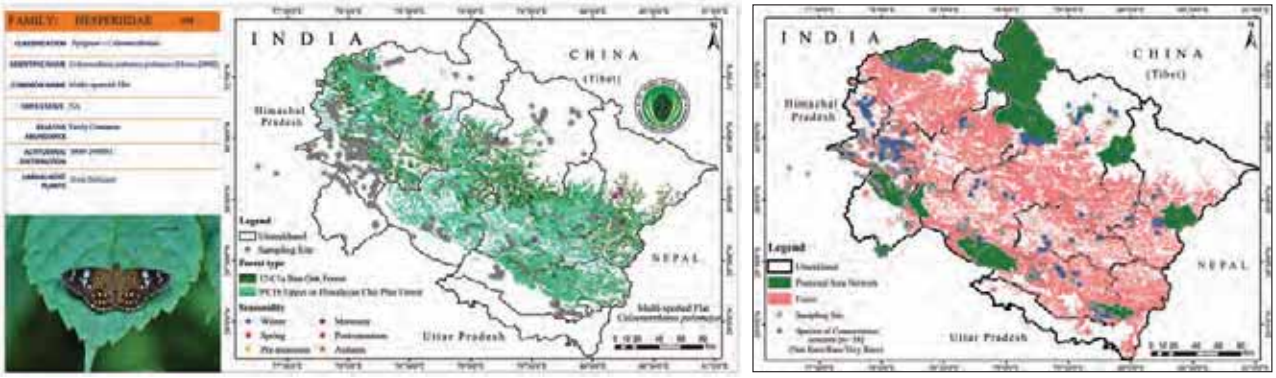
Survey, documentation and vegetation sampling in forest divisions of Bageshwar (Glacier Range), Chakrata (River Range), Dehradun (Barkot Range, Lacchiwala Range), Haridwar (Laksar Range), Mussoorie (Raipur Range),Tehri (Tehri Range, Balganga Range), Nanda Devi National Park (Chamoli Range), Rajaji National Park (Chillavali Range, Dhaulkhand Range, Beriwara Range, Haridwar range, Chilla Range) and wetlands of Ranjitpur and Baanganga were conducted. Based on quadrat sampling using biodiversity indices, grassland communities were identified and preparation of eco-distribution maps (based on Maxent model) for grassland types of Uttarakhand under preparation.

Butterflies associated with different forest types/sub-types in Uttarakhand (FRI)

Assessed for the first-time species composition and community structure of butterflies across 20 different and prominent 'forest sub-types' found across Uttarakhand, western Himalaya. Hierarchical clustering of butterfly abundances revealed seven different butterfly communities spread over 20 forest subtypes of these 04 (3C/C2a moist Shiwalik sal forest; 12/C2c moist temperate deciduous forest; 12/C1a ban oak forest; & 3C/C2c moist Terai sal forest) were identified as most important as they hold most of the butterfly diversity of the state including 58 rare taxa identified according to 'rarity' out of the total. GIS based mapping of these 58 priority species over laid on the protected area network and forest cover distribution in the state revealed 17 forested sites outside the PA network supporting these rare taxa. These sites along a physio-geographical gradient with important forest sub-types and rare taxa were recommended and listed as new sites for conservation and some for eco-tourism in the state. Database was prepared for 370 species of butterflies sampled in 23 different forest sub-types on a GIS platform on their taxonomy; distribution range in different Indian sub-regions; their seasonality; larval food plants; rarity; and GIS maps generated on their distribution in different forest sub-types in Uttarakhand.



Butterfly abundance Linkages between forest sub-types



GIS maps on distribution of butterflies in different sub-types in Uttarakhand

Assessment of plant biodiversity of Silent Valley buffer zone (IFGTB)

Extensive field surveys to assess plant biodiversity in 11 different locations of the Buffer Zone and adjacent areas of Silent Valley National Park and16 quadrats were laid to assess the plant diversity and abundance. A total of 127 plant species were identified and 162 herbariums were prepared during period of report totalling to 868 species including 48 wild edible plants, 52 ornamental and 70 RET plants from Silent Valley Buffer Zone.The information generated will serve as a baseline data for preparation of management plan for the buffer zone areas and provide strategies for conservation of RET species identified.

Creation of North-East Indian Zingiberales biodiversity garden (Gene Bank) in RFRI, Assam (RFRI)

Field surveys were conducted in forest and revenue areas of Assam, Nagaland and Arunachal Pradesh and 66 live plant specimens including *Zingiber, Curcuma, Hedychium, Alpinia, Globba, Kaempferia, Canna, Cheilocostus, Costus, Etlingera, Schumannianthus, Phrynium, Musa* and *Ensete* were collected and planted. Morphological, phenological and ecological data have been collected on-site as well as in *ex-situ* conservation site. Inventory of collected *Zingiberales* was compiled.

Studies on status of *Dalbergia latifolia* Roxb. – High valued Indian Rosewood in Karnataka and Kerala (IWST)

Field survey were conducted in natural forests, sacred grooves, and coffee estates in nine forest divisions in Karnataka and five forest divisions in Kerala. The regeneration of rosewood trees was fairly consistent in moist deciduous forests. Population analysis revealed an absence of different girth of class saplings and poles, indicating unhealthy sign of regeneration. Growth and development of the seedlings were found affected by grazing and trampling by wild animals, insect-pest attack, ground fire (including controlled burn) and competition from invasive weeds such as *Lantana camara, Chromolaena odorata* and others. Comparison between different forest divisions of Karnataka and Kerala using standard error, confidence interval and per cent CV are as follows:

Comparison between different forest divisions in Karnataka

Forest division	Standard Error	Confidence Interval ($\bar{x}$±SE*1.96)	Per cent CV
Haliyal division	1.41	6.12±2.76	14.41
Yellapur Forest Division	0.93	6.41±1.83	69.17
Bhadra Tiger Reserve	0.80	10.17±1.57	35.74
Biligiriranganatha Tiger Reserve	1.24	5.47±2.44	15.72
Karwar Forest Division	1.03	3.02±2.02	55.64
Koppa Forest Division	0.94	2.53±1.84	90.26
Madikeri Forest Division	3.37	10.38±6.61	91.05
Virajpet Forest Division	2.50	2.50±4.90	86.05
Cauvery Wildlife Sanctuary	1.29	2.00±3.12	158.11

Spring rejuvenation for water security in Himalaya Namsai, Arunachal Pradesh (RFRI)

Maps on Land use/ Land cover (LU/LC) aspect, forest cover, forest type, location, soil type and slope were prepared. Measurement of seasonal discharge of the selected springs was completed. A household survey in Namsai, Arunachal Pradesh was completed. Three conical ponds in Lathao village, the project activity area were dug. Chemical analysis of water samples from the springs was done. A capacity building workshop for training a cadre of 57 local para-hydrogeologists was organized at Namsai, Arunachal Pradesh.

Comparison between different forest divisions in Kerala

Forest division	Standard Error	Confidence Interval ($\bar{x}$±SE*1.96)	Per cent CV
South Wayanad Division	0.00013	0.0007±0.00025	30.27
North Wayanad Division	0.00012	0.0005±0.00023	39.11
Palakkad Forest Division	0.00033	0.0007±0.00064	63.95
Punalur Forest Division	0.00	0.00	0.00
Wayanad Wildlife Division	0.00	0.0005±0.00	0.00

The study revealed that the population of Dalbergia was less in Madikeri Forest Division in Karnataka; In Punalur and Wayanad division of Kerala there was no Dalbergia.

Rosewood tree in Bhadra Tiger Reserve, Karnataka

Flowering

Fruiting branches

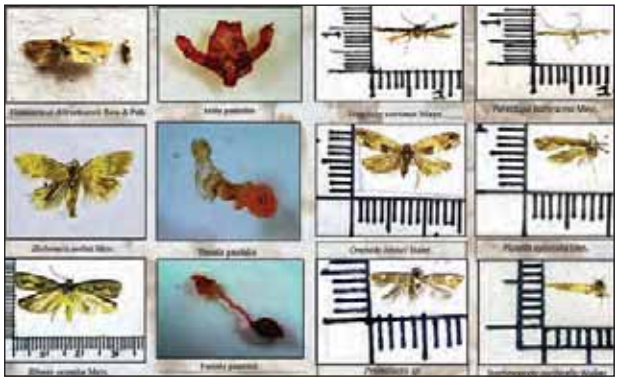
Assessment of floristic diversity of Girikhad Watershed, Himachal Pradesh for developing conservation strategies (HFRI)

Reconnaissance survey was conducted at 22 sites and 48 species were recorded which included 9 trees, 10 shrubs and 29 species of herbs; plant samples were also collected for herbarium. Phytosociological data was collected from Tahu, Jhandoli, Giriganga and Hatu. The observation on natural regeneration of trees was taken during survey. Information on agricultural and horticultural crops was collected from Pujeli and Bajoaghat villages. The soil samples were collected for analysis of the physicochemical properties of the soil.

Collection of socio-economic data and *Pinus wallichiana* forest at Raunikhad

Ecological monitoring and GIS mapping of Microlepidoptera diversity of Deodar (*Cedrus deodara*) forests of Himachal Pradesh (HFRI)

A total of 137 insect specimens belonging to 6 families of microlepidoptera were collected from Deodar Forest areas of Himachal Pradesh. All collected insect specimens were segregated taxonomically into different taxa. GIS mapping based on distribution data collected from different study sites were created by using ArcGIS software.



Dissection and plates of specimens

Collection of micromoths, stretching and preparation of taxonomic slides

GIS Location of Deodara forests of Kharapather and Jhungi

Documentation and assessment of plant diversity of sacred groves of major tribes in Jharkhand (IFP)

Survey in seven districts were carried out to assess and document the sacred groves (SG). Geotagged information regarding 36 sacred groves were documented in seven district viz Simdega (2), Lohardaga (2), Hazaribagh (2), Ramgarh (5), Gumla (3), Khunti (1) and West Singhbhum (21). Number of Munda SGs were 11; Oraon SGs 6; Santhal SGs 9 and Other tribal SGs 10; Total 47 number of plant families recorded with 126 species. Density, frequency of occurrence of species, height and DBH were documented.

Sacred groves in Jharkhand

2.1.4. Forest Botany

Revision of Osmaston's Forest Flora for Kumaon for Conservation and sustainable utilization (FRI)

Random sites of Nainital, Ramnagar, Pithoragarh, Haldwani, Bageshwar and Terai Central Forest Divisions were surveyed. Taxonomical-cum-pictorial description of floristic species was carried out. 529 species viz. Tree-257, Shrub- 176, Climber- 64 and important herbs -32 from 152 Families and 355 Genera reported from the area. Herbarium specimens collected were prepared. Local names, uses and nomenclature of recorded species were updated.

Aristolochia punjabensis

Berberis osmastonii

Gymnosporia rufa

Ilex pseudo-odorata

Revision of Kanjilal's Forest Flora of the Chakrata, Dehradun and Saharanpur Forest Divisions, Uttar Pradesh for conservation and sustainable utilization (FRI)

Random sites of Chakrata Saharanpur, Kalsi Soil Conservation, Dehradun,Tons Forest Divisions and Rajaji Tiger Reserve were surveyed and floristic composition were recorded. Taxonomical-cum-pictorial description of 448 species (198 trees, 184 shrubs, 32 climbers and 34 important herbs) belonging to 142 Families and 353 genera were updated. Distribution of species with geo-coordinate; phenological data (flowering and fruiting time) and local names, uses and nomenclature (author citation, synonyms) of recorded species were updated.

Assessment of regeneration potential of native flora in *Acacia auriculiformis* plantations (IFGTB)

The regeneration potential of native flora in *Acacia auriculiformis* plantations was assessed. Survey has been conducted in Trivandrum and Nilambur areas and recorded information on the year of planting, extent, location, growth performances, etc. for various *A. auriculiformis* plantations. Sixty quadrats of 10 m x10 m size were laid out and phytosociological analysis was under progress. *A. auriculiformis* plantations harbored over 88 native plant taxa. Soil seed banks of the plantations were assessed through seedling emergence method.

2.1.5. Tribals and Traditional Knowledge System

Study on Socio Economic status of People in Nallamalais, Sheshachalam and North Coastal Eastern Ghats in relation with Forest Biodiversity (IFB)

The effects of various factors on utility of NTFPs and biodiversity of the area and decade comparison was studied in the Nallamalais, Sheshachalam and North Coastal Eastern Ghats. There were four social groups of people namely General, OBC, SC and ST in the area. Of them, the dominant population was of scheduled tribes (STs). The study concludes that the satisfaction levels of collection of fuel-wood, medicinal plants, food, health, grazing and nutrition are significantly different for different groups both in 2009 and 2019 indicting that was there no change in the satisfaction levels of these products. Similarly, the satisfaction levels in case of gums and bamboos were not significant in both the years w.r.t. groups indicating that there was no change and all the groups were equally satisfied with these products. However, in case of honey & wax, employment, Common Property Resources (CPR) and Health, the satisfaction levels have changed in a decade's time. In case of Honey & wax, CPR and Health, the satisfaction levels were significantly different in 2009 but after a decade they were all at the same level among all the groups. In case of employment arising out of NTFP and Biodiversity, the satisfaction levels were not different on 2009 but after a decade different groups had different satisfaction levels.

2.2 FOREST PRODUCTIVITY

A. PLAN

- **Completed 03**
- **Ongoing 02**
- **New 06**

B. EXTERNALLY AIDED

- **Completed 02**
- **Ongoing 13**
- **New 01**

2.2.1. Silviculture

To study the reproductive potential of *Pistacia integerrima* and *Pittosporum eriocarpum* (FRI)

Seeds of *Pittosporum eriocarpum* collected from Kempty fall area, Mussoorie Forest Division, had 90.36 per cent germination when treated with gibberellins (500 ppm). In *P. integerrima,* 62.86 % rooting was observed through air layering with 5000 ppm IBA during monsoon season. The best results were obtained in treatments with full shade throughout the day. Branch cutting of coppice shoot of *P. integerrima* and *P. eriocarpum* treated with 5000 ppm IBA developed 15 and 20 % rooting, respectively.

Study on ecophysiology of seed germination and seedling survival for restoration of natural regeneration of two threatened species of Central India (TFRI)

Effect of various ecological factors on the ratio of flowering and fruiting were evaluated with reference to total seed production and seed viability of *Dalbergia latifolia* and *Litsea glutinosa*. *D. latifolia* seeds germinate better in mixed soil in comparison to sandy soil or clayey soil whereas *L. glutinosa* seeds germinate better in sandy soil in comparison to mixed and clayey soil. Seeds of both species are orthodox and did not lose viability up to 5-7% moisture content and at ambient temperature. Seeds of *D. latifolia* started germination at last stages of maturation when seed moisture content was around 43%. Seeds falling before this maturation stage could not produce any viable seedlings. Due to dormancy *L. glutinosa* fully mature seeds produced seedlings after five months of sowing. In both species no loss of seeds was found due to predation. Loss of moisture during early stage of growth affected *D. latifolia,* whereas *L. glutinosa* seedlings were more tolerant to drying.

Taxonomy, silviculture and management practices of selected rattans of Karnataka (IWST)

Diversity, distribution and phenological features of rattans in Biligiri Rangantah Swamy Temple Tiger Reserve, Kali Tiger Reserve, Kudremukh National Park, Agumbe (Mookambika WLS), North Canara Circle, Madikeri Forest Division, Virajpet Forest Division and Bramhagiri WLS, Karnataka were studied. Information was collected on rattans plantation raised and their management practices adopted by forest department in different forest divisions in Coorg Circle and Yellapur, Haliyal, Kadra, Karwar North Canara circle, Karnataka. For establishment of canetum at Balur Sacred Forest, germplasm of *Calamus pseudotenuis, C. vattayilla, C. nagabettai* R.R.Fernald & Dey, *C. drasfieldii* and *C. stoloniferous* was collected from different parts of Western Ghats and conserved in Bidarahalli Forest Nursery (near to Balur SF), Sampaje Forest Nursery, Koppa and IWST, Bengaluru.

Natural distribution of *Calamus nagabettai*

Calamus thwaitesii fruits

Studies on quality of nursery seedlings and their relation to outplanting performance of *Dalbergia latifolia* and *Pterocarpus marsupium* (TFRI)

Seeds of *Dalbergia latifolia* and *Pterocarpus marsupium* were collected from Jabalpur and Chhindwara districts, Madhya Pradesh. Seeds were sown in polythene bags and root trainers filled with soil, sand and FYM in the ratio of 1:2:1. Approximately 4000 seedlings of bare root and root trainer was prepared. After 1-1½ year of sowing of seeds of *D. latifolia* and after 6 months of sowing of *P. marsupium*, seedlings were grouped into four categories based on shoot length. Data on stem diameter, number of first-order lateral roots, root volume, chlorophyll content, height: diameter ratio, form, no. of leaves, carbohydrate content of four groups were estimated in the representative of 25 percentiles within the shoot height distribution of each species. Seedlings were then outplanted into a replicated experimental design on a field planting site at TFRI, Jabalpur.

Impact of Silviculture systems on the natural forests of Chhattisgarh with special reference to Sal and Bamboo (TFRI)

Eight Sal forest compartments in Dhamtari Forest division, Chhattisgarh were selected for the study and data on growth parameters, regeneration status, dominant, co-dominant trees etc., collected from the 03 sites. The sites were being managed under two different silviculture practices i.e. selection-cum-improvement system (SCI) and Improvement Felling system (IF). Among the systems, SCI plot recorded more number of individuals (667) compared to IWC (446). In both the plots highest number of Sal individuals (250 individuals in SCI and 200 individuals in IWC) were recorded followed by *Syzygium cumini* (110), *Terminalia tomentosa* (98). In the case of IWC plot, *Lannea coromandelica* had 38 individuals followed by *Cleistanthus collinus* (32) and *Buchanania lanzan* (30) etc.

Assessment of population structure and regeneration status of *Magnolia gustavii* King. - A critically endangered tree species of Assam (RFRI)

During the field surveys in different Reserve Forests of Upper Assam microclimatic data of the sites were recorded and total 116 trees of *M. gustavii* were identified. GPS coordinates were also recorded for preparing distribution map of the species. No regeneration was recorded. Of the 11 dbh classes, highest population of the species was found in three dbh classes *viz*. 36-45cm, 46-55 cm and 56-65cm. Seeds treated with hot water resulted in highest germination of 56 % and only 32% germination was recorded in untreated seeds. Coarse sand was found to be the best media for seed germination. A total of 230 seedlings were raised for reintroduction in potential habitats of the species.

Field surveys for *M. gustavii* in Reserve Forests of Upper Assam, seed collections and seelings

Investigation on factors responsible for Sal mortality in Jharkhand State (IFP)

For digitization of thematic maps, field survey and occurrence data collection of *Shorea robusta* (Sal) was completed in all 31 forest divisions of Jharkhand. A total of 880 occurrence data of Sal mortality was recorded by various mortality type viz. Water logging (7.15%), Soil Erosion / Exposure of roots (4.09%), Lightning (10.79%), Anthropogenic disturbance (35.34%), Injury/ Girdling (18.18%), Top-drying/Stag headed (42.72%). Training for Maxent species distribution modeling has been initiated.

Top-drying (Type VI Mortality) tree were reported near the water logged area

Exposed Sal roots probably due to soil erosion by the excess water

Polyporus shoreae (fruit bodies) on dead tree

Development of value chain for bamboos for mass multiplication, popularization in farmers field and industrial linkages in central India (TFRI)

A species trial with six bamboo species viz., *Bambusa nutans*, *Bambusa vulgaris* var. *green*, *Bambusa balcooa*, *Bambusa tulda*, *Bambusa burmanica* and *Pseudoxytenanthera stocksii* was established in farmer's field at Manpur, M.P. to introduce new bamboo species in Central India. A plantation of *Bambusa bambos* in 03 ha was established at Kachharwar, Umariya and survival rate was 75%. *In vitro* cultures of *Pseudoxytenanthera stocksii* was established and macro propagation through culm cuttings and cavity method has been initiated.

2.2.2. Social Forestry, Agro-forestry/ Farm Forestry

Development of *Gmelina arborea* and *Emblica officinalis* based agroforestry models on fallow lands in Uttarakhand and Uttar Pradesh (FRI)

In agroforestry trials, best growth in 3 years old plantations of *G. arborea* (Ht. 8.76m & girth 19.9cm) and *E. officinalis* (Ht. 4.75m & girth 11.7cm) was observed in 5mx5m spacing as compared to control. Comparatively estimated economics as per Net profit and Cost-Benefit ratio confirmed that the model with Gamhar-Groundnut-Wheat-Millet-Urd+til at 4mx5m spacing, was economic and viable in 8 years of rotation. The trees planted at 4mx5m spacing yielded more fruits, fuel wood and timber yield instead of 5mx5m spacing. It was also observed that the slightly alkaline pH gradually decreased to near neutral conditions and available nutrients (NPK) gradually increased at all experimental sites.

Livelihood improvement through sustainable utilization of *Grewia optiva* (Bhimal) in Uttarakhand (FRI)

For sustainable utilization lopping of trees of *G. optiva* upto 75% is better as compared to 100% lopping to obtain the fodder and fiber in the lean period. Many chemical treatments and eco-friendly materials and combinations of mechanical treatments were tried to obtain fiber and saponin. Saponin was observed up to 48%. Earlier when, Bhimal twigs were treated with chemicals, either fiber or saponin can be obtained, traditionally Bhimal fibre takes more than 90 days for its isolation, however, using SETM, both Bhimal fiber and saponin were obtained within one day. The advanced technology of steam explosion treatment machine (SETM) has been designed and fabricated by the institute. A live demonstration of this technology has been carried out in the field for the benefits of stakeholders.

Development of Kachnar, Bhimal and Kadam based agroforestry models on farmers land under rainfed conditions in Uttarakhand (FRI)

Kachnar, Bhimal and Kadam based agroforestry models on farmers land in Uttarakhand established. In 3 years old plantation, *Neolamarckia cadamba* maximum growth was observed in spacing of 6x8m with a height of 951.00cm with girth 55.60cm followed by *Bauhinia variegata* (height 628.30cm with girth 30.00cm) in spacing of 6x6m and *Grewia optiva* (height 611.00cm with 24.00cm girth) in spacing of 6x8m. Crops like wheat, maize, millet, sesame and sugarcane were grown successfully by farmers. *B. variegata* and *G. optiva* provided fodder while, *A. cadamba* provided fuel wood at 3rd year, In a period of 04 years with wheat (3 crops), millet (1 crop) and sesame (2 crops) total profit of Rs. 206000/- per ha. (200000/- from crop component and Rs. 6000/- from fuel wood and fodder) would be realized. In models with crop, Maize (2 Crops) and Sugarcane (2 Crops), the total income was 106000/- per ha during 04 years.

Establishing community fodder banks in forest fringe villages (FRI)

Established field plantations of fodder trees viz. *Bauhinia purpurea*, *Grewia optiva*, *Morus alba*, *Celtis australis*, *Terminalia tomentosa*, *Robinia pseudoacacia*, *Salix alba*, *Ficus palmata*, *Ficus glomerata* etc., and fodder grass viz. Hybrid napier at two sites in Uttarakhand (vill. Thangaon, district Dehradun and vill. Kandikhal, Tehri Garhwal) as demonstration plantations of fodder. Total 6000 trees were planted on 2.5 ha area i.e. 2500 plants in village Thangaon, district Dehradun and 3,500 plants in village Kandikhal, Tehri Garhwal, Uttarakhand.

Assessment of socio-ecological vulnerability to climate change among the agroforestry managers along an altitude gradient in the Eastern Himalaya (RFRI)

Tree diversity and carbon-storing species vary with traditional agroforestry managers in the Indian Eastern Himalayan region. The study demonstrated that the Mizo community harbored the highest number of tree species (35) with the highest tree diversity index (3.47). Total biomass carbon of tropical agroforestry systems managed by different communities ranged between 4.72 Mg ha^{-1} (Meitei community) and 29.26 Mg ha^{-1} (Bengali). Similarly, in the sub-tropical traditional agroforestry system, the highest and the lowest biomass carbon was observed in Mizo- (10.93 Mg ha^{-1}) and Angami- (6.05 Mg ha^{-1}) managed systems. Of the 31 biomass carbon important species found across the traditional agroforestry systems, *Artocarpus heterophyllus*, had the highest occurrence (50%), followed by *Parkia timoriana* (37.5%) and *Amoora rohituka*, *Delonix regia*, *Mangifera indica*, and *Toona ciliata* (25% for each species). Intriguingly, the farmers' preferred and dominant species in their agroecosystems which have a limited scope of enhanced biomass carbon storage. Therefore, improvement of traditional agroforestry systems through selective incorporation of biomass carbon important tree species is recommended to enhance the carbon sink capacity of these systems.

Development and optimization of biochar enriched supercompost from forest necromass for enhanced soil carbon sequestration (RFRI)

Super compost was developed and data of tall nursery amended with different treatment mediums was recorded and saplings are being maintained in the nursery.Total data recorded for 5 species X 3 replication x 6 treatments = 90 treated candidates + 15 control candidates. Various in-house extension activities through demonstration of the pyrolysis of necromass were conducted at FRC-LE, Agartala. Tall nursery trials performed using seedlings of *Dipterocarpus turbinatus*, *Gmelina arborea* and *Albizia procera* using soil amended with six treatment mediums of biochar enriched super-compost resulted in 90-98% survival. Growth of seedlings as compared to the control were observed to be significantly high in all the three species under trial.

Assessment, ecological niche modelling and strengthening of agroforestry systems for securing the livelihoods of inhabitants in cold desert region of Himachal Pradesh and Ladakh (HFRI)

Assessed and documented traditional agroforestry systems and species grown by local communities in 05 villages in Spiti valley of Lahaul and Spiti district, 02 villages in Ropa valley of Kinnaur district and 06 villages in Indus valley of Ladakh Union Territory. *Populus ciliata, P. nigra, Salix alba, Malus pumila, Solanum tuberosum, Pisum sativum, Raphanus sativus, Brassica oleracea, B. capitata, Phaseolus vulgaris* are the prominent agroforestry species grown by local communities in Spiti valley of Lahaul & Spiti district whereas *Malus pumila, Prunus armeniaca, P. amygdalus, Juglans regia, Populus alba, Salix alba, Fraxinus xanthoxyloides, Pinus gerardiana, Hordeum vulgare, Pisum sativum, Solanum tuberosum, Brassica oleracea, B. capitata* and *Phaseolus vulgaris* are the prominent agroforestry species grown by local communities in Ropa valley. The prominent agroforestry species grown in Indus valley of Ladakh UT are *Populus nigra*, *P. balsamifera, Salix alba*, *S. tetrasperma, Malus pumila*, *Prunus armeniaca, Pyrus communis, Triticum aestivum, Hordeum vulgare, Brassica oleracea, B. capitata, B. campestris, Solanum tuberosum, S. lycopersicum, Pisum sativum, Allium cepa, Daucus carota, Cucumis sativus*, *Raphanus sativus* and *Medicago sativa.* Soil samples from the selected villages were collected for analysis of various parameters. Seedlings of *Prunus armeniaca, Populus nigra, Salix alba, Elaeagnus angustifolia* and *Juniperus polycarpos* were raised and maintained in the nurseries for distribution among the local communities.

Genetic diversity of plant growth promontory diazotrphs and fluorescent pseudomonads associated with traditionally distinct mountain agroecosystems of Nagaland (RFRI)

Soil microbiome associated with five traditional mountain agroecosystems (Tree-based jhum, Alder-based jhum, traditional jhum, Regenerated jhum fallow and Zabo integrated land use systems) was studied and observed that Acidobacteria was the most dominated genera followed by Proteobacteria and Actinobacteria. The maximum abundance of soil bacterial communities was recorded in Tree-based jhum followed by Alder-based jhum, Regenerated jhum fallow, Zabo integrated system, and traditional jhum.

Development of *Gmelina* based agroforestry system in M.P (TFRI)

Developed *Gmelina arborea* based agroforestry system for Madhya Pradesh with some shade loving medicinal crops viz. *Asparagus racemosus, Curcuma longa,* and *Zingiber officinale* and *Piper betle* as intercrops. Nutrients status changed under the adopted system during the study period. Nitrogen content was increased upto 27.5 kg ha^{-1} as compared to sole crop 18kg ha^{-1}. The organic carbon content increased from 0.64% to 1.13%. Based on yield data, economic analysis of the system was calculated and found the 1:2.72 as compared to sole cost benefit ratio of 1:2. The findings was extended through online and offline training programmes to the various stakeholders.

Training programmes for various stakeholders and field visit at experimental plot of TFRI, Jabalpur (MP)

Population assessment, ecological niche modelling and developing sustainable harvesting technique of *Pinus gerardiana* for conservation in Himachal Pradesh and Jammu and Kashmir (HFRI)

Field surveys conducted in Kinnaur and Bharmour Forest Division of Himachal Pradesh and 45 natural populations of Chilgoza pine were identified. Population data of 45 sites also analyzed and maximum tree density was recorded in Lippa -II (500 ha^{-1}) with IVI value 215.44 followed by Karla (450 ha^{-1}) with IVI value 256.84 in Moorang Forest Range of Kinnaur Forest Division. Sapling data of 55 sites also analyzed and maximum sapling density was recorded from Telangi (340 ha^{-1}) in NorthWest aspect of Kalpa Forest Range of Kinnaur Forest Division. Seeding data of 36 sites were analyzed and maximum seedling density was recorded from Lippa-I (170ha^{-1}) NorthEast aspect in Moorang Forest Range of Kinnaur Forest Division. Shrub data of 24 sites were also analyzed and *Artemisia maritima* was having a maximum density in Karla (4430 ha^{-1}) followed by Dubling-II (4160 ha^{-1}), Ropa (3590 ha^{-1}), Gyabung (3520 ha^{-1}) in Pooh Forest Range of Kinnaur Forest Division.

Population data recording at Gyabung village, Kinnaur

Development of suitable agroforestry models in IGNP command area of Western Rajasthan (AFRI)

Three sites in Bandha, Ramgarh, Jaisalmer were selected on farmers land in IGNP command area and MoU was signed with farmers. Species planted in Agri-silvi, Agri-horti: *Prosopis cineraria* (A1), and *Tecomella undulata* (A2) in Agri-silvi model; *Zizyphus mauritiana* (B1) and *Cordia myxa* (B2) in Agri-horti; in Boundary plantation at RMM, Ramgarh, IGNP command area, Jaisalmer. Block plantation of Agri-silvi (2 ha) and Agri-horti (1.5 ha) and Boundary plantation (300 RM) model on farmer's field were laid and maintained through irrigation, soil working, weeding, anti-termite treatment, etc. 99% survival was recorded in both *Prosopis cineraria* and *Tecomella undulata* in Agri-silvi model whereas survival was 91% in *Cordia myxa* and 89% in grafted *Zizyphus mauritiana* in Agri-horti model.

Species planted in Agri-silvi, and Agri-horti: *Prosopis cineraria* (A1), and *Tecomella undulata* (A2) in Agri-silvi model; *Zizyphus mauritiana* (B1) and *Cordia myxa* (B2) in Agri-horti; in Boundary plantation at RMM, Ramgarh, IGNP command area, Jaisalmer

Establishment of community fodder banks in forest fringe villages in Uttarakhand and Himachal Pradesh (HFRI)

For establishment of community fodder bank 400 plants of *Bauhinia variegata,* 300 of *Grewia optiva* and 600 plants of Napier grass were procured and planted at Rano village, Himachal Pradesh. 436 plants of *Morus alba,* 463 plants of *G. optiva*, 50 plants of *B. variegata* and 300 plants of Napier grass were planted at Padli village, Himachal Pradesh and 500 plants of *M. alba* were planted at Maraog village, Himachal Pradesh. For causality replacement, beatingup operation was carried out in all the sites during Monsoon. Weeding, cleaning, grass cutting and hoeing etc. was done at plantation sites. Nutritional analysis of total carbohydrates, proteins, fats, fiber, ash content and moisture content of native fodder species was done. Silage trials of *G. optiva* was carried out with different concentration of urea (0 and 4 g) salt (0 and 0.8g) sugar (0, 4, 16g) and water (0, 80 ml). Best results seen in urea 4 g, salt 0.8 g, sugar 16 g and water 80ml, the silage prepared from *G. optiva* leaves can be stored upto four months after harvesting as compared to control (stored without treatment).

2.3 GENETIC IMPROVEMENT

A. PLAN

- **Completed 17**
- **Ongoing 20**
- **New 11**

B. EXTERNALLY AIDED

- **Completed 06**
- **Ongoing 26**
- **New 10**

2.3.1. Conservation of Forest Genetic Resources

Genetic Diversity Analysis and Conservation of Threatened *Salvadora oleoides* (FRI)

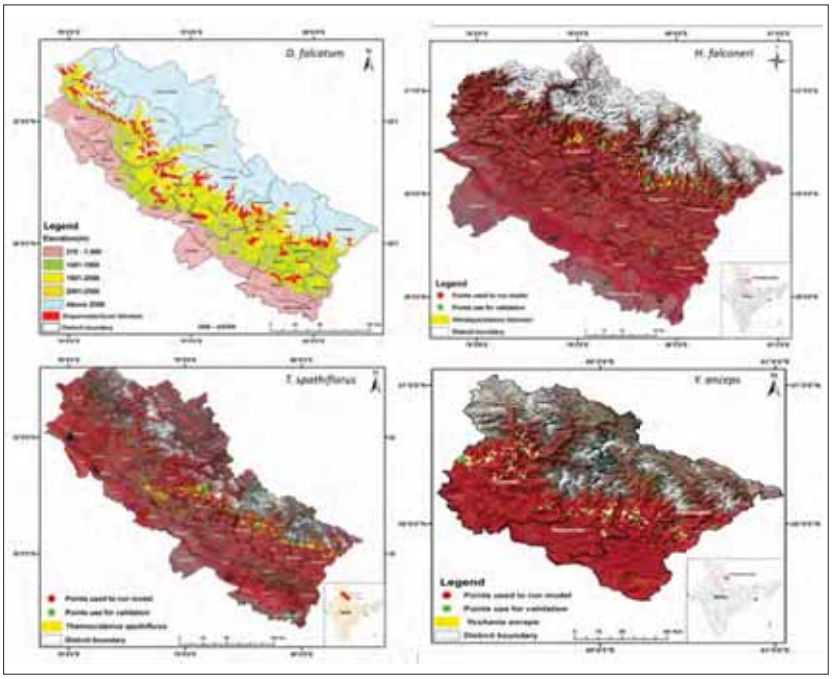
For species distribution mapping, geospatial data of 683 trees were recorded, and was used for training and the rest to validate the MaxEnt model for current and climate change scenarios (2050s and 2070s). A sharp decline in the species distribution area was observed for all Representative Concentration Pathways (RCPs) (when compared with the current estimate of 8638.01 km^2), which ranged from 2102.90 (RCP 2.6_70) to 5494.23 km^2 (RCP 8.5_70). The model output revealed that the distribution is in accordance with the 2 climatic regions, BWH (B=dry, W=winter dry, and H=hot summer of Jaisalmer, Barmer and Jalore in Rajasthan and Rann of Kutchchh in Gujarat) and BSH (B=dry, S= winter dry, and H=warm summer of Punjab and Haryana) of Köppen-Geiger climate classification system and the geological map of North-Western India. In relation to the geological variables, distribution of *S. oleoides* occurrence is conditioned to the presence of calcium-rich bedrock, which is used as a mechanism of compensation for the high salinity of desert soils. Overall, the study provides an eco-geo-distribution map and the potential use of MaxEnt in prediction modelling of the species.

857 trees were counted for the morphological parameters, and were classified into 05 frequency classes as per altitudinal (≤50 – ≥200.1 m amsl) and latitudinal gradient (≤24˚– ≥30.1˚). The altitude ≤50 (248 trees) and ≥200.1 m (324 trees) had the maximum size of the population and a large set of trees were distributed at the latitude of ≤24.1˚ (320 trees) and lowest above 30.0˚ (37 trees).

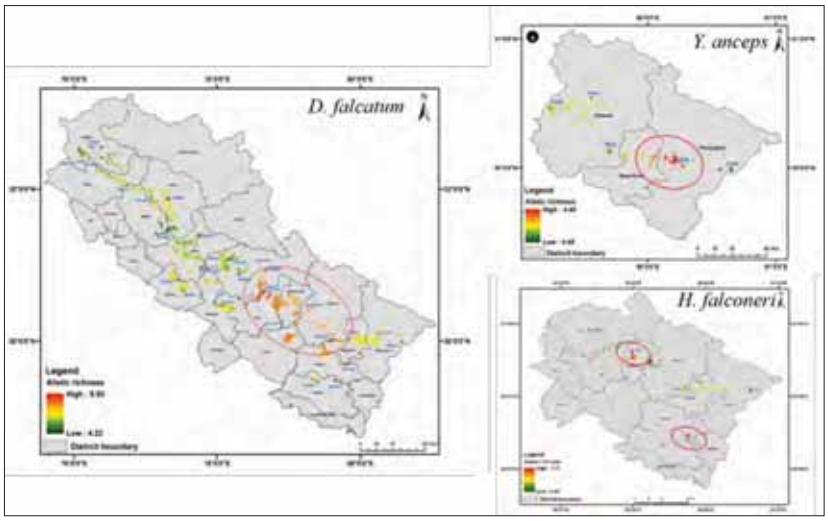
A total of 10 Gb genomic data were obtained through sequencing, out of which, 101 SSR were synthesized and tested in *S. oleoides* three populations from Rajasthan and Gujarat. Out of these, only 34 SSRs were polymorphic and a total of 101 loci were successfully amplified. The mean observed heterozygosity (Ho) was 0.529 and expected heterozygosity (He) was 0.357. Low genetic differentiation (FST =0.092) and inbreeding coefficient (FIS = -0.381) was observed and 91% genetic variation was confined within population.

Characterization of the Hill Bamboo Species (Ringal) of the North-Western Himalayas for their Conservation and Genetic Improvement (FRI)

Potential eco-distribution maps were developed for four ringal bamboo taxa in the western Himalayas, where highest area cover was estimated under *Drepanostachyum falcatum* (4096.92 km^2) followed by *Thamnocalamus spathiflorus* (981.79 km^2), *Himalayacalamus falconeri* (355.33 km^2), and *Yushania anceps* (211.59 km^2). Besides, novel genomic and marker information was generated in ringal bamboos through genome skimming approach. Marker data analysis has indicated a high genetic diversity with expected heterozygosity ranging between 0.689 (*Y. anceps*) and 0.732 (*D. falcatum*). The regions with high allelic diversity were also identified for three hill bamboo taxa for their *in-situ* conservation. Relatively, high allelic diversity of *D. falcatum* was detected for the populations of Uttarakhand Himalayas than Himachal Pradesh, and the center of diversity was predicted in the Garhwal Himalayas under districts Tehri, Rudraprayag and Chamoli. Like wise, two populations from Triyuginarayan and Devidhura were identified as diversity hotspots for *H. falconeri*, and a population from Munsyari was identified for *Y. anceps*. For species level identification of hill bamboos of western Himalayas *matK* locus was demonstrated as potential DNA barcode.



Potential eco-distribution maps of hill bamboos of western Himalayas



Diversity hot spots of three hill bamboo species in their distribution range. The regions depicted with warm colour harbour high allelic diversity than the regions with cooler colour

Evaluation of Second Generation *Eucalyptus camaldulensis* clones for higher productivity (IFGTB)

Multilocation trials each with 200 second generation clones were established at five locations at Marakkanam, Manakkarai, Gudalur, Pudukottai and Panampally in Kerala and Tamil Nadu and periodically assessed for growth. Coppicing ability and rooting potential of each clone were also studied. Rooting percentage varied form 60 – 80 %. Based on these studies, 25 superior performing clones were shortlisted for interim deployment in plantations and further tree improvement.

National Programme for Conservation and Development of Forest Genetic Resources: Pilot project on 'Creation of Centre of Excellence on Forest Genetic Resources (CoFGR)'at FRI Dehradun

The diversity, population structure and regeneration status of 250 species from Uttarakhand was documented and eco-distribution maps of 50 priority species were developed. Seeds of 90 forestry species were deposited in the Gene bank of NBPGR for long term storage at -180°C for *ex-situ* conservation. Additionally, *in vitro* regeneration protocols and propagation techniques were developed for species of high conservation concern, *ex-situ* and *in situ* gene banks were established for selected species.

Comprehensive computerized database on FGRs developed. Project outputs shared with the Uttarakhand State Forest Department through workshop.

Potential Eco-Distribution map of *Rhodendron abroreum* (Burans) in Uttarakhand

Collection of *Oroxylum indicum* pods

Evaluation and popularization of *Neolamarckia cadamba* in Tamil Nadu and Kerala (IFGTB)

The project aimed at selecting fast growing clones and families of the indigenous species *Neolamarckia cadamaba* to popularize them among farmers and wood-based industries. Three clonal trials established during 2018-20 in Tamil Nadu were evaluated for growth and tree form characters. A demonstration trial involving shortlisted clones from the clonal trials was established in IFGTB's Van Vigyan Kendra (VVK) at Thalamalai in collaboration with MYRADA Krishi Vigyan Kendra (KVK) for demonstrating to the farmers.

Neolamarckia cadamba clonal trial in Tamil Nadu

Neolamarckia cadamba clonal trial in Kerala

Selection, evaluation, conservation and documentation of genetic resources of teak and other important tree species for enhancement of productivity (IFGTB)

The details of genetic resources like Clonal Seed Orchard (CSO), Seedling Seed Orchard (SSO) and Seed Production Area (SPA) of *Tectona grandis* and *Eucalyptus camaldulensis* were collected from Kerala Forest Department (KFD) and documented. Twenty one seed production areas of teak were evaluated for genetic variation to identify plantations and populations for conservation. Leaf samples from 21 teak SPAs were collected for molecular characterization. The best teak plantations were selected for conservation which will be useful to state forest department and FGR programme. Nine genetic resources have been marked as active germplasm sites for effective utilization which includes SPA in Alathur, Mathamangalam, Cheeyambam, Nedumgayam, Poolakkapara, Thalapara Chembanaruvi, Adukuzhy.

Establishment and evaluation of provenance cum progeny trial of *Aquilaria malaccensis* (Agar) in Karnataka and Goa (Phase-I) (IWST)

Survey was carried out in North-Eastern states, Karnataka and Tamil Nadu and selected 64 trees. Significant variation was observed for fruit and seed traits between the trees and locations. The seed germination percentage ranged from 54.5% to 83.8%. Two provenance-progeny trials with 42 families were established at Iruvakki (UAHS), Shimoga, Karnataka and Valikini-Nursery (Goa Forest Department) Sanguem, South Goa during September 2020.

Evaluation and production of jigat from *Cinnamomum malabatrum* through coppice system (IWST)

Identified high yielding and adhesive quality genotypes (R3, Mananthavadi) of *C. malabatrum* from 10 localities (Somwarpet, Mudigere, Mananthavadi, Sakaleshpura, South Canara, Pachakumachi, South Goa, Niligiri hill, Bhagamandala & Medikeri) and recommended for multiplication under planting stock improvement programme. The identified superior plants will be maintained for long term tree improvement programmes.

Development of SSR markers and assessment of genetic diversity of natural populations of *Pterocarpus santalinus* L.f. distributed in the Eastern Ghats, India (IWST)

Leaf samples of *P. santalinus* were collected from 22 populations in the Eastern Ghats of Andhra Pradesh. Whole genome sequencing and *de novo* assembly has been completed and 1,76,999 genome-wide SSR motifs were mined. A total of 38 M13 tailed primers were synthesized and PCR conditions were optimized. SSR genotyping in the selected populations is presently underway.

Sample collection from natural habitat of *Pterocarpus santalinus*

Selection and evaluation of natural population of *Terminalia bellirica* (Gaertner) Roxb. for its active ingredient content (TFRI)

A total of 58 phenotypically superior trees in terms of height, girth, spreading pattern of crown and leaf morphology of *Terminalia bellirica* were selected in the states of Chhattisgarh, Madhya Pradesh and Maharashtra. Biochemical analysis of fruits showed that the highest gallic acid content (0.98%) was found in Karegaon range under Dhamtari forest division (Chhattisgarh) and lowest gallic acid content (0.6%) was found in Mouda range under Betul forest division (Madhya Pradesh).

Variability for growth, wood traits and natural regeneration status of *Hardwickia binata* a multipurpose tree species in Madhya Pradesh (TFRI)

Twelve populations of *Hardwickia binata* were identified in Khandwa, Barwah and Burhanpur forest divisions of Madhya Pradesh and their fruit/seed characters were recorded. Poor regeneration was observed in the forest divisions surveyed for the study.

Introduction and evaluation of *Melia dubia* in central India (TFRI)

Progeny trial involving 50 improved genotypes of *Melia dubia* have been established in five sites viz. Morena and Chhindwara (Madhya Pradesh), Nagpur and Amravati (Maharashtra) and Durg (Chhattisgarh). Early assessment showed high survival of 80-90 per cent in all the trial sites.

Genetic improvement and conservation of Chironji (*Buchnania cochinchinensis* Lour.) in central and eastern India (TFRI)

Surveyed Betul, East Chhindwara, West Chhindwara, Katni forest divisions of Madhya Pradesh and Marvahi in Chhattisgarh and selected 139 phenotypically superior trees of *Buchnania cochinchinensis* (chironji) and data as per DUS (Distinctness, Uniformity and Stability) guidelines recorded. Seedlings raised for establishing progeny trial of chironji.

Conservation and evaluation of bamboo genetic resources of NE India (RFRI)

Survey work was carried out for candidate plus culms (CPCs) of various species viz., *Bambusa balcooa, B. nutans, B. tulda,* and *Schizostachyum dullooa*. Three accessions of different species were collected from Nagaon, Morigaon and Tezpur district of Assam. The passport data and CPCs of the *Bambusa tulda, S. dullooa* were collected and planted in the Gene bank at FRC-BR.Twelve Bamboo rhizomes of six different species were collected and planted at FRC-LE campus nursery and tagged. Gregarious flowering in *Dendrocalamus longispathus* was recorded from Mizoram. Estimation of lignin, fibre length, fibre diameter (3 accessions) of *Bambusa balcooa* was conducted. Lignin content ranged from 30.24-31.63% while fibre length ranged from 1980-3698 µm and fibre diameter ranged from 20.33-25.73 µm.

Conservation of *Litsea glutinosa* Lour. through population establishment in Madhya Pradesh (TFRI)

In order to reduce extinction risk and increase the long-term security of *Litsea glutinosa,* one block plantation in Bargi Range, Jabalpur Forest Division was established. Leaflets entitled 'मैदा (*लीत्सिया ग्लूटिनोसा*) के पौधें उगाने की पद्धति' [Hindi] and मैदा (*लीत्सिया ग्लूटिनोसा*) ची रोपें उगवण्याची पद्धत' [Marathi] for awareness activities in vernacular languages were prepared for distribution.

Improvement of survival rate in Kair (*Capparis decidua*) under field planting conditions by architecting root biomass and *in situ* moisture management (AFRI)

Field survey of *C. decidua* populations was carried out in Jaisalmer, Barmer, Jodhpur, Nagaur, Bikaner, Pali, Jalore and Sirohi districts of Rajasthan and seeds were collected from Jodhpur, Jaisalmer and Barmer. RET (Root Elongation Tube) filled with different potting medium was prepared and seeds were sown in root trainers and polybags of different size in AFRI nursery. The roots grew 3-4 times faster than shoots 45 days after directly sowing into containers. Initial results indicated larger and longer containers are better for *Capparis* seedling growth. Maximum 70% germination was observed in *Capparis* seed and treatment with GA_3 had no effect on germination.

Exploration, identification of genetic resources and strategies for sustainable management of *Paris polyphylla* in Arunachal Pradesh, Manipur, Mizoram and Nagaland in North-East India (RFRI)

A total of 51 populations of *Paris polyphylla* were explored in the states of Arunachal Pradesh (14), Mizoram (20) and Nagaland (17). Four different forms of *Paris polyphylla*, based on phenotypic character-(no. of leaflets in circle, no. of filiform tepals and stigma and stamens) of the species were identified from the study sites and the genetic resources were conserved at FRC-BR, Aizawl. Ethno-botanical information was collected from the study areas in the three states surveyed. The plant species (herb/shrub/climber/trees etc.) associated with *P. polyphylla* were identified.

Conservation of RET species of Chhattisgarh – *Plumbago zeylanica* and *Celastrus paniculatus* and production of quality planting material (TFRI)

Germplasm bank of *Plumbago zeylanica* with selections from 10 locations and *Celastrus paniculatus* with selections from 14 locations in Chhattisgarh was established at TFRI, Jabalpur. Oil extraction from seeds and biochemical analysis in leaves and roots were carried out. Maximum tannin content (0.96%) and carbohydrate (10.7%) was found in leaves of *Celastrus paniculatus* of Ghatpendari, Pratappur. Maximum phenol content (2.05 %) was recorded in leaves of *Plumbago zeylanica* of Makri, Kodagaon and alkaloid (0.57%) in leaves of Devri, Jashpur. Oil (31.25%) was extracted from seeds of *Celastrus paniculatus* from Pendra, Chhattisgarh. *In vitro* regenerated shoots of both the species were maintained and *ex vitro* rooting was achieved for *C. paniculatus* and 100 plantlets were produced after hardening.

Vegetative propagation of *Plumbago zeylanica* in root trainers

Establishment of germplasm bank of *Celastrus paniculatus* and *Plumbago zeylanica* at TFRI, Jabalpur

Genetic improvement and conservation of Chironji (*Buchnania cochinchinensis* Lour.) in central and eastern India (IFP)

Selected 210 candidate plus trees from well-stocked populations of *Buchnania cochinchinensis* in 15 districts of Jharkhand and one district of West Bengal. The passport data was recorded. Seeds from CPTs were collected and seed length, width and 100 seed weight was recorded and seed oil content was estimated (41.2% to 51.78 % of carnel weight). Standardized pre-sowing treatment (by soaking in hot water overnight) and conservation plot was established at Lohardagga by planting 61 seedlings raised from selected plus trees.

CPT of *Buchnania cochinchinensis*

Seed Germination trial of *Buchnania cochinchinensis*

Conservation plot for *Buchnania cochinchinensis*

Identification, ecological assessments for selection and screening of superior and insect-pest resistant clones of *Salix* for their cultivation, production trends and conservation in the cold deserts of Himachal Pradesh and Jammu & Kashmir (HFRI)

The socio-economic survey was carried in Chhicham, Guling villages and Tabo, Lahaul and Spiti. Cuttings from 62 selected CPTs were planted in the Tabo nursery, Spiti. Five CPTs were found to be superior over local check. Germplasm Banks were established at Giue and Sushna in Lahaul and Spiti with 25 superior genotypes. Characterization of these genotypes using SSR markers is in progress. Vegetative propagation through cuttings and stakes had 100% survival in first fortnight of April. Carbon Stock potential of *Salix alba* in three sites were calculated through equation.

Biological control of Aphid *(Tuberolachnus salignus)* was tested using the predatory insect *Chrysomella*. Population dynamics of insect pest in seven sites of Spiti valley revealed that maximum diversity in Gue site followed by Lalung. Bio-efficacy of selected insecticides viz., neem powder, imdiacloprid and *Beauveria bassiana* fungus was tested against *Nematus pavidus*, *Plagiodera versiclora* and *Lyamntria dispar* under lab conditions.

Collection, conservation and evaluation of *Melia dubia* germplasm from North-Bengal, Odisha hills and other parts of India for identification and release of superior clones (IFP)

Second generation progeny field trials have been established at Bhonda village, Ranchi, Kaura, Chatra in Jharkhand, Ahiyapur, Begusarai and Nathpur, Araria in Bihar for identifying the superior genotype(s). Melia based subsistence agroforestry model with spacing of 3m x 2m and crops (viz. Palak, Amaranthus, Garlic, Onion, Garden Pea, Sweet corn, Potato, Brinjal, Chili, Ladies finger, carrot, other vegetables, fodder (Berseem), fruits (Papaya) etc. can be grown based on need) has been developed for small and marginal farmers and Melia based silvo-horticulture (Papaya and Moringa plants along with the Melia trees) models have been established at Maheshpur (Ranchi) and Kutam village Torpa (Khunti). Under the first-generation progeny field trial of *M. dubia*, after five years of planting volume was estimated as under bark volume (UBV) and tree volume (TV). The value of UBV was ranged from 0.03 m^3 to 0.20 m^3 with an average of 0.09 m^3 over the progenies. The highest value of UBV was estimated of genotype NBMC 9 (0.20 m^3) followed by FRI 260 (0.14 m^3) and NBMC 7 (0.13 m^3). The value of TV ranged from 0.05 m^3 to 0.36 m^3 with an average of 0.16 m^3 over the studied progenies. The highest value of TV was estimated of genotype NBMC 9 (0.36 m^3) followed by FRI 260 (0.25 m^3) and NBMC 7 (0.23 m^3).

Second generation *Melia* progeny trial at Maheshpur, Ranchi

Genetic improvement of *Pterocarpus marsupium* Roxb. through germplasm collection and conservation in eastern India (IFP)

A total of 227 CPTs have been selected from diverse areas in three states viz., Bihar, Jharkhand and West Bengal. Field data compilation is under process with respect to morphological traits. Seedlings were raised from 40 selected trees and two progeny trials have been established in Chandwa (Latehar) and Arid (Ranchi).

