ANNUAL REPORT
2014-15

Indian Council of Forestry Research and Education

P. O. New Forest, Dehradun, Uttarakhand, India

ANNUAL REPORT
2014-15

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Dehradun

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Front Cover (from top to bottom):
Progeny trial of *Melia composita*, Extraction of wood core sample, Growth data recording of biofertilizer treated seedlings, Tissue Culture Lab and Demarcating trees in the quadrats of Pench Tiger Reserve (Madhya Pradesh)

डॉ. अश्वनी कुमार, भा.व.से.
महानिदेशक, भा.वा.अ.शि.प.
तथा कुलाधिपति, वन अनुसन्धान संस्थान विश्वविद्यालय
Dr. Ashwani Kumar, IFS
Director General, ICFRE
and Chancellor, FRI University

पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार
भारतीय वानिकी अनुसन्धान एवं शिक्षा परिषद्
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Ministry of Environment, Forests and Climate Change,
Government of India
Indian Council of Forestry Research and Education
(An ISO 9001 : 2000 Certified Organization)
P.O. New Forest, Dehra Dun - 248006

FOREWORD

The Indian Council of Forestry Research and Education (ICFRE), Dehradun has continued to make great strides in the field of forestry research, extension and education as in the past, in the face of innumerable challenges. The focus of the Council has always remained on people oriented research and related activities for achieving the larger goal of sustainable management and development of forestry resources in the country. Accordingly, the activities of the Council are essentially directed on achieving the targets deciphered in National Forest Policy along with providing viable environment friendly options for enhancing livelihood of the farmers and the rural poor.

It is appropriate to mention here that the year 2014-15 was particularly eventful and challenging with a number of new developments in the Council. The long over due and much awaited 13th Sivicultural Conference was organised in November 2014 at Dehradun after a gap of eight years on the very relevant theme of 'Managing forests for multiple values' with side events on equally pertinent topics. The event was part of celebrations to mark 150 years of organised forestry in India. Besides, an important international conference on "Wood is Good: Current Trends and Future Prospects in Wood Utilization" was organized at Bengaluru as a part of golden jubilee celebrations of the establishment of IWST, Bengaluru. Adding a feather in the cap of ICFRE, the Sustainable Land and Ecosystem Management (SLEM) programme concluded successfully this year. A Coffee Table book on "Sustainable Land & Ecosystem Management: Some Best Practices from India" as part of the achievements of the SLEM project was released by Secretary, MoEF&CC, Government of India during 13th Sivicultural Conference. Further, the sixth National Report on Desertification, Land Degradation and Drought (DLDD) was prepared and submitted to UNCCD.

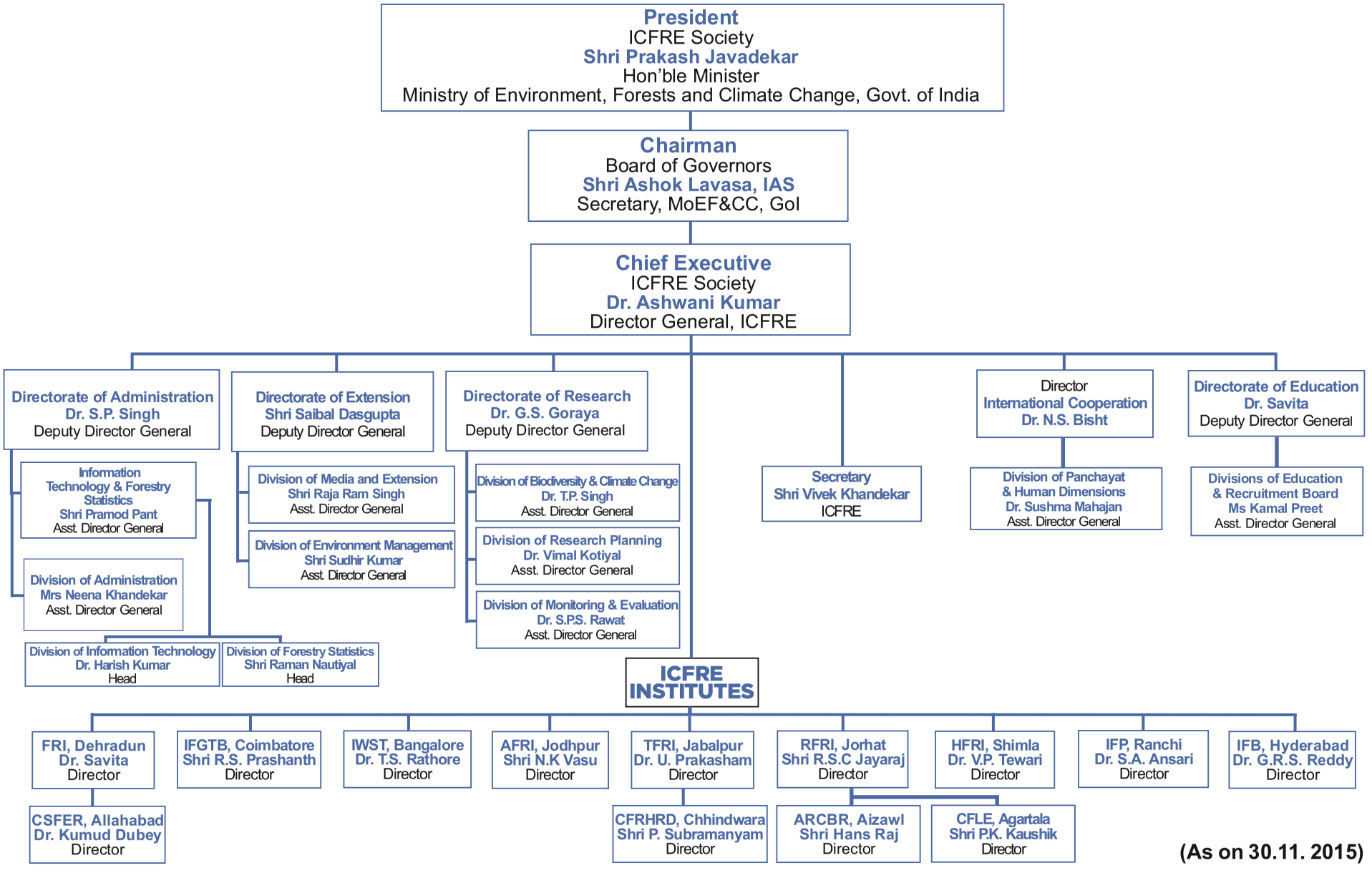
The Council, in pursuance of its efforts to undertake quality research, approved 90 new projects for the year 2015-16. During 2014-15, however, research was conducted in only 239 on-going projects including 143 externally aided projects. One of the significant outcomes of research in the Council has been the development and release of bio-pesticide formulations, 'Ento~fight Nasa'; 'Tricho - K' and 'Crawl Clean' for eco- friendly management of various insect pests. Wide range of consultancies were also taken up including those related with reclamation of degraded sites, environmental assessment of hydropower projects, development of R&R Plans etc.

Apart from the above, a wide array of technologies, processes, models, protocols etc. were developed in the field of agroforestry, biotechnology, forest products, NWFP, tree improvement, silviculture, wood technology and environmental management practices by the Council to be extended to various end users through trainings, workshops and awareness programmes and also as a part of activities under VVKs, demo villages, DTC scheme, tree growers melas and networking of VVKs with KVKs. In addition, two new research stations in Tamil Nadu and two Bamboo Treatment Centres in Tripura have been established this year.

I am sure that this Annual report will effectively provide an overview of the diverse activities of the Council during the year 2014-15 which will go a long way in implementing the findings of forestry research in various applied fields.

(Dr. Ashwani Kumar)

ORGANIZATIONAL STRUCTURE OF ICFRE SOCIETY



(As on 30.11. 2015)

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ICFRE, a pioneer forestry research organization is involved in conducting strategic and applied research, education and extension activities in six functional areas such as (i) Managing Forests and Forest Products for Livelihood Support and Economic Growth (ii) Biodiversity Conservation and Ecological Security (iii) Forests and Climate Change (iv) Forest Genetic Resource Management and Tree Improvement (v) Forestry Education and Policy Research to meet emerging challenges and (vi) taking research to people through effective extension mechanism. The highlights of the research achievements of the organization for the year 2014-2015 are presented herewith.

This Annual Report of 2014-15 describes the said functional areas in six different chapters including the projects undertaken under each of them. The information related to the Administration and Information Technology is presented in a separate chapter. The overall allotted budget for the current financial year 2014-15 for Research, Education and Extension was Rs 566.97 lakh and the expenditure incurred was Rs 551.11 lakh.

The research in the thrust area of **Managing Forests and Forest Products for Livelihood Support and Economic Growth** identifies contribution of forests for improving livelihood and economic status of the people.

Forest Research Institute (FRI) developed a web portal, for storage and analysis of data, from 275 rainfed districts. Soil Health cards were prepared for villages in Tehri Garhwal district, based on Soil Quality Index values. It estimated the quantitative production and consumption of bamboo resources, from Haryana, Punjab,

Executive Summary

National Capital Territory, Delhi and Union Territory of Chandigarh, Uttarakhand and Uttar Pradesh. It studied the role of existing agroforestry systems on socio-economic status of villages in Punjab, Haryana, Uttarakhand and North-West region of Uttar Pradesh. The Institute established a common facility centre for bamboo processing and training. It also tested and proved that vacuum drying behavior of *Cedrus deodara* and *Dalbergia sissoo* woods is more economical as compared to traditional steam-heated drying. FRI has tested that the nano-clay added to resin used in plywood preparation enhanced the physical and mechanical properties of plywood. It developed suitability of combi-ply from *Melia composita* and poplar. It has conducted histo-chemical studies with *Dendrocalamus brandisii* in culms before flowering to explore its potential for making bamboo composite products. FRI developed eco-friendly wood preservatives from barks of *Acacia auriculiformis* and *Acacia nilotica* and leaves of *Gliricidia sepium, Cassia angustifolia, Vitex negundo, Adhatoda zeylanica* and *Chromolaena odorata* . It has also evaluated Steam Volatile Creosote (SVC) as a wood preservative and its performance was tested on wood of *Acacia auriculiformis* and *Gyrocarpus jacquinii*. It has developed profile extruded and injection moulded products from lantana fibre filled polypropylene composite from natural resources available in the State of Punjab. It has prepared wooden tiles of thermally treated wood of *Melia dubia* and *Eucalyptus* species through thermal treatment process. FRI has tested the performance of treated (ZiBOC, CCA & CCB) timbers of *Pinus roxburghii*, *Pinus radiata* and *Pseudotsuga menziesii* for their natural durability. It has evaluated oil of *Santalum album* grown in the forests of Himachal Pradesh for yield and quality in terms of specific gravity, refractive index, saponification value, solubility, alcohol content, acid value and optical rotation. It has planted 3796 number of different propagules of target species at Kandara (Uttarkashi) and Khuliya in Pithoragarh. It isolated phyto-polymers as eco-friendly bio-adhesives from *Shorea robusta, Jatropha curcas, Madhuca indica, Mangifera indica, Curcuma angustifolia* and *Amorphophallus companulatus*.

Himalayan Forest Research Institute (HFRI) has established germplasm of Ashtavarga plants in the nursery beds at Potters Hill near Shimla. It has maintained 1.1 lakh nursery stocks of atish, chora and bankakri to promote cultivation of medicinal plants by the farmers.

Rain Forest Research Institute (RFRI) has documented traditional knowledge of medicinal plants from eleven Nepali villages from Sonitpur, Tinsukia and Dhemaji districts of Assam. It has studied the physico-chemical properties of soil from soil profile under forest, tea garden and jhum land in Mon, Kohima and Dimapur districts. It also explored the potential of rehabilitating degraded Jhum land through potential bamboo species and carbon sequestration.

Institute of Forest Productivity (IFP) assessed the benefit of few agro-forestry crops models in lateritic belt of eastern India.

Institute of Forest Genetics and Tree Breeding (IFGTB) established seven agro-forestry plots in Rameswaram, Tamil Nadu to enhance livelihood opportunities, through introduction of *Callophyllum inophyllum* along with horticultural crops, such as, amla, sapota and mango. It is implementing collaborative project, involving Tamil Nadu Forest Department under Commonwealth Scientific and Industrial Research Organization (CSIRO), Australia to extend the latest techniques and plant resources available, for producing biomass for energy requirements. Mapping of Casuarina and Eucalyptus plantations has been completed using LISS IV, to assess the extent of the plantations based on age/maturity of the plantations. IFGTB has established 5 ha each agro-forestry systems in various agro-climatic zones of Tamil Nadu with fast growing tree species of *Melia dubia, Gmelina arborea, Neolamarckia cadamba* and *Sweitenia*

macrophylla. It has identified population of soapnut in Tamil Nadu and collected seeds from 133 CPTs. It has standardized extraction method for saponin from fruit. Thirty high saponin yielding accessions were shortlisted and multi-location trials of 1 ha each in five locations in Tamil Nadu have been established. It documented 79 ethno-botanical usages of medicinal plants used in primary health care practices, for treating 14 diseases by the tribal communities in the Nilgiris. It has developed a biopesticide formulation "Crawl Clean" to control the pest on papaya mealy bug.

Institute of Wood Science and Technology (IWST) took up growth and yield studies on forest plantations of teak in Yellapur, Haliyal, Koppa, Madikere and Virajpet Forest Divisions, Karnataka. It has synthesized thermo-plasticization of starch with different plasticizer and developed nano-cellulose from bamboo pulp. It has chemically modified Eucalyptus hybrid oil by oxidation. It has used essential oils of different permutation and combinations for preparing soap, floor wash, agrabatti, mosquito coil and perfume spray. It has tested the wood properties of *Melia dubia* of different ages from southern India for value added products. It has conducted durability and treatability of *Melia composita* with Pongamia, neem, CNSL (Cashew Nut Shell Liquid) and CCB. It has developed new method of chemical modification of wood using iso-propenyl acetate (IPA) using iodine aluminum chloride as catalyst. It has laid experimental plots for growth assessment of *Santalum album* L., in 13 Forest Divisions in Karnataka.

Tropical Forest Research Institute (TFRI) has assessed the impact of existing harvesting methods of bamboo harvesting, on the regeneration of Bamboo Forests in Madhya Pradesh. It has standardized pruning technique with optimum doses of organic and inorganic fertilizers to increase surface area of Tendu leaf. The institute has studied the productivity enhancement of kair (*Capparis decidua*) fruit using various compositions of indigenous fertilizers. It has evaluated the nutritional values of *Schleichera oleosa*. It has standardized the preservation protocol for pulp and prepared eight value-added products (kusum vati, kusum jam, kusum sauce, kusum thandai, kusum squash, kusum sarbat, kusum morabba & kusum powder). TFRI has tested the effectiveness of consortia of bio-fertilizers.

In the area of **Biodiversity Conservation and Ecological Security,** FRI has described new genus viz. *Noyesencyrtus* Singh including three species *Noyesencyrtus brachyoculus* Singh, *Phsyllaephagus kundapurensis* Singh and *Ooencyrtus hayatii* Singh, collected from Western Ghats of India. Thirty species of Encyrtidae,collected from different states were identified and added in the National Forest Insect Collection (NFIC) of FRI. Holotypes of 24 species procured from National Pusa Collections (NPC) and Indian Agricultural Research Institute, New Delhi were studied. FRI assessed the ecological restoration sites of coal mined areas in Jhingurda for Northern Coal Field, Singrauli. Impact of invasive species of *Lantana camara, Ageratum conyzoides , Eupatorium odenophorum, Parthenium hysterophorum* etc. was studied by FRI in selected forests of Uttarakhand, Haryana and Punjab. It has developed ecological restoration model in mine spoils at Tetulmari , Sijua area for Bharat Coking Coal Limited (BCCL), a subsidiary of Coal India Limited, Dhanbad. It has assessed ten hectare degraded land for enhancing biodiversity for Northern Coalfields Limited, Singrauli. The Institute has rediscovered *Termitoloemus marshalli* Baranov termite from Jorhat and Dehradun after 78 years. FRI has also prepared Herbarium specimens for each district.

IFGTB has introduced twenty five butterfly host plants at Walayar Field station, Kerala. It has recorded 20 species of Coccinellidae and 13 spices of spiders from mangrove habitats of south India which are playing vital role in keeping the population of whiteflies under control. It has studied the population structure and regeneration capacity of Dalbergias in Thrissur Forest Division (Kerala). It has established nursery in south Andaman to restore the fifteen tsunami impacted area for restoration. It has analyzed the laterite soil for microbial and nutrient parameters to undertake reclamation in Kasargode Districts of Kerala. It has conducted treatments of bio inoculants test with varied composition of tree rich bio booster to synergies growth and pest management.

TFRI has initiated establishment of Arachnarium. It has documented 98 species of medicinal plants from buffer and transitional zone of Tadoba- Andheri Tiger Reserve (TATR), Maharashtra that are used in traditional healing. TFRI has carried out modern nursery practices for raising quality seedlings using various compositions of composting and bio-fertilizers. It has documented indigenous knowledge and the extent of utilization of herbs in folk medicine from tribal pockets of Madhya Pradesh.

AFRI has documented floral diversity of 123 sacred groves in all the districts of Rajasthan. It has initiated trial of phyto-remediation on effluent disposal sites along the river basin Jojari in Jodhpur using *Azadirachta indica, Eucalyptus Camaldulensis* and *Prosopis juliflora*. Under coordinated integrated management project of Khejri, AFRI established management trial against root pathogen. It has conducted ecological survey, assessed the morphological characters of healthy and infected *Prosopis cineraria* and conducted socio-economic survey in 377 villages to assess their dependency.

HFRI has collected 185 specimens of moth (Lepidoptera) species from cold desert region of Leh and Spiti to assess the taxonomic and molecular characteristics. It has conducted mapping of distribution patterns of food plant for butterfly along the altitudinal gradient to contribute collection of 160 specimens belonging to 44 species. Ethno-botanical data were generated from Shikari Devi Wildlife sanctuary.

RFRI has documented and established association of forest types and butterfly that were rare, very rare and endemic and specific to North-East. It has investigated the distribution of *Trichoderma* isolates from forest soils of Arunachal Pradesh and Manipur.

Institute of Forest Biodiversity (IFB) has documented floral diversity from Kawal Tiger Reserve in Andhra Pradesh. IFP has developed agro-techniques for organic cultivation of medical plants, such as, *Tribulus terrestris* and *Cissus quadrangularis* using growth regulators.

Under **Forests and Climate Change**, in the coordinated project, the impact of elevated CO_2 on various factors to assess the physiological behaviour of seedlings studies were conducted for all the species.

IFGTB used 100 teak seeds from seed orchards to study the intra-specific variation in carbon sequestration potential under elevated CO_2. Under elevated CO_2, higher biomass production, tannin were observed by IFGTB. Similarly, under elevated CO_2 , higher biomass and biochemical production were observed in important medicinal plants. IFGTB conducted survey to assess the soil organic carbon in Vellore and Tiruvannamalai Districts of Tamil Nadu. It conducted experiment with commercially important tree species to assess the response of mycorrhizae and microbial symbionts to elevated CO_2 .

IWST documented that the dead trees in the forest contribute to CH_4 budget and temperature and in methane flux from dead trees. Isolation and identification of anaerobic microorganisms from trunk wood confirmed the phenomenon of CH_4 production from dead trees under anaerobic condition.

TFRI conducted experiment to quantify carbon stock and annual sequestration in vegetation, litter and soil from the plantations raised by Rourkela Steel Plant in 15000 acres of land. Multi-institutional project coordinated by Space Application Centre of Indian Space Research Organization, Ahmadabad in association with TFRI estimated the carbon stock for Satpura and Panna.

AFRI, Jodhpur conducted the social survey in western Rajasthan under Mitigating Poverty in Western Rajasthan (MPOWER) project, for evolving livelihood through mitigation and adaptation towards Climate Change.

RFRI, Jorhat mapped Pine growing areas in Arunachal Pradesh, Meghalaya, Nagaland and Manipur through visual interpretation of satellite imageries and identified potential sites for sampling at various altitudinal ranges to study the phenology of *Pinus kesiya*.

HFRI, Shimla assessed the Carbon Stock from major forest types namely, chirpine forest, ban oak forest, deodar forest, silver fir & spruce forest, kharsu oak forest, mohru oak forest, kail forest and alpine pasture in Shimla Forest Circle, Himachal Pradesh. It identified potential sites for laying out permanent study plots in high altitude transition zones, to monitor changes in the vegetation composition.

IFB, documented species inventories from the eight plots and estimated biomass for assessing the Vegetation Carbon Pool Assessment.

In the area of Forest Genetic Resource Management and Tree Improvement, full sib families of *Corymbia torelliana* x *C.citriodora* were developed by IFGTB through controlled pollination. Selected 65 superior trees area were mass multiplied, to establish second generation (SG) seed orchard for high productivity in *Eucalyptus*. Under the bilateral collaborative project, initiated by IFGTB and Kasetsart University, Thailand, exchange visits between the two countries were organized. It established 16 ha of progeny tests trial at different locations of Andhra Pradesh, Puducherry and Tamil Nadu. IFGTB selected 90 CPTs of *Gmelina arborea* and studied its wood properties. Further progeny trials of 60 accessions were established at Kuruvampatty, Salem RF, and Thuvarankurichi, Trichy in Tamil Nadu. It assessed the wood

properties of desirable stem of *Acacia auriculiformis* for clone selection and multiplication. Three clonal trials of 1.0 ha each have been established at Peringamala (Trivandrum Division, Kerala), Kottayam and Kannakkada (Malayattoor Division, Kerala). IFGTB collected genotypes of *Leucaena leucocephala* from BAIF, IGFRI, Jhanshi, CRIDA, TNAU, NAVSARI Agricultural University and University of Hawaii, USA and established two progeny trials, each with 24 accessions at Neyveli and Thuvarankuruchi field station, Tamil Nadu. It has identified Candidate Plus Trees of *Ailanthus excelsa* from Cauvery delta zone and southern zone, assembled 30 Clones for mass multiplication. In addition, it has identified 118 CPTs of *Neolamarckia cadamba* and established four multi-location trials of 1 ha each at Gudalur, Nagercoil, Panampally and Neyveli. It has identified 128 CPTs of *Thespesia populnea* and propagated clonally. It has established Clonal Multiplication Area at Panampally, Kerala with 82 clones. In the area of biotechnological intervention, IFGTB genotyped 100 F1 individuals of *Eucalyptus camaldulensis* x *E. tereticornis* inter-specific hybrids using 100 microsatellite markers. Similarly, 100 F1 individuals of *E. tereticornis* x *E. grandis* were genotyped with 100 microsatellite markers. Protocols were refined for generation of composite and whole plant transgenics under Gene mining and transgenic programme. Additionally, a transformation vector for silencing Eucalyptus HKT1 in whole plant transgenics was also developed by IFGTB. *In- vitro* propagation of *Vanda coerulea,* tissue culture protocol was standardized to produce seedling using green pod culture technique. Hydroponic rooting technique of Eucalyptus was tested on Eucalyptus hybrids clones. Also, the institute identified 22 teak populations showing distinct and desirable characteristics like outstanding growth characteristics, good tree form with cylindrical bole and less branching pattern and selected for in-situ and ex-situ conservation. Field gene banks in four locations, namely, Andhra Pradesh (Rajahmundry and Nellore), Kerala (Panampally Research Station, IFGTB) and Chennai (Gene Bank of IFGTB) were established. It identified 91 high fruit yielding candidate plus trees of *Pongamia pinnata* from different agro-climatic zones of Tamil Nadu, Puducherry and Kerala. It has identified 19 clones of *Pongamia* having high fruit yield and oil content. IFGTB established two breeding populations of Teak at Vadaserikkara, Kerala and Dharapuram, Tamil Nadu using seed collected from 193 Candidate Plus Trees (CPTs). Twenty Distinctness, Uniformity and Stability (DUS) descriptors based on leaf, flower, inflorescence, branch and fruit characters have been developed. It has established Teak clonal seed orchards at Andhra Pradesh under the planting stock improvement programme of Teak. Eight provenance trial plots were established in the states of Tamil Nadu, Kerala and Karnataka.

Under All India Coordinated Project on *Melia composita* being led by FRI Dehradun, progenies were evaluated in the state of Haryana, Punjab, Uttar Pradesh and Uttarakhand. An inter-institutional project supported by National Bamboo Mission –BTSG was executed by FRI, Dehradun as the nodal agency along with 4 other ICFRE institutes viz. IWST, Bangalore; TFRI, Jabalpur; RFRI, Jorhat and IFP, Ranchi as participating institutes during the year 2014-15. It has contributed to identification of 357 superior clumps of ten selected bamboo species across the five ICFRE institutes. FRI and HFRI have assessed the genetic diversity in *Q. leucotrichophora,* using DNA-based markers and documented considerable genetic changes in response to fragmentation, drift, and/or barriers to gene flow. FRI established Germplasm bank of *Grewia optiva* in 2.0 ha area at Dudhli, Lachhiwala range, Dehradun Forest Division and *Quercus leucotrichophora* in 1.50 ha at Magra, Jaunpur Range, Mussoorie Forest Division. It has tested the *Eucalyptus* hybrids FRI-14 (*E. citriodora* Hook. × *E. toriliana* F.Muell.) and FRI –EH001 (*E. camaldulensis* Dehnh. × *E. tereticornis* Sm.) multiplied through micro-propagation at three different agro-climatic locations of Punjab, Haryana and Uttarakhand.

IFP, Ranchi selected 45 CPTs of *Dalbergia sissoo* from Jharkhand and Bihar state and multiplied and established a trial in Jharkhand with 12 clones.

IWST identified 67 Candidate Plus Trees (CPTs) of *Calophyllum inophyllum* from districts Dakshina Kannada, Udipi and Uttara Kannada in Karnataka and estimated the oil content. IWST has established a model nursery at Bhatoli for raising 55000 quality planting stock and demonstration plots of Sandalwood at four locations in Punjab. In addition, demo-plots of sandalwood with Indian gooseberry as secondary host and redgram as primary host were established at Mohali, Ropar, Mathewada (Ludhiana) and Bhatoli (Talwara).

TFRI selected 165 Candidate plus trees of *Dalbergia latifolia* (Kala shisham) from Chhatisgarh and Madhya Pradesh. TFRI has

identified CPTs from Rukhad and Kurai Range of Seoni (South) Forest Division as Nodal Institute for all India Coordinated Projects on Teak.

The experimental trials established at RFRI, Jorhat and Tizit, Nagaland were evaluated for their performance. Clonal accessions were multiplied and established in the form of CMA at Biotrim, Tirupathi. RFRI evaluated *Gmelina aroborea*, established in the experimental station ,Imphal, Manipur for their performance and selected twenty four clones. HFRI prepared guidelines for conifers' DUS traits.

In the area of **Forestry Education and Policy Research** to Meet Emerging Challenges, FRI, Deemed University, conducted all India Competitive Entrance Test for admission in Post Graduate Programmes. Course plans were prepared and Internal and External faculties were invited for conducting classes.

In the process of re-accreditation, 14 proposals from new universities received are being evaluated. For quality forestry education, research and extension in the area of Non- Wood Forest Products, networking process is being established with universities, State Forest Departments and other target groups. A total of 183 scientists and forest officers participated in seminars/symposia/workshops/conferences/ trainings/ meetings organized by different organizations at National and International level. During the current year, 20 research scholars were registered for Ph.D and a total 34 Ph.D degrees were awarded. Placement Brochures & student's profiles were prepared for all M.Sc. courses. Various Industries/ organizations visited the University for Campus Interview and selected 26 students. 10 Students from SAARC joined for various M.Sc. programme. Under capacity building, a total of 101 training programmes were organized at various institutes.

The ICFRE developed a websites for seminars/conferences. TFRI, Jabalpur,launched new web portal for the institute's online open access e-magazine "Van Sangyan" (ISSN 2395 - 468X) and linked it with institute's website.

ICFRE has designed and developed the Common CMS for the websites of ICFRE, HFRI Shimla, website (http://hfri.icfre.org/admin/login.php) and AFRI Jodhpur, websites (bilingual) (http://afri.icfre.org/admin/login.php and http://afri.icfre.org/hindi/admin/login.php) and implemented on live web server. New website of HFRI was designed, developed and inaugurated by DG, ICFRE during 13th Silviculture Conference, held from 24 to 28 November 2014 in Dehradun.

In the area of **Forestry Extension for taking Research to People**, as a part of networking initiatives of VVK and KVK, a series of training programmes were organized by the ICFRE institutes to disseminate the developed technologies through Van Vigyan Kendras (VVKs) and Demo Villages (DVs). The Direct to consumer scheme launched in 2011 have contributed to selection of specific activity by the institutes such as establishment of community nursery, lac cultivation, charcoal making , on farm demonstration and establishment of bamboo treatment centres to cater various target groups. In the process of transferring technology, a comprehensive policy governing the generation and management of intellectual property, emanating from ICFRE and its various institutes has been evolved. Under such initiatives, IFGTB, Coimbatore in collaboration with Biotech Consortium India Ltd., New Delhi transferred rapid, low cost, high recovery technology for the "Isolation of nucleic acids from plant tissues using non-biohazardous chemicals" on non-exclusive basis to Rapid Genomics Solutions. ICFRE imparted training for various stakeholders in close coordination with FRI, IFGTB, RFRI, HFRI and TFRI under Bamboo Technical Support Group (BTSG). Documentary film prepared on Sustainable Land and Ecosystem Management (SLEM) issues such as "Policy and Institutional Reform for Mainstreaming and Up-scaling Sustainable Land and Eco-system Management in India Project" was released by Shri Prakash Javadekar, Hon'ble Minister of State (Independent Charge) of the Ministry of Environment, Forest and Climate Change, Government of India on the occasion of World Day to Combat Desertification on 17 June 2014 at New Delhi.

The Indian Council of Forestry Research and Education is an autonomous organization under the Ministry of Environment, Forests and Climate Change (MoEF & CC), Government of India. The Hon'ble Minister of Environment, Forests and Climate Change is the President of ICFRE society and the Director General is its Chief Executive. The General Body is the supreme authority of the ICFRE, headed by the Union Minister, Environment, Forests and Climate Change, Government of India. Its members consist of serving and retried officers from various state governments, educational institutes, and scientific organizations.

A. Structure

The organizational chart is presented at Page IV. The Governing Body is headed by the Chief Executive i.e. the Director General (DG), who is the decision-making authority of the ICFRE. The DG is supported by four Deputy Director Generals (heading Administration, Research, Education and Extension Directorates); Director (International Cooperation) and Secretary ICFRE. Further, the Deputy Director Generals are assisted by Assistant Director Generals and scientists at the headquarters. Each Institute is headed by a Director and is supported by a Research Coordinator, scientists, officers and other staffs.

Mission	**To generate, preserve, disseminate and advance knowledge, technologies and solutions for addressing the issues related to forests and to promote linkages arising out of interactions between people, forests and environment on a sustained basis through research, education and extension.**
Vision	**Increasing forest cover and enhancing forest productivity through operationalisation of National Forestry Action Programme and National Forestry Research Plan.**

introduction

Directorate of Research

The Directorate is headed by Deputy Director General and supported by three Assistant Director Generals. Research Planning Division is responsible for conducting Research Advisory Group (RAG) meetings at the Institute level, as per approved calendar at each Institute and Research Policy Committee (RPC) meeting at ICFRE level. It coordinates with all the Institutes of ICFRE to formulate national level coordinated projects. Also, as a part of Bamboo Technical Support Group (BTSG), it conducts training programmes for various target groups. The Monitoring and Evaluation Division regularly monitors and peer reviews completion of various projects.

Biodiversity and Climate Change (BCC) Division is working on biodiversity, climate change related research and policy issues leading to international negotiations for United Nations Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity (CBD). The Division is also engaged in capacity building programmes of forest officers, scientists, technologists and other stakeholders in biodiversity and climate change through organizing various training programmes. ICFRE with the status of an observer organization participates in all the United Nations Framework Convention on Climate Change (UNFCCC) meetings.

Directorate of Education

This Directorate is headed by the Deputy Director General who is supported by one Assistant Director General. It is responsible for capacity building of the Council's scientific and managerial cadre, through various training programmes. Also, it enhances forestry education at national level through financial support to the state universities imparting forestry education. It also maintains the employees service matters and conducts regular Flexible Complementing Scheme and Department Promotion Committee activities. It also recruits human resources as and when required. This Directorate has also initiated accreditation process, in line with All India Council for Technical Education (AICTE) to improve the quality of forestry education and conducts national Policy Research reviews along with analysis of the existing forest policies, statutes and framework.

Directorate of Extension

The Directorate is headed by the Deputy Director General and supported by two Assistant Director Generals. The Media & Extension Division facilitates various publications, such as, bulletins, brochures, pamphlets, newsletters and annual reports and undertakes activities to promote Rajbhasha Hindi. It also extends the technologies developed by the Council to various target groups, especially the farmers, through Van Vigyan Kendras (VVKs) and Demo Villages (DVs) through comprehensive extension strategies. The Environment Management Division extends scientific expertise in the field of environment and forestry to various agencies through consultancies. The SLEM Project Unit acts as the Technical Facilitation Organization (TFO) to implement Global Environment Facility (GEF) and World Bank (WB) supported medium size projects on policy and institutional reforms for mainstreaming and up scaling sustainable land and ecosystem management in India.

Directorate of Administration

The Directorate is headed by the Deputy Director General and supported by two Assistant Director Generals. Assistant Director General, Administration assists in general administrative and matters relating with the Budget of the Council.

The Information and Technology (IT) Division, under the Assistant Director General (IT&FS), caters to the needs on Information Communication to all Institutes and ICFRE Head Quarters. The ICFRE Server Farm hosts the IFRIS application and other allied key

services. The Statistics Division under ADG (IT&FS) collects data from all the states, pertaining to forestry to disseminate through publication of yearly Forestry Statistics Reports and Bulletins.

Director, International Cooperation

The Director, International Cooperation is supported by one Assistant Director General for Panchayat and Human Dimensions Division to develop linkages with international and national organizations in respect of developing projects and processing of memorandum of understanding (MoU).

INSTITUTES AND CENTRES OF ICFRE

ICFRE has nine Regional Research Institutes and four Research Centres located in different bio-geographical regions of the country catering to the forestry research needs of the nation.

Forest Research Institute (FRI), Dehra Dun, established in 1906, is a premier scientific research and ISO 9001:2000 certified Institute. It carries forward the rich tradition of forestry research, carried out by erstwhile Imperial Forest Research Institute to cater to the forestry research needs of the states of Uttarakhand, Uttar Pradesh, Haryana, Punjab and National Capital Territory of Delhi. The advanced Centre for Social Forestry and Eco-Rehabilitation (CSFER), Allahabad, under FRI focuses on social forestry and eco-rehabilitation, catering to the needs for Eastern Uttar Pradesh, North Bihar and Vindhya, Region of Uttar Pradesh.

FRI has been conferred with the status of "Deemed University" by the Ministry of Human Resource Development, Government of India, New Delhi to conduct M.Sc. Forestry, M.Sc. Wood Science & Technology and M.Sc. Environment Management programmes besides conducting Post Masters diploma in Natural Resource Management and Non-Wood Forest Products, and Post Graduate Diploma in Pulp & Paper Technology. It also runs Doctoral Programme leading to the award of Ph.D. degree.

The National Forest Library and Information Centre (NFLIC) of the Institute is the richest centre of forestry and allied sciences, document collection in South and South-East Asia.

Tropical Forest Research Institute (TFRI), Jabalpur focuses on research activities in the states of central India, viz., Madhya Pradesh, Chhattisgarh, Maharashtra and Odisha. It has a satellite Centre for Forestry Research and Human Resource Development (CFRHRD) at Chhindwara which conducts research in the specialized areas of human resource development in forestry sector by imparting vocational training, leading to poverty alleviation through self employment.

Arid Forest Research Institute (AFRI), Jodhpur focuses on research activities in Rajasthan, Gujarat and Dadra & Nagar Havelli. The institute carries out research in forestry and allied fields to enhance arid and semi arid land productivity and vegetative cover to conserve biodiversity and to develop technologies for the end-users.

Himalayan Forest Research Institute (HFRI), Shimla was established in 1987 from Conifer Regeneration Research Centre. The institute caters to the research needs of the states of Jammu & Kashmir and Himachal Pradesh with focused research on Himalayan and cold desert areas. It has nine Field Research Stations for carrying out site-specific research, including the one located at Tabo and Lahaul-Spiti (HP) to address specific research needs of cold deserts. The Institute has also been declared as the "Advanced Centre for Cold Desert Afforestation and Pasture Management" for taking up advanced research.

Rain Forest Research Institute (RFRI), Jorhat was established in 1988 to support forestry research in North-Eastern states. The institute focuses on conservation methods for restoration of degraded lands under shifting cultivation, management of community forests and multi-facet use of bamboo and cane. Advanced Research Centre for Bamboo and Rattan (ARCBR) has also been established in Aizawl (Mizoram) as its unit in 2004, which conducts research for socio-economic upliftment of North-Eastern people, which revolve around bamboos and rattans.

Institute of Forest Productivity (IFP), Ranchi established in 1993 to look into the forestry research and education needs in eastern region i.e. the states of Bihar, Jharkhand and West Bengal. The institute also has Forest Research Centre at Mandar (Ranchi), Environmental Research Station at Sukna (West Bengal) and Forest Research & Extension Centre at Patna (Bihar) to carry out research and extension activities.

Institute of Forest Biodiversity (IFB), Hyderabad was established during December 2012 by upgradation of the erstwhile Forest Research Centre with the mandate to carry out research on forest biodiversity of Andhra Pradesh

with special emphasis on the forest biodiversity of Eastern Ghats.

Institute of Wood Science and Technology (IWST), Bengaluru was established in 1988. The institute caters to the forestry research needs of the states of Karnataka and Goa. The institute has widened its research activities in the fields of tree improvement and wood energy in addition to conventional wood sciences. This institute has also been widely recognized as the centre for advanced studies in areas of improved utilization of wood, Mangrove and coastal ecology and Sandal research of Western Ghats.

Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore was formed during 1988 by upgradation of Forest Research Centre (FRC), working under the Forest Research Institute and Colleges since 1959. The institute caters to the forestry research needs of the states of Tamil Nadu, Kerala, Andaman and Nicobar and Lakshadweep Islands. It maintains seed production areas and clonal orchards for important tree species, such as, teak, casuarinas, eucalypts, pongamia, jatropha and acacia. The Institute has field units in Kerala, Tamil Nadu and Andaman and Nicobar islands.

B. Research Management

Directorate of Research

The Directorate ensures that all the research projects taken up by ICFRE institutes are need-based and address the regional and national forestry research problems. The research prioritization by the Directorate is through participatory mechanism involving all the stakeholders and end users.

Research Planning Division under the Directorate of Research deals with the planning, formulation and finalization of plan funded forestry projects of nine research institutes and four research centers of ICFRE. The process involves stakeholders meets, Research Advisory Group (RAG) meetings at each institute and national level Research Policy Committee (RPC) meeting at ICFRE HQs under the chair of Director General, ICFRE keeping in view the balance among international, national, regional and state research requirements and decide investment in high quality forestry research/emerging issues to meet the aspiration of the society with bottom-up, transparent and participatory approach.

Research Advisory Group (RAG) meetings of each of the nine ICFRE institute for 2014-15 were convened as per approved calendar at institutes/ by circulation of the proposals to the RAG members.

XVI Research Policy Committee Meetings (RPC) for the years 2014-15 was convened under the Chairmanship of Director General, ICFRE from 27 to 28 February, 2015 at Dehradun. A total of 121 ongoing projects were reviewed and approved, 114 projects for continuation with budget outlay of 31.97 crore. 127 new projects in the area of forests and forest products for livelihood and economic growth, biodiversity and ecological security, forests and climate changes and forest genetic resources management and tree improvement were placed before the RPC of which 90 new projects with the budget out lay of Rs 13.69 crore were approved.

Monitoring and Evaluation Division under the Directorate of Research deals with the annual review and evaluation of all the ongoing research projects of ICFRE institutes. It suggests corrective measures for timely completion of the projects and achievements of the objectives with perfection. Total 239 projects are being implemented that include 170 ICFRE plan projects and 69 externally-aided projects during the year. Also, during the period, the annual review of 365 (258 ICFRE funded and 107 externally-aided) ongoing and completed research projects of all ICFRE institutes was conducted.

Biodiversity and Climate Change (BCC) Division is working on biodiversity and climate change related research and policy issues leading to international negotiations under the United Nations Framework Convention on Climate Change (UNFCCC), United Nations Convention to Combat Desertification (UNCCD) and the Convention on Biological Diversity (CBD). ICFRE has contributed as a member of the Expert Committee in preparation of Reference Document for REDD-plus in India in December 2014 prepared by Ministry of Environment, Forest and Climate Change, Government of India.

The final report of project activity on 'Forestry Sector – Mitigation and Gaps & Constraints' has been submitted to NATCOM Project

Management Cell of Ministry of Environment, Forest and Climate Change, Government of India. The Division has prepared an inception report of 'Study-cum-survey to assess the demand and supply of medicinal plants in India – in the national perspective, as well as in respect of the international market' and submitted to National Medicinal Plant Board, New Delhi. It has also prepared the 6th National Report on desertification, land degradation and drought after collection and compilation of information from various stakeholders on performance indicators of operational objectives of 10 year strategic plan of UNCCD under the project and submitted to UNCCD Secretariat through PRAIS 2 portal of UNCCD after approval of the Ministry of Environment, Forest and Climate Change, Government of India.