Establishment of progeny trial at Chandwa, Latehar

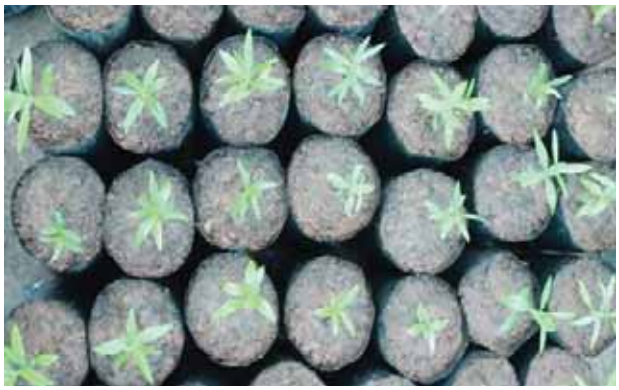
Establishment of progeny trial at Arid, Ranchi

Recovery programme for *Syzygium alternifolium* -an endangered species from Eastern Ghats (IFB)

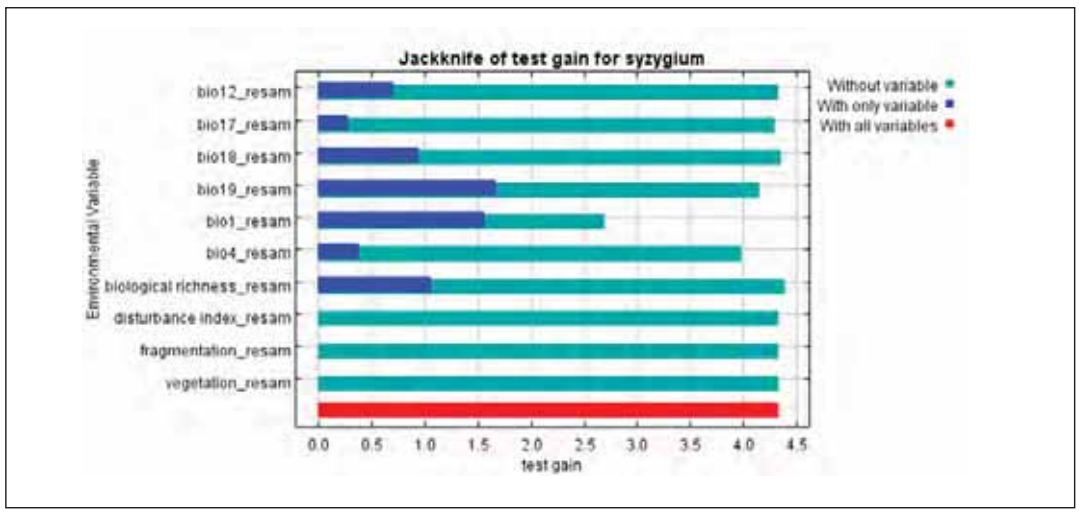
Field survey and seed germplasm collection was taken up during the month of July. Seeds were put for germination and a nursery was raised. The GPS database and the distribution map was updated with the new occurrence data. The species distribution modelling study was redone using additional predictor variables in Maxent. The generated model had an AUC (Area Under Curve) value >0.9, indicating excellent prediction. Out of the ten variables included in the model seven variables contributed to the model building. In the jackknife test of variable importance, the environmental variable 'Precipitation of the coldest quarter (BIO19)' showed maximum gain when used in isolation. This variable appears to have maximum information that are not present in other test variables. Likewise, the environmental variable 'Annual Mean Temperature (BIO1)' decreased the gain most when omitted from the model.

For the genetic diversity study in *S. alternifolium*, twenty ISSR (Inter Simple Sequence Repeats) were screened and only one primer viz., $(GA)_8$ amplified a PCR product.

Germination of *S. alternifolium* seed on raised sand bed.



Transplanted *S. alternifolium* seedling in polybags.



Jackknife test of variable importance in Maxent model for *Syzygium alternifolium*

2.3.2. Tree Improvement

Development of disease resistant clones of Shisham through biotechnological interventions

Using biochemical marker Ergosterol, a new method was developed for identification of disease resistant clones of *Dalbergia sisoo*. Four resistant clones FRI DS9, 14, 16 & 103 were identified. Further resistant clones were validated through related proteinomics i.e. Pathogennic Resistant related proteins like chintinase, B-11, 3-glucanase & pennidage. When infected the disease resistant clones had three to five times higher PR proteins.

Clones/Varieties released

Variety Releasing Committee (VRC) meeting of ICFRE was held on 18 November 2021 under the chairmanship of Director General Forests & Special Secretary (MoEF&CC) and Co-chairmanship of Director General (ICFRE). 22 varieties/clones of different species were released, details are as follows:

- FRI, Dehradun developed 06 varieties of Neem for commercial cultivation. These cultivars can produce on an average double the oil (34.67 to 36.75%) and *Azadirachtin* (6047 to 9755 ppm) content in comparison to base population.
- IFGTB, Coimbatore developed 06 clones of *Calophyllum inophyllum* valued for its fruit and oil content are also for commercial cultivation in southern states, which can give on an average upto 6 kg average fruit yield/tree after 6th year of planting compared to 4.3 kg from unimproved seed source.
- AFRI, Jodhpur developed 03 clones of *Dalbergia sissoo* for Gujarat, consistently giving high timber yield. The expected yield of total wood from these *D. sissoo* clones is 284.0 Cum/ha in 25 years, from which total income of Rs 29.40 lakhs/ha/25years can be generated as merchantable logs.
- IFP, Ranchi developed 05 clones of poplar,with high productivity and short rotation period. These poplar clones have 36.72 to 43.11 m^3/ha/year productivity, which can give income of 3.21 to 3.77 lakh /ha/year. These poplar clones have outperformed over the well known industrial clone being used at present.
- IFGTB, Coimbatore had worked on interspecific hybrids from three different species namely *Eucalyptus tereticornis*, *E. camaldulensis* and *E. grandis* and developed 02 clones of *Eucalyptus* Hybrids having growth superiority of more than 10% over and above the best clone of IFGTB, Coimbatore.

Screening of parents for clonal forestry and hybridization for higher productivity in *Eucalyptus* (FRI)

Selection of promising genotypes from already established provenance trials and evaluation trials using appropriate selection method was completed. A series of genotypes selected at various sites have been coppiced for further studies on clonal propagation and wood analysis. The selected genotypes were multiplied through macro propagation and three evaluation trials have been established in Uttar Pradesh and Haryana.

Genetic evaluation and characterization of *Toona ciliata* for productivity enhancement (FRI)

A progeny trial consisting of 19 half sib progenies and a field gene bank with 24 genotypes have been established at Maikhura village of Chamoli district, Uttarakhand. In order to capture more variability of the species, 41 plus trees have been selected from different forest divisions of Uttarakhand and Himachal Pradesh and raised in the nursery for progeny testing. Around 100 SSRs including tri- and tetra-nucleotides were synthesized and validated to study the variable alleles representing maximum genomic regions. The causal organism of leaf spot in *T. ciliata* was identified as *Colletotrichum* sp. Amplification of the internal transcribed spacer (ITS) region of rDNA indicated the pathogen as *Colletotrichum gloeosporiodes.*

Field evaluation of recombinants emanating from F_1 and F_2 generations of *Corymbia* (syn. *Eucalyptus*) hybrid *C. citriodora* Hook. × *C. torelliana* F.v. Muell for high productivity (FRI)

Hybrid clones of *Corymbia citriodora* × *C. torelliana* FRI-CH-001 to 4 were propagated through tissue culture and were planted in multi-location field trial along with seedlings of *C. citriodora* (CC) and *Corymbia torelliana* (CT) and commercial Eucalyptus clones P 23 and P413 as check entries in September 2018. The best growth at age 3.5 years was found in FRI-CH-01 followed by FRI-CH-02 as compared to checks. The timber properties of hybrid clones are suitable for load bearing columns, flooring and other structural purposes. It takes good polish and finish and therefore suitable for furniture making.

Tree improvement and biotechnological interventions capture genetic and adaptive variations in *Rhizophora* to mitigate climate changes (IFGTB)

Phenotyping of *Rhizophora* has been done with individuals selected during floristic surveys conducted in Pichavaram, Tamil Nadu (Deltaic type). Reproductive biology and breeding systems of the target taxon was studied. About 73 putative hybrids were identified and tagged for long term observations. Documented the morphological features of hybrids and their levels of productivity in contrast to either parents. Study on genetic diversity is under progress. Fourteen microsatilite primers were synthesized and optimized for the same.

Evaluation of genetic resources of *Melia dubia* in Tamil Nadu and Kerala for productivity enhancement in tree farming (IFGTB)

As part of Melia breeding programme, selected 175candidate plus trees. Genetic diversity studies have been conducted to understand the genetic base. Established research assets like progeny trials, provenance resource stands and clonal multiplication areas (Panampally, Kerala; Gudalur, Chennai; Nellore, Andhra Pradesh; Neyveli, Tamil Nadu; Hoskote, Karnataka). Twenty clones were mass multiplied and clonal trials have been laid out in two locations at Panampally, Kerala and Iruvakki, Karnataka. Wood density of different clones ranged from 0.25 to 0.49 g cm^{-3}. Transcriptome resource has been generated for contrasting phenotypes. The complete chloroplast genome has been assembled and annotated and deposited in the NCBI (accession number TPA: BK059531). DNA barcodes for species delineation between *Melia dubia* and *Melia azedarach* (Accession numbers MW604697 to MW604710 for *matK* and MW623431 to MW623444 for *rbcl*) have been published.

Evaluation of germplasm and transcriptome studies in Eucalypts for water logging and salinity (FRI)

Eucalypts clones, such as B-20, B-195, W-12, B-365, FRI-11, P-45, B-59, 71, 413, and ITC-2023, are more suited to survive in waterlogged conditions, whereas others, such as 413, B-44, B-148, 2070, B-195, SPM-32, 288, B-100, B-32, B-20, B-112 are performing better in saline conditions. Trial was established in waterlogged and saline sites at Muktsar, Punjab for performance of clones under field conditions. In waterlogged conditions the genes involved in functions like aerenchyma production, adventitious root formation, anaerobic respiration, plant growth maintenance, ethylene-response factor, were found more expressed in tolerant clones than in susceptible clones. Under saline conditions, a high number of upregulated genes were identified in tolerant clones that are associated with cell wall modification, cuticle synthesis, and the phytohormonal genes which help in stomatal closure which restrict salt entry into cells and for osmotic adjustment. The findings of this study indicate that plants of tolerant clones were more capable of maintaining the first line of defence for salt tolerance for a longer period compared to plants of susceptible clones.

Experimental setup for waterlogging stress

Experimental setup for saline stress

Deployment, demonstration and release of *E. tereticornis* x *E.grandis* selections to farmers as a veneer and pulp tree crop (IFGTB)

Most eucalypt growers prefer short pedigreed clones of Eucalyptus *in-lieu* of the traditional untested seeds. Selections with a straight clear bole over 12-14 meters and holding optimal glue shear strength are sought by ply industries. A concept called "*INDUSTREES*" (Eucalypt Trees Bred for Single purpose Industrial use) for industries is being fielded. *E. tereticornis x E. grandis* (*Terigrandis*), an inter-specific hybrid was developed through controlled pollination and has been tested for its industrial uses. The ortets were tested for veneer wood properties and industrial suitability. The shortlisted selections are to be deployed as a veneer tree crop (VTC). Currently, three pilot trials in participation with three eucalypt farmers in the districts of Coimbatore, Tiruppur and Theni of Tamil Nadu have been short-listed. Two demonstration trials with six ramets of *E. tereticornis* x *E. grandis* (40 ramets each with three ruling clones and one seedling as control) has been established in Panampally and in Neyveli.

Evaluation of *Gmelina* genetics resources for enhancement of productivity and wood quality in Kerala (IFGTB)

Intensive surveys were carried out in natural forest and plantations of *Gmelina arborea* in Tamil Nadu and Kerala and selected 40 CPTs based on growth superiority, clear bole and pest and disease resistance. The data on bio-metric, phenology and reproductive character have been recorded for the CPTs. Seeds were collected from selected CPTs and assessed variation in seeds and seedling characters. Established vegetative multiplication garden with selected clones at Forest Campus, Coimbatore and their mass multiplication is under progress. Established clonal genetic base of *Gmelina arborea* at Sholayur, Attapadi Kerala. A progeny trial was established at Sholayur, Anaikkatti with 30 families assembled from different parts of Tamil Nadu.

Improvement of teak for higher productivity in central/peninsular India (TFRI)

Recorded morphometric data of 57 Teak plus trees selected in Chattisgarh (13) and Madhya Pradesh (44) along with the GPS coordinates. A germplasm bank (31 accession) and a progeny trial (29 families) were raised in TFRI campus and being maintained regularly. Growth performance of different progenies from Chhattisgarh and Odisha were found better than the progenies of Madhya Pradesh and Maharashtra.

Analysis of natural teak populations collected from 13 agroclimatic zones of central India revealed significant differences among populations for tree height, clear bole height, girth at breast height, wood density, fibre length and fibre width. Overall, tree height ranged from 7.62m to 38m, clear bole height from 2.21m to 32m, girth at breast height from 70cm to 265cm and wood density ranges from 401.51 kg/m^3 to 792.96 kg/m^3 with a CV of 12.56%.

Selected Plus Trees in Betul forest division of Madhya Pradesh

CSO of Teak at Ghasipur (CG)

Progeny Trial of Teak in TFRI campus

Selection and screening of germplasm of *Acacia nilotica* L. (Babul) to improve productivity in Tamil Nadu (IFGTB)

Seedlings from the selected 50 CPTs were raised and established the progeny trials in three places covering different agro-climatic zones of Tamil Nadu. The progeny trials were established in Ariyalur, Tirunelveli and Tiruchi. Initial results revealed that the CPTs selected form Tirupur, Kancheepuram and Vellore districts showed better performance.

Screening of international germplasm of *Casuarina equisetifolia* for enhancing productivity and rural livelihood in Tamil Nadu (IFGTB)

Three international provenance trials were established at Thuvarankurichi, Neyveli and Gudalur, Tamil Nadu. Biometric observations were recorded at six monthly intervals and identified nine superior and stable provenances across locations. They were 17577 Papua New Guinea, 18122 Egypt, 18137 Kenya, 18141 Kenya, 18297 Thailand, 18344 Malaysia, 18378 QLB, 18153 Papua New Guinea and 18136 Kenya. Quality seeds were collected from all these trials.

Testing of new set of provenances of *Acacia mangium* and estimation of genetic gain from first and second generation seed orchards (IFGTB)

Studied variations in seed and seedling morphometric traits and germination behavior of an international provenance collection of *Acacia mangium* and found significant differences among them. Seedling growth characteristics like seedling height, basal diameter of seedlings and number of phyllodes also showed significant provenance variation. Established two provenance trials with 15 provenances at Ramnagar, Karwar district and Shaklespur, Hasan district in Karnataka. The provenance trials have been maintained by adopting silviculture practices suggested by CSIRO-Australia. Evaluated the trials for survival and growth traits viz., height, GBH, basal diameter, crown diameter, number of branches, height at first branch, branch thickness and forking ability. Shortlisted the IFGTB-SGAM, IFGTB-FGAM, PNG- Balimo, PNG-Fly River, VIE-Dong Ha, PNG- Lower Fly provenances based on survival and early growth superiority.

Selection and evaluation of *Haldina cordifolia* (Roxb.) Ridsdale for higher wood productivity (IFGTB)

Carried out extensive field surveys in Kasaragod district, Kerala, selected 24 candidate plus trees (CPT) of *Haldina cordifolia* and collected seeds from 10 CPTs. During the previous year, exhaustive field surveys were conducted in Kollam district in Kerala and selected 14 CPTs. Wood property studies were conducted with samples collected from 29 trees. Fibre length varied from 531.71 µm to 1097.15 µm. Fibre diameter ranged from 11.37 µm to 33.42 µm. Lumen diameter ranged between 8.18 µm to 26.86µm. Runkel's Ratio varied from 0.254 to 0.889 whereas, Coefficient of Fibre Flexibility ranged between 0.503 to 0.804. CPTs 93, 95 & 100 were found to be suitable for pulping purposes.

Development of management practices of Teak Seed Production Areas, Seedling Seed Orchards and Clonal Seed Orchards (TFRI)

Surveyed Seed Production Areas (SPAs) in Sagar, Dewas and Betul forest divisions of Madhya Pradesh and Pali and Chatuabhauna area of Bilaspur circle in Chhattisgarh and recorded seed production status and management practices. Seed production in CSOs and SSOs of Sagar, Betul forest divisions of M.P. and Ghasipur in Bilaspur circle of Chhattisgarh were recorded low and management practices suggested to field staffs. Established a Clonal Seed Orchard (CSO) within the Institute campus with12 ramets (bud grafted) of each of 15 clones from Madhya Pradesh.

Seedling Seed Orchard in TFRI campus

Clonal Seed Orchard established

Identification of genetically superior germplasm of priority bamboo species of Mizoram (RFRI)

135 Candidate plus culms of *Dendrocalamus hamiltonii, D. longispathus, D. latiflorus, Melocanna baccifera, Bambusa tulda* and *Schizostachyum dullooa* were collected and germplasm bank established at FRC-BR Aizawl, Mizoram. Propagation of *D. latiflorus* through culm cuttings, *D. longispathus* through seeds and *Thyrsostachy soliveriis* using *in vitro* multiplication method is in progress.

Evaluating the impact of tree improvement activities on seed quality of *Tectona grandis* in Madhya Pradesh and Chhattisgarh (TFRI)

Surveyed and selected 6 SPAs, 2 CSOs and 1 SSO in Madhya Pradesh and 5 SPA, 2 CSO and 2 SSO in Chhattisgarh and collected seeds. Seeds were also collected from unimproved plantations. In Madhya Pradesh, seeds of SPA, Tikaria (West Mandla) found superior in morphological parameters in terms of fruit length, diameter and fruit weight. Emptiness was minimum (59.24%) in seeds of SPA, MoeyaNala (West Mandla) and maximum (73.48%) in SPA Podhi (Umaria) in Madhya Pradesh. In Chhattisgarh, seeds of SPA, Pali were found superior in morphological parameters in terms of fruit length, diameter and fruit weight. Emptiness was minimum (64.29%) in seeds of SPA, Pali (Bilaspur) and maximum (75.78%) in seeds of SPA, Amaruva (Raipur).

Seed Production Area at Hathni (Damoh) in M.P. and Pali in Chhattisgarh

Selection of pest and disease free CPTs of *Gmelina arborea* and production of clonal planting material (TFRI)

Branch cuttings were collected from CPTs selected in Betul (Sonaghati), Chhindwada, Katni (Saraswahi), Damoh (Nohta, Sanga) and Jabalpur (Moiyanala, Barha) in Madhya Pradesh. Semi-hardwood cuttings were prepared and treated with with 1500 IBA solution for production of rooted plants. New CPTs (20) at different locations were also selected and propagation is being carried out with branch cuttings after treating them with different concentrations of IBA, NAA and IAA. Rooting (50%) was also achieved in soft-wood cuttings by planting them in vermiculite in root trainers after treatment with IBA. Scions were collected from selected trees and cleft grafting on rootstocks was carried out. Around 60-70% success was achieved for grafting.

Rooting of softwood cuttings of *Gmelina arborea*

Collection of cuttings from selected CPTs of *Gmelina arborea*

Cleft Grafting in *Gmelina arborea*

Genetic improvement of *Parkia roxburghii* (RFRI)

During 2021-22 one clonal trial-cum-Clonal Seed Orchard of *P. timoriana* was established by RFRI team at Tharosibi Research centre, Imphal East, Manipur and a "Monograph on *Parkia timoriana*" was published by RFRI, Jorhat.

Releasing of Monograph on *Parkia timoriana* by Hon'ble Deputy CM, Arunachal Pradesh, Shri Chau Chowna Mein

Clonal trial-cum-Clonal Seed Orchard of *P. timoriana* at Tharosibi Research Centre, Imphal East, Manipur.

Development of productive clones and economic evaluation of Poplar based agroforestry for North Bihar (IFP)

Clonal field trial of 25 different clones of poplar have been established at two different locations viz. Nathpur (Araria) and Gaya. Poplar based agroforestry models viz. poplar-wheat (at Gaya) and poplar-maize model (at Nathpur, Araria) have been established. Also, the poplar based silvo-horticulture model of poplar-litchi have been established at Karela village, Muzaffarpur. The stem cuttings of poplar clones have been raised to establish poplar ETPs for under field trial in next season. Developed and released 5 superior clones of poplar. The monetary gain estimated from the developed clones ranging from Rs. 3.21 to Rs. 3.77 Lakh $ha^{-1}year^{-1}$.

Poplar based agroforestry model developed at Muzaffarpur, Bihar

Poplar nursery established at Jadua, Hajipur

2.3.3. Biotechnology

In vitro propagation and secondary metabolite analysis in *Nardostachys jatamansi*, a critically endangered medicinal herb of West Himalaya (FRI)

In vitro propagation of *Nardostachys jatamansi* was optimized using rhizome as explant. The survival and growth performance of the rooted plantlets in nursery condition is presently being assessed. Additionally, synthetic seeds were also produced. The genetic fidelity of the *in vitro* regenerated plantlets was assessed using RAPD markers and their genetic uniformity was established.

Commercial Production of Quality planting material of bamboo species (FRI)

Three selected genotypes of *Bambusa balcooa* (clone 585), *B. vulgaris* and *Dendrocalamus asper* (DAS-1) were mass multiplied. Base cultures of *Bambusa balcooa* (clone 585) were provided to private tissue culture companies Devleela Biotech, Raipur Chhattishgarh and Almanaq Biotech Latur, Maharashtra.

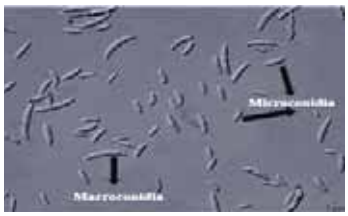
Domestication, Sustainable Utilization and Conservation of *Pterocarpus santalinus* (Red Sanders) genetic resources (IFGTB)

Field surveys were conducted in Chittoor and Kadappa districts and seeds were collected from 7 plus trees. Vegetative propagation of branch cuttings from selected trees were conducted and the number of sprouts per harvest varied from 3- 15 and the rooting per cent ranged from 10 to 80%. Approximately, 150 shoots were produced in tissue culture. Further, the genome size of *P. santalinus* was estimated using flow cytometry and 2C genome size was 0.787 ± 0.0561pg. SSRs were mined from leaf transcriptome dataset and 3128 EST-SSRs were predicted from 25,854 *de novo* assembled unigenes. Analysis of chloroplast genomes of *P. santalinus, P. dalbergioides, P. indicus, P. marsupium* and *Dalbergia latifolia* revealed 17 unique diverse hotspots which differentiated all the species. Phylogenetic analysis using chloroplast genome revealed high similarity of *P. santalinus* and *P. dalbergioides.* Eight novel barcodes were identified for authentication of *P. santalinus*. The whole genome sequencing of *P. santalinus* and *de novo* assembly has been completed.

Association mapping of quantitative disease resistance and identification of candidate wilt resistant genes in *Dalbergia sissoo* Roxb. (FRI)

Survey of *D. sissoo* populations across diverse locations was conducted and 80 individuals were added to the existing germplasm collection. Concurrently, seven *Fusarium* isolates were collected, cultured and identified as *F. solani* and their molecular characterization by sequencing the ITS5 and ITS4 region is in progress. Pathogenicity tests using root inoculation technique revealed the susceptibility of *D. sissoo* clone DS24 to all isolates, while clone DS-5004 was susceptible to isolate S21. Low depth whole genome sequencing was conducted and 15614 genome-wide SSR primer pairs were developed. A total of 12 polymorphic primer pairs were identified for genotyping of assembled germplasm. Raw sequence data has been deposited in the public repository Sequence Read Archive (SRA) of NCBI Genbank (accession no.: PRJNA708168).

Collection of diseased specimen



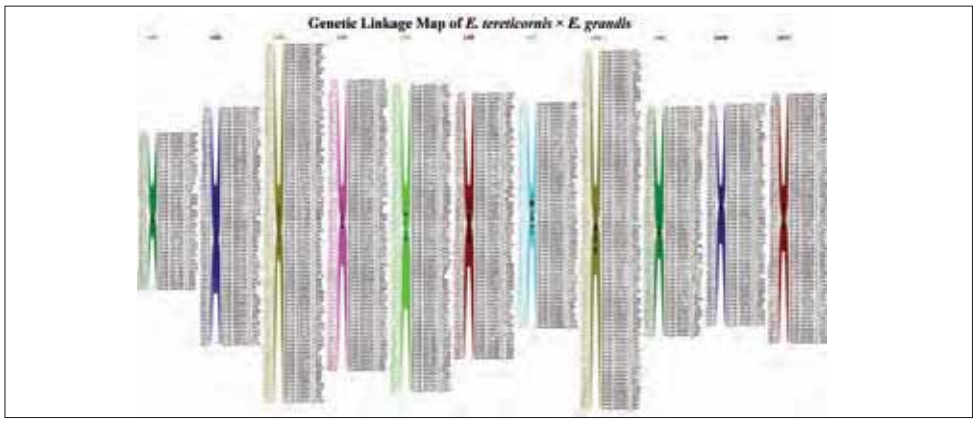
Microscopic features of *Fusarium*

Disease screening in *D.sissoo*

Primer Polymorphism in selected genotypes

Identification and tagging of QTLs/candidate genes for wood property and adventitious rooting traits in *Eucalyptus* and establishment of phenomics facility for water stress tolerance studies (IFGTB)

The *Eucalyptus* network project was implemented with the aim to develop markers for economically important traits in tropical Eucalypts. Multiple wood property traits were evaluated in mapping populations across three environments and two superior performing *Eucalyptus* hybrids were released for commercial purpose. High density linkage maps were constructed and QTL analysis identified, markers tagging adventitious rooting and wood property traits. Genome-wide association analysis predicted seven large effect markers for fibre area. Additionally, ten water stress tolerant *Eucalyptus* clones were identified for deployment in arid zones. The project has generated the genomic platform essential for implementing marker assisted selection in *Eucalyptus*. Two *Eucalyptus* hybrid clones (IFGTB-EH01 and IFGTB EH-02)were released.



Genetic linkage map of *E. tereticornis X E. camaldulensis* using SNP markers

Non-destructive *in vitro* production of pPharmacologically-active natural extract containing Guggulsterones – A Potent cardio-protective and anti-cancer drug from *Commiphora wightii* (Guggul) using Bioreactor (AFRI)

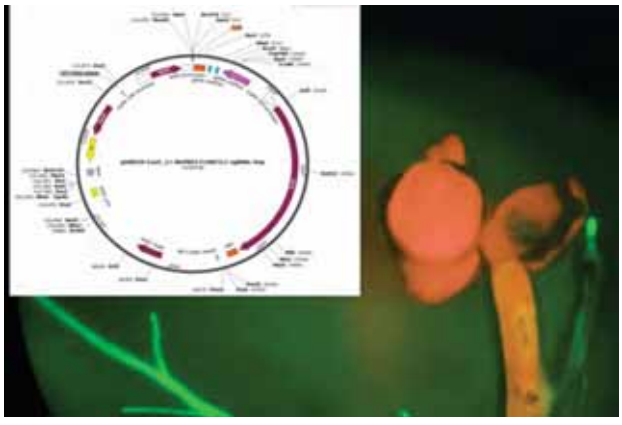
In vitro production of guggulsterone-rich cell biomass derived from *Commiphora wightii* using bioreactor was undertaken to up-scale the production of the secondary metabolite. A fed batch culture prototype was developed for growing contamination free cultures and a 4-fold increase in callus mass was documented after 60th day of inoculation. Estimation of guggulsterone was conducted in leaf and stem tissues of the mother plant, liquid culture and callus culture which revealed the presence of the metabolite. The bioreactor prototype developed for both liquid and solid cultures is a potential strategy for non-destructive extraction of guggulsterone at commercial level.

Transcriptomic analysis of salt excluding roots of *Rhizophora mucronate* (IFGTB)

Transcriptome sequencing of salt-induced roots of *R. mucronate* (salt tolerant species) and *R. apiculate* (relatively salt susceptible species) was conducted, *de novo* assembled and differentially expressed transcripts were catalogued. The data revealed 3253 and 23 differentially expressed transcripts in salt treated roots of *R. apiculata* and *R. mucronata, respectively*.

Development of a genome editing platform for functional characterization of genes (IFGTB)

This study was taken up to evaluate the effect of CRISPR/Cas mediated deletion mutations in *EcHKT1;1* gene on salt tolerance. Gene-editing vectors were generated using a 250 bp region of *EcHKT1:1* promoter (NCBI Acc.No.: MW. 7014240) and exon 1 sequences of the gene. *A. rhizogenes* mediated transformation experiments were initiated using these vectors.



GFP - tagged EcHKT1;1 gene edited roots of *Eucalyptus*

2.4 FOREST MANAGEMENT

A. PLAN

- **Completed 01**
- **Ongoing 06**
- **New 02**

B. EXTERNALLY AIDED

- **Completed 03**
- **Ongoing 15**
- **New 04**

2.4.1. Sustainable Forest Management (SFM)

Monitoring and Evaluation of District and Biodiversity Parks of Delhi Development Authority (DDA) (FRI)

The monitoring and evaluation of plantations were carried out in 11 Horticulture divisions and 03 Biodiversity Parks of DDA. More than 81% survival was observed in Yamuna, Aravali and Tilpath Biodiversity Parks; while in Horticulture division, it ranged from 70.5% to 89.96%. All the species planted in the biodiversity and district parks were found suitable for the sites. In all the parks due to hindrance by local people, DDA officials were able to use only a few numbers of tree guards to protect the plantations.

Monitoring and Evaluation of Plantation- Non-CAMPA Delhi (FRI)

As a part of Greening Delhi Mission (GDM) to improve ecology, ameliorate environment and augment the livelihood of people of the Delhi; Forest Department, encourages large scale afforestation under Non-CAMPA in Delhi. FRI, Dehradun, while carrying out monitoring and evaluation of plantation in North, West and South forest divisions (Shahadara, Alipur, Najafgarh, Mahrauli-II, Asola Bhatti and Eco-task Force forest ranges) observed that the plantations of indigenous species, were suitable for local environmental conditions, useful for local people and wildlife. Barbed wire fencing was found to be very effective against the protection from animals. The maximum survival (85%) was observed in Shahadara forest range while minimum (72%) in Mahrauli-II, forest range.

Restoration of orchid flora of Makum coalfield areas of Digboi Forest Division (RFRI)

North Eastern Coalfield areas and nearby forests harbour 48 genera with 111 orchid species, mostly of epiphytic habit. Terrestrial orchids show very localized occurrence and are represented by 19 species, amongst them *Phaius tankervilleae,* commonly known as the greater swamp orchid is in critically endangered status and observed mainly in cultivated conditions. *Dendrobium* occupied the second- largest position among the epiphytes. During the present study,17 species were observed from the study sites. All together twelve species were very occasional in distribution viz., *Bulbophyllum pteroglossum, Cleisostoma linearilobatum, Dendrobium cumulatum, D. jenkinsii, D. spatella, Era tomentosa, Gastrochilus obliquus, Micropera pallida, Phalaenopsis lobbii, Pholidota pallida, Thelasis pygmaea* and *Vanda bicolor* and were found only in the border of Arunachal Pradesh. During the investigation, the effects of various basal mediums, plant growth regulators and natural additives on organogenesis in ten orchid species have been studied. The MS media exhibited the best proliferation, followed by Mitramedium and 85-95% of seed germination was seen in all the species except *Phalaenopsis mannii.* Natural additives like Banana extract, Coconut water, potato extract and yeast extract were used for the regeneration of different *Dendrobium* species. The multiplied orchid seedlings were planted in re-vegetated mined-out sites and forest site with exhaustive care. Awareness programmes were conducted under the project along with the officials of North Eastern Coalfields about the diversity and conservation of orchids with their specific habitat.

Pinalia amica

Phalaenopsis lobbii

Phalaenopsis mannii

Dendrobium densifolium

D. lituiflorum

Vanda bicolor

Rare and Endangered orchids of Makum coal field areas (NEC)

Quantification of ecological and economic services of eco-tourism as a livelihood option for sustainability of the Rhino population in Manas Tiger Reserve (MTR) (RFRI)

Comprehensive questionnaires to survey households and to interview the tourists coming to visit MTR have been prepared and finalized and the same was also prepared digitally on KoBo android platform. Demographic data of fringe villages was collected from the 2011 census records. 23 villages situated in fringe areas of MTR in Baksa (07), Udalguri (01) and Chirang (15) districts were surveyed to know their socioeconomic status and dependency on MTR. Total 332 tourists have been interviewed visiting the MTR. Forty villages situated in fringe areas of MTR have been surveyed, out of which 21 are in fringe of core zone (MNP) and 19 are in Buffer zone. Preliminary observation showed that traditional habit of forest resource collection is there but practically there is very minimal dependency on MNP. 47% of surveyed households revealed that they are collecting part of their fuelwood from MTR. There are 16.22% of households which either are sending their cattle inside the boundary of MTR for grazing or collecting fodder. Only 5% of total households were getting their partial livelihood from tourism activities as it is mainly confined to the Bhuiyanpara, Bansbari and Panbari areas only. Total 303 tourists' groups comprising of 1022 tourists visiting Manas Tiger Reserve were also interviewed about their total travel cost, willingness to pay (WTP) and behaviour and perception towards Manas Tiger Reserve. 49.50% respondent visitors showed their WTP of Rs. 100 per visit. 29.70% visitors did not show any willingness for the same. WTP of Rs. 200 were shown by 8.25% respondents. Rapid Rural Appraisals will be carried out in subsequent months for the assessment of other sustainable livelihoods option in local communities residing in buffer zone of MTR

2.4.2. Information and Communication Technology (ICT)

Developing and popularizing digital interactive platform for tree growers and other stakeholders of Tamil Nadu (IFGTB)

As a technology-based forestry extension activity, a digital platform for tree growers planting stock suppliers, wood-based industries, research institutions and state forest departments was created to integrate information flow on research and markets for benefit of the tree growers. Based on the inputs received in the Stakeholders Workshop on March 2021, on impact of IFGTB Clones with Farmers/Tree growers an Android Mobile Application "Tree Genie" and a Web Portal on the theme "*Developing & Popularizing Digital Interactive Platform for Tree Growers & other Stakeholders of Tamil Nadu"* brought out from this project were released by Director General, ICFRE. 500+ farmers have downloaded the App from the Google Play Store. 1000+ farmers have been pre-registered from the existing list of beneficiaries. IFGTB App for Yield Calculation for important species is also integrated with the new app.

IFGTB conducted stakeholders workshop and released TreeGenie app

Preparation of volume and yield table for indigenous tree species in Tamil Nadu (IFGTB)

This project aims to provide tools to farmers for estimation of volume and yield prior to felling. Volume and biomass tables were made available for the fast growing indigenous tree species of *Melia dubia* (kadukhajur), *Gmelina arborea* (Gamhar) and *Ailanthus excelsa* (Mahanimb). Growth data from 49 plantations and a total of 282 sample trees in *Gmelina arborea,* and growth assessment of 28 plantations and a total of 171 sample trees in *Ailanthus excelsa*, were used to develop a regression model to predict the yield in standing plantations.

2.5 WOOD PRODUCTS

A. PLAN

- **Completed -**
- **Ongoing 08**
- **New 06**

B. EXTERNALLY AIDED

- **Completed 03**
- **Ongoing 03**
- **New -**

2.5.1. Wood and other Lignocellulosic Composites

Development of oriented natural fiber reinforced wood plastic composite panels (IWST)

A hybrid composite panel product was prepared by using wood polymer composite (WPC) as the matrix material along with oriented long natural fibers such as Jute, sisal and banana. The composite panel showed improved strength properties and good water resistance. Composites were also made by lying wood veneers in plywood configuration where grain direction of two veneers is perpendicular to each other. The experimental results showed a higher flexural strength, flexural modulus, tensile glue shear and internal bond strength in natural fiber reinforced thermoplastic based hybrid composite as compared to pure thermoplastics (HDPE, PP etc.).

Transparent Wood Composite - Upscaling for Industrial Applications (IWST)

Transparent wood composites (TWC) (size 240mm x 140mm x 2 mm^3) were prepared by infiltration of epoxy resin in the lignin modified bleached veneers of three hardwood species of *Populus deltoides* (Poplar), *Melia dubia* (Melia) and *Grevillea robusta* (Silver oak). The mechanical properties of transparent wood indicated a synergistic association between wood substrate and epoxy resin. Low density transparent material coupled with its shatterproof nature and good mechanical properties make it suitable for several applications including light transmitting building materials.

2.5.2. Value Addition and Utilization

Thermo-Hygro-Mechanical (THM) modification of plantation grown timbers for value addition (FRI)

Densities of plantation timbers are lower than the traditional furniture and joinery timbers of India. Despite of their suitable grain, color, texture, drying, wood working properties, the plantation species are underutilized due to unsuitability of their properties for solid-wood industry. The density and other properties of the species can be enhanced with the help of thermo-hygro-mechanical methods to make it suitable for higher end products like furniture, flooring, etc. Studies on *Melia dubia* timber has already been completed and a patent application titled 'A process for wood quality enhancement of plantation grown *Melia dubia* for furniture and joinery (No. 202111001559 dated 13th January 2021)' is filed.

THM densified *P. deltoides*

In continuation of THM process development, a series of experiments have been carried out on *Populus deltoides* timber also. The poplar wood samples were given eight treatments of hot steam: 165^{0}C (20 m), 175^{0}C (20 m), 165^{0}C (40 m) and 175^{0}C (40 m) followed by mechanical compression. Density changes, color changes, spring-back EMC% etc were studied. Results suggest that 175^{0}C (40 m) treatment resulted in best of density and spring-back performance.

Phytochemical studies of *Pterocarpus santalinus* bark for its potential utilization (IWST)

Bark extractives of Red sanders exhibited very good antifungal activity. Rubber wood and mango wood impregnated with methanol extracts of Red sanders bark exhibited very good brown shades. The colour was quantified using CIE lab colour parameters (L*, a* and b*). Rubber wood specimens coated with bark extracts exhibited very attractive shades on UV light irradiation.

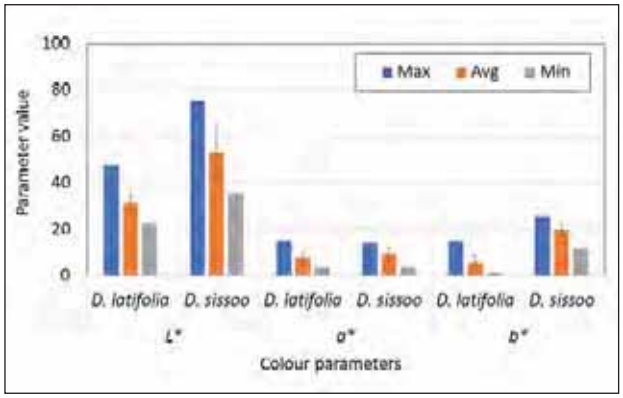
Properties assessment of Cross Laminated Timber (CLT) made from plantation grown hardwoods (IWST)

Dimensional stability of rubber wood CLT panels was carried out and results showed that CLT is more dimensionally stable than solid wood. Large size (8 ft x 4 ft x 3-inch-thick) CLT board was prepared using *Melia dubia* wood and PUR adhesive for demonstration. Dimensional stability of Melia wood CLT was analyzed. The volumetric swelling was 7.9% as compared to 13.6% for *Melia dubia* solid wood indicating better dimensional stability of CLT. Mechanical tests such as static bending, compression and block shear test were performed on CLT prepared from Eucalyptus and Silver oak. The average stiffness and bending strength of Eucalyptus CLT were 13.8 GPa and 81.5MPa while those of Silver oak CLT were 10GPa and 65.5MPa respectively. The stiffness values of CLTs were 4-8% lower while bending strength values were about 8-13% lower as compared to corresponding solid wood. The values of block shear strength and compression parallel to grain of CLT from both these species were comparable. The strength and stiffness values obtained from these hardwoods were significantly higher as compared to CLTs produced from softwoods. Delamination study as well as dimensional stability of Eucalyptus CLT samples were also carried out. The total delamination and maximum delamination were 6.6% and 23.3% respectively and these values were within the values recommended in the European standard (EN 16351). The volumetric swelling of eucalyptus CLT was significantly lower (10.6%) as compared to Eucalyptus solid wood (26.5 %) confirming better dimensional stability of CLT. Preservative treatments have shown no adverse effect on gluing efficiency of adhesives.

CLT made of *M. dubia* wood

Distinguishing *Dalbergia latifolia* Roxb. and *D. sissoo* DC. woods using anatomy, chromatography, near infrared spectroscopy and molecular marker techniques (IWST)

A fast-effective Thin layer chromatography (TLC) method was developed to distinguish the *D. latifolia* and *D. sissoo* species and 60 samples of each species were studied. Standardization of process parameter for HPLC finger printing of extracts of *D. latifolia* and *D. sissoo* continued. UV-vis. spectra of 60 samples of each species were recorded and compared. Wood colour and chemical extractives were measured. Data on density, color and extractive percentage were analyzed using multivariate PCA and PLS techniques for development of NIR calibration models. Colour data - L* of *Dalbergia latifolia* was found to be 22.97 to 47.65 while for *Dalbergia sissoo* 35.84 to 75.33. Similarly a* for *Dalbergia latifolia* 3.56 to 14.97 and for *Dalbergia sissoo* 3.49 to 14.35. The b* value for *Dalbergia latifolia* was 1.08 to 14.75 and for *D. sissoo* it was 11.45 to 25.61. Density of *Dalbergia latifolia* was recorded as 0.539 to 0.994 and *Dalbergia sissoo* 0.559 to 0.968. Anatomical characters data indicate no significant variation between the two species.



Colour Variation in DL and DS

Leaf samples of *D. latifolia* and *D. sissoo* were collected and standardization of total genomic DNA extraction from the leaf samples was performed. Standardization of PCR conditions for amplification of barcode regions (*matK* and *rbcL*) is being carried out. Nucleotide sequences of *rbcL* and *matK* genes of *Dalbergia* spp. were collected from NCBI and BOLD databases, and performed multiple sequence alignment using KALIGN to study inter specific variation. The experimental data indicates that NIR, UV-vis, TLC and HPLC can be utilized to distinguish the two species.

Photo-stabilization of wood surfaces and coatings with nanoscale UV absorbers (IWST)

Wood surfaces exposed to solar UV radiation rapidly undergo photo-degradation which is manifested by color changes, chemical degradation and structural damage. The results of study on wavelength sensitivity of photo-degradation of *Wrightia tinctoria* wood surfaces indicate high degradation of wood polymers below 380nm. Dispersion of zinc oxide (ZnO) nano particles in PU coatings significantly restricted the photo-degradation of wood polymers. Coating of radiata pine wood surfaces with ZnO embedded wax nano-emulsions exhibited an excellent UV shielding, which is of great importance for developing environment friendly nano coatings.

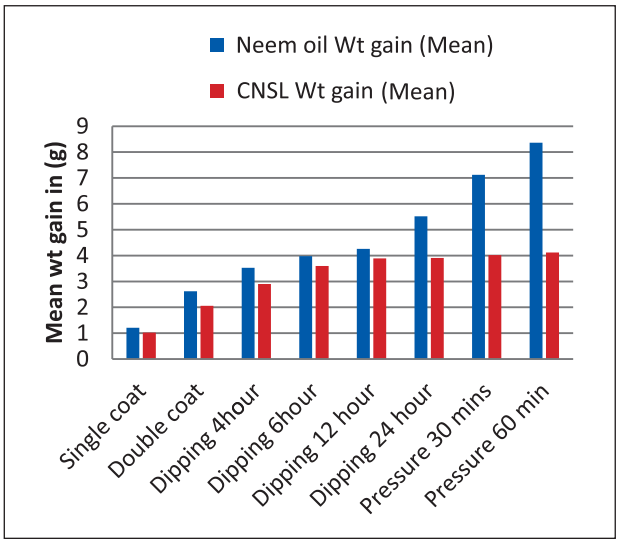
Cellulose Nano Fibrils (CNF) from different lignocellulosic materials using cryo-crushing and ultrasonication techniques (IWST)

The Cellulose Nano Fibrils (CNF) made out of bamboo and bagasse were characterized by optical microscopy, dynamic light scattering (DLS), scanning electron microscopy (SEM), atomic force microscopy (AFM) and X-ray diffraction (XRD) techniques. The optical microscopy results revealed that with increasing duration of ball milling, a significant reduction in the length of nano fibrils was observed. SEM observations also confirmed significant reduction in size of CNF with increasing milling duration. It may be concluded that increasing ball milling duration has a significant effect on length and diameter of cellulose nano fibrils.

Micrograph of Bamboo Cellulose Nanofibrils produced by Cryo-crushing

Efficacy of Neem oil and Cashew Nut Shell Liquid (CNSL) as wood preservatives against wood destroying agents (IWST)

The project was aimed at the use of abundantly available plant based non-edible Neem oil and Cashew nut shell liquid (CNSL) as wood preservatives. Both the oils showed high degree of protection against wood deteriorating agents. However, Neem oil has low shelf life whereas CNSL treatment coating is not uniform. To overcome these limitations, combinations of these two natural oils were used as preservative. Weathering and termite resistance of Rubber wood samples impregnated with neem oil followed by coating with CNSL was evaluated.



Different treatment methods with Neem oil and CNSL

Results, as shown in the graph, indicated that rubber wood samples treated with neem oil showed increasing trend in absorption of preservatives from brush coating to dipping method and pressure method whereas in case of CNSL absorption of preservatives does not increase even under pressure conditions. Neem oil has shown high degree of treatability with optimum absorption levels of preservatives compared to CNSL, treatment with CNSL alone showed difficulty in application as well as obtaining the uniform absorption. However it's quick setting and water repellency characteristics makes it an ideal for surface applications. Combination of Neem oil and CNSL use was very effective in increasing service life of timber.

Evaluation of Coconut Shell Pyrolytic Oil Distillate (CSPOD) as wood preservative for industrial applications (IWST)

Raw Coconut Shell Pyrolytic Oil (CSPOD) distillates processed out at two temperatures, 85^{0}C and 100^{0}C were copperised with copper sulphate, and the formulations are studied for its miscibility, solubility and stability characteristics. Different formulations of CSPOD preservative treated specimens were installed along with control samples at Vizag, Hyderabad, Jodhpur, Prayagraj and Nagarcoil to test their efficacy as preservatives under different eco climatic zones of India. All formulations kept for shelf life/ stability studies were used for the treatment of rubber wood and kept for conditioning before exposing for field tests. Data generated after one year of installment at Nallal showed that the CSPOD formulations were effective in field condition.

2.5.3. Pulp and paper

Assessment of Indian bamboo species for dissolving grade pulp (FRI)

Different bamboo species like *Dendrocalamus calostachyus, Dendrocalamus asper, Bambusa vulgaris, Bambusa polymorpha, Cephalostachyum pergracile, Bambusa balcooa* were evaluated for their chemical characters at different age groups. Inter-species variations in lignin, holocellulose and cellulose content in the range from 17.0 to 23.2%, 67.0 to 81.6% and 40.6 to 46.7%, respectively were recorded. The highest cellulose content was observed in *D. calostachyus* (46.71%), followed by *B. balcooa* (46.05%) and *B. vulgaris* (44.84%). Ash content was in the range of 0.93-6.04 % while the silica content was in the range of 0.14-1.51 %. Least silica (0.14 %) content was found in *B. balcooa.* Ash content in (*D. calostachyus* and *B. balcooa*) is very much similar to those hardwoods from which dissolving grade pulp is already in production. Lower ash as well as silica content is beneficial since it is an indicator of low inorganics which may interfere with subsequent chemical reactions. The results of pulping studies reveal that the kraft pulp yield for *B.balcooa* was in the range of 43.4% to 49.1% for different age group samples, whereas it was 48.0% to 54.1% for the samples *B. polymorpha*.

2.6 NON-WOOD FOREST PRODUCTS (NWFPs)

A. PLAN

- Completed 02
- Ongoing 07
- New 04

B. EXTERNALLY AIDED

- Completed 12
- Ongoing 16
- New 01

2.6.1. Resource Development of NWFPs

Development of germplasm repository of endangered medicinal tree *Oroxylum indicum* (Shyonak) (FRI)

The germplasm of *O.indicum* was collected from 21 identified locations (Uttarakhand - 08, Haryana - 04, Punjab - 03 and Uttar Pradesh - 06) based on analysis of their phyto-chemical composition. Propagation was carried out in NTFP nursery of FRI, Dehradun through seeds, roots and stem cuttings. Consequently, two germplasm repositories were established by transplantation of 252 seedlings and 180 vegetatively propagated plantlets in the campus of FRI.

Establishment of a Bamboo High Tech Nursery at IFGTB, Coimbatore (IFGTB)

Planting stock of 40,000 saplings from 10 bamboo species which are either commercially important or ornamental were produced and maintained with identity in the Bamboo Hitech Nursery of IFGTB for supplying to different endusers.

Establishment of Bamboo Demo Plantations in agro and urban ecosystems (IFGTB)

Bamboo demo plantations (20 ha. spread over 5 locations and involving 12 species and 21 accessions) were established and maintained at Agricultural Research Station - Tamil Nadu Agricultural University (ARS - TNAU), Bhavanisagar, Kumaraguru Institute of Agriculture (KIA), Sakthinagar, Erode district; Musiri Institute of Technology – College of Agriculture & Technology (MIT-CAT), Musiri; Tiruppur Corporation Land, Iduvai Village & in private farmer plots at Nanjundapuram, Coimbatore. The demo plantation of 12 species viz., *Bambusa balcooa, B.tulda, B.nutans, B. bambos, B.vulgaris* (Green), *B. pallida, B. vulgaris* (wamin), *B.vulgaris* (Yellow), *Dendrocalamus asper, D. strictus, D. giganteus* and *D. stocksii* were established.

Germplasm assemblage of medicinal Plants, *Caesalpinia bonduc* and *Annona muricata* – their characterization and utilization (IFGTB)

Twenty different locations in Tamil Nadu were surveyed to collect germplasm of *A. muricata* and *C. bonduc.* Propagation techniques using stem cuttings were standardized for mass multiplication of these species. Germplasm assemblage-cum-demo trial was established in an area of 0.772 acre at KVK-Myrada, Thalamalai (*A. muricata* 50 no's and *C. bonduc* 30 no's planted at 3m x 3.6m spacing). Biochemical characterization of fruits, seeds and leaves were carried out.

Production of Quality Planting Material of medicinal plants and creation of herbal garden in northern West Bengal (IFP)

The plants species viz., *Rauwolfia serpentina, Tinospora cordifolia, Asparagus racemosus, Acorus calamus, Messua ferrea, Saraca asoca, Terminalia arjuna, Withania somnifera, Paederia foetida, Gymnema sylvestris* and *Asparagus* spp have been raised at the Udai Singh Jote Farm at North Bengal. Trials by air layering of *Saraca asoca* for multiplication are being carried out and cuttings methods are being employed for getting saplings. Saplings have been distributed through "Ayush Aapke Dwar" under Azadi Ka Amrit Mahotsav under the aegis of NMPB. The supply of medicinal plants has been started as per demand.

Processing and Value addition of Terminalias (IFGTB)

One of the main objectives of the project is to provide a scientific validation to the NTFPs collected and assess the variation in active principles. The process of formation of secondary metabolites in Terminalias was traced from the time of fruit initiation for phenols and tannins. Depending on the maturation of the fruits, the amount of tannin decreases and the acidity (chebulic and gallic acid) of the fruits increases. The high ellagic acids found in the young fruits show gradual decrease, and in mature full ripe fruits they are found only in traces. Anthraquinones developed during maturation (unripe to ripe stages or during drying). Medium sized fruits gave maximum values for most of the compounds. As an extension activity, a total of 50 Irular tribes in ten Women Self Help Groups (WSGHs) participated in a capacity building training programme on collection and processing of NTFPs.

Evaluation of hydroponic techniques for the cultivation of medicinal plants *Bacopa monnieri, Centella asiatica, Acorus calamus* and *Stevia rebaudiana* (TFRI)

Developed and established three different mini hydroponic systems to initiate trials of targeted species at FRI, Dehradun and trials of *B. monnieri* (Brahmi) and *Acorus calamus* (Bach) has been initiated in Laboratory. The influence of NFT (Nutrient Film Technique), DFT (Deep Flow Technique) and Ebb-flow hydroponic systems on growth of Brahmi and Bach were observed. DFT hydroponics showed greater potential for Brahmi production compared to NFT and Ebb-flow with significantly higher fresh weight (96.01±1.78 g/plant) and dry weight (8.48±0.44 g/plant) after six weeks, while growth of Bach rhizomes was better in NFT system(8.90 g/plant). Hydroponics system established in TFRI, Jabalpur and species *Centella asiatica* and *S. rebaudiana* plantlets procured to start experiment.

Mini Hydroponic system at FRI, Dehradun

Hydroponic systems established at TFRI, Jabalpur

Survey and selection of Candidate Plus Trees (CPT) and identification of Seed Production Areas (SPA) and Broad Leaves Species of Rajasthan (AFRI)

Identified SPA of *Anogeissus pendula* in Bundi district and *Madhuca indica* in Meen and Taleti, Sirohi district of Rajasthan. Marked 51 CPT of *M. indica* and recorded passport data of each CPT. Identified 10 CPT of *Butea monosperma* in Siyawa, Sirohi district.

CPT marked and data recorded for *Madhuca indica:* Marking of trees (A-C); Marked CPT of *Madhuca indica* (D); and GPS map of marked CPTs at Meen village on Abu Road (Sirohi) (E).

Standardization of inoculation technique for Agarwood formation in *Aquilaria malaccensis* Lamk. in Khasi and Garo Hills of Meghalaya (RFRI)

Artificial inoculation of agar trees was done in Siju and Rongdong at South Garo Hills, Meghalaya and the data was recorded after three months of artificial inoculation. The process of agar formation started after one month of inoculation and formation of agarwood was noticed at the point of inoculation from the change of colour. A workshop on "Artificial Induction of Agarwood in *A. malaccensis*" was conducted for the benefit of agarwood farmers at Baghmara of South Garo Hills, Meghalaya.

Artificial inoculation of agar tree at Baghmara of South Garo Hills, Meghalaya

Data collection at Rongdong at South Garo Hills, Meghalaya

Workshop conducted at Baghmara of South Garo Hills, Meghalaya

Co-ordinated research programme on agar (*Aquilaria malaccensis* Lamk.) (RFRI)

A Provenance Resource Stand (PRS) was established using selected seedlings from 14 different provenances at RFRI. Further, two provenance trials were laid at Parbotjhora, Kokrajhar and KVK, Jorhat. A silvicultural trial was also laid at Silapathar Science College with respect to spacing and fertilizer. Agar-based agroforestry trials were laid at Namti, Assam; Nongpoh, Meghalaya; FRCBR Campus of Aizawl, Mizoram and in RFRI campus with intercrops lemon, ginger and turmeric. Experimental trials of artificial inoculation of agar trees has been laid out at several new provenances. Fungal inoculum for artificial inoculation of agarwood in *A. malaccensis* has been released for marketing in the brand name of "Sasi Inoculant". The product is available in two forms i.e. liquid and paste. The process of agar formation starts after one month of inoculation work and after two years the inoculated tree can be harvested.

Inauguration of Sasi inoculant by Hon'ble Chief Minister of Assam

Sasi inoculant in paste form

Sasi inoculant in liquid form

Standardization of nursery techniques for mass multiplication of *Polygonatum cirrhifolium* (Wall.) Royle (Mahameda) and its extension among local communities (HFRI)

Two natural populations of Mahameda identified in Kinnaur and Kullu districts and seeds and rhizomes were collected for further studies. Trials of seed sowing and seed germination were carried out in nurseries of the institute under polyhouse conditions as well as in open nursery beds. Laid out seed, vegetation propagation and cultivation trials at FRS, Shilaru and FRS Brundhar, Manali. Recorded 75% seed germination in Mahameda in open nursery bed in one of the treatments. Carried out laboratory analysis of collected rhizome samples for phenol, protein, carbohydrates and reducing sugar and tannin content.

Minimum Phenol content was found in Nagani-Nichar site (0.327 mg/g) and maximum was (1.432 mg/g) in Yalinge-Nichar samples. Protein content was found minimum (0.99 mg/g) in Kasol-Parvati and maximum in Tower House (3.80 mg/g) rhizome samples. Reducing Sugar content was found minimum in Nagani-Nichar (0.07%) and maximum was found in Kasol-Parvati (1.39 %) samples. The carbohydrates content was found minimum in Tosh-Parvati (18.71%) while maximum was found in Kasol-Parvati (33.75%) samples. Tannin content in the Mahameda rhizome samples was also estimated. Maximum percentage tannin content was found in the Lapah (GHNP) (i.e.2.85%) while lowest Tannin content was found in Kasol Parvati sample (i.e. 0.09%).

Around 15,000 number of Mahameda nursery stock produced for distribution among local communities.

Drying of fresh fruits of Mahameda

Rhizomes of Mahameda

Planting of Mahameda rhizome at Shillaru nursery

Germplasm evaluation of *Cinnamomum tamala* and development of appropriate agro-techniques for higher productivity in sub- himalayan tracts of Darjeeling district (IFP)

Fifty CPTs has been selected and planted for evaluation. From CPTs leaves have been collected and extraction of oil has been carried out and the oil content ranged from 0.45% to 1.87%. Vegetative propagation trials were carried out at Sukna and Salbari by air-layering. In Salbari area air-layering was 70% successful. In Sukna area desirable result was not achieved due to old age of the plant. The estimated cost of cultivation was Rs.1.50 Lakh for 1100 plants at 3mx3m spacing in 1 ha. area for the period of 5 Years. Fertilization and spacing trials have been laid out.

Tamala CPT

Tamala air layered

Survey, mapping, development of cultivation techniques, evaluation of selected germplasm and economics of *Fritillaria roylei* Hook.f. (Kakoli) an important plant of the Ashtavarga group of medicinal and aromatic plants (HFRI)

In *F. roylei* 66% germination was recorded in pre winter sowing and 52.66% in post winter sowing. Maximum of 69.3% germination recorded in seeds sown at 1.50 cm depth followed by 56 % in depth of 1.00 cm and minimum germination of 48 % in seeds sown at 0.5 cm depth. In nursery more than 95% sprouting recorded in freshly collected bulbs sown in the month of October whereas dried bulbs did not sprout.

Cultivation trials (potting media, spacing, time of planting etc.) were laid and maximum sprouting of bulbs 56 % recorded in T_6 -Soil+ Sand+ FYM (1:1:1) followed by 50% in T_3- Soil +FYM (2:1). *F. roylei* population data of 9 sites analysed and maximum density of *F. roylei* recorded from Salgran (1.8 m^2) followed by Seri (1.6 m^2) and Loharta (1.5m^2). Intercropping trials of *F. roylei* with apple laid out at Shirmoling Kanda in Ribba village of Kinnaur district. Demand and supply data were also documented.

Population data recording at Chhitkul, Kinnaur

Bulbs collection from Kullu, H.P.

Laying out of intercropping trials at Shirmoling Kanda at Ribba village, Kinnaur

Documentation of demand and supply data of *F. roylei* from Majith Mandi Amritsar

Genome wide and geospatial approaches for enhancing the adaptive potential of threatened rattan resources in India (RFRI)

Survey was carried out in protected areas viz. Gibbon Wildlife Sanctuary, Nambor–Doigrung Wildlife Sanctuary, Abhaypur reserved forest (RF), Dirgha RF, Lakhimpur, Dihing Patkai National Park, Jeypore, Dibrugarh, and Doimara area, Sonai-Rupai WLS, Assam and Zangaw reserved forest, Mamit district, and Mawmrang and Kawlbem community forests (CF), Ngopa, Champhai district, and Reiek Tlang community forest (CF), Hmuifang CF, Aizawl district, Mizoram and explored population of threatened rattans- *Calamus nambariensis, C. acanthospathus* and *Plectocomia assamica.*

Explored one population of *C. nambariensis* each from Gibbon WLS, Nambor-Doigrung RF, Abhaypur RF and three populations from Dihing Patkai National Park, Assam and three populations of *Plectocomia assamica* each from Dirgha RF, Lakhimpur, Dihing Patkai National Park, Jeypore, Dibrugarh, and Doimara area, Sonai-Rupai WLS, Assam. Also, explored three populations each of threatened rattan viz. *C. acanthospathus* and *C. nambareinsis* in Zangaw RF, Mawmrang CF, Kawlbem CF, Reiek Tlang, and Hmuifang CF, Mizoram.

Collected 25 leaf samples from each of the population for genomic study. Regeneration potential of *C. nambareinsis* was documented 110 number (seedlings) at Zangaw Reserved forest, 130 at Kawlbem CF and 140 of *C. acanthospathus* per hectare at Mawmrang CF, Champhai district, Mizoram. There was no record of any female individual or clump with fruiting in the study plots.

Awareness was generated alongwith forest field staffs of Kathalguri and Sukanjan Beat, Dehing Patkai National Park, Jeypore, Dibrugarh, Assam and Murlen National Park, Champhai, Mizoram to develop nursery of *C. nambareinsis, C. acanthospathus* and *P. assamica* in fringe villages to support livelihood.

Raised 300 seedlings of *C. nambareinsis* in nursery, RFRI campus for reintroduction in natural habitat.

2.6.2. Sustainable Harvesting and Management

Standardization of harvesting time and post harvesting techniques of *Helicteres isora* (Marorphali) and *Mucuna pruriens* (Kaunch) (TFRI)

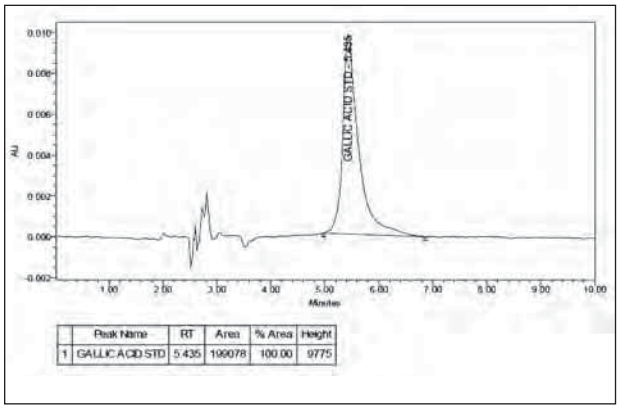
Harvesting time of *H. isora* (Marorphali) fruits and *M. pruriens* (Kaunch) seeds had been standardized as January and February, respectively in terms of bioactive marker compounds lupeol and L-dopa. Studies revealed that optimum storage time was six months for *H. isora* fruits and ten months for *M. pruriens* seeds in term of lupeol and L-Dopa content respectively. Results showed the glass containers, polythene bags and plastic containers as suitable containers for storage of the *H. isora* fruits and *M. pruriens* seeds because lupeol content in *H. isora* fruits stored in glass containers, polythene bags and plastic containers were found as 0.636±0.01, 0.633±0.01 and 0.632±0.01 respectively upto six-months time. Similarly, L-dopa content in *M. pruriens* seeds stored in glass containers, polythene bags and plastic containers were observed as 11.61±0.21, 11.08±0.12 and 11.12±0.26 respectively upto ten-months time.

Collection of *Mucuna* fruits with ruptured bamboo stick

Destructive processing of *Mucuna* fruits

Identification of prominent locations and best populations of *Terminalia chebula* (Harra) and *Anogeissus latifolia* (Dhawda) in Madhya Pradesh in terms of their active chemical ingredients (TFRI)

Morphological data of fruits of *T. chebula* (Harra) collected from 16 ranges of 02 forest divisions i.e. South Balaghat and North Balaghat of Madhya Pradesh were recorded. Harra fruits were processed to make "*Kachariya*" and powdered. Powdered fruit samples were analyzed for tannin and gallic acid contents. Total tannin content through spectrophotometer and gallic acid content through HPLC were evaluated for Harra fruits from 44 locations. The content of gallic acid in 44 samples varied from 0.83±0 to 26±0.18. The gum of *A. latifolia* (Dhawda) was collected from Alirajpur forest division and categorized into grades for further phytochemical study.



HPLC chromatogram for gallic acid

Oozing of Dhawda gum

Selection of CPTs, standardization of collection practices and quality evaluation of Gum karaya (*Sterculia urens*) in Chhattisgarh state (TFRI)

Experiments were laid out on trees of three girth classes (Group A-90 to 140 cm; Group B- 141 to190 cm and Group C- > 191) in Janjgir, Champa and Manendragarh forest areas of Chhattisgarh state. Trees were tapped mechanically with different techniques i.e. traditional and semi-arc blaze techniques to standardize the sustainable harvesting technique in the months of March, April, May and June. Observations showed that the yield of gum is directly proportional to the girth of the tree. A validated HPTLC method was developed for quantitative evaluation of glucuronic acid in gum samples which can be used for quality standardization of gum Karaya along with BIS parameters such as pH, viscosity, volatile matter, ash and foreign matter.

A: Blazing the tree with die , B&C: Length, width and depth of initial blaze on *Sterculia urens* tree, D: Refreshening of blaze (1.5 – 5 mm), E: Gum oozing from the blaze, F: Filling of the blaze.

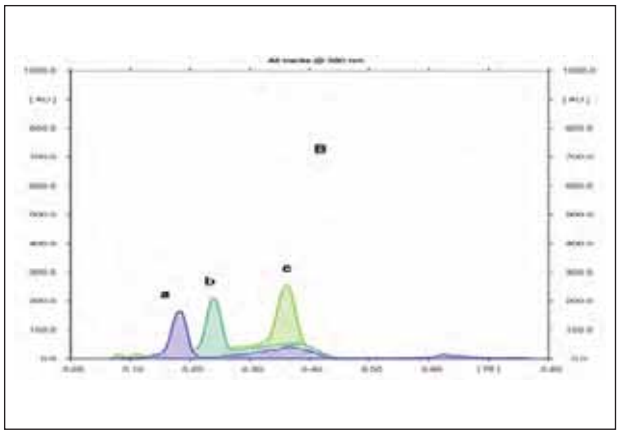
Conservation of *Stereospermum suaveolens* (Roxb.) DC. – A rare species in Madhya Pradesh (TFRI)

Surveyed ten different districts of Madhya Pradesh and mapping was done for populations of rare dashmool species *S. suaveolens.* HPTLC of root bark samples revealed chemical variations (Triacontanol content) in the range of 0.126±0.01% to 0.545±0.03%. Morphological traits were also recorded. Highest amount of triacontanol (0.545 ± 0.03%) was found in root bark collected from Khandwa forest division of Nimar (MP). Study revealed significant positive association of triacontanol with tree height, girth at breast height and clear bole height.

Investigations on active chemical ingredients and propagation of critically endangered species *Dillenia pentagyna* Roxb. for its conservation in Madhya Pradesh (TFRI)

Populations of critically endangered *D. pentagyna* Roxb. was identified in seven forest divisions of Madhya Pradesh. 10 different seed treatments and five potting were used. Preliminary results showed 12% germination in seeds treated with GA_3 300 ppm for 24 hours. Experiments for vegetative propagation were also laid out to standardize the propagation technique. Preliminary study reveals 20% rooting if treated with IAA 500ppm for 4 hr and IAA 1000 ppm for 2 hr. Total secondary metabolites i.e. alkaloids, phenols and flavonoids were also estimated. Estimated betulinic acid, β-sitosterol and

Adventitious rooting in *Dillenia pentagyna*



HPTLC Chromatograms of BA (a), BS (b) and LU (c) standards

lupeol in fruits, leaves, roots and stem bark of *D. pentagyna* with the help of HPTLC. The results showed the highest content of betulinic acid (0.920±0.02%) and lupeol (0.369±0.01%) in stem bark, while leaves contained the maximum amount of β-sitosterol (1.555±0.07%). The developed method will be used for the quality control of fruits, leaves, root, and stem bark of *D. pentagyna*.

2.6.3. Chemistry of NWFPs, Value Addition and Utilization

Characterization and Extraction of eco-friendly dyes from Eucalypts, Melia and Casuarina-leaves and bark; their application in textile industry (IFGTB)

Dye was extracted using novel dye extractor/ conventional methods from waste leaves and barks of *Eucalyptus camaldulensis*, *Casuarina equisetifolia* and *Melia dubia* and tested for its anti-bacterial and antifungal activities. A face mask was developed incorporating the extracted dye and tested for its colour fastness (washing, light, perspiration, rubbing (wet & dry) and colour strength besides bacterial filtration efficiency. Naturally dyed garments for kid wears were also developed using Eucalyptus leaves and bark waste material as dye source. The residual biomass of Eucalyptus was also used for the preparation of incense sticks.

Incense stick from waste leaves of *Eucalyptus*

Natural Dyed Garments

Natural dyes study of *Stevia ovata* (Candy leaf) and *Eupatorium adenophorum* (Kalobanmara) (FRI)

S. ovata and *E. adenophorum* were studied for their utilisation for development of eco-friendly natural dye. *S. ovata* and *E. adenophorum* were collected from Mussoorie and Dehradun areas of Uttarakhand. The collected raw materials were shade dried, sampled and analysed for the moisture content in the leaves, stem and whole plant. Dyes were extracted from the leaves and the percentage yield was determined on moisture free basis. Physio-chemical evaluation of the extracted dye from both the species were carried out to develop quality parameter for commercial uses. The dyeing parameters were optimized for material to liquor ratio, duration of extraction and concentration of dye for dyeing silk, wool and cotton fabrics. The essential oil from aerial parts of both the species were determined and identified the volatile compound using GCMS.

Bioprospecting potential of Red sanders, *Pterocarpus santalinus* Linn.f., with special reference to health care and skin care properties (IFGTB)

Extensive surveys were made in Tamil Nadu, Andhra Pradesh and Karnataka and identified 38 trees of *P. santalinus* (Red sanders) and collected leaf, bark and heartwood samples. Antioxidant activity was high in the leaf samples collected from Andhra Pradesh (95.71%). The bark and heartwood samples exhibited antagonistic activity against clinical human pathogens such as *Pseudomonas aeruginosa, Bacillus subtilis, Escherichia coli* and *Staphylococcus aureus*. Out of the 24 compounds identified through GCMS/MS analysis, five compounds were reported to have anti-inflammatory activity, four compounds antimicrobial activity and one compound anti-diabetic activity. Molecular docking of the phytocompounds against the targeted ligand protein indicated that the compound has highest docking score for anti -inflammatory activity. The skin care cream prepared passed the thermal stability test, heavy metals were below detectable limit and total microbial counts were also within the permissible limits as per standard norms.

Utilization of forest biomass through value added application as source of natural dyes (FRI)

Screening of renewable plant parts of ten selected species was undertaken and based on their dye yield and dyeing performance on different fabrics, three of them namely *Cassia occidentalis, Mimosa himalayana* and *Prosopis juliflora* were systematically investigated for development of best possible dye extraction and dyeing protocols, colourfastness properties and colour strength on different fabrics. The results on specific analysis of dyes and their dyeing characteristics for different parameters have recognized *C. occidentalis, M. himalayana* and *P. juliflora* as a potential source of natural dye thus affirming notable additions in the existing source plant inventory of natural dyes.

Phytochemical examination of *Eupatorium adenophorum* (FRI)

E. adenophorum leaf polysaccharide was isolated and purified to yield 2.14±0.05% (on moisture free basis). The Dynamic Light Scattering (DLS) study indicated polydispersity index of 25.5%. The essential oil from aerial parts (divided into category of whole plant, leaves and stems) was isolated and analyzed for presence of terpenes and terpenoids. The yield of *E. adenophorum* whole plant's essential oil was found to be 1.84% (w/w on moisture free basis) whereas; it was 2.39% from leaves and 0.43% from stems. GC-MS analysis of *E. adenophorum* whole plant, leaves and stems essential oil revealed many constituents including Copaene, α-bisabolol, Ylangene, β-bisabolene, Germacrene D and Bornyl acetate as the major constituents.

Nutritional and quality evaluation of selected wild edible plants as a source of functional food (FRI)

The nutritional status of five wild edible fruits-*Rhus parviflora, Rubus ellipticus*, *R. niveus*, *Ficus palmata,* and *Coriaria nepalensis* of Garhwal Himalaya by profiling their nutritional and phytochemical characteristic as well as their multifunctional antioxidant activity was assessed. High phenolic content and remarkable antioxidant activity of all the fruits ascertain these wild fruits as better candidates for potential use in functional foods and nutraceuticals.

BIOCURE: A medicinal plant perspective for potential viral inhibitors for severe SARS-CoV2 acute infection (IFGTB)

In order to identify potential phytochemicals as viral inhibitors, samples of *Asparagus racemosus* (rhizome), *Boerhavia diffusa* (leaf and root), *Cassia occidentalis* (leaf and root), *Cissus quadrangularis* (stem), *Clerodendrum inermi* (leaf), *Wrightia tinctoria* (leaf, bark and root), *Stereospermum suaveolens* (leaf, bark and root) and *Strobilanthes callosa* (leaf) from agroclimatic zones of Tamil Nadu and coastal zone of Karnataka were collected, processed and extracted. Preliminary screening of phytochemical of the extracts revealed that more number of phytochemicals were elicited in root samples of *S. suaveolens* followed by leaf samples of *B. diffusa*.

Exploration and utilization of natural forest resources for formulation of mosquito repellents and their evaluation (TFRI)

Herbal Mosquito repellents were developed and results were validated by NABL accredited lab. More than 90% repellency was observed in 10 different samples of mosquito repellent agarbatti sticks using *Hyptis suaveolens, Pongamia pinnata, Dalbergia sissoo, Murraya koenigii, Cassia fistula, Lantana camara, Adhatoda vasica, Andrographis paniculata, Chloroxylon swietenia, Azadirachta indica* and *Eucalyptus* species in different compositions. Further work on testing of standard parameters is under progress.

Investigations on variations and domestication of *Curculigo orchioides* Gaertn. (Kali Musli) in Madhya Pradesh (TFRI)

Tubers (apical, distal end segments and full part) of *C. orchioides* Gaertn. (Kali Musli) were sown in the field to identify and standardize the tuber part for propagation purposes. Morphological data (rhizome length, rhizome thickness, number of rootlets, length of rootlets and rootlet thickness) were recorded. Rhizome and rootlet samples were quantified for curculigoside content through HPLC technique which revealed the curculigoside content 0.372±0.017% in rhizome and 0.041% in rootlets.

Exploration of adhesive materials for incense sticks from the plant species (TFRI)

About 10 plant species of Madhya Pradesh were identified as potential species that can be used for making of Jigat for commercial production of agarbatti. Three novel compositions of Jigat were prepared and suitability of these Jigat for commercial production of Agarbatti was evaluated and were found positive. The local agarbatti industries accepted these new Jigat compositions and submitted suitability report for commercial production of Agarbatti. Leaf of *Dalbergia latifolia*, bark of *Bombax ceiba* and seed of *Cassia tora* found good for alternate source for preparation of Jigat.

Preparation of Jigat

2.7 FOREST PROTECTION

A. PLAN

- **Completed 07**
- **Ongoing 16**
- **New 12**

B. EXTERNALLY AIDED

- **Completed 05**
- **Ongoing 06**
- **New 01**

2.7.1. Insects pests, diseases and control

Studies on exploration of biological control of *Ageratina adenophora* (Sprengel) (Asteraceae) in Uttarakhand (FRI)

Pathogens and insect pests of *A. adenophora* (Crofton weed), its natural enemies were explored in Uttarakhand for biological control of the weed. Surveys were conducted in Gaurkhiyakhal, Mandakhal, Kaflana and Thano range forests and diseased *A. adenophora* plant samples were collected. Highest disease incidence was recorded in Pine forests of Mandakhal and lowest in mixed forest of Kaflana. *Pestalotiopsis* sp., *Alternaria* sp., *Cladosporium* sp. and *Colletotrichum* sp. were isolated from the infected plants. Further survey was carried out in Dehradun, Kalsi, Chakrata, Mussoorie, Upper Yamuna, and Tons Forest Division and insect fauna of four insect order Diptera, Coleoptera, Hemiptera, Hymenoptera, Thysanoptera and Araneida were collected. Low to moderate incidence of gall stem fly, *Procecidochares utilis* Stone (Diptera:Trypetidae) were observed in Dehradun, Mussoorie and Kalsi Forest Divisons.

Insect pest management of poplar using bio-pesticide (FRI)

Essential oil of three species of plants viz. *Scimica* sp., *Thymus* sp. and *Artemisia* sp. and two commercially available bio-pesticide were tested against *Clostera cupreata* to identify effective plant extract based pest management strategy for poplar defoliators. The study revealed that *Scimica* sp. was most effective followed by NCS-F16, *Thymus* sp., *Artemisia* sp. and Minchu+ with their efficacy of 0.028, 0.043, 0.176, 1.062 and 1.278 %, respectively.

Insect pests of western Himalayan oaks and their control (FRI)

Relationship between cerambycid wood borer infestation and human-induced biotic interferences causing mortality of Kharsu (*Quercus semecarpifolia*) Oak trees in Garhwal were studied. Identified 235 species of oak infesting pests in Uttarakhand; a database having 128 species of Lepidoptera, 100 species of coleoptera, 16 species of Hemiptera and one species of Diptera has been prepared. Control methods such as application of entomo-pathogenic fungi (*Beauveria bassiana*) and using a fumigant (saturated solution of para- di-cholorobenzene in Kerosene oil) and spray of synthetic pyrethroid i.e 0.1% Cypermethrin or commercially available *Bacillus thruringensis* (BT) were standerdised and suggested for oak stem / wood borers and defoliators respectively. For shoot borers, acorn weevils and sap sucking insects using systemic insecticides like Imidacloprid @0.5ml/litre by mixing in soil close to the root system of the tree is recommended. The results indicated that the maximum insect pest control was achieved with chlorpyriphos followed by nimbicidine. Plant extracts of Pissumar and Insect predator *Chrysoperla* were also very effective against lepidoptera defoliator of Mohru Oak. These replications show encouraging results in containing the insect pest of Oaks of Himachal Pradesh and will be utilized to develop management technology for different stakeholders.

Screening of poplar clones for tolerance against poplar leaf defoliator, *Clostera cupreata* But. (FRI)

Mass-reared *Clostera cupreata* larvae were used for Poplar clonal screening experiment under laboratory condition. Biology of *C. cupreata* on twelve poplar clones carried out to assess clonal influence on life cycle. Chemical analysis of twelve clones for total phenols, total flavonoids and total tannin content to relate with the impact of these chemicals on the life cycle of poplar leaf defoliator has been completed. Experiments on the impact of leaf defoliation by poplar leaf defoliator on plant growth and wood production were conducted at three locations viz. Dehradun, Rorkee and Haridwar. The study revealed that in two year old *P. deltoides* trees with the defoliation level of 25-100% the loss in tree growth was 22.12 to 65.88%. Subsequently, natural relative resistance screening of 88 clones of poplar was also made against *Clostera cupreata* and thirteen clones i.e. FRI-PD-FS-21, FRI-PD-FS-28, G-48, FRI-PD-FS-95, 1110120, WSL-18, WSL-22, FRI-PD-FS-13, FRI-PD-FS-194, FRI-PD-AM-19, FRI-PD-AM-44, FRI-PD-AM-96, and FRI-PD-AM-112 were recorded to be the relatively most tolerant clones against poplar leaf defoliator.

Study of structural dynamics and genetic improvement of *Grevillea robusta* A. Cunn (Silver Oak) (FRI)

Ten insect pests were recorded infesting to *G. robusta* out of which occurrence of five insect pests i.e. *Ascotis selenaria*, *Hyposidra talaca*, *Olene inclusa*, *Oxyrachis tarandus* and *Ceroplastes rusci* were recorded for the first time on *G. robusta*.

Ascotis seleneria

Hyposedra talaca

Olene inclusa

Oxyrachis tarandus

Ceroplastes rusci

Bio-ecology and management of Sal seed borer - *Dichocrocis leptalis* Hamp. (Lepidoptera: Pyralidae) (FRI)

Studies on the bio-ecology of Sal seed borer *D. leptalis* revealed that the pest completed four generations in a year, first generation in the inflorescence during March-April, second to fourth generations in seeds during April-June, which goes into hibernation in larval stage and adult emergence during next year in the month of March-April. Data on the body characters, mating and feeding behavior, methods of initiation and progression of infestation of the pest recorded. Percentage of infestation studied in two different locations is being compared for two years. Maximum incidence of attack was found in Thano followed by Timli. Data on intensity of attack by the borer from various sites in and around Dehradun was also recorded. For the management of Sal seed borer, fumigant Ethylene di bromide was found effective compared to Carbon disulphide.

1. Adult, 2. Egg; 3-Larva; 4. Larval damage; 5. Pupa; 6 to 8. Control trial by using insecticides; 9. Fumigation trial of *D. leptalis*

Health assessment of the living root bridges in Meghalaya (FRI)

Meghalaya Basin Management Agency (MBMA) as part of Meghalaya Community – led Landscape Management Project (MCCLMP) was developing a research- based Conservation and Development plan for UNCESCO World Heritage Site nomination of Ficus- based Living Root Bridge (LRB) Ecosystems. A team of experts from Forest Research Institute examined two LRBs viz., Wah Sohot and Wah Umlyngoh near Lait Shuthim Village and one LRB at Nohwet. The health assessment of these bridges were conducted based on signs, symptoms and other indicators with respect to pathological and insect-pest problems, physiological stresses, anthropogenic issues, hydrological and edaphic problems. The other possible contributory factors were also taken in account for ascertaining probable predisposing factors. Ficus trees of both the LRBs near Lait Shuthim are situated on a seasonal river thus have limited water availability for most part of the year. On the contrary Nohwet root bridge has an advantage of a perennial river with wide river bed and a natural water harvesting system comprising of rock barricades ensuring sufficient moisture round the year for the root bridge trees and surrounding vegetation. However, no significant pathogens or insect-pests were recorded on any of the LRBs. The present study recommended *in situ* and *ex situ* measures to conserve soil and water in the core areas of the living root bridges for improvement in tree health and minimize anthropogenic disturbances.

Nohwet root bridge with perennial water body and rocks forming natural check dams

Studies on semiochemicals for management of Sal heart-wood borer, *Hoplocerambyx spinicornis* Newman (Coleoptera: Cerambycidae) (FRI)

Oviposition behavior of Sal heart-wood borer is strongly influenced by plant volatile of sal tree emitting from physical injuries on main stem, exposing the inner bast. Female of Sal heart-wood borer beetle is highly capable of discriminating the odour of stressed trees from those of healthy trees that would be less suitable for colonization. Insect behavior traits like adult emergence, abundance, aggregation, stimulation, pairing, copulation, orientation, attractiveness etc. have been studied in field and in the laboratory. 25 samples of bast were collected from Tree Trap laid in Timli and Jhajhra forest ranges and extracted the biological active compound (Kairomone) for bio-assay study in the laboratory. Bioassay was done in both the sexes of Hoplo beetle with Olfactometer in the laboratory and analysed data showed that HXD and MA compound have maximum attraction for *H. spinicornis* beetle. Chemicals identified in the bast sap of *Shorea robusta* are Alpha pinene, Alpha- Phellandrene, (-)-B-Pinene, Delta-3-carene, (R)-(+)-Limonene and Alpha-Terpinene with Kairomonal activities.

Kairomonal trap

Olfactometer studies

Tree trap

Hoplo beetle attracted towards tree trap for food

Selecting blaze site on tree

Hoplo beetle in action

Hoplo beetle feeding on sap

Eggs laid on blaze

Hoplo beetle behavior towards kairomonal compounds in Sal forest

Development of volatile based lure for key insect pests of commercial tree species - teak (*Tectona grandis*) and Ailanthus (*Ailanthus excelsa* and *A. tryphysa*) (IFGTB)

Teak defoliator, *Hyblaea puera* showed antennal response to the volatile compounds like terpen 4 ol, geraniol, cis 3 hexene 1 ol, 1 Hexanol, caryophyllene oxide and linalool released from the teak leaves. *Ailanthus* defoliator, *Eligma narcissus* showed behavioural responses to compounds like Z 3 hexenol and 4 methyl 2 pentenol in electro-antenogram coupled with GCMS analysis. These compounds that cause the pheripheral neuronal response give a lead to utilize them for the tree breeding programmes to identify the clones / varieties that can emit higher levels of these compounds and that they could serve as source of resistance to *H. purea* and *E. narcissus.* Further studies on the proper identification along with the structure and the combinations of compounds in appropriate proportion will enable us to develop trap to be used in the fields to attract and kill defoliators.

Development of nano-biopesticides for application in forestry and agriculture (IFGTB)

From the leaves of *Tectona grandis, Ailanthus excelsa, Pterocarpus santalinus* and *Gmelina arborea* total 112 endophytic fungi were isolated. Twelve entomopathogenic endophytic fungi were successfully encapsulated with synthesized chitosan nano particle and confirmed through nano characterization such as Scanning Electron Microscope (SEM) and Particle Size Analysis (PSA) with Zeta potential, X-Ray diffraction and Fourier Transform Infrared (FTIR). The nano encapsulated entomopathogenic endophytic fungi were observed to have significant biopesticidal efficacy against targeted insect with no toxicity against beneficial insects and found promising for the development of nano-biopesticide.

Development of microbial inoculants consortia for quality seedling production and imparting Training-cum-Demonstration on Bio-fertilizer production and application in nursery and field (IFGTB)

Rhizosphere soil samples from the root zone of 28 different commercially important tree species from Kerala Forest Department nurseries at Chettikulam, Nilambur, and Kulathupuzha were analyzed for their physico-chemical parameters and four Plant Growth-Promoting Rhizobacteria (PGPR) strains from 36 beneficial isolates were tested for growth on ten plant seedlings (*Macaranga peltata, Mimusops elengi, Tectona grandis, Terminalia bellirica, Swietenia macrophylla, Bambusa bambos, Artocarpus hirsutus, Phylanthus emblica, Ficus benghalensis, Sterculia guttata*). Antagonistic potential of the 36 isolates were studied against six plant pathogens viz., *Fusarium oxysporum, Rhizoctonia solani, Colletotrichum* sp., *Sclerotium rolfsii, Phytopthora* sp., and *Diplodia natalensis* under *in vitro* condition. Based on the results, suitable dose of *PGPRs* was standardized for the nursery plants of Kerala. The staff of Forest Department of Kerala was given training on biofertilizers and their use. A product *Bio bacilin* was distributed to farmers for controlling root diseases in nurseries. Biofertilizer application would improve the quality planting stocks and limit chemical fungicide use.

Training-cum-demonstration on biofertilizers to the field staff of Kerala Forest Department

Efficacious management of wood borers in protected areas of forest by pheromone loaded organogel (IWST)

Attempts were made to manage the wood borer *Lyctus africanus* infestation in protected forests by semiochemical loaded organogel, 3-pentyl dodecanoate, a semiochemical known to play a main role in the aggregation behavior of female *L. africanus*. Characterization of the pheromone chemical using ^{1}H-NMR, HRMS, FT-IR showed that a new target needs to be identified for the efficient management of *L. africanus*. Extraction of semiochemicals from an active culture of *L. africanus* at National Bureau of Agricultural Insect Resources (NBAIR), Bengaluru identified few of the new targets as analyzed by Gas chromatography–mass spectrometry (GCMS). Attempts have been made for developing new semiochemical loaded organogels for the management of *L. africanus*.

Determination of the vectors of Sandal Spike Disease (SSD) of Indian sandalwood (*Santalum album* L.) and development of integrated vector management strategies (IWST)

Over 100 sandalwood samples collected from Marayoor Sandal Reserve, Chamundi Hills and IWST, Bengaluru were screened for SSD Phytoplasma. The leaf hoppers were directly collected from light traps from different locations viz., Marayur in Kerala and Chikmagaluru and Male Mahadeshwara (MM) hills in Karnataka. A total 1064 specimens were sent to Pune National Centre for Cell Science (NCCS) for molecular identification of hoppers. Total 22 groups were formed based on the morphological characters of the collected insect samples. All representative samples are subjected to the identification based on Cytochrome c oxidase subunit I (COI) gene. The samples are being sequenced currently for their COI gene marker.

Identification of indigenous species of *Trichogramma* (Hymenoptera: Trichogrammatidae) and their assessment against major insect pest of teak in Telangana and Andhra Pradesh (IFB)

Data from Telangana and Andhra Pradesh showed that release of indigenous egg parasitoid, *T chilonis*, @ 1.25 lakh/ha in natural forests and plantations of teak resulted in significant (P<0.05-P<0.001) reduction in defoliation and skeletonization caused by teak pests, *H. puera* and *E. machaeralis*, when compared to non-released sites. Development of tolerance to Monochrotophos was studied with sequential increase in the dose of insecticide (0.004-0.09%). At the lowest concentration (0.004%), the adult survivability was 10% and parasitism 50% in the initial generation. After continuous exposure for 13 generations, survival of 95% and 100% parasitisation was obtained.

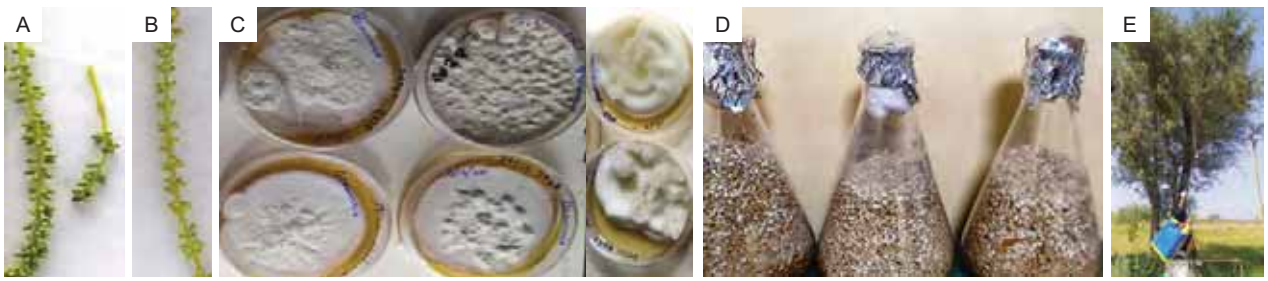
Development of delivery system for field application of *Canthecona furcellata* as biological control agent against major insect pests (TFRI)

Field valuation of the predatory potential of *C. furcellata* against *Hyblaea puera*, *Eutectona macheralis* and *Helicoverpa armigera* in teak nursery at Kanchangaon range (Mandla) and chick pea crop at Para village (Bargi), Jabalpur, M.P revealed that the first instar nymphs were not feeding on all the three hosts due to their zoophytophagous nature. At fifth nymphal instar maximum predation was observed with *E. macheralis* larvae followed by larvae of *H. armigera* predation and minimum predation on *H. puera* larvae. Results reflect that *C. furcellata* could safely be used as potential bio-control agent in pest management programme of major larval defoliator pests in teak and chick pea.

Development of integrated management strategy against flower gall inducers of *Prosopis cineraria* (L.) Druce (AFRI)

Assessment of incidence of flower gall of Khejri recorded severe infestation at Phalodi, Lohawat and Osian locations in comparison to Baori and Pipar in Rajasthan. Fewer pods were developed in highly gall infested (12 – 25 galls) inflorescence. Galls varied in size and shape forming oval and globular masses on inflorescence during the flowering season. On normal inflorescence 12-16 pods per inflorescence were observed. Average number of galls per inflorescence was higher at Phalodi followed by Lohawat in comparison to that at Osian, Baori and Pipar.

A total of two rounds of sprayings were done at 15 days interval in February-March at bud initiation stage with different entomopathogenic fungi (EPF), botanicals and pesticides in field conditions at five selected sites viz., Phalodi, Lohawat, Baori, Pipar and Osian. The treatment with *Putranjiva* and *Balanites* among botanical treatment; *Metarhizium anisopliae*, *Hirsutella thompsonii* and *Lecanicillum lecanii* among biological control and Abamectin and Germentech among pesticides were found effective. The best combination treatment was *Putranjiva* and *Balanites* (1:1 ratio) followed by *Putranjiva* and *Metarhizium anisopliae* (1:1 ratio). Effect of lopping on the incidence of inflorescence gall formation was also evaluated as lopping at one year, lopping at two year and lopping at three year and control (no lopping). The average gall per inflorescence was least in lopping at two year followed by lopping at one year.

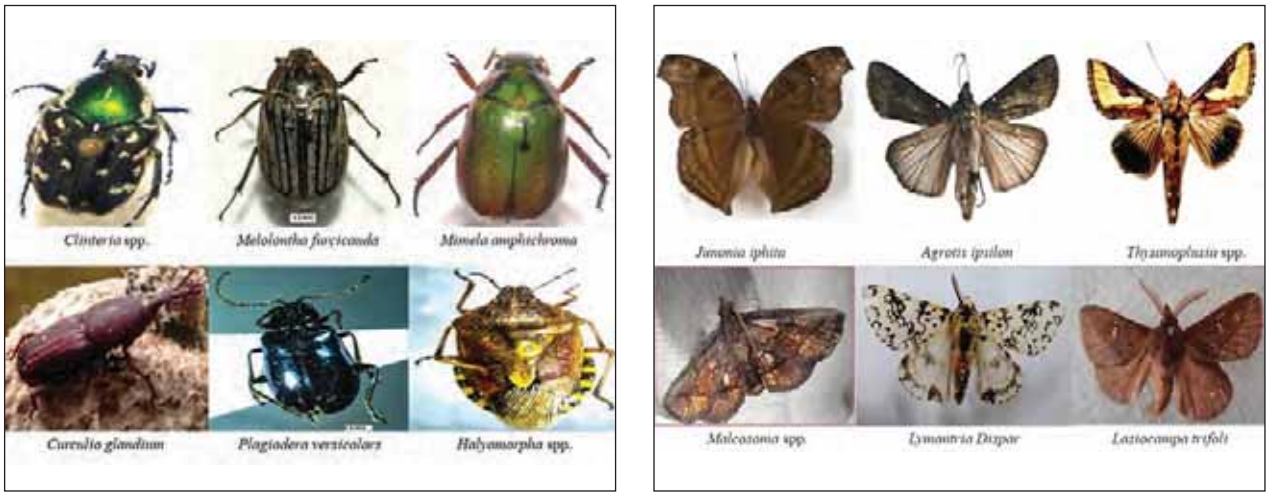


Management of flower gall formation in Khejri: Flower gall initiation (A) and development (B) in Khejri tree; Mass multiplication of entomopathogenic fungi (C-D); and Laying out of management trials (E).

Studies on changing forest insect pest status of High Altitudinal Transitional Zone and their management in Himachal Pradesh (Phase-I) (HFRI)

Monitoring of insect pests of high altitudinal transitional zones of H.P led to identification of 42 species of insect pests of various Oak species belonging to four insects order (20 species of leaf defoliator, five species of gall insect, 12 species of beetles and 5 species of sap sucker). Insect specimens identified are:

Lepidoptera: Leaf defoliators i.e., *Areas galactina*, *Derocaincon clusa* and *Arctorni ssubmarginata, Malcosoma* sp. and *Cerace* sp.; **Hemiptera:** *Halyomorpha* sp. (Sap sucker) and *Physomerus* sp. (Defoliator); **Coleoptera:** *Phyllobius argentatus* (Sap sucker), *Curculio* sp. [Seed borer]; **Hymenoptera**: Gall forming insects, *Cynips* sp.



Insect pests of High Altitudinal Transitional Zone of H.P.

Infected samples of Oaks were further analyzed in the lab and field to assess the damage potential. Field trials of different treatments like mechanical method to control the tent caterpillar attack on *Q. floribunda,* biological control using *Chrysoperla carnea* and *Trichogramma* sp., treatments with insecticide (Chlorpyriphos, Nimbicidine), biopesticides (*B. albiflora*), HMOs were conducted to check their efficacy against the insect pests of Oaks. The results indicated that the effects of treatments differed significantly and effective methods can be deployed to manage serious insect pests of Oaks.

Application of treatments on insect infested trees of *Quercus* species

Studies on changing forest insect pest status of High Altitudinal Transitional Zone and their management in Himachal Pradesh (Phase-II) (HFRI)

The population status of insect pests infestation and effect of different treatments were assessed on the trees at four study sites i.e. Rohtang Pass (Kullu), Chanshal Pass (Rohru), Inderhar Pass (Dharamshala) and Saach Pass (Churah) of High Altitudinal Transitional Zones of H.P. during the field studies and it was observed that defoliators and borers were most prevalent insects in the region. The techniques using different treatments i.e, natural enemy complex such as insect predators e.g, *Chrysoperla carnea* and insect parasitoids (*Trichogramma chilonis*) which were collected from the natural habitat were tried to test their bio-efficacy along with other treatments such as, Cypermethrin, Nimbicidine and *B. albiflora* (Pissumar) extract, biopesticides, Herbal Mineral Oils (HMOs) and parasitoides to control the pest species *Malacosoma indica*, *Chrysomela populi* and Acorn weevil in the field and other insect-pests of *Abies pindrow*, *Betula utilis*, Bird cherry, Maple (*Acer* sp.) and Kharsu Oak. The average mortality of insect pest was found to be 98%, 56% and 35% with Cypermethrin, Nimbicidine and Pissumar extract respectively.

Lab studies of different treatments against Insect pests High Altitudinal Transitional Zone of H.P.

Studies on the mealy bug *Dysmicoccus brevipes* Cockerell (Hemiptera: Pseudococcidae) and the bark feeding borer *Indarbela quadrinotata* Walker (Lepidoptera : Coccidae) on Mangroves (IWST)

Monitoring and collection of *D. brevipes* and the bark feeding borer *I. quadrinotata* at Thane, Bhiwandi, Airoli and Gorai regions of Mumbai were done. Natural enemies, host range and alternate hosts were recorded during the survey. Pest specimens were also collected from the alternate host (Eucalyptus, Casuarina, Copperpod tree, pineapple etc.). Collected insect specimens were reared in laboratory conditions.

2.7.2. Mycorrhizae, rhizobia and other useful microbes

In vitro mass propagation of *Angelica glauca* Edgew. rootlet biomass for the production of bioactive phytocompound/s using bio-inoculation technology (FRI)

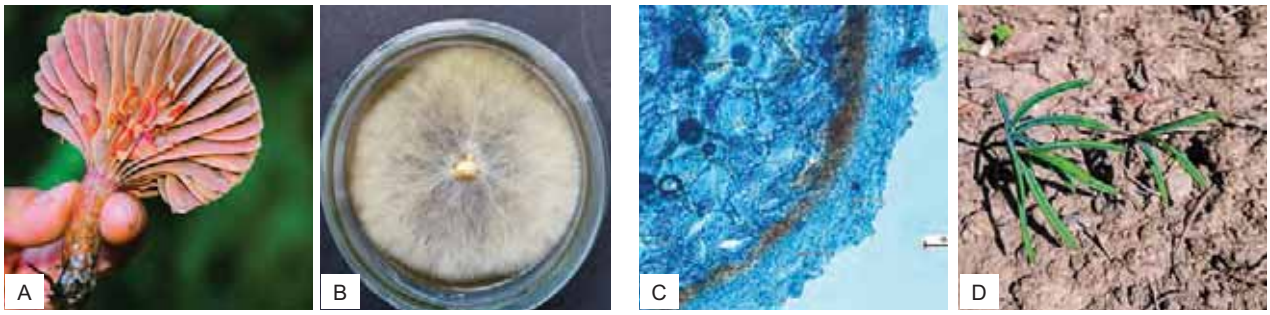
Surveys in the Uttarakhand region was conducted for the collection of rhizospheric soil samples and root samples. A total of five sites from Uttarakhand were explored. Isolation from the collected samples was completed for both endomycorrhizae (VAM) and root fungal endophytes. The isolated fungal strains were cultured, sub-cultured and preserved in -80°C deep freezer. Mass Culture of elite strains of endophytes and endomycorrhizae were also carried out. Collaboration with High Altitude Plant Physiology Research Centre (HAPPRC), HNB Garhwal University was sought to set up the field experiment in High altitude Nursery at Baniykund, Chopta. Production of callus for rootlet biomass is completed and production of rootlet biomass from root callus is under way.

Utilization of ectomycorrhizal diversity for the quality stock production of *Juniperus, Quercus* and *Castanopsis* in Sikkim, India (RFRI)

Trainings on mycorrhizal application were organized at Kyongnosla, Pangthang and Mangan forest nurseries and trained 15 nursery workers of each nursery. Field performance of mycorrhizal inoculated seedlings as well as control seedlings of *Castanopsis indica* recorded 100% survival with significant differences in root colonization with mycorrhizal fungi and growth characteristics. Seedlings inoculated with ectomycorrhiza (ECM) had maximum increase in shoot height and it ranged from 10.04-16.67% in *Castanopsis indica*, 11.02-12.67% in *Juniperus macropoda* and 15.07 to 17.66% in *Quercus lamellose*, similarly, highest root colonization was recorded in ECM inoculated seedlings, *J. macropoda* 42.47%, *C. indica* 62.5% and *Q. lamellose* 73.45%.

Study on impact of mycorrhizal inoculations on the growth and field performance of *Abies pindrow* and *Picea smithiana* (HFRI)

Root samples and 59 ectomycorrhizal mushrooms associated with fir and spruce were collected and their morpho-anatomical characters were recorded. The ectomycorrhizal mushrooms were identified into 22 species representing 14 genera. *Russula* (4 species), *Ramaria* (3 species), *Geastrum* (2 species), *Lactarius* (2 species), *Boletus* (2 species) and *Amanita* (2 species) were recorded as dominant genera. Pure cultures of *Ramaria* sp. and *Geastrum* sp. have been successfully isolated and maintained. DNA of *Ramaria* and *Geastrum* spp. was isolated, sequences were amplified using polymerase chain reaction (PCR) and amplified DNA sequences are under process for Internal transcribed spacer (ITS) sequencing. Mass inoculum of *Geastrum* and *Ramaria* spp. was produced on wheat grains and incorporated in 3000 poly bags during seed sowing of *A. pindrow* and *P. smithiana*.



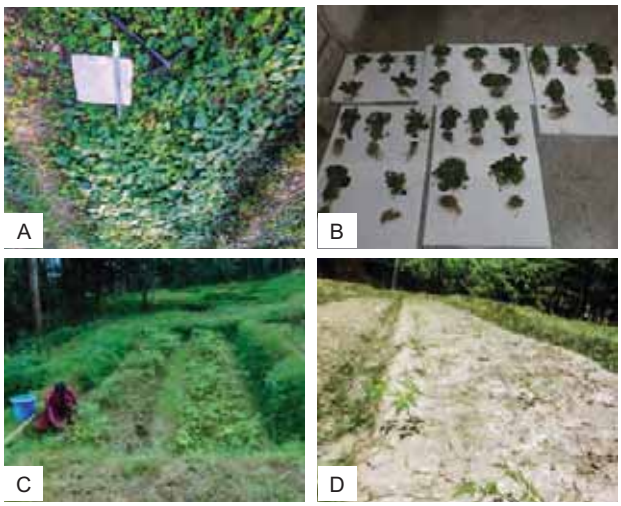
A. Fruiting body of *Lactarius* spp., B. Pure culture of *Ramaria* spp., C. T.S. of *Abies pindrow* root, D. *Abies pindrow* seedlings in Nursery

Isolation and characterization of *Rhizobium* strains from leguminous trees and their evaluation in biological nitrogen fixation (FRI)

The seedlings of *Acacia catechu*, *Erythrina variegata* and *Erythrina blakei* collected from different areas of Uttarakhand were studied for the morphological characters likes size, shape, colour and number of nodules. No nodules were found with *Bauhinia variegata* species. Isolation and identification of *Rhizobium* species on the basis of their morphological and biochemical parameters were done. The effect of abiotic stress on *Rhizobium* strain/s, such as salinity, was examined. The growth of salt tolerant *Rhizobium* strain/s was observed after each bacterial strain was inoculated into YEMA medium with a 2 per cent NaCl concentration at different pH levels. Evaluation of efficiency of the isolated *Rhizobium* strain/s by acetylene reduction assay was also done. Colorimetric method was used for ethylene sufficiently sensitive to estimate nitrogenase in *Rhizobium* strains. Isolated strain/s was also efficient for mass production in nitrogen free medium (Jensen's medium). The Cyanmethemoglobin method is used for quantification of leg- haemoglobin which is produced by *Rhizobium* strain/s. To test the potential of isolated *Rhizobium* strain/s, Leonard jar assembly is constructed.

Studies on effect of AM inoculations on the active ingredient contents and biomass production in *Angelica glauca* Edgew. and *Valeriana jatamansi* Jones (HFRI)

Earlier 27 Arbuscular Mycorrhizal Fungi (AMF) species belonging to four genera and 29 AMF species belonging to five genera were isolated and identified from rhizosphere soil of *V. jatamansi* and *A. glauca* respectively. Mass cultures of both dominant and consortium of AMF was maintained with living host in pots. Beds prepared in nursery and apple orchard and planted nine seedlings in each bed inoculated with AMF. The growth parameters (height, area and number of leaves) of outplanted plants was higher in the inoculated plants. *V. jatamansi* were harvested at the age of one year and analyzed rhizomes for the quantity of Valepotriates viz. Valtrate, Acevaltrate, Didrovaltrate, IVHD valtrate by High Performance Liquid Chromatography (HPLC). The results revealed higher content in the inoculated plants.



A. *V. jatamansi* in nursery bed, B. *V. jatamansi* harvested from nursery bed, C-D. *A. glauca* in nursery bed

2.7.3. Weeds and Invasive species

Impact of *Lantana camara* removal in Chhattisgarh State (TFRI)

Aim of the study is to assess the impact of *L. camara* removal on local biodiversity, regeneration status, physical, chemical properties of soil micro fauna, seed bank status in soil, NTFP/medicinal plants collection and fire incidents. Three forest divisions *viz.,* Balrampur (Northern Hilly zone), Marwahi (Chhattisgarh plains zone) and Bastar (Bastar Plateau zone) were selected as representative divisions of three agro-climatic zones of Chhattisgarh and established permanent plots with high, medium and low infestation areas and collected detailed information of the sites. Soil samples from each site have also been collected from three depths (0-15, 16-30 and 31-45 cm) and analyzed for chemical properties (EC, pH, N, P, K and Organic Carbon). The pH of Marwahi Forest Division was found to be in the range 4.8 -6.0. The quantity of Organic Carbon varied 0.5 to 1.07 percentage while N, P and K ranged 13 -40 Kg/ha, 20-80 Kg/ha and 2.5 -22 Kg/ha, respectively.

Scheme-1

"Strengthening Forestry Research For Ecological Sustainability and Productivity Enhancement" (SFRESPE)

To fulfill national commitments, ICFRE proposed a dedicated scheme entitled "Strengthening Forestry Research for Ecological sustainability and Productivity Enhancement" funded by National Authority, CAMPA, MoEF&CC, New Delhi. Under this scheme ICFRE is working on research by formulating 31 All India Coordinated Research Projects (AICRPs) thus bringing in synergy through collaboration amongst other ICFRE institutes and also institutes outside ICFRE. Council has also undertaken studies on Forest Genetic Resources. In a bid to equip the planners and managers with inputs to make suitable changes to the policies and to take informed decisions, ICFRE is undertaking studies in different areas of forestry sector on short term basis. The scheme is also implementing capacity building programmes to create awareness on REDD+ related issues, key concepts analysis of COP decisions on REDD+ and their relevance to India. The Council has developed an Extension Strategy which shall take care of the awareness to masses, taking technology to stakeholders, establishing pilot plantations, nurseries etc. To achieve the target of updating the knowledge of its scientists, technical and administrative staff, ICFRE has prepared an HRD plan under this scheme.

Through this scheme ICFRE aims to deliver patents, technologies and all possible technological know-how to stakeholders. ICFRE being primarily a research organization will provide an extensive base data for many economically and ecologically important issues for MoEF&CC. The scheme is for 5 years with budget of Rs. 313.67 crores.

Component-I : All India Coordinated Research Projects (AICRPs)

Testing and deployment of clones and seed sources of *Casuarina* for different planting environments and end-use applications

The main aim of this project is to maximize the use of high-yielding varieties released by ICFRE and to create new research assets for long-term genetic improvement of Casuarina. Two sets of field trials were established: (i) clonal trials with the accessions already released for testing in new areas and for new end uses and (ii) family trials with a broad genetic base which will function as a source of next generation clones and also as seed orchards. During 2021-22, nine clonal trials were established in the States of Andhra Pradesh, Gujarat, Haryana, Jharkhand, Madhya Pradesh and Uttar Pradesh. So far in last 2 years total 15 clonal trials have been established in nine States. Seven progeny trials of *Casuarina junghuhniana* were established in five States using open-pollinated seeds collected from the existing advance generation seed orchards. Seeds of *C. equisetifolia* were imported from China, Kenya and Malaysia through import permits obtained from ICAR-NBPGR. These seeds were obtained through collaboration with the Forestry Research Institute, Nairobi, Research Institute for Tropical Forestry, Guangzhou, China and YSG Bioscape, Malaysia. The imported germplasm will be planted in trials along with collections from seed orchards existing within the country during 2022-23.

The clonal trials established during 2020-21 were evaluated for first year's survival and growth. In all locations clone CH5 recorded the best survival (80-90%) and growth (3-4 m height) followed by clones CH1 and CH2. This early trend indicates that these clones have the potential for planting in locations similar to the test environments.

Clonal trials established in last two years

Institute	No. of trials	Location of clonal trials
IFGTB	3	Ariyalur and Palapattu, Tamil Nadu; Navsari AU, Gujarat
FRI	3	Shajanpur, UP; Gillakhera and Seonthi, Haryana
AFRI	1	Mahuva, Gujarat
TFRI	3	TFRI Campus, CoA, Balaghat, and KVK, Umaria, MP
IFP	2	Arid and Chandwa, Jharkhand
IWST	1	Battemallapa, Karnataka
IFB	2	Kondapuram, Nellore, AP; Dulapally, Telangana
Total	15	

Establishment of progeny trials

Institute	No. of trials	Location of areas identified for planting	Month & year of planting	Remarks
IFGTB	1	Chettinadu, TN	September 2021	112 families
FRI	4	Shajanpur, UP; Kalanaur, Gillakhera and Hisar, Haryana	July 2021 October 2021	96 families
TFRI	1	Umaria, MP	September 2021	80 families
IFB	1	Mulugu, Telangana	September 2021	80 families
Total	7			

Higher survival and faster growth of clone CH5 (left) compared to control seedlot (right) at Dulapally, Telangana.