An inception meeting of 'REDD Plus Pilot Project in the Van Panchyats of Uttarakhand' was organised on 21 July 2014 at ICFRE, Dehradun followed by the stakeholder consultation of the Uttarakhand REDD plus project with the officers of the Uttarakhand Forest Department.

Director (International Cooperation)

Director, International Cooperation (IC) and Panchayat and Human Dimension Division (P&HD) co-ordinates and liaisons with ICFRE institutes for processing and implementation of externally-aided projects from national and international funding agencies. It facilitates sanctioning and signing of MoU of externally-aided projects of ICFRE institutes respectively from the Director General, ICFRE and the MoEF & CC. It also acts as an interface with rural Panchayat level institutions through its nine research institutes.

Status of Externally-Aided Projects (EAPs) of ICFRE institutes was compiled for the period 1 April 2014 to 31 March 2015. Summary of the same is given below:-

Institutes	Ongoing (EAPs)		Submitted (EAPs)		Completed (EAPs)		Total No. of MoU/ Consu -ltancy Project
	Total No. of Projects	Total Budget Outlay (Rs. in lakhs)	Total No. of Projects	Total Budget Outlay (Rs. in lakhs)	Total No. of Projects	Total Budget Sanctioned (Rs. in lakhs)	
AFRI, Jodhpur	15	251.94	6	138.40	3	34.81	4
FRI, Dehradun	30	1350	19	880.57	2	21.76	2
HFRI, Shimla	12	242.20	7	172.12	1	11.31	1
IFGTB, Coimbatore	22	547.39	13	915.13	5	74.61	1
IFP, Ranchi	5	1511.35	5	187.89	2	72.40	1
IFB, Hyderabad	4	70.68	2	98.21	1	20.00	4
IWST, Bangalore*	21	374.00	4	55.58	5	54.89	Nil
RFRI, Jorhat	4	168.30	7	394.58	2	104.83	3
TFRI, Jabalpur	20	343.82	8	105.33	2	23.21	2
TOTAL	133	4859.68	71	2947.81	23	417.82	18
		(48.60 crore)		(29.47 crore)		(4.17 crore)	

* Also submitted a project to ITTO costing US $ 318,238.

Following projects and MoUs were processed for approval of the competent authorities at ICFRE/MoEF & CC and approvals communicated to the respective institutes:

INTERNATIONAL

1. Approval of MoEF&CC for extension of ongoing project **"New Bio-control Opportunities for Prickly Acacia: Exploration in India"** with Department of Agriculture, Fisheries and Forestry, Australia and IFGTB, Coimbatore till June 2015.
2. Approval for research contract with Tetra-tech under Forest Plus Programme of USAID and FRI to become **"on call partner"** with Tetra-tech ARD for implementing Forest Plus Program of USAID.
3. Project proposal entitled **"Promoting Livelihood Innovations in forest fringes to reduce forest degradation"** by ICFRE/FRI submitted to USAID.
4. MoU between Malayasian Forestry Research and Development Board and ICFRE to strengthen the research, exchange of research information, technology sharing in forestry research related areas, besides promotion and development of cooperation including training and capacity building and exposure visits in the field of biotechnology, tree improvement and forest genetics resources.

NATIONAL

1. Project "**Establishment of Herbal Garden**" funded by National Medicinal Plants Board (NMPB) to IFB, Hyderabad.
2. Project on **"Measurement of vegetation and Biomass parameters under Vegetation Carbon Pool Assessment (VCP) sub-project of the ISRO-Geosphere Biosphere Programme (IGBP) National Carbon Project (NCP)"** sanctioned by NRSC, Hyderabad to Institute of Forest Biodiversity, Hyderabad.
3. Two Collaborative Research Projects of IFGTB Coimbatore with ITC Life Science and Technology Centre, Bengaluru viz. **"Developing Varieties of *Acacia mangium* Wild with Low Heartwood content and Lower Wood Density"** and **"Selection of suitable Bamboo species for quality Agarbathi sticks production"**
4. MoU between AMITY Institute of Microbial Technology (AIMT), AMITY University, Uttar Pradesh and AFRI, Jodhpur to implement a project funded by DST for **"Value addition to plants of agricultural and horticultural importance by application of consortium of root fungal endophyte and nitrogen fixing prokaryote-Azotobacter spp."**
5. MoU signed between Indian Council of Forestry Research and Education, Dehradun and AMITY University Uttar Pradesh, Noida on 24 March 2015.
6. MoU between Vanavarayar Institute of Agriculture, Pollachi (Tamil Nadu) and IFGTB, Coimbatore.
7. Model nursery by IFB, Hyderabad under the project of A.P. Medicinal and Aromatic Plants Board with species, such as, *Gloriosa superba,* Myrobalans (*Terminalia* spp.) Sandal wood.
8. MoU between FRI, Dehradun and Avantha Centre for Industrial Research & Development, (ACIRD), Thapar Technology Campus, Patiala for two research projects **"Pre-treatment of lignocelluloses biomass for hemicelluloses extraction for bio-ethanol production" and "Preparation and applications of cationized nano-cellulosic strength agents for paper making".**
9. MoU between FRI, Dehradun and United Spirits Ltd. Bengaluru.

Benefiting people through forestry research has been major thrust area that aims for sustainable management of the forests and natural resources vis-a-vis economic upliftment of people. Timber and Non-wood Forest Produces provide substantial input into the livelihood of large section of society. Hence, it becomes imperative to conserve the natural resources by integrating the findings of the research so as to utilize the potential diversity of the forests and forest products for the betterment of people. The ICFRE has been engaged in implementing the research projects to address the objectives of this thrust area that are described in this chapter.

Silviculture and Forest Management

2.1

Identification of extent of forest land in forest fringe villages (FRI)

The forest fringe villages were identified in 230 rain-fed districts of India by applying GIS techniques. The forest types occurring in the forest fringe and the area occupied by each forest type were estimated in 275 districts. The area occupied by different density classes of forests was also estimated in 275 districts. The socio-economic status and dependence of forest fringe villagers on forest and the ecological status of fringe forests were assessed in 194 districts. The ecological status of the forest has been studied in 194 districts. A web portal has been developed for storage and analysis of data being generated for 275 rain-fed districts.

Soil Quality Index (SQI) for different land uses of Tehri Garhwal district of Uttarakhand (FRI)

For evaluating the impact of land use on soil health of Tehri Garhwal district through Soil Quality Index (SQI), soil samples were collected from miscellaneous forest, pine forest, oak forest, agricultural field and grasslands. Soil Quality Index of all the sites under forests, agriculture and grassland was calculated seasonally. Soil Health cards were prepared for the different villages based on soil quality index values. It was noted that after summer seasons, SQI varied from 40.86% to 71.14% and after rainy season, SQI varied from 42.11% to 74.26%, whereas after winter season, SQI varied from 38.42% to 79.27%. There was good concentration of Organic Carbon, Nitrogen and Phosphorus in Tehri soils. Among microorganisms, fungi in soils were less in number, whereas bacteria and actinomycetes were adequately present.

Managing Forests and Forest Products for Livelihood Support and Economic Growth

Studies on soil profile attributes under forests and jhum lands areas of some selected sites of Nagaland state (RFRI)

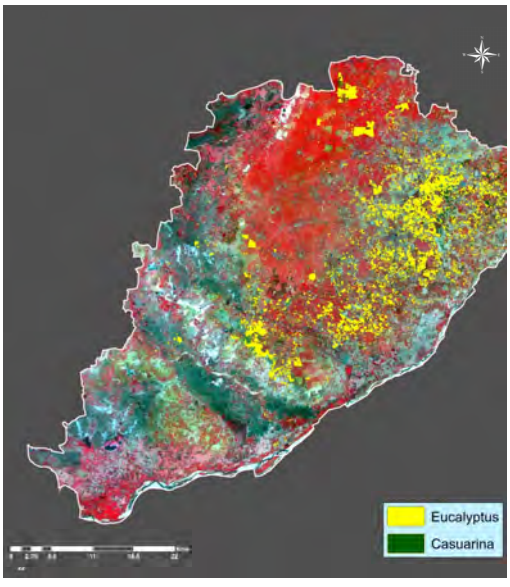
Physico-chemical analysis of soil sample collected from soil profile under forest, tea garden and jhum land of Mon, Kohima and Dimapur districts revealed that soils were loamy, sandy clay loam to clay loam, loamy sand or sandy in texture and had medium to high bulk density, that increased down the soil profile under all land uses. Soil was organic in nature and total water soluble salt (EC) content was found low. Organic carbon content was higher in forest land than under Jhum and Tea garden areas. Organic carbon decreased down the soil profile under all the land use systems. Medium to high available nitrogen, potassium and low to medium available phosphorus were found in soil under all the three land uses. Low to high range of Cation Exchange Capacity (CEC) was found among the entire soil sample having low base saturation percent under all the three land uses.

Expanding carbon sinks through sustainable tree biomass energy production in semi-arid areas of Tamil Nadu India (IFGTB)

This collaborative project involving IFGTB, Tamil Nadu Forest Department and CSIRO, Australia aims at increasing the awareness among people in semi-arid areas of Tamil Nadu about the latest techniques and plant resources available for producing biomass for energy requirements. Following field visits of the scientists of IFGTB and CSIRO to India and Australia, 28 species of Eucalyptus "mallees" have been introduced in the target areas to select the best accessions for biomass production in dry areas. Early results show that the essential oil yielding mallee, *E. polybractea* and high biomass yielding species like *E. chlorophylla* are performing better than the others. These valuable genetic resources will be maintained for their sustainable use in afforesting semi-arid areas.

Mapping and monitoring of Casuarina and Eucalyptus Plantations in Tamil Nadu using RS and GIS (IFGTB)

Mapping of Casuarina and Eucalyptus plantations has been completed using LISS IV Resourcesat-2/ L-4FMX and extent of the plantations based on age/maturity of the plantations. Field sampling for biomass estimation is being done.



Extent of Casuarina and Eucalyptus plantations in Ariyalur district (2012-2013)

Standardization of plantation techniques for major forest plant species in Madhya Pradesh (TFRI)

Observations of quarterly recorded growth data on eight species (for 21 months) revealed that *Dalbergia sissoo* had highest survival percentage and highest growth rate while lowest survival percentage was recorded in *Gmelina arborea*. During the year 2014-15, it was observed that the maximum average height was attained by *Dalbergia sissoo* (123 cm) followed by *Dendrocalamus strictus* (106 cm) and *Terminalia arjuna* (68.3 cm) and minimum height was achieved by *Tectona grandis* (29.59 cm).

02

Determination of Nursery Requirements and Initial Planting Performance of *Diploknema butyracea* (Roxb.) H. J. Lam and *Myrica esculenta* Buch. Ham. under Mid-hill Conditions of Himachal Himalayas (HFRI)

The growth and survival data of Cheura *(D. butyracea* Roxb.) stock maintained in two nurseries, raised from earlier seed collections, was recorded periodically. Kaphal seeds collected during the year from Shimla, Sirmaur, Solan and Mandi district of Himachal Pradesh were used for germination studies with various pre-sowing treatments. The germination studies conducted in nursery during rainy season of 2013 and 2014 on all the three sources exhibited substantial increase in germination from 12.89% (5.33 to 17.33%) in 2013 to 53.17% (31.00 to 66.50%) in 2014. The percent filled seeds recorded to vary from 64.33 to 67.67% during 2013 for three studied sources and were found to vary from 86.67% to 94.00% for the same sources during 2014.

Observations recorded periodically in the plantations as well as in the nursery. In vegetative propagation studies carried out during 2014 in Kaphal under semi-controlled conditions with auxin treatments, the cuttings failed to root in all the trials. Cheura seedlings raised locally were again planted in Nalagarh area of Solan district. In Cheura plantations, the initial survival was found to be encouraging. However, during the last two winters, it was observed that Cheura plants recorded mortality due to frost sensitiveness.

Survey of Bamboo resources and quantitative assessment of their production and consumption in North India (FRI)

The study was conducted in the states of Haryana, Punjab, National Capital Territory, Delhi and Union Territory of Chandigarh, Uttarakhand and Uttar Pradesh. The analysis of the data shows that the contribution of state's own production in the consumption of bamboo of states under study area is, between 4 and 31%. However, Union Territory of Chandigarh and National Capital Territory, Delhi have no production of their own and bamboos are brought from outside.

Growth and yield studies on forest plantations of teak in Karnataka for their sustainable management (IWST)

Annual measurements were carried out in 27 sample plots laid out in Yellapur, Haliyal, Koppa, Madikere and Virajpet Forest Divisions and growth data were recorded in all the sample plots. Data analysis indicated that the average height and DBH varied from 7.75m to 22.36m and 6.76cm to 28.79cm, respectively. Similarly, basal area/ha and volume/ha ranged from 7.05 m^2 to 37.49 m^2 and 29.12m^3 to 412.09m^3, respectively according to age, density and site quality. Dominant height of the stands varied from 12.01m to 28.43 m. The mean annual increment (MAI) in volume was found to vary from 2.08 to 11.78 m^3/ha/yr. The age of the stands varied from 14 to 38 years, while density ranged from 498 to 1963 stems/ha. Form factor varied from 0.42 to 0.58.

Agroforestry and people-forestry interface

2.2

Colophospermum mopane - Cenchrusciliaris Silvipastoral System (AFRI)

Annual growth data (height, crown diameter and collar diameter) was recorded for *C. mopane* plants. The increment in crown diameter was 13.82% in control trees compared to 11.46% in trees with grass. Growth difference (21.2%) was highly significant for collar diameter with mean value of 18.03 mm for control trees compared to 14.88 mm for tree with grass.

Soil pH in June 2014 was 7.69 and 7.95 in 0-20 and 20-40 cm soil layer respectively inside plant pit, however mean soil EC was 1.07 and 0.46 d Sm^{-1} for the same layers. Again in Feb 2015, pH was 7.9 to 8.22 and 7.95 to 8.29 inside plant pit for 0-20 cm and 20-40 cm soil layer. Similarly, EC values are also in normal range of 0.44 to 0.5 and 0.17 to 0.67 d Sm^{-1} for upper and lower soil layer, respectively indicating that plant growth helps in soil amelioration.

Suaeda nudiflora-Cymopsis tetragonoloba agroforestry system(AFRI)

Initial germination after one week of sowing was 50-60% which increased to 80-85% in first week of September 2014. Afterwards, it rained and water logging took place in the crop area resulting in only 10-15% survival in Mid October. Crop yield was estimated in November 2014. Out of the two cultivars, total dry yield of C-1017 were 170g/m^2 with 41.5g/m^2 seed yields in comparison to 1003 cultivar with 140g/m^2 including 34g/m^2 seed yield. Saline conditions of soils reduced the total dry yield as it was 164g/m^2 (35.1 g/m^2 seed yield) for C-1017 variety and 109.0 g/m^2 23.1 g /m^2 seed yield) for C-1003. Seed size decreased, number of seed per gm was 35 and 36 for C-1003 and C-1017 respectively as compared to 27 and 29 originally. After rain and due to leaching of salts many species appeared on the bunds.

Study on status of Agroforestry systems existing in Punjab, Haryana, Uttarakhand and North-West region of Uttar Pradesh (FRI)

Socio-economic survey of 40 villages was conducted and data were collected on socio-economic status and agroforestry practices. Compilation and computation of data on existing agroforestry and socio-economic status of 36 villages of Bareilly (12) Yamunanagar (12) and Ambala (12) has been completed.

Socio-economic survey of Agro-forestry in Haryana

Development of Integrated Dry Land Agroforestry Systems in Tamil Nadu for enhancing livelihood opportunities (IFGTB)

Superior planting stocks of Casuarina, Pungam, Neem and Teak were multiplied for field planting. Superior grafts of horticultural crops like amla, sapota and mango were procured from Horticultural farm in Sundaramudayan village in Rameswaram. As envisaged, seven Agroforestry plots have been established. Further, the introduction of superior planting stocks of *Callophyllum inophyllum* selected by IFGTB for high fruit and oil yield can address the issues relating to the biodiesel needs of fisherman communities in this region in the near future.

Assessment of Impact of the Harvesting Practices on the Regeneration of Bamboo Forest in Madhya Pradesh (TFRI)

Survey was undertaken with Bamboo growers and Forest fringe village of 8 districts of Madhya Pradesh to document the prevalent harvesting methods of bamboo harvesting. The number of Karla produced was found to be highly ($p<0.01$) correlated to the clump girth. A significantly high correlation was also observed between the number of Karla produced to number of Mahila and number of Pakia in both the experiments. Removal of half of the total number of Pakia and all Pakia had encouraging effects on the regeneration of the clumps. There was no significant difference in the number of new shoots produced in the managed and unmanaged bamboo plantation,

Standardization of technique to enhance the quality and sustainable production of *Diospyros melanoxylon* leaves in Chhattisgarh (Sub-project- Standardization of pruning practices and optimum doses of organic and inorganic fertilizers to increase leaf surface area of tendu) (TFRI)

Experiments on pruning practices of tendu were conducted considering three sets of treatments including 18 combinations viz. time interval of pruning, height of pruning and girth classes. Results showed that pruning of tendu seedlings of medium girth (2 – 4 cm) at ground level every year maximized the leaf surface area and minimized the leaf weight or enhanced the quality of leaves.

Introduction and evaluation of fast growing tree species under Agroforestry systems in different agro-climatic zones of Tamil Nadu (IFGTB)

Agroforestry systems were established with fast growing tree species of *Melia dubia*, *Gmelina arborea*, *Neolamarkia cadamba* and *Sweitenia macrophylla* over 5 ha each in three zones. Intercropping activities carried out and the biomass and yield of annuals of various species

(as intercrops) has been assessed. One training has been conducted on "*Capacity building on agroforestry plantation establishment and management*" for the farmers of Pudukottai district.

Establishment of Agroforestry system with Melia dubia with Turmeric under farmers' field in western zone of Tamil Nadu

Sapindus emarginatus for livelihood support

Population of soapnut in Tamil Nadu was identified. 133 CPTs were identified and collected seeds were processed and germination test was conducted. Extraction method for saponin from fruit rind was standardized. Thirty high saponin yielding accessions were shortlisted and laid out as multilocation trials (1 ha each) in five. The growth and survival data have been recorded at six months interval.

Augmentation of medicinal plants resources for primary health care practices by the tribal communities in the Nilgiris and enabling their livelihood enhancement (IFGTB)

Data on 79 ethono-botanical usages of different medicinal plants in 14 diseases among 4 sub-caste of tribes and seven villages were documented. The various traditional practices adopted by the communities with regard to their primary health care have been recorded during the survey. A training programme on "*Role of medicinal plants and other forest products in livelihood enhancement of tribals for Nilgiri district*" was also conducted.

Development of Lac based Agroforestry (Silvi- Agri-Lac) system (TFRI)

Experiments were conducted to assess the effect of *Flemengia semialata* on the grain production of pulse and growth of crop during year 2013 and 2014. Maximum yield of grain was recorded in treatment T3 (*F. semialata* + agri crop + lac) followed by T5 (*F. macrophylla* + agri crop + lac) and T8 (control) as compared to intercrops. No negative effects were recorded on the grain yield and nutrient level under the system during study period.

Managing resources to enhance productivity of agroforestry system in dry areas of AICP Project: Tree crop interaction study of exiting MPTs based silvi-agri system in arid and semi-arid region of India (AFRI)

The four treatments were: Intact tree (T_1), Tree branch removal upto 70% of total tree height (T_2), root barrier treatment (T_3), and both tree branch removal and root barrier treatment (T_4). *Cyamopsis tetragonoloba* crop was grown with *Hardwickia binata,* whereas, integrated *Cenchrus ciliaris* grass with *Colophospermum mopane* trees was maintained. The grain production of *C. tetragonoloba* was significantly ($P<0.05$) higher in T_4 than other treatments. Clump number and diameter and production of *C. ciliaris* grass were also higher in control as compared to the tree integrated plots.

Soil water content (SWC) did not differ among the treatments under *C. tetragonoloba* crop grown with *H. binata* but SWC increased significantly ($P<0.05$) with increasing distances (i.e., as compared to 0.5 m distance). SWC was significantly ($P<0.05$) higher in T_4 treatment as compared to T_1 treatment in *C. ciliaris* grass with *C. mopane* trees plots. Tree root density did not differ among the treatments in both the species. Physico-chemical properties of soil were analysed which did not differ among the treatments. Nitrogen content in *C. tetragonoloba* crop was low in T_4 and sole crop plots.

Productivity enhancement of Kair (*Capparis decidua*) fruit to generate livelihood in rural areas of Thar Desert (AFRI)

EXP -1(Gogelo beed, Nagaur):-

Plants were divided into three blocks. Fertilizer treatments of leaf compost (LCM), goat FYM (GM) and VAM in combination with different fertilizers like SSP, SSP + K, K, Zn and SSP, K, + Zn and NPK were applied alongwith irrigation in 2014. Data analysis of April and May indicated maximum flowering (73.5%) in frost affected leaf compost treated Kair plants followed by VAM treated plants (24.3%). Flowering was minimum (14.4%) in Goat FYM treated plants till second week of April. There was no flowering in untreated plants. Treatment-wise, total mean

fruit yield was 298.4 g in Block A, 25.0 g in Block B and 125.4 g in Block C.

Second fruiting was observed in the third week of July which was 48.3% in LCM block, 26.3% in GM Block and 26.8 % in VAM Block. Third fruiting was observed in the third week of October and it was 62.9% in A block, 52.6% in B block and maximum 67.6% in C block which was significantly high as compared to that of April and July.

Out of three organic manures, LCM has been found as the best in combination with inorganic fertilizers where T_4 and T_5 are the best treatments so far. Further observations are underway.

EXP -2 (Khari Khurd, Jodhpur)

Kair population in Luni forest range was enumerated and a detailed status map of the area prepared & boundary was demarcated. Plants bowl was prepared and additional plants and grasses were removed. All plants were divided into two blocks. Organic fertilizer and inorganic fertilizer with different combination LCM (1 Kg) + SSP 625g/ stem + K_2SO_4 (115 g/ stem) + $ZnSO_4$ (40 g /stem) block –A and GM (1.5 kg/stem) +SSP 625g/ stem + K_2SO_4 (115 g/ stem) + $ZnSO_4$ (40 g /stem) in block- B were applied with irrigation in August 2014.

Soil sampling was done to analyze the initial soil status. Growth data were recorded and the mean height and crown diameter ranged from 209 to 292 cm and 203 cm to 336 cm, respectively in A block, while in B block, it ranged from 192.5 to 308 cm and 231.5 to 338 cm respectively.

In November 2014, scanty flowering was observed that ranged from 16.6 % trees to 50% trees with no effect of treatments. There was frost damage to upper branches of plants (10 to 25%) from last week of December 2014 to 1st week of January 2015. No flowering or fruiting was recorded in January to March 2015.

Rehabilitation of degraded Jhum land through potential bamboo species with reference to carbon sequestration and livelihood development (RFRI)

To explore potential bamboo species for rehabilitation of degraded land, quantified carbon stock of three economically important bamboo species were raised through rhizome as well as from seedlings. Progressive growth data, upto four years old plantation showed that growth of *Bambusa balcooa* was significantly higher as compared to that of *Bambusa tulda* and *Bambusa nutans*. Total dry biomass production revealed the sequence of *B. balcooa* >*B. tulda*>*B. nutans*. Though *B. balcooa* has fairly good morphological characteristics, its culm emergence is less, hence maximum dry biomass was recorded in *B. tulda* plantation due to highest number of culm. Above ground and under ground carbon stock along with the soil organic carbon were significantly higher in *B. tulda*. Study concluded that *B. tulda* had a better potential to sequester CO_2 and may be introduced in degraded fallow Jhum land for effective rehabilitationto help in climate change mitigation.

Studies on the traditional knowledge of medicinal plants used by Nepali community in Assam and identification of important species for chemical analysis (RFRI)

Survey was conducted in 11 Nepali villages in Sonitpur, Tinsukia and Dhemaji districts of Assam for the collection of information on traditional uses of medicinal plants by Nepali community. It was found that women had fair knowledge of the uses of traditional medicines particularly for children. They use the easily available plants in the villages and plants conserved in the homestead garden. The medicinal plants are used for fever, cough, blood pressure, jaundice, diabetes, worms in children, injury or cut etc. Medicinal plants along with parts used and mode of usage were also recorded.

Introduction of selected genotypes of Karanj, Kusum and Bamboo as tree components in Agroforestry models in lateritic belt of eastern India (IFP)

During 2014, cultivation of 3-5 agricultural crops under Kusum & Karanj was done. For reduction of shade, clump management was done on bamboo plots in 2011. Shade reduction in Kusum plots was done through pollarding at 1.25 m height above ground level in February 2014. Later on, lac inoculation on pollarded Kusum saplings in agroforestry plot was also carried out. Common cost of cultivation of agricultural crops was calculated under the sub-section of Land preparation, Fertilization, Seed & Sowing, Cultural practices & Fixed cost. Benefits of production by cultivation practice were also calculated. Among five crops, cultivation of ginger and turmeric was found suitable and economical. Growth of tree components was higher under agroforestry than mono tree cultivation.

Wood Science and Technology

2.3

Study on the performance of treated timbers (ZiBOC, CCA & CCB) and their natural durability (FRI)

The study revealed that the *Pinus roxburghii, Pinus radiata* and *Pseudotsuga menziesii* wood species treated with CCA, CCB and ZiBOC and tested in prototype and industrial cooling tower exhibit significant protection by all three preservatives.

Chemical modification of wood for durability improvements (FRI)

P. deltoides and *P. roxburghii* samples were treated with citric acid (CA) and Sodium Hypophosphite Monohydrate (SHP). The result showed that maximum weight gain percentage was obtained when the samples were treated with 20.7 % CA + 19.5 % SHP. The Anti Swelling Efficiency (ASE) was calculated and the samples treated with 20.7 % CA + 19.5 % SHP showed ASE of 68 % in *P. deltoids* and 40% in *P. roxburghii*.

Establishment of common facility centre for bamboo processing and training at FRI

A Common Facility Centre funded by BTSG-NBM for Bamboo Processing and Training (CFCBPT) has been established at Forest Research Institute, Dehradun.

Refinement in vacuum timber dryer designed by FRI and its performance studies

Experiments were conducted to study vacuum drying behavior of *Cedrus deodara* and *Dalbergia sissoo* woods. Drying data, analyzed for vacuum drying of these two species revealed faster drying rate, of the species in vacuum drying as compared to that in traditional steam-heated drying. Thus, drying in vacuum will be more economical as compared to drying in traditional kilns.

To study the effect of nano-clay on Physical and Mechanical properties of Plywood (FRI)

Results indicated that when nano-clay is added to resin used in plywood preparation, physical and mechanical properties of plywood improved. Analysis of the results are in progress.

To study the suitability of combi-ply from *Melia composita* and poplar (FRI)

Combination plywood of 3-ply, 5-ply, 7-ply, and 9-ply have been developed and tested. Two trials have been completed.

Effect of flowering on culm quality of *Dendrocalamus brandisii* and to explore its potential for making bamboo composite products (IWST)

Histo-chemical studies indicated higher starch distribution in culms before flowering as compared to culms during and after flowering stages. Quantitative estimation of starch by biochemical studies showed less starch content in the flowered bamboo as compared to that in non-flowered and during flowered culms. Physical and mechanical properties and comparative analysis of the properties of bamboo composites (WPC) have also been carried out.

Screening of certain plant extractives for developing eco-friendly wood preservatives (IWST)

Eco-friendly wood preservatives from barks of *Acacia auriculiformis* and *Acacia nilotica* and leaves of *Gliricidia sepium*, *Cassia angustifolia*, *Vitex negunda, Adathoda zeylanica* and *Chromolaena odorata* have been developed by extracting the plant parts with different solvents and incorporating copper ions in them.

Evaluation of the performance of Steam Volatile Creosote (SVC) as a wood preservative (IWST)

Steam Volatile Creosote (SVC) was distilled and applied to wood surface of eight selected tree species. Of the eight wood species studied, *Acacia auriculiformis* showed very good resistance for termite attack for 24 months and *Gyrocarpus jacquinii* exhibited minimum resistance.

Chemical derivatization of α-cellulose into value added products (IWST)

An efficient and new route for synthesis of Carboxymethyl cellulose (CMC), a most widely

used bio-polymer for various applications has been developed.

Development of Sandal (*Santalum album* Linn.) information system (IWST)

Model web database has been completed and Mini Sandal book is under preparation.

Nano-cellulose filled starch based composites (IWST)

Thermo-plasticization of starch with different plasticizers was carried out. Nano-cellulose was synthesized from bamboo pulp.

1. TPS granules
2. TPS using glycol-water
3. TPS using glycol-PVA-water

Liquefaction of Wood and value added products from the liquefied wood (IWST)

Rubber wood meal of 200 mesh size was liquefied. The FTIR spectroscopic analysis of the residuals indicated complete dissolution of lignin and partial dissolution of cellulose.

Chemical modification of *Eucalyptus* hybrid oil and development of fragrant Products (IWST)

Eucalyptus hybrid oil has been chemically modified by oxidation. Using *Eucalyptus* hybrid oil with other essential oils of different permutation and combination, different blends were developed and odour profiles assessed for these blends. Based on odour profile, trials have been undertaken for preparation of soap, floor wash, agrabathi, mosquito coil and perfume spray.

Evaluation of wood properties of *Melia dubia* of different ages from Southern India for finding suitability for various end products and development of value-added products (IWST)

Data were collected on physical properties of 5-6 and 9-10 year old trees. The average GBH of 5-6 year old *Melia* was found to be around 50-55 cm and that of 9-10 years was 60-65 cm. Heartwood % was calculated for five trees at bottom, middle, and top portion of trunk. The highest heartwood proportion of stem wood was around 60% and the lowest 43% in case of 5-6 years old trees and 65% and 45% in case of 9-10 years old *Melia* trees. Total shrinkage value was found quite high (15-20%) in wood of both age groups as compared to standard teak wood (≈7%).

Variability of growth stresses in *Melia composita* (IWST)

Longitudinal growth strains were measured in a clonal plantation. Growth strain was well below the threshold strain i.e. 700-800 microstrain suggesting that growth stress may not be a serious concern in this species.

Durability and treatability of *Melia composita* (IWST)

Melia composita specimens were treated with *Pongamia*, Neem, CNSL (Cashew Nut Shell Liquid) and CCB. The treated specimens along with untreated controls were installed in the test-yard for field exposure following randomized block design. The results showed that the weight loss was more in the control than the treated specimens.

Microwave assisted chemical modification of wood (IWST)

Microwave-assisted solvent free acetylation and butyrylation of rubber wood was carried out. Extent of modification of wood, estimated from weight percent gain (WPG), of microwave heated reaction was compared with that obtained by conventional heating. Degree of modification in all cases increased with iodine concentration. The modified wood exhibited good ASE.

New methods of chemical modification of wood for improving dimensional stability and durability (IWST)

Experiments on chemical modification of rubber wood with Iso-propenyl Acetate (IPA) using iodine (concentration 0.02-0.035M) as catalyst was carried out at 70- 95°C up to 10 hours. The average weight gain percentage increased with increasing reaction time. Work on chemical modification of rubber wood with IPA using aluminum chloride as catalyst was also carried out. The effect of temperature, reaction time and catalyst concentration was studied. A very good level of modification (> 20 WPG) was achieved. Modified wood was characterized using FTIR and NMR spectroscopy. Dimensional stability of IPA modified wood was evaluated by determining Anti-swelling efficiency (ASE). Modified wood exhibited good dimensional stability.

New method of chemical modification of wood using IPA based on iodine and aluminum chloride as catalyst has been developed.

Development of natural fibre filled thermoplastic composites from natural resources available in the State of Punjab (IWST)

Lantana fibre with and without bark (40%), PP (60%) and MAPP (6% of the basis of wood weight) were premixed and blended in a high speed mixture. The mixed material was extruded and palletized. The palletized composite material was injection moulded and tested for mechanical properties.

Profile extruded and injection moulded products from lantana fibre filled polypropylene composite were developed.

Thermal modification of wood for value addition to plantation timbers (IWST)

Data collected on the physical and mechanical properties of heat treated wood samples from *Melia dubia* and *Eucalyptus* species were analyzed for optimizing the thermal processing parameters. Wooden tiles of thermally treated wood of *Melia dubia* and *Eucalyptus* species were prepared for demonstration of the thermal treatment process.

Thermally modified wood of Eucalyptus, Melia and Poplar

NWFP and Medicinal plants 2.4

Phyto-chemical screening of selected wild edible plants for exploration of new sources of Luteolin (FRI)

Total phenolic content and total flavonoid content in *Myrica esculenta* (Kaphal) fruit extracts were estimated. Free radical scavenging activity of chloroform, acetone and methanol extracts of *Myrica esculenta* fruits were examined following DPPH protocol and correlation between TPC & FRS activity was established.

Process refinement for extraction of quality fibre and optimal isolation of bioactive constituents from *Agave sisalana* (FRI)

The steroid mixture Hecogenin-Tigogenin was recovered from sapogenin part and isolation of hecogenin was attempted with 90 % purity. Quantitative estimation of the target phytochemical was carried out using HPTLC that recorded the Hecogenin content as 0.4%.

Leaves of *A. sisalana* were subjected to disintegration with biodegradable materials at varying levels of pH and time for extraction of full length fibre. Fibre was extracted from pre-treated leaves followed by processing and yield determination. FTIR analysis for fibres obtained by various methods was also carried out.

Standardization of extraction methods, evaluation and quantification of Halmaddi from *Ailanthus malabaricum* DC (IWST)

120 trees were marked for experiment, out of which, 80 were above 60 cm in girth and 40 were below 60 cm in girth at Puttur Range, Manglore Division. Herring bone pattern was adopted for extraction in 3 different seasons viz., summer, winter and rainy. The resin yield was 20% more as compared to traditional method and also the wound healing process was rapid. High resin yield was observed during winter i.e., December-February.

Standardization of sustainable harvesting practices of Mahul Patta (*Bauhinia vahlii*) (TFRI)

Experiments were laid out to standardize sustainable harvesting practices of Mahul Patta (*Bauhinia vahlii*). Average % increase of number and size of *Bauhinia vahlii* leaves were observed after 40%, 60% and 80% harvesting at Keochi (Marvahi), Sapalwa (Pali) Katghora and Lamni (Bilaspur) experimental sites. Flowering was recorded in matured climbers only. The leaf samples collected from different sites in summer season showed more strength (2.47-2.53N) followed by leaf samples collected in spring (2.23-229 N).

Bioprospecting of *Acacia mearnsii* (IFGTB)

Insecticidal properties of *Acacia mearnsii* seeds were assessed. Aqueous and acetic acid extracts have been found to be effective in controlling selected pests. Flowers of *Acacia mearnsii* were processed and extraction of essential oils from plant material completed.

Structural studies and utilization of *Acacia tortilis* gum exudates (FRI)

The polysaccharide was isolated from the gum exudates of *A. tortilis* in 46.91% yield. Concentration of galacturonic acid and glucuronic acid were 4.29% and 4.96% respectively. Total uronic acid content of both polysaccharide was 15.63% and 6.5% respectively.

Refining of process for detoxification studies of Jatropha seed oil (FRI)

The fractionation of the oil was done using liquid-liquid and solid-liquid chromatography which resulted in removal of the toxic compounds. The process is facile and upgradable.

Phytochemical studies on medicinally important *Diploknema butyraceae* (Indian Butter Tree) Seeds (FRI)

Chemistry of the kernels of medicinally important *Diploknema butyraceae* (Indian Butter Tree, Cheura butter) was examined. Total seven compounds were isolated.

Enzyme aided alternative process for the extraction of oil from *Cymbopogon citrates* (Lemon grass) (FRI)

Enzyme aided extraction of the essential oil from *Cymbopogon citratus* (lemon grass) was carried out. Composition of the isolated essential oil was studied using GC-MS and compared with that obtained by conventional hydro-distillation method. Enzyme treatment resulted in production of the essential oil of improved composition and yield.

Evaluation of *Santalum album* grown in Uttarakhand and Himachal Pradesh for yield, quality and composition of essential oil (FRI)

Essential oils of *Santalum album* grown in the forests of Himachal Pradesh were isolated by hydro and steam distillation of the heartwood samples. These oils were evaluated for yield and quality in terms of specific gravity, refractive index, saponification value, solubility, alcohol content, acid value and optical rotation.

Phytochemical examination of *Acacia albida* (FRI)

Systematic investigation was carried out to isolate and characterize the phyto-constituents of *Acacia albida*. Total phenolic and flavonoids contents were also estimated in the leaves and bark. The bark and leaves extracts were screened for antifungal activity against three fungi viz. *Cylindrocladium quinqueseptatum, Rhizoctonia solani* and *Aspergillus niger*.

Development of sustainable model for enrichment of selected Medicinal Plant Conservation Areas (MPCAs) of Uttarakhand Himalayas (FRI)

Enrichment field trials by three selected species at two MPCA sites i.e. Kandara (Uttarkashi) and Khuliya in Pithoragarh are in progress. Three target species viz. *Aconitum heterophyllum,* natural population are found in Kandra MPCA and *Nardostachys grandiflora* D.C (syn-*N. jatamansi* D. C) are found only in MPCA at Khuliya and *Picrorhiza kurrooa* Royle ex Benth.(Kutki) are reported in both MPCA. Total 3796 number of different propagules of target species were planted and survival percentage of different propagules was recorded in both sites.

Baseline Survey/Inventory of Guggal and Salai Guggal distribution in Haryana (FRI)

This study aims at preparing district-wise availability of Guggal and Salai Guggal in forest and non-forest areas of Haryana for serving as baseline documentation for future conservation and potential utilization of *Commiphora wightii* and *Boswellia serrata*. South-west Haryana was surveyed and the distribution of both the species were recorded.

Assessment of economic contribution of NTFP of Chir Pine in the economy of forest dwellers in North India (FRI)

The project work has been undertaken in the state of Jammu and Kashmir, Himachal Pradesh, and Uttarakhand. Economic contribution of NTFPs of Chir pine mainly resin, on economy of forest dwellers has been studied. The observation showed that resin extraction works contributed 73% -83% shares in the total income of dependent forest dwellers.

Distribution, assessment and growth of *Santalum album* L., an important medicinal plant of Karnataka (IWST)

Survey was conducted to lay out the sample plots and to take observations in the identified 13 Forest Divisions in Karnataka having sandalwood population. 42 sample plots were laid out and growth data recorded in these plots. Proforma for collection of data from sandalwood growing farmers was developed. The data collected has been compiled and computations are in progress.

Evaluation of *Schleichera oleosa* (Kusum) fruits for their nutritional value and development of value added products for economic development of local people (TFRI)

Collected fruits of *Schleichera oleosa* were processed for pulp which was then evaluated for its nutritional values. The preservation protocol for pulp was also standardized. Eight value added products (Kusum Vati, Kusum Jam, Kusum Sauce, Kusum Thandai, Kusum Squash, Kusum Sarbat, Kusum Morabba & Kusum Powder) were prepared. Further study on phyto-chemical analysis and shelf lives of above mentioned products are under progress.

Standardization of processing and storage techniques of Malkangni (*Celastrus paniculatus*), Baheda (*Terminalia belerica*) & Baividang (*Embelia tsjeriam –cottam*) fruits/seeds (TFRI)

The collected fruits/ seeds of Malkangni, Baividang and Baheda were dried and processed. Dried seeds of Malkangni (*Celastrus paniculatus*), Baividang (*Embelia tsjeriam – cottam*) and rind of Baheda (*Terminalia belerica*) fruits were stored in different containers. Some of the samples of fruits/ seeds were also stored at 4-5°C in refrigerator to examine the effect. Seeds of Malkangni were analyzed for oil percentage by Soxhlet apparatus. Seeds of Baividang and rind of Baheda fruits stored in different containers were evaluated for embelin and gallic acid content respectively using HPTLC technique. In preliminary study, polythene containers at room temperature were found suitable for storing the above said plant materials.

Chemo-profiling of some Dashmoola species (*Solanum indicum*, *Solanum xanthocarpum* and *Uraria picta)* in Madhya Pradesh (TFRI)

Forest area was surveyed and plant material of *Solanum xanthocarpum* was collected using the purposive random sampling from three places each from eleven (11) agro-climatic regions. Quantification of Lupeol in different plant parts of *Uraria picta* and Caffeic acid in different plant parts of *Solanum indicum* and *Solanum xanthocarpum* collected from different agro-climatic regions was carried out using HPTLC technique. Lupeol content in the roots, stem and leaves of *U. picta* varied from 0.49 – 0.15 %, 0.018 – 0.005% and 0.014 – 0.003% respectively.

Studies on harvesting time of some medicinal plant for their natural antioxidant constituent (TFRI)

The phyto-chemicals and antioxidant activity value were evaluated in the collected samples. The total phenol and flavonoids percentage in *Argyreia speciosa* leaves varied from 0.21 to 3.16% and 0.92 to 2.79% respectively in the samples collected in July and December. The antioxidant activity in term of IC_{50} varied from 2.05 to 2.70 mg/ml. Total phenols in *Asparagus racemosus* fresh root varied from 0.24 to 0.32%. No flavonoid content was detected in *A. racemosus* root samples. IC_{50} value varied from 30.6 to 68.0 mg/ml. Phenolic acids were quantified by HPTLC. Total phenol, flavonoids and antioxidant activity as IC_{50} value varied 0.69 to 3.16%, 0.92 to 2.60% and 40.5 to 57.8 mg/ml, respectively collected in the month of December.