High survival and fast growth of clone CH5 in Navsari, Gujarat

All India Coordinated project on Bamboos

Extensive field surveys were carried out in various forest areas of Uttarakhand, Himachal Pradesh, Rajasthan, Gujarat, Odisha, Jharkhand, Bihar, West Bengal, and the North-East states to find potential genotypes of various bamboo species. More than 150 new CPCs of several bamboo species were selected across the country and the superior clumps were mass propagated for their dissemination to the users. For eco-distribution mapping, SENTINEL satellite data was utilized for the North eastern hill states, detailed methodology was designed for LULC map generation of the states, namely Arunachal Pradesh, Assam, Manipur, Meghalaya, and Nagaland with 87.33% accuracy.

The species *Murraya koenigii* and *Ageratina adenophora* were tested for antifungal potential against fungal isolates from diseased bamboo samples. It was found that 1.5% extract of *Murraya koenigii* was most inhibiting against *Pestalotiopsis* followed by *Alternaria* and *Fusarium*. Whereas, 1.5% extract of *Ageratina adenophora* was most effective against *Alternaria* followed by *Fusarium* and *Pestalotiopsis*.

Viability of seeds of *B. bambos* and *D. strictus* under storage at different temperature (ambient room temperature and 5^0C) and two moisture contents (7 % and 10 %) evaluated. The seeds stored at 5^0C with 7 and 10% moisture maintained 90% viability and the ones stored at ambient room temperature at 10% mc, lost viability completely.

For evaluation of Bamboo species for reclamation of salt affected lands, two species trial (5 species each) established in salt affected areas of Prayagraj and Banda district of U.P. For evaluation of Bamboo species for reclamation of coal mined affected area, two species evaluation trials each of 13 bamboo species established at Tirap colliery of NE Coal fields and Makum coalfields. Similarly a third site for plantation has been identified at Ledo, OCP of North Eastern Coal Field Ledo, Tinsukia, Assam. For development of Bamboo based multipurpose windbreak models, three windbreak model plantation have been established in wind affected areas each at Champaknagar, West Tripura; Gaburcherra, South Tripura district and Lembucherra, Tripura using *Thyrsostachys oliveri* and *Bambusa polymorpha.*

De-structured bamboo boards of *Dendrocalamus somdevai* and *Dendrocalamus membranaceus* were prepared with various pressure levels viz; 21.0, 24.5, 28.0, 31.5 kg/cm^2 and physical and mechanical testing carried out.

IFP Ranchi has maintained *in vitro* shoot multiplication of 05 bamboo species, for *D. strictus* and *D. hamiltonii in-vitro* root culturing and hardening carried out. Germplasm bank/bambusetum established at IFP Ranchi campus and its Mander Research station. Similarly two bambusetums established by FRI Dehradun each at PAU Research Farm, Ladowal (Punjab) with 18 species and at Mansa in Research Farm of ICAR-IISWC (Indian Institute of Soil and Water Conservation), Chandigarh with 21 species.

Vegetative propagation trial of Hill Bamboo in Shillaru

Survey and identification of clump in forest

Silvicultural thinning in bamboo clumps

Dev ringal clump in forest

Conservation, Improvement, Management and Promotion of Sandalwood (*Santalum album* Linn.) cultivation in India

Comprehensive guidelines for collection and evaluation of Sandalwood germplasm developed. Twenty-five populations were identified from Karnataka, Tamil Nadu and Rajasthan and 263 trees were marked for seed collection. A total of 50 polymorphic SSRs including 12 EST SSRs were short-listed for genotyping of base populations. The first Methylated cytosine map of wood and leaf tissues of *S. album* was generated.

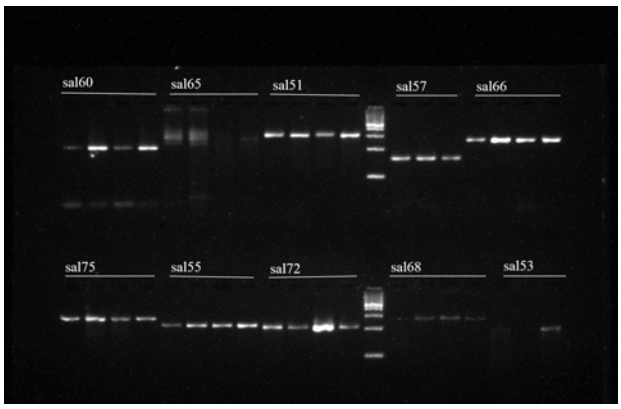
Axillary shoots were induced in 11 genotypes and maximum sprouting was recorded in genotype KL-1 (89.8%). Multiple shoot induction was achieved in 4 genotypes and the number of shoots ranged from 30 – 60%.

Established six agroforestry trials at Muthur, Tiruppur district, Tamil Nadu (2 acres); TFRI campus, Jabalpur, Madhya Pradesh (1 acre); Gottipura Field station of IWST, Karnataka (1 acre); Pratapgarh, Rajasthan (1 acre) and Research Experimental Area of Punjab Agricultural University, Ludhiana, and Regional Research Station, Bathinda, Punjab(1 acre each).

Incidence of red stem borer in farmer's fields in Andhra Pradesh, Telangana and Karnataka revealed younger and pruned plantations were highly susceptible to pest infestation. The mortality due to sandal spike disease in Chamundi hills, Yelwala, Chikmagalur, MM hills and Marayoor sandal reserves was recorded up to 10%.

The heartwood of standing trees from 27 plantations was estimated using Electrical resistivity tomography (ERT) and 90% similarity was documented with wood core samples. A video demonstrating the procedure was also developed (Available at https://www.youtube.com/watch?v=x7fTiXa8LVc)

Groundnut-sandalwood trial



SSR-profiling

Eucalyptus improvement

Multiplication of 48000 clonal plants was carried out at IFGTB and about 24200 clonal plants were individually numbered and transported to IFB, IFP, TFRI, CSFER, FRI and AFRI. Established germplasm bank at Panampally, Kerala with 285 clones. Established nine MLTs inTamil Nadu, Telangana, U.P., Gujarat and M.P.

Fifteen and seven best performing clones were selected as seed and pollen parents respectively. From branch cuttings established the grafts successfully. Induced flowers early and hybrid seeds produced in 28 combinations. Each capsule yielded 12-17 hybrid seeds. Hybrid seeds were germinated, field trial at Thiyagadurgam, Tamil Nadu established for selection of individuals showing hybrid vigour.

Selected about 20 plus trees of *E. tereticornis* from Panampally and Karunya provenance trials. About 25 seedlots of 6 species of *Eucalyptus* were imported from CSIRO. For establishment of Progeny tested Clonal Seed Orchard, selected 25 clones of *Eucalyptus camaldulensis* based on the progeny growth performance. Collected stem cuttings from CSO, Karunya and CSO Kurumbapatty and raised 320 grafts and established one CSO at Gudalur research station (1.0 ha). For popularizing new clonal varieties, a Demo plot of released clones of IFGTB has been established in an area of 1.0 ha in the ICAR-KVK, MYRADA at Thalamalai, Tamil Nadu.

For development of transgenics/ transgrafts with enhanced salt and insect tolerance, *Agrobacterium* mediated transformation experiments were initiated using existing CaMV promoter driven *EcHKT1;1*hpRNA construct. The MsPRP2:*EcHKT1;1* hpRNA:HSP construct was synthesized in pUC57 plasmid and developed five transformation constructs.

Generated *Eucalyptus* composite plants using A4RS pCAMBIA1305.1::MsPRP2:*GUS*:HSP. An average of 1.4 GUS spots was observed in 14.5 % of the NaCl treated hypocotyl explants, while an average of 1 GUS spot was observed in 1.6 % of untreated explants indicating that MsPRP2 promoter is salt inducible.

Six month - old MLT at Mulakalapally Palloncha, TN

Biomass studies conducted in clonal tirals of *Eucalyptus* at Kallakuruchi

Development of dielectric heating-based processing technologies for solid-wood, bamboo, and their composites

Microwave vacuum dryer has been developed. Poplar wood having dimensions of 6' (length), 4'' (thickness) and 4'' (width) was dried in MW-Vacuum machine. Approximately 10-12% decrease in moisture content was observed. Three batches of *Bambusa tulda* culms were also dried, for drying the middle and top portions took only 14 hours, whereas, bottom portion of the culms took approximately 24 hours without any significant visible defect.

Experiments were carried out to compare drying rates of different intensities of microwave with air seasoning of bamboo. Samples exposed to higher intensity dried faster as compared samples irradiated at lower intensity (1800w> 1600w > 1200w). Under these experimental conditions the samples did not develop defects and also retained their original color.

For optimizing MW treatment for improving treatability of wood, defect free specimens were prepared from *E.* hybrid and *M. dubia*. The samples were pre-treated with MW irradiation at different intensities (360, 480, 600, 720, 840 and 960 MJ/m^3). MW pretreated samples were than treated with CCA, CCB, ZiBOC and Borax boric acid preservatives at 6% conc. Anatomical studies to see the effect of MW irradiation showed increase in vessel diameter with the increase in MW intensity in both the species. Retention studies showed that in *M. dubia* optimum retention (12-16 kg/m^3) with different preservatives is obtained in samples pretreated at 720 MJ/m^3 and 840 MJ/m^3 MW intensity followed by pressure treatment at 150 lbs/in^2 pressure. Whereas in *Eucalyptus* hybrid maximum retention (8-10 kg/m^3) with different preservatives was obtained in samples pretreated at 960 MJ/m^3 MW intensity followed by pressure treatment at 150 lbs/in^2 and dipping for 24 hrs in preservative solution. Results also showed that the samples treated with CCA, CCB, and ZiBOC preservatives of both species showed very slight to slight termite attack whereas the samples treated with borax-boric acid preservative (BBA) and control samples showed moderate to high attack of termites.

Microwave Vacuum dryer for wood drying

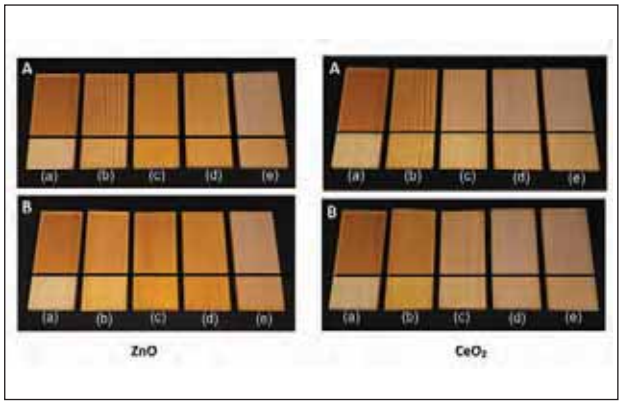
Value addition of wood and wood-based composites using nano-material

For study on nano-material embedded eco-friendly wood preservatives/coatings, wood coating based on zinc oxide (ZnO) and cerium oxide (CeO_2) nanoparticles embedded linseed oil nano-emulsion were prepared. Significant improvement in UV shielding of wood surfaces of *Pinus radiata* coated with nanoparticle dispersed oil nano-emulsion was observed. The overall ΔL* and ΔE* in case of control was -17.2 and 25.6 respectively which reduced to -3.2 and 4 respectively in case of 10% oil dispersed with 2% ZnO NP and -3.7 and 4.5 in case of 30% oil dispersed with 2% ZnO NP. Performance of CeO_2 was also found to be at par with ZnO. The study establishes potential use of nano emulsions of vegetable oils as environment friendly coating materials.

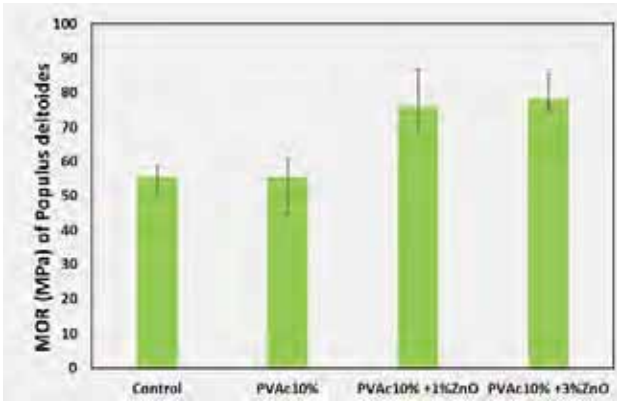
For improvement of quality of low-density woods by impregnating with nano-filler blended resins, stable dispersions of nanoparticle ZnO in PVAc and Furfuryl alcohol (FA) were imbibed into Poplar wood sections to see its impact on the properties. Significant increase ($p<0.05$) in flexural strength (55.59±8.12 to 78.05±7.20 MPa), hardness (5.08±0.37 to 6.24±0.36kN) and compressive strength (41.98±5.45 to 56.19±4.98 MPa) was observed.

To improve properties of wood composites using nanomaterials, medium density fibre (MDF) boards were prepared with urea formaldehyde resin embedded with 1 to 3% nanoclay loadings. Addition of nanoclay was able to reduce the fungal growth on the surface of the MDF boards.

For development of nano cellulosic fibre filled composites, cellulose nano fibrils (CFN) were synthesized from bamboo, *Eucalyptus* and waste paper. Density of board varied from 0.84-0.95 g/cm^3, MOR from 8.2-10.18 N/mm^2 and MOE varied from 1687.74-1441.4 N/mm^2. Boards were also prepared using *Eucalyptus* CNF and PVAc (3%) as a binder with banana fibres. MOR and MOE values were 26.93 N/mm^2 and 1282.31 N/mm^2 respectively. Further characterization of Cellulose Nano Crystals (CNC) from groundnut shell and pistachio cell was carried out and composites with 10% CNC content exhibited highest increase in tensile strength.



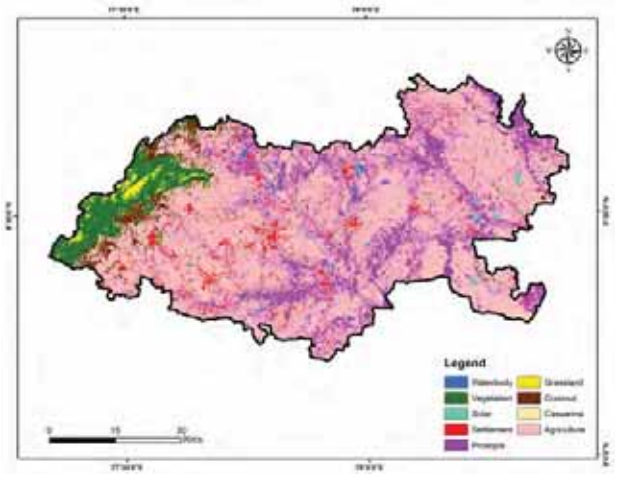
UV resistance of wood coated with nano ZnO embedded nano-emulsion



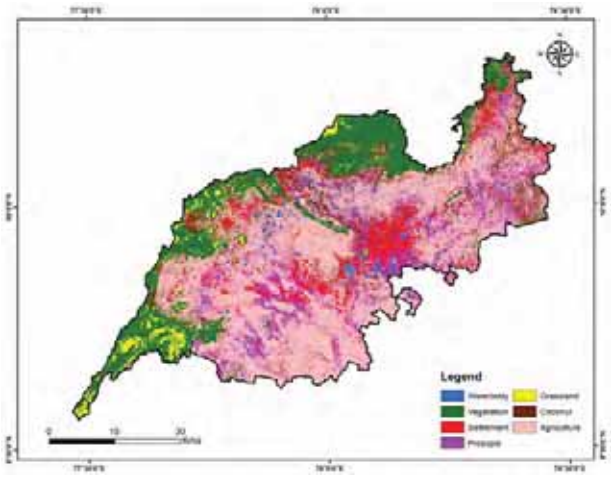
Bending strength of Poplar wood impregnated with nano ZnO blended PVAc

Assessment and monitoring of Invasive Alien Plant Species in India and formulation of strategies for management of key Invasive Alien Plant Species in different regions of the country

Information on the occurrence of *Prosopis juliflora, Lantana camara, Acacia mearnsii* and *Mikania micrantha* have been collected in different areas of Gujarat, Rajasthan, Himachal Pradesh, Uttarakhand, Uttar Pradesh, Assam, Bihar, Jharkhand, West Bengal, Chhattisgarh, Madhya Pradesh, Assam, Kerala and Tamil Nadu states. Spatial mapping of *P. juliflora* invasion using Landsat and Sentinel satellite images in seventeen districts of Tamil Nadu has been completed. The habitat suitability for *P. juliflora* has been assessed using Maxent Species Distribution Model. The overall habitat suitability for *P. juliflora* has been predicted to increase under the future climate change scenario (RCP 2.6 and RCP 8.5 for 2050 and 2070).



Extent of *Prosopis juliflora* in Virudhunagar district, Tamil Nadu

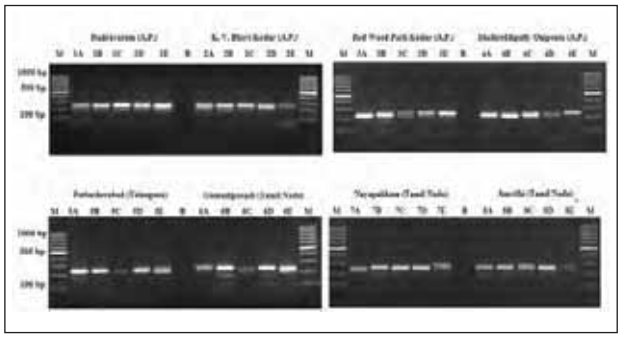


Extent of *Prosopis juliflora* in Madurai district, Tamil Nadu

Conservation and productivity improvement of Red Sanders

Provenance surveys were taken up by IFB and BIOTRIM in Kadapa, Nellore, northern Seshachalam, Veligonda and Chittoor provenances and seed germplasm was collected from 107 trees. Provenance-wise seedlings from previous year were maintained at BIOTRIM.

Two strains of *Rhizobium*, three species of AM fungi (*Glomus geosporum, G. fasciculatum, G. aggregatum*) and two species of Phosphobacteria (*Bacillus megaterium, Pseudomonas striata*) were isolated from the rhizosphere soils of *P. santalinus*. *Pseudomonas striata* showed good phosphate solubilization activity. The bacteria were mass multiplied and inoculated into the seedlings and stem cuttings of *P. santalinus*. Nitrogenase activity was assessed on another strain of *Rhizobium* and found to be 22.0443.063 nmol of C_2H_4 mg^{-1} of protein hr^{-1}. The seedlings inoculated with the combination of PSB with AM fungi showed significantly higher height growth (49.7 cm), biomass (424.4 g $plant^{-1}$), leaves number (15.3 $plant^{-1}$) and number of nodules (18.6 $plant^{-1}$) than control. *De novo* transcriptome analysis of two leaf samples of accessions of Rudravaram (RAP) and Nayapakkam (NTN), and one stem sample of (RAP) was performed. RNA sequencing analysis resulted in the clean reads of 6596462, 7466163 for leaves of RAP, NTN and 34978036 for stem of RAP accession. The GC% of clean reads varied from 44.57 to 56.21 for the samples analysed. . Altogether 40,389 EST-SSRs were identified, of which mono-nucleotide repeats were found to be the highest (50.2%) followed by di-nucleotide and tri-nucleotide repeats. Five cross-species SSRs were screened and successful amplification was observed in 3 primer pairs. The primer mPeCIR_D12 generated 3 polymorphic alleles.



PCR amplification profile in Red sanders generated with cross-species SSR primer mPeCIR_D12.

Provenance-wise seedlings maintained at BIOTRIM (Seedling size – 30 cm in 5" x 9" size bag)

Phosphate solubilizing bacteria inoculated in Red sanders seedlings

Quality teak production: capitalizing on cloning

The project targets to popularize tissue culture plantations of teak in agroforestry systems. Growth assessment were carried out in various aged plantations raised through commercial sources planted in Kerala, Tamil Nadu, Chhattisgarh, Maharashtra and Andhra Pradesh and found the growth at the age of five years was adequate with average height and girth of 9.0m and 35.0cm respectively. IFGTB has signed memorandum of agreement with three commercial tissue culture labs for large scale production. Field demonstration trials were established as blocks and bunds in twelve locations in Punjab, Gujarat, Tamil Nadu, Kerala and Madhya Pradesh covering an area of 28 ha. Early observations revealed that the performance of clonal plants of teak are better than seedling raised plants in terms of survival and early establishment.

Teak plantations from six months to five years old

Developing seed testing and seed storage protocols of selected forestry species from diverse forest types

For identification of seed sources population survey of species was carried out for 10 species in Uttarakhand and UP, six species in Madhya Pradesh, 10 species in Tamil Nadu, two in Karnataka, five in Himachal Pradesh and two species in Rajasthan. Germination of freshly collected seeds varied from 4 to 92% with species; *Mesua ferrea* and *Magnolia champaca* 65%; *Dipterocarpus macrocarpus* 66%; *Elaeocarpus serratus* 20%; *Shorea robusta* 35%; *Duabanga grandiflora* 45%; *Morus laevigata* 68%; *Phoebe goalparensis* 30%; *Pinus kesiya* 32%; *Chukrasia tabularis* 90%; *Schima wallichi* 28%; *Bischofia javanica* 79%; *Cipadessa baccifera* 14%; *Cullenia exarillata* 10%; *Elaeocarpus serratus* 4%; *Leea indica* 58%; *Maesa indica* 19%; *Memecylon umbellatum* 20%; *Betula alnoides* 72%; *B. utilis* 75%; *Prunus cerasoides* 92% and *Rhododendron campanulatum* 85%.

To develop seed storage protocols of various species, storage studies were carried out and germinability of the seeds was evaluated periodically. Seeds of some species stored better at 5 ^{0}C like *Albizia julibrissin* (75% germination after 12 months); *Sterculia villosa* (80% germination after 10 months); *Pterospermum acerifolium* (83% germination after 12 months), *Toona serrata* (25% germination after 15 months), *Chukrasia tabularis* (65 % germination after 12 months), *Pinus kesia* (52% germination after one month). Seeds of few species fared better at 15^{0}C like *Albizia odoratissima* (68% germination after 20 months), *Quercus glauca* (70% germination after 16 months), *Kydia calycina* (16% germination after 22 months). While seeds of some high-altitude species like *Betula utilis* (70% germination after 18 months), *B. alnoides* (63% germination after 9 months), *Rhododendron campanulatum* (72% germination after 18 months), *Sorbus lanata* (80% viability after 18 months) stored better at sub-zero storage temperature (-5^{0}C) except those of *Prunus cerasoides* which responded best to storage at 2^{0}C (89% germination after 9 months).

Mature seeds of *Elaeocarpus serratus*

Seed germination in *Maesa indica*

Seedlings of *Chukrasia tabularis* in nursery

All India coordinated project on *Dalbergia sissoo* mortality

For developing biocontrol formulation effective against Shisham wilt caused by *Fusarium solani* and root rot by *Ganoderma lucidum*, total 161 *Trichoderma* spp. isolates were isolated and pure cultured from Uttarakhand, Haryana, Punjab, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Madhya Pradesh, Rajasthan, Gujarat and North East states of India to screen antagonism towards different pathogen isolates. For identifying virulent pathogen isolates, 77 *Fusarium* sp. isolates and 56 *Ganoderma* sp. isolates were isolated and pure cultured from diseased samples collected from above mentioned states. In dual culture tests, *Trichoderma* sp. isolate successfully caused maximum 89% inhibition of the pathogen colonies. For mass multiplication of *Trichoderma*, 16 organic substrates comprising of agro wastes and weeds / other plant based composts were tested. For *in vitro* screening of *Dalbergia sissoo* genotypes against *Fusarium solani* and *Ganoderma lucidum* infection, total 400 calli cultures for 18 genotypes were produced.

Based on the superiority in morphological characteristics selected total 235 CPTs (25 CPTs in eastern UP, 7 CPTs in Punjab and Haryana, 72 CPTs in Himachal Pradesh and Jammu and Kashmir and 13 CPTs in South-Eastern part of Rajasthan).

Assessment of demand and supply of timber, fuel-wood and fodder in India

Stratified Multi-stage random sampling was identified for collecting household level information about timber, fodder and fuelwood. The draft manual on sampling methodology containing the estimators for estimating mean and total of various parameters i.e. fuelwood and fodder, as per sampling strategy has been developed. The questionnaire for household survey, industrial survey, and State Forest Department has been finalized through pilot survey. Data from 110 wood-based industries and 1350 households have been collected. The Manual on Status of Timber is under preparation.

Valuation of forests for GDP, green GDP and payment of eco-system goods and services

The questionnaire for estimation of goods from forests was developed, tested, and modified through piloting. Census-based parameters for forestry sector for estimating Gross Domestic Products were identified. Methodology for quantification of forest resources for GDP estimation is being finalised. A draft manual on Practical guidelines for household questionnaires has been developed. Estimation method for services like fuelwood, fodder, NWFP, small timber, large timber, manures, employability, and eco-tourism has been developed. Draft manual for estimating air pollution abetment services of forests has been developed.

Forest Fire Research and Knowledge Management

The FRI, Dehradun is in process of development of fire fighting equipment and tools including leaf litter blowers and protective clothing in collaboration with IIT Roorkee, Deptt. of Metallurgy, UPES, Dehradun and Indo Danish Tool Room, Jamshedpur. The customized sample tool kits: Kit-1 hand tools (15 sets), Kit-2 safety clothing (06 sets) have been fabricated by UPES, Dehradun and same have been sent to Uttarakhand, Odisha and Kerala SFDs for testing in actual field conditions. The designing and development of Kit-3 (advanced tools including leaf litter blower) is under progress.

Tamarind (*Tamarindus indica* Linn.) : Domestication, conservation and deployment of genetic resources for sustenance and livelihood amelioration

Preliminary study on the morphological characterization of the tamarind genetic resources available at Tamil Nadu, Telangana, Andhra Pradesh and Gujarat was conducted. The descriptors were developed as per the guidelines of PPVFRA. Passport data was collected from 55 tamarind clones for developing National Tamarind Registry. Assessed gum recovery percentage from 22 different sources of Tamil Nadu to develop tamarind genotypes with high TSG value. Shortlisted five superior clones based on the high gum recovery percentage for deploying large scale plantation programme. Categorized 55 Tamarind clones based on flowering behaviour and fruit setting pattern. Studied leaf anatomical variation to understand the foliar morphology among the red, sour and sweet variants. No significant differences were recorded among the three variants in foliar morphology.

Assessed variations in the clone banks of tamarind in Mulugu in Telangana and shortlisted five clones. Shortlisted 10 high productive clones at VMG, Forest Campus; Red and sweet tamarind germplasm bank and attempted 3500 grafts. Established and maintained three multi-location clonal trial of tamarind using 25 high productive clones of Red, Sweet and Sour tamarind, at IFGTB field research station, Neyveli, Cuddalore district, Kangeyam, Tirupur district, and Melur, Madurai district through precision silvicultural techniques. Established 03 Tamarind clonal trials each at Bayala, Thumkkuru and Naickenpalayam, Coimbatore. Established Tamarind plantations with 5000 seedlings at selected lands at panchayat, temples, schools, avenues and village roads for their stocking of TGRs towards the livelihood improvement of the rural population.

The tamarind growing farmers who have FPO were identified in Dharmapuri regions. Value added product from tender tamarind and tamarind flower gulkand were prepared.


Tamarind flower gulkand


Tender tamarind pickle

Bioprospecting for industrial utilization of lesser-known forest plants

Documentation and analysis of current knowledge/ information of 60 lesser known forest plants (LKFPs) were completed, and a structured format for prioritization of the LKFPs was developed. Scoring of the institute-wise selected 60 LKFPs was done in the format, and the following 28 LKFPs were prioritized for their intended investigations:

AFRI	*Balanites aegyptiaca, Citrullus colocynthis, Xanthium strumarium, Sterculia urens*
FRCER	*Vitex negundo, Pithecellobium dulce, Mallotus philippensis*
FRI/ HFRI	*Neolitsea pallens, Cupressus torulosa, Punica granatum, Prinsepia utilis*
IFB	*Soymida febrifuga, Buchanania axillaris, Gardenia gummifera*
IFGTB	*Balanites aegyptiaca, Careya arborea, Cassine glauca, Vitex altissima*
IFP	*Cinnamomum cecidodaphne, Pithecellobium dulce, Schima wallichi*
RFRI	*Litsea cubeba, Mallotus nudiflorus, Carallia brachiata*
TFRI	*Anogeissus pendula, Careya arborea, Cyperus rotundus, Woodfordia fruticosa*

Surveys were conducted, 342 populations of 25 LKFPs were identified, and their geocoordinates were recorded. Chemical screening of the identified populations was undertaken to determine their chemical variability and to identify chemically superior genotypes. 3 populations of *Cupressus torulosa* located in Oogla, Bhatwari and Gopeshwar of Uttarakhand and 3 populations of *Neolitsea pallens* located in Dalhousie, Jahal-Devidarh Road and Khajjiar of Himachal Pradesh were found to be chemically superior for further investigations. Protocols for recovery of natural dye in the yield of 28.1%, 19.7% and 24.6%, from the peels of *Punica granatum*, and barks of *Soymida febrifuga* and *Buchanania axillaris*, respectively were standardized. A process in collaboration with the R&D Global Consultant Pvt. Ltd, Thane, Mumbai, has been developed to use *Soymida febrifuga* derived dye as hair colorant gel which has been tested and found comparable with the marketed hair colorant samples.

Silvicultural interventions for productivity enhancement and carbon sequestration in plantations of important tree species

In this study, mixed planting of Teak and Casuarina has been attempted for the first time in the country and per hectare only 625 teak planting stock is required. The cost cutting in the purchase planting stock of Teak will be 75%. Established Teak + Casuarina mixed block planting in 2 locations i.e. Kangeyam and in KVK, Myrada and boundary planting in 2 locations i.e., Kanchipuram and Tiruppur in Tamil Nadu. Initial observations showed promising good growth and establishment of both Teak and Casuarina under this new planting technique.

Enhancement of fodder availability and quality to reduce unsustainable grazing in the forest

The major focus of the project is on conducting field trials in the mandated regions of nine institutes of ICFRE. The tree species were selected as per the site conditions and were planted in high density spacing (1m x 1m, 1.25m x 1.25m and 1.5m x 1.5m) and managed with different frequency of coppicing. Planting has been done at the following number of sites: AFRI Jodhpur 1 site, FRI Dehradun 3 sites, HFRI Shimla 1 site, IFB Hyderabad 1 site, IFGTB Coimbatore 1 site, IFP Ranchi 3 sites and TFRI Jabalpur 1 site. Fodder harvest frequencies being tested are once/year, twice/year and thrice/year. Grass species are also being tested in the field trials.

Growth of Teak and Casuarina in Mixed Block plantation at farmers field in Tamil Nadu

Development of Biopesticide products/formulations from extracts of tree borne oil seeds and different tissues of wild plants for management of insect pests

Testing the efficacy of the ICFRE biopesticides formulations ***Tree PAL^{H}*** and ***Crawl Clean*** at multi locations across the country in Himachal Pradesh, Uttarakhand, Rajasthan, Madhya Pradesh, Telangana, Karnataka and Tamil Nadu was carried out against various forest pests like Shisham defoliator, teak defoliator and skeletonizer, defoliators of *Tecomella*, *Prosopis, Ailanthus, Pterocarpus* and *Gmelina*. Results revealed that 1% concentration of Tree PAL^{H} can give significant control of key pests of forest tree crops. ***Crawl Clean*** did not have satisfactory control on various forest pests tested.

Development of superior biofertilizers for enhanced plant productivity

The biofertilizer *Azospirillum brasilense* and the pathogen *Diploidia* sp. were cultured together in the common Trypticase soya agar medium and found that the biofertilizer *A. brasilense* suppressed the growth of the pathogen. This experiment confirmed the anti fungal activity of *A. brasilense.* Field trial of *Gmelina arborea* established at Dharmapuri, Tamil Nadu was inoculated with both IFGTB and commercial biofertilizers. The IFGTB biofertilizers inoculated *G. arborea* attained a height of 4 feet growth within 6 months however the commercial biofertilizers inoculated seedlings had only 2 ft of growth.

A field trial of both IFGTB and commercial biofertilizer inoculated seedlings of *Santalum album* was established at Sotai village and JIST Campus near RFRI, Assam. Preliminary observations showed that biofertilizer inoculated seedlings of *S. album* had better growth (110 cm) than uninoculated control seedlings (60 cm).

Established a plantation of *Santalum album*, *Melia dubia* and *Gmelina arborea* in demo village at Attivatta, Hoskote taluk, Karnataka for the assessment of the out planting performance of biofertilizers inoculated plants in different field conditions and recorded 94.80% survival. Distributed the seedlings of all three species to Attivatta village farmers and a training programme on “Creation of awareness on bio-fertilizers” was conducted at Attivatta.

Preparation of Forest Soil Health Cards under different Forest Vegetation in all the Forest Divisions of India

Soil laboratories were upgraded with required scientific instruments at all participating institutes of ICFRE. A total of 9006 soil samples have been collected countrywide for analysis of 12 comprehensive parameters. Participating institutes has so far performed 53393 number of analysis.

State-wise results of sample analysed so far have been tabulated for drawing forest soil health cards for about 788 forest divisions of the country. Since reference ranges for drawing recommendations are not available for Indian forest soils for all 12 parameters,therefore, state wise results for non-degraded forests are under processing to draw reference ranges. After drawing reference ranges for the states, soil health cards will be prepared and released. Matter for developing forest soil health cards web portal is being taken up with NIC Delhi/Uttarakhand.

Collection of soil sample

Collection of soil core

Genetic improvement and value addition of *Madhuca longifolia*

On the basis of criteria of flower yield, phenotypically superior trees were selected-400 from 20 different locations of Chhattisgarh, Madhya Pradesh and Maharashtra;70 from 13 different locations of Tamil Nadu and two locations in Kerala; 145 from Uttar Pradesh; 115 from 28 different locations of Jharkhand, Bihar and West Bengal; 195 from locations in Telangana and Andhra Pradesh. Morphometric data of all trees, flowers, fruits and seeds was recorded.

Studies on natural regeneration were carried out at Chhatarpur, Umaria, Mandla, Dhar, Khandwa and Dindori in Madhya Pradesh and Surajpur in Chhattisgarh. Frequency of 96.48% was recorded at Mandla and density of 67.55% and abundance of 55.10% was recorded at Chattarpur. At Surajpur frequency (64.15%), density (64.78 %) and abundance (39.11%) was observed.Regeneration study has been carried out in Coimbatore at one location and two locations in Madurai. Density and abundance of 31.6% was recorded in Coimbatore.

TFRI, Jabalpur collected scions from 90 selected phenotypically superior trees from 9 locations and cleft grafting was carried out in 300 root stocks. Grafting success of 50% was achieved. IFP, Ranchi collected scions from 26 CPTs and more than 200 grafts were made. So far 10-15% success has been achieved for 4 CPTs. A total of 180 air layers were made through air layering by IFB, Hyderabad. Seedlings have been raised by TFRI from seeds collected from 200 selected trees.

Different ITK practices viz., for storage of flowers, processing of flowers and seeds, traditional uses, etc. were documented through questionnaire, videos and photos from 11 locations in M. P., 5 locations of Tamil Nadu and 10 locations in Telangana. FRC-SD, Chhindwara developed products like energy bars, herbal tooth paste, herbal cream and hair conditioner. Consumer acceptability/nutritional parameters, shelf life are being assessed.

Collection of Mahua flowers, drying, processing for biochemical estimation and oil estimation from seed samples and extracted oil

Grafting of mahua

M. longifolia energy bar

M. longifolia Herbal Cream

Combating desertification by enhancing vegetation cover and people livelihoods in degraded drylands and deserts of India

Surveys were carried out by different institutions in respective regions *Viz.* Jharkhand, Himachal Pradesh, Punjab, Rajasthan, Uttar Pradesh and Tamil Nadu. Selection of indigenous herbs, shrubs, and tree species for use in various restoration programmes and raising of seedlings for various plantation activities has been completed. HFRI has established plantation of *Juniperus polycarpos* in 1 ha. area at Badami Bag, Leh and snow harvesting devices/ structure also constructed at Maine for augmenting water supply to the selected clusters of farmers. FRI, Dehradun has completed screening of the germplasm of *Salvadora oleoides* and *Salvadora persica* against salinity and drought stress. Salt affected land has been selected at Babina, Jhansi; Central University of Punjab, Bhatinda; and Chaksarkar, Ferozepur, Punjab for restoration purposes. TFRI, Jabalpur has selected a total of 22.68 ha area for plantation at ravine land (16.20-ha under Morena forest division and 6.48 ha of RVSKVV land) in M. P. IFGTB Coimbatore has carried out boundary plantation of *Casuarina junghuhniana* and *Azadirachta indica* in 2.1 ha. area (*Casurina junghuhniana.* at K. Pettai, Kammanallur villages in the Cauvery delta zone and Pappanpatti and Kambur in the Southern agro-climatic zones. *Azadirachta indica* has been planted at Kammanallur village in the Cauvery delta zone and Pappanpatti and Thoppadaipatti villages in the Southern agro-climatic zone). For rehabilitation of reactivated sand dune, degraded hill and degraded sandy plain total 37 ha area was selected by AFRI (10 ha in Bikaner, 12 ha in Jodhpur and 15 ha in Jaisalmer). For live hedge fencing at farmer's field, two Cluster of village (Chouradia and Khet Singh Nagar in Setrawa, Jodhpur) were selected and seed sowing of *Acacia senegal* and *Prosopis cineraria* have been done along the boundary of 32 ha area. Silvi and horti species seedlings were also planted on the farmer's lands.

Nursery of *Populus nigra* at Tabo (Spitti)

Nursery of *Salix alba* at Tabo (Spitti)

Reactivated sand dunes Udsar site

Vegetation study at Udsar site

Domestication, genetic characterization, improvement and diversified utilization of poplars

Field trials of 16 clones of *Populus deltoides* have been laid out at six sites: Sippiyan Kalan, Yamunanagar district (Haryana), Dasuya, Hoshiarpur district (Punjab), Mirzapur, Saharanpur district (Uttar Pradesh) by FRI, Dehradun, Tamkuhi Raj, Kushinagar district (Uttar Pradesh) by FRC-ER, Prayagraj, Nalagarh, Solan district (Himachal Pradesh) by HFRI, Shimla and Nathpur, Araria (Bihar) by IFP, Ranchi. The same set of clones has been planted in randomized complete block design.

Data on survival and growth parameter were collected for the provenance trial of *P. ciliata* at Brundhar, Kullu, Himachal Pradesh.

Cuttings of *P. alba* along with *P. ciliata*, *P. nigra* and *Salix alba* have been planted by FRI, Dehradun and RFRI, Jorhat in their nurseries for introduction trials in their regions. The germplasm of the four species was supplied by HFRI, Shimla. Cuttings of *P. alba* have been raised in the nursery by HFRI, Shimla.

Studies on DNA extraction and standardisation of DNA markers were initiated at FRI Dehradun, HFRI Shimla and RFRI Jorhat. PCR protocols for 4 nuclear and 3 chloroplast SSR primers of *P. alba* have been standardized and fingerprinting of 14 populations of *P. alba* have been completed by HFRI, Shimla.

Surveillance of insect pests and diseases was carried out in Punjab, Haryana and Uttar Pradesh. Fulfilment of Koch's postulates established *Calonectria* sp. as an incitant of blight disease of *P. deltoides.*

Genetic Improvement of *Azadirachta indica* A. Juss. (Neem)

Survey and selection of neem trees was carried out in different agroclimatic zones and total 926 neem trees were selected across the country. Preliminary oil estimations from seeds collected from these seed sources reflect wide variation of 12.66% to 77.96%. Under the gene transfer component of the project, *Agrobacteriun* harbouring pCAMBIA vector was used for cocultivation of neem calli that lead to positive gene transfer event. *Gus*Agene expression after 12 weeks and later was achieved indicating stable transformation and gene integration in host genome. *GlyIII*gene-based plasmid was successfully transferred to *Agrobacterium* strains. Co-cultivation experiments optimized with pCAMBIA vectors earlier were used for transfer Gly III and *hptII*gene successfully using these freshly transformed strains of *Agrobacterium.* This was confirmed through PCR test. Positive results of gene sequencing were also obtained confirming successful transformation of the neem genome with *hptII* and *GlyIII* gene integration, under laboratory conditions. For the development of *in vitro* azadirachtin, flower-induced callus was transferred for initiation of suspension culture and maintained through sub-culturing. The flower callus yields highest Aza compared to leaf and embryo callus culture.

Conservation and sustainable management of wild edible fruiting species

Survey was carried out in 81 Forest divisions for population, species richness, and diversity of targeted 10 species (*Semecarpus anacardium, Flacourtia indica, Pyrus pashia*, *Ficus palmata, Limonia acidissima*, *Pithecellobium dulce, Myrica esculenta, Prunus cornuta, Prunus jenkinsii,* and *Spondias pinnata)*. 211 superior plants of 10 species were selected for germplasm conservation. 98% germination was achieved in *Myrica esculenta* seeds in treated condition which were difficult to germinate in untreated condition. Type of container, sowing depth was also standardized for this species. Seed treatments for *Flacourtia indica* and *Semecarpus anacardium* was standardised for better germination. Induction of rooting was successful in *Flacourtia indica* with treatment. Seedlings of 20 germplasm of *Semecarpus anacardium* were raised for conservation. Evaluation of storability of 10 species is continued for *ex-situ* conservation. Six value-added products: karonda chips and energy drink, karonda Powder, khatmithgoli, karonda candy and cherry karonda were prepared from fruits of *Carissa carandas*.

Six value added products from fruits of *C. carandas*

Population status, collection, conservation, characterization, and evaluation of genetic resources of Indian Rosewood, *Dalbergia latifolia*

Field surveys has been conducted in Karnataka, Tamil Nadu, Kerala, MP, Jharkhand, Uttarakhand, Uttar Pradesh and Punjab. Studied population structure, regeneration pattern, and recorded phenological features and lat-long information. A total of 266 superior trees of *D. latifolia* were selected based on the morphological characters. Root suckers, fruits, herbarium/leaf samples were collected and recorded in the database. Information on pollinators, their frequency of visitation was recorded; *Apisdorsata* and *Apiscerana* were observed to be the major pollinators. Freshly harvested seeds show 80 percent seed germination in nursery conditions; raised more than 20,000 seedlings. Identified insect-pest and diseases and symptoms viz., blighted leaf margins, necrotic spots and yellowing of leaves. The fungal pathogens were identified as, *Neopestalotiopsis* sp. and *Colletotrichum* sp., *Fusarium* sp., *Alternaria* sp. and *Pestalotiopsis* sp. Standardized protocol for genomic DNA isolation and successfully isolated DNA from 200 individual trees. Internal Transcribed Spacer (ITS) region of ribosomal DNA (rDNA) was amplified with fungal universal primer pair ITS 5 (5'-GGA AGT AAA AGT CGT AAC AAG-3') and ITS 4 (5'-TCC TCC GCT TAT TGA TAT GC-3').

Selected trees of *D. latifolia* in Wada, Maharashtra

Dalbergia latifolia flowers

Sustainable management of NTFP's through conservation and value addition

Surveyed, identified the locations and collected germplasm of targeted 34 species by different institutes with GPS coordinates for all sites. Collected germplasm of different species has been established at different institute Germplasm banks. Present prevailing and traditional harvesting practices of economically important ten species for different regions have been documented in the field. Experiments for germination of different species have been conducted. In *Oroxylum indicum* in potting mixture with Soil: Sand: FYM, ratio 2:1:1 seeds showed~90% germination. In *Uraria picta* 83% germination was obtained after pre-treatment with concentrated H_2SO_4 for 15 minutes. Established vegetative propagation trial from cuttings of *T. wallichiana* by giving treatment of IBA 1000 ppm at Model nursery Baragaon, Shimla. In AFRI nursery, survival in *Acacia concinna* was 70.50% and 61.64 % in *Miliusa tomentosa. Averrohea carambola* seedlings did not survive. Value added products-hand wash, cream from *Cassia tora* leaves, gel Soap from *Butea monosperma* flowers, three edible products of *Dillenia indica* fruits and two composition of shampoos from the seed pulp of *Dillenia indica* and *Sapindus mukorossi* were prepared. Herbal tea has been prepared from the combination of powdered *T. wallichiana*, *T. serpyllum*, *Viola* sp. and *Urtica dioica* in different proportions. Leaflets (Hindi and English) were prepared for distribution to stakeholders on nursery technique for seedlings production of *Oroxylum indicum* (Sonpatha) and *Uraria picta* (Prishnaparni).

NTFPs yielding species prioritized by different institutes (on the basis of literature survey and role in livelihood generation)

Name of Institute	Germplasm of different species collected by Institutes	Prioritized species for sustainable harvesting and post harvest management
TFRI, Jabalpur	*Oroxylum indicum, Desmodium gangeticum, Uraria picta, Embelia tsjeriam-cottam*	*Oroxylum indicum*, *Curculigo orchoides, Terminalia chebula, Andrographis paniculata, Helicteris isora, Desmodium gangeticum, Wrightia tinctoria, Butea monosperma, Semicarpus anacardium, Casia fistula*
FRC-SD, Chhindwara	*Curcuma angustifolia, Sapindus laurifolius*	*Butea monosperma, S. laurifolius, Cassia tora, Withania somnifera, Moringa oleifera, Curculigo orchioides, Hiptis suaveolens, Curcuma angustifolia, Asparagus racemosus, Aegle marmelos*
AFRI, Jodhpur	*Eclipta alba, Acacia concianna, Grewia tiliifolia, Miliusa tomentosa*	*Averrohea carambola, Pithocellobium dulce, Trigonella foenum, Feronia limonia*, *Tamarindus indica*, *Boswellia serrata, Manilkara hexandra*, *Butea monosperma*, *Madhuca indica*, *Withania somnifera*
RFRI, Jorhat	*Clinogyne dichotoma, Taccabi bracteata, Aoprosaoctendra, Hydocarpus kurzii*	*Dellinia indica, Garcinia penducalata, Livistona jenkinsiana, Schumannianthus dichotomus, Thysanolaena maxima, Bamboo* spp. (shoot),*Costus speciosus, Phoebe cooperiana, Phrynium capitatum*
IFP, Ranchi	*Mesua ferrea, Dillenia indica, Oroxylum indicum, Paederia scandens*	*Terminalia bellirica, Tinospora cordifolia, Emblica officinalis, Asparaus racemosus, Terminalia chebula, Moringa oleifera, Madhuca latifolia, Aegle marmelos, Pongamia pinnata, Buchanania cochinchinensis*
IFB, Hyderabad	*Pimpinella tirupatiensis, Costus speciosus, Shorea tumbuggaia, Terminalia pallida, Gloriosa superba*	*Costus speciosus, Gloriosa superba, Pimpinella tirupatiensis, Entada pursaetha, Decalepis hamiltonii, Strychnosnux-vomica*, *Sapindus* sp., *Semicarpus anacardium, Madhuca indica, Tamarindus indicus*
HFRI, Shimla	*Aconitum hetrophyllum, Taxus wallichiana, Thymus serphyllum, Rheumaustrale*	*Picrorhiza kurroa, Berberis aristata, Saussurea costus, Viola sp., Polygonatum cirrhifolium, Pistacia integerrima,* 4 species are same as for germplasm collection
FRI, Dehradun	*Diploknema butyracea, Dioscorea deltoida, Desmodium gangeticum, Gentiana kurroo*	*Girardinia diversifolia, Rhododendron arboreum, Gmelina arborea, Myrica esculenta, Aegle marmelos,* Ringal*, Grewia optiva, Desmodium gangeticum, Diploknema butyracea, Bauhinia vahlii*

Assemblage of *Desmodium gangeticum* in NWFP nursery of TFRI, Jabalpur

Value added product prepared from fruits of *Dillenia indica*

Handwash from *Cassia tora* leaves

Soap from *Butea monosperma* flowers

All India coordinated research project on *Gmelina arborea* Roxb.

Total 171 CPTs were selected for the study (79 in Jharkhand, 20 in Bihar, 25 in Assam, 26 in CG and 21 in MP). The seedling of 18 progenies at FRI, 16 at IFP, 14 at RFRI, 28 at TFRI were raised and made ready for field evaluation in the respective nurseries. Established two progeny trials in Haryana and one in NB farm Chandwa, Jharkhand. Seeds were collected from 34 CPTs identified in Jharkhand and Bihar for raising nursery and variability in stone were recorded. Nursery has been raised from the seeds of identified CPTs and progenies collected from IFGTB, Coimbatore.

Established Gmelina based agroforestry system intercropped with *Brassica compestris* and *Cicer arietinum* at TFRI

Evaluated clonal trials of *Gmelina* for growth superiority and tolerance to pest and disease. Shortlisted ten high productive clones based on early growth superiority. Maintained the multi-location clonal/progeny trial located at Forest campus, Coimbatore, IFGTB-Field research stations, Salem and Neyveli Tamil Nadu for better growth and development. Established vegetative multiplication garden of *Gmelina arborea* at IFGTB- Modern Nursery and GTI propagation complex, Coimbatore. Assessed variations in seed morphometric, germination and seedling characters of 20 open pollinated families of *G. arborea* and significant variation was observed. Identified superior families based on seedling growth attributes. Quality planting stocks were produced from 20 open pollinated families of *Gmelina* and distributed to tree growers. Established Gmelina based agroforestry models - *Gmelina* + Banana at Vadakadu, Pudhukottai, T.N. and *Gmelina* + Papaya at Kangeyam, Thiruppur, T. N.; *Gmelina* + *Casuarina* + Ground nut at Sulakkal, Pollachi, Kerala; *Gmelina* + Mustard and *Gmelina*- Gram at Jabalpur, M.P. and *Gmelina*-chilly at Hyderabad. Survey was carried out in nursery and plantation in M.P. and Chhattisgarh for insect pests incedence. Insect pests recorded on *G. arborea* were, *Oxya nitidula, Calopepla leayana, Ectropis bhurmita, Odontotermus* sp, *Macrotoma fisheri, Indarbela quadrinota* and *Phyllocnistis amydropa*.

Study of climate driven effects on Indian forests through long term monitoring

ICFRE has established permanent research plots (Eleven 10 ha plots; one 4ha plot; two 3ha plots; twenty three 1ha plots) in different forest types with an area of 143 ha, to monitor impact of climate change on Indian forests through its nine institutes and four outside institutes [Indian Institute of Science (IISc), Bangalore; French Institute of Pondicherry (IFP); Ashoka Trust for Research in Ecology and the Environment (ATREE), Bangalore and Kerala Forest Research Institute (KFRI)]. A total of 2921 individuals of trees and shrubs belonging to 264 species have been geo-tagged for periodic phenological observation. Automatic weather stations have been installed at the experimental sites to study micro climatic effects of forests.

Establishment of 10 ha permanent research plot at Kali Tiger reserve, Dandeli, Karnataka

Component 2 - National Programme for Conservation and Development of Forest Genetic Resources

Nodal centre- FRI (Partner institutes FRI, AFRI, HFRI, IFP, RFRI)

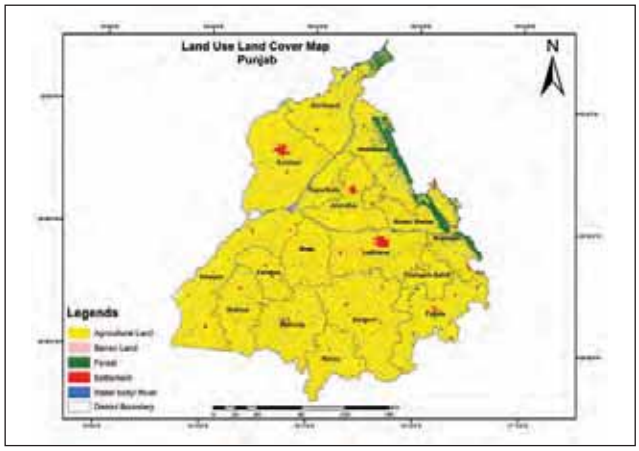
The regeneration and population structure status of selected FGR and vulnerable species, namely *Commiphora wightii*, *Moringa concanensis*, and *Anogeissus sericea* var. *nummulari*, has been recorded in Bihar, Haryana, Jharkhand, Punjab, Rajasthan and Uttar Pradesh. The FRI has created a visual guide of 200 prioritized species for field workers for accurate species identification. Total 240 herbarium specimens of various FGR species were prepared. More than 70 populations of selected FGRs have been collected from different forest divisions of Arunachal Pradesh, Assam, Bihar, Haryana, Jharkhand, Meghalaya, Nagaland, Punjab, Rajasthan, Uttar Pradesh and West Bengal for genetic diversity studies. The methodology for Eco distribution mapping for prioritized FGR species (150 species) developed. GIS based mapping of ten FGR species carried out for Himachal Pradesh and four species for Jharkhand state. For the genetic diversity analysis, the DNA isolation procedures have been standardized for 10 species. The SSR development has been completed through shallow genome sequencing approach for 5 FGR species.

Germplasm of 21 accessions of *Terminalia arjuna*, nine accessions of *Acacia catechu*, 200 seedlings of *Salvadora persica*, and 400 seedlings of *Commiphora wightii* were raised for the development and standardization of nursery

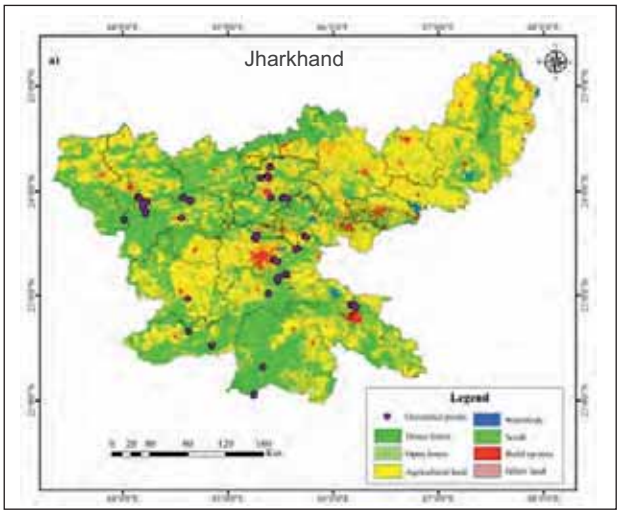
procedures, as well as for establishment of a field gene bank. Seeds of 50 species collected from different populations for the storage trials and *ex-situ* conservation. Six seed samples of four species viz., *Acacia catechu*, *Boswellia serrata*, *Holoptelea integrifolia*, and *Chukrasia tabularis* were deposited at the ICAR-NBPGR seed bank in New Delhi, together with complete passport data.