Quality standardization of some important medicinal plants of Madhya Pradesh (TFRI)

The samples collected in rainy, summer and winter seasons from various agro-climatic zones of Madhya Pradesh were processed for chemical analysis and active components.

Total phenol content in *Ocimum sanctum* samples ranged from 1.56-7.72 % being highest in summer samples of Malwa Plateau. Total flavonoids ranged from 0.87-6.03%, highest in winter sample of Chhattisgarh Plains while antioxidant activity, IC_{50} value ranged from 0.32-8.86 which was found to be best in the samples collected in rainy season from Bundelkhand zone.

Total phenol content in *Gymnema sylvestre* samples ranged from 0.22-13.19 %, highest quantity was observed in winter sample of Kymore Plateau & Satpura Hills agro-climatic zone. Total flavonoids ranged from 1.81-8.93%, highest in summer samples of Malwa plateau and antioxidant activity, IC_{50} value ranged from 0.40-60.8 which was found to be best in the samples of Kymore Plateau and Satpura Hills winter samples.

Total phenol content ranged from 1.09-6.8 % found to be highest in winter sample of *Phyllanthus amarus* collected from Chattisgrah plains. Total flavonoids ranged from 0.23-7.38% with maximum in winter samples of Jhabua Hills.

Maximum quantity of total phenolic content, flavonoids and IC_{50} value in *Tinospora cordifolia* stems were estimated, highest observed in winter season in samples collected from Chhattisgarh Plain agroclimatic zone, Nimar Plains respectively.

The concentration of phyllanthin, active ingredient of *P. amarus* was found to vary in different processing methods. The quantity of phyllanthin ranged from 0.457-1.108%.

Evaluation of non-edible oil seeds for development of surfactants and their utilization in pest management (TFRI)

Seeds of *Pongamia pinnata*, *Schleiochera oleosa*, *Jatropha curcas* and *Sapindus mukrossi* were collected and processed. Seed's biochemicals were isolated and modified into surfactants. The properties of surfactants at different dilutions were assessed.

Evaluation on phyto-polymers as eco-friendly bio-adhesives (TFRI)

Starch and crude protein were isolated from *Shorea robusta, Jatropha curcas*, *Madhuca indica, Mangifera indica, Curcuma angustifolia* and *Amorphophallus companulatus* for the preparation of adhesives. The tensile strength and thermal properties of the adhesives were determined. Adhesiveness was assessed on various substrates.

Tapping the potential of some selected indigenous lesser known wild edible plants for food and nutrition in arid and semi-arid region (AFRI)

Nutritional values of eight wild plants with their edible leaves/fruits/tubers were evaluated. Preservation in the form of various value added products viz. pickle, murabba, squash, dehydrated juice of *Cordia gharaf* fruits, *Grewia tenax* fruits and *Leptadenia reticulata* pods has also been done.

Quantification, value addition of NTFP and improved agricultural productivity to enhance livelihood opportunities in tribal belt of Sirohi District of Rajasthan (AFRI)

Quantification of NTFPs in tribal dominated area of Abu Road in Sirohi district of Rajasthan revealed that NTFP collection is round the year activity and it contributed to about 15% of the total income in 10% to 30% of families.

NTFPs and their selling in local markets of Rajasthan

Raising planting materials of selected cane species and establish plantation in fringe villages of Karbi-anglong, Assam to sustain rural livelihood (RFRI)

Survey had been carried out in 11 different villages and selected 3 fringe villages to collect seed/seedling/ wildlings for development of cane nursery. Nursery has been established and 10, 000 seedlings were raised. 500 seedlings of *Calamus gracilis* were collected from fringe villagers. 1.00 ha land in homestead garden at Jongpha, Karbi-anglong has been developed to carry out plantation.

Development of Descriptors and evaluation of artificial inoculation in *Aquilaria malaccensis* L (RFRI)

Extraction of DNA from tender leaves of different variants of *Aquilaria malaccensis* were successfully carried out. Seeds and seedlings of different variants of *A. malaccensis* were collected and maintained as germplasm bank in RFRI campus.

Evaluation of forest fruits for the nutritional value and development of value added products for economic enhancement of the local people (RFRI)

Field tours were conducted for collection of fruits from forests and homestead gardens of selected districts of Assam. Laboratory work has been carried out for antioxidant properties, carbohydrate and protein content of the fruit plant species- *Carallia brachiata* (kuji thekera), *Spondias axillaris* (Mitha amora), *Garcinia pedunculata* (Borthekera), *Crataeva magna* (Borun) and *Artocarpus chaplasha* (cham). Laboratory works have been done for nutritional value of the products. Three value added products have been prepared from *Carallia brachiata*, two from *Spondias axillaris* and two from *Garcinia pedunculata*. Evaluation of antioxidant properties and shelf life of value added product are in progress.

Status, Survey and Mapping of Ashtavarga Group of Medicinal and Aromatic Plants (MAPs) in Himachal Pradesh (HFRI)

Field survey was conducted in Shimla, Sirmour, Pangi (Chamba), Kinnaur and Kullu districts of Himachal Pradesh. During the field visits, germplasm of Ashtavarga plants and samples of their associated species were collected, processed and herbarium sheets of the collected species were prepared and preserved. The germplasm was planted in the nursery beds at Potters Hill near Shimla. Household data were collected from different villages of Sirmour and Shimla districts.

Production of Quality Planting Material of *Aconitum heterophyllum* Wall. ex Royle, *Podophyllum hexendrum* Royle & *Angelica glauca* Edgew and Extension of Their Cultivation Technology to Local Communities (HFRI)

Seed collection, processing and sowing of Atish, and Chora was carried out in different nurseries of the institute for raising planting material. The seeds of Ban Kakri collected from Kargil area of J&K were sown in Brundhar nursery of the institute. A total of around 1.1 lakhs nursery stock of Atish, Chora and Bankakri were raised and maintained at different nurseries of the institute. To promote cultivation of medicinal plants by the farmers, distributed around 20,000 medicinal plants and seeds of these species to various stakeholders in H.P. and J&K. Two training and demonstration programmes at Mansari (Manali) and at Shaneri, (Rampur) in the state of HP were organized for local communities. One booklet and three pamphlets in Hindi for the benefit of various stakeholders were published. The works on data base of herb

collectors and traders of Kullu and Rampur regions has been initiated.

Establishment of demonstration plots of Nisoth (*Operculina turpethum*) and Sheonak (*Oroxylum indicum*) (IFP)

Nisoth and Sheonak seedlings/plantlets were planted in field located at the experimental area at Lalgutwa during 30 June to 5 July 2014 for the establishment of demonstration plots.

Sheonak seedlings were planted during first week of July 2014. Kalmegh seeds were also sown in nursery beds on 6th June 2014. Kalmegh seedlings were planted at the spacing of 30 cm x 30 cm during 19-22 July 2014 between two rows as intercrop to assess the suitability of kalmegh as intercrop. In Sheonak, significant variation was found among plant height, collar diameter and root yield between different spacing. 0.75 x 1 m spacing was found statistically superior for growth parameters i.e. plant height (37.44 cm) and collar diameter (5.09 cm) and root yield (74.98 g per plant). There was no significant variation between root yield in 0.75 x 1 m spacing and 0.75 x 3 m spacing. Coefficient of variation for collar diameter was found maximum.

Fungus and microbes 2.5

Interaction between *Pseudomonas fluorescens* and AM fungi on *Dendrocalamus strictus* (FRI)

Plants raised in co-inoculation of fluorescent Pseudomonad and *Glomus etunicatum* performed better in terms of growth and macroproliferation of bamboo seedlings in unsterilized soil. The effect of microbial inoculants on the root architecture of bamboo seedlings was also investigated.

Medicinal and edible mushroom cultivation for income generation in rural areas in Uttarakhand (FRI)

Spawn of *Ganoderma lucidum, Pleurotus sajor-caju* and *P. florida* was provided to stakeholders for cultivation trial. Capacity building programme at Forest Pathology Division, FRI for media preparation, isolation, purification and spawn preparation was organized for the volunteers.

Development of molecular diagnostic kits for identification and early detection of nursery and plantation pathogens of Eucalyptus (FRI)

Fresh diseased eucalypts foliar samples were collected for the isolation of pathogenic species. The taxonomic identification based on microscopic characteristics was done followed by development of DNA extraction protocol for *Cladosporium* spp.

Formulation of biofertilizers consortium and their distribution to forest department (TFRI)

Soil and root samples of *Albizia lebbek, A. procera, Dalbergia sissoo, D. latifolia, Pterocarpus marsupium, Tectona grandis, Terminalia arjuna* and *T. tomentosa* have been collected and rhizobacteria (PSB, *Azotobactor, Azospirillium* and *Rhizobium*) have been isolated on specific media. Identified mother culture/starter culture of rhizobacteria have been maintained in laboratory including 3 strains of *Rhizobium* (nursery), 8 strains of PSB (3 from nursery and 5 from natural forest), 13 strains of *Azospirillium* (6 from nursery and 7 from natural forest) and 6 strains of *Azotobactor* (natural forest). Seeds of *Albizia lebbek, Dalbergia sissoo, D. latifolia, Tectona grandis, Terminalia arjuna* and *T. tomentosa* have been collected for nursery experiment.

Evaluation of antifungal potential and identification of broad spectrum antifungal compound from selected tree/shrubs/weeds of Indian arid region (AFRI)

Antifungal properties of root, leaves, fruits and bark of *Balanites aegyptiaca*; roots, leaves seeds and flowers of *Tephrosia purpurea*; leaves, fruits and roots of *Citrullus colocynthis* and *Tribulus terrestris*; leaves, roots, seeds and flowers of *Datura stramonium*; and roots, flowers and fruits of *Argemone mexicana* were evaluated. Aqueous and ethanolic extract were prepared from each

plant and evaluated against selected fungi (*Rhizoctonia solani*, *R.bataticola, Fusarium moniliforme, Fusarium solani* and *Alternaria alternata*). Antifungal activities of extracts were determined by poison food technique. The antifungal activity of this extract was assessed in terms of percentage inhibition of fungus growth. Effect of different concentration (10, 20, 30, 40 and 50) of ethanol extract on growth of selected fungi showed an inverse relationship with fungus growth.

Effect of the endomycorrhiza along with other bio-agents on biomass production, conservation and accumulation of some phyto-chemicals in *Abroma augusta* L. (RFRI)

Assessment of the endo-mycorrhizal biodiversity and presence of other beneficial bioagents in *Abroma augusta* L. along with physico-chemical variability analysis in all the rhizospheric soil samples have been completed. Rhizospheric soil and seeds samples were collected from 8 natural locations. A total of 26 fungi species belonging to 14 families were isolated from the rhizospheric soil of *A. augusta*.

Highest density (1.00) was observed in case of *Aspergillus candidus* and highest abundance value (2.0) in *Penicillium capsulatum* and *Rhizoctonia* sp. Isolation and multiplication of putative endomycorrhizae along with other beneficial microbes inhabiting the rhizosphere of *A. augusta* have been completed. Mass multiplication of endomycorrhizal strains (*Glomus* sp. + *Acaulospora* sp.) was done through starter and pot cultures. Inoculation of the target plant species with three bio-agents (viz., a bacterium, a non-mycorrhizal fungus and an AM fungus), alone or in consortia for biomass production has been completed. The inoculation experiments showed good significant results on growth and development of this target plant species.

Eco-friendly management of bark eating caterpillar, *Indarbela quadrinotata* on aonla (*Emblica officinalis*) in plantations (TFRI)

Seasonal incidence of bark eating caterpillar, *Indarbela quadrinotata* was studied. Maximum incidence (75%) was recorded in the month of August. Three Entomopathogenic fungi were isolated, purified and identified as *Fusarium oxysporum*, *F. monaliformae* and *Aspergillus niger*. Solvent extract of *C. collinus* in petroleum ether (57.01%) was found most effective against *I. quadrinotata*. Application of fungal suspension of *Fusarium moniliformae* $1.5x10^{-6}$ (60.73%) was also found to be most effective against *I. quadrinotata*

Pest and Disease Management

2.6

Studies on diversity of egg parasitoid wasps *Trichogramma* spp. from Punjab and Haryana and their application in biological control of important forest insect pests (FRI)

Collected *Trichogramma* spp. from five agro-climatic zones of Punjab. 150 specimens of *Trichogramma* were identified into eleven species. Two cultures of indigenous species of *T. chilonis* and *T. japonicum* were taken from the fields of Punjab.

Biology of hispine bamboo borer-*Estigmena chinensis* Hope. (Coleoptera: Chrysomelidae) damaging green standing bamboo and its management (FRI)

Bamboo species damaged by *Estigmena chinensis* were collected from Timli, Jhajra, Thano, Choharpur ranges and reared in the laboratory to observe biology. Thirteen bamboo species has been found attacked by this bamboo borer in the field. The maximum percentage of attack was recorded in *B. nutans* (72.50%).

Studies on Thrips of forest and medicinal plants, problems caused by them and their management in Uttarakhand (FRI)

Survey was conducted in the forest plantations at Dehradun, Yamkeshwar, Kotdwar, Raipur Forest Division, Central nursery and FRI campus. Management of thrips infested three plant species; *Ficus benjamina, Terminalia chebula* and *Mallotus philippinensis* by three insecticides viz; Monocrotophos, Dimethoate (Rogar) and Imidachlorpid has been done.

Biological control of Eucalyptus Gall wasp, *Leptocybe invasa* (FRI)

Approximately 9,700 parasitoids of *Megastigmus* sp. were released at Phillaur and nearby areas for biological control of *Eucalyptus* gall wasp, *Leptocybe invasa*. Further, during September-October, 2014, approximately 45,400 parasitoids of *Megastigmus* sp. were released at Hoshiarpur, Jalandhar, Ropar and adjoining areas. At experimental parasitoid release site, Bhunga, gall intensity reduced from 25.93% to 7.79% while at non-release control site (Kailon) gall infestation was slightly decreased from 25% to 20.28%.

Parasitoids multiplication chamber at Insectary, FRI, Dehradun

Release of parasitoids in Gurdaspur, Punjab.

New bio-control opportunities for prickly acacia: exploration in India (IFGTB)

Host specificity tests through No-choice method for the two prioritized agents *Dereodus denticollis* and *Anomalococcus indicus* on 6 Australian plant species with Prickly acacia as control were carried out in the insectary on potted plants. The data collected from the No-choice trial involving single non-target plant species.

Biopesticide against papaya mealy bug (IFGTB)

Extensive survey was conducted on the colonization of mealy bug from 20 districts of Tamil Nadu. A biopesticide formulation *"Crawl Clean*" was developed for control of the pest.

Development of coccinellids based biocontrol programmes for the management of sandal scales and mealy bugs (IWST)

Release of *C. montrouzieri* against *F. virgata* at the rate of 10 beetles per sandalwood tree were found very effective to manage scales and mealy bugs in field condition.

Bionomics and management of *Purpuricenus sanguinolentus* Oliver (Cerambycidae: Coleoptera) the stem borer of Sandal (*Santalum album* L.) in Karnataka (IWST)

Biological observations on *Purpuricenus sanguinolentus* in laboratory and field conditions were completed. The whole biological parameters were worked out and its population dynamics was assessed for two years. Four different types of Hymenopteran parasitoids were collected and they were identified. Control experiments were conducted with plant products and with Sealer cum healer, a plant based product developed by IIHR, Bengaluru.

Studies on hard substratum fauna in five major ports on the east coast of India (IWST)

Marine exposure trials at four major ports, i.e., Tuticorin, Chennai, Kolkata and Haldia continued and new trials initiated at Paradeep port. Both short term (wood) and long term (aluminum) test panels were collected and observations were made on aspects related to marine fouling and wood boring. The retrieved test panels were analyzed using Photogrid software. The panels were split open for observations on internal destruction by marine wood borers. The wood boring organisms were collected and identified. Passive sampling of fouling organisms at Chennai and Tuticorin ports were conducted. Water samples were collected and analysis of hydrographical parameters were carried out.

Status of Sal heartwood borer, *Hoplocerambyx spinicornis* Newman and its management (TFRI)

Sal forest areas of M.P. and C.G. were surveyed for monitoring of Sal borer and collection of information on borer incidence and abiotic and biotic factors. Information on Sal borer incidence in core and buffer zones of Kanha Tiger Reserve, Mandla and Satpura Tiger Reserve, Hoshangabad were collected. Categorization of borer affected Sal trees and trap tree operation to the front-line staffs of Forest Department were demonstrated and leaflets on Sal heartwood borer, categorization of borer affected trees and trap tree operation were distributed.

Development of rearing technique for production of insect predator, *Canthecona furcellata*, as bio-control agent for larval defoliators (TFRI)

Natural forest, plantation and nursery of Sal, Teak, Bamboo and Aonla were surveyed and eggs, nymph and adult of *C. furcellata* were collected. Screening of alternate host has been carried out for the mass rearing of predator throughout the year in laboratory at different temperature regime (20 ± 1^{0}C, 27 ± 1^{0}C and 35 ± 1^{0}C) and relative humidity 70±5% on *Corcyra cephalonica, Eutectona machaeralis, Hyblea puera, Caveria sericia, Plecoptera reflexa, Cryptisia coclesalis* and *Gallaria menollena*.

Studies on insect bio-control agent, *Chrysoperla carnea* and its potentiality as insect predator (TFRI)

Natural forest and nursery of teak and bamboo in Rukhar and Dudhiya, Mul road Chandrapur, (Maharashtra), nursery and plantation of Bamboo, Teak in Dindori and Mandla forest, TFRI nurseries and plantations Jabalpur (M.P.) and Sal forest of Chilpi Kawardha (Chattisgarh) were surveyed. The adult and eggs of predator were collected. Rearing of predator on *Corcyra cephalonica* as alternate host was done in the laboratory. Laboratory experiment on life cycle of predator was completed. Predatory potential of *Chrysoperla carnea* had been recorded on *Corcyra cephalonica*.

Studies on effect of introduction of honey bee on seed production of teak seed orchards (TFRI)

Teak Seed Orchards (Ghissi, Behrai and Nanditola, Dharana) were selected for experimentation on effect of introducing domesticated honey bee, *Apis mellifera* colonies on seed production. Observations on current status of fruiting and seed quality parameters like flowering status, fruit/seed setting on each marked trees, fruit/seed weight, size, total number of fruit/seed per tree and total weight were recorded before introducing the colonies to assess the effect of honey bee afterwards.

Studies on the causes of *Gmelina arborea* mortality in plantation of MP, CG and its integrated management (TFRI)

Disease and insect survey in *Gmelina arborea* plantation was conducted and data were recorded on mortality status in MP and CG. On an average only 18.9% trees were recorded healthy with no infection while rest 81.1% trees showed low to heavy infestation (36.8% trees showed low infestation, 29.9% medium and 14.5% showed heavy infestation) at different sites. Two insects, *Tingis beesonii* and *Indarbella quadrinotata* and four fungi, *Hendersonula, Hexagonia, Hypoxylon* and *Torula* were found associated with mortality of khamer.

Studies on seed insect pests of indigenous and exotic forest tree species and to develop IPM package for major insect damages in Gujarat (AFRI)

The checklist of one hundred and seventy one insect pests associated with eight important forest trees and grass species of Gujarat has been prepared. The infested seed samples were examined for pest incidence and the adult insects were identified. The life cycle of some major pest such as: *Atteva fabriciella, Eligma spp., Caryedon serratus, Hyblaea puera, Bruchus bilineatopygus, Helopeltis antonii* and *Hydrelia flammeolaria* have been studied. The decline in population was observed in early summers and late winters. August, September and October were the months, when the population of *Caryedon serratus* and *Bruchus bilineatopygus* were at its peak. The tin and glass containers were found as the most suitable for seed storage. *Balanites aegyptica* and *Psorolea corylifolia* plant extracts are recommended as antifeedents. Rockon was the most effective botanical insecticide in field trial in the plantations of *Ailanthus excelsa* and *Tectona grandis* and Weapon was found effective for stored seeds of *Acacia nilotica* and *Prosopis cineraria*. Crab spider, praying mantids, cocinellid beetles are the most effective bio-agents or predators. *Beauveria bassiana* and *Paecilomyces farinosus* were recommended as the most promising entomo-pathogenic fungi. Quinalphos and

Monocrotophos were found to be the most effective chemical insecticides to check the spread of the insect pests upto epidemic level.

Studies on the diversity of soil-borne entomo-pathogenic fungi in different land-use system of North East India and their utility for the management of major defoliators of *Gmelina arborea* Roxb. and *Aquilaria malaccensis* Lamk (RFRI)

Eight fungi were isolated from the infected insects and identified. The soil borne fungi *Fusarium* sp., *Beauveria bassiana, Mucor* sp., *Aspergillus ochraceus, Trichoderma* sp., *Trichophyton* sp., *Verticillium lecanii* and *Pacilomyces* sp. were isolated from the cadavers of *G. mellonella* through insect bait method. The biology of the Agar pest *Heortia vitessoides* was studied in laboratory condition. Pathogenicity of the isolated fungi, *Fusarium* sp., *Beauveria bassiana, Metarhizium anisopliae, Aspergillus flavus, Aspergillus ochraceus, Trichoderma* sp., *Mucor* sp. and *Verticillium lecanii* were conducted on the targeted pest in laboratory condition. *Beauveria bassiana* and *Metarhizium anisopliae* were found very effective in control of the pest viz.100% and 80% respectively after 7 days period.

Biology and Management of Insect pests of seeds of *Juniperus polycarpos* C. Koch and Evaluating the Insect-pests Resistance Performance in Nursery (HFRI)

The berries and seeds of *Juniperus polycarpos* were found infected with insects and about 60% berries were found infected in the field at some places. This infestation resulted in reduced viability of seeds. The seeds /berries showed little or no symptom of insect attack during seed development. It has been found that the insect species takes about 45-56 days to complete the life cycle and it completes only one life cycle in a year. Two micro moths (Lepidoptera) were found feeding on the berries. As Juniper seeds take longer period (12-14 months) to germinate hence, field observations were taken during March, 2014 for the seed sown during February –March, 2013. In the laboratory studies the treatment of the seed with Fursa (1%) recorded maximum control of insect-pests damage followed by Robust (0.5%).

Re-discovery of *Termitoloemus marshalli* Baranov, a promising biological control agent of termites (FRI)

Termitoloemus marshalli Baranov (Diptera: Calliphoridae: Bengaliinae) is known to the science only through one male holotype and two female paratypes collected from Kanpur (Uttar Pradesh, India) in 1935 and deposited in NHM, London. Since then, no scientific record about collection of additional material from India or anywhere in the world is available. This species was rediscovered after 78 years from Jorhat (Assam) and Dehradun (Uttarakhand) predating voraciously on the workers and soldiers of mound building termite species *Odontotermes obesus* and *O. giriensis* respectively. Work on taxonomy and some aspects of biology of the fly have also been done. Material identified shall be deposited with the national and international insect depositories so that the species may be well understood and exploited for termite biological control programmes.

Figures a-c. Termitoloemus marshalli Baranov: a, male in lateral view; b, females in dorsal view showing colour variations; c, T. marshalli fly attacking soldier of termite Odontotermes giriensis.

Tree-rich Bio-booster: A novel approach to synergize growth and pest management (IFGTB)

About twelve treatments of bio-inoculants (FYM, effluent compost, vermi-compost and green manure) along with coir pith and vermiculite as base material were prepared to study the effect of mixture along with bio-manure on growth performance of *Ailanthus, Gmelina* and *Neolamarckia*.

Effect of Bio-booster, made of organic bio-compost like vermi-compost, decomposed coir pith, vermiculite, effluent waste, decomposed green manure along with Plant Growth Promoting Rhizobacteria (PGPRs), Pink Pigmented Facultative Methylotrophs (PPFMs), arbuscular mycorrhizal fungi and *Frankia* was evaluated for its effect on the seedlings of *Ailanthus, Gmelina arborea* and *kadamba* and

conventional soil potting mixture (sand, soil and farm manure) was used as control. Jatropha kernel cake and aegle cake were evaluated along with aforementioned biocomposts to develop a composite. The inoculations of PGPRs, PPFM, AM fungi and *Frankia* significantly increased the germination percentage by 40-43 percent as compared to conventional nursery practice. Nutrients, such as, carbohydrates, protein, chlorophyll, Ca, K, N, P, Mg, S and organic carbon were found to be significantly increased in the treated seedlings when compared to control. The growth performance was found to be significant in terms of shoot length, collar diameter, biomass yield and survivability from 30 to 60 days after treatment which reduced the use of chemical fertilizers. The combined effect of bio-inoculants with organic biocompost significantly increased the germination percentage, survivability and biomass yield which are considered as performance indicators of quality planting material.

Development of package for integrated management of insect pest and diseases (IPDM) and improvement of planting stock material of Neem (*Azadirachta indica*) through biofertilizers (AFRI)

Survey was conducted to identify and isolate infected samples of neem. Samples of Charcoal root rot disease, white root rots, Damping off and wilting were collected. Fungus associated with these diseases were isolated and identified as *Macrophomina phaseolina, Ganoderma* spp., *Phytophthora* spp., *Rhizoctonia solani* and *Fusarium solani* respectively. Two different types of molluscs and one sap sucker were also recorded from AFRI nursery, Jodhpur. *Myllocerus* and molluscs were identified damaging neem seedlings in nursery.

Soil samples were collected and biopesticides like *Trichoderma viride* and *Pseudomonas fluorescence* were isolated. Few bioagents were procured from IMTECH, Chandigarh like *Azospirillum brasilense, Azotobacter beijerinckii, Bacillus thuringiensis,Trichoderma harzianum*. Consortia of Arbuscular mycorrhiza like *Glomus, Gigaspora sclerocystis* and *G. scutellospora* were isolated and multiplied on maize in pots.

Azospirillum brasilense, Azotobacter beijerinckii, Bacillus thuringiensis, Trichoderma harzianum, consortia of AMF (Arbuscular mycorrhizal fungi consisting of species of *Glomus, Gigaspora sclerocystis* and *G. scutellospora*) individually as well as in different combinations were used on neem seedlings in greenhouse condition were to study their efficacy in promoting growth. Data on shoot length, root length, collar diameter, fresh weight and dry weight after 90 days of treatment were recorded. The results showed that the consortia of biofertilizers were more effective as compared to the individual microorganisms.

Studies on the economically important diseases of medicinal and aromatic plants of Assam to develop management practices through organic approach (RFRI)

Surveys for economically important diseases of medicinal and aromatic plants were conducted in the state of Assam. Disease assessments were made by observing numerous representative plants to determine the general health and presence or absence of disease symptoms and signs. The major constraint for cultivation of *Pogostemon cablin* (patchouli) is wilt disease caused by *Fusarium solani*. Leaf blight was

Leaf blight of Citronella

Leaf spot of C. tenuis

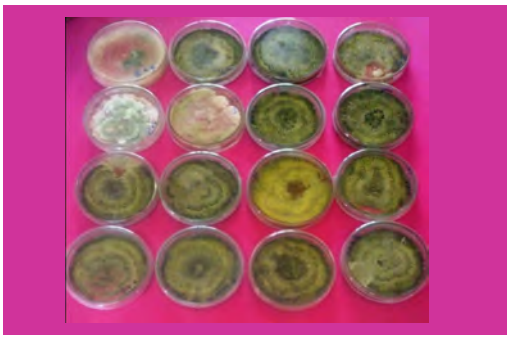
Wilt of Pogostemon cablin

found to be the most devastating disease of *Citronella* in this region. *Curvularia maculans* was found to be associated with a severe leaf necrosis disease of *Curculigo orchoides*. A potentially devastating leaf spot disease was observed in *C. tenuis*. Aqueous extracts of locally available plant species were prepared and tested against target pathogens to see the detrimental effect. *Trichoderma* isolates were found effective against target pathogens in laboratory and glass house conditions

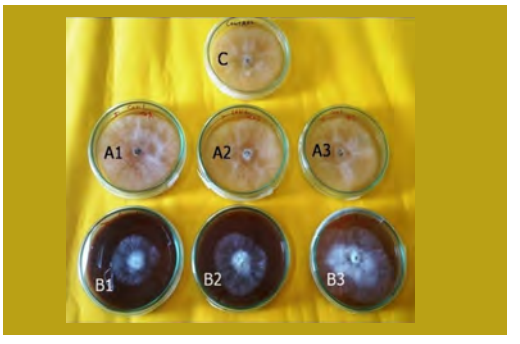
Studies on *Trichoderma* isolates inhabiting different forest ecosystem of North East India (RFRI)

The distribution of *Trichoderma* isolates prevalent in forest soils of Arunachal Pradesh (Ziro, Pange Forest range, Talle valley) and Manipur (Pine forest and Dipterocarp forest) was investigated. Studies in previously uninvestigated regions or habitats have led to the isolation of *Trichoderma* spp. showing distinct cultural characteristics. Difference in colony morphology, color and growth pattern was observed and the isolates were clustered into different groups. A combination of *Trichoderma* isolates were found effective as a foliar spray against leaf blight of *Citronella*, one of the most devastating diseases of *Citronella* in North East India. Further, TH soil treated plants also showed reduced symptoms. These findings indicate that induction of plant defence may participate to reduce the symptom expression.

Aqueous extracts of locally available plant species were prepared and tested against *Trichoderma harzianum* to see the detrimental effect. Out of 10 plant extracts tested, only guava leaf extract showed moderate growth inhibition.



Differences in color and growth Patterns of Trichoderma isolates



Guava leaf extract at different concentration (B1, B2 and B3) inhibited the mycelial growth of T. harzianum

Bio oils and Biodiesel

2.7

Study on microwave assisted direct biodiesel production from *Pongamia pinnata* (L) seed oil by two phase solvent extraction (IWST)

The seeds were procured and sorted. After initial cleaning, the seeds were irradiated to microwave for different time (1.0, 1.30 and 2.0 min). The microwave irradiated and control seed samples were powdered and sieved for oil extraction using two phase solvent extraction method. The physical and chemical properties of the treated and control oil sample was evaluated. The result of the study suggested that density and refractive index of oil remain unchanged in treated and untreated seeds.

Biodiversity plays important role in maintaining the ecological functions, including stabilizing the water cycle, maintenance and replenishment of soil fertility, pollination and cross-fertilization of crops and other vegetation, protection against soil erosion and stability in food production and minimizing impact of changing climate in recent past. Conservation of biodiversity leads to conservation of essential ecological diversity which ensures the ecological security as it provides raw material for diverse medicinal and health care systems along with genetic base for the continuous up-gradation of agriculture, fisheries and for critical discoveries in scientific, industrial, forestry and other sectors. ICFRE Institutes have been engaged in carrying out research based projects on various biodiversity, its conservation and ecological security related studies. They have also been imparting trainings on various issues related to biodiversity conservation and ecological services. Seminars, workshops etc. have also been organised to have more in-depth knowledge on recent trends of studies on the subject. Followings are some of the studies conducted by these institutes during 2014-15.

Biodiversity Conservation 3.1

Studies on Taxonomy of the Family Eulophidae (Hymenoptera: Chalcidoidea) present in National Forest Insect Collection (NFIC) except Doon Valley (FRI)

Sorted out Eulophids from the alcohol preserved collections in NFIC from Uttarakhand, Punjab and Karnataka. Collections (from Nainital and Chamoli districts of Uttarakhand) preserved in alcohol were dried using HMDS technique. Identified following eulophid species: *Pediobius agantha, Pediobius bethylicidus, Tetrastichus* spp., *Tetrastichus tunicus* and *Euplectrus petiolatus*.

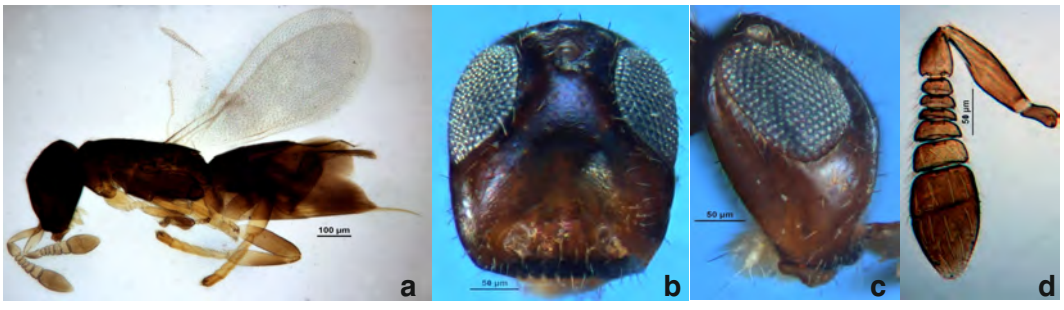
Biodiversity Conservation and Ecological Security

Studies on Taxonomy of the Family Encyrtidae (Hymenoptera: Chalcidoidea) present in National Forest Insect Collection (NFIC) except Doon Valley (FRI)

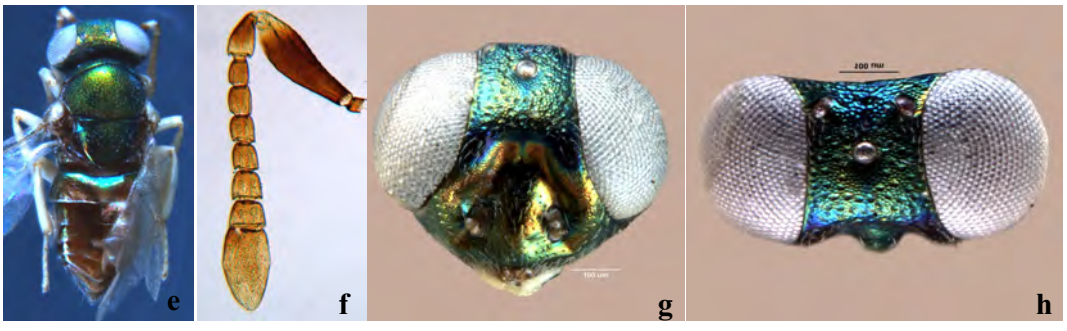
New genus and species of Encyrtidae (Hymenoptera: Chalcidoidea):

Described a new genus Noyesencyrtus Singh and three species - *Noyesencyrtus brachyoculus* Singh (Figs a-d), *Psyllaephagus kundapurensis* Singh (Figs e-h) and *Ooencyrtus hayatii* Singh (Figs i-l) new to the science, collected from Western Ghats of India. Species *Noyesencyrtus brachyoculus* Singh is an interesting species that was reared from wood decaying fungi, which parasitized coleopterous/dipterous larvae inhabiting the fungal fruiting bodies.

Collections (from Nainital and Chamoli Districts of Uttarakhand) preserved in alcohol were dried and about 200 dried specimens were mounted on cards. Some of them were identified to be belonging to genera *Anagyrus, Adelencyrtus, Anamalicornia, Cheiloneurus, Cerchysiella, Copidosoma, Encyrtus, Leptomastix, Psyllaephagus* etc. Identified following species of encyrtids collected from Calicut (Kerala): *Aenasius advena, Aenasius bambawalei, Blepyrus insularis, Metaphycus bolangerae, Trechnites manaliensis, Copidosoma gracilis, Copidosoma floridanum, Psyllaephagus macrohomotomae* and *Psyllaephagus garuga*. Thirty species of Encyrtidae collected from different states of India were identified and added in the National Forest Insect Collection (NFIC).

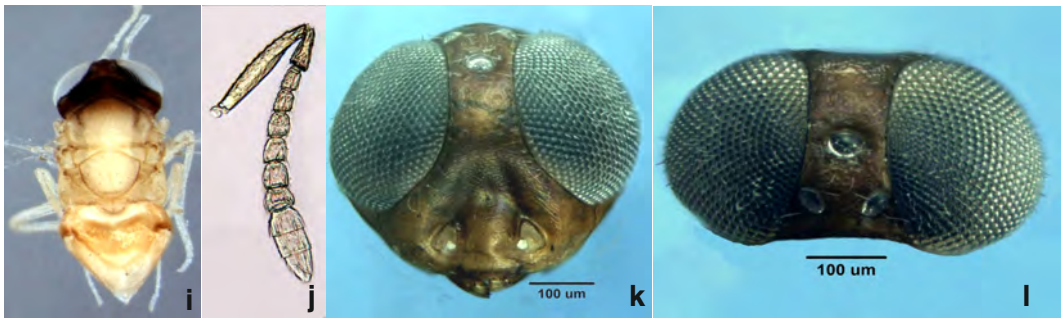


Figures a-d, Noyesencyrtus brachyoculus Singh gen. and sp. nov., female: a, body in lateral view; b, head in frontal view; c, head in lateral view showing short eyes, brachy (short) + oculus (eye); d, antenna.



Figures e-h, Psyllaephagus kundapurensis Singh sp. nov., female: e, body in dorsal view; f, antenna; g, head in frontal view; h, head in dorsal.

03



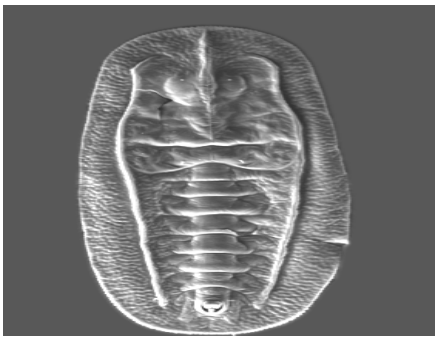
Figures i-l, Ooencyrtus hayatii Singh sp. nov., female: i, body in dorsal view; j, antenna; k, head in frontal view; l, head in dorsal view

Morphological taxonomy of the family Aleyrodidae Westwood (Hemiptera: Sternorrhyncha) of India: revisions of the genera and species (FRI)

A total of 40 host plants infested with whiteflies were collected and identified. Whitefly species of 16 genera have been identified in addition to previously identified 13 genera: *Acaudaleyrodes, Aleurocanthus, Aleuroclava, Africaleurodes, Aleurodicus, Aleurolobus, Aleurotrachelus, Bemisia, Cockerelliella, Dialeurodes, Neomaskellia, Minutaleyrodes, Rhachisphora, Setaleyrodes, Singhiella* and *Trialeurodes*.

The holotypes of 24 species, 4 determined and 116 unidentified species taken on loan from NPC, IARI, New Delhi were studied, of which, one new species *Tetraleurodes champaiensis* Dubey has been described. SEM studies of pupal cases have been done for 17 species. The developmental stages such as eggs, 1st, 2nd and 3rd instars, pupal cases and adults have been photographed for four pest species viz., *Aleuroclava jasmini* (Singh), *Aleurodicus dispersus* Russell, *Neomaskellia andropogonis* Corbett and *N. bergii* (Singnoret). Auto-montage images of habitus of puparium of 15 species have been taken. The genus *Rabdostigma* Quaintance and Baker earlier a synonym of *Dialeurodes* was resurrected and revised based on the type specimens from India and USDA, USA. Two species, *Aleuroclava citrifolii* (Corbett) and *Dialeurodes cephalidistinctus* (Singh) are recorded for the first time from India, the latter is transferred to genus *Rabdostigma*. Two new genera, *Takahashius* Dubey & Evans and *Pennaleurodes* Dubey & Evans and three new combinations have been proposed. *Acanthaleyrodes styraci* Takahashi is re-described from Hong Kong, based on slides loaned from the Natural History Museum, London, UK, as the original description of this species was lacking details of taxonomic characters.

Tetraaleorodes



Acanthaleyrodes

Floral Diversity Survey in the State of Bihar (FRI)

Out of 11 districts, qualitative and quantitative survey of six districts (Gaya, West Champaran, Nawada, Nalanda, Kaimur and Rohtas) were carried out. In each forest type, categorization was done on the basis of crown density i.e. very dense, moderately and open forest. Importance Value Index (IVI) of each species occurred in each density class was estimated. List of species both in forest area and "Tree Outside Forest" and medicinal plants was prepared. Herbarium specimens in triplicate of each district were prepared.

Development of models for conversion of plantations into secondary forests in Andaman (IFGTB)

Identification and selection of sample plots are being undertaken. The sample plots were selected based on the areas where three major

forest types, viz., Andaman evergreen, semi-evergreen and moist deciduous forests were found adjoining the plantations of teak, padauk and mixed species. The species diversity, relative density, dominance and frequency have been carried out. Thinning is carried out in the plantations (35%). Seed collection is in progress.

Butterfly diversity in relation to landscape changes in the Walayar Valley, at Palakkad Gap in the Western Ghats (IFGTB)

The diversity of butterflies was studied in Walayar Valley, covering different forest types/landscape elements occurring both in Kerala and Tamil Nadu part. About 65 species of butterflies were recorded from moist deciduous forests, 44 species from semi-evergreen forests, 59 species from dry deciduous forests, 28 species from riparian forests, 24 species from grasslands and 70 species from thorny scrub forests. The teak plantations raised in the forest areas contained 53 species of butterflies, while the Tamarind plantations had about 35 species. About 46 species of butterflies were also recorded from the agricultural areas adjoining the forests. The mined out areas were found to be very poor in butterfly diversity (i.e. 21 species). Altogether, about 117 species of butterflies have been recorded from the Walayar Valley so far.

Twenty five butterfly host plants were introduced at the Field Station of IFGTB at Walayar, Kerala to study the colonization of butterflies on these plants.

Establishing Arachnarium at TFRI, Jabalpur, M.P.

Arachnarium is a structure where spiders are reared, raised and bred. The process of establishing of Arachnarium at TFRI, Jabalpur has been initiated since February 2015. There would be both indoor and outdoor exhibits of live spiders. They would be reared in the laboratory as well as in their natural habitat. To begin with, 50 species of spiders are proposed to be included in the Arachnarium. Some extraordinary spiders, like the fish eating pisaurids and bird eating giant wood spider would be in prime focus.

Chada Vanogram in the Dindori Forest Range was surveyed and 3 sites were selected for spider collection. Habitats for tarantulas were searched, located and geo-referenced. Spider faunal diversity in and around TFRI estate were recorded. Arachnarium of TFRI is going to be the 1st of its kind in India and would be completed within 3 years from now.

Documentation of sacred groves of Rajasthan and assessment of biological diversity in some of them for improved management and people livelihood (AFRI)

The inventory of 123 sacred groves covering all districts of Rajasthan showed the presence of 131 woody species belonging to 48 families. These sacred groves were observed dominated by 26 types of tree species. Dominant species with decreasing number of sacred groves were in order *A. pendula*>*P. juliflora*>*Salvadora oleoides*> *Capparis decidua*>*P. cineraria*>*Tectona grandis*>*Acacia leucophloea*>*Acacia nilotica*>*Butea monosperma*>*Ziziphus rotundifolia*. Sacred groves dominated by *P. roxburghii, W. tinctoria, E. officinalis, B. monosperma, M. parviflora, A. indica, A. catechu* and *Tectona grandis* indicated higher vitality in terms of diversity and regeneration status. In arid region, *P. cineraria* and *Salvadora* spp. were found effective in maintaining diversity of the groves. At least 19 birds, 25 mammals and 10 reptiles including the Alexandrine parakeet were observed. Effective management strategies for protection and conservation of sacred groves would be strengthening the existing conservation system of the villagers and would restore once degraded sacred groves following landscape level approach.

Taxonomy and Molecular Analysis (through RAPD-PCR) of Moths (Lepidoptera) of Cold Deserts (Spiti and Leh) of Indian Himalayas (HFRI)

A total of 185 specimens of moth (Lepidoptera) species were collected from different localities in the cold desert region of Leh and Spiti. RAPD-PCR protocol for analysis of moths was standardized. Twenty OPERON series primers

Fig-1

Fig-2

Fig. 1. male genitalia of Mocis discios Kollar

Fig. 2. Female genitalia of Mocis discios Kollar

(OPA1 to OPA20) for RAPD analysis of 20 species were used, of which OPA13 showed better results. Different RAPD profiles were observed for different species. To avoid anomaly, only one

Lepidoptera species, *Athetis delecta* (male) was taken in agar gel 1 and 2, while in agar gel 3 & 4, male and female of the species were taken. Similarly, all 20 species were characterized and nine serious pest species (*Agrotis ypsilon, G. operculella, Y. rorella, S. litura, Plusia orichalcea*, Diamond back moth, *Polyphaenis confecta , Helicoverpa armigera , Xestia c-nigrum , Ochropleura vallesioca*) along with others were studied for PCR band patterns. The banding patterns from DNA extracts with the selected primers shall be employed for phylogenetic study of moth species of the cold deserts.

Ecological Studies on Distribution Patterns and Food Plant Resources of Butterflies Along Altitudinal Gradients in Different Ecosystems of Western Himalayan Sub-Alpine Forest of Himachal Pradesh (HFRI)

Sites in Sub-alpine forest Chansal (Shimla), Marhi (Manali), Kalatop (Chamba), Bhangal (Kangra), Hatu (Narkanda), Chitkul (Kinnaur), Pangi (Chamba), Shikari devi and Jalori jot were selected to study butterfly biodiversity. A total 160 specimens belonging to 44 species were collected from these sites. The GPS coordinates of all the sites selected were taken and GIS mapping has been initiated with the technical support of Dept. of Science & Technology, Govt. of H.P.

Everes Argiades (Pallas)
This species of butterfly is found at Hattu alpine forest of Western Himalaya. The altitude of this site is 3350 meters from MSL with co-ordinates 31° 15' 12" N and 77 ° 27' 22" E. Seen along alpine meadows wandering around flowers and grassy patches.

Plant Diversity Studies in Shikari Devi Wildlife Sanctuary of District Mandi, Himachal Pradesh for Long Term Ecological Monitoring (HFRI)

An extensive survey of the Shikari Devi Wildlife Sanctuary was carried out. The floristic and phyto-sociological studies were carried out in three of the selected sites. In alpine pasture, 49 herb species were identified with *Sibbaldia cuneata* as the dominant species followed by *Plantago depressa* and *Trifolium repens*. For shrubs, 7 species were identified of which *Viburnum cotinifolium* was dominant species followed by *Rosa macrophylla* and *Cotoneaster microphyllus*. In Raigarh beat, at three elevations of 2400-2700 m, 2700-3000 m and 3000-3300 m the total number of plant species recorded were 68, 56 and 50 respectively, whereas, in Keonal, 66, 34 and 56 plant species were recorded at the same three elevations, respectively. Six threatened plant species namely, *Betula utilis, Taxus wallichiana, Polygonatum verticillatum, Bergenia stracheyi, Rhodiola heterodonta* and *Rhododendron companulatum* have also been recorded from the studied sites as per available list of threatened plants. The ethno-botanical data have been collected from eight villages through semi-structured questionnaires and plants of ethno-botanical importance have been listed out.

Studies on the species diversity of whiteflies (Aleyrodidae: Homoptera) and their natural enemies in Mangrove habitats of India (IWST)

The study revealed the breeding of 11 species of whiteflies on 12 species of pure mangrove plants. Among the 11 species of whiteflies, two species were determined as new to science. In addition, six species of whiteflies were found breeding on three species of mangrove associates which includes one new species. The two species of whiteflies which were collected from main land were determined new to the science. Among the whiteflies found breeding on mangrove habitats of south India, *Aleurolobus marlatti* (Quaintance) was found breeding on seven host plants. Several new hosts of whiteflies have been discovered from mangrove habitats. One new host for 11 species of whiteflies viz., *Africaleurodus karwarensis, Aleurocanthus martini, Acanthus ilicifolius, Aleuroclava complex, A. kavalurensis, A. takahashi, Aleuromarginatus kallarensis, Aleuroplatus alcocki, Bemisia tabaci, Cockerelliella meghalayensis* and *Dialeuropora decempunctata* and three new hosts each for *Aleurocanthus vindhyachali*, *Aleurodicus dispersus* and 7 new hosts for *Aleurolobus marlatti* have been recorded. The study revealed that whitefly species are increasing their host range. The study also revealed the presence of 20 species of Coccinellids and 13 species of

spiders in the mangrove habitats of south India. They might be playing active role in keeping the populations of these whiteflies under control. Futher, parasitoids were recovered from four species of whiteflies.

The successional trends and productivity studies of Sriharikota (SHAR) and Pulicat Lake ecosystems for conservation of biodiversity (IFB)

Phyto-sociological data of terrestrial and aquatic ecosystem of Sriharikota and Pulicat Lake were collected from 30 quadrats laid randomly in the area. Data on people's perception about natural regeneration, priorities and local vegetation were also collected. The plant species present in the permanent quadrats were enumerated and recorded for frequency, density and basal area and also biomass and rates of productivity. The phenological observations of the vegetation of the area were recorded. The aquatic ecosystem of the sampling area was monitored by collecting water samples and recording of flora and fauna. Biotic interference and productivity aspects of terrestrial ecosystem were assessed in the permanent quadrats with portable photosynthetic system. The flow of energy is also being assessed by estimating the calorific value of the vegetation and biome.

Forest Botany 3.2

Digitization of Forest Research institute herbarium

Dehradun herbarium is the largest forestry herbarium in the country. Complete digitization of this Herbarium is a massive work as the recorded number of specimens are over 0.3 million and subsequently, the number of available species shall be more. So far, out of 200 families up to 90 families have been entered into the software with complete details.

Inventorisation, characterization and conservation strategies of selected rare and endangered plant species of India (FRI)

The threatened species like, *Ilex pseudo-odorata*, *Catamixis baccharoides*, *Sophora mollis* , *Pittosporum eriocarpum, Indopiptadenia oudhensis, Mahonia jaunsarensis* and *Trachycarpus takil* were studied. Extensive field survey was carried out in Mussoorie , Jhari Pani, Hathipaon, Rishikesh and adjoining area, Rajaji National Park, Champawat, etc. *Pittosporum eriocarpum* and *Ilex pseudo-odorata* were found in the Jhari Pani and Hathipaon area. *Sophora mollis, Catamixis baccharoides, Mahonia jaunsarensis* and *Indopiptadenia oudhensis* were located in the Shahstradhra, Viasi, Chakrata and Champawat areas respectively. Population of these species was very less in their respective localities. Seed and stem cutting of above species were collected and planted in polybags in the Botanical Garden for ex-situ conservation.

Ecology & Environment 3.3

Detailed ecological restoration study including assessment of site conditions of the mine and analysis of results of plantation work carried out during previous years in Jhingurda mine of NCL, Singrauli (FRI)

The study was conducted to assess the enhancement of biodiversity and development of soil quality under age-series of coal mined rehabilitated areas in Jhingurda coal mine of Northern Coal Fields (NCL), Singrauli. There was maximum 28 years old plantation on slopes. The bulk density has reduced significantly from 1.66 to 1.03 after 28 years of rehabilitation. pH value increased from 6.57 to 7.14 after 28 years of rehabilitation. Similar behaviour was also observed in Organic Carbon (0.95% to 2.87%), available nitrogen (0.0125% to 0.02227%),

available phosphorus (0.080% to 0.413%) and exchangeable potassium (0.0008% to 0.002%) after 28 years of rehabilitation. A significant increase in species diversity of herbaceous plants in rehabilitated area has been recorded over the years. Total basal area (m^2ha^{-1}) was recorded in order of 0.91, 6.50, 22.14 and 26.16 respectively in 2, 7, 15 and 28 years old rehabilitated areas.

Allelo-pathic potential in regeneration of sal (*Shorea robusta*) forests (FRI)

Seeds of sal have been collected and germination experiments were conducted in laboratory to observe the effect of leachates on germination and early growth of sal seedlings. Sal seed was also sown in nursery at FRI, Dehradun to raise the seedlings for experimentation. Allelo-pathic interactions of one under-storey species (*Ardisia solanacea*) and two invasive species (*Ageratina adenophora* & *Lantana camara*) with the keystone species - sal were studied. The foliage leachates (0%, 5%, 10%, 15% & 20%) of these species were investigated on the seed germination, root and seedling growth of *S. robusta* in laboratory as well as in nursery. The leachate concentrations had inhibitory effect on seed germination, root growth, root hairs and seedling growth causing yellowing of leaves and weakening of seedlings subsequently. The inhibition in germination and nursery growth was also validated by calculating the response index (RI) of various parameters in the study. The allelo-chemicals present in foliage leachates were also analyzed using HPLC technique at CDRI, Lucknow.

Impact of invasive species on plant diversity in selected forest sites of Uttarakhand, Haryana and Punjab (FRI)

Species, such as, *Lantana camara, Ageratum conyzoides, Eupatorium adenophorum, Parthenium hysterophorum* etc. have been reported from the area. Floristic survey and quantitative analysis of tree, shrub and herb layer in Uttarakhand (Mussoorie and adjoining areas, Jhajra Range and Ashrodi Range,Champawat), Haryana (Darpur, Kalesar, Pinjore and Kalka Range, Morni Hills) and Punjab (Takhani and Rahmapur wildlife sanctuary, Baroti and Khadka beat, Hoshiarpur) were carried out. It was found that *Eupatorium adenophorum* is the major threat in the hilly regions and *Lantana camara* in plain. Species diversity index and evenness were higher in control site than that of infested site. Dry biomass of lantana in Haryana was estimated to be 0.9 tons / ha and *Eupatorium* was found to be 2.0 tons/ha.

Population structure, regeneration status and pollination ecology of *Dalbergia latifolia* and *D. sissoides* (IFGTB)

The population status and regeneration of *Dalbergia* spp. were assessed in Thrissur Forest Division (Kerala). The density of *D. latifolia* was found to be higher (32.8 trees/ha) in this division, while that of *D. sissoides* was very low (0.8 trees/ha). In the case of former, there was fairly good representation of trees in the lower girth classes, while absence of trees in the higher girth classes was striking. In the case of latter, trees were totally absent in the lower girth classes and it was represented only in the higher girth class. The regeneration of *D. latifolia* was found to be fair, with 15.40 seedlings/100 m^2, but only one-fifth of the seedlings reached sapling stage.

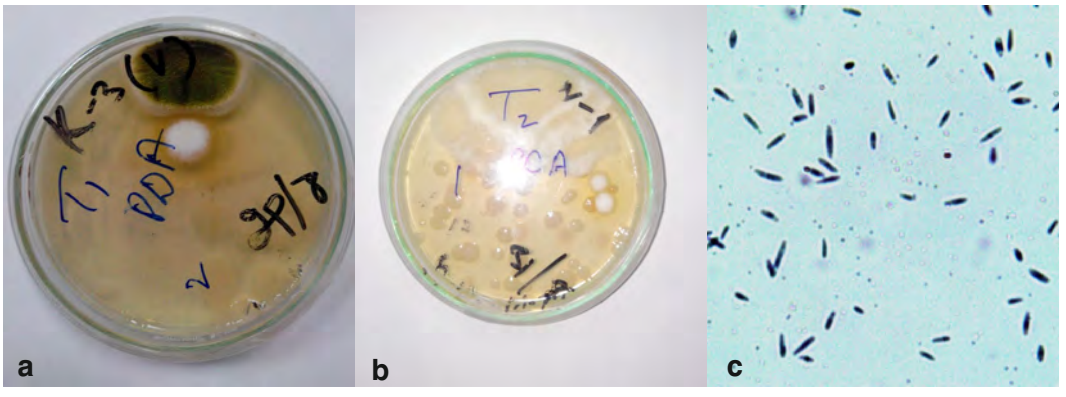
Phenological and pollination ecological studies of *D. latifolia* was carried out in Chelakode area of Thrissur Forest Division and found that under open pollinated condition, about 5.24 percent of flowers set fruits; during artificial cross-pollination, the fruit setting was about 4 percent. When artificial self pollination was carried out, only 2 percent of flowers set fruits, but they fell off prematurely. *D. latifolia* was found to be an obligate outcrosser with insects like bees and butterflies mainly involved in pollination. A species of sunbird was also found to visit the flowers for nectar.

Population dynamics of threatened medicinal plants species growing in buffer and transition zone of Tadoba-Andheri Tiger Reserve (TATR), Maharashtra (TFRI)

Survey was conducted in TATR, buffer zone. A total of 714 species were recorded of which, 98 species were documented being used by the traditional healers for preparation of various herbal formulations during the study. The population of *Uraria picta* and *Andrographis paniculata*, once found in abundance in the study area, is gradually declining now. Survivorship function, survival probabilities, reproductive output, fertility coefficient of these species at different stages, for different populations (4 populations of *Uraria picta* and 7 populations of *Andrographis paniculata*) were determined.

Innovative approaches for augmentation of composting and biofertilizer production in hot arid regions (AFRI)

The main objectives of the project were the development of innovative rapid decomposting, vermi-composting and production of biofertilizers (AM, *Rhizobium, Azosprillum* and *Azotobacter*) and to improve seedling growth of forestry species. The nursery experiments were conducted by using alone as well as various combinations of AM fungi, *Rhizobium, Azosprillum* and *Azotobacter.* Indigenous strain of *Trichoderma viride* was also selected as a bio-agent for the best growth and vigour of seedlings of Khejri (*P. cineraria*), Shisham (*Dalbergia sissoo*) and Ardu (*Ailanthus excelsa*). Consortium inoculum of AM fungi with dominancy of *Glomus fasciculatum* was used for the experimentation. The seedlings treated with (*Rhizobium* + *Trichoderma viride* + *Bacillus thuringiensis* (BT) had shown better growth and vigour especially in *P. cineraria* and *Dalbergia sissoo* seedlings. In case of *Ailanthus excelsa*, combination of AM + *Azosprillum* + PSB was found as the best as compared to other treatments. Vermi- compost samples were analysed for soil organic carbon (SOC), soil organic matter (SOM), Ammonium (NH_4-N) and nitrate(NO_3-N) with various padding material viz., *Azadirachta indica, Alestronia* spp., *Cordia myxa* and mixed leaves of various species. The SOC ranged from 4.5 to 5.13 mg/kg, SOM ranged between 7.75 and 8.79 mg/kg. NH4-N 13.49 to 21.46 mg/kg and NO_3-N ranged from 90.27 to 103.34 mg/kg in various treatments. Microbial population was determined by using dilution plate technique and observed higher in samples of vermi-compost as compared to compost. The mycoflora were isolated and identified from vermicompost samples as *Acremonium* spp., *Cladosporium* spp., *Penicillium* spp., *Aspergillus niger, Aspergillus flavus, Alternaria* spp., *Trichoderma viride, Fusarium* spp. and *Actinomycetes* (identified as *Streptomyces*). Unidentified bacterial colonies were also observed. *Asperigillus* spp. and *Mucor* spp. were found abundantly.



a. Aspergillus niger colony(black)

b. Bacterial colonies

c. Acremonium sp.

d. Alternaria sp.

e. Fusarium sp.

f. Nursery experiments on biofertlizer

Nursery experiment and mycoflora associated with litter decomposing fungi

Co-ordinated project on integrated management of khejri mortality for socio-economic upliftment in Rajasthan (AFRI)

Aims of this co-ordinated project are: to find out causal organism, bio-ecological studies of *Acanthophorus serraticornis,* field demonstration for mortality management, development of IPM package, genetic improvement and mapping genetic diversity, socio-economic impact of mortality and generation of awareness to manage it. The findings are described below:

Component - Forest Protection Studies

Survey work in Nagaur, Sikar, Jodhpur, Churu and Jhunjhunu districts has been done. Mortality ranged from 18 to 22% with an average mortality of 20.9%. Rearing of *Acanthophorous serraticornis* on standardised artificial diet for studying complete life cycle is in progress. Inoculation of *Ganoderma lucidum* in control conditions was done using mycelium to prove pathogenicity through Koch's postulate. Data indicate that all infested Khejri trees were found invariably infested with either root borer or root rot. After third round of field management trials using AFRI, CAZRI, ARS treatments alongwith a control at different experimental sites in five districts, average loong production increased in the treated trees. Total average increase in loong production of severely infested Khejri trees of all four experimental sites was 1.64 kg in T1 AFRI, 1.45 kg in CAZRI, 1.42 in ARS whereas, in control treatment, there was an average increase of 0.30 kg.

Management trial against the root rot pathogen was laid out in nursery. Approximately, 400 seedlings were established and inoculated with the pathogen. The disease was established after two months as evident from the top drying symptoms. Integrated management trial against *Ganoderma* spp. using integration of bio-control agent with chemical fungicides and botanicals (compatible to each other) are being used.

Component - Ecological Component

For assessing the effect of abiotic stresses on Khejri mortality, meteorological data of Churu, Jhunjhunu and Jodhpur and Ground water table data (pre monsoon and post monsoon) of Churu, Sikar, Jhunjhunu, Nagaur districts were collected. Soil samples were collected from the Khejri mortality areas and analysed for pH, EC, organic carbon, phosphorus, ammonium and nitrate nitrogen. Initial analysis indicated that maximum temperature and minimum relative humidity has the positive effect on infestation percentage. Trees in Jodhpur district, where average ground water recharge was positive (489.00 million m^3) suffered less mortality and infestation. The districts namely Churu, Sikar and Nagaur, where ground water recharge was negative, were associated with maximum mortality.

Component - Biochemical Studies

Bark and root samples were collected from infected and healthy trees of *Prosopis cineraria* (Khejri) from different districts and their morphological parameters were recorded. Samples were analysed for studying the variations for protein, proline, potassium and ash contents. An overall decrease in average protein content from healthy (11.6%) to infected trees (5.84%) was observed. Average proline content was also less in healthy trees (1.98 μmol/gm) and it was higher in infected trees (4.75 μmol/gm). In case of roots, an increase in the average proline content from 4.69 μmol/gm (healthy trees) to 8.33 μmol/gm (infected trees) was observed. However, a decrease in ash content from 8.89% in healthy trees to 3.28% in infected trees was seen. Potassium content was also measured in root and bark samples. In stem bark samples, the overall potassium content decreased from 9.25 ppm in healthy to 8.28 ppm in infected trees, whereas, it increased with infection from 5.62 ppm to 8.42 ppm. Further analysis is in progress.

Component - Socio-Economic Component

A detailed socio-economic survey of 377 villages was done and 1500 farmers were interacted. In five districts viz. Jodhpur, Nagaur, Sikar, Churu and Jhunjhunu, a total 7745 khejri trees were recorded in 735.12 ha area during 2005 to 2010. Out of these, 1601 trees died in 2010. Density of khejri tree was maximum in Sikar (2945 trees in 313.5 ha area) and minimum in Jhunjhunu district. The rate of mortality was maximum in Sikar and minimum in Jodhpur district. Average lopped fuelwood/tree was 37.71 kg/tree in 2005 which decreased to 15.71 kg/tree in 2010. From 2005-2010, the loss of lopped fuelwood in these districts was recorded to be 25.19 kg/tree. Maximum lopped fuelwood obtained in 2005 and 2010 was from Jodhpur (40.20 kg/tree) and Jhunjhunu (18.33 kg/tree) respectively.

Phyto-remediation of soil for productivity enhancement during land disposal of effluent (AFRI)

Survey was conducted on effluent disposal along the river basin Jojari in Jodhpur and Bandi in Pali districts. Effluents, soil and plant samples were collected from effluent disposal area and analyzed for different physico-chemical parameters. Plantation in field (split plot design) and lysimeter experiment (CRD) have been maintained by applying different treatments. Growth data in field (yearly basis) and lysimeter experiment (monthly basis) was recorded. Preliminary observation indicates that *Azadirachta indica*, *Eucalyptus camaldulensis* and *Prosopis juliflora* performed better in terms of growth under application of effluent at ¾ level of full irrigation.

Ecological Studies on the distribution patterns and food plant resources of

butterflies along the altitudinal gradients in different forest ecosystems of the Eastern Himalayas (Arunachal Pradesh) (RFRI)

Seasonal sampling surveys in 5 districts of Arunachal Pradesh were conducted. Surveys have been completed in forested areas of 16 districts of Arunachal Pradesh state from November 2011- December 2014. 190 transects covering 2916 points were sampled randomly during all the seasons. A total of 412 species have been identified. A GIS database and Butterfly Atlas of Arunachal Pradesh with distribution maps for each species along with

Screen shot of GIS database for species distribution map in Arunachal Pradesh

information on their ecology i.e. seasonality, relative abundance, altitudinal distribution, spatial distribution in the state, Indian Wildlife (Protection) Act, 1972 status, larval food plants, forest type association of butterfly habitats has been prepared. These include "rare" and "very rare" species, endemic species to North-East India.

Impact of *Mikania micrantha* Kunth. ex H.B.K. on micro-environment of native species in Bherjan-Borjan-Padumoni R.F., Dilli R.F. and Abhayapur R.F. of upper Assam (RFRI)

Vegetation composition and plant diversity, biomass production were assessed and soil sample analysis of *Mikania* infested and non-infested areas is being studied. Infestation of *Mikania* was recorded mainly in surrounding areas other than core areas. Continual documentation of Micro-environmental parameter like light intensity, interception, soil temperature were done. Butterflies were also sampled in *Mikania* infested sites mainly in the forest edge and non-infested sites inside the forest to see the impact on the micro-environment. Data on abundance of 138 species have been collected.

Infestation of Mikania micrantha in different forest of Upper Assam

Investigations on the mortality of *Parkia roxburghii* in North East India (RFRI)

Survey carried out in different plantations of *Parkia roxburghii* in Manipur and Nagaland revealed 100% and 30% disease incidences in Tegnopol, Manipur and Zubza, Nagaland, respectively.

Creating awareness for revival, recharging, sanitation and hygiene of natural water resources through adoption of scientific intervention in model village Lanabanka Distt. Sirmour (HP) (HFRI)

Interaction meetings with the farmers were held to apprise the local people of Lanabanka village

about water sanitation and hygiene and adopting organic farming. Three natural water resources were repaired and famers were demonstrated about preparation of compost from locally available material. The interested farmers were also provided with vermi-beds for the preparation of the compost. Farmers were also educated to take up plantation activities on their farm bunds and around natural water resources.

Two natural water resources (Bawaris) selected for repair and revival and hygiene, Sirmour, HP

Natural regeneration studies of important tree species of Nallamalais, Seshachalam Hills and Kaundinya wildlife sanctuary of Eastern Ghats of Andhra Pradesh (IFB)

About 33 local communities were sampled for knowing their priorities for certain important tree species and their perception about the natural regeneration. 17 soil samples have been collected, processed & the data have been compiled for analysis.

Ecological diversity of Kawal Tiger Reserve in Andhra Pradesh - A bench Mark study (IFB)

Enumeration of plant species (Angiosperms), grasses and legumes and other fodder species across different ranges like Thallapet, Khanapur, Pembi, Indanapally, Ichoda, Both, Beersaipet, Indravelli, Utnoor, Jannaram were done. Enumeration of macrofauna (Mammals & Aves) by local enquiry has been done.

Seed Science and Technology

3.4

Standardization of the techniques for germination, collection and maintenance of maximum viability of four important tropical species: *Bridelia retusa, Sterculia urens, Boswellia serrata* and *Saraca indica* (TFRI)

Effect of temperature, light, soil type and quality on germination of *Sterculia urens* and *Boswellia serrata* were evaluated. Best pre-treatment for germination of *Sterculia urens* was standardized. Seeds of *Bridelia retusa* were incapable to germinate at any stages of maturation and were found dead before full ripening. Seeds of *Sterculia urens* and *Boswellia* serrata were identified as orthodox category and those of *Saraca indica* as recalcitrant seeds. Seeds of *Boswellia serrata, Sterculia urens* and *Saraca indica* were stored at different conditions. Stored seeds were sampled at different intervals for evaluation of viability.

Germination of Boswellia serrata seeds

Germination of Sterculia urens seeds in germinator

Germination of Saraca indica seeds

Neem seedlings

Rohida seedlings

Recording of growth parameters in Nursery, AFRI, Jodhpur

Refinement of modern nursery practices for raising quality seedlings of selected important forest tree species in arid and semi-arid areas (AFRI)

Prosopis cineraria, Tecomella undulata and *Azadirachta indica* were raised in different sized polybags viz. long (24x19 cm), middle (19x18 cm) and small (20x13 cm) as well as in two sized root trainers 150 cc and 250 cc. Manure compost (C), vermicompost (V), gobar manure (G), leaf compost (L) and goat manure (M) were used. These seedlings were filled with different potting mixture ratio of soil: sand: manure viz. $C_1/G_1/M_1/V_1/L_1$ (1:1:1), $C_2/G_2/M_2/V_2/L_2$ (1:1:2), $C_3/G_3/M_3/V_3/L_3$ (1:1:3) and $C_4/G_4/M_4/V_4/L_4$ (1:2:1) respectively. Growth parameters of all these species were recorded at 2 months intervals. On the basis of growth performance, the treatments were treated with 5 types of biofertilizers viz., PSB, *Azospirullum, Azotobactor, Trichoderma* and VAM. Controls without biofertilizers were also kept for comparisons.

Khejri seedlings

Growth data recording of biofertilizer treated seedlings

After 4 months, *Tecomella undulata* seedlings with compost manure in long polybags performed better in all treatments. In leaf compost treatments L_1 and L_4 long polybags performed better. In vermicompost manure treatment in long polybags, V_1, V_3 and V_4 performance was better.

Similarly, *Azadirachta indica* seedlings with compost manure and long polybags performed better in C_2, C_3 and C_4 treatments after 4 months. Gobar manure with long polybags seedlings performed better in G_2, G_3 and G_4 treatments. In Goat manure G_1 treatment with small size polybags performed better. In leaf compost, treatments L_1 to L_4 long polybags performed better. In vermicompost manure treatment, the performance of long polybags of V_1- V_4, was better. In Goat manure, long polybags performed better.

Prosopis cineraria seedlings with compost manure and small polybags seedlings performed better in C_1, C_2 and C_3 treatments. In leaf compost, in treatments L_3 and L_4 long polybags performed better, whereas, in treatments L_1, middle sized polybags performed better. In treatments L_2, small polybags performed better. In Goat manure, with M_2 -M_4 treatment long sized polybags performed better. In vermicompost manure treatment, the performance in long polybags of V_1- V_4 was

better. In Gobar manure, long polybags and small polybags seedlings performed better in G_1, G_2 and G_3 treatments. In Goat manure with G_4 treatment long sized polybags performed better. Performance of individual biofertilizers varies in different treatments. Root shoot ratio and other parameters were recorded for further analysis for all species.

Development of agro- techniques for organic cultivation of *Tribulus terrestris* L. and *Cissus quadrangularis* L.- medicinal plants extensively used in Traditional System of Medicine (Ayurveda, Unani and Chinese) (IFP)

Tribulus terrestris and *Cissus quadrangularis* are widely used by the Munda and Oraons communities in the state of Jharkhand. Attempts have been made to grow these plants scientifically from cuttings round the year with the application of growth regulators. Fertilizer and spacing trial experiments have also been conducted for obtaining maximum yield of the plants. Cuttings of *Cissus quadrangularis* were treated with different concentrations of plant growth regulators viz., IAA, IBA, NAA etc. Young shoots developed from most of the cuttings. The success of the growth of the cuttings was as high as 95%.

Seeds of *Tribulus terrestris* were also subjected to different physical and chemical treatments viz., hot water, acid, plant growth regulators. In case of physical treatment the germination percent was very low (10%). In chemical treatment, the success rate was approximately 15%.

Eco-restoration 3.5

Developing ecological restoration model in mine spoils at Tetulmari under Sijua area, BCCL, Dhanbad (FRI)

To accelerate the ecological succession and restore the biodiversity loss in the mining areas of Dhanbad coalfields, various means of propagation such as planting of seedlings, stem cuttings, culms, bulbils and broadcasting of various seeds of trees, shrubs, herbs and grasses were carried out in Tetulmari mine spoil of Sijua area, Dhanbad, Jharkhand. In a period of three years, 34 number of plant species including 16 trees, seven shrubs, seven grasses, three herbaceous and three bamboo species were planted in the 10 hectare area. The species were of multiple uses like timber, fodder, medicinal, edible, soil binder, soil ameliorator etc. Planted species were periodically monitored in terms of growth performance and survival for their potentiality and applicability in reversing the biodiversity loss in mined out areas. The site has recovered and now supports rich diversity of vegetation. As per growth and survival of some native tree species used in the eco-restoration programme, it was found that the *Albizia procera* had the maximum growth in height and diameter followed by *Dalbergia sissoo* in forestry while among horticulture species, highest growth and survival was recorded by

Before restoration

After three years of restoration

Ecological restoration at BCCL, Dhanbad

Emblica officinalis followed by *Mangifera indica*, *Albizia procera, Dalbergia sissoo* and *Pongamia pinnata*, that had maximum survival of 90% each among forestry species while *Syzygium cumini*, *Emblica officinalis* and *Psidium guajava* had survival percentage of 90, 88, 80 respectively among horticultural species.

Identification and Reclamation of 10 hectare of degraded land and Bio-diversity development at Northern Coalfields Limited (NCL), Singrauli (FRI)

Ecological restoration of degraded coal mine spoils is being carried out at Nighai and Krishanshila of NCL, Singrauli. Various physical measures including top soil spread, mulching and biological measures including planting, seed sowing of different trees, shrubs and grass species were applied for restoration of degraded mine spoil. A total number of 5,500 saplings of different plant species were planted at both the sites. A total number of 43 plant species including 23 trees, two shrubs, five herbaceous, two bamboo, four horticulture, six grasses and one cereal species were planted at Nighai and 45 plant species including 24 trees, three shrubs, five herbaceous, two bamboo, four horticulture, six grasses and one cereal species were also planted at Krishanshila. *Dalbergia sissoo, Bauhinia variegata, Pongamia pinnata, Aegle marmelos* and *Gmelina arborea* etc. were recorded as the most successful species with respect to survival and growth after nine months of restoration.

Before restoration

After nine months of restoration

Reclamation and biodiversity development at NCL Singrauli

Restoration ecology and species recovery studies in Tsunami impacted mangrove areas in Andaman (IFGTB)

Mangrove areas in south Andaman, Baratang, middle Andaman and north Andaman were surveyed to assess the impact of Tsunami particularly upliftment and submergence of mangrove areas in these regions due to Tsunami. Sample plots in each island group have been selected based on stratification and the damaged areas have been stratified as heavily damaged, moderately damaged and less damaged. 15 sample plots have been selected and demarcated on ground for restoration, vegetation survey in the impacted areas and also in the adjoining undisturbed areas have been done. Mangrove nurseries have been established in south Andaman and middle Andaman. Nursery has been established in following sites :- Indira nagar (*Rhizophora* sp., *Ceriops* sp.) Shoal bay (*Rhizophora* sp.), Yerrata (*Rhizophora* sp., *Bruguiera* sp., *Ceriops* sp.), Mohanpur (*Rhizophora* sp., *Bruguiera* sp.), Parangra (*Rhizophora* sp., *Xylocarpus* sp.).

Reclamation of laterite lands using beneficial microbes in Kasargode District (IFGTB)

The study sites were selected at Karmamthodi, Bhavikonam range of Kasargode district and collected the laterite soil samples to analyse microbial and nutrient parameters. The microbial status was very low, however, the *Azospirillum*, AM fungi and *Phosphobacterium* were isolated and cultured. The N, P and K status of laterite soils are very poor, particularly, potassium. Seedlings of *Butea monosperma, Swietenia macrophylla, Ailanthus tryphysa* and *Holoptelia integrifolia* were grown in laterite soils (as potting media) and inoculated with beneficial microbes, such as, *Azospirillum, Phosphobacterium* and AM fungi. The seedlings inoculated with these beneficial microbes showed increased growth and biomass. Initial planting has been done to stabilize the laterite lands. In this trial planting, it was found that *A. tryphysa* and *S. macrophylla* are forming well and they may be suitable to laterite lands.

Species evaluation for landscaping and restoration of degraded Aravalli hills at IIM Campus, Udaipur (AFRI)

The project has been initiated during August 2014 with the aim to evaluate different tree and shrub species for their suitability in restoration of degraded hills. Advance soil working has been

done with the help of state forest department involving village forest protection and management committee (VFPMC). One hundred thirty three plants of *Dendrocalamus strictus* and *Terminalia catappa* were planted in October 2014.

Indigenous/Traditional Knowledge 3.6

Study on Indigenous knowledge and Documentation of extent of utilization of herbs in folk- medicines prevalent in tribal pockets of Madhya Pradesh (TFRI)

The study was conducted in districts of Chhatarpur, Panna, Satna, Jabalpur and Seoni to document information. Information from vaidraj and local communities about use of indigenous flora and plant parts used in herbal medicines were recorded along with plant parts used as roots, rhizomes, leaves, bark, flowers, fruits, gum etc. Information about over- exploitation and extinction of species also recorded from local communities and traditional healers.

The plant species over- exploited were documented viz. *Amorphophallus sylvaticus* (Bajra kand), *Andrographis echioides* (Kalmegh), *Butea monosperma* (Palash), *Bacopa monnieri* (Brahmi), *Beta vulgari* (Chukandar), *Caesalpinia bonduc* (Gattaran), *Chlorophytum arundinacaea* (Safed Musli), *Citrullus colocynthis* (Kahira), *Costus specious* (Keokand), *Curcuma amada* (ama haldi), *Eulophia herbacea* (Bilarikand), *Hedychium coronarium* (Gulbakawli), *H. spicatum, Jasminum grandiflorum* (Van chameli), *Justicia procumbens* (pitpada), *Mimosa pudica* (Lajwanti) , *Nardostachy grandiflora* (Jatamansi), *Plumbago zeylanica* (Chitrak), *Litsea glutinosa* (Maidachal), *Parkia biglandulosa* (Shivlingi), seeds of *Psoralea corylifolia* (Bavchi), *Commiphora mukul*, *Solanum surattense*, *Tinospora cordifolia* (Giloy) and *Vetiveria zizanioides* (Khus).

The plant species at the verge of extinction were documented viz. *Abroma angusta* (Ulat kambal), *Abelmoschus moschatus*, (Bajrakand), *Abrus precatorius* (Gunchi), *Butea parviflora* (Palash bel), *Terminalia arjuna* (Arjun), *Vajradanti, Dioscorea hispida* (Bechandi) *Curcuma angustifolia* (Tikhur), *Curculigo orchoides* (Kali musli), *Mucuna pureins* (Kemach), *Grewia hirsuta* (Gudsakri), *Gloriosa superba* (Kalihari), *Terminalia bellarica* (Baheda) and *Terminalia chebula* (Harra).

Studies on ecological and ethno-mycological aspects of wild mushrooms of Meghalaya (RFRI)

78 mushroom species were collected from Shillong and Cherrapunji areas of Meghalaya. Out of which, only 14 spp. were edible and 64 were non-edible. Topography, vegetation, habitat of the site in which mushroom is growing and specific association of fruit body with surrounding trees, herbs and shrubs were documented alongwith GPS data. Traditional knowledge on wild mushrooms from the local community and market survey is in progress. Out of 78 mushroom species, only fifteen species have been identified till date. Identification of rest of the species is in progress. Chemical analysis of important wild edible mushroom for their moisture, protein, carbohydrates, fat and fibre content has however, been carried out.

Institutes under ICFRE have initiated various field studies under the theme "Forest and Climate Change" covering various aspects of climate change mitigation and adaptation. FRI, Dehradun and IFGTB, Coimbatore have initiated studies on plant physiological behaviors under various levels of elevated CO_2. The findings will develop our understanding towards adaptation of plants to high level of CO_2 concentrations. Similarly, AFRI, Jodhpur is in the process of documenting how local communities are adapting to climate change. On the mitigation aspects of forests, HFRI, Shimla; TFRI, Jabalpur; IFB, Hyderabad and IFGTB, Coimbatore are working on various aspects of carbon sequestration.

Studies on chemo-enzymatic treatment of black liquor recovery of reducing sugars for bioethanol production (FRI)

Under the project entitled "Studies on chemo-enzymatic treatment of black liquor for recovery of reducing sugars for bioethanol production", different black liquor samples were analyzed for physico-chemical properties. Spectrophotometric determination of reducing sugars in black liquor samples with and without hydrolysis was carried out. Effect of salt concentration and pH on the growth of *Saccharomyces cerevisiae* and *Pichia stipitis* were optimized. Fermentation of agro-based black liquor (Kraft and soda) was carried out by using *Saccharomyces cerevisiae* and *Pichia stipitis*. Concentration of bio-ethanol was measured through spectroscopic methods.

AICP on elevated CO_2

The observation on growth dynamics and physiological behavior of plants species under the condition of elevated CO_2 in Open Top Chambers (OTC) were recorded. Following treatments were given to each OTC:

(i) AMB: Outside of the OTC Chamber (Natural Control)

(ii) OTC 1 : Ambient condition (Chamber Control)

(iii) OTC 2: Elevated CO_2 (800 ppm)

(iv) OTC 3: Elevated temperature (ambient + 2°C)

(v) OTC 4: Elevated CO_2 (800 ppm) + Elevated temperature (ambient + 2°C)

(vi) OTC 5: Elevated temperature (ambient + 2°C) + Humidity

Forest and Climate Change

(vii) OTC 6: Elevated CO_2 (800 ppm)+Elevated temperature (ambient+2°C)+Simulated Humidity (SH)

Plant height was enhanced with rising level of CO_2 for all the species of tree seedling or clones. The maximum plant height was measured for seedling exposed under elevated OTC 2 followed by OTC 4, OTC 6, OTC 3, OTC 5, OTC 1 and AMB. Significant impact of elevated CO_2, elevated temperature and simulated humidity and also the combined effects of the above treatments on Relative Growth Rate (RGR) were investigated. More number of leaves were recorded for the seedling/clones of tree species under OTC 1 followed by OTC 6, OTC 4, OTC 3, OTC 5 and AMB. Similarly, biomass partitioning in various parts of the seedlings, such as, leaf, stem and branches, shoot, root and total biomass accumulation was examined and expressed in gram (gm). The highest total biomass accumulation was recorded for OTC 2, followed by OTC 4, OTC 6, OTC 3, OTC 5, OTC 1 and AMB.

The impact of elevated CO_2, elevated temperature and simulated humidity and combinations of these factors on physiological behaviour of seedlings, such as, photosynthesis, transpiration, stomatal conductance and water use efficiency were also studied for all species. Significant variations between treatments for all the species were observed. Photosynthetic rate (μmol $m^{-2}s^{-1}$) was recorded higher for the seedlings grown in OTCs, whereas, lowest for AMB. Transpiration rate (m mol m^{-2} s^{-1}) was the highest for seedlings grown in AMB whilst the lowest for OTC 6. Stomatal conductance (m mol $m^{-2}s^{-1}$) decreased from AMB to OTC 6. The water use efficiency (μ mol/m mol) increased from AMB to OTC 6 and maximum achieved by seedlings grown in side OTC 6 and minimum for AMB.