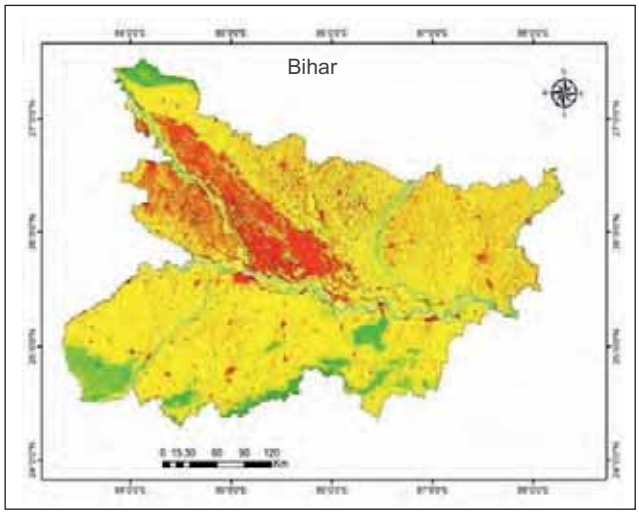
For *in-vitro* storage of species of high conservation concern, cultures established *for Leptadenia reticulata, Commiphora wightii, Salvadora persica, Ziziphus nummularia, Anogeisus pendula, Tinospora cordifolia* & *Capparis deciduas* A National Forest Seed Research and Referral Centre is being established at FRI.

Survey and documentation of FGR species



A LULC map of different forest areas surveyed in Punjab





LULC maps of Jharkhand and Bihar

Nodal centre-IFGTB (Partner institutes IFGTB,TFRI, IWST & IFB)

Localized distribution maps were prepared for FGR species; 35 species by IFGTB and TFRI each, 30 species by IWST and 19 species by IFB. For cataloguing collected germplasm, IFGTB compiled database of 75 FGR, IWST catalogued the data for individual trees and IFB added field data for 19 prioritized species. Field surveys and population density studies conducted and selected seed sources for FGR species; 62 by IFGTB, 25by TFRI, 22 by IWST and 19 by IFB. For FGR seed germplasm storage, IFGTB standardized processing and extraction of seeds for 20 species. Seed storage studies after 3 months of storage at -20°C were completed for 6 species. For FGR characterization, which includes fruit/ seed characters in the lab; the work has been done for 15 species by IFGTB, 7 by TFRI and 6 by IFB. For molecular/biochemical characterization of selected species/populations, the DNA extraction protocol was standardized for 4, 3, and 1 species by the IFGTB, TFRI,

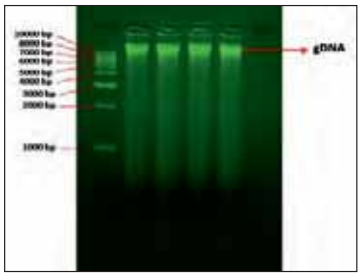
and IWST, respectively.

For FGR Conservation in Field Gene bank, IFGTB raised seedlings, transplanted, and initiated hardening of 3 species-*Artocarpus heterophyllus, Sapindus emarginatus, Oroxylum indicum*, while TFRI maintained the nursery of 4 species- *Haldina cordifolia, Careya arborea, Oroxylum indicum* and *Ailanthus excelsa.*

Selection of seed source of *Baccaurea courtallensis*

Survey for seed sources in Virajpet forest division, Karnataka

Germination test of *Wrightia arborea*



Cullenia exarillata and *Kingiodendron pinnatum*- DNA isolation

Morphological Charactericzation of *Elaeocarpus tuberculatus* and *Terminalia chebula*

Seed collection in *Pterocarpus marsupium*

Component 4 - Capacity buildings of State Forest Departments for Developing State REDD+ Action Plans

As per the National REDD+ Strategy of India, capacity building of the State Forest Departments is required to implement and accurately assess and measure the performance of REDD+ activities. Ministry of Environment, Forest and Climate Change, Government of India has assigned the task of building the capacities of SFDs for preparation of State REDD+ Action Plans and on other aspects of REDD+ implementation to ICFRE. ICFRE built the capacity of State Forest Departments for developing State REDD+ Action Plan through organizing 17 capacity building workshops for 409 participants.

Scheme 2 - Estimation of economic losses in real term per hectare basis due to Forest Fire in Uttarakhand and Madhya Pradesh

The pilot study "**Estimation of economic losses in real term per hectare basis due to forest fire in Uttarakhand and Madhya Pradesh**" with the main objectives to quantify the forest loss in terms of total economic value was implemented by **Indian Council of Forestry and Research (ICFRE) Dehradun & Institutes in collaboration with Forest Survey of India (FSI), Dehradun , Govind Ballabh Pant National Institute of Himalayan Environment (GBPNIHE), Almora ,Wildlife Institute of India (WII), Dehradun and National Institute of Hydrology (NIH), Roorkee**

The study sites in Uttarakhand (U.K.) and Madhya Pradesh (M.P.) were 42 forest fire polygons (out of 289 polygons of U.K.) and 49 forest fire polygons (out of 228 polygons of M.P.) respectively for all partner institutions. The tangible and intangible losses were estimated from two neighbouring plots (burnt and un-burnt) of 1 ha size in each of the identified fire-prone forests type-specific to each state.

Summarized output:

1. ICFRE & its institutes (FRI & TFRI) **estimated economic losses of vegetation and carbon content changes as a result of forest fire:**

a) In the case of **Uttarakhand Forests**, the losses of five carbon pools in tropical moist deciduous forest are Rs.17,619/ha (moderate burnt) & Rs. 3,179/ ha (low burnt), in tropical dry deciduous forest is Rs. 16276/ha (moderate burnt) & Rs. 8,026/ha (low burnt), subtropical pine forest are Rs. 23,332/ ha (moderate burnt) & Rs. 5,287/ ha (low burnt), in Himalayan Moist Temperate Forest, Rs. 36,126/ ha (moderate burnt) sites and Rs. -684/ha (low burnt) sites and ToF and plantations is Rs. 22,962/ha (moderate burnt) and Rs. 10,020/ ha (low burnt).

b) The losses in **M.P** in five carbon pools for tropical moist deciduous forests is Rs. 21,354/ha (severe); Rs. 19,489/ha (moderate) and Rs. 17,329/ha (low burnt). Similarly, in tropical dry deciduous forest total losses were Rs. 20,670/ha (severe), Rs.16,276/ha (moderate) and Rs. 7977/ha (low burnt).

2. GBPNIHE, Almora **estimated the economic losses of forest produce (fodder, fuel wood, NTFPs, MAPs, wild edibles, litter fall, and forest regeneration) due to forest fire**.

a) In the case of **Uttarakhand Forests**, the losses of forest produce in tropical moist deciduous forest are Rs.46824/ha (moderate burnt) & Rs. 26915/ ha (low burnt), in tropical dry deciduous forest is Rs. 121328/ ha (moderate burnt) & Rs. 9595/ha (low burnt), subtropical pine forest are Rs. 201633/ha (moderate burnt) & Rs. 191905/ ha (low burnt), Himalayan Moist Temperate Forest, at Rs. 190024/ ha (moderate burnt) sites and Rs. 217537/ha (low burnt) sites and ToF and plantations is Rs. 78105/ha (moderate burnt) and Rs. 38868/ ha (low burnt).

b) The losses in **M.P**, the losses of forest produce for tropical moist deciduous forests is Rs. 96155/ha (severe); Rs. 83628/ha (moderate) and Rs. 115136/ ha (low burnt). Similarly, in tropical dry deciduous forest total losses were Rs. 120825/ha (severe), Rs.126287/ha (moderate) and Rs. 103348/ha (low burnt).

3. **Wildlife Institute of India estimated the economic losses due to forest fires to wildlife and other related variables including wildlife habitat** in selected Protected Areas of Uttarakhand and Madhya Pradesh.

- **In Uttarakhand,** the loss of wildlife in tropical moist deciduous forest are Rs.1004.80/ha (moderate burnt) & Rs. 6330.00/ ha (low burnt), in tropical dry deciduous forest is Rs. 56.30/ha (moderate burnt) & Rs. 130.00/ha (low burnt), in subtropical pine forest are Rs. 1574.10/ha (moderate burnt) & Rs. 5411.80/ ha (low burnt), in Himalayan Moist Temperate Forest, at Rs. 489.00/ ha (moderate burnt) sites and Rs. 653.78/ha (low burnt) sites and ToF and plantations is Rs. 150.72/ha (moderate burnt) and Rs. 60.30/ ha (low burnt).
- **The losses in M.P**, the losses of wildlife for tropical moist deciduous forests is Rs. 11517.00/ha (low burnt).

4. National Institute of Hydrology, Roorkee estimated the economic **losses due to forest fire is change in hydrological** behaviour caused by forest fire.

- In the case of **Uttarakhand Forests**, the losses in tropical moist deciduous forest are Rs. 5550.57/ ha (moderate burnt) & Rs. 1382.31/ha (low burnt), in tropical dry deciduous forest is Rs. 727.81/ha (moderate burnt) & Rs. 4885.41/ha (low burnt), in subtropical pine forest are Rs. 946.73/ha (moderate burnt) & Rs. 178.24/ ha (low burnt), in Himalayan Moist Temperate Forest, Rs. 3063.92/ ha (moderate burnt) sites and Rs. 86.17/ha (low burnt) sites and ToF and plantations is Rs. 1171.48/ha (moderate burnt) and Rs. 6121.66/ ha (low burnt).
- The losses in **M.P** in tropical moist deciduous forests is Rs. 768.87/ha (severe); Rs. 132.88/ha (moderate) and Rs. 90.17/ha (low burnt). Similarly, in tropical dry deciduous forest total losses were Rs. 958.01/ha (severe), Rs.727.81/ha (moderate) and Rs. 305.69/ ha (low burnt).

Scheme 3 - Execution of Readiness Activities for Implementation of REDD+ in India

REDD+ is now widely accepted as climate change mitigation option under United Nations Framework Convention on Climate Change. In order to access the financial support for REDD+, India needs to develop the National REDD+ Strategy, Forest Reference Level, National Forest Monitoring System and Safeguards Information System. India has already developed National REDD+ Strategy and Forest Reference Level.

Developed draft Safeguard Information System (SIS) for implementation of REDD+ activities through stakeholder consultation process. Draft of the SIS for REDD+ submitted to the Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India for webhosting on the Ministry website for inviting public comments. Final draft of SIS was approved by the Ministry on 31 March 2022.

CHAPTER

03

EDUCATION VISTAS

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EDUCATION VISTAS

3.1. FRI DEEMED TO BE UNIVERSITY (FRIDU)

Forest Research Institute Deemed to be University, Dehradun is recognized as a premier institution in the field of forestry education in India. The University is promoting pioneering research in specialized areas under Ph.D. programme. The following academic courses are also offered by FRIDU on a regular basis:

1. M.Sc. Forestry
2. M.Sc. Wood Science & Technology
3. M.Sc. Environment Management
4. M.Sc. Cellulose & Paper Technology

Entrance Tests for M.Sc. courses and Ph.D. programme were conducted well in time. 120 Indian students and 7 foreign students joined the postgraduate programmes, while 114 Indian students and 11 foreign students completed the M.Sc. programmes, 109 research scholars were registered for Ph.D. at the FRI Deemed to be University and 34 Ph.D. degrees have been awarded during the year.

Placements: Over 70 different agencies participated in the placement drive including Wildlife Trust of India, Noida; GICIA India Pvt. Ltd., Noida (UP), India; SG Analytics, Pune; HCL Foundation, Lucknow; Terracon Ecotech Pvt. Ltd., Mumbai; Orient Paper & Industries Ltd, M. P.; Century Pulp & Paper, Uttarakhand; Star Paper Mill, Saharanpur; Orient Paper Mills, West Bengal; BILT Papers Yamuna Nagar; Latiyal Handicrafts, Jodhpur; Marque Impex, Moradabad; Rushil Décor Ltd., Chickmangluru; Paharpur Cooling Tower, Gujrat; Century Plyboards (I) Ltd., Kolkata; The Energy and Resources Institute (TERI), New Delhi; J.K. Papers Ltd., New Delhi; National Highway Authority of India; MoEF&CC, New Delhi; SIDCUL; Sterlite Power Transmission Ltd., New Delhi etc.

Course-wise placement details are as follows:

1. M.Sc. Wood Science & Technology-100%
2. M.Sc. Cellulose & Paper Technology-100%
3. M.Sc. Forestry-33% (other students opted for higher education)
4. M.Sc. Environment Management-60% (other students opted for higher education)

3.2. TRAINING PROGRAMMES ORGANIZED (HRD)

3.2.1. Forestry Training and Capacity Building (FTCB)

Training programmes organized by ICFRE institutes under Forestry Training and Capacity Building (FTCB) Scheme:

Sl. No.	Name of Institute	One week training for IFS officers	Two days training for IFS officers	Trainings for stake holders	Trainings for personnel for other services
1.	FRI, Dehradun	3	1	2	2
2.	IFGTB, Coimbatore	-	1	1	1
3.	IWST, Bengaluru	1	1	1	1
4.	TFRI, Jabalpur	-	-	1	-
5.	RFRI, Jorhat	1	-	1	1
6.	HFRI, Shimla	1	-	2	-
7.	IFB, Hyderabad	-	-	1	-
	Total	6	3	9	5

Training on Community Engagement for Co - Production of Ecosystem Services from Hill Forests at HFRI

3.2.2. CAMPA Component 5- Operationalization of Human Resource Development Plan of ICFRE

Under HRD plan 12 training programmes for scientists of the council were organized in which 252 scientists participated. For technical staff 12 training programmes were organized, which were attended by 390 staff. Three training programmes organized for Administrative Staff were attended by 93 personnel. Induction training courses were conducted for 56 scientists and 15 technical staff.

Training programmes organized under HRD Plan

Sl. No.	Name of Institute	No. of training programmes	Duration (in days)	No. of Participants
1	ICFRE (HQ), Dehradun	13	59	318
2	FRI, Dehradun	04	15	59
3	IFGTB, Coimbatore	03	12	72
4	IWST, Bengaluru	01	05	20
5	TFRI, Jabalpur	03	15	86
6	RFRI, Jorhat	04	12	117
7	IFP, Ranchi	02	10	78
	Total	30	128	750

Advanced training in Molecular Biology Techniques and its application at TFRI

3.3. AWARDS

3.3.1. ICFRE Awards

To promote and motivate the professional competence in the scientific community in the field of forestry for the year 2020, ICFRE Awards for Excellence in Forestry were awarded to the following candidates for the year 2020 and 2021.

(A) Awards for ICFRE personnel serving in ICFRE (HQ) and its Institutes/Centres

For the year 2020

ICFRE Best Research Paper Award

- Dr. Gaurav Mishra, Scientist-D RFRI, Jorhat

ICFRE Young Professional Award

- Dr. Naseer Mohammad, Scientist-D, TFRI, Jabalpur

For the year 2021

ICFRE Lifetime Meritorious Services Award

- Dr. K.T. Chandrashekar, CTO, IWST, Bengaluru
- Sh. Kartar Singh, Forest Range Officer, HFRI, Shimla

ICFRE Outstanding Employee Award

- Mr. N. Chandrashekhar, ACTO, IWST, Bengaluru
- Mrs. S. Shashikala, ACTO, IWST, Bengaluru
- Mrs. R. Mahalakshmi, Technical Officer, IFGTB, Coimbatore
  Shri Amol Keshavrajit Raut, Technician (Artist), FRI, Dehradun
- Sh. Rakesh Kumar, Section Officer, HFRI, Shimla

(B) Awards for Non-ICFRE Individuals, Institutions and Organizations

For the year 2020

ICFRE Forestry Research Award for State & UT's Forest Department/Forest Corporation/ State Agricultural Universities

College of Forestry,

University of Agricultural and Horticultural Sciences, Shimoga, Ponnampet, Distt. Kodagu, Karnataka

ICFRE Forestry Research Award for Individual/ NGO

shared by:

1. Dr. K.T. Parthiban,
   Prof. (Forestry) & Dean Forest College & Research Institute, TNAU, Mettupalyam (TN)
2. Prof. Shri Kant Tripathi,
   Deptt. of Forestry, Mizoram University, Aizawl, Mizoram

3.3.2. Other Awards

- Brandis Prize was awarded to Dr. (Miss) Arundhati Baruah and Dr. (Ms.) Indrani P. Bora for outstanding contribution of research paper by '*The Indian Forester*'.
- Dr. S.S. Samant, Director and Dr. Pawan Kumar, Scientist-E, HFRI, Shimla were awarded with National Himalayan Excellence Awards 2020-21 in Research, Teaching Sports, Talent & Service by Govt. P.G. College Seema, Shimla (H.P.) & SMS (SP), MBS (HP), USAS (HP), SESWSM (HP) AGS (HP) LIKHIT, Sansthan India, in the Multi-disciplinary International Conference on Indian Culture, Science and Traditions organized by HFRI, Shimla in collaboration with Degree & PG Colleges of HP and Haryana from 13 to 15 November, 2021 at HFRI.
- Shri. A. Mayavel was awarded Best Oral Presentation Awards for the paper Phytochemical Screening of Red Tamarind clones in Tamil Nadu.
- Shri. A. Mayavel was awarded Best Poster Award for the poster entitled "Evaluation of Phytochemical Properties in the leaves of *Gmelina arborea*: A potential medicinal tree".
- Shri. A. Mayavel was awarded best Oral Presentation Award for the paper Breeding System and Potential Pollinators of *Tamarindus indica*, L. presented at First International Conference on Emerging Trends and New Vistas in Applied Sciences (ETNVAS 2022) was held at SVMCH & RC, Puducherry, on 12th February, 2021. He also received Best Researcher Award by the Society of Nature and Applied Sciences at the event.
- Dr. D. Thangamani, Scientist-D, Forest Genetic Resource Management Division, IFGTB, Coimbatore was awarded with Best Women Scientist Award for scientific excellence-2021 on 21st April, 2021 by Nature Science Foundation, Coimbatore.

- Shri Kaushal Tripathi, Scientist-B received Prof. S.N. Chaturvedi medal for best research paper presentation during Conference of Indian Botanical Society from 18-20 Oct. 2021 held at Jai Narayan Vyas University, Jodhpur.
- Shri Kaushal Tripathi, Scientist-B received Young Scientist Award 2021 by the Society of Biological Sciences and Rural Development on the occasion of International conference on Emerging sustainability trends in Agriculture, Rural and Environmental development, 19 and 20 December 2021.
- Dr. Mohan C, Scientist-B, receieved Scientists of the year award 2021 at International Conference on emerging sustainability trends in Agricultural, Rural and Environmental development 19 and 20 December 2021.
- Lal, C. and Jishtu, V. were awarded Best Oral Presentation in 8th International e-conference on 11 & 12 September 2021 organised by Him Science Congress Association.
- Kanwar, B., Kumar, P. and Sharma, N. were awarded Best Oral Presentation in 8th International e-conference on 11 & 12 September 2021.
- Preety, A. and Sharma, S. were awarded Best Oral Presentation in 8th International e-conference on 11 & 12 September 2021.

Ministry of Skill Development and Entrepreneurship has recognized IWST, Bangaluru as a **Centre of Excellence (CoE) in the field of Skilling Ecosystem in the country**. (Notification dt. 24th December 2021 in the Gazette of India, Extraordinary)

3.4. PARTICIPATION IN SEMINARS/SYMPOSIA/WORKSHOP/TRAININGS

Sl No.	Name of Institute	No. of Seminars /Symposia/ Workshops /trainings	Duration (in days)	No. of Participants
1	ICFRE (HQ), Dehradun	44	157	144
2	FRI, Dehradun	78	264	207
3	IFGTB, Coimbatore	70	294	247
4	IWST, Bengaluru	58	218	2016
5	TFRI, Jabalpur	162	315	413
6	AFRI, Jodhpur	33	108	89
7	RFRI, Jorhat	24	42	50
8	HFRI, Shimla	165	172	405
9	IFP, Ranchi	56	227	240
10	IFB, Hyderabad	36	263	63
	Total	**726**	**2060**	**3874**

3.5. CAMPA COMPONENT 3- POLICY STUIDES UNDER CENTRE FOR FOREST POLICY RESEARCH

Following two Policy Research Studies have been completed under Centre for Forest Policy Research (CFPR) of ICFRE during 2021-22:

1. Institutions of community participation including Joint Forest Management Committees (JFMCs) and Eco-Development Committees (EDCs), linkages with Panchayati Raj Institutions, review of their working in various regions of the country and identification of successful models and shortcomings

The study analyzes that multiplicity of community participation institutions for natural resource management is causing confusion. The governance models for Schedule V, Schedule VI, and Non Scheduled areas have been suggested to overcome the problem. A single committee is suggested at Gram Sabha level in Schedule V area, Village council or equivalent institutions in Schedule VI areas and for Non Scheduled areas at Gram Panchayat level which would be a sub-committee of the Village Panchayat formed with the consent and powers

of Gram Sabha. This committee can be named as Natural Resource, Forest, and Biodiversity Management committees. The roles and responsibilities of Gram Sabha, State Forest Department, Access and Benefit sharing, finances have also been defined in the study. The existing policy framework, acts, regulatory regimes have been taken as basis for recommending Gram Sabha based governance. The study recommends to implement Gram Sabha based governance on pilot basis for about 5-10 years in order to understand its positive and negative implications on natural resources and local livelihoods. Further, depending on the experience gained, request can be made for replicating the same in all the states. The pilot implementation would provide scope for due corrections.

2. Policy issues in agro forestry including market mechanisms, forward and backward linkages, regional availability, transit of forest produce, linkages with NDC targets, choice of species and utilization aspects

Based on the analysis of reviewed documents and opinion of the stakeholders the study makes the following recommendations

- Effective institutional set-up at state and local level
- Improving incentives and financial support through institutions
- Strengthening Marketing Mechanism
- Enhancing production of Quality Planting Material & Accreditation of Nurseries
- Relaxation on the tree regulations
- Secure land tenure and tenancy rights
- Accounting the Role of AGF in C-sequestration, REDD+, NDC targets
- Certification of Agroforestry Produce
- Strengthening of Extension Service
- Promotion of high value tree species Agroforestry
- Reducing import of wood
- Developing Catchment area for Wood Based Industries
- Strengthening data base of timber production from Agroforestry, demand and supply
- Extension and capacity building
- Expanding Agroforestry in potential wastelands
- Agroforestry model with complete package

Following 4 Policy Research Studies are being conducted by Centre for Forest Policy Research (CFPR) of ICFRE:

1. Functioning of Forest Development Corporations and their role in the present scenario
2. Popularization of the use of wood and wood substitutes as per the National Forest Policy and modalities for facilitating industries for its optimum utilization
3. Issues in Forest Certification and Certifying Agencies.
4. Study of Grazing Policies in different States and Formulation of Grazing Policy Guidelines for States.

CHAPTER

04

EXTENSION PANORAMA

CHAPTER 04

EXTENSION PANORAMA

4.1. LAB TO LAND

Development of compost out of waste involving tribal for their livelihood support: a part of Swachh Bharat Mission (IFGTB)

As a - Tribal development and their livelihood support initiatives of IFGTB the technology of "Tree Rich Biobooster (TRB)"-a waste based organic potting mixture was developed using coir pith waste, compost and other municipal waste composts such as vegetable wastes and flower waste along with bio wastes and demonstrated through onsite and offsite trainings to 520 tribal women inhabiting forest fringe villages. Alternate formulations using paddy straw, sugarcane bagasse, casuarina needles and zea mays straw were also evaluated. After establishing necessary infrastructure at IFGTB, organic certification from Tamil Nadu Organic Certification Department (TNOCD) for TRB was obtained and a short film on "Recycling waste and supporting livelihood-A tribal development initiative of IFGTB" was released.

Swachh Bharat Mission-Onsite demonstration of Tree Rich Biobooster to Tribes at Mundanthurai, T.N.

Promoting livelihood by bamboo charcoal production and briquetting to the selected forest fringe villages of Karbi Anglong district, Assam (RFRI)

Constructed Facility Centre with a brick kiln at Thiolangso, Deithor Karbi Anglong district, Assam and organized three days *in-situ* hands-on training programme on "Bamboo Charcoal Production and Briquetting. Workshop on "Bamboo Charcoal Production and Value Addition for Livelihood Needs" was organized at RFRI, Jorhat for Bamboo Growers from Karbi Anglong district. A market chain has been established between Nagaland Bamboo Resource Centre (NBRC), Nagaland and beneficiaries from Karbi Anglong.

Training programme on charcoal production

Awareness training for conservation of *Pinus gerardiana* (Chilgoza) through scientific intervention in Moorang forest range of district Kinnaur, Himachal Pradesh (HFRI)

Eight field demonstration-cum-awareness training programmes on "चिलगोजा का संरक्षण एवं स्थायी प्रबंधन की आवश्यकता" were conducted in which 357 farmers and front-line field staff of Dubling, Spillow, Labrang, Kanam, Kalpa, Duni, Roghi, Pangi, Barang, Powari, Urni and Meeru Panchayats of Pooh and Kalpa Forest Ranges of Kinnaur Forest Division participated. One-hectare Chilgoza demonstration plot established. Booklet on Chilgoza entitled "चिलगोजाः जिला किन्नौर का पारिस्थितिक सामाजिक एवं आर्थिक रूप से एक महत्वपूर्ण वृक्ष–वर्तमान स्थिति, संरक्षण एवं प्रबंधन की आवश्यकता" was published and distributed among the farmers and front-line forest field staff and 40 multi angular long reach pruners were also distributed to each Panchayats.

Field demonstration at Pangi village, Kinnaur, H.P.

Extension of biological control of Teak defoliator and skeletonizer through egg parasitoid, *Trichogramma raoi* (TFRI-Trichocards) in plantation (TFRI)

Hosts insects of biological control agents *Canthecona furcellata* and egg parasitoid, *Trichogramma raoi* were reared for the production of TFRI- Trichocards as per requirement of stakeholders. Seven Lakh egg parasitoids were released in experimental site against Teak defoliator and skeletonizer. 12 trainings programmes on "Biological Control of Teak Skeletonizer/Defoliator insects" to popularize bio-rational and ecofriendly insect pest management and to improve the environmental quality were organized for the frontline staff of six forest divisions (Korba, Katghora, Sarguja, Ambikapur, Khairagad and Rajanandagaon) of CG State Forest Department.

Field demonstration of management of Teak defoliator / skeletonizer through TFRI Trichocard

Monitoring and dissemination of knowledge to manage sal heartwood borer, *Hoplocerambyx spinicornis* in Chhattisgarh (TFRI)

Survey and monitoring the status of sal heart wood borer, *Hoplocerambyx spinicornis* infestation carried out in sal forests at Kondagaon, Keskal, Bhanupratppur, Ghariyaband and Kawardha forest divisions of C.G.. Data revealed that a total of 1070 sal trees were affected during the year 2021. Eight trainings on "Management of Sal heart wood borer, *H. spinicornis*" were conducted for the frontline staff of six forest divisions (Korba, Kawardha, Kondagaon, East Bhanupratapur, Sarguja, Ambikapur, and Rajanandagaon) of Chhattisgarh wherein 200 peoples were trained.

Popularization of improved var. of *Leucaena leucocephala* (Lam.) de Wit. based agroforestry system (TFRI)

Leucaena based agroforestry system with intercropping of *Zea mays* (Kharif) and *Brassica juncea* and *Cymposistetra gonaloba* (Rabi) has been promoted and distributed seedlings to farmers of Chandiya and Umariya villages under MoU with wood-based industry to buy back the wood material from the farmers, established at farm field. *L. leucocephala* performed better with intercrops and attained the height of 3.5m within two years as compared to the sole crop.

Capacity building of nursery staff on preparation of organic fertilizer and its application (TFRI)

For encouraging the usage, popularization and better understanding of ecofriendly methods in forestry, 35 hands-on trainings on preparation and application of biofertilizers for Chhattisgarh field staffs of six circles with 921 participants were successfully conducted.

Practical demonstration of biofertilizer production

Capacity building on seed and nursery technology and plantation techniques for prioritized species of Chhattisgarh state (TFRI)

Extension material on 'Seed and nursery techniques of commercially important tree species' was prepared for distribution among forest officials and other stakeholders. Also online training programme was conducted on "Seed handling techniques, plantation and management of commercially important forest species" for the forest department officials of Durg, Raipur, Bilaspur, Ambikapur and Jagdalpur circles of Chhattisgarh.

Conservation status, germplasm collection and resource augmentation of priority medicinal plants in the cold deserts of Ladakh (HFRI)

Germplasm of *Rhodiola tibetica*, *Sinopodophyllum hexandrum* and *Dactylorhiza hatagirea* collected from Suru valley region and planted in the shade house at VVK, Leh. Community awareness and plantation work carried out at three villages and two schools at Leh. Two interaction programmes with school children were carried out in Lankarchey and Thulus villages of Kargil. An interaction programme was also arranged between Forest Officials of Kargil district and HFRI, Shimla staff.

Germplasm plantation at FRS, Leh

Field work in Suru Valley, Kargil

'Skill development in parataxonomy for local communities of Gangotri – Govind and Darma - Byans valley of Uttarakhand (FRI)

Three trainings were organized, one training was conducted at FRI and two trainings were organized in the field (i.e. Gangotri and Gobind Landscape). Trainees were acquainted with different aspects of biodiversity through class room lectures, field visits and hands-on techniques of herbarium collection and preparation. A total of 35 candidates from each village was selected for second phase of training.

Ecosystem Services Improvement Project (ICFRE)

Carbon fluxes between vegetation and atmosphere through eddy covariance-based carbon flux towers were recorded in the project areas of Madhya Pradesh and Chhattisgarh.Two training programmes on application of eddy covariance system for forest carbon measurement were organised at Itarsi (M.P.) and Ambikapur (CG) to build the capacity of officials of State Forest Departments and Science & Technology Institutions.

Training programmes organised for SFDs and JFMCs of Chhattisgarh and Madhya Pradesh

Trainings on Measurement of Forest Carbon Stocks were organised. Seven trainings for 296 officers from 57 Forest Divisions of M.P. and CG. Nine trainings for 494 Joint Forest Management Committees of five and four forest ranges of M.P. and CG respectively.

Activities for upscaling of SLEM Best Practices implemented in the ESIP areas of CG and M.P.:

- Restoration of degraded ecosystem through distribution of improved cook stoves to the 5248 number of local communities.
- Integrated farm development for sustainable productivity through distribution of vermibeds and earthworms for vermicomposting to the 3822 members of local communities.
- Lac cultivation for livelihood generation and biodiversity conservation to 1456 members of local communities for Chhattisgarh.
- Developed a portal “SLEM Knowledge Sharing and Reporting System” (https://nrdp.icfre.gov.in) for increasing national capacity for monitoring the land degradation and desertification and SLEM outcomes and national reporting to UNCCD.
- Sixty-eight training on Upscaling of SLEM Best Practices and Environment and Social Safeguards for 5263 members of the local community in the villages of Pandariya West Forest Range, Marwahi Forest Range, Pali Forest Range, Raghunathnagar Forest Range of Chhattisgarh, and Banapura Forest Range, Budhni Forest Range, Bhaura Forest Range, Itarsi Forest Range and Sukhtawa Forest Range of M.P.
- Developed a road map for institutional and policy mainstreaming of SLEM in India.
- Conducted the study to evaluate working/ effectiveness of Van Vigyan Kendras established in different states, to improve upon the working and effectiveness of VVKs in future.

Distribution of cook stove

ESIP site at Pipalgota, Hosangabad, (M.P)

Lac Cultivation

Vermi beds

Improving the traditional homestead to a viable agro-forestry system for biodiversity conservation and inclusive growth of Khampti tribe of Namsai district, Arunachal Pradesh (RFRI)

Five agroforestry demo plots for improvement of homestead of Khampti villages of Namsai district Arunachal Pradesh were established and seedlings of *Cinnamomum zeylanicum, Ziziphus mauritiana, Citrus limon, Aquilaria malaccensis* and *Areca catechu* were planted. Annual crops such as ginger, turmeric, sesame, black gram, maize, potato, mustard were intercropped. PRA was conducted and baseline information on socioeconomic condition and plant species of selected Khampti villages was recorded.

Training on establishment of agroforestry nursery, cutting and bud grafting, and vermicomposting; eight technology-based awareness camps on 'Mushroom cultivation' and 'Vermicomposting'; one on–site technology awareness camp for entrepreneurs on available bioresources for product development were organised.

Promotion of Bamboo based Agroforestry System for economic upliftment and livelihood security of farmers in Madhya Pradesh (TFRI)

Bamboo Technical Support Group (BTSG)

One high-tech Bamboo Nursery at FRI Dehradun Campus and a small nursery at Nalagarh field station, Himachal Pradesh were established and 73,930 plants were produced in these nurseries.

A total of 11 ha of demo bamboo plantation (IFP-7 ha & FRI-4 ha of hill bamboo) was raised in the agroecosystem and urban ecosystem.

Initiated establishment of bamboo processing units - Bamboo Common Facility Centre, Incense Stick Making and Preservation Plant at IFP, Ranchi, Bamboo Shoot Processing unit at RFRI, Jorhat and Bamboo Handicraft and Jewellry unit at FRC-BR Aizawl for Entrepreneurship Development.

RFRI conducted three days training programmes for hands-on demonstration of making various value-added products of bamboo such as Bamboo Shoot with Tamarind, Lemon, King Chilli, Green Chilli, Chicken, Banana Inflorescence, Olive, Green Mango, Dry Brassica leaves, Garlic and Ginger.

Bamboo-based agroforestry systems were established and maintained in 15 farmers field. Tools were provided to maintain and manage the bamboo culms for pruning, and inter-culture operations for healthy culms. A training programme was organized at farmer's field to demonstrate the harvesting and management techniques of bamboo culms.

Inaugurated '***Banh Bithika'***, a sale counter for bamboo handicraft by Shri Kamakhya Prasad Tasa, Hon'ble MP on 5th June, 2021 at RFRI, Jorhat.

Inauguration of 'Banh Bithika

CAMPA Component 6- Operationalization of Forestry Extension Strategy and Action Plan of ICFRE

Technology Demonstration Centre (TDC)

- IFP, Ranchi established Technology Demonstration centre at the institute.
- FRI, Dehradun established a photogallery and opened for visitors. TDC establishment under progress.
- Vacuum Pressure Impregnation Unit under TDC was procured and installed at RFRI, Jorhat campus for preservative treatment of Bamboo. The unit was inaugurated by Hon'ble Deputy CM of Arunachal Pradesh. The Unit will be operated through PPP mode.
- The Hon'ble Vice President of India, Shri M. Venkaiah Naidu inaugurated the Marine Interpretation Unit at FRC-CE, Visakhapatnam under IFB, Hyderabad.

Technology Demonstration Centre at IFP, Ranchi

Vacuum Impregnation Unit at RFRI, Jorhat

Photogallery at FRI, Dehradun

Establishment of new VVKs

- New VVK was established at Environmental Research Station, Sukna, West Bengal by IFP, Ranchi.
- AFRI, Jodhpur established a New VVK at Kalka Mata Nursery, Udaipur.
- A new VVK was established at Metaguda, Jagdalpur (CG) by TFRI, Jabalpur.
- IFB, Hyderabad signed a MoU for establishment of a new VVK at FCRI, Mulugu and initiated establishment work. Simultaneously, two trainings were conducted at VVK, FCRI, Mulugu.

Inauguration of VVK at ERS-Sukna

Maintenance of VVKs including networking with KVKs

HFRI, Shimla:

- Maintained threeVVKs at Brundhar, Manali (H.P.); Janipur, Jammu (UT) and Badamibagh, Leh, Ladakh (UT)
- Raised 23000 no of QPM of different medicinal plants and forestry tree spp. viz. *Angelica glauca, Picrorhiza kurroa, Sinopodophyllum hexandrum, Prunus armeniaca, Pyrus pashia* at VVK, Jagatsukh, Manali, H.P and Poplar clones (6418) at VVK Janipur, Jammu, J&K UT.

Polyhouse at VVK-Dharampur

- Procured seedlings of different medicinal plants viz., Harad, Baheda, Aonla, Arjun, Neem and Chandan and planted those seedlings at Shivdwala demo nursery for further multiplication and demonstration purposes.
- To demonstrate checking of soil erosion, established plantation of *Dendrocalamus strictus* along the boundary line of Shivdwala demo nursery.
- As per demand of local communities, procured the seeds of *Tectona grandis* from Kerala Forest Research Institute, Trissur and *Santalum album* from IWST, Bengaluru and sown in poly bags at demo nursery Shivdwala for distribution amongst farmers.

AFRI, Jodhpur:

- Conducted training on “Forest and Livelihood Resources” for forest functionaries and farmers (39 trainees) at GFRI, Gandhinagar (Gujarat) under VVK Rajkot, Gujarat.

IWST, Bengaluru:

- Upgraded VVK established at Gottipura, Karnataka.
- Conducted three trainings on, Nursery Techniques, Cultivation Practices of selected medicinal plants and wood preservation techniques at Valpoi, Goa through VVK and “Management and harvesting of bamboos” at VVK, Gottipura, Karnataka and Sandalwood cultivation at Bhadravathi.
- Condcuted technology demonstration programme at VVK, Gottipura on Agroforestry models and Sandalwood cultivation techniques for 30 farmers.

FRI, Dehradun:

- Established a Hi-Tech Nursery under VVK, Gorakhpur.
- Conducted training at Village Kandi, Pauri Garhwal for 60 participants.

IFP, Ranchi:

Organized one training programme for 37 participants including farmers, Panchayat members, NGOs etc. for livelihood generation in Jharkhand.

Organized 12 trainings in Jharkhand and West Bengal through virtual and offline mode to the farmers, SFD officials etc.

RFRI, Jorhat:

Organized two skill development trainings one on Bamboo Handicraft at Imphal, Manipur for 24 vulnerable youth of Manipur. Second training at VVK Assam on Bamboo, Agarwood, Mushroom and Vermicompost at Goalpara, Assam for 40 participants.

Handicraft Training at Manipur by RFRI, Jorhat

IFGTB, Coimbatore:

Conducted training on Windbreak Clones based Agroforestry Systems for 40 farmers, volunteers of Vetry, Tirupur and officials of Agricultural dept. Tirupur district.

IFB, Hyderabad:

Organized two one-day VVK-training programmes for Forest Range Officers from TSFA on “Development of Agroforestry Models” and “Utilization of Medicinal Plants and its importance”.

FRC-CE, Visakhapatnam organized a VVK-training programme on Sustainable Forestry and Tree Improvement at Koraput, Odisha for 36 officials from SFD participated.

Networking of VVKs with KVKs

- IFGTB, Coimbatore established demo trials of *Calophyllum inophyllum, Gmelina arborea,* Tamarind, Teak (T.C), Cadamba, Precision Silvicultural Technique with Teak and Casuarina, Tree fodder species, Medicinal Plants, etc. under 5.20 ha (each 0.5 ha) at ICAR KVK MYRADA, Talamalai.
- FRI, Dehradun conducted training on “Making Mycorrhiza based organic fertilizer” under VVK -KVK Networking at KVK-Damla, Yamunanagar for 38 participants.

Training on Windbreak Clones based agroforestry systems at Tirupur, T.N.

IFGTB & ICAR KVK training on Cadamba planting to farmers

- HFRI, Shimla conducted two trainings on “Cultivation of Important Temperate Medicinal Plants: An Option for Diversification and Income Augmentation at Krishi Vigyan Kendra, Rohru for 45 participants and “Productivity Enhancement and Sustainable Livelihood through Forest Technology Interventions” at KVK, Jammu, R S Pura, J&K, UT for 60 farmers.
- AFRI, Jodhpur conducted two trainings on “Role of forest for soil and water conservation” for forest functionaries, VFPC members and 47 farmers at KVK, Udaipur and “Quality planting materials and Nursery Management” for forest functionaries and farmers (95 trainees) at KVK, Jaisalmer.

Training in collaboration with KVK, Rohru, H.P.

Demo Village (DV)

- IFP, Ranchi established a new Demo Village at Kutam, Topra, Khunti, Jharkhand. Established vermi-bed and honey box and distributed vermi-bed and worms to farmers. Organized trainings on vermi-compost and lac cultivation.

Different programmes at DV Kutam, Jharkhand

- HFRI, Shimla established DV at Badagaon and organized a training programme on "Sustainable Development and Livelihood through Forestry Intervention" for 45 villagers. Planted and distributed seedlings of *Dendrocalamus strictus* (500 no.) and *Quercus oblongata* (100 no.). For sustainable availability of fodder, seedlings of different fodder species viz., *Celtis australis, Grewia optiva, Albizia* spp. and *Morus alba* were raised.

Training at DV- Badagaon, Shimla

- IWST, Benglauru conducted training to create awareness on Biofertilizers to farmers at Attivatta Demo Village. Sandalwood based agroforestry model was established in Attivatta Demo Village.
- AFRI, Jodhpur initiated the work on establishment of a new DV at Mohangarh, Jaisalmer.
- FRI, Dehradun initiated the process of establishment of a new DV at Ranipokhari area of Dehradun.

Training to create awareness on Biofertilizers (on field) to farmers of Attivatta Demo Village, Karnataka

Tree Growers Mela (TGM)/Kisan Mela/ Inudstry-Farmers Meet

Organized six TGM and three industry-farmers meet

- IFGTB, Coimbatore organized TGM at Erode (Tamil Nadu). About 1223 farmers participated
- FRC-ER, Prayagraj organized TGM on the theme 'Forestry for Livelihood' about 5000 persons visited the Mela.
- IFP, Ranchi organized TGM and workshop for Bamboo Growers and Bamboo Entrepreneurs.
- TFRI, Jabalpur organized "Kisan Mela" for 400 farmers at KVK Mandla.
- RFRI, Jorhat organized TGM cum Second National Seminar on Agarwood at Jorhat for various stakeholders.
- Farmers' mela was organized to create awareness for Neem cultivation at Phoolpur, Uttar Pradesh by FRI, Dehradun in association with Indian Farmer Fertilizer Cooperative Limited (IFFCO).
- Three Industry-Farmers' Meet on *Melia dubia* were organized in association with Wood Technologists Association in the states of Haryana and Uttar Pradesh.

Kisan Mela at KVK, Mandla, Jabalpur

Tree Grower Mela at Erode, T.N.

TGM on 'Forestry for Livelihood' at Prayagraj

TGM and workshop for Bamboo Growers and Bamboo Entrepreneurs at Ranchi

Felicitation of Farmers for Agroforestry adoption

- FRI, Dehradun felicitated five farmers for adopting agroforestry on commercial basis after getting technologies from FRI on 73th Republic Day on 26th January, 2022 by Director General, ICFRE, Dehradun.
- TFRI, Jabalpur felicitated eight farmers for adopting Tree farming, Bamboo farming, Lac farming, Organic farming, Medicinal plant farming and also involved in value addition of Lac, Bamboo products, Jaiwik products, wood products, medicinal plant products, during farmers mela held at Mandla, Madhya Pradesh.

Woman SHG felicitated during Kisan Mela 2022

Modified Direct to Consumer (MDTC)

IFGTB, Coimbatore conducted the following activities:

- Manufacture of ArborEasy DNA isolation kit: A total of 430 reactions were sold.
- VAM Production unit extended for producing 2000 kg of VAM/year.
- Produced 3000 Quality Planting Materials of windbreak clones for supply to farmers to establish demo plots.
- Established one demo plot with the windbreak clonal plants produced under MDTC-CAMPA in Narasipuram village in Coimbatore District of Tamil Nadu.
- Conducted three online trainings on seed cake mixture for the staff of SFDs.

AFRI, Jodhpur carried out following activities:

- Raised 45000 high quality seedlings of Khejri (5000), Rohida (5000), Neem (5000), Shisham (3000), Karanj (2000), Drumstick (5000), Kumatha (2000), Khari jal (7000) Meethi jal (2000), Gunda (2000), Gundi (5000), Tecoma (2000).
- Prepared 7900 plants through vegetative propagation for Bouganbillia (1500 plants), Golden durenta (800 plants), Anaremi (300), Gudhal (200), ficus (100)

Windbreak Clonal Plants by IFGTB, Coimbatore

Guggal (2000 plants), Shisham clone (1800 plants) through cutting and Khejri (600 plant) and ber (600 plant) through budding.

- AFRI, Jodhpur produced 52,900 QPM of 19 species and supplied to various stakeholders like Nagar Nigam, Agricultural university, CAZRI, BSI, NIFT, Jodhpur; IBPGR, Noida; State forest department, Haryana; NGO like Dharti Amrit Jaipur, Nagour, Sahgal Foundation Barmer.

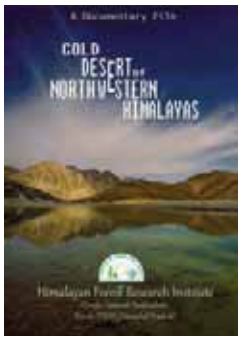
  Conducted one day training on "Value addition in Biofertilizer" for 50 farmers and forest staff.

Documentaries/Videos

- Estimation of heartwood using ERT in standing trees of sandalwood- IWST.
- Cold Desert of NW Himalayas- HFRI.
- Sandalwood Spike Disease and Agroforestry- IWST.
- Research, extension and education activities of FRC-ER, Prayagraj.
- Tamil version of documentary film on IFGTB "*Pesum Marangal*".
- A short film titled "*Rendezvous with Natural History*" on Gass Forest Museum (GFM), Coimbatore.

Short film on Gass Forest Museum

Release of IFGTB film in stakeholders' workshop



Documentary on Cold Desert of NW Himalayas

Documentary on Sandalwood Spike Disease and Agroforestry

Prakriti

Prakriti, a scientist – student connect programme, is operational through all ICFRE institutes across the country. During the year, over 5,000 students and teachers from various KVs, JNVs and other schools and colleges have been educated on various aspects of environment and forest. Conducted online knowledge series programme, Lectures, Plantations, Screening of films, Cleanliness drive and other awareness programmes.

Practical training on plants identification at FRI, Dehradun

Subject experts interacting with teachers and students at FRI, Dehradun

4.2. GREEN SKILL DEVELOPMENT PROGRAMME (GSDP)

As ENVIS Resource Partner on'Forest Genetic Resources and Tree Improvement' IFGTB, Coimbatore imparted seven trainings under GSDP on (1) Plant Tissue Culture Techniques and its Applications; (2) Vermicompost Production and Organic Waste (3) Quality Planting Material Producer (4) Value Addition and Marketing of NTFPs-Bamboo Crafts (5) Forest Entomology and Pest Control and (6) Products and Activities of Bioprospecting Lab from 10 November to 18 March 2022. One hundred and seventy participants were trained.

GSDP activities by IFGTB, Coimbatore

4.3. POPULARIZATION OF CLONES/VARIETIES/IMPROVED GERMPLASM

1. **Quality planting material supplied to stakeholders**

- **FRI:**
  - Eight quintal seeds and five lakh of seedlings of *Melia dubia* have been supplied to Chhattisgarh, Uttar Pradesh, Uttarakhand, Punjab Forest Departments, ICAR, Agriculture/Forestry Universities, farmers, industries, NGOs and other stakeholders.
  - 60, 000 seedlings of released varieties of Neem to IFFCO.

- QPM of various bamboo species 720 in number was supplied to the farmers. Tissue culture base cultures of *Bambusa balcooa* clone were supplied to Almaq Biotech LLP, Maharashtra.
- QPM of resistant and moderately resistant genotypes of Shisham 1240 in number was supplied to the Research wing of Haryana Forest Department for establishment of three ha clonal seed orchard.

- **IFGTB:**
  - 14000 ramets of windbreak clonal plants of Casuarina supplied to the farmers.
  - A total of 3.00 lakhs of QPM including Casuarina (2.75 lakhs), teak (25,000) and Eucalyptus (500) was produced and supplied to different stakeholders including Karnataka Forest Development Corporation, Vetri Foundation and farmers.
  - Supplied 26.130 kg quality seeds of 13 tree species to various stakeholders including, SFDs, farmers, industries and NGOs.

Windbreak Clonal Plants by IFGTB, Coimbatore

IWST, Bengaluru supplied TC base cultures of *B. tulda* (40 bottles) and *D. stocksii* (15 bottles) to Karnataka Forest Deparment.

TFRI, Jabalpur sold plants of two varieties of *Rauvolfia serpentina* to Chhatissgarh Medicinal Plant Board.

RFRI, Jorhat produced 71500 QPM of bamboo and sold 34000 to stakeholders.

HFRI, Shimla produced 30218 plants of 10 species in VVKs and distributed to villagers.

IFP, Ranchi raised 5000 QPM through tissue culture and rooting cuttings of *Dendrocalamus asper, D. hamiltonii, D. strictus* and supplied to the NHAI for roadside plantation.

2. Training was conducted on cultivation of Melia to offiicals of IFFDC, NGOs of Punjab and Uttar Pradesh
3. Developed farmers' nursery for *Melia dubia* in Saharanpur, Uttar Pradesh.
4. Established three Seed Multiplication Areas of Neem (1 acre each) in IFFCO unit of Phoolpur, Uttar Pradesh.
5. Established a TC lab in IFFCO unit of Kalola, Gujarat for production of quality planting material of released varieties of Neem through micropropagation.

Production of QPM at AFRI

4.4. LICENSE/MATERIAL TRANSFER AGREEMENT SIGNED

- FRI, Dehradun, and Himachal Pradesh Forest Department, Nahan for transfer of technology on Extraction of fiber from Pine needles.
- IFGTB, Coimbatore and Seshasayee Paper and Boards Limited, Erode for commercial propagation and supply/sale of clone *Eucalyptus camaldulensis* (IFGTB-EC-6).
- IFGTB, Coimbatore and M/s Anandha Agricultural Solutions, Thoothukudi for windbreak clones of IFGTB (*Casuarina junghuniana*).
- IFGTB, Coimbatore and Karunya Institute of Technology and Sciences, Coimbatore for Studies on Root architecture of Eucalyptus clones using Ground Penetrating Radar (GPR).
- RFRI, Jorhat and Chroma Biotech Ltd., Dibrugarh for selected high yielding genotype of *Bambusa tulda.*
- RFRI, Jorhat and Pro Agro Tech, Jabalpur for mass multiplication of bacterial consortia for commercial use/supply of bacterial isolates bearing strain code: KhAn, MKGB, MKGPf, MKGAz, KHB, KHPf, KHAz.
- RFRI, Jorhat and for mass multiplication of fungal culture for commercial use/supply of fungal isolates bearing the isolate code: *Pestalopsiosis* sp. with Enhanced Bio-Fuels and Technologies (India) Pvt. Ltd., Coimbatore.
- The technology of *in vitro* multiplication of selected teak clones was transferred to three commercial tissue culture laboratories, Labland Biotech, Mysore; HU Gugle Biotech, Bengaluru and Santhi Clonal Nursery, Cuddalore for commercial production of identified superior performers of teak through tissue culture.

4.5. PRODUCTS/APPS DEVELOPED

FRI, Dehradun

- Developed a range of Dhoopbatti formulations with medicinal properties viz., Stress reliever, Sleep facilitator, Meditation promoter, General wellness improver, Indoor air sanitizer, and Mosquito repellent under the generic name “Dhoopwell”. A brochure on *Dhoopwell* has been prepared and uploaded on FRI website for popularization among user groups.

IFGTB, Coimbatore

- Royal Seema – ICFRE Red Sander Soap – Organic Soap Using Red Sanders extract along with *Hidnocarpus pentandra* seed oil as major ingredients.

- Naturally Dyed Garments from weaved cotton dyed with the extract of Eucalyptus leaves and bark along with natural mordants like Myrobalan, Aloe vera, Turmeric & Pomegranate peel.
- Incense sticks developed using waste leaves and bark of Eucalyptus.
- Hy-ACT – Biopesticide - The product has been applied for registration in Central Insecticide Board and Registration Committee for registration. Once granted the product will be commercialised by the collaborator industry,
- Mobile Apps for Yield estimation in *Ailanthus excelsa* and *Gmelia arborea*
- Android Mobile Application “TreeGenie” and Web Portal on the theme “*Developing & Popularizing Digital Interactive Platform for Tree Growers & other Stakeholders of Tamil Nadu”* was released. The digital platform would bring tree growers, planting stock suppliers, wood-based industries, research institutions and state forest departments at one platform and would integrate information flow on research and markets for benefit of the tree growers. IFGTB Apps for Yield Calculation for important species is also integrated with the new app.

Android Mobile Application “TreeGenie

AFRI, Jodhpur

- AFRI, Jodhpur prepared compost using fallen leaves of *Azadirachta indica* (Neem) and other species growing in AFRI premises. This is being sold at Rs. 30/kg and is in good demand.

RFRI, Jorhat

- Fungal inoculam for artificial inoculation of agarwood in *Aquilaria malaccensis* has been released for marketing in the brand name of "Sashi Inoculant". The product is available in two forms i.e. Liquid and Paste.

4.6. INTELLECTUAL PROPERTY - PATENTS GRANTED/APPLIED

Patents granted

- Management of fungal Deterioration of stored Medicinal Plant Products (Patent No. 381620).
- Simple and Rapid Infrared (IR) Spectrum based detection method for discrimination of pure Sandalwood and other essential oils (Patent No. 373596).
- A Transparent Wood Composite (Patent No. 376245).

Technologies developed and Patents Applied

- A solar heated vacuum timber dryer and method of vacuum drying thereof (Application No. 202111034170, dt. 29.07.2021).
- A Portable and Folding Solar Dryer for Drying of Medicinal Plants or Other Non-Wood Products (Application No. 202111048206, dt. 25.10.2021).
- An Herbal Composition for Pesticide Removal from Edible Produce and Preparation Method Thereof (Application No. 202111048206, dt. 22.10.2021).
- A multilocus high resolution melting analysis as diagnostic tool for detection of viral genes (Application No.: 202041018705, dt. 01.11.2021).
- A synergistic composition for fabrication of veneer wood composite boards and method thereof (Application No.:202141060212, dt. 23.12.2021).
- A method for de-acidification of oil (Application No.: 202241004804, dt. 28.01.2022).