Screening tree species for intra-specific variation in carbon sequestration potential under elevated CO_2 (IFGTB)

The study aims to assess intra-specific variation in growth and morphology in response to the elevated CO_2 level under ambient and simulated temperature regimes. Teak seeds were collected from seed orchards and seedlings were raised. 100 seedlings were used for production of seedling coppice. The coppice shoots obtained from these seedlings were rooted and placed in the mother bed chambers for further multiplication of individual clones. On the basis of rooting ability for further multiplication, 33 clones have been short-listed for studying intra-specific variation in teak for carbon sequestration potential under elevated CO_2 levels. Mass multiplication of selected clones of teak is in progress.

Effect of elevated CO_2 on active principles of important medicinal plants (IFGTB)

Seedlings of *Andrographis paniculata, Adhatoda vasica, Phyllanthus amarus* and *Gymnema sylvestre* were raised. Plants were kept under the different elevated CO_2 levels at nursery. Periodical data on growth, total plant fresh and dry weight, root shoot ratio, number of leaves, primary and secondary roots etc. were taken. Observations on physiological parameters were recorded from different treatments. Medicinal plants parts were dried for alkaloids estimation. The Chlorophyll 'a', 'b' and 'total' for these medicinal plants, under different CO_2 levels were worked out. In all the medicinal plants, higher the elevated CO_2 levels, the higher the biomass production, bio-chemicals including the total protein, tannin etc. were observed.

Assessment of soil organic carbon under different land uses in Tamil Nadu (IFGTB)

Extensive survey was undertaken in Vellore and Tiruvannamalai districts covering the North-

Eastern Agro-climatic zone of Tamil Nadu. Soil samples (60 Nos.) belonging to Kolathur and Mangalathupatti soil series were collected from different land uses viz., Agriculture, Agro-forestry and plantation for estimation of carbon stock. Soil samples were collected from three plots and at four depths viz., 0-30, 31-50, 51-80 and 81-100 cm. The percentage of coarse fragments (>2 mm size) was calculated for each layer based on visual observation of the area occupied by coarse fragments. The samples were fractionated into three aggregate size classes viz., macro-aggregates (250-2000 μm), micro-aggregates (53-250 μm) and silt and clay sized fraction (<53 μm) and soil carbon was estimated.

Studies on response of Sholas of Nilgiris to Climate change (IFGTB)

Three sholas (Glenmorgan, Pykara, Shooting Mund) – a chain link fenced, a dilapidated chain link fenced and a natural patch were selected for climate change studies in the Nilgiris. Quadrat and belt transects were laid out for periodic recording of data. Smaller quadrats for recording regeneration status of tree species were also laid out. Phenological data on tree species are being recorded.

Response of mycorrhizae and microbial symbionts to elevated CO_2 in commercially important tree species (IFGTB)

Rhizosphere soils samples of selected tree species were collected and isolated *Rhizobium,* Azospirillum AM fungi and Phosphobacteria. These isolates were multiplied and maintained in laboratory. VAM fungi, *Glomus geosporum*, *G. viscose* and other microbial symbionts, such as, *Rhizobium* and *Frankia* were cultured and maintained in the laboratory. *Acacia auriculiformis*, *Melia dubia*, *Casuarina equisetifolia*, *C. junghuhniana*, *Eucalyptus camaldulensis* and *Neolamarkia cadamba* were raised in nursery and inoculated with these microbial symbionts, such as, AM fungi, *Rhizobium* and *Frankia* individually and in combinations. The seedlings were placed in CO_2 chambers with 600 ppm of CO_2. After 15 days of incubation the seedlings showed improved growth and stem girth rather than non-inoculated control seedlings. The seedlings kept in ambient CO_2 conditions also showed lesser growth than the seedlings with 600 ppm CO_2 supply. The rooted stem cuttings of *Acacia auriculiformis* inoculated with *Rhizobium* showed early nodulation at 600 ppm elevated CO_2. This is a new finding in the rooted stem cuttings of *A. auriculiformis*. The growth and biomass of *A. auriculiformis* cuttings was also improved. The seedlings of *C. equisetifolia* and *C. junghuhniana* showed more number of nodules inoculated with *Frankia* under elevated CO_2 (666 ppm). The seedlings of *Melia dubia* and *Neolamarkia cadamba* inoculated with AM fungi showed increased height, stem girth and biomass than the control seedlings under elevated CO_2 conditions. The seedlings of *Acacia auriculiformis* inoculated with *Rhizobium* with AM fungi showed higher biomass than the control seedlings under elevated CO_2 conditions. The root nodules number and biomass were also increased in the seedlings inoculated with *Rhizobium*. The bacteria *Azospirillum* and *Bacillus* sp (PSB) found more effective in the seedlings of *Ailanthus excelsa*, *Neolamarkia cadamba* and *Gmelina arborea*. The growth and biomass improved 2 times higher than the control seedlings. Under 600 ppm conditions, the photosynthetic rates were also obtained higher than the non-inoculated controls. Tissue Nitrogen (N) content was also found lower under 900 ppm elevated CO_2 conditions than ambient control and 600 ppm levels. The nodule numbers (14.2 plant^{-1}) and nodule biomass (28.2 mg plant^{-1}) were found in *C. equisetifolia* under ambient control. Increased nodule biomass (33.5 mg plant^{-1}) and nodule number (22.7 plant^{-1}) were found under 600 ppm elevated CO_2 level. Increased rates of Photosynthesis (6.37 μm^{-2} s^{-1}) in 600 ppm level of elevated CO_2 conditions was found than ambient control (4.81 μm^{-2} s^{-1}). This study showed that the extreme elevated CO_2 level conditions (900 ppm) affect the activity of *Frankia* adversely and suppressed the growth of *C. equisetifolia*. The ambient and increased CO_2 levels (600 ppm) positively influenced the activity of *Frankia* in *C. equisetifolia*.

Assessment of decay of wood in the forests and impact on methane release contributing towards climate change (Funding Agency: CAMPA, KFD) (IWST)

The results of the study indicated that dead trees in the forest contribute CH_4 budget and temperature play important role for methane flux from dead trees. Significant variation of methane emission was observed among the different decay tree stands. It was found that time variation caused huge quantities of methane emission from diseased trees. Isolation and identification of anaerobic microorganisms from trunk wood confirm the phenomenon of CH_4

production from dead trees under anaerobic condition, as mechanisms of CH_4 production from dead trees is still not very well understood. Further study of anaerobic microorganisms from trunk wood based on molecular DNA sequencing is needed.

Utilization of Automatic weather station/Agro-meteorological station data for agriculture, forestry and hydrological applications in Madhya Pradesh (TFRI)

This is a multi-institutional project coordinated by Space Application Centre of ISRO, Ahmedabad, with the objective to quantify energy and carbon exchange using field measurement and remote sensing data in different ecosystems of Madhya Pradesh.

In the 1st phase of the project (2010-11 to 2011-12), allometric regression equations for quantification of carbon in *Shorea robusta* trees by non-destructive method were developed. Study sites were selected near Automatic Weather Stations (AWS) and Agro Meteorological Stations (AMS) installed in Kanha, Bandhavgarh and Madhav National Parks of M.P. Data on seasonal variation in grass biomass, soil moisture profile, Specific Leaf Area and Leaf Area Index etc. were collected.

In the 2nd phase (2012-13 to 2014-15), 11 quadrats of 0.1 ha size each were laid out in Pench, Panna and Satpura Tiger Reserves of M.P. Growth data of the trees were collected regularly in the selected quadrats and observed seasonal variation in herbaceous and litter biomass and soil moisture profile.

Density and vegetation diversity in the selected quadrats of the tiger reserves was found in the order of: Satpura>Pench> Panna.

Carbon stock per ha was found maximum in the selected quadrats at Pench, followed by Satpura and Panna, while annual sequestration was found maximum in Satpura followed by Pench and Panna.

Laying out 0.1 ha quadrat for vegetation survey in Satpura Tiger Reserve

Carbon sequestration through afforestation at Rourkela Steel Plant (RSP), Odisha (TFRI)

The project has been conceptualized to quantify carbon stock and annual sequestration in vegetation, litter and soil in more than 40 lakh tree of plantations origin raised by Rourkela Steel Plant in 15000 acres of land and in the nearby natural forest. The objectives of the study are to assess CO_2 released by RSP to the atmosphere through the manufacturing processes and to monitor seasonal, diurnal and locational variation in its concentration. Valuation of plantations for their tangible and intangible benefits will be assessed and outcomes of the project will be disseminated to the stakeholders through training programmes to officers and staffs of SAIL.

Study sites have been selected for phyto-sociological studies for trees, shrubs, herbs and litter collection in the plantations and natural forest. Bio-physical parameters including growth of trees and soil moisture are being studied. As part of the programme, a 10 acre plantation with 11 tree species having higher carbon sequestration potential has been raised at Rourkela Steel Plant, Rourkela with the help of Odisha State Forest Department.

Vegetation survey of plantations showed that a total of 30 tree species were recorded with maximum number of individuals of *Tectona grandis* (Teak) (284), followed by *Alstonia scholaris* (160) and *Cassia siamea* (105). In the natural forest, total 12 tree species with different

Demarcating trees in the quadrats of Pench Tiger Reserve (M.P.)

Tree quadrat laid out at Rourkela Steel Plant, SAIL (Odisha)

10-Acre plantation raised at Rourkela Steel Plant, SAIL (Odisha)

genus and 11 families were recorded. Shannon Weiner Diversity Index was calculated to be 0.77 and Simpson Index as 0.18.

The soil of Rourkela Steel plant was found to contain 32.19 t Carbon/ha (1.2 soil density and SOC 0.88%)

Studies on the effects of MPOWER programme on mitigation and adaptation towards Climate Change in western Rajasthan (AFRI)

This project is funded under Mitigating Poverty in Western Rajasthan (MPOWER) project and has been implemented on pilot basis in six blocks, one each in Jaisalmer, Barmer, Jodhpur, Pali, Jalore and Sirohi districts of western Rajasthan for mitigating poverty of the target groups households through strengthened capacity, improved livelihood, sustainable enterprises, natural resources management and increased access to credit and markets. One hundred two villages were selected for field survey and data collection. Three types of questionnaires were developed, i.e. related to village profile data collection; socio-economic and people perception about climate change and adaptation strategies; and interaction with project implementing agencies. Further, depending upon availability of land uses in the selected village, soil samples were collected in 0-30 cm soil layer and analysed for soil organic carbon, bulk density and gravel content estimation. Out of 28691 households, a total number of 2345 households were surveyed and people were interviewed. Interactions with the local people indicate: (i) villagers experience varying rainfall and warming of the day because of decreased rainfall and increased summer temperature; (ii) people are reducing livestock herd size because of decreased pastures; (iii) people use to collect fuelwood from forest area within few days and store it for use during summer and rainy seasons; (iv) people use to develop assets like jewelleries, livestock, poultry farming etc. as a coping mechanism against any future adversity. As an adaptation to climate change, they practise: (i) use of hybrid seeds, chemical fertilizers, pesticides to increase production; (ii) mix-cropping and vegetable farming by dividing agriculture land for crops and vegetables, for generating immediate benefits by selling seasonal vegetables, which help them improve livelihood; (iii) irrigated area has been increased in many villages, where villagers are irrigating their farmland as use of 'Saran' (irrigation channel) (in Bali block); (iv) rain water harvesting (through community water tank) to ensure drinking water supply. It was also observed (in Baitu and Sankra blocks) that people are changing their occupation and used to migrate to other places for livelihood opportunities.

People interaction and construction of 'Tanka' for rainwater harvesting as adaptation to climatic abrasions

A study on distribution and phenological events of *Pinus kesiya* along the altitudinal gradient at regional scale in North-East Indian Himalayas (RFRI)

Pine growing areas in Arunachal Pradesh, Meghalaya, Nagaland and Manipur were identified through visual interpretation of satellite imageries and potential sites for sampling were identified at various altitudinal ranges. Distribution of the species was analysed from herbarium data that are accessible through the Global Biodiversity Information Facility supplemented by documented geographic distribution and other published literature. Site-specific length of needles at maturity was statistically determined from collected samples. Dimensions of specimens (length of needle and length and girth of female cone), collected from

the marked and tagged trees were analysed and descriptive statistics were determined, in order to ascertain the phenophase of the trees on the date of observation. One ecotone region in Meghalaya has been identified for further investigation.

Assessment of Carbon Stock in Forest Types of Shimla Forest Circle, Himachal Pradesh (HFRI)

Major forest types namely chirpine forest, ban oak, deodar, silver fir & spruce, kharsu oak forest, mohru oak, kail and alpine pasture were identified in Shimla circle and selected for carbon stock assessment. A total biomass of 3.80, 5.5 and 10.40 t/ ha, carbon stock of 1.99, 2.75 and 5.40 t C/ha and total soil organic carbon stock of 133.11, 160.00 and 132.16 t C/ha respectively was recorded for Kawar, Chansel and Talra pasture respectively. The field study for chirpine forest was conducted at Dhami and Guma; for ban oak forest at Taradevi and Koti; for deodar forest at Koti; for fir, spruce, kharsu oak and bhojpatra forest at Larot as per standard methodology. The specific gravity of wood samples of chirpine, ban oak and deodar varied from 0.57-0.72, 0.70– 0.90 and 0.77-0.84, respectively. The soil organic carbon varied from 0.98-2.92, 1.22-3.90 and 1.90-2.78% for chirpine, ban oak and deodar respectively.

In chirpine forest, carbon stock in litter varied from 1.198 to 1.235 t C/ha whereas, in Ban oak forest, it varied from 1.35 to 1.40 t C/ha. Soil carbon pool in chirpine forest varied from 53.16 to 57.54 t C/ha whereas, in Ban oak forest it varied from 70.99 to 74.75 t C/ha. The field study for kharsu and kail and Northern dry mixed deciduous forest of Chopal and Shimla Forest Division was conducted. In mohru, kharsu and bhojpatra forest, litter production was 3.08, 1.86 and 2.13 t/ha whereas, carbon stock in litter was 1.694, 0.985 and 1.15 t C/ha respectively. Soil carbon pool in mohru, kharsu, bhojpatra, deodar and kail forest was 68.53, 61.78, 63.99, 74.26 and 74.87 t C/ha respectively.

Kharsu Oak Forest (Chopal Division)

Blue Pine Forest (Shimla Forest Division)

Northern Dry Mixed Deciduous Forest (Shimla Forest Division)

High Altitude Transition Zone in Himachal Pradesh: Long-term Study to Assess the Effect of Global Warming and Trails to Rehabilitate Degraded Site in this Zone (HFRI)

Potential sites were identified for laying out permanent study plots in high altitude transition zones to monitor changes in their composition over a period of time. Seeds and cuttings of *Rhododendron campanulatum* were collected and sown in nursery/mist chamber. *Syringa emodi* and *Betula utilis* cuttings were put in mist chamber beds. *Quercus baloot* sowing was done in polybags in Kinnaur and their growth parameters were regularly monitored. Also collected the germplasm of threatened medicinal plants from the HATZ for *ex- situ* conservation and maintained in nursery beds.

Measurement of Vegetation and biomass parameters under Vegetation Carbon Pool Assessment (VCP) (IFB)

Out of the total 38 field study plots, a total of 8 plots were visited and species inventories were performed. Voucher species of all the species encountered were collected and preserved. Biomass estimation of the plant species were also done for the field plots visited. Data base of all the visited plots are being prepared. The species inventorized in the field plots include, *Lannea coromandelica, Diospyros melanoxylon, Chloroxylon sweitenia, Soymida febrifuga, Anogeissus latifolia, Tectona grandis, Dalbergia paniculata, D. latifolia, Butea monosperma, Terminalia* sp., *Buchanania lanzan, Cleistanthus, Acacia* sp. etc.

Forest genetics and tree breeding research in ICFRE is oriented towards selection of superior genotypes, their field evaluation, development of propagation methods, establishment and improvement of seed orchards and seed production areas, population genetic studies for conservation of forest genetic resources. Development of productive and adaptive varieties/ clones through conventional and biotechnological approach is an important aspect of council's research. Biotechnology tools are being further used to strengthen the conventional tree improvement programmes. Genetically superior clones of different forest tree species developed by ICFRE institutes are being used by wood-based industries, pulp and paper mills and plywood/veneer factories in the country contributing effectively in betterment of our economy. Farmers and forest department is using improved planting stock for economic gains.

Eucalyptus

Fullsib families of *Corymbia torelliana* x *C. citriodora* were developed at IFGTB, Coimbatore through controlled pollination. Inheritance of both maternal and paternal traits was noticed in the fullsib families. Two fullsib trials were established at Panampally, Kerala and Nellore, Andhra Pradesh. Various combinations of eucalypts dihybrids were developed with *E. tereticornis* as a seed parent. A VMG nursery has been developed at TNPL Kagithapuram premises with 11 intra - specific fullsib seed lots. Evaluation of mapping population has been done and 30 clones have been short-listed based on their at par and above performance as compared to the commercial clones for productivity and wood traits.

Vegetative propagation were carried out in the crosses of *E. camaldulensis* X *E. grandis*, *E.tereticornis* X *E. grandis* and parents. Multi Locational Hybrids Trials (MLHCT) were established in different locations in Tamilnadu. In order to establish second generation (SG) seed orchard for high productivity in *Eucalyptus*, 65 superior trees have been selected and are being mass multiplied.

A bilateral collaborative project was initiated by IFGTB and Kasetsart University, Thailand. Under this programme, a visit to Thailand was conducted to study their genetic improvement efforts. Similarly, a study visit was conducted for a team of scientists from Thailand to visit AFRI, Jodhpur; TERI, Delhi and FRI, Dehradun to learn the *Eucalyptus* tree improvement efforts.

Forest Genetic Resource Management and Tree Improvement

At Forest Research Institute, *Eucalyptus* hybrids FRI-14 (*E. citriodora* Hook. × *E. toriliana* F. Muell.) and FRI –EH001 (*E. camaldulensis* Dehnh. × *E. tereticornis* Sm.) multiplied through micro-propagation technique were field evaluated at three different agro-climatic locations of Punjab, Haryana and Uttarakhand.

Casuarina

Initiatives were taken by IFGTB for making advancement to the ongoing breeding programme of *Casuarina* to the second generation. About 16 ha of progeny tests have been established in different locations of Andhra Pradesh, Puducherry and Tamil Nadu. Trials have been periodically assessed for growth, stem form and wood traits and variation among families and seed sources have been estimated. All trees in each progeny test have been ranked and inferior trees have been marked for thinning. These plots will start functioning as second generation seed orchards once the thinning is completed.

Calophyllum inophyllum (Punnaga)

Populations of *C.inophyllum* in the districts Dakshina Kannada, Udipi and Uttara Kannada of Karnataka were surveyed and 67 Candidate Plus Trees (CPTs) identified. Oil content was estimated in 50 CPTs.

Gmelina arborea (Gamhar)

Extensive survey was conducted in the natural forest of Tamil Nadu, Kerala and farmers plantations. 90 CPTs were selected, based on growth superiority, clear bole, GBH, tree spread and apical dominance. Wood properties of the plus trees were studied. Progeny trials of 60 accessions at Kuruvampatty, Salem RF and Thuvarankurichi, Trichy were established.

The clonal trials of *G. aroborea*, established earlier at RFRI experimental station and Imphal, Manipur were evaluated for their performance. Twenty four clones in the RFRI experiment trials were selected, based on their performance. Seven clones were screened as moderately less resistant to the pest defoliator (*Calopepla leayana*).

Acacia auriculiformis (Northern black wattle)

Selection of clones of *Acacia auriculiformis* with desirable stem form and wood properties was carried out. Promising clones of *A. auriculiformis* were multiplied and trials raised.

Three clonal trials of 1.0 ha each were planted at Peringamala (Trivandrum Division, Kerala), Kottayam and Kannakkada (Malayattoor Division, Kerala) during July to September 2014.

One year old clonal trial of Acacia at Gudulur Chennai Research Station

Leucaena leucocephala (Subabul)

Wood and energy production genotypes from BAIF, IGFRI, Jhanshi, CRIDA, TNAU, NAVSARI Agricultural University and University of Hawaii, USA were collected. Two progeny trials, each with 24 accessions at Neyveli and Thuvarankuruchi field station, Tamil Nadu were established. One year growth data at Neyveli show that some accessions from Hawaiian giant variety are outstanding in growth and stem form.

Plantation of Leucaena leucocephala

Dalbergia sissoo (Shisham)

Forty five CPTs of *D. sissoo* have been selected in Jharkhand and Bihar state by IFP, Ranchi and multiplied. A clonal trial has been established in Jharkhand with 12 clones. Collection of growth data, biochemical and molecular characterization have been done for promising clones.

Dalbergia latifolia (Kala shisham)

Forest surveys were conducted and 165 Candidate plus trees of *Dalbergia latifolia* were selected from the state of Chhatisgarh and Madhya Pradesh. The morphological data on total height, clear bole height, GBH, crown diameter, number of primary branches, status of flowering and fruiting were recorded. Half-sib seeds were collected from the trees.

Dalbergia Latifolia trees selected in Chhindwara (Tamia)

Dalbergia latifolia trees selected in Betul (Mohda)

Melia composita (Malabar Neem)

Under All India Coordinated Project on *Melia composita*, being led by FRI Dehradun, progenies were evaluated for genotype X environmental interactions over geographical locations in the state of Haryana, Punjab, Uttar Pradesh and Uttarakhand to understand growth performance, stability and adaptability. Research works were carried out on DNA fingerprinting of various genotypes to understand the genetic diversity of the species. The experimental trials established at RFRI, Jorhat and Tizit, Nagaland were evaluated for their performance. Field gene banks in four locations, namely in Andhra Pradesh (Rajahmundry and Nellore), Kerala (Panampally Research Station, IFGTB) and Chennai (Gene Bank of IFGTB) were established. Clonal accessions were multiplied and established in the form of CMA at Biotrim, Tirupathi. Eight provenance trial plots have been established in the states of Tamil Nadu, Kerala and Karnataka.

Three progeny trials consisting of 24 families established at Jodhpur, Gandhinagar and Deesa, were maintained by AFRI.

Progeny trial of Melia composita at Jodhpur

Progeny trial of Melia composita at Deessa: Soil drenching with fungicide & insecticides

On the basis of general combining ability analysis, family Nos. 24 and 75 exhibited positive values for both the traits in all three locations. In addition to this, two more trials at Bassi, Jaipur and Ghodiwada, Jhunjhunu with twenty one families each have been established.

Growth variability in plantations and seed germination studied in *Melia dubia* cultivated in Karnataka. Preliminary observations reveal that *M. dubia* trees need intensive management practices for utilising its growth potential. It needs larger spacing. On an average, an intensively managed plantation put on a girth up to 15 to 18 cm per year, whereas, it can be drastically reduced to 3 to 4 cm girth per year in an unmanaged plantation. Progeny trial was established at Megaharwali, Agumbe.

Progeny trials with 21 progenies have been established at two locations in Jharkhand (FRC, Mandar and Nagri) and at one location in Bihar (KVK, Manjhi, Saran). Surveys have been

conducted at various places in Bihar, Jharkhand and districts of North Bengal (Malda, Siliguri, Jalpaiguri, Cooch Behar and Darjeeling) to identify and select superior genotypes of *Melia dubia*.

Progeny trials were established at IFB, Hyderabad and at Nallal in Bangalore, Karnataka. The screening of populations has been carried out and new source of plus trees were found for *M. dubia* in Khammam district of Andhra Pradesh, Kollegal of Karnataka and Kothur, Krishnagiri of Tamil Nadu. Experiments were conducted for rooting of stem cuttings of *M. dubia* and *M. azedarach* inside the mist chamber as well as outside the mist chamber using shade net by giving different treatments of auxins. The vegetative propagation technique was successful with more than 80 per cent rooting.

Bombax ceiba (Semul)

Evaluation of *Bombax ceiba* for seed sources was carried out in Northern India. Rooting was achieved in juvenile cuttings of *Bombax ceiba* while mature cuttings failed to root. Seedlings of 32 CPTs were maintained and a field trial was established during July 2014.

Pinus gerardiana (Neoza Pine)

Variation in Natural Populations of *Pinus gerardiana* was studied. The data recorded on morpho-metric traits, cone and seed characters for different populations were analysed. Populations were found to have significant differences for these traits. Preliminary run of the electro-phoretic data was done. The number of alleles per locus for polymorphic loci were found to vary from 2-4 for the enzyme systems studied.

Michelia champaca (Champaca)

Study on seed source variation for germination and seedling growth and establishment of seedling seed orchard of *Michelia champaca* was carried out. Large variation in morphological traits was observed and 24 phenotypically superior genotypes (plus trees) were selected. The progenies from selected genotypes were raised in the nursery for further research.

Pongamia pinnata (Karanj)

A total of 91 high fruit yielding candidate plus trees of *Pongamia pinnata* were selected from different agro-climatic zones of Tamil Nadu, Puducherry and Kerala. The oil content in the selected trees varied from 15 to 33%. A total of 7 clones showed high fruit yield of 103 to 250 Kg per tree and 12 clones exhibited 27 to 33% oil content. A total of 19 clones of *Pongamia* have been identified as high fruit yield and high oil content.

Candidate plus trees of *Pongamia pinnata* selected from northern part of the country were screened for phenotypic characters in different states and progeny trails conducted in previous year. The estimation of oil content ranged in the same pattern as was reported last year from i.e. 28 to 42 %.

Assessment of variability and genetic fingerprinting in *Pongamia pinnata* using micro-satellite markers was carried out. High level of polymorphism and moderate genetic diversity was obtained among 24 genotypes under study. The high oil-yielding accession (K-19) exhibited consistently unique and different amplification pattern than other genotypes that indicates its suitability in development of genetic marker for high oil-yield.

Messua ferrea (Nag champa) and *Madhuca insignis*

Seed behavior and effect of differential drying and temperature on viability of *Messua ferrea* and *Madhuca insignis* (species of wet evergreen forest of Western Ghats) were studied. The results revealed that the *M. ferrea* seeds had intermediate storage behaviour. Seeds remained viable for 75 days at 15°C temperature and by 90 days complete loss of viability was recorded. Results show recalcitrant storage behaviour for *M. insignis*.

Sandal

Demonstration plots of Sandalwood were established at four locations in Punjab by IWST. A model Sandalwood Nursery was established at Bhatoli with a capacity of raising 55,000 Sandalwood quality planting stock. Demo-plots of sandalwood with Indian gooseberry as secondary host and redgram as primary host were established at Mohali, Ropar, Mathewada (Ludhiana) and Bhatoli (Talwara).

Bamboos

A total of 102 genotypes of *D. stocksii* were evaluated after plotting the coordinates of selected genotypes using GPS along with edapho-climatic parameters. All the 102 sampled *D. stocksii* locations along the Western Ghats were grouped into 10 populations. Variation was found among *D. stocksii* phenotypes for culm and clump characteristics.

An inter-institutional project supported by National Bamboo Mission –BTSG was executed

by FRI, Dehradun as the nodal agency along with 4 other ICFRE institutes viz. IWST, Bangalore; TFRI, Jabalpur; RFRI, Jorhat and IFP, Ranchi as participating institutes during the year 2014-15 on ten priority species viz. *Dendrocalamus strictus, Bambusa bambos, B. vulgaris, B. tulda, B. nutans, B. balcooa, D. hamiltonii, Pseudoxytenanthera stocksii* (syn. *Dendrocalamus stocksii*), *D. brandisii* and *D. somdevai*. In the first phase, the ongoing bamboo evaluation trials/plots established by ICFRE institutes/other institutes with the selected clumps of bamboo species in different regions across the country were revisited and evaluated with a set of selection parameters. This activity has resulted in identification of 357 superior clumps of ten selected bamboo species across the five ICFRE institutes.

Teak

Open pollinated seeds were collected from 193 Candidate Plus Trees (CPTs) of seed production areas of Topslip, Parambikulam, Nilambur, Kulathupuzha, Konni and Walayar. Two breeding populations of Teak at Vadaserikkara, Kerala and Dharapuram, Tamilandu were established.

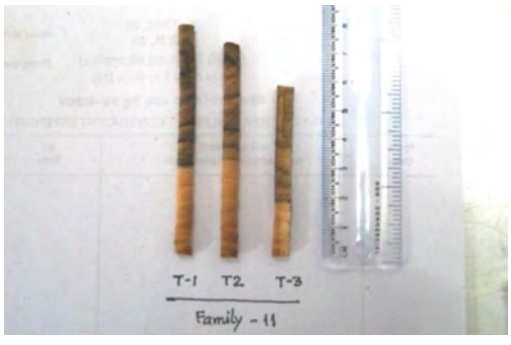
Development of descriptors and DUS testing guidelines for indigenous forest tree species was carried out in *Tectona grandis* and *Melia dubia*. About 20 DUS descriptors based on leaf, flower, inflorescence, branch and fruit characters have been developed.

Marked Candidate Plus trees in Pali Range of Bilaspur Division

Under the planting stock improvement programme of Teak, clonal seed orchards have been established at several locations in Andhra Pradesh with an objective to produce genetically superior seeds.

All India Coordinated Projects on Teak with TFRI, Jabalpur as Nodal Institute, selections of plus trees, raising their progeny trials and establishing germplasm bank was initiated as coordinated programme for genetic improvement of Teak. Rukhad and Kurai range of Seoni (South) Forest Division were visited and surveyed. Seven CPTs were marked and data recorded on them along with 35 comparison trees in the prescribed format. Five CPTs were marked from Pali beat and 14 CPTs from Chatuva Bhauna beat and data recorded on them along with 25 and 70 comparison trees, respectively, in the prescribed format. Investigations on genetic variation and inheritance of Western Indian teak (*Tectona grandis* L.f) was then carried out.

Individual tree data from four progeny trial established with 16, 16, 28 and 9 halfsib families of teak at Rajpipla, Shivrajpur, Sajjangarh and Jodhpur respectively were collected and analyzed.



Variation in wood parameter

Extraction of wood core sample

It appeared that growth and wood traits in teak of this region are controlled by both additive and non-additive gene actions. From the general combining ability estimates, 9 parents were found to possess positive values of GCA for wood specific gravity, which is the single most important trait.

Pinus roxburghii (Chir pine)

For identification of distinct traits for DUS characters development for Conifers, wood samples from five trees from ten populations each of deodar and chir pine were collected by HFRI, Shimla and submitted to Dr. YS Parmar UHF, Nauni, Solan for wood property analysis. Guidelines for DUS traits for conifers were prepared.

Different types of bark pattern in Cedrus deodara

Ailanthus (Ardu)

Identification of the Candidate Plus Trees of *Ailanthus excelsa* has been done in the Cauvery delta zone and southern zone based on growth characteristics. 30 Clones have been assembled in the VMG for mass multiplication.

Neolamarckia cadamba (Kadam)

Selection of Candidate Plus Trees (CPTs) has been done by scoring the selected trees in two plantations of Tamil Nadu (Narasipuram and Devarayapuram) and in natural forest of Kerala, Andamans and Assam. About 118 CPTs have been identified. Four multilocation trials, one each of 1 ha at Gudalur, Nagercoil, Panampally and Neyveli have been established.

Thespesia populnea (Indian Tulip Tree)

Extensive field surveys were undertaken in the Western, North Western, Cauvery Delta, Southern, North Eastern and High Rainfall Zones of Tamil Nadu, Puducherry, Northern and Central Regions of Kerala and selected 128 CPTs of *Thespesia populnea* based on growth and stem form. Selected Plus Trees were propagated clonally and a Clonal Multiplication Area was established at Panampally, Kerala with 82 clones.

Tecomella undulata (Rohida)

Progeny trial was established with 36 families at Dorasar Nursery, Jhunjhunu (Rajasthan). After 1 year of its establishment, progeny of CPT No-36 from Pali district gave the best growth attaining the height of 120 cm and collar diameter of 1.58 cm.

Biotechnology Intervention

Substancial importance is given to the biotechnological approach for tree improvement and conservation of genetic resources. The biotechnology research achievements are summurised below:

- Studies on Genetic mapping and QTL analysis of Eucalypts targeted adventitious rooting properties and wood properties continued. In the current year, phenotyping for adventitious rooting traits was completed in the inter-specific hybrid progenies of *E. tereticornis* X *E. grandis*.
- Genotyping of dihybrids of *E. tereticornis, E. camaldulensis* and *E. grandis* using 300 SSR markers are in progress at IFGTB to generate genetic linkage map. Till date, 100 F1 individuals of *Eucalyptus camaldulensis* x *E. tereticornis* inter-specific hybrids were genotyped using 100 microsatellite markers. Similarly, 100 F1 individuals of *E. tereticornis* x *E. grandis* were genotyped with 100 microsatellite markers.
- Gene mining and transgenic programme is in progress at IFGTB, Coimbatore. Protocols were refined for generation of composite and whole plant transgenics. To study the role of

HKT1 gene in *Eucalyptus*, EcHKT1 gene silencing construct is being used for developing composite transgenic *Eucalyptus*. Additionally, a transformation vector for silencing of *Eucalyptus* HKT1 in whole plant transgenics was developed. PsLecRLK gene construct was also mobilized into a more potent *Agrobacterium tumefaciens* strain, AGL1 and is being used for generation of *Eucalyptus transgenics*.

- Bioinformatic analysis of *L. invasa* whole transcriptome sequence data was completed to identify unique RNAi target regions for 5 genes involved in growth and development of *L. invasa*.
- The antipest property of the mannose-binding lectin (*Ws*MBP1) isolated from *Withania somnifera* was validated in tobacco through ectopic expression of the gene driven by 35s CAMV promoter. The total protein isolated from the transgenic tobacco showed significant antipest activity against the teak defoliator, *Hyblaea puera*.
- Production of transgenic teak tolerant to defoliating pests was carried out.
- An experiment was designed to induce somatic embryo production from teak seedling explants *viz*. internode and leaf. The effect of different concentration of IBA & TDZ and their interaction on callus induction in the teak seedling explants was studied.
- Studies on population structure, linkage disequilibrium and marker-trait association mapping of Indian teak are being carried out.
- Development of DNA based identification system for three important timber species of Karnataka was initiated. Objectives included the development of DNA database for selected timber species of Karnataka, marker gene sequencing and characterization and standardization of protocol of DNA marker.
- Twenty-nine populations of *Q. leucotrichophora* from the states of Uttarakhand and Himachal Pradesh, representing the natural range of distribution were studied by FRI Dehradun and HFRI Shimla for genetic diversity using DNA based markers. Results revealed that majority of the oak forests of Himalayan landscape depicted low level of genetic diversity and revealed that it had undergone considerable genetic changes in response to fragmentation, drift, and/or barriers to gene flow. Most of the diversity in *Q. leucotrichophora* resided within populations than among populations.
- Population genetic analysis of *Dendrocalamus hamiltonii* was initiated at FRI. Sites of natural populations of *D. hamiltonii* were identified in its natural range of distribution for sampling by collecting information through literature and from SFDs of concerned states. Sampling of 11 populations from Mizoram, Nagaland and Assam have been completed.
- Studies on assessment of genetic diversity and structure of *Boswellia serrata* populations through RAPD and ISSR molecular markers have been initiated. Results revealed a high diversity index and fragmented population of the species in M.P. and Chhattisgarh. Wood core samples have been collected from 20 trees of 03 populations of Chhattisgarh viz. Dhamtari, Narayanpur and Surguja and analysed for fibre length. A considerable variation in fibre length was noted which ranged from minimum 919 μm (Dhamtari) to maximum 1010 μm (Surguja).
- Study on salt tolerance through gene expression pattern analysis was conducted at AFRI. The project aimed at analyzing the pattern of expression of four genes (NHX1, SOS1, HKT1 and CLC-c) that are known to function in maintaining ionic balance within the plant particularly in regulating the non-toxic levels of sodium chloride, which is the dominant salt in saline soils.

Micro and macro-propagation

- Vegetative propagation studies in *Myrica esculenta* was conducted. Ten percent of nodal cuttings treated with 400 ppm IBA showed rooting response. Air layering was done on the *M. esculenta* trees and result shows that 4000 ppm of IBA gave better response.
- Refinement and standardization of protocols for in-vitro propagation and genetic fidelity studies of micro propagated plants of two bamboo species of *Bambusa balcooa* and *Thyrsostachys oliveri* carried out. In *Thyrsostachys oliveri*, multiple shoots were more in MS medium fortified with additives, TDZ (0.5-1.0mg/l) and NAA (0.5 mg/l) and 7-9 fold multiplication was observed. In *B. balcooa*, MS liquid medium with additives + NAA (0.1 mg/l) + BAP (1.0 mg/l) proved the best combination for further shoot

multiplication and produced 15.87 shoots from 4-5 shoot clump.

- Biotechnological tools for clonal propagation and supply of genetically superior trees of Neem, Ardu and Bamboo were carried out. In- vitro shoot multiplication in neem was optimized in MS medium supplemented with BAP (1.0 mg/l) + KI (1.0 mg/l) and additives (ascorbic acid, citric acid, adenine sulphate, ammonium sulphate and amino acids). In Bamboo, *in- vitro* shoot multiplication was optimized using MS medium supplemented with BAP (3-5.0 mg/l). In Ardu, *in- vitro* shoot multiplication was achieved in MS medium supplemented with BAP (2.0 mg/l) + IAA (0.5 mg/l) and additives. In neem, *in- vitro* rooting was achieved in MS medium supplemented with IBA (1.0 mg/l) + additives. In case of bamboo, 3 mg/l NAA or 10.0 mg/l IBA was used for *in- vitro* rooting.
- *In- vitro* propagation of *Vanda coerulea*, tissue culture protocol was standardized to produce seedling using green pod culture technique. These seedlings are being hardened in mist chamber and cent percent survival is recorded during hardening phase.

An aseptically grown Vanda coerulea

Well established Vanda coerulea cultures

- Development of technologies for multiplication of economically important desert plants *Capparis decidua* and *Salvadora persica* is in progress.
- Hydroponic rooting technique of *Eucalyptus* was tested on *Eucalyptus* hybrids clones at IFGTB, Coimbatore. Maximum rooting of 95% was observed in one hybrid clone cuttings treated with IBA- 100 ppm (10 minutes).

Conservation of Forest Genetic Resources

- Both conventional and biotechnological approaches are being followed in the Council for conservation of valuable resoureces. The activities related to conservation efforts are summarized below:-
- Germplasm bank of *Grewia optiva* and *Quercus leucotrichophora* was established using collections from Himanchal Pradesh, Uttarakhand and Jammu & Kashmir. 117 plus trees of *Grewia optiva* and 80 plus trees of *Quercus leucotrichophora* were identified from above three states. Germplasm bank for *Grewia optiva* was established in 2.0 ha area at Dudhli, Lachhiwala range, Dehradun Forest Division and *Quercus leucotrichophora* in 1.50 ha area germplasm at Magra, Jaunpur Range, Mussoorie Forest Division.
- For conservation of *Pterocarpus marsupium*, germplasm collection has been done from nine localities corresponding to three agro-climatic zones of Chhattisgarh. On the basis of availability, 20 trees have been marked in each locality as superior trees based on phenotypic characters.
- A total of 22 teak populations showing distinct and desirable characteristics like outstanding growth characteristics, good tree form with cylindrical bole and less branching pattern were selected for *in-situ* and *ex-situ* conservation.

Teak population selected for conservation at Nilambur, Kerala

- Work is in progress on conservation of critically endangered *Litsea glutinosa* germplasm from Madhya Pradesh and Chhattisgarh. Planting materials were collected from Dhamtari, Kondagaon, Seoni (South), Bhanupratapur, Jabalpur, Jagdalpur, Rewa, Marwahi, Satna and Anuppur Forest Divisions. Detailed morphometric data were recorded for the mother tree. Nursery was also raised.

Marking and recording of data of Litsea glutinosa tree in Amarkantak Forest Division

Fruits of Litsea glutinosa tree collected during field visit

- Plantations of *Morinda citrifolia* were raised successfully at RFRI, Jorhat; ARCBR, Aizawl and Panchakarma Unit of Forest Dept, Tripura. Planting stock brought from Central Plantation Crop Research Institute, Kerala, and Noni seeds procured from Hyderabad. Standardized the propagation techniques of *M. citrifolia* through seed and stem cuttings.
- Collection of germplasm of *Madhuca indica* for identification of best sources in Chhattisgarh through phytochemical evaluation was carried out. Mahua trees were selected from five girth classes, viz., 61-90 cm, 91-120 cm, 121-150 cm, 151-180 cm and over 181 cm. The maximum oil content (%) was obtained in girth class 61-90 cm. Minimum amount of saponin was obtained in seeds collected from trees of girth class above 180 cm.

ICFRE endeavors to promote forestry education in the country by providing grant-in-aid to the forestry teaching universities and up-gradation of skills of the scientists working in ICFRE and its institutes by permitting them for participating in the national/international seminars, workshops and symposia etc.