4.7. TRAININGS ORGANIZED

Institute	No. of Trainings	Duration	No. of participants
ICFRE HQ	84	91	6008
FRI, Dehradun	16	37	542
IFGTB, Coimbatore	29	217	1095
IWST, Bengaluru	15	36	749
TFRI, Jabalpur	41	64	1639
AFRI, Jodhpur	04	10	213
RFRI, Jorhat	06	21	111
HFRI, Shimla	17	23	781
IFP, Ranchi	17	17	758
IFB, Hyderabad	05	05	186
Total	**234**	**521**	**12082**

Training on Livelihood Generation at Goalpara under VVK Assam

Training on Bamboo Nursery and Management

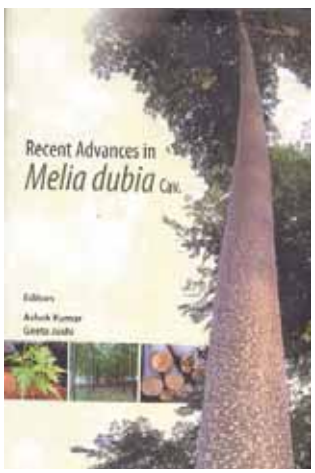
Training on "Bhimal Fibre Extraction" by FRI

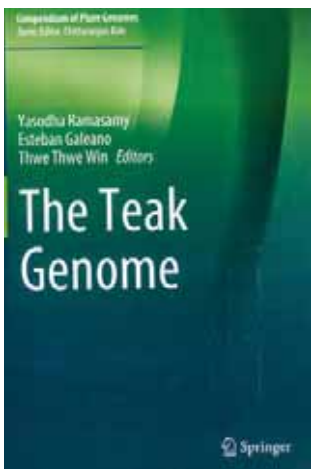
Training on Cultivation of Important Medicinal Plants: An option of Augmentation of Local Communities Income

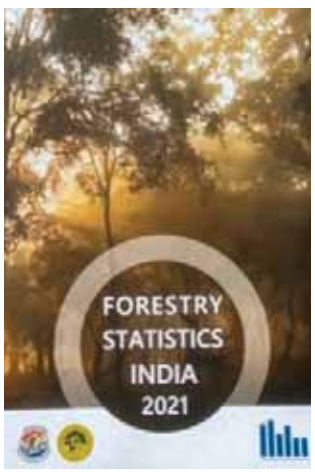
Training on Management of Bamboo and Tree Improvement at FRI

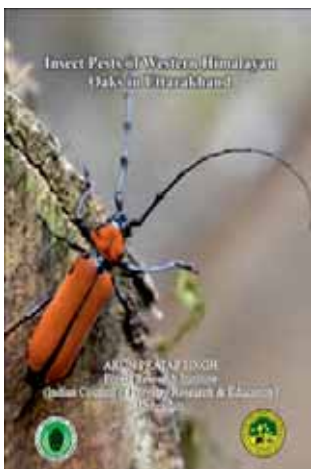
4.8. RESEARCH PUBLICATIONS

HQ/ Institutes	Books	Booklets/ Brochure/ Bulletins/ Phamphlets	Article in Seminars/ Conferences/ Workshops etc.		Popular Article	Research Papers in Journals		Chapters in Books/ Proceedings
			Articles	Abstracts		Foreign	Indian	
ICFRE HQ	02	-	-	03	-	05	06	02
FRI	03	11	05	10	03	46	79	39
IFGTB	08	08	16	09	23	29	34	18
IWST	02	03	-	19	35	26	30	09
TFRI	01	05	-	28	21	16	37	03
AFRI	02	44	-	19	16	02	04	01
RFRI	06	07	-	04	02	08	14	08
HFRI	01	03	-	38	13	13	21	09
IFP	02	03	04	-	-	06	08	02
IFB	16	04	-	04	01	02	02	01
Total	**43**	**88**	**25**	**134**	**114**	**153**	**235**	**92**









4.9. SEMINARS/SYMPOSIA/WORKSHOPS ORGANIZED

HQ/ Institutes	No. of Seminars/ Symposia/ Workshops/ meetings organized	No. of days	No. of participants
ICFRE HQ	08	12	376
FRI	23	24	1485
IFGTB	23	24	2291
IWST	23	24	3284
TFRI	11	10	581
AFRI	02	02	110
RFRI	08	13	426
HFRI	11	12	566
IFP	41	45	2450
IFB	06	12	305
Total	**156**	**178**	**11874**

Seminar on Advances in Forest Hydrology: Challenges and Opportunities at FRI

Workshop on TreeGenie at IFGTB

Webinar on Scientific and Technological Achievements at IFB, Hyderabad

4.10. AWARENESS /DEMONSTRATION PROGRAMMES ORGANIZED

Institutes	No. of Awareness/ Demonstration programmes organized	No. of days	No. of participants
FRI	24	32	801
IFGTB	17	17	2104
IWST	01	01	23
TFRI	25	27	1159
AFRI	06	06	325
RFRI	07	11	271
HFRI	13	12	565
IFB	34	83	728
Total	**127**	**189**	**5976**

Awareness program at Khatnol, Shimla

Awareness programm at Dhaluwala Kalan, Haridwar

4.11. CONSULTANCIES

ICFRE (HQ)

- During the year 2021-22 works on fifteen environment related consultancy projects, awarded by various Govt. PSUs and Non Govt. organization. Among the ongoing scientific consultancy projects seven projects were awarded and initiated.
- A total of ten scientific consultancy study reports pertaining to environmental audit and carring capacity etc. for various stakeholders and five observations on the R&R Plan Reports related to Bellary, Chitradurga and Tumkur districts of Karnataka under ongoing consultancy projects were prepared and submitted to project authorities. Nine on-going scientific consultancy projects were closed during the year 2020-21. Revenue of approx. Rs. 3.15 crores generated.

IFGTB, Coimbatore

- Developing High Yielding Clones and Breeding Orchards of *Casuarina* and *Leucaena* to Increase Plantation Productivity in Andhra Pradesh (Funded by Andhra Paper Limited, Rajahmundry, Andhra Pradesh)
- Developing Clonal Seed Orchard of *Casuarina equisetifolia* with Superior Clones to Produce Genetically Improved Seeds for the Farm Forestry Programmes (Funded by Seshasayee Paper and Boards Limited, Erode, Tamil Nadu)
- Sustainable Pulpwood Production through High-Yielding Varieties of Nitrogen Fixing and Drought Tolerant Trees (Funded by the Tamil Nadu Newsprint and Papers Limited, Tamil Nadu).

IWST, Bengaluru

- Development and standardization of non-destructive method for detection of anomalies using ultrasonic techniques in wood logs (by M/S Wipro Limited, Bangalore).

TFRI, Jabalpur

- Development of SOP for developing Quality Planting Material (QPM) of forestry species in Odisha awarded by Odisha SFD
- Implementable forestry research for ash utilization promotion and development of research park at APML, Gondia-Adani Power Maharashtra Limited, Maharashtra
- Pilot study on Raising short rotation forestry crops for intermittent periods at Dubna-Sakradhi Iron and manganese ore mines in Keonjhar district of Odisha". Odisha Mining Corporation Limited, Odisha
- Study of flora and fauna and preparation of Wildlife Conservation Plan including endangered species if any and comprehensive study of the impact of mining on the wildlife for Rajendra UG and Damini mine, SECL Sohagpur Area (Madhya Pradesh) for SECL, CIL.
- Preparation of Wildlife Conservation Plan for Endangered Species found in and around Dhelwadih UG, Bagdeva UG and Singhali UG mines of DSB Sub Area, SECL Korba Area (Chhattisgarh) for SECL, CIL.

AFRI, Jodhpur

- Preparation of DPR for Restoration of Degraded Land in the Aravali zone (Funded by MoEF&CC, Govt. of India).

RFRI, Jorhat

- "Feasibility study on entreprenurship model of muga food plantation through vegetative nurseries" under an ongoing World Bank project - Assam Agribusiness and Rural Transformation Project **(**funded by Dept. of Sericulture, Govt. of Assam).
- Augmentation of Agarwood production in *Aquilaria malaccensis* Lamk. in Tripura through fungal technology (Funded by Tripura Forest Department under CAMPA scheme).
- Artificial inoculation of agarwood in 500 agar trees of North Bengal. (Funded by West Bengal Forest Department).

HFRI, Shimla

- In PBR consultancy project, block and district level PBRs of Shimla (11 blocks) and Solan (3 blocks) prepared for submission to HPSBB.

IFP, Ranchi

- Technical Assistance for setting up of Tissue Culture Laboratory at Garkhatanga, Ranchi (Funded by SFD, Jharkhand).
- Study for assessment of damage and calculation of environmental compensation from legally and illegally operated stone mines in Birbhum districts (Funded by West Bengal Pollution Control Board, Kolkata).
- Development of Standard Operating Procedures for Developing Quality Planting Material for State Forest Department, Odisha.
- Eco-restoration on mined out areas and waste dumps at Meghahatuburu iron ore mines, SAIL, in Saranda Forest Division, West Singhbhum, Districts of Jharkhand.

- Top Soil Conservation and Eco-Rehabilitation of Selected Degraded Coal Mines of Central Coalfield Limited, Jharkhand through Forestry Intervention.

IFB, Hyderabad

- Peoples' Biodiversity Registers (17 Gram Panchayats) for Andhra Pradesh State Biodiversity board were prepared and submitted to Andhra Pradesh State Biodiversity.
- Study of assessment of ecological damage including the cost of river bed material, cost of ecological restoration, and NPV of future ecosystem services foregone on account of illegal mining sites in Subarnarekha River in Odisha and West Bengal.

4.12. TECHNICAL SERVICES

4.12.1. Monitoring and Evaluation

FRI, Dehradun

- Monitoring & evaluation of plantations (Punjab – CAMPA & UK-CAMPA) projects, sale of quality seed of various forestry species and medicinal plants to state forest departments and other stakeholders.Total revenue Rs.83,51,700/- was generated.

HFRI, Shimla

- Prepared report on the issue of Pine mortality under Nahan Forest Division and submitted their report to the DFO, Nahan.
- Conducted Post Entry Quarantine inspection of walnut whip plants imported by Pyramid Seeds, Namdeo Umaji Agritech (I) Pvt. Ltd. at Budgan, Jammu and Kashmir (UT).

Preparation of DPRs of 13 major Indian rivers

The DPRs of rejuvenation of thirteen major Indian rivers namely Jhelum, Chenab, Ravi, Beas, Sutlej, Yamuna, Brahmaputra, Luni, Narmada, Godavari, Mahanadi, Krishna, and Cauvery through forestry Interventions were released by the Hon'ble Minister, Environment, Forest and Climate Change, GoI on 14 March 2022.

The task of prepration of DPRs was entrusted to Indian Council of Forestry Research and Education (ICFRE) by NAEB, MoEF&CC, Govt. of India

The timely and effective implementation of the proposed forestry interventions as envisaged in DPRs of 13 major Indian Rivers are expected to significantly contribute towards rejuvenation of the rivers in terms of ensuring *Aviral Dhara*, *Nirmal Dhara* besides *Swachh Kinara*, improved terrestrial and aquatic biota, and livelihoods.

4.12.2. Identification and testing services

IFGTB, Coimbatore

- Technical services were rendered for the analysis of physico-chemical properties of 1150 nos. of soil, litter and water samples received from various projects handled by the Institute.
- Provided plant identification services to various institutions under Biological diversity Act 2002.

IWST, Bengaluru

- A total number of 77 wood samples tested for wood identification, 54 wood samples for wood moisture content and 49 samples for wood density, 87 for mechanical properties, 10 sandalwood oil samples and 5 wood samples for chemical analysis. Total revenue generated was Rs. 12.36 lakhs.

FRI, Dehradun

- Identified 113 wood samples received from various organizations including Police, Customs, Intelligence Officer, Divisional Forest Officer, Dy. Central Vigilance Officer, CPWD, Ordnance Factory, MES, Prasar Bharati, PGCIL, NTPC, Railway, NBCC and private firms and Rs.13,75,000/- revenue generated.
- Identified 16 plant samples received from different organization/universities and amount of Rs. 9,440/- revenue generated.
- Tested two samples received from Forest Division, Haldwani for Rasin based on physicochemical characteristics and an amount of Rs. 11800/- was realized.

IFP, Ranchi

- The institute is providing soil analysis services to various agencies. In all, 2026 soil samples have been analyzed and generated revenue of Rs. 4,46,000/-.

4.13. ADVISORIES GIVEN TO SFDS AND OTHER STAKEHOLDERS

TFRI, Jabalpur

1. Suitable recommendations suggested for white grub infestation in teak nursery at Kanchangaon range, M.P.
2. Suitable recommendations suggested to manage sal heartwood borer outbreak in sal forest at Kondagaon range, C.G.
3. An advisory was issued for effective control measures for drying of teak seedlings and infestation of teak skeletonizer, termite attack in plantation at Durgapur, Bargi and Saliwada, Jabalpur.

4.14. RADIO/TV TALKS

- FRI delivered 16 Radio Talks on All India Radio
- RFRI delivered 05 on All India Radio
- HFRI delivered 06 TV Talks on Door Darshan and ETV
- IFGTB delivered 01 Radio Talk on Rathinavani Community Radio

4.15. ACTIVITIES OF RAJBHASHA

ICFRE is actively engaged in promoting Rajbhasha Hindi across the ICFRE Headquaters and its Institutes. Following are the regular activities conducted pertaining to implementation of Rajbhasha Hindi:

- 36 Quarterly meetings of Official Language Implementation Committees.
- 24 Quarterly training workshops on implementation of official language Hindi.
- Rajbhasha inspections of subordinate offices.

ICFRE and its Institutes enthusiastically observed Hindi Day/Week/Fortnight during the month of September 2021. IFP, Ranchi celebrated Vishwa Hindi Diwas on 10 January 2022.

The best performance in implementation of Rajbhasha Hindi amongst the institutes during a year is awarded by "ICFRE Rajbhasha Puraskar". The award for the year 2020-2021 was conferred to HFRI, Shimla amongst the institute situated in "A" region and to IFGTB, Coimbatore amongst the institute situated in "C" region.

TFRI received award from TOLIC, Jabalpur for commendable work of Hindi implementation in this institute, etc. during 2021-22

In addition to R&D publications periodicals such as ICFRE annual Hindi magazine Taruchintan, monthly Vaniki Samachar, e- magazine Van Anusandhan, AFRI Darpanand Hindi – Asamese bilingual magazine Varsharanyam were published regularly.

ICFRE observed Hindi Fortnight 2021

4.16. VISITS OF DIGNITARIES

- Shri Giriraj Singh, Hon'ble Minister of Rural Development & Panchayati Raj, Government of India visited IWST, Bangalore on 25 September 2021.
- Shri Prahlad Singh, Hon'ble Union Jal Shakti Minister visited FRI on 9 October 2021.
- Hon'ble Chief Minister of Assam, Dr. Himanta Biswa Sarmah visited RFRI, Jorhat on 19 August 2021 along with three Hon'ble Cabinet Ministers *viz*., Dr. Ranuj Pegu, Shri Atul Bora and Shri Jogen Mohan; two Hon'ble Members of Parliament *viz*., Shri Kamakhya Prasad Tasa and Shri Tapan Gogoi; four Hon'ble Members of Legislative Assembly *viz*., Shri Hitendra Nath Goswami, Smt. Renupoma Rajkhowa, Shri Bhaben Bharali and Shri Pradip Hazarika apart from Deputy Commissioner; DIG, Eastern Range and Superintendent of Police, Jorhat.
- Shri T. J. Lalnuntluanga, Hon'ble Minister of State, Environment, Forests & Climate Change, Govt. of Mizoram along with Sh. Jitendra Kumar, Principal Secretary and PCCF visited FRCBR, Aizawl, Mizoram on 26 February 2022. The Hon'ble Minister released a Digital Versatile Disc (DVD) on Artificial Pollination of Orchids.
- Shri Arjun Ram Meghwal, Hon'ble Union Minister of State for Parliamentary Affairs & Culture, Govt. of India, visited AFRI, Jodhpur on 14 October 2021.
- Shri Sukhram Bishnoi, Hon'ble State Minister for Forest and Environment, Govt. of Rajasthan visited AFRI, Jodhpur on 9 November 2021.
- Shri Suresh Bhardwaj, Hon'ble Minister of Urban Development, Town & Country Planning, Housing, Parliamentary Affairs, Law and Legal Remembrance, Cooperation Minister, HP; visited HFRI, Shimla during the Multi-disciplinary International Conference on Indian Culture, Science and Traditions organized by HFRI, Shimla in collaboration with Degree & PG Colleges of HP and Haryana from 13 to 15 November 2021 at HFRI Campus.
- Shri Chow Chowna Mein, Deputy Chief Minister of Arunachal Pradesh visited RFRI, Jorhat on 4 March 2022. During his visit, he inaugurated "Vacuum Pressure Impregnation Unit" as well as "Herbarium Unit" at RFRI, Jorhat.
- Shri Mrinal Saikia, Hon'ble MLA, Khumtai, Golaghat visited RFRI, Jorhat on 13 September 2021.
- Parliamentary Standing Committee on Science & Technology, Environment & Forests and Climate Change visited FRI, Dehradun on 23 November 2021.
- His Excellancy Mr. Thomas Selby Pillayon, High Commissioner of Republic of Seychelles visited FRI, Dehradun on 24 September 2021.
- Shri K.P. Dubey, IFS, Principal Chief Conservator of Forests (Research), Uttar Pradesh visited IFP, Ranchi on 25 March 2022.
- Dr. V.K. Bahuguna, Ex-Director General, ICFRE a special guest visited TFRI, Jabalpur on 5 November 2021.
- Dr. Ashwani Kumar Sharma, I.A.S., Special Secretary, Department of Health and Family Welfare, Government of Himachal Pradesh visited HFRI, Shimla on 20 December 2021.
- Shri B. Kalyan Chakravarthy, Principal Secretary to the Govt. of Assam visited RFRI, Jorhat on 29 September 2021.
- Mr. Deepak Singh, IAS, Chief Forest Secretary, Government of Bihar, visited IFP, Ranchi on 13 December 2021.
- Chief Secretary, Himachal Pradesh and the Addl. Chief Secretary (Forests, GoHP) visited to the Western Himalayan Temperate Arboretum (WHTA) being established by HFRI, Shimla on 23 March 2022.
- Shri Deepak Kumar Kedia, IPS, Inspector General of Police, Assam along with Shri Ankur Jain, IPS, Superintendent of Police, Jorhat visited RFRI, Jorhat on 18 July 2021.
- Dr. Panjab Singh, Chanceller of Rani Laxmibai Bundelkhand Agricultural University, Jhansi visited TFRI, Jabalpur on 31 December 2021.
- Lt. Gen (Dr) A K Misra, AVSM (Retd) Vice Chancellor of Manglayatan University visited TFRI, Jabalpur on 17 December 2021.
- Professor P.C. Trivedi, Vice-Chancellor of JNVU, Jodhpur visited AFRI on 27 July 2021.
- Dr. Onkar Nath Singh, Vice-Chancellor, Birsa Agricultural University, Ranchi, visited IFP, Ranchi on 24 September 2021.

4.17. AZADI KA AMRIT MAHOTSAV

Azadi Ka Amrit Mahotsav is an initiative of the Government of India to celebrate and commemorate 75 years of independence and the glorious history of it's people, culture and achievements. The official journey of Azadi Ka Amrit Mahotsav commenced on 12 March 2021 till 31 March 2022, institutes of ICFRE conducted 167 events like Tree growers mela, River rejuvenation programmes, Birsa Munda Jayanti, Avoid of single use plastics, Celebration of Important days, Awareness programmes, Tree plantation campaigns, Cycle rallies, Cleanliness drives, Lectures, Training, Seminars, Competitions etc.

Institute	Events Conducted
FRI	37
HFRI	13
TFRI	11
AFRI	11
RFRI	9
IWST	18
IFGTB	20
IFP	30
IFB	19

Total No. of Activities Performed from March 2021-March 2022: 167

- Webinar/Seminar – 63
- Training/Skill Development – 30
- Competition (Quiz/Painting/Photo/ Poster/Essay/ Elocution) – 12
- Awareness Programme (/Plantation/Visit/Sensitization) – 17
- Conference/Workshop – 09
- Tree Growers Mela – 05

Advances in Forest Hydrology Challenges and Opportunities at FRI, Dehradun

Training programme on High-tech Forest Nurseries for officials of Forest Department of Sri Lanka

Training on Bamboo Shoot Processing & Value Addition at RFRI, Jorhat

Bamboo handicraft- Bamboo production & value addition for self-employment

International coast line cleanup day celebrated at Sagar Nagar beach by FRC-CE, Visakhapatnam

Establishment of Clonal Demo Plantations

Birsa Munda Jayanti

On the occasion of birth anniversary of Birsa Munda IFP, Ranchi and TFRI, Jabalpur celebrated "Birsa Munda Jayanti" under the celebration Azadi ka Amrit Mahotsav to commemorate his contribution in the tribal freedom struggle.

TFRI: Celebrating Birsa Munda Jayanti

IFP, Ranchi celebrating Birsa Munda Jayanati

ICONIC WEEK – "Avoid Single use plastic"

Single use plastic is a grave global environmental concern as it is polluting water, soil and air. MoEF&CC allocated the week of 4 to 10 October 2021 as Iconic Week under 'Azadi Ka Amrit Mahotsav' celebrations for holding paradigmatic and impactful events and keeping in view the clarion call of the Hon'ble Prime Minister to phase out single use of plastics by 2022 ."Awareness programmes to avoid the use of single use plastic" is identified as one of the themes. ICFRE conducted 15 activities during the week including lectures, cleanliness drives and awareness programmes.

Awareness programme at FRC-LE Agartala

Awareness programme at TFRI, Jabalpur

Cleanliness drive organized by IFP Ranchi

Awareness Drive by HFRI Shimla

"Celebrating Rivers of India"

To instigate awareness among the students and locals of the area and to keep the river and its surroundings clean various events were organized by different regional institutes of ICFRE under the theme **"Celebrating Rivers of India"**. On this occasion lectures, essay writing and quiz competition were organized by different institutes. "Cleaning of surroundings near river Narmada" was organized by TFRI.

Students Campanign for Cleaning River Narmada

Cleaning River Narmada

Special Activities (Observing Van Mahotsav, Forestry Day and Other Important Days)

ICFRE and its Institutes/Centres observed national days i.e. Independence Day, Republic Day and Gandhi Jayanti with great enthusiasm. In addition, other important days were also observed by the Council such as World Wetlands Day, World Earth Day, International Biodiversity Day, World Environment day, World Day to Combat Desertification, International Yoga Day, Van Mahotsav, International Mangrove Conservation Day, Himalayan Day, National Forest Martyrs Day, International Ozone Day, World Bamboo Day, International Coastal Cleanup Day, World Soil Day, National Unity Day etc.

DG, ICFRE administering Ekta Diwas pledge at ICFRE, Dehradun

DG, ICFRE offering floral tribute at Forester Memorial at FRI, Dehradun

Releasing a poster on the occasion of IBD-2021 at IFGTB, Coimbatore

International Mountain Day celebration at HFRI, Shimla

Celebration of World Forestry Day at FRI, Dehradun

Good Governance Week at HFRI, Shimla

DG, ICFRE planting a seedling during Van Mahotsav at FRI, Dehradun

Van Mahotsav at HFRI, Shimla

Van Mahotsav at IFP, Ranchi

International Yoga Day 2021 at HFRI, Shimla

Van Mahotsav at RFRI, Jorhat

World Soil Day 2021 at IFGTB, Coimbatore

Cleanliness campaign by ICFRE and its Institutes/Centres

ICFRE and its institutes/centres implemented Swachh Bharat Abhiyan during the month of October 2021. The cleanliness drive was started with taking pledge for cleanliness and activities like cleaning of the campuses and nearby areas, e-waste disposal, awareness programme etc. were conducted.

DG, ICFRE administering the cleanliness pledge at ICFRE, Dehradun

Cleanliness programme at FRI, Dehradun

Cleanliness campaign at Government School in Ranchi by IFP, Ranchi

Cleanliness drive at IFGTB, Coimbatore

Vigilance Awareness Week

Vigilance Awareness Week was celebrated across the ICFRE and its Institutes/Centres from 26 October to 01 November 2021. The celebrations initiated with Integrity Pledge administered to all ICFRE personnel followed by other activities

Vigilance Awareness Week at ICFRE, Dehradun

Vigilance Awareness Week at TFRI, Jabalpur

4.18. OTHERS EXTENSION ACTIVITIES

- **Participation in Melas**
  - ICFRE and Institutes participated in Vigyan Sarvathra Pujyate–A Mega Exposition showcasing various achievements in Science and Technology at New Delhi.
  - TFRI, Jabalpur participated in various exhibitions like Agro-vision at Nagpur and "International Herbal Fair" at Bhopal.
  - HFRI, Shima participated in Kisan Mela organized by Rice and Wheat Research Centre, Malan, Kangra (CSKHPKV, Palampur), in "Exhibition: Destination Himachal Pradesh – 2021" at Himachal Pradesh. In an exhibition of technologies, products and services linked to livelihood hosted by the Forest Department, J&K UT at Convention Centre, J&K.
- Registration of six clones of Casuarina and one clone of Eucalyptus with PPV&FRA under the Protection of Plant Varieties and Farmers Rights Act, 2001 by IFGTB, Coimbatore.
- Programme through AYUSH "AYUSH AAPKE DWAR" was organized at Environmental Research Station, Sukna at Uttar Banga Agricultural University (UBKV), Kheribari and Rajkot (Siubar) village of Naxalbari Block of West Bengal by IFP, Ranchi and by IFGTB, Coimbatore in association with Centre for Urban Biodiversity Conservation and Educaction. The importance and uses of medicinal plants were explained and plants were distributed.

'Ayush Aapke Dwar'

4.19. NATIONAL FOREST LIBRARY AND INFORMATION CENTRE (NFLIC)

The NFLIC is richest in document collection on forestry and allied sciences in South and Southeast Asia. It has been providing all types of library and information services, *viz*, reference, referral, lending, reprography, current awareness, inter-library loan, retrieval of information from Online Public Access Catalogue, etc. to its users. During the year (2021-22), 6368 books were loaned to the users for outside reading, Besides 14239 documents consulted inside the library.

The document collection of the NFLIC was enriched by the addition of 933 latest books and other documents. The NFLIC subscribed 40 Indian periodical titles and 382 issues of the periodicals were received as gratis.

During the year 144 books and 4 DVD were sold to the State Forest Departments, universities, etc. and generated revenue of Rs. 21017.

4.20. ENVIRONMENTAL INFORMATION SYSTEM (ENVIS)

IFGTB, Coimbatore

Details of the Tree genetic resources established and maintained in the form of *in situ* conservation stands and *ex situ* field trials maintained by SFDs were collected and incorporated into the FGR database. A database on the available forest genetic resources with various stake holders in south India is maintained in the website www.ifgtbenvis.in.

Published the quarterly newsletter *"Van Vigyan"* (ISSN: 2394-7543).

Various awareness programmes were organized digitally on the occasion of Green Days. In addition, online awareness programmes like webinars, quiz programmes, online elocution competitions, photography competitions, Essay competitions and painting competitions were organized for students and public. Prizes were awarded to the winners and E Certificates to all the participants. These awareness programmes were also registered in the respective global networks. Periodical updates were done in the Mobile Apps released by IFGTB ENVIS, Tree Pests of India and Forest Tree Diseases (English and Tamil version).

CHAPTER

05

ADMINISTRATION AND INFORMATION TECHNOLOGY

CHAPTER 05

ADMINISTRATION AND INFORMATION TECHNOLOGY

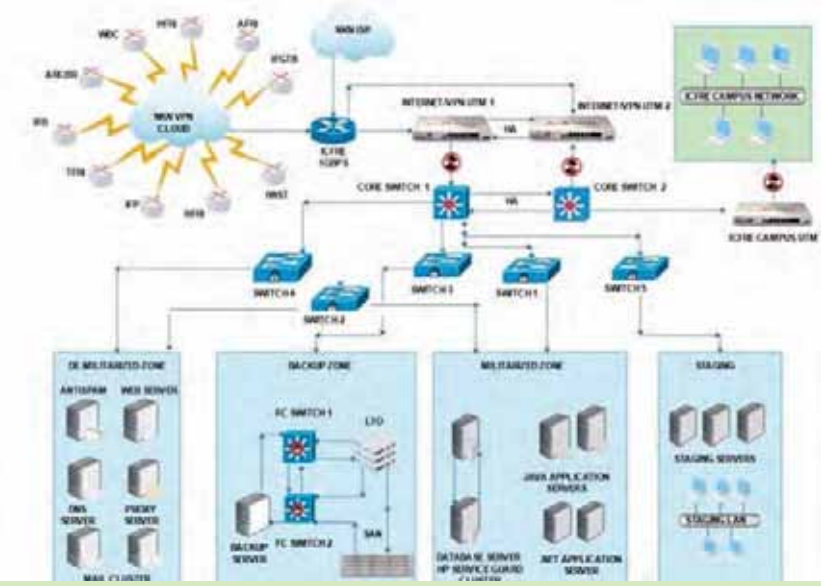
5.1. INFORMATION TECHNOLOGY

Information Technology Division at ICFRE HQ plays an important role in supporting research, administrative and other activities. ICFRE is using Information Communication Technology, progressively providing the users 24X7 services to their satisfaction. IT Division caters to the Information Communication Technology needs of all institutes under ICFRE and ICFRE HQ. It is keeping pace with the technological advancement of ICT within the allocated budget to the best possible extent. Apart from providing the regular services, new initiatives are also being taken time to time.

Following new initiatives were taken during 2021-22:

1. ICFRE Data Centre (Server Farm)

ICFRE Data Centre services are available 24*7*365 at ICFRE Head Qtr, ICFRE Institutes and Centres across the country since 01.02.2010. Some of services provided by Data Centre are Mail, Internet, Web, Video conferencing, Antivirus, FTP, Network Security System, Databases, Building Management System (BMS), Virtual Private Network (VPN) services, Push Mail Service, Web casting etc. Total 71 Web applications/websites are hosted on Data Centre and 1890 active email accounts are there on the Mail server. Service Desk and IFRISDESK are Institutional framework for the resolution of issues across ICFRE.



Data Centre Architecture

2. New applications/websites developed / implemented

A. Redesigned and redeveloped ICFRE website: The website of ICFRE has been redesigned and redeveloped by embedding the social media accounts of ICFRE on Home page. Facebook account (https://www.facebook.com/ICFREIndia) and twitter account (https://twitter.com/IcfreIndia) of ICFRE had been embedded on the home page of ICFRE. The links of other social media accounts i.e. Instagram, Koo, Youtube, Flickr, etc. have also been provided on the top of home page. URL of website of ICFRE is https://icfre.gov.in/ for English and https://hindi.icfre.gov.in/ for Hindi. Also the reports of all the activities conducted by the institutes under Azadi Ka Amrit Mahotsav have been uploaded on the ICFRE website.

Screenshots of ICFRE website in Hindi and English

B. Development of ICFRE Recruitment Portal: ICFRE implemented the portal / application for the recruitment of Scientists in the year 2019. It was decided to modify the existing ICFRE Recruitment Portal with implementation of new functionalities, customization, amendment, modification, activation of payment gateway, security audit from the firm empanelled on Cert-In India and maintenance for a period of one year after successful Go-Live.

New Portal has been redeveloped. Security Audit and user Accepatnce Testing (UAT) of the portal are completed. Portal would be made live after advertisement for the recruitment of scientists.

C. Development of ICFRE Pensioners' Portal: Development of a web and mobile application (ICFRE Pensioners portal) for preparing the pension of ICFRE pensioners and providing the details of pension to the ICFRE pensioners was started in the month of December 2020. During 2021-22 portal has been developed and is being tested.

Screenshot of ICFRE Pension Portal under testing phase

D. Development of Group-C recruitment portal: The online portal for Group-C recruitments for various posts at AFRI developed with the help of RISL, Government of Rajasthan was utilized for management of candidates' data during written exams.

3. **Maintenance of Software Applications/ websites:** Around 60 websites/Database/CMSs/ applications including applications and websites of ICFRE institutes which are on live were maintained and updated time to time.

4. **Updation of website of ICFRE (http://icfre.gov.in):** ICFRE's website is promptly updated as and when new information is received from various divisions. A total of 1330 Website updation were made during 1st April 2021 to 31st March, 2022.

5. **e-Office:** Efforts are on for implementation of eOffice at ICFRE and its institutes. Communications have been made with MoEF&CC to onboard ICFRE in the existing eOffice instance of MoEF&CC.

6. **Video conferencing (VC) Services:** ICFRE is having state of the art Video conferencing facilities at ICFRE HQ. Video Conferencing can be conducted with all the ICFRE institutes as well as with external agencies using Polycom MCU through the VC system as well as the mobile phones. VC sessions can also be conducted through the licensed web platforms Cisco Webex. The management of VCs is being carried out through a web application, developed by IT Division, ICFRE. In total about 300 numbers video conferencing sessions were organized during the period.

7. **Social Media:** Twitter, Facebook, Instagram, Koo, Youtube, Flickr accounts of ICFRE are in operation and links are provided on the Home page of ICFRE website. ICFRE and institutes are maintaining these accounts. During the period under report ICFRE made 324 tweets, 226 Facebook posts, and a number of updates on Instagram, Koo and Youtube. ICFRE also retweeted1330 tweets of relevance.

8. **Operation & Maintenance (O&M) of LAN across ICFRE :** The LAN of ICFRE and its institutes has been maintained successfully during the year 2021-22.

9. **National Knowledge Network (NKN) connectivity:** NKN connectivity has been provided to 12 locations of ICFRE. The National Knowledge Network (NKN) connectivity availability is more than 99% at ICFRE Head Qtr. The 1 Gbps internet leased line is provided by NKN through RailTel India at ICFRE Head Qtr and media for 1 Gbps internet leased line through BSNL is also provided at ICFRE Head Qtr. The internet and other IT services are extended across ICFRE locations throughout the country through NKN.

10. **Installation of EPABX System and upgradtion of LAN:** At RFRI, Jorhat installation of new 150 port EPABX System and successful migration of PBN number of the system as per new technology has been done. Renovation work of LAN in part of Field Laboratory and Main Building upgrading the CAT5 cabling to CAT6 cabling in structured way has been completed. Extension of LAN and provision of Wi-Fi in Library has also been done.

5.2. ADMINISTRATION

The Directorate of Administration deals with preparation of budget estimates allocation of budget preparing annual mandatory financial statements; filing of mandatory financial and administrative returns of ICFRE; disbursement of payments and TDS; it also deals with inventory management and procurement for stores, maintains support service and official infrastructure. Besides handling general administration, the Directorate looks after civil and technical works of the Council and its Institutes. ICFRE Pension cell and ICFRE Pensioners Health Scheme are also administered by the Directorate.

5.2.1. Sevottam

'Sevottam' is an assessment improvement framework targeted to improve the quality of services to the citizens. Sevottam symbolizes the Government's intent to move from 'administration' mind set to 'service orientation' in delivery of public services. It emphasizes the relationship between service provider and service receivers. It is a standardized Services Delivery Excellence Model whose main features are to identify the services provided by the organization, to set norms for each service, to ensure delivery as per norms, to assess quality of delivery on a continuous basis and to proactively redress public grievances.

ICFRE using the framework of 'Sevottam' is committed to continuously improve quality of service in ICFRE (Hq) and its Institutes. ICFRE is a research organization, which mainly deals with the forestry research activities and is also involved in extending the research support to the Forest Department in general and public at large. Therefore, ICFRE is committed to excellence in the field of forestry and environment. This wide range of clientele segmentation necessitates that we have a standard service delivery system that caters to the need of all. The system needs to provide transparency, accountability, reliability, responsiveness and empathy. Based on the guidelines issued by Government and, as a part of the Performance Monitoring and Evaluation System (PMES) for Government Departments, ICFRE has formulated the Citizen Charter for the Council. It is a document, which represents systematic efforts to focus on the commitment of the organization towards its citizens/ clients in respect of standard of services, information, choice and consultation, non-discrimination and accessibility, grievances redressal, courtesy and value for money. It also includes expectations of the organization from the citizens/ clients for fulfilling the commitment of the organization.

5.2.2. Welfare measures for the SC/ ST/ backward/ minority communities

ICFRE (Hq.) and Institutes have the Grievance Redressal Cells for SC/ST/ OBC employees to address the grievances of SC/ST/OBC personnel. A separate committee is in place for addressing the grievances of women personnel.

AT IFGTB, Coimbatore 03 heirs of deceased employee who belong to SC category were given appointment under Compassionate Grounds during year 2021-2022. Also all vacant SC/ST/OBC posts are filled in MTS (Gr.C) category under Direct Recruitment during 2021-22.

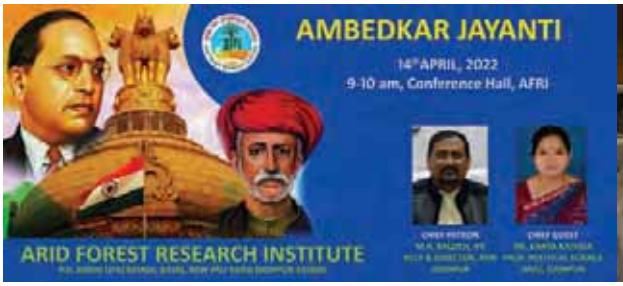
Specific activities performed to extend the green benefits and sensitise the members of these communities. Demonstrated the bioproduct "Tree Rich Biobooster" a waste based potting mixture developed using coir pith waste compost along with bio waste compost, flower waste and vegetable waste composts for application in kitchen garden, terrace garden and other similar applications to the tribes and farmers (60 participants) in the Training programme "Training on Agroforestry and Nursery techniques to SC/ST farmers" organized by Tamil Nadu Forest Department, Madurai and Tamil Nadu Adi Dravidar Housing and Development Corporation (TADHCO), Madurai on 22.3.2022. Trainings were also conducted in tribal areas for awareness about medicinal plants and their uses by TFRI, Jabalpur.

IFP, Ranchi and TFRI, Jabalpur observed Birsa Munda Jayanti and conducted 04 events.

TFRI, Jabalpur observed Birsa Munda Jayanti at Rani Durgawati Samadhi

Celebration of Dr. Ambedkar's 130th Birthday

ICFRE observed the 130th birth anniversary with great respect and sense of gratitude to the legendary Baba Saheb. At AFRI, Jodhpur Shri I.R. Genwa, Principal, ITI, Jodhpur was the chief guest on this occasion. Addressing the gathering he called for taking inspiration from the life of Dr. Ambedkar and to make India a strong nation by observing rights and duties as given in the constitution.



5.2.3. Welfare measures for women

ICFRE is committed to welfare of women. Committees to address the women issues are functional at headquartes and at institutes. Members of women cell meet and discuss rules and guideline concerning women employee at workplace. Grievances, if any, were addressed as and when arise.

At IFGTB, Coimbatore various welfare measures for the women employees were taken up including allocation of a women friendly common room “Vasudha”. Two incinerators were installed in ladies rest room for effective disposal of feminine hygiene products. Gender sensitization programs including a HRD training on “Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 was organized.

International Women’s day was celebrated across the ICFRE Institutes on 8th March 2022. At AFRI, Jodhpur all women employee attended this programme. A talk was delivered regarding women cell and its aims. Rights of women employee at workplace were explained. Women field workers were also honoured on this occasion.

TFRI, Jabalpur organized “International Women’s Day 2022” with the theme “Break The Bias”. Dr. Pragya Dhirawani, MBBS, DGO, Jabalpur Hospital & Research Center, was the Chief Guest of the function. She while sharing her experience as a doctor expressed concern that despite lots of education and laws by government the issue of female foeticides is still very critical. She emphasized that a woman can be empowered by the cooperation among the women themselves.

IFP, Ranchi on this occasion organized an awareness programme on लिंग भेदभाव के विरूद्ध महिला सशक्तिकरण. Around 70 people including 50 women attended the programme.

HFRI, Shimla, observed ‘International Women’s Day’. On this occasion Dr. Shramja Munjal, Associate Professor, Department of Botany, St. Bede’s College Shimla as a keynote speaker delivered a very informative and interesting lecture on ‘Women Empowerment In Science’ in conference hall of the Institute. About 80 participants attended the event.

Celebration of International Women's Day at AFRI, Jodhpur

Celebration of International Women's Day at HFRI, Shimla

5.2.4. Creating awareness to the constitution

India adopted constitution on 26 November 1949 and it came into force on 26 January 1950. To commemorate the occasion of the 72nd year of the adoption of the constitution "Constitution Day" was celebrated across all ICFRE institutes under Azadi ka Amrit Mahotsav on 26th November, 2021. 11 Events such as Oath ceremony, Preamble reading, Talks on Indian Constitution were organized in different institutes of ICFRE in which Directors, Scientists, HoDs and staff took part with great enthusiasm.

Constitution Day at IFP, Ranchi

Constitution Day at AFRI, Jodhpur

Reading Preamble of our Constitution on Constitution Day at ICFRE, Dehradun

5.2.5. Information on the status of activities under "The Rights of Persons with Disabilities Act, 2016" during the year for the persons with Disabilities

1. Information about total budget provision of the Ministry/ Department for 'Persons with Disabilities'

No separate budget provision is made for persons with disabilities

2. Allocation under various schemes for the benefit of persons with Disabilities, the amount released and the amount utilized.

Rs. 17,91,891/- has been paid to persons with Disabilities as double Transport Allowance.

3. The number of beneficiaries with Disabilities and their percentage in relation to the toal number to beneficiaries.

Number of beneficiaries with disablities – 24 out of 1403 employees i.e., 1.71%.

BALANCE SHEET

BALANCE SHEET

INDIAN COUNCIL OF FORESTRY RESEARCH AND EDUCATION
DEHRADUN

BALANCE SHEET
2021-22

Sudarshan Sharma & Co.
Chartered Accountants

Independent Auditor's Report

The Members'
Indian Council of Forestry Research and Education
PO: New Forest, Dehra Dun

1. REPORT OF FINANCIAL STATEMENTS

We have audited the attached Balance Sheet of the **"Indian Council of Forestry Research and Education,** a society registered under the Societies Registration Act 1860**, Post New Forest, DEHRA DUN-248006** as 31st March 2022 and also the annexed Income & Expenditure Account for the year ended 31.03.2022 on that date. These financial statements are the responsibility of the management of society. Our responsibility is to express an opinion on these financial statements based on our audit.

2. RESPONSIBILITIES OF MANAGEMENT AND THOSE CHARGED WITH GOVERNANCE FOR FINANCIAL STATEMENTS

Management is responsible for the preparation and presentation of these financial statements that give a true and fair view of the financial position and financial performance of the entity in accordance with the accounting principles generally accepted in India.

3. AUDITORS' RESPONSIBILITY

We conducted the audit in accordance with auditing standards generally accepted in India. These standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statement. An audit also includes assessing the accounting principles used and significant estimates made by the management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

4. OPINION & IT'S BASIS

We enclose in the Annexure a statement on the matters specified in paragraph 5 of the report.

S-9, Tula's Palace, Araghar, Dehradun-248001

5. FURTHER TO OUR COMMENTS IN THE ANNEXURE REFERRED TO ABOVE, WE REPORT THAT

(i) We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purpose of our audit;

(ii) The Balance Sheet, Profit and Loss Account and the Cash Flow Statement dealt with by this report are in agreement with the books of account kept by Society.

(iii) Without qualifying our opinion, we invite attention to the following notes to Annexure

(iv) In our opinion and to the best of our information and according to the explanations given to us, the said accounts give the information required as per applicable law, in the manner so required and give true and fair view in conformity with the accounting principles generally accepted in India:

a. In the case of Balance Sheet, of the state of Society affairs, as at 31.03.2022 and;

b. In the case of the Income & Expenditure Account of the Society, Excess of Income over Expenditure of the Society for the year ended 31.03.2022.

For M/s Sudarshan Sharma & Co.,
Chartered Accountants

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

Date: 07/11/2022
Place: Dehra Dun

(Anand Singh Rawat)
Partner, M. No. 077616, FRN 09222C

-9, Tula's Palace, Araghar, Dehradun-248001

Sudarshan Sharma & Co.
Chartered Accountants

NOTES ON ACCOUNT

These notes form an integral part of and should be read in conjunction with the accompanying financial statements.

GENERAL

The Indian Council of Forestry Research and Education (the "Society") is incorporated under The Societies Registration Act, 1860 The address of its registered office is at Post New Forest, Dehra Dun, Uttrakhand -248006. The Society has 18 Branches/Sections across India and works under different trade names but is governed by the Society.

1. ACCOUNTING CONVENTION

These financial statements are prepared on an accrual basis of accounting under historical cost convention in accordance with generally accepted accounting principles in India.

The preparation of financial statements requires estimates and assumptions that affect the reported amount of assets, liabilities, revenue and expenses during the reporting period. Although such estimates and assumptions are made on a reasonable and prudent basis taking into account all available information, actual results could differ from these estimates & assumptions and such differences are recognized in the period in which the results are crystallized.

2. BASIS OF ACCOUNTING

The financial statements have been prepared under the historical cost convention, except as disclosed in the accounting policies below. Society has adopted an accrual system of accounting during the year.

3. PROPERTY PLANT & EQUIPMENT

a. Tangible assets are carried at historical cost less accumulated depreciation/ amortization.

b. Society is maintaining fixed assets at its branch level and fixed assets register is duly maintained at the branch level. The fixed assets register carries the original value, there is no system to show depreciation in that register. Due to the non-maintenance

of the ledger book by the branches, the written-down value could not be verified from the books of account of the branch. The depreciation is continuously charged at the consolidation level and the value of depreciation is not put in the books of account.

c. Society has purchased various capital assets in Externally Aided Projects, which the society did not recognize as a capital assets of the society till ownership lies with the funding agency.

4. DEPRECIATION

a. Society has charged depreciation on the "Written Down Value" method and adopted the current rate of depreciation as applicable under Income Tax Act 1961.
b. Since assets purchased under EAP are put separate and did not include fixed assets of Society, therefore depreciation in respect of such assets is kept outside of the purview of depreciation.

5. REVENUE RECOGNITION

Revenue for the Society comprises the fair value of the consideration received or receivable for the sale of goods and rendering of services, net of goods and services tax, rebates and discounts, Government Grants, and externally aided projects.

Revenue is recognized as follows:

(a) Sale of goods Revenue from the sale of goods is recognized when a entity has delivered the products to the customer, and the customer has accepted.
(b) Rendering of Consultancy Services is recognized over the period in which the services are rendered, by reference to the completion of the specific transaction assessed on the basis of the actual service provided as a proportion of the total services to be performed.
(c) Interest income: Interest income is recognized on a time-proportion basis using the effective interest method.
(d) Rental income Rental/House License Fees are recognized on a cash basis.
(e) Government Grant is recognized only after approval from Central Government. The nature of the grant received from Central Government is of an assistance nature.

6. RESEARCH AND DEVELOPMENT

The main object of Society is research and development in Forestry. The principles and methods of determining the Research and

Development Costs and their classification are not found in the financial accounting of the Society.

7. RETIREMENT BENEFITS

Society has adopted various schemes for benefit of retired employees but none of the schemes is running as per prevailing applicable law.

8. PRIOR PERIOD ADJUSTMENT

Since the society has adopted an accrual system of accounting during the year, the expenses related to the prior period are set off against Capital Fund.

9. CONTINGENT LIABILITIES

Society did not recognize contingent liability during the year.

10. TAXATION

Society is registered u/s 12A(b) under Income Tax Act 1961, which allows an institution exemption from Income Tax on complying with requirements stated u/s 12A(b) of the Income Tax Act 1961. The society has duly complied provision of Section 12A(b) during the year.

11. OTHER NOTES

Previous year figures have been regrouped and recast wherever necessary.

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

S-9, Tula's Palace, Araghar, Dehradun-248001

Sudarshan Sharma & Co.
Chartered Accountants

ANNEXURE - KEY AUDIT MATTERS:

1. MAINTENANCE OF RECORDS

ICFRE has issued illustrative guidelines for the maintenance of records with effect from 01.04.1992, but we found in following defects in the guidelines set the maintenance of records:

a. Non-Maintenance of General Ledger:
Clause, I of the illustrative guidelines carry a provision that
"The records are to be maintained on a double entry system w.e.f. 01-04-92 to facilitate the preparation of accounts accordingly. Therefore, each Drawing & Disbursement Officer will maintain the following records:-

Cash Book:
General Ledger"

The practice of maintaining a General Ledger is not adopted by Society.

b. Non-Preparation of Trail Balance

Clause VI of the illustrative guidelines carries a provision of "Preparation of Monthly Trail Balance.

But the Society did not adopt the practice of preparation of Trail Balance to date. In a double-entry system, maintenance of the Ledger is essential. Without preparation of Trial Balance, the object to follow a double-entry accounting system cannot be achieved.

2. COMPLIANCE UNDER GST ACT 2017

The Society is registered under GST Act 2017 and the society has taken multiple registrations at the location of institutes of the Society. None of the institutes is having updated knowledge about the various provisions of the GST Act. None of the institutes has filed the correct return under GST Act in respect of the supply of services and goods made by them. The Society is providing Consultancy Services to various organizations, but the showing them as a Supply of Service at the time of receipt of money, whereas the same should be kept under advance money, till the supply of service is progressively completed. There is an immense need for improvement and legal updates and time-to-time monitoring GST return filing system of all the branches.

S-9, Tula's Palace, Araghar, Dehradun-248001

The management of Society in its reply stated that the capacity building program on GST has been organized by the council and it is decided to prepare a common booklet for all compliances related to GST and applicable to the council and the same will be given to all the institutes.

3. POST-EMPLOYMENT BENEFITS TO RETIRED EMPLOYEES

The Society is running a separate wing under name of PENSION CELL for the schemes applicable to benefits of retired employees. The society is running the following schemes under Pension Cell and we observed shortcomings of serious nature, which remain unnoticed at any level.

Description	Shortcomings
Employees Provident Fund	Society has to get register EPF trust under EPF Act 1952 but Society is not taken the registration to date. Due to this reason the exemption of income earned during the year will not be available to Society, nor to employees. There was clear mandate given by BOG ON 21.07.1994 to get registration with EPFO.
Pension-Employee ICFRE	ICFRE has to ensure all rules & regulations of pension scheme are applicable to Central Government Employees but as per receipt & payment account, it is revealed that the fund is not managed as per applicable rules and regulations. Since the office did not create any separate legal entity for Pension Fund, therefore, the financials of the fund should be shown with the financials of ICFRE.
Pension-Central Government Employee	The society has borrowed a sum of Rs 115 Crore from Pension Cell, ICFRE to pay Pension to Central Government Retired Employees.
NPS-National Pension Scheme	ICFRE has adopted National Pension Scheme 2004, the office is running NPS under Pension Cell and preparing the Receipt & Payment Account but the receipt and payment account is not prepared as per provisions of the National Pension Scheme. There should be a NIL balance at the year's end as this unit receives contributions from employer and employee and the same is to be remitted to Pension Fund Manager. The said division is carrying bank

	balance and fixed deposit. Since this office is not having a separate legal entity, the bank balance should be merged with ICFRE.
ICFRE PHS SCHEME	As per the mandate of MoEF dated 13/12/2012, ICFRE is allowed to extend medical facilities -ICFREPHS to its employees. ICFRE has set apart money as per the order and continues PHS Fund as a separate entity. Since the mandate did not order to constitute a separate legal entity, the fund set apart for medical purposes should be shown in the books of account of ICFRE which is not followed by Society.

The management of Society in its reply stated that the above said so-called regulations are not observed by CAG since the inception of ICFRE. Therefore, they have stated that management will get it examined legally and will proceed further during the financial year 2022-2023.

4. DEFICIT OF PENSION GRANT

The Central Government Pension Cell has utilized the fund of pensioners of ICFRE for the payment of pensions of erstwhile Central Government employees. The ICFRE employees prior to NPS will not be able to get a pension in the future as there is a direct loss of interest income for future pensions. The total amount borrowed is Rs 115.68 Crore. This situation arises due to the non-payment of pensioners' money by the Central Government.

5. ACTUARIAL VALUATIONS

Society did not recognize the retirement benefits of employees towards obligation in the future. Society should estimate the amount of obligation and make provisions according to future requirements, which is not done by Society.

6. METHOD OF ACCOUNTING

Society has prepared its financial statements on an accrual basis but there is an immense need to aware their institutes about the correct method of accounting under the accrual system.

Society is having Consolidated Audited Financial Statements of previous year but the institute-wise audited statement of account was not available for verification. The institute-wise Receipt & Payment Account was available with Society but the same was not carrying the signature and seal of the auditor. Therefore, we relied on such unsigned statements for our audit.

7. CONSULTANCY PROJECT:

Consultancy projects are income-generating projects of Society and it attracts GST also. Under GST, Society is showing entire receipts as Income at the time of receipt whereas the same should be shown as advance money. The consultancy income under GST should be shown as per its utilization from time to time.

8. CONTINGENT LIABILITY

a. The GST department may raise liability of taxes, interest, late fees and penalties due to the filing of incorrect returns/compliances.
b. Non registration of EPF trust with Provident Fund Authorities may cause huge liability of interest and penalty.

S-9, Tula's Palace, Araghar, Dehradun-248001

Sudarshan Sharma & Co.
Chartered Accountants

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION

P.O. New Forest, Dehradun

BALANCE SHEET AS AT 31ST MARCH, 2022

CORPUS/CAPITAL FUND AND LIABILITIES	SCHEDULE	CURRENT YEAR 31.03.2022		PREVIOUS YEAR 31.03.2021
		RS.	RS.	RS.
CORPUS/CAPITAL FUND	1		89,49,87,668.12	1,08,44,07,492.19
RESERVES AND SURPLUS	2		-	-
EARMARKED/ENDOWMENT FUNDS :				
> Grant Plan	3A	10,74,83,544.23		-
> Project (Externally Aided)	3B	64,64,28,200.21		95,91,56,825.31
> Chair of Excellance	3C	16,82,51,929.73	92,21,63,674.17	16,11,60,222.00
SECURED LOANS AND BORROWINGS			-	-
UNSECURED LOANS AND BORROWINGS			-	-
CURRENT LIABILITIES AND PROVISIONS				
(A) CURRENT LIABILITY:	4A	15,81,97,029.01		14,80,72,403.05
(B) PROVISIONS:	4B	-	15,81,97,029.01	-
TOTAL			**1,97,53,48,371.30**	**2,35,27,96,942.55**

ASSETS		CURRENT YEAR 31.03.2022		PREVIOUS YEAR 31.03.2021
		RS.	RS.	RS.
FIXED ASSETS	5		96,90,68,171.65	1,09,78,87,242.73
INVESTMENTS-FROM				
> F.D.R.(For One Time Special	6		16,76,98,000.00	16,03,54,894.00
> F.D.R.(With Institutes)				
CURRENT ASSETS, LOANS, ADVANCES				
> CURRENT ASSETS	7A	78,46,19,000.39		1,07,41,05,443.82
> LOANS,ADVANCES ETC	7B	5,39,63,199.26	83,85,82,199.65	2,04,49,362.00
TOTAL			**1,97,53,48,371.30**	**2,35,27,96,942.55**
SIGNIFICANT ACOUNTING POLICIES				
CONTINGENT LIABILITIES AND NOTES ON				

Sh. Arun Singh Rawat (Director General, ICFRE)

Sh. Rakesh Kumar Dogra, (Deputy Director General, Admin., ICFRE)

Sh. Sushant Kumar, (Assistant Director General, Admin, ICFRE)

Sh. Brijesh Kumar Sharma, (Section Officer, Budget Section, ICFRE)

"AS PER OUR SEPARATE REPORT OF EVEN DATE ANNEXED"
FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

Anand Singh Rawat
Digitally signed by Anand Singh Rawat
Date: 2022.11.07 16:59:55 +05'30'

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 008591C

DATED: 07.11.2022
PLACE: DEHRADUN

UDIN 22077616BCJWRE3432

S-9, Tula's Palace, Araghar, Dehradun-248001

Sudarshan Sharma & Co.
Chartered Accountants

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION
P.O. New Forest, Dehradun

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
SUPPLY OF SERVICE AND GOODS	8	12,02,74,001.69	16,31,35,543.73
GRANT INCOME			
(A) Grant under Plan alloted during the year	9A	2,42,88,63,000.00	2,12,00,00,000.00
(B) Grant EAP/Consultancy applied during the year	9B	73,32,27,937.91	64,22,62,194.06
INCOME FROM INVESTMENT	10		
Interest earned on OTSG Grant invested with Bank		76,91,781.00	29,03,644.00
INTEREST EARNED	11	2,36,71,665.03	3,25,68,272.97
OTHER RECEIPTS	12	5,78,015.00	9,37,786.00
Total (A)		**3,31,43,06,400.63**	**2,96,18,06,940.76**

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
EXPENDITURE ON GRANTS			
(A) GRANT -PLAN		**2,42,88,63,000.00**	**2,42,74,08,836.55**
Establishment Expenses	13A	1,92,36,00,630.00	2,06,74,32,123.04
Administrative Expenses	13B	38,77,27,686.88	35,99,76,713.51
Capital Expenditure	13C	1,00,38,398.40	
Unutilized Grant & Others	13D	10,74,96,284.72	
(B) GRANT -EXTERNALY AIDED PROJECT		**73,32,27,937.91**	**53,43,75,018.66**
Grant Utilized During the Year	14	73,32,27,937.91	53,43,75,018.66
EXPENSES ON SUPPLY OF SERVICE & GOODS	15	13,90,00,228.28	
DEPRECIATION ON FIXED ASSETS	5	13,88,61,399.48	15,63,46,080.75
TOTAL(B)		**3,43,99,52,565.67**	**3,11,81,29,935.96**
Balance being excess of Income over Expenditure(A-B)		**(12,56,46,165.04)**	**(15,63,22,995.20)**
BALANCE BEING DEFICIT CARRIED TO CORPUS FUND		(12,56,46,165.04)	(15,63,22,995.20)
SIGNIFICANT ACCOUNTING POLICIES			
CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS			

Sh. Arun Singh Rawat, (Director General, ICFRE)

Sh. Rakesh Kumar Dogra, (Deputy Director General, Admn., ICFRE)

Sh. Sushant Kumar, (Assistant Director General, Admn, ICFRE)

Sh. Brijesh Kumar Sharma, (Section Officer, Budget Section, ICFRE)

"AS PER OUR SEPARATE REPORT OF EVEN DATE ANNEXED"
FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS
Anand Singh Rawat
(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 008591C
DATED: 07/11/2022
PLACE: DEHRADUN

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

UDIN 22077616BCJWRE3432

S-9, Tula's Palace, Araghar, Dehradun-248001

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION

P.O. New Forest, Dehradun

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2022

Schedule 1	HEAD OFFICE	CURRENT YEAR 31.03.2022		PREVIOUS YEAR 31.03.2021	
		RS.	RS.	RS.	RS.
	Balance as at the beginning of the year	1,08,44,07,492.19		1,18,15,89,487.39	
	Add: Balance of net income/expenditure transferred from the Income and Expenditure Account (Deficit)	(12,56,46,165.04)		(15,63,22,995.20)	
		95,87,61,327.15		1,02,52,66,492.19	
	LESS: Prior Year Adjustment	1,68,25,669.77		(5,91,41,000.00)	
	Less: Amount Remitted/Appropriated to HQ	4,69,47,989.26	89,49,87,668.12		1,08,44,07,492.19
	BALANCE AS AT THE YEAR-END	36,10,90,578	89,49,87,668.12		1,08,44,07,492.19

Schedule 2	RESERVES AND SURPLUS:	CURRENT YEAR 31.03.2022		PREVIOUS YEAR 31.03.2021	
		RS.	RS.	RS.	RS.
	TOTAL		-		-

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION

P.O. New Forest, Dehradun

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2022

Schedule 3 (A & B)	EARMARKED/ENDOWMENT FUNDS	CURRENT YEAR 31.03.2022		CURRENT YEAR 31.03.2022	
		PLAN	PROJECT ACCOUNTS (EAP)	PLAN	PROJECT ACCOUNTS (EAP)
	a) Opening balance of the funds	-	95,91,56,825.31		70,45,67,821.30
	b) Additions to the Funds (Primary)				
	Project Receipts	-	53,56,45,308.11		89,65,56,052.07
	Plan (General,Salary & Capital)	2,42,88,63,000.00	-		
	Income from Investments made on account of funds		2,72,84,211.00		
	Total ...	2,42,88,63,000.00	56,29,29,519.11	-	89,65,56,052.07
	C) Additions to the Funds (Alloted/Secondry)				
	Plan (General, Salary & Capital)	2,42,88,63,000.00	-		
	Excess Expense Incurred	3,26,809.07	-		
	Income from Investments made on account of funds	9,10,874.00	18,22,589.00		
	Total ...	2,43,01,00,683.07	18,22,589.00	-	-
	TOTAL(a+b+c)	4,85,89,63,683.07	1,52,39,08,933.42	-	1,60,11,23,873.37
	d) Utilisation/Expenditure towards objectives of funds				
	i) Capital Expenditure				
	Others	1,00,38,398.40	-		13,44,99,680.40
	Total ...	1,00,38,398.40	-	-	13,44,99,680.40
	ii) Revenue Expenditure				
	Salaries, Wages and allowances etc.	1,92,36,00,630.00	-		2,16,48,633.00
	Rent				43,966.00
	Other Administrative expenses	38,77,27,686.88	-		16,97,44,533.58
	Project Payments	-	69,46,27,542.69		31,60,30,235.08
	Total ...	2,31,13,28,316.88	69,46,27,542.69	-	50,74,67,367.66
	e) Grant Refund & Transfer				
	Interest Transfer	3,56,457.56	85,99,740.00		
	Grant Laps	6,305.00	20,531.00		
	Transfer to Reserve & Surplus	-	8,41,77,583.16		
	Fund Transfer	8,87,661.00	5,14,54,941.14		
	f) Disbursement of Primary Grant to Units				
	Project Receipts	-	3,86,00,395.22		
	General, Salary & Capital	2,42,88,63,000.00	-		
	To Plan (GC-Capital)	-	-		
	Plan (GC-Salary)	-	-		
	TOTAL(d+e+f)	4,75,14,80,138.84	87,74,80,733.21	-	64,19,67,048.06
	NET BALANCE AS AT THE YEAR END(a+b+c-d-e-f)	10,74,83,544.23	64,64,28,200.21	-	95,91,56,825.31

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2022

Schedule 3C	OTHER FUNDS	CURRENT YEAR 31.03.2022		PREVIOUS YEAR 31.03.2021	
		RS.	RS.	RS.	RS.
	Other Funds				
	-Chair of Excellance	16,81,83,318.73		16,11,60,222.00	
	-PHS ICFRE	68,611.00	16,82,51,929.73		16,11,60,222.00
	TOTAL		16,82,51,929.73		16,11,60,222.00

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION

P.O. New Forest, Dehradun

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2022

Schedule 4A	CURRENT LIABILITIES AND PROVISIONS	CURRENT YEAR 31.03.2022		PREVIOUS YEAR 31.03.2021	
		RS.	RS.	RS.	RS.
1	Sundry Creditors:				
	a) For Goods	-			
	b) Others	2,77,32,578.49	2,77,32,578.49		-
2	Statutory Liabilities:				
	b) Others	-	-	64,50,676.00	64,50,676.00
3	Other Current Liabilities				
	a) Security & EMD Account	2,97,72,336.52	2,97,72,336.52	1,72,64,276.04	1,72,64,276.04
	b) Amount Payable to Controller, Pension Cell, ICFRE				
	GPF Subscription/ Refund	-		98,92,246.01	
	Pension Medical Claim Payable	14,557.00			
	New Pension Scheme	-	14,557.00		98,92,246.01
	c) Amount Payable to PAO (F), NEW DELHI				
	GPF Subscription/ Refund	-		(18,660.00)	
	Any Other Recovery	4,09,374.00	4,09,374.00		(18,660.00)
	d) Amount Payable to Other Units				
	Saving Fund	-		89,361.00	
	Death Claim	-		44,013.00	
	Advance Recovery	-		541.00	
	Other	-		15,40,971.00	
	CGEIS	-	-	(1,941.00)	16,72,945.00
	e) Amount Payable to Others				
	FA/TA Payable	3,02,873.00			
	GST Payable	4,26,782.00			
	Interest Payable to MOEF	1,669.00			
	Salary Payable Account	9,87,46,783.00		112810920.00	
	Other Deduction (Staff)	7,90,076.00			
	Other Expenses Payable	-	10,02,68,183.00		11,28,10,920.00
	TOTAL(A)		15,81,97,029.01		14,80,72,403.05
Schedule 4B	B.PROVISIONS				
	TOTAL(B)		-		-
	TOTAL(A+B)		15,81,97,029.01		14,80,72,403.05

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION

P.O. New Forest, Dehradun

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2022

SCHEDULE 5 -FIXED ASSETS													
	GROSS BLOCK					DEPRECIATION						NET BLOCK	
DESCRIPTION	Cost valuation As at beginning of the year	Addition during the year before 30.09.2021	Addition during the year after 30.09.2021	Deductions during the year	Cost/valuation at the year-end	Rate of depreci-ation	As at the beginning of the year	On Additions during the year before 30.09.2021	On Additions during the year after 30.09.2021	On deductions during the year	Total up to the Year-end	As at the Current year-end	As at the previous year-end
	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.
A. Fixed Assets:					-								-
1.LAND:				-	-	0%	-	-	-	-	-	-	-
a)Freehold	1,08,79,420.00	5,501.00	-	-	1,08,84,921.00	0%	-	-	-	-	-	1,08,84,921.00	1,08,79,420.00
b)Leasehold	-	-	-	-	-			-	-		-	-	-
2.BUILDINGS:					-			-	-		-	-	-
a)On Freehold Land	1,27,18,64,560.00	-	-	-	1,27,18,64,560.00	10%	51,83,02,749.17	7,53,36,181.08	-		59,36,38,930.25	67,82,05,629.75	75,35,61,810.83
b)On Leasehold Land		-	-	-	-			-	-		-	-	-
c)Ownership Flats/Premises		-	-	-	-			-	-		-	-	-
d)Superstructures on land not		-	-	-	-			-	-		-	-	-
3.PLANT MACHINERY & EQUIPMENT					-			-	-		-	-	-
a) Scientific Equipment	39,48,08,578.99	16,17,301.00	22,51,139.00	-	39,86,77,018.99	15%	19,27,81,776.97	3,05,46,615.45	1,88,835.43		22,34,97,227.85	17,51,79,791.14	20,20,26,802.03
b) I.T.Equipment	13,53,25,635.40	26,61,293.00	16,37,292.40	-	13,96,25,220.80	40%	9,54,18,248.51	1,70,27,871.96	3,27,458.48		11,27,73,578.95	2,68,51,641.85	3,99,07,386.89
4.VEHICLES	1,58,73,110.00	-	-	-	1,58,73,110.00	15%	90,86,924.65	10,17,927.80	-		1,01,04,852.45	57,68,257.55	67,86,185.35
5.FURNITURE FIXTURES	3,05,34,673.00	1,83,313.00	3,59,097.00	-	3,10,77,083.00	10%	1,33,15,636.78	17,40,234.92	17,954.85		1,50,73,826.55	1,60,03,256.45	1,72,19,036.22
6.OFFICE EQUIPMENT	11,76,85,156.72	5,49,457.00	4,51,153.00	-	11,86,85,766.72	15%	7,20,60,777.53	69,26,075.43	33,836.48		7,90,20,689.43	3,96,65,077.30	4,56,24,379.20
7.ELECTRIC INSTALLATIONS	22,03,690.00	-	-	-	22,03,690.00	15%	15,91,907.71	91,267.34	-		16,83,675.05	5,20,014.95	6,11,782.29
8.LIBRARY BOOKS	8,97,30,436.00	65,813.00	2,59,969.00	-	9,00,56,218.00	40%	7,80,37,029.80	46,25,368.68	51,993.93		8,27,14,392.28	73,41,825.72	1,16,93,406.20
9.TUBEWELLS & W.SUPPLY	9,23,616.00	-	-	-	9,23,616.00	0%		-	-		-	9,23,616.00	9,23,616.00
10.MUSEUM	79,24,238.00				79,24,238.00	10%	5,49,540.35	7,37,469.77	-		12,87,010.12	66,37,227.89	73,74,697.65
12.TOOLS & EQUIPMENTS	37,98,950.00	-	-	-	37,98,950.00	15%	25,20,229.92	1,91,808.01	-		27,12,037.93	10,86,912.07	12,78,720.08
					-			-	-		-	-	-
TOTAL OF CURRENT YEAR	2,08,15,52,064.11	50,83,678.00	49,58,650.40	-	2,09,15,94,392.51	185%	98,36,64,821.38	13,82,61,320.45	6,00,079.03	-	1,12,25,26,220.86	96,90,68,171.65	1,09,78,87,242.73
PREVIOUS YEAR	-	-	-	-	-		-	-	-	-	-	-	-
R.CAPITAL WORK-IN-PROGRESS	4,46,023.00	-		-	4,46,023.00		4,46,023.00	-		-	-	-	-
TOTAL	2,08,19,98,087.11	50,83,678.00	49,58,650.40	-	2,09,20,40,415.51		98,41,10,844.38	13,82,61,320.45	6,00,079.03	-	1,12,25,26,220.86	96,90,68,171.65	1,09,78,87,242.73

(Note to be given as to cost of assets on hire purchase basis included above).

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION

P.O. New Forest, Dehradun

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2022

Schedule 6	INVESTMENTS FROM EARMARKED/ENDOWMENT FUNDS	CURRENT YEAR 31.03.2022	CURRENT YEAR 31.03.2021
		RS.	RS.
	1. In Government Securities		
	> F.D.R.(For One Time Special Grant)	16,76,98,000.00	16,03,54,894.00
	> F.D.R.(With Institutes)		
	2. Other Approved Securities	-	-
	3. Shares	-	-
	4. Debentures and Bonds	-	-
	5. Subsidiaries and Joint Ventures	-	-
	6. Others(to be specified)	-	-
	TOTAL	16,76,98,000.00	16,03,54,894.00

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION

P.O. New Forest, Dehradun

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2022

Schedule 7A	CURRENT ASSETS,LOANS, ADVANCES ETC.	CURRENT YEAR 31.03.2022		PREVIOUS YEAR 31.03.2021	
		RS.	RS.	RS.	RS.
	A.CURRENT ASSETS:				
1	INVENTORIES:				
	> Stores and Spares	1,51,310.00			
	> Postage, Stamps & Stationery in Hand	1,40,220.00			
	> Raw Materials	-	2,91,530.00		
2	Cash balances in hand(including cheques/drafts and imprest)				
	> Cash (Plan General)	60.00			
	> Cash (EMD)	1,48,000.00		5,49,537.00	
	> Cash (EAP)1	94,870.00			
	> Cash (EAP)2	11,077.00			
	> Cash (Revenue A/c)	1,08,809.00	3,62,816.00		5,49,537.00
3	Bank Balances:				
	a)With Scheduled Banks:	-			
	> On Savings Bank Accounts	-		95,24,59,773.18	
	Bank EAP	49,43,14,183.77			
	Bank AIRCP	6,17,94,597.83			
	Bank EAP II	2,09,57,680.34			
	Bank EAP III	5,17,789.19			
	Bank EAP Campa	54,82,073.60			
	Bank EAP Other	2,400.50			
	Bank EMD	1,81,05,071.52			
	Bank Plan Capital	1,14,966.35			
	Bank Plan	25,07,507.12			
	Bank Plan Capital II	0.70			
	Bank Plan General	14,00,489.74			
	Bank Plan Salary	14,04,24,225.91			
	Bank Income Tax	1,000.00			
	UBI FRI	1,000.00			
	Bank FRI Deemed University	1,04,400.00			
	Bank Service charges	68,52,369.62			
	Bank Student Service Charges	3,25,359.00			
	Bank-Chair of Excellance	6,90,491.73			
	Bank Testing Account	29,94,593.00			
	Bank Pension Account	18,63,586.00			
	Cheq in Hand	6,21,603.00			
	Bank Revenue Account	2,31,62,917.27	78,22,38,306.39		95,24,59,773.18
	> On Current Accounts				
	ICFRE Recruitment Fund	17,26,348.00	17,26,348.00	6,68,54,612.64	6,68,54,612.64
	> On Deposit Accounts			5,42,41,521.00	
			-		5,42,41,521.00
	TOTAL (A)		78,46,19,000.39		1,07,41,05,443.82

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION

P.O. New Forest, Dehradun

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH,2022

Schedule 7B	CURRENT ASSETS,LOANS,ADVANCES ETC.	CURRENT YEAR 31.03.2022		PREVIOUS YEAR 31.03.2021	
		RS.	RS.	RS.	RS.
1	**LOANS,ADVANCES AND OTHER ASSETS**				
	Loans:				
	a) Staff Advance			13,51,105.00	
	TA Advance	4,32,608.50			
	Etc. (Please specify)	3,07,29,455.45	3,11,62,063.95		13,51,105.00
	b)Other Entities engaged in activities/objectives similar to that of the Entity				
	c)Other(Specify)				
	Grant Receivable	21,16,170.07			
	Chair Of Excellance	-	21,16,170.07		-
2	**Advances and other amounts recoverable in cash or in kind or for value to be received:**				
	a)On Capital Account				
	CPWD	-		1,94,000.00	
	CCU	-		25,37,895.00	
	CCU -(Plan Account)	11,48,000.00			
	CCU -(Plan OTHERS A/c))				
	SCIENTIFIC EQUIPMENTS	-	11,48,000.00		27,31,895.00
	b)Prepayments				
	Advance for Construction of Wall	14,97,200.00			
			14,97,200.00	62,13,882.00	62,13,882.00
	c)Others				
	Amount Recoverable From PAO (F) NEW DELHI				
	GPF Advance	-		18,96,964.00	
	GPF Part/Final Payment	-			18,96,964.00
	Amount Recoverable From Other Units	-			
	Misc Recovries			61,71,926.00	
	GPF Subscription	-	-		61,71,926.00
3	**Income Accrued:**	-			
	a)On Investments fromEarmarked/Endowments Funds	-			
	b)On Investments-Others	-			
	c)On Loans and Advances				
	Loan EAP	1,361.00			
	Advance for Building Maintenance	61,07,887.00			
	Other Receivable	1,18,98,588.24		20,83,590.00	
	Advance for Other Maintenance	-	1,80,07,836.24		20,83,590.00
4	**Claims Receivable**				
	TDS EAP	31,929.00			
			31,929.00		-
	TOTAL(B)		5,39,63,199.26		2,04,49,362.00
	TOTAL(A+B)		1,12,80,68,643.08		2,04,49,362.00

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION

P.O. New Forest, Dehradun

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH 2022

Schedule 8	INCOME FROM SALES/SERVICES		CURRENT YEAR 31.03.2022 RS.	PREVIOUS YEAR 31.03.2021 RS.
A	SUPPLY OF GOODS TAXABLE UNDER GST			
1	Sale of Product	77,100.00		1,50,98,650.00
2	Sale of Publication	1,07,479.00		1,59,883.00
4	Sale of Museum Ticket & Gate Pass	25,55,459.00		
5	Sale of Scraps	8,30,956.00		
6	Sale of Tender Documents	4,32,728.00		2,42,690.00
7	Sale of Timber	8,67,200.00		
	Sale of Unservicable Stores	49,04,649.40	97,75,571.40	1,99,19,302.00
B				
1	SUPPLY OF SERVICE TAXABLE UNDER GST			
1	Conference Hall	65,587.00		
3	Forfieture of Security Money	86,185.00		
4	Income Earned from EAP	13,26,411.00		
5	Institutional Charges	2,59,02,711.00		
5	Licence Agreement Fees	3,62,080.00		
7	Mandap Fees	28,79,619.08		
8	Other Income	45,48,942.55		4,20,59,181.93
9	Rent Received (staff other than ICFRI)	30,375.00		
9	Professional /Consultancy Services	62,45,435.00		47,09,062.00
10	Treatment Charges			60,54,048.00
12	Testing Fees	52,89,120.00		19,78,183.00
	Unutilized Fund & Balance of Projects	2,47,50,818.89	7,14,87,284.52	
C				
1	SUPPLY OF GOODS EXEMPTED UNDER GST			
1	Sale of Plants	48,79,314.00		
2	Sale of Grass	3,600.00		
3	Sale of Fire Wood	6,500.00		
4	Sale of Scraps	-	48,89,414.00	
D	SUPPLY OF SERVICE EXEMPTED UNDER GST			
1	Application & Other Fees for Recruitment	91,250.00		22,71,534.00
2	Charges for Issuance of Identity cards	1,890.00		
3	Dessartarion Charges	12,00,000.00		
4	Electricity & Water Charges	37,28,254.00		
5	Intership Fees & Overdue Charges	10,958.00		
6	Guest House Rent	29,16,287.00		5,28,582.00
7	House Licence Fees	2,22,12,930.67		
8	Maintenance Services(Equipment/Property)	9,95,546.10		
9	Lab Charges	2,48,000.00		
10	Library Charges	84,611.00		
11	Private Use of Govt. Vehicles	20,681.00		
12	Other Fees	2,02,000.00		1,27,40,867.00
13	Income Tax Refund			81,44,354.00
14	Staff Bus Fare	2,10,914.00		
15	Penalty Charges	14,858.00		
16	Photography Charges	1,194.00		
17	Received from FRI Deemed University	2,52,000.00		
18	Receipts from PHD Students	1,10,000.00		
19	Registration Fees & Penal Interest	1,04,558.00		
20	Right to Information	330.00		
21	Room Service Charges	85,000.00		
22	Room Rent Income	9,500.00		
23	Security & Caution Money	66,000.00		
24	Fees & Subscription			4,65,23,147.80
25	Service Charges- Revenue	8,56,734.00		
26	Student Service Charges	1,35,500.00		
27	Service Charges	82,150.00		27,06,059.00
28	Training Fees	4,80,586.00	3,41,21,731.77	
	TOTAL		12,02,74,001.69	16,31,35,543.73

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION

P.O. New Forest, Dehradun

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH 2022

Schedule 9	GRANTS/SUBSIDIES		CURRENT YEAR 31.03.2022 RS.	PREVIOUS YEAR 31.03.2021 RS.
A	**E.A.P. Balance**			
	Opening of Unutilized Grant	95,91,56,825.31		
	Add: Grant Received during the year	53,56,45,308.11		
	Add: Interest Received during the year	2,91,06,800.00		
	Less: Interest Transferred to funding agency	43,00,307.00		
	Less: Transfer to Reserve & Surplus	8,41,77,583.16		
	Less Grant Transfer to Other Unuts	15,51,536.96		
	Less: Transferred to funding agency	4,93,09,490.20		
	Less: Transferred to HO	49,13,877.98		
	Less: Unutilized Grant	64,64,28,200.21	73,32,27,937.91	64,22,62,194.06
B	**PRIMARY GRANTS:**			
	Central Government			
	To Plan (GC-General, Salary & Capital)			
	Opening of Unutilized Grant	-		
	Add: Grant Allocated during the year	2,42,88,63,000.00		
	Add: Interest Accrued during the year	18,92,141.00		
	Add: Excess Expense Incurred	3,26,809.07		
	Less: Transferred to funding agency	2,94,458.00		
	Less: Transferred to HO	19,30,927.56		
	Less: Grant Lapsed	6,305.00		
	Less: Unutilized Grant	10,74,83,544.23	2,32,13,66,715.28	2,12,00,00,000.00
	TOTAL		3,05,45,94,653.19	2,76,22,62,194.06

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION

P.O. New Forest, Dehradun

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH 2022

Schedule 10	INCOME FROM INVESTMENT	CURRENT YEAR 31.03.2022 RS.	PREVIOUS YEAR 31.03.2021 RS.
	With Scheduled Banks	76,91,781.00	29,03,644.00
	Total	76,91,781.00	29,03,644.00

Schedule 11	INTEREST EARNED	CURRENT YEAR RS.	PREVIOUS YEAR RS.
1	On Saving Accounts: With Scheduled Banks	2,35,46,454.03	3,22,92,908.97
2	On Loans: Employees/Staff	1,25,211.00	2,75,364.00
	TOTAL	2,36,71,665.03	3,25,68,272.97
	Note - Tax deducted at source to be indicated		

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION

P.O. New Forest, Dehradun

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH, 2022

Schedule 12	OTHER INCOME /PRIOR PERIOD ITEMS:		CURRENT YEAR 31.03.2022 RS.	PREVIOUS YEAR 31.03.2021 RS.
1	Grant Chair of Excellance	5,78,015.00	5,78,015.00	
2	Other Income			9,37,286.00
	TOTAL		5,78,015.00	9,37,286.00

Schedule 13A	ESTABLISHMENT EXPENSES		CURRENT YEAR 31.03.2022 RS.	PREVIOUS YEAR 31.03.2021 RS.
1	**Expenses Salary Grant**			
	Estblishment Expenses - Research			
	Salary & Allowances	1,03,26,67,207.90		1,47,10,04,790.47
	Medical	1,71,93,143.00		
	10% Pension of ICFRE Employees	3,46,07,081.00		20,15,17,842.00
	> Honorarium	55,000.00		
	> LTC	25,84,668.00		
	> Children Education Allowance	4,58,368.00		
	> LSPC	10,54,003.00		
	> RBI	7,44,58,841.00		
	> New Pension Scheme	2,13,94,204.00	1,18,44,72,515.90	26,34,25,000.00
2	**Estblishment Expenses - Non-Research**			
	Salary & Allowances	37,32,67,882.00		
	Medical	1,10,87,857.00		
	10% Pension of ICFRE Employees	66,66,179.00		
	> Honorarium	18,000.00		
	> LTC	9,13,559.00		
	> Children Education Allowance	4,59,000.00		
	> RBI	2,55,60,894.00		
	> New Pension Scheme	33,80,150.00	42,13,53,521.00	
3	Other (specify) Shairing cost			
	> Expenses on K.V.S.	8,62,13,483.00	8,62,13,483.00	8,73,66,000.00
4	Salary paid in excess than provision of previous year			
5	Bank Charges	820.10	820.10	
8	Contribution to Pension Cell	20,72,07,000.00	20,72,07,000.00	
9	Other			4,41,18,490.57
	TOTAL		1,89,92,47,340.00	2,06,74,32,123.04
	Less: Prior Period Expenses		7,39,96,656.00	
	Add: Salary Payable As on 31.3.22		9,83,49,946.00	
	TOTAL		1,92,36,00,630.00	2,06,74,32,123.04

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION

P.O. New Forest, Dehradun

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH, 2022

Schedule 13B	Administrative Expenses		CURRENT YEAR 31.03.2022 RS.	PREVIOUS YEAR 31.03.2021 RS.
1	**Expenses General Grant Infrastructure**			
	Rent & Taxes	20,86,787.00		21,37,745.00
	Electricity & Water Charges	4,30,09,399.00		3,73,08,674.00
	Vehicles Running Expenses (Fuel)	40,90,606.00		31,53,260.00
	Insurance	10,50,966.00		9,69,194.00
	TDS under GST (21360-23134)	(1,774.00)		
	Others	20,11,770.00	5,22,47,754.00	
2	**Repairs/Maintenance of Infrastructure of Assets**			
	Roads/Buildings (Minor Works)	3,30,11,775.00		3,52,03,422.40
	Plant & Machinery (Scientific Equipment)	4,91,822.00		26,55,543.00
	Furniture & Fixtures	1,52,483.00		39,534.00
	Vehicles (Repair)	27,41,059.00		27,33,681.00
	Office/IT Equipment	1,03,91,835.00		82,96,234.00
	Others	3,59,253.00	4,71,48,227.00	
3	**Communication**			
	Postage & Telephone	30,34,543.72		29,48,885.00
	Others	34,574.00	30,69,117.72	
4	**Others**			
	Newspapers & Periodicals	39,26,775.00		20,90,152.00
	Stationery	21,11,871.00		18,57,750.00
	Travel Expenses -- Domestic-Non-Research (T.E.)	49,82,261.00		23,55,450.00
	Legal & Professional Charges	10,74,670.00		7,02,699.00
	Auditor's Remuneration	2,35,935.00		1,99,231.00
	Hospitality Expenses	1,08,635.00		
	Medicines & Medical Consumables	25,97,842.00		30,78,887.00
	Liveries	4,73,314.00		1,05,000.00
	Contingency	19,30,70,739.32		16,26,48,641.05
	Caution Money return	10,000.00		
	Others	46,39,361.00	21,32,31,403.32	1,29,83,612.36
5	**Research Expenses**			
	Travel & Conveyance -- Domestic-Research (T.E.)	71,62,458.00		66,20,567.95
	Other Consumables (M&S)	80,10,201.00		94,38,818.55
	Other Research Expenditure (FRE)	1,80,06,540.84		85,77,056.50
	Fellowship/ Scholarship/ Cash Award	2,75,87,953.00		2,81,57,541.00
	Maint. of Scientific Equipment	25,92,343.00		17,65,346.00
	RBI	15,23,894.00		6,68,871.00
	Others (RAG/RPC Meetings)	9,68,501.00	6,58,51,890.84	1,72,65,421.70
6	**Extension**			
	Direct to Consumers-Projects	-		5,788.00
	Ext. Activities -- VVK, Demo Village, Training etc.	-		84,406.00
	> Normal	15,96,804.00		13,67,033.00
	> VVK	12,17,587.00		7,01,734.00
	Advertisement & Publicity	7,79,523.00		10,90,242.00
	RBI	30,915.00		20,49,116.00
	Printing & Publication	22,23,395.00	58,48,224.00	
7	**Education Expenses**			
	Subsidies given to Inst./Sci Societies/Other Organisations	7,42,000.00		
	ICFRE Awards	2,20,636.00		
	Seminar/ Conferences	10,52,234.00	20,14,870.00	7,17,177.00
8	Bank Charges	1,416.00	1,416.00	
	TOTAL		38,94,12,902.88	35,99,76,713.51
	Less: Prior Period Expenses		36,44,334.00	
	Add: Expenses Payable As on 31.3.22		19,59,118.00	
	TOTAL		38,77,27,686.88	35,99,76,713.51

SUDARSHAN SHARMA DEHRADUN CHARTERED ACCOUNTANTS

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION

P.O. New Forest, Dehradun

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH, 2022

Schedule 13C	EXPENSES ON CAPITAL GOODS		CURRENT YEAR 31.03.2022 RS.	PREVIOUS YEAR 31.03.2021 RS.
	Purchase Scientific Equipment	38,68,440.00		
	Purchase Office Equipment	10,00,610.00		
	Purchase IT Equipment	42,99,585.40		
	Purchase Furniture	5,42,410.00		
	Books & Journal	3,25,782.00	1,00,36,827.40	
	TOTAL		1,00,36,827.40	
	Add: Expenses Payable As on 31.3.22		1,571.00	
	TOTAL		1,00,38,398.40	-

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH, 2022

Schedule 13D	Unutilized Grant & Others of Plan		CURRENT YEAR 31.03.2022 RS.	PREVIOUS YEAR 31.03.2021 RS.
	Unspent Grant for Next Year	10,74,83,544.23		
	Add: Grant Laps	6,305.00		
	Add: Transfer to HO	19,30,927.56		
	Add: Transferred to funding agency	2,94,458.00		
	Less: Interest Accrued during the year	18,92,141.00		
	Less: Excess Expense Incurred	3,26,809.07	10,74,96,284.72	
	TOTAL		10,74,96,284.72	-

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION

P.O. New Forest, Dehradun

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH, 2022

Schedule 14	EXPENDITURE ON GRANTS (EXTERNALLY AIDID PROJECT)	CURRENT YEAR 31.03.2022 RS.	PREVIOUS YEAR 31.03.2021 RS.
1	**Grants given to Institutions/Organisations**		
	Grant to University		2,69,07,651.00
2	**Expenditure of External Aided Project**		
	Capital Expenditure- EAP	16,43,00,283.66	
	Revenue Expenditure -EAP	56,81,67,418.25	50,74,67,367.66
	Other Expenses	7,60,236.00	
	TOTAL	73,32,27,937.91	53,43,75,018.66

Schedule 15	EXPENSES ON SUPPLY OF SERVICE & GOODS	CURRENT YEAR 31.03.2022 RS.	PREVIOUS YEAR 31.03.2021 RS.
1	Bank Charges	51,804.36	
2	Contribution to Pension Cell	9,90,02,128.52	
3	Contribution PHS Scheme	1,00,00,000.00	
4	Expenses Deemed University	2,10,213.00	
5	Expenses on PHS-ICFRI HQ Pension	9,374.00	
6	Expenses on Services	15,08,114.95	
7	Expenses on Testing Charges	32,221.00	
8	Refund of Testing Fees	23,600.00	
9	Recruitment Expenses	10,34,861.58	
10	Expenses on Chair of Excellance Fund	6,40,053.00	
11	Interest Transfer to HO (MOEF)	1,18,36,304.00	
12	Interest Transferred to Funding Agency (EAP)	31,741.00	
13	Interest Transfer to EAP	6,81,792.00	
14	Interest Transfer to Funding Agency	1,11,39,054.87	
15	Expenses -Student Service Account	1,260.00	
16	Other Expenses	27,97,706.00	
17	Prior Period Adjustment		
	TOTAL	13,90,00,228.28	-

SUDARSHAN SHARMA DEHRADUN CHARTERED ACCOUNTANTS

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION

P.O. New Forest, Dehradun

RECEIPT AND PAYMENT ACCOUNT FOR THE F.Y. 2021-22

RECEIPTS	AMOUNT RS.	T.AMOUNT RS.	PAYMENTS	AMOUNT RS.	T.AMOUNT RS.
Opening Balance of Cash & Bank					
Cash in hand	5,49,537.00		**FDR Made During the Year**		16,75,98,000.00
Saving Account	95,24,59,773.18				
Current Account	6,68,54,612.64		**Payment Under EAP**		
Deposits Account	5,42,41,521.00	1,07,41,05,443.82	a) Fixed Assets Purchase -EAP	16,43,00,283.66	
			b) Revenue Expenditure -EAP	56,81,67,418.25	
Maturity of Fixed Deposit		16,03,54,894.00	c) Other Expenses of EAP	7,60,236.00	
			d) Fund Transfer to Funding Agency EAP	9,47,35,794.82	
Receipts of Grant Money			e) Interest Transfer to Funding Agency EAP	43,00,307.00	
EAP	53,56,45,308.11		f) Transfer to AIRCP	24,21,000.00	83,46,85,039.73
Plan	2,30,00,00,000.00	2,83,56,45,308.11			
			Payment Under Plan		
Receipts of Interest			a) Capital Expenses	1,00,36,827.40	
Interest Received on EAP Grant	2,91,06,800.00		b) Administrative Expenses	38,94,12,902.88	
Interest Received on Plan Grant	18,92,141.00		c) Establishment Expenses	1,89,93,28,729.00	
Interest Received on Other Account	2,35,46,454.03		d) Payment for Prior Year Expenses	54,62,806.47	
Interest Received on FDR (OTSG)	76,91,781.00		e) Payment of Outstanding Salary	2,88,850.00	
Interest Received Income Tax Department	1,319.00		f) Payment to MOEF	24,72,346.98	2,30,70,02,462.73
Interest Received on Loan to Staff	1,23,892.00	6,23,62,387.03			
			Expenses on Supply of Goods & Services		13,88,28,414.70
Receipts from Sale & Services					
Supply Of Goods Taxable Under GST	97,75,571.40		**Loans & Advances**		
Supply Of Service Taxable Under GST	7,14,87,284.52		EMD Payment	1,09,85,732.40	
Supply Of Goods Exempted Under GST	48,89,414.00		Recovery of Other Advances from Staff & Under Sec. Pension Cell	79,52,87,593.37	
Supply Of Service Exempted Under GST	3,41,21,731.77	12,02,74,001.69	Loan Refunded (Plan)	14,13,92,398.45	
			Other Payment & Advances	2,02,66,524.20	
Loans & Advances			Payment to Pension Cell	1,44,54,912.00	98,23,87,160.42
EMD Receipts	1,02,01,823.00				
Recovery of Other Advances from Staff & Under Sec. Pension Cell	76,88,89,696.58		**Closing Balance of Cash & Bank**		
Loan Received (Plan)	14,17,16,553.55		Cash in hand	3,62,816.00	
Other Recoveries & Advance	2,47,90,743.19		Saving Account	78,22,38,306.39	
Received from Pension Cell	1,65,88,497.00	96,21,86,513.32	Current Account	17,26,348.00	
			Deposits Account		78,43,27,470.39
TOTAL		**5,21,49,28,547.97**	**TOTAL**		**5,21,49,28,547.97**

Sh. Arun Singh Rawat (Director General, ICFRE)

Sh. Rakesh Kumar Dogra, (Deputy Director General, Admin., ICFRE)

Sh. Sushant Kumar, (Assistant Director General, Admin, ICFRE)

Sh. Brijesh Kumar Sharma, (Section Officer, Budget Section, ICFRE)

"AS PER OUR SEPARATE REPORT OF EVEN DATE ANNEXED"

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 008591C
DATED:07.11.2022
PLACE: DEHRADUN

CENTRAL GOVERNMENT EMPLOYEE PENSION ACCOUNT

ICFRE, PO NEW FOREST
Dehradun

BALANCE SHEET AS AT 31ST MARCH, 2022

CORPUS/CAPITAL FUND AND LIABILITIES	SCHEDULE	CURRENT YEAR AS ON 31.03.2022		PREVIOUS YEAR 31.03.2021
		RS.	RS.	RS.
CENTRAL GOVERNMENT PENSION ACCOUNT	1		-	-
UNSECURED LOANS AND BORROWINGS				
Loan from General Pension Fund Account	2	1,15,68,22,488.80	1,15,68,22,488.80	86,29,87,000.00
TOTAL			1,15,68,22,488.80	86,29,87,000.00

ASSETS		CURRENT YEAR AS ON 31.03.2022		PREVIOUS YEAR 31.03.2021
		RS.	RS.	RS.
CURRENT ASSETS & LOANS & ADVANCES				
(a) Current Assets				
Amount Receivable from Cental Government	3	1,15,68,22,488.80	1,15,68,22,488.80	86,29,87,000.00
TOTAL			1,15,68,22,488.80	86,29,87,000.00

Sh. Arun Singh Rawat (Director General, ICFRE)

Sh. Rakesh Kumar Dogra, (Deputy Director General, Admin., ICFRE)

Sh. Sushant Kumar, (Assistant Director General, Admin, ICFRE)

Sh. Brijesh Kumar Sharma, (Section Officer, Budget Section, ICFRE)

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07/11/2022
PLACE: DEHRADUN

CENTRAL GOVERNMENT EMPLOYEE PENSION ACCOUNT

ICFRE, PO NEW FOREST
Dehradun

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
INTEREST EARNED	4	1,53,369.00	-
Total(A)		1,53,369.00	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
OTHER EXPENSES		-	
TOTAL(B)		-	-
EXCESS OF INCOME OVER EXPENDITURE		1,53,369.00	-

-

Sh. Arun Singh Rawat (Director General, ICFRE)

Sh. Rakesh Kumar Dogra, (Deputy Director General, Admin., ICFRE)

Sh. Sushant Kumar, (Assistant Director General, Admin, ICFRE)

Sh. Brijesh Kumar Sharma, (Section Officer, Budget Section, ICFRE)

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07/11/2022
PLACE: DEHRADUN

CENTRAL GOVERNMENT EMPLOYEE PENSION ACCOUNT

ICFRE, PO NEW FOREST
Dehradun

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2022

Schedule 1	CENTRAL GOVERNMENT PENSION ACCOUNT	CURRENT YEAR	31.03.2022	PREVIOUS YEAR	31.03.2021
		RS.	RS.	RS.	RS.
	Opening Balance				
	Add:Excess of Income and Expenditure Account	1,53,369.00			
	Add: Pension Contribution-Employer	20,72,07,000.00			
	Add: Recovery of Excess Pension paid	2,61,057.00			
	Add: Loan taken from General Pension Cell	29,38,35,488.80			
	Add: Amount Received from Central Government	1,37,330.20	50,15,94,245.00		
	Less: Application of Fund				
	Pension paid to Pensioners	38,43,74,603.00			
	Commutation of Pension	5,70,20,895.00			
	Gratuity	6,01,98,747.00	50,15,94,245.00		
	BALANCE AS AT THE YEAR-END		-		-

Schedule 2	UNSECURED LOANS AND BORROWINGS	CURRENT YEAR		PREVIOUS YEAR	
		RS.	RS.	RS.	RS.
	Loan From General Pension Cell ICFRE	1,15,68,22,488.80	1,15,68,22,488.80	86,29,87,000.00	86,29,87,000.00
	TOTAL		1,15,68,22,488.80		86,29,87,000.00

Schedule 3	AMOUNT RECEIVABLE	CURRENT YEAR		PREVIOUS YEAR	
		RS.	RS.	RS.	RS.
	Amount Receivable from Central Government	1,15,68,22,488.80	1,15,68,22,488.80	86,29,87,000.00	86,29,87,000.00
	TOTAL		1,15,68,22,488.80		86,29,87,000.00

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH 2022

Schedule 4	INTEREST EARNED ETC.	CURRENT YEAR		PREVIOUS YEAR	
		RS.	RS.	RS.	RS.
1	On Term Deposits: With Scheduled Banks				
2	On Saving Accounts: With Scheduled Banks	1,53,369.00	1,53,369.00		
	TOTAL		1,53,369.00	-	-

PENSION FUND ACCOUNT (PRIOR TO NPS)

ICFRE, PO NEW FOREST
Dehradun

BALANCE SHEET AS AT 31ST MARCH, 2022

CORPUS/CAPITAL FUND AND LIABILITIES	SCHEDULE	CURRENT YEAR 31.03.2022		PREVIOUS YEAR 31.03.2021
		RS.	RS.	RS.
PENSION FUND ACCOUNT	1		1,64,40,24,709.21	1,61,26,78,753.69
TOTAL			1,64,40,24,709.21	1,61,26,78,753.69

ASSETS		CURRENT YEAR 31.03.2022		PREVIOUS YEAR 31.03.2021
		RS.	RS.	RS.
INVESTMENTS	2		40,00,00,000.00	
CURRENT ASSETS & LOANS & ADVANCES				
(a) Current Assets				
> CASH & BANK BALANCES & FDR	3	8,72,02,220.41		74,96,91,753.69
(b) Loans & Advances				
> LOANS,ADVANCES ETC	4	1,15,68,22,488.80	1,24,40,24,709.21	86,29,87,000.00
TOTAL			1,64,40,24,709.21	1,61,26,78,753.69

Sh. Arun Singh Rawat (Director General, ICFRE)

Sh. Rakesh Kumar Dogra, (Deputy Director General, Admin., ICFRE)

Sh. Sushant Kumar, (Assistant Director General, Admin, ICFRE)

Sh. Brijesh Kumar Sharma, (Section Officer, Budget Section, ICFRE)

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07/11/2022
PLACE: DEHRADUN

PENSION FUND ACCOUNT (PRIOR TO NPS)

ICFRE, PO NEW FOREST
Dehradun

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
INTEREST EARNED	5	3,94,21,150.00	-
Total(A)		3,94,21,150.00	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
OTHER EXPENSES		-	
TOTAL(B)		-	-
EXCESS OF INCOME OVER EXPENDITURE TFD TO PENSION FUND ACCOUNT		3,94,21,150.00	-

Sh. Arun Singh Rawat (Director General, ICFRE)

Sh. Rakesh Kumar Dogra, (Deputy Director General, Admin., ICFRE)

Sh. Sushant Kumar, (Assistant Director General, Admin, ICFRE)

Sh. Brijesh Kumar Sharma, (Section Officer, Budget Section, ICFRE)

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07/11/2022
PLACE: DEHRADUN

PENSION FUND ACCOUNT (PRIOR TO NPS)

ICFRE, PO NEW FOREST

Dehradun

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2022

Schedule 1	PENSION FUND ACCOUNT	CURRENT YEAR RS.	31.03.2022 RS.	PREVIOUS YEAR RS.	31.03.2021 RS.
	Opening Balance	1,61,26,78,753.69			1,61,26,78,753.69
	Add:Excess of Income and Expenditure Account	3,94,21,150.00			
	Add:Contribution from Employer	9,90,02,128.52			
	Add: Recovery from Pensioners	2,26,146.00			
	Add:Contribution from Employee	4,93,72,818.00	1,80,07,00,996.21		
	Less: Disbursement of Pension	7,00,35,666.00			
	Less: Commutation of Pension	1,47,53,139.00			
	Less: Contribution towards GPF Cell	3,60,72,608.00			
	Less: Gratuity paid during the year	3,58,14,874.00	15,66,76,287.00		
	BALANCE AS AT THE YEAR-END		1,64,40,24,709.21		1,61,26,78,753.69

Schedule 2	INVESTMENTS	CURRENT YEAR RS.	31.03.2022 RS.	PREVIOUS YEAR RS.	31.03.2021 RS.
	Investment with LIC	40,00,00,000.00	40,00,00,000.00		-
	TOTAL (A)		40,00,00,000.00		-

Schedule 3	CASH & BANK BALANCES	CURRENT YEAR RS.	31.03.2022 RS.	PREVIOUS YEAR RS.	31.03.2021 RS.
	FDR			61,71,99,983.00	
	Bank A/c No. 89822	8,72,02,220.41	8,72,02,220.41	13,24,91,770.69	74,96,91,753.69
	TOTAL (A)		8,72,02,220.41		74,96,91,753.69

Schedul 4	LOANS & ADVANCES	CURRENT YEAR RS.	31.03.2022 RS.	PREVIOUS YEAR RS.	31.03.2021 RS.
	B. LOANS & ADVANCES				
	Loan to Central Govt. Pension A/c, ICFRE	1,15,68,22,488.80	1,15,68,22,488.80	86,29,87,000.00	86,29,87,000.00
	TOTAL(B)		1,15,68,22,488.80		86,29,87,000.00

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH 2022

Schedule 5	INTEREST EARNED ETC.	CURRENT YEAR RS.		PREVIOUS YEAR RS.	
1	On Term Deposits:				
	With Scheduled Banks	3,63,04,267.00	3,63,04,267.00		
2	On Saving Accounts:				
	With Scheduled Banks	31,16,883.00	31,16,883.00		
	TOTAL		3,94,21,150.00	-	-

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

NATIONAL PENSION SCHEME (NPS)

ICFRE, PO NEW FOREST
Dehradun

BALANCE SHEET AS AT 31ST MARCH, 2022

CORPUS/CAPITAL FUND AND LIABILITIES	SCHEDULE	CURRENT YEAR 31.03.2022		PREVIOUS YEAR 31.03.2021
		RS.	RS.	RS.
NATIONAL PENSION SCHEME FUND ACCOUNT	1		77,01,684.00	82,97,720.00
TOTAL			77,01,684.00	82,97,720.00

ASSETS		CURRENT YEAR AS ON 31.03.2022		PREVIOUS YEAR 31.03.2021
		RS.	RS.	RS.
CURRENT ASSETS & LOANS & ADVANCES				
> CASH & BANK BALANCES & FDR	2	77,01,684.00		82,97,720.00
> LOANS,ADVANCES ETC			77,01,684.00	
TOTAL			77,01,684.00	82,97,720.00

Sh. Arun Singh Rawat (Director General, ICFRE)

Sh. Rakesh Kumar Dogra, (Deputy Director General, Admin., ICFRE)

Sh. Sushant Kumar, (Assistant Director General, Admin, ICFRE)

Sh. Brijesh Kumar Sharma, (Section Officer, Budget Section, ICFRE)

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07/11/2022
PLACE: DEHRADUN

NATIONAL PENSION SCHEME (NPS)

ICFRE, PO NEW FOREST
Dehradun

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
INTEREST EARNED	3	4,45,911.00	-
Total(A)		4,45,911.00	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
OTHER EXPENSES		-	
TOTAL(B)		-	-
EXCESS OF INCOME OVER EXPENDITURE TFD TO HQ		4,45,911.00	-

Sh. Arun Singh Rawat (Director General, ICFRE)

Sh. Rakesh Kumar Dogra, (Deputy Director General, Admin., ICFRE)

Sh. Sushant Kumar, (Assistant Director General, Admin, ICFRE)

Sh. Brijesh Kumar Sharma, (Section Officer, Budget Section, ICFRE)

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07/11/2022
PLACE: DEHRADUN

NATIONAL PENSION SCHEME (NPS)

ICFRE, PO NEW FOREST
Dehradun

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2022

Schedule 1	NATIONAL PENSION SCHEME FUND ACCOUNT	CURRENT YEAR 31.03.2022		PREVIOUS YEAR 31.03.2021	
		RS.	RS.	RS.	RS.
	Opening Balance	82,97,720.00			
	Add: Excess of Income and Expenditure Account	4,45,911.00			82,97,720.00
	Add: Contribution from Employer	4,78,42,027.00			
	Add: Contribution from Employee	3,41,64,635.00			
		9,07,50,293.00			
	Lees: Premium Paid to LIC of NPS	8,30,48,609.00	77,01,684.00		
	BALANCE AS AT THE YEAR-END		77,01,684.00		82,97,720.00

Schedule 2	CASH & BANK BALANCES & FDR	CURRENT YEAR		PREVIOUS YEAR	
		RS.	RS.	RS.	RS.
	Cash in Hand				-
	FDR	60,00,000.00		70,00,000.00	
	Bank A/c no- 84994	17,01,684.00	77,01,684.00	12,97,720.00	82,97,720.00
	TOTAL (A)		77,01,684.00		82,97,720.00

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH 2022

Schedule 3	INTEREST EARNED ETC.	CURRENT YEAR		PREVIOUS YEAR	31.03.2021
		RS.	RS.	RS.	RS.
1	On Term Deposits: With Scheduled Banks				
2	On Saving Accounts: With Scheduled Banks	4,45,911.00	4,45,911.00		
	TOTAL		4,45,911.00	-	

SUDARSHAN SHARMA & CO. CHARTERED ACCOUNTANTS DEHRADUN

General Provident Fund Cum Pension Scheme (EPF)

ICFRE, PO NEW FOREST
Dehradun

BALANCE SHEET AS AT 31ST MARCH, 2022

CORPUS/CAPITAL FUND AND LIABILITIES	SCHEDULE	CURRENT YEAR AS ON 31.03.2022		PREVIOUS YEAR 31.03.2021
		RS.	RS.	RS.
EMPLOYEES PROVIDENT FUND ACCOUNT	1		96,66,16,658.89	89,05,59,813.89
CURRENT LIABILITIES AND PROVISIONS				
(A) CURRENT LIABILITY:	2	-		1,04,60,992.00
(B) PROVISIONS:		-	-	-
TOTAL			96,66,16,658.89	90,10,20,805.89

ASSETS		CURRENT YEAR AS ON 31.03.2022		PREVIOUS YEAR 31.03.2021
		RS.	RS.	RS.
INVESTMENTS	3		25,37,11,472.22	
CURRENT ASSETS & LOANS & ADVANCES				
(a) Current Assets				
> CASH & BANK BALANCES & FDR	4	70,80,93,797.67		90,10,20,805.89
(b) Loans & Advances				
> LOANS,ADVANCES ETC	5	48,11,389.00	71,29,05,186.67	
TOTAL			96,66,16,658.89	90,10,20,805.89

Sh. Arun Singh Rawat (Director General, ICFRE)

Sh. Rakesh Kumar Dogra, (Deputy Director General, Admin., ICFRE)

Sh. Sushant Kumar, (Assistant Director General, Admin, ICFRE)

Sh. Brijesh Kumar Sharma, (Section Officer, Budget Section, ICFRE)

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07/11/2022
PLACE: DEHRADUN

General Provident Fund Cum Pension Scheme (EPF)

ICFRE, PO NEW FOREST
Dehradun

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
INTEREST EARNED	6	6,71,25,505.00	-
Total(A)		6,71,25,505.00	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
OTHER EXPENSES		-	
TOTAL(B)		-	-
EXCESS OF INCOME OVER EXPENDITURE TFD TO FUND ACCOUNT		6,71,25,505.00	-

Sh. Arun Singh Rawat (Director General, ICFRE)

Sh. Rakesh Kumar Dogra, (Deputy Director General, Admin., ICFRE)

Sh. Sushant Kumar, (Assistant Director General, Admin, ICFRE)

Sh. Brijesh Kumar Sharma, (Section Officer, Budget Section, ICFRE)

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07/11/2022
PLACE: DEHRADUN

General Provident Fund Cum Pension Scheme (EPF)

ICFRE, PO NEW FOREST

Dehradun

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2022

Schedule 1	EMPLOYEES PROVIDENT FUND ACCOUNT	CURRENT YEAR 31.03.2022		PREVIOUS YEAR	31.03.2021
		RS.	RS.	RS.	RS.
	Opening Balance	89,05,59,813.89			
	Add:Excess of Income and Expenditure Account	6,71,25,505.00			-
	Add: Contribution from Employees	20,44,71,650.00			
		1,16,21,56,968.89			
	Less: Refund of GPF Advance Recovered	34,80,200.00			
	Less: Non Refundable Advance to Employee	9,30,47,248.00			
	Less: Permanent Withdrawal by Retired Employee	9,90,12,862.00	96,66,16,658.89		
					89,05,59,813.89
	BALANCE AS AT THE YEAR-END		96,66,16,658.89		89,05,59,813.89