Improving Formal Forestry Education 6.1

Networking project of Non-Timber Forest Produce is under implementation involving 09 Universities with the following objectives:

i) Availability and source of quality planting material, regeneration techniques, qualitative and quantitative potential and research gaps.

ii) Examination of the value addition chain and scope of improvements, available good practices, available R&D inputs and innovations in the area and elsewhere.

iii) Examining the working techniques of each selected NTFP, the department prescriptions and establishing parameters and protocols for sustainable harvest levels, to be used by the departments.

iv) To further examine the role of forest department in the changed context of FRA, as also with reference to the local innovations, to promote benefit to the local communities.

In order to provide excellence in academic inputs, two chairs of Excellence in Ecology and Biodiversity and Forest Climate Change were engaged in FRI, Dehradun. Online entrance exam for M.Sc. courses was started. The syllabus for all courses was also revised.

Forestry Education and Policy Research to Meet Emerging Challenges

FRI University 6.1.1

The FRI (Deemed) University has been offering academic courses on a regular basis i.e. two years M.Sc. courses in Forestry, Environment Management, Wood Science & Technology and Cellulose & Paper Technology and one year course in Post-Graduation Diploma in Aroma Technology.

Besides delivering lectures, scientists and officers have also guided many students in dissertation, divisional attachment and term paper works.

During the current year, 20 research scholars were registered for Ph.D. and a total 34 Ph.D. degrees were awarded. Placement Brochures & student's profiles were prepared for all M.Sc. courses. 17 industries/ organizations visited the university for campus interview and 26 students were selected. 10 students from SAARC have joined for various M.Sc. courses.

HFRI, Shimla 6.1.2

A Memorandum of Understanding (MoU) was signed between HFRI, Shimla and Dr. Y S Parmar UHF, Nauni, Solan (HP) on 24 May 2014 to carry out the research work of Ph.D. Scholars through collaborative research efforts / guiding of research scholar as co-supervisors in either case at their respective organizations for the award of Ph.D. Degrees by FRI (DU), Dehradun or UHF, Nauni, Solan.

Accreditation of Universities 6.2

ICFRE, Dehradun

Process of re-accreditation of 18 Universities accredited with ICFRE earlier and accreditation of some new universities have been initiated.

During 2014-15, 14 proposals from the Universities for Accreditation/Re-Accreditation have been received from the Universities and the evaluation teams have been constituted to visit the Universities for evaluation of the courses running in the Universities.

Out of the above, 14 proposals received from the Universities, the evaluation team has visited 05 universities during 2014-15 for evaluation of forestry courses.

06

Networking Forestry Education with research and extension

6.3

The following mandate was targeted to achieve prior to NTFP Project which is under process:

- Creating infrastructure for Universities for imparting impetus to forestry education matching international standards for forestry education.
- Providing access to international level teaching and learning resources, including books and journals through e-consortium and information system.
- Providing well laid IT-enabled environment for academic excellence.
- Development of a very clear road-map for each University for the purpose of future growth in terms of institutional management, financial resource allocation and utilization, physical infrastructure, faculty and staff, students affairs profile, course delivery, co-curricular and related activities, research and development.
- Fostering international cooperation in the field of forestry education through networking, faculty and students exchange to bring international wisdom.
- Policy Research Support to the MoEF&CC by hosting the policy research committee at ICFRE to review and analyze the existing forest policies, statutes and their framework.

Participation in Seminars/ Symposia/Workshops/Trainings

6.3.1

About 183 scientists, officers and officials participated in different seminars/ symposia/workshops/conferences/trainings/ meetings organized by different organizations in variety of subjects including Foundation Training Programme; Administration and Research Management; Climate Change and Carbon Mitigation; Climate Change Vulnerabilities and Adaptation Strategies; Managing Technology Value Chains; Science for Progress in India: Innovations in Technologies; National consultation on inter-sectoral strategy for management of medicinal plants; Indian Science Congress; Participatory Biodiversity Monitoring and Ecosystem Services in the Context of Climate Change; 122nd Meeting of the Board of Governors, IPIRTI; Biodiversity Conservation with special reference to Aquatic, Coastal and Marine Biodiversity; 90th Meeting of the Board of Governors, IIFM; National Seminar on Holistic Development of Agroforestry : Potential and Policy Issues; Round table Meetings of the Asia-Europe Meeting (ASEM)/East Asia Summit (EAS) countries; National Seminar on Sustainable Livelihoods Development through Non-Timber Forest Products: Issues, Challenges and way Forward; Technical Advisory Group Meet: Rainfed Programme; National Workshop on Importance of Traditional Medicines in Health Care Management; E-Learning Methods and Instruments; National Workshop on Forestry Research with Special Emphasis on Natural Forest Management Plantation Development, Agro Forestry, Eco-System Service and Prioritization of Research Themes; Workshop on the theme of The Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006: A Revisit; *Chintan Shivir* for North & Central Zone at IIFM, Bhopal; training course on DNA Barcoding; 3rd International Conference on Natural Resources Management for Food Security and Rural Livelihoods; Expert Group Meeting on benefits of REDD Programme for the SAARC Region; 9th Uttarakhand State Science & Technology Congress (USSTC); Hill Bamboos an Important Resource for Improving Rural Livelihood; 13th Silviculture Conference; Tropical Ecology Congress on Tropical Ecosystems in a Changing World; International Symposium on Transforming Mountain Forestry; Strategic Environmental Assessment (SEA); Research Writing; Inception workshop of Forest Plus; awareness programme on HIV; ICIMOD-GIZ-ICFRE REDD^{+} Planning Workshop REDD^{+} Himalayas: Developing and using experience in implementing REDD in the Himalayas;

NATCOM for preparation of bi-annual update report to UNFCCC; National Stakeholders Meet on 'Trees Outside Forests and Wood-Based Enterprise'; Gender Budgeting; Chem Bio Innovations for Bioproducts; 29th Carbohydrate conference; Sustainable Management of Medicinal Plants and NTFPs; Desert Science-Challenges and Opportunities, New Developments in Drug Discovery from Natural Products and Traditional Medicines' DDNPTM-2014; Recent Trends in Bioinformatics & It's Application in Modern Biotechnology; mass and NMR applications; Application of Mass Spectrometry for Proteomics; Current Trends in Biological Sciences: Advances and Challenges; 2014 IUFRO World Congress; Ethnopharmacology and Drug discovery; Environment Statistics; Agro-forestry for Bio-fuels and Bioenergy; Holistic Development of Agroforestry: Potential and Policy Issues; IIRS User Interaction Meet; Application of Remote Sensing and GIS for natural resources; Asia Flux training and seminar on tropical ecosystem monitoring; 14th Off – campus outreach certificate programme on Remotes Sensing and Geographical Information System for Natural Resources; 3rd International Conference on Recent trends in Computing (ICRTC) 2015; Wood is Good: current trends and future prospects in wood utilization; 7th International Colloquium of Eucalyptus pulp; 2nd International Conference on Emerging trends in Agriculture, Horticulture and environment Engineering; ISTS-IUFRO Conference on Sustainable Resource Management for Climate change mitigation and social security; Recent advances on Bamboo Research and Development in India; Hill Bamboo- An Important Resource for Improving Rural Livelihood; Role of Technology in Enhancing Bamboo use; Advances of Material Science in Physics; National seminar on Ethnobotany; Green Revolution for Sustainable Development; Advances, perspective and challenges in chemical sciences (CHEMCON 2015); Role of Land Use/Land Cover Mapping in Sustainable Resource Management; Applications of Mass and NMR Techniques in Drug Research; Holistic Development of Agroforestry: Potential and Policy Issues; CARBO – XXIX on Carbohydrates: Chem Bio Innovations for Bioproducts Organized by Centre of Innovative & Applied Bioprocessing (CIAB); Tree Volume and Biomass Allometric equations in South Asia; Agricultural Genomics Symposium; New Frontiers in Agricultural Biotechnology; Bioinformatics & Biopharmaceuticals; Bio-energy, Environment and Sustainable technologies; Bamboos-its Importance, Utilization and Conservation; Challenges and Innovative approaches in crop improvement; Biocatalysts for fuels and chemicals from biomass; 36th Scientific advisory committee meeting by Sri Avinashilingam kendra at Krishi vigyan Kendra, Vivekandapuram; National Conference on Medicinal Plants; Alien Species Removal and Reclamation of Sholas and Grasslands, funded by Environment Protection and Renewable Energy Development (EPRED); Plant Metabolomics; Innovative Approaches in Biological Sciences towards Sustainable Development; Biology and Application Potentials of Fungi; Techniques in Mycorrhizal Fungi; Microbial Bio-fertilizer Technology; Boosting of Guar Gum Exports: Technical Needs and Requirements and the Way Forward; Molecular Pharmacology, Drug Discovery and Nanopharmaceuticals (MPDDNP-2015); Medicinal Plants and Herbal Drugs for Human Welfare (ICMP-2015); Innovative Approaches in Bioscience; Mycological Research – Emerging Trends, Applications and Prospects; Trends and Techniques in Tree Green initiatives in Energy and Environment; Biosecurity issues in relation to insects and quarantine and celebration on classical biological control of eucalyptus gall wasp; Training scientific findings to farming communities in southern districts and training farm technocrats and turning agriculture into viable enterprise; New Safer Molecules and Biocontrol Technologies for Integrated Pest Management in Crops; Green Living for Sustainable Development; Trends in Plant Systematic; Long-term Monitoring of Forest Ecosystem Dynamics; Bamboo Fest- 2014; Desert Science opportunities and challenges; Elevation in Science; Working Plan preparation using Remote Sensing and GIS Technology; Automotive Weathering Technology Symposium; Achieving sustainable development; Conservation of Wood and Wooden Artifacts; Role of Technology in Enhancing Bamboo Use; Green Urban Futures; consultative UNCCD workshop; Comprehensive Protection Conservation and Management of Environment (CPCME-2015); Statistical Methods for behavioral research; Modern Scientific Techniques for Indian Systems of Medicine & Natural Products Development; Women Empowerment; Urbanization and its Impacts on Environment; Contribution of life science in socio-economic development of mankind; Environmental Conservation Challenges and Remedies; Role of Scientists in Environment & Natural Resources Management; Sal borer mortality; Effect of forests on water resource management in the catchment area of West Mandla Forest Division; Strengthening of network for outreach of research findings; Biodiversity Act 2002, India; Environmental impacts of Diamond Mine Project, Majhgawan,

Panna; Entomology as a Science and IPM as a Technology – The way forward; Recent Trends in thurst area of Life Sciences; Harnessing the sub-Himalayan Plant Diversity for Human Welfare; ICFRE Extension workshop; Strengthening Network for Outreach of research Findings; Biotechnology & Molecular Biology; Developing Bamboo based livelihood and Enterprise Opportunities; National Stakeholders Meet on Forestry and Mining: Forest Mining; Interface in Service of Nation; Desert Science-Opportunities and Challenges; Conservation of Great Indian Bustard; Changing scenario of pest problems in agri-horti ecosystem and their management; Biodiversity: harmonizing conservation with life and landscape of arid and semi-arid area; Alignment of national Action Programme on Combating Desertification; Conservation and Management of Pollinators for Sustainable Agriculture through an Eco-system Approach; Panel of Environment & Social Experts at Directorate of Energy, Govt. of HP, Shimla; SFD funded NMPB – Conservation Project, at Karnodi, Sundernagar, Mandi; National media on Climate Change and Development in the Indian Himalayan Region; Nakthan HEP for EIA and EMP studies at State Pollution Control, Shimla; Contemporary importance of intercropping of medicinal and aromatic plants; National Mission on Himalayan Studies; 35th PSC Meeting of National Medicinal Plant Board (NMPB), New Delhi; Conservation Assessment and Management Prioritization (CAMP); Transforming Mountain Forestry; To Showcase the Findings of Forestry Research Institutions; CEIA study of Chenab basin; Medicinal Plants and Health Expo; CEIA study of Ravi Basin; 17th Project Evaluation Committee (PEC);SEAC for environment clearance of Surgani Sundla HEP; Release of Block level soil fertility map of four district of Jharkhand namely Dumka, Jamtara, Ramgarh and Hazaribag; Marketing of non-wood forest produce; Importance of the Traditional Medicines in Health Care Management; Research Advisory Committee (RAC) of CTRTI; Cluster Development in Jharkhand (Fresh Vegetables/IQF/Organic); VIII International Conference on Mushroom Biology and Mushroom Products; XXIII Annual Conference of the Indian Council of Chemists; National Entomologists Meet; Reversing Environmental Degradation and Rural Poverty through Adaptation to Climate Change in Drought Stricken Areas in Southern India: A Hydrological Unit Pilot Project Approach; bee keeping;Triple Bottom Line Multi-Criteria Analysis Methodology for Protected Area; Access Benefit Sharing Expert Committee; New Frontiers in Medicinal Plants Research (NCMP-2015); Cultivation of Medicinal Plants in Agroforestry;

Plant distribution during Camp Workshop at Nichar, Kinnaur district of Himachal Pradesh

Sustainable agroforestry models for Andhra Pradesh and Standardization and quality control of herbal raw drugs, besides these the scientists/officers of ICFRE and its institutes acted as resource person and delivered talks on various aspects of forestry.

Camp Workshop at Nichar, Kinnaur district of Himachal Pradesh

Visits Abroad 6.3.2

1. Dr. P.P. Bhojvaid, Director, FRI, Dehradun, attended training on Arts and Humanities Research Council on 14 and 15 May, 2014 at U.K.
2. Sh. Saibal Dasgupta, DDG (Extension), ICFRE, Dehradun and Dr. T. P. Singh, ADG (F&CC), ICFRE, Dehradun attended training session on National Reporting to the UNCCD from 7 to 9 May, 2014 at Korea.
3. Shri V.R.S. Rawat, Scientist 'E', ICFRE, participated in the UNFCCC forty sessions of the Subsidiary Body for Implementation and the Subsidiary Body for Scientific and Technological Advice as well as in the session of the Ad Hoc Working Group on the Durban Platform for Enhanced Action in

Bonn, Germany from 4 to 15 June 2014 as a member of the Government of India delegation.

4. Dr. H.S.Ginwal, Scientist F, FRI, Dehradun attended IUFRO sponsored conference on (1) 5-Needle Pine Genetics and Conservation, (2) Rusts of Forest Trees and (3) Strobusphere at Ft. Collins, Colorado, U.S.A. from 15 to 20 June 2014 and presented a paper titled "Cross species transferability of microsatellites, and genetic diversity in Himalayan five needle pine (*Pinus wallichiana* A.B. Jacks) and Chir pine (*P. roxburghii* Sarg.) Forests".

5. Sh. M.P. Singh, Head, Climate Change, FRI, Dehradun attended planning and exchange programme in forest science from 09 to16 June, 2014 at Sweden.

6. Dr. P.P. Bhojvaid, Director, FRI, Dehradun, visited Sweden from 11 to 23 August, 2014 under MCT Training of IFS officers.

7. Sh. M.P. Singh, Head, CC&FI Div., Dr. R.K. Aima, Head, Silviculture Div., FRI, Dehradun visited Sweden from 18 to 25 August, 2014 for planning application for teachers and students exchange involving SLU and FRI, Dehradun.

8. Dr. R. Yasodha, Scientist-F, IFGTB, Dr. Kannan C.S. Warrier, Scientist-E, Dr. Maheshwar T. Hegde, Scientist-E, Dr. R. Anandalaksmi, Scientist-E, Dr. A. C. Surya Prabha, Scientist-E, IFGTB, Coimbatore, Dr. H.S.Ginwal, Scientist F, and Shri R.K. Meena, Scientist C, FRI, Dehradun, Dr. Rajesh Sharma, Scientist-F, HFRI, visited USA from 2 to 12, September, 2014 for the Study Tour on Tree crop improvement under the sustainable landscapes and adaptation programme.

9. Dr. Renu Singh, ADG (Edu &PR), ICFRE, Dehradun attended training course on Remote Sensing of Forest Resources (B) from 3 September to 22 October, 2014 at Japan.

10. Dr. Rekha R.Warrier, Scientist-D, IFGTB, Coimbatore attended Regional Workshop to support the implementation of the global plan of action on forest genetic resources from 17 to 19 September, 2014 at Malaysia.

11. Dr. R.K. Borah, Scientist-E, RFRI, Jorhat attended International Conference on Forests, Soil and Rural Livelihood in a Changing Climate from 27 to 30 September, 2014 at Nepal.

12. Dr. V.P. Tewari, Director, HFRI, Shimla, Dr. H.S. Ginwal, Scientist-F, FRI, Dehradun, Dr. Manisha Thapliyal, Scientist-E, FRI, Dehradun, Dr. Meena Bakshi, Scientist-D, FRI, Dehradun, Dr. Anita Tomar, Scientist-C, CSFER, Allahabad, Dr. R. Sundararaj, Scientist-G, IWST, Bangalore, Dr. B.N. Diwakar, Scientist-D, IWST, Bangalore, Dr. R. Yashodha, Scientist-F, IFGTB, Coimbatore, Dr. Modhumita Dasgupta, Scientist-E, IFGTB, Coimbatore, attended IUFRO Congress from 05 to 11 October 2014 at USA.

13. Dr. T.P. Singh, ADG (BCC), ICFRE, Dehradun attended REDD^{+} Planning Workshop-Inception meeting from 20-30 October 2014 at Bhutan.

14. Dr. Ashwani Kumar, Director General, ICFRE, Dehradun attended Ex. Committee and Conference on Mangroves from 10 to 13 November 2014 at Malaysia.

15. Dr. M.R.G. Reddy, Director, IFB and Dr. T.P. Singh, ADG (BCC), ICFRE, Dehradun attended Regional Training on Triple Bottom Line Multi-criteria analysis from 16 to 21 November, 2014 at Thailand.

16. Dr. Hukum Singh, RO, FRI, Dehradun attended Asia Flux Seminar and Training from 01 to 05 December, 2014 at Vietnam.

17. Sh. V.R.S. Rawat, Scientist-E, BCC, ICFRE participated in the 20th Session of Conference of Parties (COP-20) from 01 to 12 December, 2014 at Peru.

18. Sh. Saibal Dasgupta, DDG (Extn.), ICFRE, Dehradun visited USA from 02-11 December 2014 for the study tour on Valuation of Ecosystem Services.

19. Dr. B.Gurudev Singh, IFGTB, Coimbatore, Dr. A. Nicodemus IFGTB, Coimbatore and Dr. V. Sivakumar IFGTB, Coimbatore, visited Thailand from 17 to 27 January, 2015 for holding meeting under USAID Project.

20. Dr. B. Deepa, PDF, IWST, Bengaluru attended the workshop on Biopest control on 28 and 29 January, 2015, in Chiang mai, Thailand, organized by Echo Asia Impact Centre, Thailand.

21. Dr. V. P. Tewari, Director HFRI, Shimla, visited George August University, Germany from 01 to 15 February 2015 for preparing research proposal.

Capacity Building of Scientific and Management Cadre (Trainings Organized)

6.4

The various training programmes on different subjects i.e. Climate Change Module of Mid Carrier Training Programme (Phase III) for IFS Officers; Climate Change and Carbon Mitigation; Climate Change Vulnerability and Adaptation Strategies; Community based natural resource management; Raising, managing and marketing of bamboo; Forest, Wildlife and Environmental conservation; Agroforestry and land management; Development of Agroforestry models with special reference to *Melia*, Aonla and Medicinal plants; Silviculture/Forestry;Forestry in Disaster Management; Forestry in Landslide Risks Management; Forest Fire Mitigation & Management; Conservation and Management of Coastal Ecosystem; Forestry as Livelihood in Climate Change Adaptation; Essential Oils, Perfumery & Aromatherapy; value addition of oyster mushroom by preparing pickles and other products; Application of Biofertilizers in Forestry; National Working Plan Code 2014; Application of Remote Sensing and GIS for natural resources; Promoting Non- Wood Forest Products (NWFP) and Forest Invasive Species (FIS) for livelihood support to Rural women of Uttarakhand; Awareness Programme on Wood Processing and Wood Working Machines; Preparation of Bamboo Handicrafts for farmers/ artisans of Himachal Pradesh; Preparation of Bamboo Handicraft for Artisans, Farmers and Self Help Group of Himachal Pradesh and Punjab; Wood Science & Technology; गैर–वन लकड़ी उत्पाद वनस्पति प्रजातियों एवं लैन्टाना व इपिटोरियमः आक्रामक प्रजातियों का ग्रामीण महिलाओं की जीविका उपार्जन के लिए उपयोग्य, various aspects of growing planting stock of NTFP; Research Writing; Establishment and Management of Seed Orchards; Sensitization course in forest, wildlife and environmental conservation; plant taxonomy; Biodiversity Act, 2002 ; Bamboo Growers & Entrepreneurs Meet, 2014 (BGEM-2014); Bamboo-its Importance, Utilization and Conservation; IT training ; HPLC, Methods of chemical analysis; Training –cum-Demonstration on Bio-fertilizer Production and Application in Nursery and Field; Role of medicinal plants and other forest products in livelihood enhancement of tribals for Nilgiri district; Techniques in Ectomycorrhizal Fungi-Importance, Isolation and Identification, Pure culture production, maintenance and application methods; Lac Cultivation and Bamboo Charcoal making and its Briquetting for livelihood support;

Participants with faculty of Training on Raising, managing and marketing of bamboo, FRI, Dehradun

Training for growing of planting stock of NTFP species, FRI, Dehradun

Various aspects of Forest and Forestry; Field Functionaries Training on Bamboo Propagation and Management; Bamboo Propagation, Nursery Management & bamboo preservation techniques; Training- cum-workshop on Bamboos Handicraft; Bamboo cultivation, propagation, management and different product development; Training –cum- workshop on Bamboos Ornaments; Field demonstration on propagation of Bamboo; Tissue Culture techniques of Bamboo and Micro propagation; Cultivation of Medicinal Plants; Cultivation of Atish, Ban Kakri, Chora and other High Valued Temperate Medicinal Plants; Eco-restoration of Wastelands and Cultivation of High Valued Temperate Medicinal Plants; Production, Management and Marketing of Bamboo were organized by ICFRE's institutes.

Summary of trainings organized by the ICFRE are given below:

Sl.No.	Institute/Hq.	No. of Trainings
1.	ICFRE, Dehradun	3
2.	Forest Research Institute, Dehradun	27
3.	Institute of Forest Genetics & Tree Breeding, Coimbatore	10
4.	Institute of Wood Science & Technology, Bengaluru	8
5.	Tropical Forest Research Institute, Jabalpur	15
6.	Arid Forest Research Institute, Jodhpur	1
7.	Himalayan Forest Research Institute, Shimla	7
8.	Rain Forest Research Institute, Jorhat	33
	Total	**104**

Glimpses of training organized by ICFRE Institutes

The Council endeavours to transfer simple implementable technologies to the intended target groups, especially State Forest Departments and farmers. It also engages in development and dissemination of forestry extension programmes. It coordinates various extension activities of ICFRE institutes and Centres. It also provides consultancy/technical services in the field of forestry, environment and allied sciences as well as environment impact assessment, environment management plan and other related areas. The Council is committed to disseminate its research outputs to the stakeholders through various schemes, such as, Van Vigyan Kendras, Demo Villages, Networking of Van Vigyan Kendras with Krishi Vigyan Kendras, through organizing and participating in various extension activities and by means of quality publications.

Collection, Compilation and Publication of Forestry Reports/Journals 7.1

Research Publications 7.1.1

Books and newsletters were published by ICFRE headquarter during the year are:

- Annual Report of ICFRE for the year 2013-14.
- Bi-annuals ICFRE Newsletter and *Vaniki Samachar.*
- Book on "Sustainable Land and Ecosystem Management: Some Best Practices from India".
- Book on "Monitoring and Evaluation Indicators Framework for UNCCD-Desertification, Land degradation and Drought".

Forestry Extension for Taking Research to People

- "SLEM Baseline Report- Issues, Challenges and its Prospects in Sustainable Land and Ecosystem Management".
- Book on "Elucidation of the Fifth National Report Submitted to UNCCD Secretariat".
- Two issues of "ICFRE Climate News" were prepared and uploaded in ICFRE website.
- Proceedings of the Seminar on the occasion of the World Day to Combat Desertification (17 June 2014) on the theme "Land Belongs to the Future, Let's Climate Proof It".
- Proceedings of the National Seminar "Bamboo Productivity in Forest and Non-Forest Areas" under BTSG-ICFRE (National Bamboo Mission) was published for distribution.

Ministry of Environment, Forests and Climate Change, Government of India released the "Reference Document for REDD-plus in India" in December 2014. Dr. T.P. Singh, ADG (BCC), ICFRE and Sh. V.R.S. Rawat, Scientist-E, BCC Division, ICFRE contributed as a member of the Expert Committee for preparation of this document.

Documentary film on Sustainable Land and Ecosystem Management (SLEM) issues under the "Policy and Institutional Reform for Mainstreaming and Up-scaling Sustainable Land and Eco-system Management in India Project" was prepared. The main objective of this film was to highlight the SLEM approach and create awareness with respect to SLEM best practices. The film was released by Shri Prakash Javadekar, Hon'ble Minister of State (Independent Charge) of the Ministry of Environment, Forests and Climate Change, Government of India on the occasion of World Day to Combat Desertification on 17 June 2014 at New Delhi.

A total of 313 research articles were published by ICFRE institutes in scientific journals of national and international repute and in the books during the year as per the following details:

S. No.	Name of the Institute	Number of research articles published in scientific journals and books/proceedings		
		National Journal	Foreign Journal	Book Chapter/in Proceedings
1	FRI, Dehradun	83	41	07
2	IWST, Bengaluru	23	22	04
3	IFGTB, Coimbatore	21	21	03
4	AFRI, Jodhpur	08	12	07
5	TFRI, Jabalpur	07	03	04
6	RFRI, Jorhat	14	10	03
7	HFRI, Shimla	14	04	01
8	IFB, Hyderabad	-	1	-
	Total	**170**	**114**	**29**

A total of 50 research articles were presented in seminars/conferences/ workshops and 87 abstracts and 25 popular articles were also published by ICFRE institutes during the year as per the following details:

S. No.	Name of the Institute	Number of articles presented in seminar/conferences/ workshops and abstracts & popular articles published		
		Article presented	Abstract published	Popular article
1	IFGTB, Coimbatore	-	1	1
2	FRI, Dehradun	-	12	8
3	IWST, Bengaluru	36	4	-
4	RFRI, Jorhat	-	40	3
5	TFRI, Jabalpur	8	3	3
6	AFRI, Jodhpur	-	12	9
7	HFRI, Shimla	6	11	1
8	IFB, Hyderabad	-	4	-
	Total	**50**	**87**	**25**

A total of 9 books and 7 booklets, brochures/pamphlets were published by the ICFRE institutes during the year as per the following details:

S. No.	Name of the Institute	Number of books and booklet, brochures/pamphlets published	
		Books	Booklets/Brochures/ Bulletins/ Pamphlets
1	TFRI, Jabalpur	5	-
2	FRI, Dehradun	3	1
3	RFRI, Jorhat	1	1
4	HFRI, Shimla	-	5
	Total	**9**	**7**

National Forest Library and Information Centre 7.1.2

National Forest Library and Information Centre (NFLIC) is the richest in document collection on forestry and allied sciences in South and South-east Asia. The NFLIC has been providing all types of library and information services, viz. reference, referral, lending, reprography, current awareness, inter-library loan, retrieval of information from the machine readable database etc. to its users. During the year, 25,958 books were loaned to the users for outside reading. Besides, 53,657 documents were consulted in the library.

The document collection of the NFLIC was enriched by the addition of 4,232 books and other documents, out of which, 301 books were purchased at a cost of Rs. 8.00 Lakh. The NFLIC subscribed 63 Indian periodicals. It also received 596 issues of the periodicals as gratis. A bibliographical database on forest science was also subscribed for providing access to old as well as latest research articles on forestry to all institutes and centres of ICFRE.

The NFLIC has been selling ICFRE publications through its Book Depot. During the year, 321 books and 13 VCDs were sold to the state forest departments, universities etc. and a revenue of Rs.115,733/- was generated.

Environmental Information System Centres 7.1.3

The Ministry of Environment, Forests and Climate Change, Government of India established Environmental Information System (ENVIS) Centre on Forestry at NFLIC, FRI, Dehradun. The ENVIS Centre enriched the following five databases by the addition of new references: Indian Forestry Abstracts, Participatory Forests Management, *Prosopis juliflora*, Poplars, Environment and Forest (in Press). Besides, two books entitled "Bamboos in India" and "Poplars in India" have been edited which are under publication. Six issues of *Environment and Forests News Digest* were also compiled during the year.

The Ministry of Environment, Forests and Climate Change, Government of India established Environmental Information System (ENVIS) Centre on "Forests Genetic Resources and Tree Improvement" at IFGTB, Coimbatore. Information on the thematic subject area was uploaded in the website on a regular basis. It can be accessed from www.envisindia.in/ifgtb. The ENVIS centre has brought out two issues of the Newsletter *Van Vigyan* (ISSN-2394-7543). Apart from these, a booklet on Environmental Awareness Quiz for the school children and a poster on Tree Improvement have also been released during the third month of its operation. IFGTB organized the Evaluation Workshop of the Southern Regional ENVIS Centres at Coimbatore on 5-6 February 2015 as per the instructions of the Ministry of Environment, Forest and Climate Change, Government of India.

Dissemination of Developed Technologies 7.2

Van Vigyan Kendras (VVKs) and Demo Villages (DVs) 7.2.1

- FRI, Dehradun conducted one day training programme on "Monitoring and evaluation of health of urban trees and plantation" for officers/ field staffs of Municipal corporation, Horticulture Department and Chandigarh Forest Department at Van Vigyan Kendra, Chandigarh on 9 August 2014.
- FRI, Dehradun conducted a training programme on "Management of disease and insect-pest of agroforestry species" under VVK and KVK networking on 13 February 2015 at Damla, Yamunanagar.
- IFGTB, Coimbatore had provided irrigation

Training programmes on Monitoring and Evaluation of health of Urban trees and plantation at VVK, Chandigarh

facility through digging the bore-well to the tribal people for adoption of tree-based farming in the Kandiyur demo village. Planting stocks of different tree species was raised in the nursery and distributed to the tribal community for plantation.

- IFP, Ranchi had signed a memorandum of understanding with the State Forest Department, Jharkhand on 29 December 2014 for establishment of a Van Vigyan Kendra at Forest Training Institute, Mahilong, Ranchi.

Training programme on Management of disease and insect-pest of agroforestry species at Damla, Yamunanagar

- IWST, Bengaluru organized a training programme on “Sandalwood cultivation” at Krishi Vigyan Kendra, ICAR Research Complex, Old Goa on 14 October 2014, at K.H. Patil Krishi Vigyan Kendra, Hulkoti, Dharwad on 16 October 2014 and at Krishi Vigyan Kendra, Uttar Kannada, Sirsi on 28 October 2014 under VVK and KVK networking.
- TFRI, Jabalpur organized following training programmes in Van Vigyan Kendra of Chhattisgarh, Madhya Pradesh and (Maharashtra) for the frontline staffs of State Forest Departments, Vandoots, Non-Governmental Organisations, Self Help Groups and farmers:
  - Training programme on "वन रोपणियों तथा वृक्षारोपणों के कीटों तथा रोगो का समन्वित प्रबंधन" at Raipur on 26 May 2014, at Jabalpur (Madhya Pradesh) on 27 August 2014 and at Jalana (Maharashtra) on 08 December 2014,
  - Training programme on "उन्नत नर्सरी तकनिकी एवं कृषि वानिकी पर प्रशिक्षण" at Raipur on 26 May 2014,
  - Workshop-cum-training programme on “Strengthening network for outreach of research findings of ICFRE and its institutes” at Bilaspur (Chhattisgarh) from 28 to 29 May 2014, at Jabalpur on 17 October and 30 October 2014 and at Jalana (Maharashtra) on 9-10 October 2014,
  - Training programme on "मध्य क्षेत्र हेतु उपयुक्त कृषि वानिकी पद्धतियाँ एवं उनका प्रबंधन" at Jabalpur (Madhya Pradesh) on 18 September 2014,
  - One day training programme on "उच्च गुणवत्ता के पौध उत्पादन हेतु उन्नत नर्सरी तकनीकी एवं बीजों का चयन तथा भंडारण" at Jabalpur (Madhya Pradesh) on 29 September 2014,
  - Training programme on "उन्नत नर्सरी, बीज प्रौद्योगिकी, वृक्ष सुधार तकनिक एवं कृषि वानिकी " on 07 December 2014 at Jalana (Maharashtra).
- In the Demo village at Moyia Nala demonstration trials on "Relative resistance in some Teak clones against defoliator and skeletonizer and use of biofertilizer (VAM and *Azospirillium*) in forestry tree species" were maintained by TFRI, Jabalpur.
- AFRI, Jodhpur had maintained the hi-tech nursery and demonstration trials at Demo village, Salawas. Seedlings of different tree species were provided to the farmers for promoting agroforestry practices.
- RFRI, Jorhat had organized a training programme on "Propagation and multiplication of common bamboo species" at VVK, Aizawl, Mizoram on 13 January 2015.
- RFRI, Jorhat had raised the planting stocks of *Areca* nut (*Areca catechu*), Agar (*Aquilaria malaccensis*), Jaluk (*Piper nigram*), Moha neem (*Azadirachta indica*); Piper (*Piper betle*) etc. at Demo village, Melang Grant a hamlet

Inspection of Nagbani Nursery, Jammu

of three villages in fringe of Hollangapara Gibbon Wildlife Sanctuary and planting stocks distributed to the interested farmers for plantation under agro-forestry. The best quality seeds were also supplied to the interested farmers of Demo village.

- HFRI, Shimla had carried out renovation works in the office building of VVK, Janipur. Fencing, water drainage system and irrigation facilities have been established in the Research Nursery, Nagbani (Jammu). Planting stocks (4120 plants) of *Populus deltoides* were provided to the local farmers. Planting stocks of *Populus deltoides* have been raised in the nursery.

Discussion with the officers of SFRI, Jammu regarding VVK activities

- Demonstration trials at Demo Village, Lana-Baka, District Sirmour, Himachal Pradesh were maintained by HFRI, Shimla.

Direct to Consumer Scheme

7.2.2

Direct to Consumer Scheme was launched in July 2011 as a novel extension strategy to bring the technological advancements made through research breakthroughs in ICFRE at the doorstep of end-user without loss of time. This scheme is introduced to increase the outreach of research findings and linking the livelihoods of people with forestry. Besides, State Forest Departments, farmers, industries and rural communities are expected to benefit from the Scheme.

FRI, Dehradun had conducted following activities under Direct to Consumer Scheme of the Council:

- Advised farmers and nursery–men for poplar disease management under nursery and plantation conditions.
- A talk on "Management of forest diseases in nursery and plantations" was delivered to Army Task Force.
- A lecture on "An approach to diagnosis of poplar diseases" was delivered at Advance Centre of Plant Pathology, GB Pant University of Agriculture & Technology, Pantnagar (Uttarakhand) on 13 September 2014.

AFRI, Jodhpur had prepared a technical report on "Suitable Species for Biomass Energy Production" and submitted to the Department of Forests, Government of Rajasthan and Banswara, Biomass Energy Pvt. Ltd., Banswara (Rajasthan) in collaboration with MP University of Agriculture & Technology, Udaipur under Direct to Consumer Scheme of Council.

IFGTB, Coimbatore had chosen a project on "Development of macro and micro-propagation techniques for *Melia dubia* for planting stock production" under direct to consumer scheme of the Council. *Melia dubia* is one of the most preferred species of the farmers today and finds a place in the "Tree Cultivation in Private Lands Scheme" of the Government of Tamil Nadu. In order to popularize the species, quality planting stock of *Melia dubia* was supplied to the farmers for plantation. Publications/extension material in Tamil and English languages were also published and distributed to the farmers and other stakeholders.

RFRI, Jorhat had conducted following activities under Direct to Consumer Scheme of the Council:

- Lac cultivation and bamboo charcoal making and its briquetting for livelihood support.
- Promotion of bamboo plantation in degraded jhum land for livelihood security and carbon sequestration
- Establishment of Community Livelihood Nurseries: In order to restore bamboo cover in the state of Tripura, community participation was encouraged by establishing Community Livelihood Nurseries (CLNs) in demo villages which has been proved to be an effective approach in motivation, capacity building and sustainable income generation. So far, nurseries on homesteads have been initiated in 50 locations.
- The techniques developed on agroforestry by

Community Livelihood Nurseries in Demo Villages, RFRI, Jorhat

RFRI were extended in Tripura and assessed in field conditions through on-farm demonstration for their sustainability and adaptability. The techniques of broom grass agroforestry were extended to the Jhumias to stabilize abandoned Jhum lands with different crop components.

- Vigorous campaigns were carried out for popularizing low cost vermicomposting units in Demo villages as well as other parts of Tripura. So far, 1500 villagers have been trained and supported for installation of 120 low-cost vermi-composting units.

Low cost vermi-composting units, CFLE, Agartala

- Two bamboo treatment centres have been established at Kanchanpur and Nowagaon.

Bamboo Treatment Centre under Bamutia Cluster, CFLE, Agartala

Broom grass agroforestry

Technologies transferred

7.2.3

ICFRE is striving expeditiously to disseminate and share research results in an open and accessible manner. At the same time, ICFRE recognizes the importance of protecting its technologies under Indian and other applicable foreign intellectual property laws and commercializing them in a manner befitting its commitment to public good and welfare. In the process, a comprehensive policy governing the generation and management of intellectual property emanating from ICFRE and its various institutes has been evolved along with Material Transfer Agreement and License Agreement.

- FRI, Dehradun demonstrated the developed technologies on the occasion of World Environment Day, International Day for Forests and Science Day to the various stakeholders.
- The technology for the extraction of natural dyes from *Eupatorium* leaves and its application on silk and wool fabrics was demonstrated to the trainees on 25 March 2015 by FRI under the DST funded project titled "Promoting Non-Wood Forest Products and Forests Invasive Species for livelihood support and economy to rural woman of Uttarakhand".

Director, IFGTB, Coimbatore exchanging an MoU with General Manager, Rapid Geonomics Solutions, Coimbatore

- Technologies and products developed by FRI were displayed in the Forest Products Exhibition (Craft Mela) from 19 to 21 January 2015 during the symposium on Transforming Mountain Forestry at FRI, Dehradun.
- A rapid, low cost, high recovery technology for the "Isolation of nucleic acids from plant tissues using non-biohazardous chemicals" was transferred on non-exclusive basis to Rapid Genomics Solutions, Coimbatore on 10 July 2014 in collaboration with Biotech Consortium India Ltd., New Delhi. This is the first initiative of IFGTB, Coimbatore on technology transfer to Biotech Industries.
- Seminar- cum- workshop was organized by TFRI, Jabalpur for "Outreach of Research Findings". This programme was organized to disseminate research findings of the identified technologies suitable for the state of Madhya Pradesh.
- Two days workshop on "Transfer of ICFRE-TFRI Technologies" were held at Bilaspur (Chhattisgarh) on 28 and 29 May 2014; at Jabalpur (M.P.) on 30 October 2014 and at Jalna (Maharashtra) on 9 and 10 December 2014 for the progressive farmers and forest officials of Chhattisgarh, Madhya Pradesh and (Maharashtra) states. Technologies for Teak-turmeric silvi-medicinal system, Bamboo based silvi-agri system and Bach-paddy agri-medicinal system were transferred to the stakeholders during these workshops.

Technologies on PRA techniques and micro planning, bamboo treatment, vermicompost, apiculture, patchouli agrotechniques, *Trichoderma* production and field application, mycorrhizal technology, biopesticide production and field application, seed handling - grading and sowing techniques, technology on chili based agroforestry model, technology on air layering of various economically important tree species using Sphagnum, technology on low-cost vermicompost and technology on raising of agar (*Aquilaria malaccensis*) plantations and cultivation of muskdana (*Abelmoschus moschatus*) were also transferred in 2014-15 to the fields by RFRI, Jorhat.

Evolving and Coordinating Comprehensive Extension Strategies in Forestry Research

7.3

Sustainable Land and Ecosystem Management (SLEM) Project and UNCCD project

7.3.1

Following activities were carried out under the project during the year:

- A three day training programme on "Sustainable land and ecosystem management (SLEM): problems & prospects" was organized at the Institute of Wood Science and Technology, Bengaluru from 24 to 26 April 2014, under the SLEM project. The programme was organized for field officers of various Government Departments, Forest Department, scientists and NGO's of Karnataka State. A total of 30 members participated in the training programme.
- One day consultative workshops on "Alignment of National Action Programme on Combating Desertification to 10 year Strategy of United Nation Convention to Combating Desertification (UNCCD)" were organized by ICFRE at Bengaluru on 12 November 2014, at Bhubaneswar on 11 February 2015, at Kolkata on 24 February 2015 and at Jodhpur on 18 March 2015 under GEF funded UNCCD project.