Schedule 2	CURRENT LIABILITIES AND PROVISIONS	CURRENT YEAR	31.03.2022	PREVIOUS YEAR	31.03.2021
		RS.	RS.	RS.	RS.
	A. Current Liabilities				
	Pension Fund Account -Wrongly Credited in EPF A/c			1,04,60,992.00	1,04,60,992.00
	TOTAL(A)		-		1,04,60,992.00

Schedule 3	INVESTMENTS	CURRENT YEAR	31.03.2022	PREVIOUS YEAR	31.03.2021
		RS.	RS.	RS.	RS.
	Investment in Bond & Securities	25,37,11,472.22	25,37,11,472.22		
	TOTAL(A)		25,37,11,472.22		-

Schedule 4	CASH & BANK BALANCES & FDR	CURRENT YEAR		PREVIOUS YEAR	31.03.2021
		RS.	RS.	RS.	RS.
	FDRs			87,71,99,970.00	
	Flexi FDRs	70,69,74,110.00		2,25,00,000.00	
	Bank A/c No 3491	11,19,687.67	70,80,93,797.67	13,20,835.89	90,10,20,805.89
	TOTAL (A)		70,80,93,797.67		90,10,20,805.89

Schedule 5	CURRENT ASSETS & LOANS & ADVANCES	CURRENT YEAR		PREVIOUS YEAR	31.03.2021
		RS.	RS.	RS.	RS.
	B. LOANS & ADVANCES				
	Refundable Advance to Employee	48,11,389.00	48,11,389.00		
	TOTAL(B)		48,11,389.00		-

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH 2022

Schedule 6	INTEREST EARNED ETC.	CURRENT YEAR		PREVIOUS YEAR	31.03.2021
		RS.	RS.	RS.	RS.
1	On Term Deposits: With Scheduled Banks	5,82,82,752.00	5,82,82,752.00		
2	On Saving Accounts: With Scheduled Banks	88,42,753.00	88,42,753.00		
	TOTAL		6,71,25,505.00	-	

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

GROUP SAVINGS LINKED INSURANCE SCHEME (GSLIS)

ICFRE ,PO NEW FOREST
Dehradun

BALANCE SHEET AS AT 31ST MARCH, 2022

CORPUS/CAPITAL FUND AND LIABILITIES	SCHEDULE	CURRENT YEAR 31.03.2022		PREVIOUS YEAR 31.03.2021
		RS.	RS.	RS.
RESERVE AND SURPLUS	1		12,66,847.11	12,23,006.11
CURRENT LIABILITIES AND PROVISIONS				
(A) CURRENT LIABILITY:	2	3,81,710.00		4,14,021.00
(B) PROVISIONS:		-	3,81,710.00	-
TOTAL			16,48,557.11	16,37,027.11

ASSETS		CURRENT YEAR AS ON 31.03.2022		PREVIOUS YEAR 31.03.2021
		RS.	RS.	RS.
CURRENT ASSETS & LOANS & ADVANCES				
(a) Current Assets				
> CASH & BANK BALANCES & FDR	3	16,48,557.11		16,37,027.11
(b) Loans & Advances				
> LOANS,ADVANCES ETC			16,48,557.11	
TOTAL			16,48,557.11	16,37,027.11

Sh. Arun Singh Rawat (Director General, ICFRE)

Sh. Rakesh Kumar Dogra, (Deputy Director General, Admin., ICFRE)

Sh. Sushant Kumar, (Assistant Director General, Admin, ICFRE)

Sh. Brijesh Kumar Sharma, (Section Officer, Budget Section, ICFRE)

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07/11/2022
PLACE: DEHRADUN

GROUP SAVINGS LINKED INSURANCE SCHEME (GSLIS)

ICFRE, PO NEW FOREST
Dehradun

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
INTEREST EARNED	4	54,410.00	-
Total(A)		54,410.00	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
OTHER EXPENSES		-	
TOTAL(B)		-	-
EXCESS OF INCOME OVER EXPENDITURE TFD		54,410.00	-

Sh. Arun Singh Rawat (Director General, ICFRE)

Sh. Rakesh Kumar Dogra, (Deputy Director General, Admin., ICFRE)

Sh. Sushant Kumar, (Assistant Director General, Admin, ICFRE)

Sh. Brijesh Kumar Sharma, (Section Officer, Budget Section, ICFRE)

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07/11/2022
PLACE: DEHRADUN

GROUP SAVINGS LINKED INSURANCE SCHEME (GSLIS)

ICFRE, PO NEW FOREST
Dehradun

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2022

Schedule 1	RESERVE AND SURPLUS	CURRENT YEAR 31.03.2022		PREVIOUS YEAR 31.03.2021	
		RS.	RS.	RS.	RS.
	Opening Balance	12,23,006.11			
	Add:Excess of Income and Expenditure Account	54,410.00			12,23,006.11
	Add: Contribution from Employees	13,68,032.00			
		26,45,448.11			
	Less: Premium Paid to LIC	13,78,601.00	12,66,847.11		
	BALANCE AS AT THE YEAR-END		12,66,847.11		12,23,006.11

Schedule 2	CURRENT LIABILITIES AND PROVISIONS	CURRENT YEAR	31.03.2022	PREVIOUS YEAR	
		RS.	RS.	RS.	RS.
1	**A. Current Liabilities**				
	GSLIS Claim Payble Account				4,14,021.00
	Opening Balance	4,14,021.00			
	Add: Claim received during the year from LIC	42,87,671.00			
		47,01,692.00			
	Less: Claim Paid to Retired Employee	29,29,710.00			
	Less: Claim Paid for deceased Employee	13,90,272.00	3,81,710.00		
	TOTAL(A)		3,81,710.00		4,14,021.00

Schedule 3	CASH & BANK BALANCES & FDR	CURRENT YEAR		PREVIOUS YEAR	
		RS.	RS.	RS.	RS.
	Cash in Hand				
	Bank A/c no- 3498	16,48,557.11	16,48,557.11	16,37,027.11	16,37,027.11
	TOTAL (A)		16,48,557.11		16,37,027.11

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH 2022

Schedule 4	INTEREST EARNED ETC.	CURRENT YEAR		PREVIOUS YEAR	31.03.2021
		RS.	RS.	RS.	RS.
	On Term Deposits: With Scheduled Banks				
	On Saving Accounts: With Scheduled Banks	54,410.00	54,410.00		
	TOTAL		54,410.00	-	

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

ICFRE PENSIONER HEALTH SCHEME (PHS)

ICFRE, PO NEW FOREST
Dehradun

BALANCE SHEET AS AT 31ST MARCH, 2022

CORPUS/CAPITAL FUND AND LIABILITIES	SCHEDULE	CURRENT YEAR 31.03.2022		PREVIOUS YEAR 31.03.2021
		RS.	RS.	RS.
PENSIONER HEALTH SCHEME FUND ACCOUNT	1		3,78,40,209.59	3,95,55,593.59
TOTAL			3,78,40,209.59	3,95,55,593.59

ASSETS		CURRENT YEAR AS ON 31.03.2022		PREVIOUS YEAR 31.03.2021
		RS.	RS.	RS.
CURRENT ASSETS & LOANS & ADVANCES				
:- CASH & BANK BALANCES & FDR	2	3,78,40,209.59		3,95,55,593.59
:- LOANS,ADVANCES ETC			3,78,40,209.59	
TOTAL			3,78,40,209.59	3,95,55,593.59

Sh. Arun Singh Rawat (Director General, ICFRE)

Sh. Rakesh Kumar Dogra, (Deputy Director General, Admin., ICFRE)

Sh. Sushant Kumar, (Assistant Director General, Admin, ICFRE)

Sh. Brijesh Kumar Sharma, (Section Officer, Budget Section, ICFRE)

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07/11/2022
PLACE: DEHRADUN

ICFRE PENSIONER HEALTH SCHEME (PHS)

ICFRE, PO NEW FOREST
Dehradun

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
INTEREST EARNED	3	23,07,816.00	-
Total(A)		23,07,816.00	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
OTHER EXPENSES		-	
TOTAL(B)		-	-
EXCESS OF INCOME OVER EXPENDITURE TFD TO FUND ACCOUNT		23,07,816.00	-

Sh. Arun Singh Rawat (Director General, ICFRE)

Sh. Rakesh Kumar Dogra, (Deputy Director General, Admin., ICFRE)

Sh. Sushant Kumar, (Assistant Director General, Admin, ICFRE)

Sh. Brijesh Kumar Sharma, (Section Officer, Budget Section, ICFRE)

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07/11/2022
PLACE: DEHRADUN

ICFRE PENSIONER HEALTH SCHEME (PHS)

ICFRE, PO NEW FOREST

Dehradun

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2022

Schedule 1	PENSIONER HEALTH SCHEME FUND ACCOUNT	CURRENT YEAR 31.03.2022		PREVIOUS YEAR 31.03.2021	
		RS.	RS.	RS.	RS.
	Opening Balance	3,95,55,593.59			
	Add:Excess of Income and Expenditure Account	23,07,816.00			3,95,55,593.59
	Add:Contribution from Pensioners	36,76,800.00			
	Add:Contribution from Employer	1,00,00,000.00			
		5,55,40,209.59			
	Less: Expenses under Health Scheme	1,77,00,000.00	3,78,40,209.59		
	BALANCE AS AT THE YEAR-END		3,78,40,209.59		3,95,55,593.59

Schedule 2	CASH & BANK BALANCES	CURRENT YEAR		PREVIOUS YEAR	
		RS.	RS.	RS.	RS.
	Cash in Hand				-
	FDR	3,69,99,000.00			3,90,00,000.00
	Bank A/c No. 87440	8,41,209.59	3,78,40,209.59		5,55,593.59
	TOTAL (A)		3,78,40,209.59		3,95,55,593.59

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH 2022

Schedule 3	INTEREST EARNED ETC.	CURRENT YEAR		PREVIOUS YEAR	
		RS.	RS.	RS.	RS.
1	On Term Deposits: With Scheduled Banks	21,63,481.00	21,63,481.00		
2	On Saving Accounts: With Scheduled Banks	1,44,335.00	1,44,335.00		
	TOTAL		23,07,816.00	-	

ACCOUNT SECTION ICFRE

[A Unit of Indian Council of Forestry Research and Education]
Dehradun

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
SUPPLY OF GOODS/SERVICE	8	2,95,47,647.62	-
GRANTS RECEIVED	9	35,95,08,002.11	-
INTEREST EARNED	10	84,858.00	-
OTHER INCOME	11	-	-
Total(A)		38,91,40,507.73	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
EXPENDITURE ON GRANTS (PLAN)			
Establishment Expenses	12A	15,18,92,183.10	-
Other Administrative Expenses etc.	12B	4,96,41,008.06	-
Capital Expenditure	12C	16,14,726.00	-
EXPENDITURE ON GRANTS (EAP)	13	15,63,60,084.95	-
OTHER EXPENSES	14	1,18,32,611.60	-
DEPRECIATION ON FIXED ASSETS	5	-	
TOTAL(B)		37,13,40,613.71	-
EXCESS OF INCOME OVER EXPENDITURE (A-B)		1,77,99,894.02	-

(Head of Institute)

(Drawing & Disbursement Officer)
ACCOUNT SECTION ICFRE
DEHRA DUN

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER M. NO. 077616, FRN 009222C

DATED: 07.11.2022
PLACE: DEHRADUN

VAN VIGYAN BHAWAN

[A Unit of Indian Council of Forestry Research and Education]
New Delhi

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
SUPPLY OF GOODS/SERVICE	8	21,62,200.10	-
GRANTS RECEIVED	9	19,96,477.07	-
INTEREST EARNED	10	3,20,473.00	-
OTHER INCOME	11	-	-
Total(A)		44,79,150.17	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
EXPENDITURE ON GRANTS (PLAN)			
Establishment Expenses	12A	-	-
Other Administrative Expenses etc.	12B	16,56,161.07	-
Capital Expenditure	12C	3,40,316.00	-
EXPENDITURE ON GRANTS (EAP)	13	-	-
OTHER EXPENSES	14	5,39,533.63	-
DEPRECIATION ON FIXED ASSETS	5	-	
TOTAL(B)		25,36,010.70	-
EXCESS OF INCOME OVER EXPENDITURE (A-B)		19,43,139.47	-

(Head of Institute)

(Drawing & Disbursement Officer)
VAN VIGYAN BHAWAN
NEW DELHI

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED:07.11.2022
PLACE: DEHRADUN

FOREST RESEARCH INSTITUTE (PLAN)

[A Unit of Indian Council of Forestry Research and Education]
Dehradun

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
SUPPLY OF GOODS/SERVICE	8	2,18,46,086.08	-
GRANTS RECEIVED	9	69,30,76,799.00	-
INTEREST EARNED	10	3,16,978.00	-
OTHER INCOME	11	-	-
Total(A)		71,52,39,863.08	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
EXPENDITURE ON GRANTS (PLAN)			
Establishment Expenses	12A	53,18,11,118.00	-
Other Administrative Expenses etc.	12B	15,92,45,681.00	-
Capital Expenditure	12C	20,20,000.00	-
EXPENDITURE ON GRANTS (EAP)	13	-	-
DEPRECIATION ON FIXED ASSETS	5	-	
TOTAL(B)		69,30,76,799.00	-
EXCESS OF INCOME OVER EXPENDITURE (A-B)		2,21,63,064.08	-

16/11/22

(Head of Institute)

16-11-2022
समूह समन्वयक (अनुसंधान)
वन अनुसंधान प्रशिक्षण
पो.ओ० न्यू फॉरेस्ट, देहरादून

(Drawing & Disbursement Officer)
FOREST RESEARCH INSTITUTE (PLAN)
DEHRA DUN

16/11/22

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07.11.2022
PLACE: DEHRADUN

FOREST RESEARCH INSTITUTE (PROJECT SECTION)

[A Unit of Indian Council of Forestry Research and Education]
Dehradun

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
Income from Sales/Services	8	1,43,42,136.80	-
Grants/Subsidies	9	14,08,73,934.00	-
Interest Earned	10	75,29,847.78	-
Other Income	11	-	-
Total(A)		16,27,45,918.58	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
EXPENDITURE ON GRANTS (PLAN)			
Establishment Expenses	12A	-	-
Other Administrative Expenses etc.	12B	-	-
Capital Expenditure	12C	-	-
			-
EXPENDITURE ON GRANTS (Externally Aided Project)	13	14,08,73,934.00	
OTHER EXPENSES	14	50,60,379.87	-
DEPRECIATION ON FIXED ASSETS	5	-	
TOTAL(B)		14,59,34,313.87	-
Excess of Income over Expenditure (A-B)		1,68,11,604.71	-

Director
Forest Research Institute
(Head of Institute)

(Drawing & Disbursement Officer)
FOREST RESEARCH INSTITUTE (PROJECT SECTION)

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07.11.2022
PLACE: DEHRADUN

FOREST RESEARCH CENTRE FOR ECO-REHABILITATION

[A Unit of Indian Council of Forestry Research and Education]
Prayagraj

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
SUPPLY OF GOODS/SERVICE	8	1,15,557.51	-
GRANTS RECEIVED	9	2,75,82,499.71	-
INTEREST EARNED	10	42,312.00	-
OTHER INCOME	11	-	-
Total(A)		2,77,40,369.22	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
EXPENDITURE ON GRANTS (PLAN)			
Establishment Expenses	12A	1,76,38,077.00	-
Other Administrative Expenses etc.	12B	63,07,512.75	-
Capital Expenditure	12C	-	-
EXPENDITURE ON GRANTS (EAP)	13	36,36,909.96	-
OTHER EXPENSES	14	32,430.00	-
DEPRECIATION ON FIXED ASSETS	5	-	
TOTAL(B)		2,76,14,929.71	-
EXCESS OF INCOME OVER EXPENDITURE (A-B)		1,25,439.51	-

(Head of Institute)

Head
Forest Research Centre
for Eco-Rehabilitation
Prayagraj

16-11-22

(Drawing & Disbursement Officer)
FOREST RESEARCH CENTRE FOR ECO-REHABILITATION
PRAYAGRAJ

D.D.O.
Research Centre for Eco-Rehabilitation
Prayagraj

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07.11.2022
PLACE: DEHRADUN

INSTITUTE OF FOREST GENETICS & TREE BREEDING

(A Unit of Indian Council of Forestry Research and Education)
Coimbatore

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
SUPPLY OF GOODS/SERVICE	8	51,03,793.37	-
GRANTS RECEIVED	9	30,52,45,755.98	-
INTEREST EARNED	10	22,67,257.75	-
OTHER INCOME	11	-	-
Total(A)		31,26,16,807.10	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
EXPENDITURE ON GRANTS (PLAN)			
Establishment Expenses	12A	18,99,57,530.00	-
Other Administrative Expenses etc	12B	3,28,01,389.00	-
Capital Expenditure	12C	12,73,932.00	-
EXPENDITURE ON GRANTS (EAP)	13	8,12,12,904.98	-
OTHER EXPENSES	14	6,33,379.00	-
DEPRECIATION ON FIXED ASSETS	5	-	-
TOTAL(B)		30,58,79,134.98	
EXCESS OF INCOME OVER EXPENDITURE(A-B)		67,37,672.12	

16/11/2022

DIRECTOR
(Head of Institute)
Institute of Forest Genetics and Tree Breeding, Coimbatore-2

(Drawing & Disbursement Officer)
INSTITUTE OF FOREST GENETICS & TREE BREEDING
COIMBATORE

ACCOUNTS OFFICER
Institute of Forest Genetics and
Tree Breeding, Coimbatore-2

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07.11.2022
PLACE: DEHRADUN

INSTITUTE OF WOOD SCIENCE AND TECHNOLOGY

[A Unit of Indian Council of Forestry Research and Education]
Bangalore

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
SUPPLY OF GOODS/SERVICE	8	70,06,835.00	-
GRANTS RECEIVED	9	22,24,48,910.00	-
INTEREST EARNED	10	24,78,141.00	-
OTHER INCOME	11	5,78,015.00	-
Total(A)		23,25,11,901.00	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
EXPENDITURE ON GRANTS (PLAN)			
Establishment Expenses	12A	14,59,17,336.00	-
Other Administrative Expenses etc.	12B	2,67,68,651.00	-
Capital Expenditure	12C	9,12,146.00	-
EXPENDITURE ON GRANTS (EAP)	13	4,88,50,777.00	-
OTHER EXPENSES	14	24,07,423.00	-
DEPRECIATION ON FIXED ASSETS	5	-	
TOTAL(B)		22,48,56,333.00	-
EXCESS OF INCOME OVER EXPENDITURE (A-B)		76,55,568.00	-

निदेशक / Director
काष्ठ विज्ञान एवं प्रौद्योगिकी संस्थान
Institute of Wood Science & Technology
बेंगलूर / Bangalore - 560 003

(Head of Institute)

(Drawing & Disbursing Officer)
INSTITUTE OF WOOD SCIENCE & TECHNOLOGY
BANGLORE

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07.11.2022
PLACE: DEHRADUN

TROPICAL FOREST RESEARCH INSTITUTE

(A Unit of Indian Council of Forestry Research and Education)
Jabalpur

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS
SUPPLY OF GOODS/SERVICE	8	1,06,15,709.15	-
GRANTS RECEIVED	9	26,90,50,465.35	-
INTEREST EARNED	10	26,62,633.00	-
OTHER INCOME	11	-	-
Total(A)		28,23,28,807.50	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
EXPENDITURE ON GRANTS (PLAN)			
Establishment Expenses	12A	16,04,81,959.00	-
Other Administrative Expenses etc.	12B	2,26,44,249.00	-
Capital Expenditure	12C	8,58,819.00	-
EXPENDITURE ON GRANTS (Externally Aided Project)	13	8,50,65,438.35	-
OTHER EXPENSES	14	11,42,137.00	-
DEPRECIATION ON FIXED ASSETS	5	-	
TOTAL(B)		27,01,92,602.35	-
EXCESS OF INCOME OVER EXPENDITURE (A-B)		1,21,36,205.15	-

निदेशक
Director
उष्ण कटिबन्धीय वन अनुसंधान संस्थान
Tropical Forest Research Institute
पदेन/Head of Institute, Jabalpur (M. P.)

16/11/22

(Drawing & Disbursement Officer)
TROPICAL FOREST RESEARCH INSTITUTE
JABALPUR

16/11/2022
उ.व.अ.सं./T.F.R.I.
जबलपुर/Jabalpur

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07.11.2022
PLACE: DEHRADUN

FOREST RESEARCH CENTRE FOR SKILL DEVELOPMENT

[A Unit of Indian Council of Forestry Research and Education]
Chindwara

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
SUPPLY OF GOODS/SERVICE	8	1,52,025.00	-
GRANTS RECEIVED	9	1,37,35,882.10	-
INTEREST EARNED	10	1,236.00	-
OTHER INCOME	11		
Total(A)		1,38,89,143.10	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
EXPENDITURE ON GRANTS (PLAN)			
Establishment Expenses	12A	1,17,17,395.00	-
Other Administrative Expenses etc.	12B	11,08,722.70	-
Capital Expenditure	12C	2,44,325.00	-
EXPENDITURE ON GRANTS (EAP)	13	6,65,439.40	-
DEPRECIATION ON FIXED ASSETS	5	-	
TOTAL(B)		1,37,35,882.10	-
EXCESS OF INCOME OVER EXPENDITURE (A-B)		1,53,261.00	

(Head of Institute)
Scientist Incharge
Forest Research Centre for
Skill Development
Chhindwara (M.P.)

(Drawing & Disbursement Officer)
FOREST RESEARCH CENTRE FOR SKILL DEVELOPMENT
CHHINDWARA

D.D.O.
FRC-SD, Chhindwara

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07.11.2022
PLACE: DEHRADUN

ARID FOREST RESEARCH INSTITUTE

[A Unit of Indian Council of Forestry Research and Education]
JODHPUR

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
SUPPLY OF GOODS/SERVICE	8	1,17,56,525.00	-
GRANTS RECEIVED	9	20,25,65,563.22	
INTEREST EARNED	10	4,36,108.00	-
OTHER INCOME	11	-	-
Total(A)		21,47,58,196.22	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
EXPENDITURE ON GRANTS (PLAN)			
Establishment Expenses	12A	14,24,74,339.00	-
Other Administrative Expenses etc	12B	2,26,49,990.00	-
Capital Expenditure	12C	3,98,274.00	-
EXPENDITURE ON GRANTS (EAP)	13	3,70,42,960.22	-
DEPRECIATION ON FIXED ASSETS	5	-	
TOTAL(B)		20,25,65,563.22	-
EXCESS OF INCOME OVER EXPENDITURE (A-B)		1,21,92,633.00	-

(Head of Institute)

(Drawing & Disbursement Officer)
ARID FOREST RESEARCH INSTITUTE
JODHPUR

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED:07.11.2022
PLACE: DEHRADUN

HIMALAYAN FOREST RESEARCH INSTITUTE

(A Unit of Indian Council of Forestry Research and Education)
Shimla

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
SUPPLY OF GOODS/SERVICE	8	45,05,996.22	-
GRANTS RECEIVED	9	15,72,66,089.58	-
INTEREST EARNED	10	15,24,262.00	-
OTHER INCOME	11	-	-
Total(A)		16,32,96,347.80	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
EXPENDITURE ON GRANTS (PLAN)			
Establishment Expenses	12A	7,71,73,935.00	-
Other Administrative Expenses etc.	12B	1,57,06,774.00	-
Capital Expenditure	12C	6,01,009.00	-
EXPENDITURE ON GRANTS (EAP)	13	6,37,84,371.58	-
OTHER EXPENSES	14	11,20,266.00	-
DEPRECIATION ON FIXED ASSETS	5	-	
TOTAL(B)		15,83,86,355.58	-
EXCESS OF INCOME OVER EXPENDITURE (A-B)		49,09,992.22	-

"AS PER OUR SEPARATE REPORT OF EVEN DATE ANNEXED"
FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

(Head of Institute)

(Drawing & Disbursement Officer)
HIMALAYAN FOREST RESEARCH INSTITUTE
SHIMLA

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED:07.11.2022
PLACE: DEHRADUN

INSTITUTE OF FOREST PRODUCTIVITY

[A Unit of Indian Council of Forestry Research and Education]
Ranchi

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
SUPPLY OF GOODS/SERVICE	8	39,72,266.00	-
GRANTS RECEIVED	9	13,98,21,798.59	-
INTEREST EARNED	10	18,40,893.00	-
OTHER INCOME	11	-	-
Total(A)		14,56,34,957.59	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
EXPENDITURE ON GRANTS (PLAN)			
Establishment Expenses	12A	8,29,32,783.00	-
Other Administrative Expenses etc.	12B	1,50,90,566.00	-
Capital Expenditure	12C	8,19,698.00	-
EXPENDITURE ON GRANTS (EAP)	13	4,09,78,751.59	-
OTHER EXPENSES	14	12,20,545.95	-
DEPRECIATION ON FIXED ASSETS	8	-	
TOTAL(B)		14,10,42,344.54	-
EXCESS OF INCOME OVER EXPENDITURE (A-B)		45,92,613.05	-

(Head of Institute)

(Drawing & Disbursement Officer)
INSTITUTE OF FOREST PRODUCTIVITY
RANCHI

Drawing & Disbursing Officer
Institute of Forest Productivity
Ranchi-835303

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA & CO. DEHRADUN

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07.11.2022
PLACE: DEHRADUN

Director
Institute of Forest Productivity
Ranchi-835303

INSTITUTE OF FOREST BIODIVERSITY

[A Unit of Indian Council of Forestry Research and Education]
Hyderabad

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
SUPPLY OF GOODS/SERVICE	8	8,94,514.11	-
GRANTS RECEIVED	9	8,40,73,588.28	-
INTEREST EARNED	10	9,03,858.00	-
OTHER INCOME	11	-	-
Total(A)		8,58,71,960.39	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
EXPENDITURE ON GRANTS (PLAN)			
Establishment Expenses	12A	5,79,75,853.80	-
Other Administrative Expenses etc.	12B	73,62,593.30	-
Capital Expenditure	12C	2,49,846.40	-
EXPENDITURE ON GRANTS (EAP)	13	1,84,85,294.78	-
OTHER EXPENSES	14	7,66,653.58	-
DEPRECIATION ON FIXED ASSETS	5	-	
TOTAL(B)		8,48,40,241.86	-
EXCESS OF INCOME OVER EXPENDITURE (A-B)		10,31,718.53	-

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07.11.2022
PLACE: DEHRADUN

(Head of Institute)

(Drawing & Disbursement Officer)
INSTITUTE OF FOREST BIODIVERSITY
HYDERABAD

निदेशक / Director
वन जैव विविधता संस्थान
Institute of Forest Biodiversity
हैदराबाद / Hyderabad - 14

FOREST RESEARCH CENTRE FOR COASTAL ECOSYSTEM

[A Unit of Indian Council of Forestry Research and Education]
Vishakhapatnam

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
SUPPLY OF GOODS/SERVICE	8	-	-
GRANTS RECEIVED	9	20,43,490.00	-
INTEREST EARNED	10	4,680.00	-
Other Income	11	-	-
Total(A)		20,48,170.00	

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
EXPENDITURE ON GRANTS (PLAN)			
Establishment Expenses	12A	-	-
Other Administrative Expenses etc.	12B	19,37,770.00	-
Capital Expenditure	12C	1,05,720.00	-
EXPENDITURE ON GRANTS (EAP)	13	-	-
OTHER EXPENSES	14	4,680.00	-
DEPRECIATION ON FIXED ASSETS	5	-	
TOTAL(B)		20,48,170.00	-
EXCESS OF INCOME OVER EXPENDITURE (A-B)		-	-

Counter Signed
(Head of Institute)

(Drawing & Disbursement Officer)
FOREST RESEARCH CENTRE FOR COASTAL ECOSYSTEM
Vishakhapatnam

आहरण एवं संवितरण अधिकारी
Drawing & Disbursing Officer
वन पर्यावरण अनुसंधान केन्द्र
Institute of Forest Biodiversity
हैदराबाद / Hyderabad - 14

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07.11.2022
PLACE: DEHRADUN

16/11/2022

Head
FRCCE, IFB

RAIN FOREST RESEARCH INSTITUTE

[A Unit of Indian Council of Forestry Research and Education]
Jorhat

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
SUPPLY OF GOODS/SERVICE	8	71,89,645.60	-
GRANTS RECEIVED	9	20,48,12,060.70	-
INTEREST EARNED	10	26,90,536.00	-
OTHER INCOME	11		-
Total(A)		21,46,92,242.30	-

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
EXPENDITURE ON GRANTS (PLAN)			
Establishment Expenses	12A	13,16,47,304.60	-
Other Administrative Expenses etc	12B	1,97,36,785.00	-
Capital Expenditure	12C	5,99,587.00	
EXPENDITURE ON GRANTS (EAP)	13	5,28,28,384.10	-
OTHER EXPENSES	14	52,22,010.00	-
DEPRECIATION ON FIXED ASSETS	5	-	
TOTAL(B)		21,00,34,070.70	-
EXCESS OF INCOME OVER EXPENDITURE (A-B)		46,58,171.60	-

16.11.2022

(Head of Institute)

निदेशक / Director
वर्षा वन अनुसंधान संस्थान
Rain Forest Research Institute
जोरहाट (असम) / Jorhat (Assam)

(Drawing & Disbursement Officer)
RAIN FOREST RESEARCH INSTITUTE
JORHAT

आहरण एवं संवितरण अधिकारी
व.व.अ.सं., जोरहाट, असम
rawing and Disbursing Officer
RFRI, Jorhat, Assam

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07.11.2022
PLACE: DEHRADUN

FOREST RESEARCH CENTRE FOR LIVLIHOOD EXTENSION

(A Unit of Indian Council of Forestry Research and Education)

AGARTALA

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
SUPPLY OF GOODS/SERVICE	8	9,47,766.00	-
GRANTS RECEIVED	9	1,04,51,437.00	
INTEREST EARNED	10	2,01,201.00	
OTHER INCOME	11	-	
Total(A)		1,15,99,904.00	

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS.
EXPENDITURE ON GRANTS (PLAN)			
Establishment Expenses	12A	75,25,316.00	-
Other Administrative Expenses etc.	12B	10,40,869.00	-
Capital Expenditure	12C	-	-
EXPENDITURE ON GRANTS (EAP)	13	18,85,252.00	-
DEPRECIATION ON FIXED ASSETS	5	-	
TOTAL(B)		1,04,51,437.00	-
EXCESS OF INCOME OVER EXPENDITURE TFD TO HQ		11,48,467.00	-

Head of Office
Forest Research Centre
for Livelihood Extension
Agartala

(Head of Institute)

(Drawing & Disbursement Officer)
FOREST RESEARCH CENTRE FOR LIVLIHOOD EXTENSION
AGARTALA

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DDO
एफ. आर. सी. एल. ई.
F.R.C.L.E.
अगरतला / Agartala

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

SUDARSHAN SHARMA & CO. DEHRADUN CHARTERED ACCOUNTANTS

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616, FRN 009222C

DATED: 07.11.2022
PLACE: DEHRADUN

FOREST RESEARCH CENTER FOR BAMBOO & RATTAN

[A Unit of Indian Council of Forestry Research and Education]
AIZAWL

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2022

INCOME	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS	RS.
SUPPLY OF GOODS/SERVICE	12	1,15,798.13	
GRANTS RECEIVED	13	1,28,34,900.50	
INCOME FROM INVESTMENT	15		
INTEREST EARNED	17	81,824.50	
OTHER INCOME	18	-	
Total(A)		1,30,32,523.13	

EXPENDITURE	Schedule	Current Year 31.03.2022	Previous Year 31.03.2021
		RS.	RS
EXPENDITURE ON GRANTS (PLAN)			
Establishment Expenses	20A	72,48,500.50	
Other Administrative Expenses etc.	20B	40,28,965.00	
Capital Expenditure	20C	-	
EXPENDITURE ON GRANTS (Externally Aided Project)	21	15,57,435.00	
EXPENDITURE ON CONSULTANCY PROJECT	22	-	
OTHER EXPENSES	23A	16,050.13	
INTEREST	23B	-	
DEPRECIATION ON FIXED ASSETS	8	-	
TOTAL(B)		1,28,50,950.63	
EXCESS OF INCOME OVER EXPENDITURE (A-B)		1,81,572.50	

FOR M/S SUDARSHAN SHARMA & CO.,
CHARTERED ACCOUNTANTS

(Head of Institute)

(ANAND SINGH RAWAT)
PARTNER, M. NO. 077616. FRN

(Drawing & Disbursement Officer)
FOREST RESEARCH CENTER FOR BAMBOO & RATTAN
AIZWAL

DATED: 07/11/2022
PLACE: DEHRADUN

Head
Forest Research Centre
for Bamboo and Rattan
Aizawl : Mizoram

Drawing & Disbursing Officer
Forest Research Centre
for Bamboo and Rattan
Aizawl : Mizoram

Statement of Allotment & Expenditure for the year 2021-22

(Rs.in lakh)

Sl. No.	Budget Sub-Head / Name of Institutes/Centres	Plan (GC)											
		Salaries				General				Capital			
		Budget Allot.	Opening balance	Total	Exp. 2020-21	Budget Allot.	Opening balance	Total	Exp. 2020-21	Budget Allot.	Opening balance	Total	Exp. 2020-21
1	ICFRE/Pension	2072.07	0.00	2072.07	2072.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	VVB, New Delhi	0.00	0.00	0.00	0.00	16.56	0.00	16.56	16.56	3.39	0.01	3.40	3.40
3	DDO, ICFRE	1471.50	146.63	1618.13	1503.30	495.22	-5.67	489.55	489.55	16.13	0.04	16.17	16.15
4	FRI, Dehradun	5286.74	355.35	5642.09	5297.53	1580.60	0.03	1580.63	1580.55	20.20	0.00	20.20	20.18
5	FRC-ER, Prayagraj	178.18	13.26	191.44	176.38	62.98	0.26	63.24	63.04	0.00	0.00	0.00	0.00
6	IFGTB, Coimbatore	1747.00	153.85	1900.85	1758.20	326.77	2.71	329.48	329.48	12.74	0.00	12.74	12.74
7	IWST, Bangalore	1429.45	130.74	1560.19	1445.10	297.11	0.00	297.11	290.18	9.49	0.00	9.49	9.12
8	TFRI, Jabalpur	1532.29	69.06	1601.35	1496.18	225.29	1.42	226.71	226.44	8.50	0.09	8.59	8.59
9	FRC-SD, Chhindwara	114.88	10.90	125.78	115.95	10.50	0.73	11.23	11.10	1.50	0.20	1.70	1.38
10	AFRI, Jodhpur	1325.55	104.82	1430.37	1328.25	226.48	0.02	226.50	226.50	4.00	0.01	4.01	3.98
11	HFRI, Shimla	853.40	62.40	915.80	833.22	156.98	0.09	157.07	157.07	6.00	0.01	6.01	6.01
12	IFP, Ranchi	852.97	68.74	921.71	829.28	150.77	0.15	150.92	150.91	8.00	0.20	8.20	8.20
13	IFB, Hyderabad	578.00	38.43	616.43	571.68	87.90	0.01	87.91	87.91	2.50	0.00	2.50	2.50
14	FRC-CE, Vishakhapatnam	0.00	0.00	0.00	0.00	19.40	0.00	19.40	19.38	1.56	0.00	1.56	1.56
15	RFRI, Jorhat	1413.21	115.06	1528.27	1400.29	193.05	0.04	193.09	193.09	5.99	0.01	6.00	6.00
16	FRC-LE, Agartala	75.66	4.17	79.83	75.20	9.95	0.53	10.48	10.48	0.00	0.00	0.00	0.00
17	FRC-BR, Aizawl	69.10	8.62	77.72	67.96	40.44	0.04	40.48	40.35	0.00	0.00	0.00	0.00
Total		19000.00	1282.03	20282.03	18970.59	3900.00	0.36	3900.36	3892.59	100.00	0.57	100.57	99.81

Section Office (Budget)
ICFER

Assistant Director General (Admin.)
ICFRE

Statement of Revenue received in Budget Section, ICFRE for the year 2021-22 (Rs.in lakh)

Sl. No.	Name of Institutes/Centres	Revenue Generated								
		Externally Aided Projects	Consu-ltancy	Scientific Consultancy charges other than consultancy projects	Internal Resource Generation	Sale of Forest Products	Income from Interest	Misc. Income	Any other source which have not been mentioned above	Total
1	ICFRE	0.00	0.00	0.00	0.00	0.00	2.23	22.24	0.00	24.47
2	VVB, New Delhi	0.00	0.00	0.00	0.00	0.00	1.73	11.70	0.00	13.43
3	DDO, ICFRE	351.35	0.00	0.00	0.00	0.00	0.85	8.18	0.00	360.38
4	FRI, Dehradun	110.74	0.00	0.00	22.70	51.77	3.13	174.98	0.03	363.35
5	IFGTB, Coimbatore	28.29	0.00	0.00	3.05	2.44	0.59	20.56	4.93	59.86
6	IWST, Bangalore	4.36	2.18	0.00	16.39	0.00	1.77	24.21	0.40	49.31
7	TFRI, Jabalpur	18.59	50.00	0.00	0.46	0.00	1.28	10.35	22.13	102.81
8	AFRI, Jodhpur	2.69	0.00	0.00	0.00	15.55	1.35	108.97	0.02	128.58
9	HFRI, Shimla	16.21	12.45	0.00	6.39	0.48	0.61	9.65	2.59	48.38
10	IFP, Ranchi	29.61	0.00	0.00	7.46	1.14	1.96	4.93	0.08	45.18
11	FRC-ER, Prayagraj	0.07	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.11
12	FRC-SD, Chhindwara	0.00	0.00	0.00	0.72	0.09	0.01	0.64	0.00	1.46
13	IFB, Hyderabad	7.40	0.00	0.00	0.00	0.00	0.16	1.53	0.00	9.09
14	RFRI, Jorhat	6.01	12.34	0.00	0.02	4.56	0.23	13.43	3.88	40.47
15	FRC-LE, Agartala	9.71	0.00	0.00	0.00	0.02	0.37	0.12	0.00	10.22
16	FRC-BR, Aizawl	0.02	0.00	0.00	0.00	0.00	0.01	0.64	0.00	0.67
Total		585.05	76.97	0.00	57.23	76.05	16.28	412.13	34.06	1257.77

Section Office (Budget)
ICFRE

Assistant Director General (Admin.)
ICFRE

Statement of Allotment & Expenditure upto October 2022

(Rs.in lakh)

Sl. No.	Budget Sub-Head / Name of Institutes/Centres	Plan (GC)					
		Salaries		General		Capital	
		Budget Allot.	Exp. upto Oct. 2022	Budget Allot.	Exp. upto Oct. 2022	Budget Allot.	Exp. upto Oct. 202
1	ICFRE/Pension	0.00	261.92	20.51	0.00	34.00	0.00
2	VVB, New Delhi	0.00	0.00	10.00	2.46	0.00	0.00
3	AO, ICFRE	1619.00	1020.41	291.14	218.34	0.00	1.72
4	FRI, Dehradun	5653.81	3628.82	1014.95	681.17	12.00	7.37
5	FRC-ER, Prayagraj	193.20	127.94	27.00	15.04	1.00	1.00
6	IFGTB, Coimbatore	1984.00	1251.10	170.00	95.69	10.50	5.98
7	IWST, Bangalore	1449.54	1009.89	174.50	98.11	10.00	17.81
8	TFRI, Jabalpur	1705.00	1065.92	142.00	96.69	0.00	0.00
9	FRC-SD, Chhindwara	128.52	85.03	9.00	5.22	0.00	0.00
10	AFRI, Jodhpur	1483.90	887.39	138.00	106.21	5.00	3.88
11	HFRI, Shimla	985.00	608.27	94.50	52.72	7.50	2.99
12	IFP, Ranchi	913.53	624.34	83.50	53.92	7.00	5.32
13	IFB, Hyderabad	605.00	391.02	60.50	29.00	2.50	1.00
14	FRC-CE, Vishakhapatnam	0.00	0.00	10.00	6.07	3.00	1.00
15	RFRI, Jorhat	1607.00	1057.32	120.50	90.02	5.50	2.61
16	FRC-LE, Agartala	76.50	43.85	10.90	4.48	0.00	0.00
17	FRC-BR, Aizawl	96.00	66.45	23.00	10.49	2.00	0.72
Total		**18500.00**	**12129.67**	**2400.00**	**1565.63**	**100.00**	**51.40**

Statement of Revenue Generated upto October, 2022.

(Rs.in lakh)

Sl. No.	Name of Institutes/Centres	Approved Revenue Target for 2022-23	Revenue Generated upto Oct. 2022
1	VVB, New Delhi	20.00	12.45
2	AO, ICFRE	400.00	460.96
3	FRI, Dehradun	400.00	183.01
4	FRC-ER, Prayagraj	15.00	0.01
5	IFGTB, Coimbatore	160.00	36.11
6	IWST, Bangalore	180.00	43.34
7	TFRI, Jabalpur	180.00	52.36
8	FRC-SD, Chhindwara	15.00	1.14
9	AFRI, Jodhpur	180.00	81.20
10	HFRI, Shimla	120.00	12.95
11	IFP, Ranchi	120.00	7.42
12	IFB, Hyderabad	60.00	0.85
13	RFRI, Jorhat	120.00	14.18
14	FRC-LE, Agartala	15.00	0.30
15	FRC-BR, Aizawl	15.00	0.62
Total		**2000.00**	**906.90**

Section Office (Budget)
ICFER

Assistant Director General (Admin.)
ICFRE

Proposed Budget Estimate for the
Financial Year 2023-24

(Rs.in lakh)

Sl.No.	Budget Component	Proposed BE 2023-24
1	Grant-in-aid "Salary"	260.00
2	Grant-in-aid "General"	60.00
3	Grant-in-aid "Capital"	20.00
	Total	**340.00**

Target Proposed for Revenue ICFRE (Hqtr.) Institutes/Centres for the year 2023-24

(Rs.in lakh)

S.No.	Name of Institutes/Centres	Target Proposed
1	VVB, New Delhi	20.00
2	DDO, ICFRE	400.00
3	FRI, Dehradun	400.00
4	FRC-ER, Prayagraj	15.00
5	IFGTB, Coimbatore	160.00
6	IWST, Bangalore	180.00
7	TFRI, Jabalpur	180.00
8	FRC-SD, Chhindwara	15.00
9	AFRI, Jodhpur	180.00
10	HFRI, Shimla	120.00
11	IFP, Ranchi	120.00
12	IFB, Hyderabad	60.00
13	RFRI, Jorhat	120.00
14	FRC-LE, Agartala	15.00
15	FRC-BR, Aizawl	15.00
	Total	**2000.00**

Section Office (Budget)
ICFER

Assistant Director General (Admin.)
ICFRE

ANNEXURES

ANNEXURES

ANNEXURE – I

RIGHT TO INFORMATION

A Public Information Officer and Appellate Authority are functioning in Public Authority, ICFRE under the RTI Act 2005. During the year 2021-22, RTI application and RTI Appeals are disposed off. Consolidated Quarterly RTI returns of the Public Authority are regularly uploaded by the ICFRE on CIC website (*rtir.nic.in*).

RTI Applications/ Requests	No. of applications received as transfer from other P/As u/s 6(3)	Received during the month (including cases transferred to other Public Authority)	Number of cases transferred to other Public Authorities u/s6(3)	Decisions where requests/ Appeals rejected	Decisions where requests/ Appeals accepted
1st Quarter	10	212	0	--	222
2nd Quarter	30	119	2	--	147
3rd Quarter	26	97	05	--	118
4th Quarter	51	106	08	--	149
Total	**117**	**534**	**15**	--	**636**
			--	--	
RTI First Appeals			--	--	
1st Quarter	N/A	10	N/A	--	10
2nd Quarter	N/A	09	N/A	--	09
3rd Quarter	N/A	14	N/A	--	14
4th Quarter	N/A	14	N/A	--	14
Total	**--**	**47**	**--**	--	**47**

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ANNEXURE – II

INFORMATION ON VIGILANCE CASES

A Chief Vigilance Officer is functioning at ICFRE, Dehradun. During the year 2021-22, the cases handled were as follows:

Vigilance cases carried forward from previous years	Vigilance cases initiated in the year	Vigilance cases disposed	Vigilance cases pending	Nature of such cases
04	02	03	03	Violation of conduct rules

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Information on the Audit Objections raised by Principal Director of Audit (Scientific Department), New Delhi

Audit objections carried forward from previous year	Audit objections initiated in the year	Audit objections disposed	Audit objections pending	Nature of Audit objections	Remarks, if any
88	Nil	Nil	88	Paras on Research/ Projects/ Admin/ Accounts	Reply of the all Audit Paras have been submitted

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ANNEXURE – V

LIST OF ABBREVIATIONS

ADG	-	Assistant Director General
AFM	-	Atomic Force Microscopy
AFRI	-	Arid Forest Research Institute
AGF	-	Agroforestry
AMF	-	Arbuscular Mycorrhizal Fungi
AMINT	-	Automated Mangrove Incubation Nursery Technique
ArcGIS	-	Aeronautical Reconnaissance Coverage Geographic Information System
AUC	-	Area Under Curve
AYUSH	-	Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy
BD	-	Bulk Density
BIS	-	Bureau of Indian Standards
BLAST	-	Basic Local Alignment Search Tool
BMS	-	Building Management System
BOLD	-	Barcode of Life Data System
BTSG	-	Bamboo Technical Support Group
BUR II	-	Second Biennial Update Report
CAMPA	-	Compensatory Afforestation Fund Management and Planning Authority
CF	-	Community Forest
CFPR	-	Centre for Forest Policy Research
CG	-	Chhattisgarh
CIL	-	Coal India Limited
CLT	-	Cross Laminated Timber
CNF	-	Cellulose Nano Fibrils
CNSL	-	Cashew Nut Shell Liquid
CoE	-	Centre of Excellence
CoFGR	-	Centre of Excellence on Forest Genetic Resources
COI	-	Cytochrome oxidase Subunit I
CPCs	-	Candidate Plus Culms
CPR	-	Common Property Resource
CPT	-	Candidate Plus Trees
CRISPR	-	Clustered Regularly Interspaced Short Palindromic Repeats
CSIRO	-	Commonwealth Scientific and Industrial Research Organization
CSO	-	Clonal Seed Orchard
CSPOD	-	Coconut Shell Pyrolytic Oil Distillate
DBH	-	Diameter at Breast Height
DDA	-	Delhi Development Authority
DDG	-	Deputy Director General
DFT	-	Deep Flow Technique
DG	-	Director General
DLS	-	Dynamic Light Scattering
DNA	-	Deoxyribonucleic Acid

DPR	-	Detailed Project Report
DRI	-	Directorate of Revenue Intelligence
DUS	-	Distinctness Uniformity and Stability
DV	-	Demo Village
EC	-	Electrical Conductivity
ECM	-	Ectomycorrhiza
EDC	-	Eco- Development Committees
EMC	-	Equillibrum Moisture Content
ENVIS	-	Environmental Information System
EOS	-	End of the Season
EPF	-	Entomopathogenic Fungi
ERT	-	Electric Resistance Tomography
ESIP	-	Ecosystem Services Improvement Programme
ETNVAS	-	Emerging Trends and New Vistas
ETP	-	Entire Trans Planting
FRC-BR	-	Forest Research Centre - Bamboo & Rattan
FRC-CE	-	Forest Research Center - Coastal Ecosystem
FRC-ER	-	Forest Research Centre - Eco-Rehabilitation
FRC-LE	-	Forest Research Center - Livelihood Extension
FRC-SD	-	Forest Research Centre - Skill Development
FRI	-	Forest Research Institute
FRS	-	Forest Research Station
FTCB	-	Forestry Training and Capacity Building
FTIR	-	Fourier Transform Infrared
FTP	-	File Transfer Protocol
FYM	-	Farm Yard Manure
GA	-	Gibberellic Acid
GCMS	-	Gas chromatography–mass spectrometry
GDM	-	Greening Delhi Mission
GFM	-	Gass Forest Museum
GHGs	-	Greenhouse gases
GHNP	-	Great Himalayan National Park
GIS	-	Geographic Information System
GPR	-	Ground Penetrating Radar
GPS	-	Global Positioning System
GSDP	-	Green Skill Development Programme
HAPPRC	-	High Altitude Plant Physiology Research Centre
HDPE	-	High Density Polyethylene
HFRI	-	Himalayan Forest Research Institute
HMOs	-	Herbal Mineral Oils
HoDs	-	Head of Departments
HPLC	-	High Performance Liquid Chromatography
HPSBB	-	Himachal Pradesh State Biodiversity Board
HPTLC	-	High Performance Thin Layer Chromatography
HRD	-	Human Resource Development
HXD	-	n-Hexadecana
IAA	-	Indole Acetic Acid

IBA	-	Indole Butyric Acid
ICAR	-	Indian Council of Agricultural Research
ICFRE	-	Indian Council of Forestry Research and Education
ICT	-	Information and Communication Technology
IF	-	Improvement Felling System
IFB	-	Institute of Forest Biodiversity
IFFCO	-	Indian Farmers Fertiliser Cooperative
IFFDC	-	Indian Farm Forestry Development Cooperative Limited
IFGTB	-	Institute of Forest Genetic and Tree Breeding
IFP	-	Institute of Forest Productivity
IGNP	-	Indira Gandhi Nahar Project
IMD	-	Indian Meteorological Department
IPM	-	Integrated Pest Management
IR	-	Infrared
ISSR	-	Inter Simple Sequence Repeat
ITS	-	Internal Transcribed Spacer
IVI	-	Importance Value Index
IWC	-	Improvement Working Circle
IWST	-	Institute of Wood Science and Technology
JFMC	-	Joint Forest Management Committees
JNV	-	Jawahar Navodaya Vidyalayas
KFD	-	Karnataka Forest Department
KVK	-	Krishi Vigyan Kendra
LAN	-	Local Area Network
LOS	-	Length of the Season
LRV	-	Living Root Bridge
LU/LC	-	Land Use/ Land Cover
MBC	-	Microbial Biomass Carbon
MBMA	-	Meghalaya Basin Management Agency
MCCLMP	-	Meghalaya Community Led Landscape Management Project
MDTC	-	Modified Direct to Consumer
MNP	-	Manas National Park
MODIS	-	Moderate Resolution Imaging Spectroradiometer
MoEF&CC	-	Ministry of Environment Forest and Climate Change
MoU	-	Memorandum of Understanding
MTR	-	Manas Tiger Reserve
MTS	-	Multi Tasking Staff
NAA	-	Naphthalene Acetic Acid
NABL	-	National Accreditation Board for Testing and Calibration Laboratories
NAEB	-	National Afforestation and Eco development Board
NATCOM	-	India's Initial National Communication
NBAIR	-	National Bureau of Agricultural Insect Resources
NBF	-	Number of Flower Buds
NBPGR	-	National Bureau of Plant Genetic Resources
NBRC	-	Nagaland Bamboo Resource Centre
NCBI	-	National Centre for Biotechnology Information
NCCS	-	National Centre for Cell Science

NCT	-	National Capital Territory
NDC	-	National Determine Contribution
NDVI	-	Normalized Difference Vegetation Index
NFLIC	-	National Forest Library and Information Centre
NFT	-	Nutrient Film Technique
NGO	-	Non-Governmental Organization
NKN	-	National Knowledge Network
NMPB	-	National Medicinal Plants Board
NTFP	-	Non-Timber Forest Product
NTPC	-	National Thermal Power Corporation
NWFPs	-	Non Wood and Forest Products
OBD	-	Over Burden Dumps
OTCs	-	Open Top Chambers
PA	-	Protected Area
PBR	-	People's Biodiversity Registers
PCCF	-	Principal Chief Conservator of Forests
PCR	-	Polymerase Chain Reaction
PGPR	-	Plant Growth Promoting Rhizobacteria
PLS	-	Partial Least Square
PMES	-	Performance Monitoring and Evaluation System
PRS	-	Provenance Resource Stand
PSA	-	Particle Size Analysis
PU	-	Polyurethane
QPM	-	Quality Planting Material
QTL	-	Quantitative Trait Locus
RAPD	-	Random Amplified Polymorphic DNA
RBM	-	River Bed Material
RCPs	-	Representative Concentrations Pathways
REDD+	-	Reducing Emissions from Deforestation and Forest Degradation
RET	-	Rare Endangered Threatened
RET	-	Root Elongation Tube
RF	-	Reserved Forest
RFRI	-	Rain Forest Research Institute
RNA	-	Ribonucleic acid
SCI	-	Selection cum Improvement System
SECL	-	Southeastern Coal Fields Limited
SEM	-	Scanning Electron Microscope
SEM	-	Scanning Electron Microscopy
SETM	-	Steam Explosion Treatment Machine
SF	-	State Forest
SFDs	-	State Forest Departments
SG	-	Sacred Groves
SLEM	-	Sustainable Land and Ecosystem Management
SOC	-	Soil Organic Carbon
SOS	-	Start of the Season
SPA	-	Seed Production Area
SRA	-	Sequence Read Archive

SSC	-	Suspended Sediment Concentration
SSD	-	Sandal Spike Disease
SSO	-	Sedling Seed Orchard
SSR	-	Simple Sequence Repeat
TADHCO	-	Tamil Nadu Adi Dravidar Housing and Development Corporation
TBC	-	Total Basal Cover
TC	-	Tissue Culture
TDC	-	Technology Demonstration Centre
TDS	-	Tax Deducted at Source
TFRI	-	Tropical Forest Research Institute
TGM	-	Tree Growers Mela
THM	-	Thermo Hygro Mechanical
TLC	-	Thin Layer Chromatography
TNC	-	Third National Communication
TNOCD	-	Tamil Nadu Organic Certification Department
TOLIC	-	Town Official Language Implementation Committees
TRB	-	Tree Rich Biobooster
TV	-	Tree Volume
TWC	-	Transparent Wood Composite
UAHS	-	University of Agricultural and Horticultural Sciences
UAT	-	User Acceptance Testing
UBV	-	Under Bark Volume
UNCCD	-	United Nation Convention to Combat Desertification
UT	-	Union Territory
UV	-	Ultra Violet
VAM	-	Vesicular Arbuscular Mycorrhiza
VPN	-	Virtual Private Network
VRC	-	Variety Releasing Committee
VTC	-	Veneer Tree Crop
VVK	-	Van Vigyan Kendra
WHO	-	World Health Organization
WHTA	-	Western Himalayan Temperate Arboretum
WLS	-	Wildlife Sanctuary
WPC	-	Wood Polymer Composite
WSGHs	-	Women Self Help Groups
WTP	-	Willingness to Pay
XRD	-	X-ray Diffraction
YEMA	-	Yeast Mannitol Agar

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