Seminars/Symposia/Workshops Organized

7.3.2

- World Day to Combat Desertification on 17 June 2014: Celebration of the World Day to Combat Desertification (WDCD) was organized by ICFRE and Ministry of Environment, Forests and Climate Change, Government of India on 17 June 2014 at New Delhi. The theme of this year's WDCD was ecosystem-based adaptation with the slogan "Land Belongs to the Future, Let's Climate Proof It". The 2014 WDCD highlights the benefits of mainstreaming sustainable land management policies and practices into our collective response to climate change. Shri Prakash Javadekar, Hon'ble State Minister of Environment, Forest and Climate Change (Independent Charge) was the chief guest of the function. The minister said that desertification, loss of biodiversity along with climate change is the greatest challenges to sustainable development.
- A workshop on "REDD-Plus Planning" was organized by ICFRE in collaboration with ICIMOD and GIZ at Dehradun from 26 to 28 August 2014 for finalizing the operational part of REDD-plus capacity development programme for Bhutan, Nepal, Myanmar and India.
- Consultative workshops on "*Preparation of India's Biennial Update Report to UNFCCC-Forestry Sector-Mitigation and Gaps & Constraints*" was organized by ICFRE on 11 September 2014 at Dehradun and at RFRI, Jorhat on 16 September 2014.
- Two-day "Research Workshop" was organized on "*Showcasing the Significant Findings in Forestry Research*" by ICFRE on 24 and 25 February 2015 at Van Vigyan Bhawan, New Delhi with support of Ministry of Environment, Forests and Climate Change, Government of India.
- 13th Silviculture Conference was organised at Forest Research Institute, Dehradun, Uttarakhand from 24 to 28 November 2014. The theme of the conference was "*Managing forests for their multiple functions*". Following concurrent events were also organised during the conference:
  - National seminar on "*Role of technology in enhancing bamboo use*" from 25 to 26 November 2014.
  - National workshop on "*Sustainable management of medicinal plants and NTFPs*" from 26 to 27 November 2014.

Shri Prakash Javadekar, Hon'ble Minister of Environment, Forests and Climate Change lighting the lamp on the occasion of the World Day to Combat Desertification on 17 June 2014 at New Delhi organized by ICFRE

- National stakeholders meet on "*Trees outside forests and wood based enterprise*" on 27 November 2014.
- National stakeholders meet on "*Forestry and mining: forest mining interface in service of the Nation*" on 28 November 2014.

Inaugural Session of 13th Silviculture Conference

- FRI, Dehradun in collaboration with ICIMOD, Kathmandu (Nepal) organized a symposium on "*Transforming Mountain Forestry*" at Dehradun from 18 to 22 January 2015.

Inaugural Session of Symposium on Transforming Mountain Forestry

- HFRI, Shimla organised a National Seminar on "*Hill Bamboos – An Important Resource for Improving the Rural Livelihood*" at Manali, District Kullu, Himachal Pradesh from 17 to 18 October 2014. About 20 eminent scientists participated in this seminar and presented their research papers.
- HFRI, Shimla organized workshop on "*Celebrating and Sustaining Ecology*" at St. Thomas School, Shimla on 28 May 2014.
- HFRI, Shimla organized a Stakeholder's Workshop for identifying forestry research needs of Himachal Pradesh and Jammu & Kashmir on 17 September 2014. Senior Forest Officers of the state, Field Forest Officers, Scientists from the Universities /Research Institutions including Representatives NGOs, Progressive Farmers, *Mahila Mandals* etc. attended the workshop.
- IWST, Bengaluru organised an International Conference "*Wood is Good: Current Trends and Future Prospects in Wood Utilization*" from 21 to 23 November 2014 at Bengaluru. This Conference was conducted as a part of year-long celebration of the IWST's Platinum Jubilee year. The aim of this conference was to provide a forum for academicians, researchers and wood industries across the globe to present and discuss the most recent innovations, trends & challenges in the field of wood science and technology.
- A half day session of Indo-Italian Workshop was organized by INTAC and Chitrakala Parishad, Bengaluru and supported by IWST on 02 December 2014.
- TFRI, Jabalpur orgnaised a workshop on "*National Biological Diversity Act, 2002:*

constraints and opportunities for scientific community" under the auspices of National Biodiversity Authority from 19 to 20 March 2015 at Jabalpur.

- TFRI, Jabalpur orgnaised a workshop on "*Carbon sequestration through afforestation*" at Rourkela steel plant (Odisha) on 26 June 2014.
- National Conference on "*New Frontiers in Medicinal Plants Research*" was organized by Department of Botany, Osmania University College for Women, Hyderabad in collaboration with IFB, Hyderabad from 26 to 27 February 2015.
- RFRI, Jorhat organized a National seminar on "Recent Advances on Agarwood Research in India" at Jorhat on 10 and 11 March 2015. About 71 participants including scientists, researchers, traders and farmers from all over the country especially from north-east India participated in the seminar and 40 research papers were presented in four technical sessions during the seminar.
- ARCBR, Aizawl organized a regional seminar on "*Livelihood Opportunities with Bamboo and Rattan in the North-East India*" on 14 March 2015. The regional seminar was organized with the aim to bring together forest officers, scientists, academicians, industrialists and other stakeholders of North-East region to ponder over the various issues and opportunities so as to make bamboo and rattan sector play its role in the socio-economic upliftment of the region.

Regional seminar on "Livelihood Opportunities with Bamboo and Rattan in the North-East India" at ARCBR, Aizawl

Workshop on evolving strategies for enhancing conservation and management of private and community forests: Analysis of policies and programmes at ARCBR, Aizawl

Scientific Exhibition/ Trade Fair/ Mela etc

- *"National Bamboo Craft Mela"* was organized by HFRI, Shimla at Manali, Kullu Valley (Himachal Pradesh) from 16 to 20 October 2014.

Bamboo Craft Mela at Manali, Kullu, HP

- National Bamboo Craft Mela was organized at FRI, Dehradun from 25 to 27 November 2014 during the 13th Silviculture Conference under BTSG-ICFRE project. There were 40 stalls where artisans, craft-men, NGOs and SHGs displayed their artifacts for exhibition and sale.

National Bamboo Craft Mela, FRI, Dehradun

- IWST, Bengaluru had put up a stall where it showcased the activities and technologies of the Institute in Kisan Mela which was held at Mudigere in Chikmagalur district from 28 to 29 November 2014.
- AFRI participated in *Hastshilp Mela* organized at Jodhpur, Rajasthan from 2 to 11 January 2015. Demonstration of Institute research work was done through display board for public awareness at stall.
- IWST, Bengaluru had put up a stall in the Kisan Mela 2015: Indian Agriculture Trade Fair which was conducted from 9 to 11 January 2015 at International Exhibition Centre, Bengaluru.
- Forest Products Exhibition/Craft Mela was organized by FRI at Dehradun from 19 to 21 January 2015 during "Transforming Mountain Forestry Symposium". There were 25 stalls where artisans, craft-men, NGOs and SHGs displayed their artifacts for exhibition and sale.
- Rain Forest Research Institute, Jorhat(Assam) organized, one day Stakeholders' meet on *Aquilaria* (Agar) sponsored by National Medicinal Plants Board, Ministry of AYUSH, Government of India on 31 January 2015 at Sonaram High School, Bharalumukh, Guwahati.
- AFRI, Jodhpur participated in Banad Kisan Mela organized by NABARD on 9 February 2015 and introduced farmers about research activities of the institute through various display boards and pamphlets.
- AFRI, Jodhpur participated in Kisan Mela organized by NABARD at Rohit, Pali on 11 February 2015. Farmers were introduced about research achievements and activities of AFRI through various display boards and pamphlets about management of Khejri mortality.
- AFRI, Jodhpur participated in a farmer fair organized by NABARD at Jaisalmer on 17 February 2015. Farmers were introduced about research achievements and activities of AFRI. Pamphlets about management of Khejri mortality problem were also distributed to farmers.
- The Annual Kissan Mela-cum-Exhibition was organized on 29 January 2015 at Indian Institute of Natural Resins and Gums, (IINRG) Namkum, Ranchi, in which a stall of IFP, Ranchi was set up for exhibition of cultivation of lac, medicinal plants, tissue culture plants, bamboos, vermi-compost with relevant literatures.
- RFRI, Jorhat organized its first "*Tree Growers Mela*" at its Deovan Campus on 20 and 21 March 2015 with an objective to make awareness among the famers of entire North -East India on forestry. More than 350 farmers took part in this *Mela* and interacted with the invited expert about their experience and problems in their field.

Tree Growers Mela, RFRI, Jorhat

Special Activities (Such as Van Mahotsava, Forestry Day and Other occasions)

7.3.3

FRI, Dehradun conducted following special activities during the year:

- National Technology Day was celebrated on 11 May 2014. All museums of the Institute were open free on this occasion of National Technology Day.
- World Environment Day & FRI Day was celebrated on 5 June 2014. A special exhibition was also displayed in front of the Information Centre of FRI. All the divisions of the institute participated in the exhibitions and displayed the exhibits showcasing the recent scientific and technical achievements useful to the general people. All museums of the institute were kept free open for public on this day. The main building was decorated with lights in the night to celebrate the day. Photo gallery, City section (Ranger College) was opened for general public on this day.

Exhibition during celebration of Environment Day at FRI, Dehradun

- Van Mahotsava was celebrated on 4 August 2014 and more than 100 saplings were planted on the occasion.
- Celebrated the *Swachh Bharat Abhiyan* on 145th birth anniversary of Rashtrapita Mahatma Gandhi.

Swachh Bharat Abhiyan at FRI, Dehradun

- "National Unity Day" was celebrated on the occasion of 139th Birth Anniversary of Sardar Vallabhbhai Patel on 31 October 2014. All officers, scientist, staff of FRI & ICFRE and students of FRI (Deemed) University participated on this occasion.
- Celebrated an International Day for Forests on 21 March 2015. An Exhibition was organized in the Information Centre which included posters and models depicting the achievements of the Institute in forestry.

Exhibition during celebration of International Day for Forests at FRI, Dehradun

IFGTB, Coimbatore conducted following special activities during the year:

- On the occasion of the World Environment Day on 5 June 2014, a tree planting

programme was organized at IFGTB, Coimbatore.

- Celebrated an International Day for Biological Diversity on 22 May 2014.

World Environment Day at IFGTB, Coimbatore

AFRI, Jodhpur conducted following special activities during the year:

- Celebrated International Biodiversity Day on 22 May 2014.

International Biodiversity Day at AFRI, Jodhpur

- Celebrated World Environment Day on 5 June 2014.
- Celebrated World Day to Combat Desertification on 17 June 2014.
- Van Mahotsav 2014 was celebrated on 19 July 2014 with involvement of Jai Naryan Vyas University, Jodhpur. Sh. Gajendra Singh Shekhawat, MP, Jodhpur was invited as the chief guest of the function.

RFRI, Jorhat conducted following special activities during the year:

- Celebrated an "International Day of Biological Diversity" at Sorojini Devi Uccha Balika Vidyalaya, Kenduguri, Jorhat. A large group of school student, scientists, officers and supporting staff of RFRI participated in the celebration.
- Celebrated 'World Environment Day' in collaboration with "*Rengoni*", a Jorhat based NGO at Sessa Satra M. V. School, Mori

International Day of Biological Diversity, RFRI, Jorhat

Jhanji, Jorhat (Assam) on 5 June 2014. Approximately 400 school students, officials of RFRI and local citizens participated in the celebration.

HFRI, Shimla conducted following special activities during the year:

- Celebrated the "44th Edition of Earth Day" on 22 April 2014 at Western Himalayan Temperate Arboretum, Potters Hill, Shimla.
- Celebarated an International Day for Biological Diversity on 22 May 2014. About 30 students from different schools of Shimla participated in various events/competition like Quiz, Painting Competition and Slogan Writing on the theme "Island Biodiversity".
- Organised *"Van-Mahotsav"* at its campus, on 12 August 2014. All the scientists, officers and staff members of the institute participated in the Van-Mahotsav by planting Deodar and other important medicinal plants.

International Day for Biological Diversity, HFRI, Shimla

IFP, Ranchi conducted following special activities during the year:

- An '*International Day of Biological Biodiversity*' was organized on 22 May 2014 on the theme of Islands Biodiversity.
- Celebrated "Van Mahotsav" on 11 July 2014 and all officials of institute participated in plantation of different species viz. *Mallotus roxburghianus, Musea ferra, Melia dubia, Nyctanthes arbor-tristis* etc.

International Day of Biological Biodiversity at IFP, Ranchi

Van Mahotsav at IFP, Ranchi

IWST, Bengaluru celebrated Van Mahotsava, the annual tree planting festival of India on the 7 July 2014. Fulfilling the institute's objective of conserving rare, endangered and threatened species of the Western Ghats, tree species like *Saraca asoca, Oroxylum indicum, Syzigium canarense, Michelia champaca, Santalum album* etc were planted in the campus.

TFRI, Jabalpur and CFRHRD, Chhindwara celebrated World Environment Day and International Day for Biological Diversity.

Consultancy Services 7.4

In the process of enhancing and sustaining the scientific service performance of the council, the Environment Management Division under Directorate of Extension, ICFRE, Dehradun has submitted one river basin Cumulative Environmental Impact Assessment of hydropower consultancy study during the period 2014-2015 for Yamuna Basin in Uttrakhand to Uttarakhand Jal Vidyut Nigam Ltd.

Social Impact Assessment survey for Thana Plaun hydropower project (191 MW) in District Mandi for Himachal Pradesh Power Corporation Limited (HPPCL), Himachal Pradesh has been completed.

In the mine sector, continued and completed with 11 individual Reclamation and Rehabilitation (R&R) Plan of category 'A' and 'B' for the mines in Bellary, Chitradurga and Hospet Districts as per the directions of the Honourable Supreme Court in line with CEC guidelines to Department of Mines and Geology, Government of Karnataka.

FRI, Dehradun provided following consultancy services to the various stakeholders:

- Consultancy for "Quality assessment of cooling timbers and onsite training" was given to M/s Hindustan Petroleum Corporation Ltd., Visakha Refinery and Visakhapatnam.
- Paper samples received from Govt. organizations and private industries, such as, Employment News, New Delhi; ICFRE,

Dehradun; Army, New Delhi; NCERT, New Delhi; M/s Ayukta Rajya Siksha Kendra, Bhopal; M/s. Distt. Siksha Kendra, Betul (M.P); M/s. Distt. Siksha Kendra, Shivpuri (M.P.); M/s. Distt. Siksha Kendra Sarv Siksha Abhiyan, Khargon (M.P); Director, Academic Research & Training, Dehradun, Uttarakhand; Sate Bank of Patiala, Punjab; Chaudhary Charan Singh University, Meerut (U. P.); Assam state Text book production and Publication Corporation Ltd., Assam etc. were tested for physical and optical properties as per BIS specification.

- Dealt 131 enquiries; 184 wood samples identified and worth of Rs. 11.20 lakh revenue generated.
- Dealt 17 police cases and worth of about Rs. 2 Lakh revenue generated- enquiries received from Police, Customs; Commissioner NCT, Dy. Central Vigilance Officer and private firms.

IFGTB, Coimbatore provided following consultancy services to the various stakeholders:

- A Consultancy Project on Genetic improvement of *Casuarina* through establishment of seed orchards was implemented for the client M/s BILT Tree Tech Limited (BTTL), Gurgaon, Haryana. Under this project, selected high-yielding clones of *Casuarina junghuhniana* and planting designs were provided to BTTL for establishing seed orchards. Using these resources, BTTL has established two seed orchards at Ashti in Vidarbha region of Maharashtra. The seeds produced from these orchards will be used to raise plantations in Andhra Pradesh, Maharashtra, Odisha and Telengana to benefit farmers.

IWST, Bengaluru provided following consultancy services to the various stakeholders:

- Testing and consultancy services, such as, wood identification, determination of moisture content, density and strength properties etc. were rendered to various organizations (Govt./No-Govt./PSU/Private/individual etc.). A total revenue of Rs. 7.55 lakh was collected from testing, training and consultancy services rendered by the institute.

TFRI, Jabalpur provided following consultancy services to the various stakeholders:

- Consultancy to MPSBM for - Evaluation of present status of CFC, need analysis and capacity building of stakeholders.
- Consultancy to IITDM for – Plantation and greening of IITDM campus in sync with ecology of the site.
- Consultancy to SAIL India for - Carbon sequestration through afforestation at Rourkela Steel Plant.
- Preparation of the Wild life Conservation Plan for Mahan-II, SECL, Bhat Gaon area.
- Preparation of the Wild life Conservation Plan for Ketki SECL, Bhisrampur area.
- Preparation of the Wild life Conservation Plan for Amagaon SECL, Bhisrampur area.
- Assessment of green cover and its tangible and intangible benefits and tree cover management plan for STPP-Korba Project' of NTPC, Korba.
- Preparation of conservation plan and comprehensive study of the impact on the wildlife for Rajgamar underground project, SECL, Korba (C.G.).
- Preparation of conservation plan for endangered species in and around Saraipali open cast project, SECL, Korba (C.G.).

HFRI, Shimla provided the following consultancy services to the various stakeholders:

- A consultancy for carrying out *"Monitoring & Evaluation of plantations raised under CAMPA"* has been awarded to the Institute

Monitoring of plantations raised under CAMPA by HFRI, Shimla

by HPSFD, Shimla for three and half months at a total cost of Rs. 43.00 lakh during January, 2015.

- The Institute is involved in studies on EIA and preparation of Environment Plans of Nakthan, Thana-Plaun, Triveni-Mahadev & Surgani-Sundla Hydroelectric Project being implemented by the Environment Management Division of ICFRE.

AFRI, Jodhpur had done systematic survey and soil profile studies at 56 locations under a consultancy project on 'Preparation of baseline database on soil and vegetation status at the new campus of IIM, Udaipur at village Balicha, Tehsil Girwa.

Activities of Rajbhasha 7.5

- ICFRE Hqs. published Hindi Magazine "*Taruchintan*".
- ICFRE and its institutes observed "*Hindi Saptah*" during the month of September 2014. During *Hindi Saptah*, competitive events, such as, essay writing, drafting, English to Hindi translation and Hindi typing were organized for promoting Hindi in official works.
- IFGTB has organized the competitions for the staffs on Hindi elocution, Dictation and Essay writing and distributed the prizes on the Hindi Day which was celebrated on 15 September 2014 at the institute.
- ICFRE, Dehradun organized district level Hindi essay competition on the topic *"Ghatate van, badti aapdayen"* under the aegis of TOLIC, Dehradun on 21 November 2014 at ICFRE Auditorium. Shri Saibal Dasgupta, DDG (Extn.), ICFRE was the Chief Guest on this occasion. Smt. Neena Khandekar, ADG (M&Extn.), ICFRE welcomed all the guests and participants. Shri Dhoom Singh, Member Secretary, TOLIC, Dehradun was present at the event as observer from TOLIC, Dehradun.

Dr. Ashwani Kumar, DG, ICFRE addressing the gathering during the closing ceremony of ICFRE Hindi Saptah

ICFRE organized district level Hindi essay competition

Awards and Honours

7.6

- Dr. Manisha Thapliyal, Scientist E, FRI, Dehradun was awarded SAP fellowship by IUFRO (Vienna) for attending IUFRO World Congress at Salt Lake City, USA from 5 to 11 October 2014.
- Ms. Shanti Devi, Research Scholar, Chemistry Division, FRI, Dehradun was awarded Young Scientist Award for the poster presentation entitled "Studies on flavonoid glycosides & polysaccharides from *Malvastrum coromandelianum*" in 9th Uttarakhand State Science and Technology Congress held from 26 to 28 February, 2015 at Vigyan Dham, Dehradun.
- Ms. Deepa Sharma, Project Assistant, Chemistry Division, FRI, Dehradun was awarded Young Scientist Award for the poster presentation entitled "Cheura butter: an excellent source of nutrition and livelihood of hilly areas" in 9th Uttarakhand State Science and Technology Congress held from 26 to 28 February, 2015 at Vigyan Dham, Dehradun.
- Sh. Devesh Tewari, JRF, Chemistry Division, FRI, Dehradun awarded first prize for best poster presentation titled "Assessment of antidepressant efficacy of *Ocimums kilimandscharicum* Gurke" in the National Seminar- cum- Workshop on Advances, Perspective and Challenges in Chemical Sciences held on 11 and 12 February, 2015 at SBS PG Institute of Biomedical Sciences and Research, Dehradun.
- Paper entitled "Structural analysis of polysaccharides and flavonoids of *Malvastrum coromandelianum*" by Dr. Vineet Kumar and Ms. Shanti Devi of FRI, Dehradun was chosen among the best papers during the 29th Carbohydrate Conference organized by Centre of Innovative & Applied Bioprocessing (CIAB), Mohali jointly with Association of Carbohydrate Chemists & Technologists (India) from 28 to 31 December 2014.
- Ms. Nishat Anjum, JRF, Chemistry Division, FRI, Dehradun was awarded for best poster presentation titled 'Evaluation of antioxidative activity in selected wild edible fruits for harnessing their health benefits' in symposium on Phytochemistry and Ayurveda: Potential and Prospects held on 24 December, 2014 at Dehradun.
- Sh. Devesh Tewari, JRF, Chemistry Division, FRI, Dehradun was awarded first prize for best poster presentation entitled "Development and validation of high performance thin-layer chromatographic method for quantification of hecogenin in *Agave sisalana* Leaves in 84th Annual Session and Symposium on "Desert Science- Challenges and Opportunities" organized by The National Academy of Sciences, India from 4 to 6 December 2014 at JNV University, Jodhpur.
- Sh. Devesh Tewari, JRF, Chemistry Division, FRI, Dehradun was awarded 2nd Prize for best poster presentation titled "Ecofriendly extraction of sisal fiber and its FT-IR spectroscopic characterization" in National Workshop on Sustainable Management of Medicinal Plants and NTFPs, 13th Silviculture Conference, held from 24 to 28 November, 2014 at FRI, Dehradun.
- Hridesh Kumar, Dr. Sadhna Tripathi and Dr. Himani Pant of FRI, Dehradun received S.K. Seth Prize for valuable contribution in the Indian Forester titled "Wood protection by *Pongamia pinnata* seed oil through heating process" in the field of Forestry in 2015.
- Thakur P., A. K. Joshi, B. K. Gupta, M.K. Brahmi, P. Kumar and A. Chandra of FRI, Dehradun received best poster award for "Value addition of native and naturalized plant parts from Himachal Pradesh and Uttrakhand for dry flower industry" presented at "National Workshop on Sustainable Management of Medicinal Plants and NTFPS" on 27 November, 2014 in 13th Silviculture Conference.
- Ms. Ankita Gupta and Dr. Sangeeta Gupta of FRI, Dehradun received best poster award for "Effect of mining on the wood anatomical

features: A case study of Phosphate mines, Maldeota, Dehradun" during 13th Silviculture Conference.

- Dr John Prasanth Jacob, Scientist F, IFGTB, Coimbatore received award for outstanding contribution for the Classical Biological Control of Eucalypts Gall Wasp in India from National Bureau of Agricultural Insect Resources (Indian Council of Agricultural Research) Bengaluru, August 2014.
- Dr. C. Kunhikannan, Scientist-F, IFGTB, Coimbatore has been elected as member of Executive Council of Indian Association for Angiosperm Taxonomy (IAAT) for the year 2015-2017.
- Dr. N. Senthilkumar, Scientist-E, IFGTB, Coimbatore was awarded II prize in oral presentation of a paper entitled "Secondary metabolites and nutrient balance in casuarinas: A study on internal trade-off in resource allocation between growth and defense". National Seminar on New Frontiers in Plant Sciences and Biotechnology on 29 and 30 January, 2015, Department of Botany, Goa University, Goa.
- Dr. V. Mohan, Scientist-F, IFGTB, Coimbatore received certificate of First Prize for Best Poster Paper presentation during 13th Silviculture Conference.
- Ms. V. Dharanishanthi, Senior Research Fellow, IFGTB, Coimbatore was awarded second prize under 'oral category' for the paper presented in the National Seminar on Bioinformatics & Biopharmaceuticals held at Bharathiar University, Coimbatore on 3 March 2015.
- Dr. N. Roychoudhury, Scientist-G, TFRI, Jabalpur was awarded 1st prize for the poster entitled "Toxicity of bio- and chemical pesticides against beetles of sal heartwood borer, *Hoplocerambyx spinicornis* Newman and their efficacy in tree traps and loss in timber depot" at 13th Silviculture Conference.
- Veer Durgadas Smriti Smarak Sthal, Jodhpur awarded Veer Durgadas Rathore Award for the year 2014 to Dr. Ranjana Arya, Scientist G, AFRI, Jodhpur for outstanding contribution in reclamation of salt affected soils in Rajasthan and Gujarat on 08 August 2014.
- Dr. Ranjana Arya, Scientist G, AFRI, Jodhpur awarded for her outstanding contribution by Indian Society of Salinity Research Scientists for the year 2014.
- Dr. Vipin Parkash, Scientist D, RFRI, Jorhat was honoured with the best paper presentation category in the National Symposium on "Unraveling plant microbe interactions for supporting plant health" held at Department of Botany, Gauhati University, Guwahati, Assam on 27 and 28 October, 2014.
- Dr. Vipin Parkash, Scientist D, RFRI, Jorhat was selected for "Achiever Award" conferred by the Society for the Advancement of Human and Nature (SADHNA), Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh.
- Dr. Vipin Parkash, Scientist D, RFRI, Jorhat was conferred with International "George Bentham Research Award-2015 in Biodiversity" by International Agency for Standards and Ratings (IASR) for outstanding scientific contributions.
- Shri Rajesh Kumar, Dr. Shailesh Pandey, Dr. Ashwani Tapwal, Shri R Raja Rishi, Dr. Krishna Giri and Dr. Gaurav Mishra of RFRI, Jorhat received "International Photon Young Scientist Award-2014" in Ethnobiology and Traditional Medicine by Photon Foundation USA.
- Shri Sandeep Yadav, Scientist B, RFRI, Jorhat was awarded 2nd Prize in 14th Foundation Training Programme for Scientists & Technologists from 17 November 2014 to 6 February 2015, sponsored by DST at Indian Institute of Public Administration, New Delhi
- Poster entitled "Biological Control of *Thysanoplusia orichalcea* Fab. (Lepidoptera: Noctuidae) – A Potential Pest of *Saussurea costus"* as presented by Singh, R., Kumari, P. and Kumar V. of HFRI, Shimla was awarded the 2nd best prize during 13th Silviculture Conference.

DISTINGUISHED VISITORS

- H.E. Mr. Alexis Kande Mupompa, Governor (Chief Minister) of the province of Kasai & H.E. Mr. Francois Balumuene Nkuna, Ambassador of the Democratic Republic of the Congo visited FRI, Dehradun on 12 April 2014.
- Sh. Rakibul Hussain, Hon'ble Minister, Forest, Environment and P&RD, Assam visited FRI, Dehradun on 26 April 2014.
- Shri Barin Ghosh, Hon'ble Chief Justice, Uttarakhand High Court, Nainital visited FRI, Dehradun on 12 May 2014.
- Sh. S.K. Sharma, Hon'ble Justice, Patna High Court visited FRI, Dehradun on 29 May 2014.
- Ms. Uma Bharti, Hon'ble Minister for water resources, River Development & Ganga Rejuvenation, Government of India visited FRI, Dehradun on 16 September 2014.
- H.E. Dr. Aziz Qureshi, Governor of Uttarakhand visited FRI, Dehradun on 24 November 2014.
- Sh. Prakash Singh Badal, Hon'ble Chief Minister of Punjab visited FRI, Dehradun on 27 November 2014.
- H.E. Sh. K.K. Paul, Governor of Uttarakhand visited FRI, Dehradun on 22 January 2015.

The Council through solution-based forestry research is involved in providing improved services and opportunities to the people. IT Division of the Council plays an important role in hosting and dissemination of various administrative, research, education and extension activities of ICFRE.

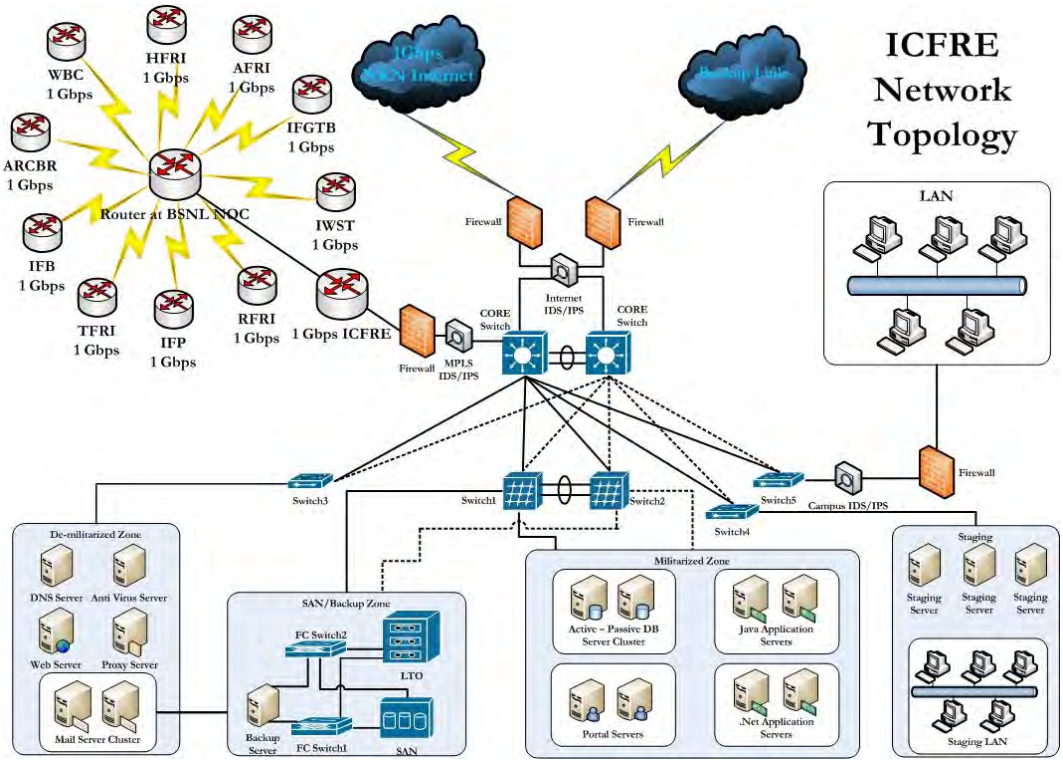
Information Technology 8.1

Information Technology (IT) Division at ICFRE Headquarter (HQ) plays an important role in hosting and disseminating various administrative, research, education and extension activities of ICFRE. IT Division caters to the Information Communication Technology (ICT) needs of all other ICFRE institutes/centres also. In keeping pace with the latest technological advancement in ICT, the division is providing regular services. New initiatives are also being taken from time to time.

Administration and Information Technology

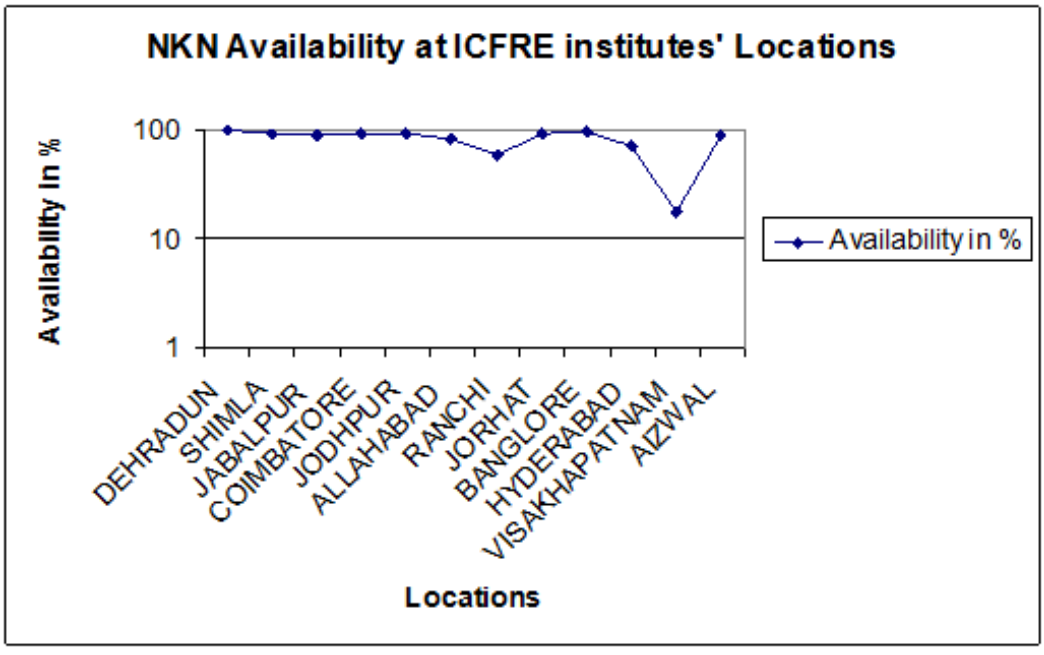
ICFRE Data Centre:

The ICFRE Server Farm was established in the year 2009-10 and has been functional since then. It provides 24x7x365 services to all the employees of ICFRE and its Institutes. Apart from hosting enterprise wide application, catering to various research and administration needs which are known as Indian Forestry Research Information System (IFRIS). It also caters to services like Messaging Service, Web Service, Database Service, Proxy Service, DNS Service, DHCP Service, FTP Service, Backup Service, Internet Service, NKN-VPN service, Videoconferencing, Antivirus Service, Helpdesk Service and CAEMS, ISS. Twenty eight websites on the different aspects of ICFRE and its Institutes have been hosted on ICFRE Web Server. ICFRE Data Centre Building Management System (BMS) has been implemented & configured for effective management, monitoring and integration of various Non-IT equipments like Fire Alarm System, Very Early Smoke Detection Appliance (VESDA) system, Rodent Controller, Water leakage detector, Access system, Surveillance system, Public Address (PA) system, Cooling system etc. The achievement of the ICFRE Server Farm in terms of availability for 2014-15 was 100 %.



ICFRE Network Topology

NKN-VPN availability in year 2014-15 is as below:



Availability at Visakhapatnam and Ranchi was low because of site being down due to Hud-Hud Cyclone and Power cut problem respectively.

Activities undertaken at IT Division, ICFRE and its institutes by respective IT Division of institutes:-

Websites: Websites of ICFRE and respective institutes are updated and maintained by the IT divisions of ICFRE / institutes. IT Divisions are also developing the websites for seminars/conferences. TFRI, Jabalpur has launched new web portal for the institute's online open access e-magazine "*Van Sangyan*" (ISSN 2395 - 468X) and linked with institute's web site. The pages are being updated on regular basis and issues have been uploaded on monthly basis over it for ease of access to the users.

Video Conferencing: Video conferencing services at ICFRE was started in May 2008 and till date more than 1050 video conferencing sessions have been successfully completed. Video conferencing services among ICFRE institutes are carried through NKN VPN tunnel. Video Conferencing facility is also available for outside participant through public network.

Indian Forestry Research & Information System (IFRIS): PIMS (Personal Information Management System), PMS (Payroll Management System), FAS (Financial Accounting System), RIMS (Research Information System), EDMS (Electronic Documentation System) etc. are some of the modules widely used across the institutes.

Network Support: The LAN / WAN services are available to all the institutes and managed by the IT Division, ICFRE. Equipments of LAN are maintained, monitored and reported by the IT Division of the respective institutes.

Maintenance of Hardware: Apart from maintenance of the Network Hardware, IT Division also undertakes the maintenance of Computer and peripheral hardware installed at different locations.

Databases: Many databases are available and maintained at ICFRE and its institutes like Indian wood insects database, anatomical database of Indian hardwoods, National Forest Insect Collection (NFIC), Database of IWST Xylarium, Expert system for Indian woods, NWFP information system, Research Projects Database etc. These are being updated from time to time.

Following new initiatives were taken during 2014-15:

Websites and CMSs:

- **Designed and developed the Common Content Management System (CMS) of Institutes' websites**: IT Division ICFRE has designed and developed the Common CMS for the websites of ICFRE and its institutes. Afterwards, CMS for HFRI Shimla website *(http://hfri.icfre.org/admin/login.php)* and AFRI Jodhpur websites (bilingual) *(http://afri.icfre.org/admin/login.php* and *http://afri.icfre.org/hindi/admin/login.php)* were designed, developed and implemented on live web server.

- **HFRI website** *(http://hfri.icfre.org)***:** New website of HFRI was designed and developed by IT Division, ICFRE and inaugurated by DG, ICFRE during 13th Silviculture Conference held from 24 November to 28 November 2014 in Dehradun. User ID and Password are provided to the institute to update the material on website through Content Management System of HFRI website.

Screen shot of new Website of HFRI, Shimla

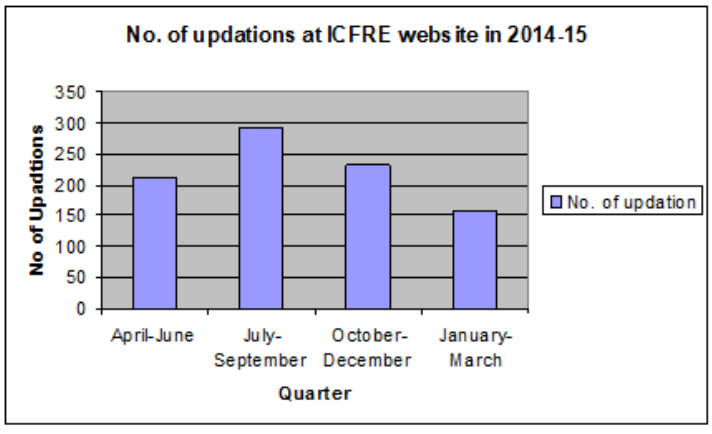
- **AFRI Website (English):** IT Division, ICFRE has designed, developed and implemented the website of AFRI Jodhpur (English) having around 191 web pages *(http://afri.icfre.org)*. User ID and Password were provided to the institute to update the material on website through Content Management System of AFRI website (English).

- **AFRI Website (Hindi):** IT Division, ICFRE has designed, developed and implemented the website of AFRI Jodhpur (Hindi) having around 191 web pages

(http://afri.icfre.org/hindi). User ID and Password were provided to the institute to update the material on website through Content Management System of AFRI website (Hindi).

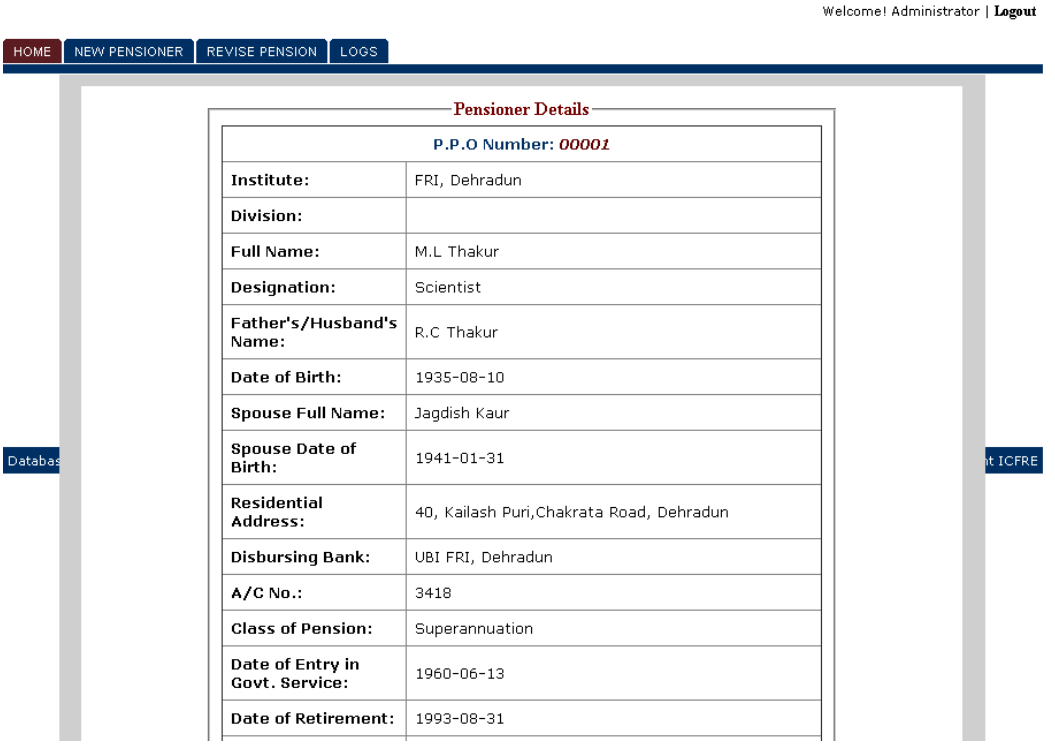
Screen shot new Hindi Website of AFRI, Jodhpur

- **Updating of website of ICFRE (http://icfre.gov.in):** ICFRE's website is promptly updated. Details of ICFRE Website updating during 1 April 2014 to 31 March, 2015 is as below:



Database:

- **Pensioners' Database and Application:** IT Division, ICFRE has designed, developed and implemented the Pensioners Database (including digitization of records) and application on live server. Scanning of 786 pensioners ledger register has been finished. With this application, Pension Cell has all the data of pensioners including digitized records. Pensioners can search the data of a particular pensioner and they can add the data of a new pensioner.



Screen shot of Database of Pensioners of ICFRE

Webcasting:

Live webcasting of technical session of International Symposium on "*Transforming Mountain Forestry: Bridging Trans boundary Challenges under 21st Century Paradigms for the Welfare of Mountain People, Forests and Environment in the Hindu Kush*" from 18 January 2015 to 22 January 2015 at Forest Research Institute, Dehradun was done successfully by IT Division, ICFRE. The event was organized by International Centre for Integrated Mountain Development (ICIMOD) and supported by the Ministry of Environment, Forests and Climate Change of India through Forest Research Institute in Dehradun, the German Agency for International Cooperation (GIZ), DFID-UK Aid and the Austrian Development Agency.

Sevottam: 8.2

The Council deals with the solution based forestry research with the larger objective of providing improved services and opportunities to the people. "Sevottam" is an assessment improvement framework targeted to improve the quality of services to the citizens. The Council using the framework of "sevottam" is committed to continuously improve quality of service in ICFRE (HQ) and its institutes. The 'sevottam' framework consists of three components viz. the

Citizens' Charter, Public Grievance lodging and redressal mechanisms and service delivery capability.

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.

Action taken to formulate the Charter for the Department and its subordinate formation

8.2.1

The Citizen's Charter is drafted and implemented by all the institutes and centres of ICFRE with a provision for annual review of the Charter services provided. It is available on the website of the ICFRE *(www.icfre.gov.in)*. For providing information to the public and the clients, the council largely relies on the web-based tools, dissemination of information through a variety of means –including IT interface, Citizens' Charter, responses to citizens by way of the tools that come under the purview of Right to Information Act and through workshops and seminars conducted by the organization.

The subordinate formations of ICFRE consist of its regional institutes and centres across the country. The websites of these institutes are integrated with the main website of ICFRE and are hosted in the same server. As the work of institutes of ICFRE merges into the overall work of ICFRE, the Citizens' Charter of ICFRE on the website mentioned above provides the requisite information that is applicable to the institutes/centres also, besides showing pertinent information about various institutes/ centres.

Action taken to implement the Charter

8.2.2

As stated earlier, the Citizen's Charter is on the website of ICFRE. It provides the bird's-eye view of ICFRE including its vision, mission, objectives, functions, services and service standards. The Charter also provides the grievance redressal mechanism and contact information of persons who should be approached for registering and receiving responses on, specific grievances in each institute of ICFRE. With the aim of implementing the Charter, the ICFRE institutes and centres direct and implement their research endeavors after assessing the need of the users/ stakeholders. Also, in accordance with the need, up-gradation of the skills and knowledge of the staff, as also upgrading infrastructure of the institutes/ centres with state of art facilities and their proper maintenance is also taken up to meet the upcoming challenges.

Services provided are regularly monitored by the Head of the Division/Group Coordinator (Research)/Director and also by the officials of ICFRE as per norms. The instruments are standardized with set procedures. Getting an unbiased feedback from the stakeholders is given due importance. Based on feedback, necessary changes in the training programmes are incorporated.

Details of training programmes, workshops, etc. held for proper implementation of the Charter

8.2.3

In an endeavor to create awareness and as a part of extension activity; trainings and workshops are organised at regular intervals in the ICFRE institutes and centres. Besides, the RAG Committee meetings, stakeholders' meet, "melas" for interaction with end users', diverse trainings etc. are held from time to time. The training component has been covered in detail under Chapter 6 and organised workshops have been indicated under Chapter 7 of this report. Evaluation of the implementation of the Citizen's Charter is also done at the institute/ centre level.

Welfare measures for the SC / ST/ backward / minority communities

8.3

The Grievance Redressal Cell for SC/ST/ OBC employees of ICFRE (Hq.) was formed vide Secretary, ICFRE, order no 63-37/2010-ICFRE dated 23 February 2011. The Deputy Director General (Education) functions as the Chief Liaison officer for SC/ST/ OBC. Similarly, institutes at their level have Grievance Redressal Cells like IWST, Bengaluru. Similarly in AFRI, Jodhpur, to promote the general interest of SC/ST/OBC employees and to work for their collective betterment, development and upliftment, there is AFRI SC/ST/OBC Employees Welfare Association. For promotion/recruitment process, roster has been maintained as per guidelines of the GOI. The Employees Welfare Association of AFRI celebrated Dr. Ambedkar Jayanti on 14 April 2014 to commemorate the birthday of Babasaheb Ambedkar.

In HFRI, Shimla, a special officer has been nominated by the institute to look after the interests of the SC/ ST/ backward/ minority communities. In addition to this, a roster is being maintained for recruitments being made by the institute.

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATIOI
DEHRADUN

BALANCE SHEET
2014-15

17th NOVEMBER, 2015

Balance Sheet

CONTENTS

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

BALANCE SHEET AS AT 31ST MARCH, 2015

(Amount in Rs.)

CORPUS/CAPITAL FUND AND LIABILITIES	SCHEDULE	CURRENT YEAR AS ON 31.03.2015		PREVIOUS YEAR 31.03.2014
		RS.	RS.	RS.
CORPUS/CAPITAL FUND	1		1,403,369,671	1,456,978,115
RESERVES AND SURPLUS	2		-	-
EARMARKED/ENDOWMENT FUNDS :	3			
> One Time Special Grant		272,278,602		-
> Project Unspent Balance		331,395,911		608,771,769
> Corpus Fund Unspent Balance		29,652,221	633,326,734	
SECURED LOANS AND BORROWINGS	4		-	-
UNSECURED LOANS AND BORROWINGS	5		-	-
DEFFERRED CREDIT LIABILITIES	6		-	-
CURRENT LIABILITIES AND PROVISIONS				
(A) CURRENT LIABILITY:	7	100,833,837		
(B) PROVISIONS:		-	100,833,837	60,687,374
TOTAL			2,137,530,242	2,126,437,258

ASSETS		CURRENT YEAR AS ON 31.03.2015		PREVIOUS YEAR 31.03.2014
		RS.	RS.	RS.
FIXED ASSETS	8		1,297,369,072	1,394,944,452
INVESTMENTS-FROM EARMARKED/ENDOWMENT	9			
> F.D.R.(For One Time Special Grant)			80,000,000	80,000,000
> F.D.R.(With Institutes)				-
INVESTMENTS-OTHERS	10		-	-
> F.D.R.(With Institutes)				
CURRENT ASSETS, LOANS, ADVANCES ETC.	11		760,161,170	651,492,805
MISCELLANEOUS EXPENDITURE		-	-	-
> (to the extent not written off or adjusted)				
> (items under reconcilation)				
TOTAL			2,137,530,242	2,126,437,257
SIGNIFICANT ACOUNTING POLICIES	24			
CONTINGENT LIABILITIES AND NOTES ON ACOUNTS	25			

"AS PER OUR SEPARATE REPORT OF EVEN DATE ANNEXED"
FOR P.K.SINGHAL & CO.,
CHARTERED ACCOUNTANTS

(P.K.SINGHAL)Partner
Chartered Accountant
Membership No. 73882
DATED: 17TH NOVEMBER, 2015
PLACE: DEHRADUN

Dr. ASHWANI KUMAR (Director General, ICFRE)

Dr. S.P. SINGH , (Dy. Director General, Admin., ICFRE)

SMT. NEENA KHANDEKAR, (Asstt. Director General, Admin., ICFRE)

SMT. VIJAY DHASMANA (Under Secretary, Budget, ICFRE)

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 2015

INCOME	Schedule	Current Year 31.03.2015	Previous Year 31.03.2014
		RS	RS.
Income from sales/services	12	1,089,000	2,952,092
Grants/Subsidies	13	1,408,600,000	1,213,737,864
Fees/Subscriptions	14	126,827.00	9,000
Income from Investments (Income on Invest .from earmarked/endow.	15	-	-
Income from Royalty, Publications etc.	16	772,189.00	-
Interest Earned	17	22,765,493	1,196,755
Other Income	18	65,440,359.00	105,679,449
Increase/(decrease) in stock of finished goods and works-in-progress	19	-	-
Total(A)		**1,498,793,868**	**1,323,575,160.15**

EXPENDITURE	Schedule	Current Year 31.03.2015	Previous Year 31.03.2014
		RS.	RS.
Establishment Expenses	20	1,151,385,487	1,028,087,221
Other Administrative Expenses etc.	21	283,325,326	319,735,412
Expenditure on Grants, Subsidies etc.	22	819,739	758,558
Interest	23	1,365	-
Depreciation(Net Total at the year end-corresponding to Schedule 8)		110,613,358	8,385,437
TOTAL(B)		**1,546,145,275**	**1,356,966,627**
Balance being excess of Income over Expenditure(A-B)		(47,351,407)	(33,391,467)
Transfers to Special Reserve(Specify each)		-	
Transfer to/from General Reserve		-	
BALANCE BEING DEFICIT CARRIED TO CORPLUS FUND		**(47,351,407)**	**(33,391,467)**
SIGNIFICANT ACCOUNTING POLICIES	24		
CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS	25		

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INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2015

Amount-(Rs)

SCHEDULE 1-CORPUS/CAPITAL FUND:	CURRENT YEAR 31.03.2015		PREVIOUS YEAR 31.03.2014	
	RS.	RS.	RS.	RS.
Balance as at the beginning of the year		1,456,978,115.45		1,431,476,721.28
		-		-
Add: Revenue Received at DDO's		68,989,891.26		99,592,077.63
Add: Contributions towards Corpus/Capital Fund				
Plan Account	11,250,000.00		37,500,000.00	
North East	-	11,250,000.00	20,000,000.00	57,500,000.00
Less: Balance of net income/expenditure transferred		(47,351,406.98)		(33,400,466.83)
LESS: Revenue Receipt paid to D.G. ICFRE by the DDO.s		(86,496,928.68)		(98,190,216.63)
BALANCE AS AT THE YEAR-END		1,403,369,671.05		1,456,978,115.45

SCHEDULE 2-RESERVES AND SURPLUS:	CURRENT YEAR 31.03.2015		PREVIOUS YEAR 31.03.2014	
	RS.	RS.	RS.	RS.
1. Capital Reserve:				
As per last Account	-	-	-	-
Addition during the year	-	-	-	-
Less: Deductions during the year	-	-	-	-
2. Revaluation Reserve:	-	-	-	-
As per last Account	-	-	-	-
Addition during the year	-	-	-	-
Less: Deductions during the year	-	-	-	-
3. Special Reserves:	-	-	-	-
As per last Account	-	-	-	-
Addition during the year	-	-	-	-
Less: Deductions during the year	-	-	-	-
4 General Reserve:	-	-	-	-
As per last Account	-	-	-	-
Addition during the year	-	-	-	-
Less: Deductions during the year	-	-	-	-
TOTAL	-	-	-	-

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P.K. SINGHAL & CO. * Chartered Accountants *

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2015

Amount-(Rs)

SCHEDULE 3-EARMARKED/ENDOWMENT FUNDS	FUND -WISE BREAK UP				TOTALS	
	ONE TIME SPECIAL GRANT	PROJECT ACCOUNTS	INTEREST CORPUS FUND	Fund	Current Year 31.03.2015	Previous Year 31.03.2014
	RS.	RS.	RS.	RS.	RS.	RS.
a)Opening balance of the funds	254,801,492.00	332,789,173.00	21,181,104.00	-	608,771,769.00	467,762,599.00
Adjustment of Exp. From Plan (GC) A/c to OTSG A/c under Minor Works						
b)Additions to the Funds:						
i) Donations/grants						
One Time Special Grant (General)	-	-	-	-	-	-
One Time Special Grant (Creation of Assetsl)	70,882,000.00				70,882,000.00	161,654,000.00
ii) Income from investments made on account of funds	-	-	9,254,959.00	-	9,254,959.00	8,711,835.00
iii) Other additions (specify nature)	-	-	-	-	-	-
iv) Project Receipts	-	337,133,925.15	-	-	337,133,925.15	376,786,691.27
TOTAL(a+b)	325,683,492.00	669,923,098.15	30,436,063.00	-	1,026,042,653.15	1,014,915,125.27
C) Utilisation/Expenditure towards objectives of funds					-	-
i) Capital Expenditure					-	-
- Fixed Assets	42,463,196.00	-	-	-	42,463,196.00	61,392,160.00
- Others	-	-	-	-	-	-
Total.....	42,463,196.00	-	-	-	42,463,196.00	61,392,160.00
ii) Revenue Expenditure			-	-	-	-
- Salaries, Wages and allowances etc.	-	-	-	-	-	-
- Rent	-	-	-	-	-	-
- Other Administrative expenses	10,941,694.00	-	783,842.00	-	11,725,536.00	35,934,574.00
- Project Payments	-	338,527,186.77	-	-	338,527,186.77	308,816,622.64
Total	10,941,694.00	338,527,186.77	783,842.00	-	350,252,722.77	344,751,196.64
					-	
TOTAL(C)	53,404,890.00	338,527,186.77	783,842.00	-	392,715,918.77	406,143,356.64
NET BALANCE AS AT THE YEAR END(a+b-c)	272,278,602.00	331,395,911.38	29,652,221.00	-	633,326,734.38	608,771,768.63

Dr. ASHWANI KUMAR (Director General, ICFRE)

Dr. S.P. SINGH , (Dy. Director General, Admin., ICFRE)

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FOR P.K.SINGHAL & CO.,
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(P.K.SINGHAL)Partner
Chartered Accountant
Membership No. 73882
DATED: -17.11.2015
PLACE: DEHRADUN

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2015

Amount-(Rs)

SCHEDULE 4-SECURED LOANS AND BORROWINGS:	CURRENT YEAR 31.03.2015		PREVIOUS YEAR 31.03.2014	
	RS.	RS.	RS.	RS.
1. Central Government	-	-	-	-
2. State Government(Specify)	-	-	-	-
3. Financial Institutions				
a) Term Loans	-	-	-	-
b) Interest accrued and due	-	-	-	-
4. Banks:				
a) Term Loans	-	-	-	-
-Interest accrued and due	-	-	-	-
b) Other Loans(specify)	-	-	-	-
-Interest accrued and due	-	-	-	-
5. Other institutions and Agencies	-	-	-	-
6. Debentures and Bonds	-	-	-	-
7. Others(specify)	-	-	-	-
TOTAL	-	-	-	-

Note: Amount due within one year

P.K. SINGHAL & CO. * Chartered Accountants *

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2015

Amount-(Rs)

Schedule 5-UNSECURED LOANS AND BORROWINGS	Current Year 31.03.2015 RS.	Previous Year 31.03.2014 RS.
1. Central Government	-	-
2. State Government	-	-
3. Financial Institutions	-	-
4. Banks:	-	-
a) Term Loans	-	-
b)Other Loans (specify)	-	-
5. Other Institutions and Agencies	-	-
6. Debentures and Bonds	-	-
7. Fixed Deposits	-	-
8. Others(specify)	-	-
TOTAL	-	-
Note: Amount due within one year		

SCHEDULE 6-DEFERRED CREDIT LIABILITIES:	Current Year 31.03.2015 RS.	Previous Year 31.03.2014 RS.
a) Acceptances secured by hypothecation of capital equipment and other	-	-
b) Others	-	-
TOTAL	-	-
Note: Amounts due within one year		

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2015

Amount-(Rs)

SCHEDULE 7-CURRENT LIABILITIES AND PROVISIONS	CURRENT YEAR 31.03.2015		PREVIOUS YEAR 31.03.2014	
	RS.	RS.	RS.	RS.
A.CURRENT LIABILITIES				
1.Acceptances	-	-	-	-
2.Sundry Creditors:	-	-	-	-
a)For Goods	-	-	-	-
b)Others	-	-	-	-
3.Advances Received	-	-	-	-
4.Interest accrued but not due on:	-	-	-	-
a)Secured Loans/borrowings	-	-	-	-
b)Unsecured Loans/borrowings	-	-	-	-
5.Statutory Liabilities:	-	-	-	-
a)Overdue	-	-	-	-
b)Others	-	-	-	-
6.Other Current Liabilities				
Security & EMD Account	12,859,663.20	12,859,663.20	19,113,567.20	19,113,567.20
Amount Payable to Controller, Pension Cell, ICFRE				
GPF Subscription/ Refund	621,242.00		(199,937.00)	
GSLIS	(15,071.00)		(14,518.00)	
Pension Contribution	6,668,439.00		(676,942.00)	
New Pension Scheme	(1,240,622.00)	6,033,988.00	1,184,963.00	293,566.00
Amount Payable to PAO (F), NEW DELHI				
GPF Subscription/ Refund	358,692.00		358,692.00	
CGEGIS	11,740.00		11,980.00	
Any Other Recovery	128,451.00	498,883.00	128,451.00	499,123.00
Amount Payable to Other Units				
Saving Fund	64,071.00		64,071.00	
Death Claim	44,013.00		44,013.00	
Advance Recovery	511.00		511.00	
Other	1,424,138.00		1,298,600.00	
CGEIS	(261.00)	1,532,472.00	1,031.00	1,408,226.00
Amount Payable to Others				
L.I.C.	4,246.00		4,116.00	
T.D.S./Service Tax/ Professionala Tax	(278,828.00)		(246,943.00)	
Payable to Controller ICFRE	15,794,923.00		3,394,572.00	
Misc. Recoveries	(7,067,737.00)		(4,281,126.00)	
Inter Unit Account	(2,261,949.68)	6,190,654.32	(21,981,363.68)	(23,110,744.68)
Salary Payable Account		73,718,176.00		62,483,636.00
TOTAL(A)		100,833,836.52		60,687,373.52
B.PROVISIONS				
1.For Taxation		-	-	-
2.Gratuity		-	-	-
3.Supernnuation/Pension		-	-	-
4.Accumulated Leave Encashment		-	-	-
5.Trade Warranties/Claims		-	-	-
6.Others(Specify)		-	-	-
TOTAL(B)		-	-	-
TOTAL(A+B)		100,833,836.52		60,687,373.52

P.K. SINGHAL & CO. * Chartered Accountants *

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2015

Amount-(Rs)

SCHEDULE 8 -FIXED ASSETS													
DESCRIPTION	GROSS BLOCK					DEPRICIATION						NET BLOCK	
	Cost valuation As at beginning of the year	Addition during the year before 30.09.2014	Addition during the year after 30.09.2014	Deductions during the year	Cost/valuation at the year-end	Rate of depreciation	As at the beginning of the year	On Additions during the year before 30.09.2014	On Additions during the year after 30.09.2014	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:													
a)Freehold	10,879,420.00	-	-	-	10,879,420.00	-	-	-	-	-	-	10,879,420.00	10,879,420.00
b)Leasehold	-	-	-	-	-	-	-	-	-	-	-	-	-
2.BUILDINGS:	-	-	-	-	-	-	-	-	-	-	-	-	-
a)On Freehold Land	1,075,485,057.84	-	91,768.00	-	1,075,576,825.84	0.05	50,741,638.22	51,237,170.98	2,294.20	-	101,981,103.40	973,595,722.44	1,024,743,419.62
b)On Leasehold Land	-	-	-	-	-	-	-	-	-	-	-	-	-
c)Ownership Flats/Premises	-	-	-	-	-	-	-	-	-	-	-	-	-
d)Superstructures on land not belonging to the entity	-	-	-	-	-	-	-	-	-	-	-	-	-
3.PLANT MACHINERY & EQUIPMENT		-	-	-	-	-	-	-	-	-	-	-	-
a) Scientific Equipment	214,607,467.66	3,054,912.00	3,844,622.00	-	221,507,001.66	0.15	29,002,922.57	28,149,027.01	288,346.65	-	57,440,296.23	164,066,705.43	184,605,268.09
b) I.T.Equipment	22,605,029.84	238,496.00	609,290.00	-	23,452,815.84	0.60	11,795,147.00	6,629,027.30	182,787.00	-	18,606,961.30	4,845,854.54	10,809,882.84
4.VEHICLES	11,893,337.11	-	-	-	11,893,337.11	0.15	1,784,000.57	1,516,400.48	-	-	3,300,401.05	8,592,936.06	10,109,336.54
5.FURNITURE,FIXTURES	19,522,009.27	(671.00)	306,953.00	-	19,828,291.27	0.10	1,699,418.85	1,782,191.94	15,347.65	-	3,496,958.44	16,331,332.83	17,822,590.42
6.OFFICE EQUIPMENT	82,796,759.70	623,888.00	1,244,075.00	-	84,664,722.70	0.15	12,133,349.73	10,842,986.25	93,305.63	-	23,069,641.60	61,595,081.10	71,662,686.97
7.COMPUTER/PERIPHERALS	-	-	-	-	-	-	-	-	-	-	-	-	-
8.ELECTRIC INSTALLATIONS	2,181,699.95	-	-	-	2,181,699.95	0.15	327,254.99	278,166.74	-	-	605,421.74	1,576,278.21	1,854,444.96
9.LIBRARY BOOKS	69,090,281.63	11,295.00	3,013,350.00	-	72,114,926.63	0.15	9,512,156.04	8,938,413.09	226,001.25	-	18,676,570.38	53,438,356.25	59,578,125.59
10.TUBEWELLS & W.SUPPLY	-	-	-	-	-	-	-	-	-	-	-	-	-
11.OTHER FIXED ASSETS	-	-	-	-	-	-	-	-	-	-	-	-	-
12.TOOLS & EQUIPMENTS	3,387,384.45	-	-	-	3,387,384.45	0.15	508,107.67	431,891.52	-	-	939,999.18	2,447,385.27	2,879,276.78
TOTAL OF CURRENT YEAR	1,512,448,447.45	3,927,920.00	9,110,058.00	-	1,525,486,425.45		117,503,995.64	109,805,275.32	808,082.38	-	228,117,353.33	1,297,369,072.12	1,394,944,451.81
PREVIOUS YEAR	1,350,251,108.45	29,076,930.00	133,120,409.00	-	1,512,448,447.45		109,118,558.84	4,090,971.20	4,294,465.00	-	117,503,995.64	1,394,944,451.81	1,241,132,549.61
B.CAPITAL WORK-IN-PROGRESS	-	-		-	-		-	-		-	-		-
TOTAL	1,512,448,447.45	3,927,920.00	9,110,058.00	-	1,525,486,425.45		117,503,995.64	109,805,275.32	808,082.38	-	228,117,353.33	1,297,369,072.12	1,394,944,451.81
(Note to be given as to cost of assets on hire purchase basis included above)													

Dr. ASHWANI KUMAR (Director General, ICFRE)

SMT. VIJAY DHASMANA (Under Secretary, Budget, ICFRE)

Dr. S.P. SINGH (Dy. Director General, Admin., ICFRE)

SMT. NEENA KHANDEKAR, (Asstt. Director General, Admin., ICFRE)

"AS PER OUR SEPARATE REPORT OF EVEN DATE ANNEXED"
FOR P.K.SINGHAL & CO.,
CHARTERED ACCOUNTANTS

(P.K.SINGHAL) Partner
Chartered Accountant
Membership No. 73882
DATED: 17/11/2015
PLACE: DEHRADUN

P.K. SINGHAL & CO. * Chartered Accountants *

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2015

Amount-(Rs)

SCHEDULE - 9 INVESTMENTS FROM EARMARKED/ENDOWMENT FUNDS	CURRENT YEAR 31.03.2015	PREVIOUS YEAR 31.03.2014
	RS.	RS.
1. In Government Securities		
> F.D.R.(For One Time Special Grant)	80,000,000.00	80,000,000.00
> 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	80,000,000.00	80,000,000.00

SCHEDULE 10- INVESTMENTS-OTHERS	CURRENT YEAR 31.03.2015	PREVIOUS YEAR 31.03.2014
	RS.	RS.
1. In Government Securities		
> 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	-	-

P.K. SINGHAL & CO. * Chartered Accountants *

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2015

Amount-(Rs)

SCHEDULE - 11 CURRENT ASSETS,LOANS, ADVANCES ETC.	CURRENT YEAR 31.03.2015		PREVIOUS YEAR 31.03.2014	
	RS.	RS.	RS.	RS.
A.CURRENT ASSETS:				
1.INVENTORIES:				
> Stores and Spares	-	-		
> Loose Tools	-	-		
> Stock in trade	-	-		
> Finished Goods	-	-		
> Work-In- Progress	-	-		
> Raw Materials	-	-		
2.Sundry Debtors:	-	-		
> Debts Outstanding for a period exceeding six months	-	-		
> Others				
4.Cash balances in hand(including cheques/drafts and	**412,171.00**	412,171.00	432,124.00	432,124.00
5.Bank Balances:				
a)With Scheduled Banks:				
> On Current Accounts	416,496,682.84		472,008,961.31	
> On Deposit Accounts	177,942,868.00	594,439,550.84	4,700,000.00	476,708,961.31
> On Savings Accounts				
b)With non-Scheduled Banks:				
> On Current Accounts	-		-	
> On Deposit Accounts(includes margin money)	-			
> On Savings Accounts	-	-	-	-
6.Post Office-Savings Accounts	-	-	-	-
TOTAL (A)		594,851,721.84	-	477,141,085.31

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH, 2015

Amount-(Rs)

SCHEDULE 11 – (A) CURRENT ASSETS,LOANS,ADVANCES ETC.(Cont.)	CURRENT YEAR 31.03.2015		PREVIOUS YEAR	31.03.2014
	RS.	RS.	RS.	RS.
B.LOANS,ADVANCES AND OTHER ASSETS				
1. Loans:				
a) Staff Advance				
Forest Advance	793,245.00		1,777,603.00	
Festival Advance	2,673,646.00		3,396,601.00	
Car advance	393,126.00		426,726.00	
Scooter Advance	(64,030.00)		(29,899.00)	
Cycle Advance	253,326.00		253,176.00	
House Building Advance (HBA)	1,928,803.00		2,800,943.00	
TA Advance	(225,595.00)		1,686,300.00	
LTC Advance	343,941.00		956,807.00	
TTA Advance	1,421,777.00		1,108,348.00	
Medical Advance	(88,883.00)		666,752.00	
Pay Advance	914,689.00		797,389.00	
Amount Recoverable	-		149,308.00	
Computer Advance	495,814.00		510,498.00	
Etc. (Please specify)	265,529.00	9,105,388.00	240,089.00	14,740,641.00
b) Other Entities engaged in activities/ objectives similar to that of the Entity				
c) Other(Specify)				
2. Advances and other amounts recoverable in cash or in kind or for value to be received:				
a) On Capital Account				
CPWD	7,073,685.00		6,491,685.00	
CCU -(North East)	117,917,000.00		113,917,000.00	
CCU -(Plan Account)	1,914,334.00		1,914,334.00	
CCU -(Plan OTSG A/c))	20,200,000.00		20,200,000.00	
KVS Account	-		8,270.00	
SCIENTIFIC EQUIPMENTS	186,737.00	147,291,756.00	151,747.00	142,683,036.00
b) Prepayments	-			
c) Others	-	-		
Amount Recoverable From Controller, Pension Cell, ICFRE				
GPF Advance	723,649.00		280,109.00	
DCRG	1,814,687.00		6,937,611.00	
Provisional Pension	348,803.00		348,803.00	
GPF Part/Final Payment	3,848,899.00		4,179,409.00	
ICFRE PHS	(2,507,580.00)		466,410.00	
Gratuity	-	4,228,458.00	-	12,212,342.00
Amount Recoverable From PAO (F) NEW DELHI				
GPF Advance	489,947.00		521,802.00	
CGEGIS	965,296.00		965,296.00	
DCRG	526,855.00		526,855.00	
Provisional Pension	282,136.00		282,136.00	
GPF Part/Final Payment	322,508.00	2,586,742.00	322,508.00	2,618,597.00
Amount Recoverable From Other Units				
DDOs (Premium for the moth of March)	-		-	
Deputation & Others	-		-	
Service Tax	-		-	
GPF Subscription	13,514.00	13,514.00	13,514.00	13,514.00
3. Income Accrued:				
a) On Investments from Earmarked/Endowments Funds	-		-	
b) On Investments-Others	-		-	
c) On Loans and Advances	2,083,590.00		2,083,590.00	
d) Others (includes income due unrealized - Rs.....)	-	2,083,590.00	-	2,083,590.00
4. Claims Receivable				
TOTAL(B)		**165,309,448.00**		**174,351,720.00**
TOTAL(A+B)		**760,161,169.84**		**651,492,805.31**

P.K. SINGHAL & CO. ★ Chartered Accountants ★

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT

FOR THE YEAR ENDING 31ST MARCH, 2015

SCHEDULE 12 – INCOME FROM SALES/SERVICES	CURRENT YEAR 31.03.2015	PREVIOUS YEAR 31.03.2014
	RS.	RS.
1) Income from Sales		
a) Sale of Finished Goods	-	-
b) Sale of Raw Material	-	-
c) Sale of Scraps	-	-
2) Income from Services		
a) Labour and Processing Charges	-	-
b) Professional /Consultancy Services	-	
c) Agency Commission and Brokerage	-	-
d) Maintenance Services(Equipment/Property)	-	-
e) Others(Specify)	-	-
f) Shairing Cost received from Other Users of KV	1,089,000.00	2,952,092.00
TOTAL	**1,089,000.00**	**2,952,092.00**

SCHEDULE 13 –GRANTS/SUBSIDIES	CURRENT YEAR 31.03.2015	PREVIOUS YEAR 31.03.2014
		RS.
(Irrevocable Grants& Subsidies Received)		
1) Central Government		
- To Plan (GC-General)	1,031,350,000.00	917,737,864.00
- To Non Plan (GC-General-KV)	260,000,000.00	241,000,000.00
- To North East (GC-General)	117,250,000.00	55,000,000.00
2) State Government	-	-
3) Government Agencies	-	-
4) Institutions/Welfare Bodies	-	-
5) International Organisations	-	-
6) Others(Specify)	-	-
TOTAL	**1,408,600,000.00**	**1,213,737,864.00**

Chartered Accountants * P.K. SINGHAL & CO.*

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH, 2015

Amount-(Rs)

SCHEDULE 14 -FEES/SUBSCRIPTION	CURRENT YEAR 31.03.2015	PREVIOUS YEAR 31.03.2014
	RS.	RS.
1) Entrance Fees	-	-
2) Annual Fees/Subscription	-	-
3) Seminar/Program Fees	-	-
4) Consultancy Fees	126,827.00	9,000
5) Others(specify)	-	-
TOTAL	126,827.00	9,000

Note – Accounting Policies towards each item are to be disclosed

SCHEDULE 15-INCOME FROM INVESTMENTS	Investment from Earmarked Fund		Investment -Others	
(Income on Invest .from Earmarked/Endowment funds transferred to Funds)	CURRENT YEAR 31.03.2015	PREVIOUS YEAR 31.03.2014	CURRENT YEAR 31.03.2015	PREVIOUS YEAR 31.03.2014
	RS.	RS.	RS.	RS.
1) Interest				
a) On Govt. Securities	-	-	-	-
b) Other Bonds/Debentures	-	-	-	-
2) Dividends:		-	-	-
a) On Shares	-	-	-	-
b) On Mutual Fund Securities	-	-	-	-
3) Rents	-	-	-	-
4) Others(Specify)	-	-	-	-
			-	-
		-		
TOTAL	-	-	-	-
TRANSFERRED TO EARMARKED/ENDOWMENT FUNDS				

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH, 2015

(Amount – Rs.)

SCHEDULE 16 – INCOME FROM ROYALTY, PUBLICATION ETC.	CURRENT YEAR 31.03.2015	PREVIOUS YEAR 31.03.2014
	RS.	RS.
1) Income from Royalty	-	-
2) Income from Publications	772,189	-
3) Others (specify)		-
4) Revenue Received (House Licence Fees,Guest House,Mandap etc.		-
TOTAL	772,189	-

SCHEDULE 17 – INTEREST EARNED ETC.	CURRENT YEAR 31.03.2015	PREVIOUS YEAR 31.03.2014
	RS.	RS.
1) On Term Deposits:		
a) With Scheduled Banks	-	1,196,755
b) With Non-Scheduled Banks	-	-
c) With Institutions	-	-
d) Others	-	-
2) On Saving Accounts:		-
a) With Scheduled Banks	22,765,493	-
b) With Non–Scheduled Banks	-	-
c) Post Office Savings Accounts	-	-
d) Others	-	-
3) On Loans:		-
i) Interest accrued during the year		
a) Employees/Staff	-	-
ii) Interest earned during the year	-	
a) Employees/Staff	-	-
4) Interest on Debtors and Other Receivables	-	-
TOTAL	22,765,493	1,196,755

Note – Tax deducted at source to be indicated

Chartered Accountants * P.K. SINGHAL & CO.*

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH, 2015

(Amount – Rs.)

SCHEDULE 18 – OTHER INCOME /PRIOR PERIOD ITEMS:	CURRENT YEAR 31.03.2015		PREVIOUS YEAR 31.03.2014
	RS.	RS.	RS.
1) Profit on Sale/disposal of Assets:			
a) Owned assets		-	-
b) Assets acquired out of grants, or received free of cost		-	-
2) Export Incentives realized		-	-
3) Fees for Miscellaneous Services		-	-
4) Miscellaneous Income		65,440,359.00	105,679,449.15
5)Prior Period Income		-	
(i) Accrued interest income of earlier years		-	-
TOTAL		65,440,359.00	105,679,449.15

SCHEDULE 19 – INCREASE/(DECREASE) IN STOCK OF FINISHED GOODS & WORK IN PROGRESS	CURRENT YEAR 31.03.2015		PREVIOUS YEAR 31.03.2014
	RS.	RS.	RS.
a) Closing stock			
- Finished Goods		-	-
- Work-in-progress		-	-
b) Less: Opening Stock			
- Finished Goods		-	-
- Work-in-progress		-	-
NET INCREASE(DECREASE) [a-b]		-	-

SCHEDULE 20 – ESTABLISHMENT EXPENSES	CURRENT YEAR 31.03.2015		PREVIOUS YEAR 31.03.2014
	RS.	RS.	RS.
a) Salaries and Wages			
NON PLAN (General Component-General)			
By Salaries	204,151,067.00		210,912,127.00
By Grant to KV (Salaries)	45,000,000.00	249,151,067.00	41,554,847.18
Plan (General Components-General)			
By Salaries	734,782,261.00		-
By Salary North East	81,931,164.00	816,713,425.00	650,991,397.00
\		-	-
c) Contribution to Provident Fund		-	-
d) Contribution to other Fund (specify)			
Revenue Paid to Pension Cell ICFRE out of Own Revenue		84,704,745.18	124,628,849.39
e) Staff Welfare Expenses		-	-
f) Expenses on Employees' Retirement and Terminal Benefits		-	-
g) Other (specify) Shairing cost		816,250.00	-
h) Salary paid in excess than provision of previous year		-	-
TOTAL		1,151,385,487.18	1,028,087,220.57

P.K. SINGHAL & CO. Chartered Accountants

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH, 2015

(Amount - Rs.)

SCHEDULE 21 - OTHER ADMINISTRATIVE EXPENSES ETC.	CURRENT YEAR 31.03.2015		PREVIOUS YEAR 31.03.2014
	RS.	RS.	RS.
a) Purchases			
b) Labour and processing expenses			
c) Cartage and Carriage Inwards			
d) Electricity and power		32,095,009.00	34,220,725.00
e) Water Charges		1,833,369.00	1,744,344.00
f) Insurance			
g) Repairs and maintenance			
> Minor Works/Maintenance	18,441,915.60		34,128,671.00
> M & S (Lab Contingencies)	6,547,155.00	24,989,070.60	7,077,328.00
h) Excise Duty		-	
i) Rent, Rates and Taxes			
> Rent building / Equipment	1,928,683.00		551,387.00
> Municipal Tax	-	1,928,683.00	594,147.00
j) Vehicles Running and maintenance			
> Fuel	4,244,814.00		5,795,065.00
> Repair	1,783,899.00		2,403,270.00
> Road Taxes / Insurance	1,151,009.00	7,179,722.00	1,982,651.00
k) Postage, Telephone & Communication Charges			
> Telephone charges	3,102,605.00		2,594,810.72
> Postal / Stamp Charges	347,184.00	3,449,789.00	1,030,257.00
l) Printing and Stationary			
> Printings & Publication	1,880,215.00		2,365,812.00
> Stationery	1,781,131.00	3,661,346.00	1,926,435.00
m) Traveling and Conveyance Expenses			
> T.E. (Technical Staff)	6,562,794.00		8,524,838.00
> T.E. (Non Technical Staff)	4,220,294.00		4,628,610.00
> O.E. (Technical)	-	10,783,088.00	
n) Expenses on Seminar/Workshops			
> Seminar / Conference / HRD	357,652.00		2,161,443.00
> Extension - Normal	478,706.00		1,539,113.00
> V.V.K. & Demo Villages	246,596.00		1,929,634.00
> Direct to Consumer Project	97,854.00		499,762.00
> DOE	-		-
> Field Research Expenses	23,687,791.00	24,868,599.00	37,502,661.00
o) Subscription Expenses			
p) Expenses on fees			
> Fellowship/Scholarship/cash Awards		13,830,785.00	15,008,299.00
q) Auditors Remuneration		114,045.00	89,888.00
r) Hospitality Expenses		-	
s) Professional Charges		1,691,387.00	1,498,348.00
t) Provisions for Bad and Doubtful Debts/ Advances		-	
u) Irrecoverable Balances Written-off		-	
v) Packing Charges		-	
w) Freight and Forwarding Expenses		-	
x) Distribution Expenses		-	
y) Advertisement and Publicity		1,188,893.00	1,386,181.00
z) Maintenance of Equipments			
> Scientific	869,042.00		1,593,442.00
> Office	14,735,733.00		13,853,064.00
> I.T. Equipments / Services	1,304,130.00		
> Building	-	16,908,905.00	1,029,114.00
za) Others (specify)		100.00	1,147,680.00
zb) Contingency Expenditure		102,521,423.51	73,221,282.39
zc) Medicines / X-ray		9,023,481.00	6,928,600.00
zd) Liveries		58,649.00	105,971.00
ze) Newspaper Bill		653,500.00	498,358.00
zf) North East Expenditure		26,545,482.00	50,174,220.50
TOTAL		283,325,326.11	319,735,411.61

P.C. SINGHAL & CO. Chartered Accountants

ANNEXURE OF PLAN NORTH EAST EXPENDITURE

FOR THE YEAR ENDING 31.03.2015

PARTICULARS	AMOUNT RS.
By Salaries (Technical Staff)	-
By Salaries (Non Technical Staff)	-
By Salaries (Research KVS)	-
	-
Plan (General Components)	-
By Salaries (Technical Staff)	57,272,596.00
By Salaries (Non Technical Staff)	18,789,397.00
By T.E. (Technical Staff)	1,307,988.00
By T.E. (Non Technical Staff)	1,353,911.00
By O.E. (Technical)	-
Maintenance of Vehicle	-
- Fuel	380,468.00
- Repair	684,986.00
- Road Taxes / Insurance	162,158.00
Electricity Charges	1,556,085.00
Telephone charges	54,354.00
Maintenance of Equipments	-
- Scientific	60,909.00
- Office	151,148.00
- I.T. Equipments / Services	275,251.00
- Buildings	339,058.00
Others	
- Water Charges	58,945.00
- Stationery	225,434.00
- Contingency Expenditure	8,995,028.00
- Legal / Consultancy charges	101,200.00
- Municipal Tax	-
- Medicines / X-ray	-
- Liveries	-
- Postal / Stamp Charges	469,988.00
- Advertisement	175,485.00
- Seminar / Conference / HRD	1,159,979.00
- Newspaper Bill	89,435.00
- Extension -Normal	1,115,589.00
- V.V.K. & Demo Villages	466,349.00
- Direct to Cunsumers Project	939,937.00
- Rent building / Equipment	-
Plan (Research)	
By Fellowship/Scholarship/cash Awards	2,395,711.00
Printings & Publication	172,766.00
Field Research Expenses	1,572,514.00
By M & S (Lab Contingencies)	1,083,246.00
By Minor Works/Maintenance	1,197,560.00
Conveyance Advances	-
HBA	-
TOTAL:	**102,607,475.00**

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

SCHEDULES FORMING PART OF INCOME EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH, 2015

(Amount – Rs.)

SCHEDULE 22 – EXPENDITURE ON GRANTS, SUBSIDIES ETC..	CURRENT YEAR 31.03.2015	PREVIOUS YEAR 31.03.2014
	RS.	RS.
a) Grants given to Institutions/Organisations		
> Grants to Universities	819,739	758,558
b) Subsidies given to Institution/Organisations		
TOTAL	819,739	758,558

SCHEDULE 23 – INTEREST.	CURRENT YEAR 31.03.2015	PREVIOUS YEAR 31.03.2014
	RS.	RS.
a) On Fixed Loans	-	-
b) On Other Loans (including Bank Charges)	1,365.00	-
c) Other (specify)		
TOTAL	1,365.00	-

P.K. SINGHAL & CO. * Chartered Accountants *

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN
RECEIPT & PAYMENT ACCOUNT FOR THE YEAR ENDING 31st, MARCH, 2015

RECEIPTS	AMOUNT RS.	T. AMOUNT RS.	PAYMENTS	AMOUNT RS.	T. AMOUNT RS.
I. Opening Balances			**I. Expenses**		
a) Cash in hand	432,124.00		a) Establishment Expenses	1,055,252,952.00	
b) Bank Balances			b) Administrative Expenses (Corresponding to Schedule 21)	259,443,108.11	
i) Incurrent accounts	472,008,961.99		c) Expenditure On Grant Subsidy Etc(Corresponding to Schedule 22	819,739.00	1,315,515,799.11
ii) In deposit accounts	84,700,000.00	557,141,085.99	**II. Payments made against funds for various projects**	-	
			Expenditure incurred out of one time special grant	53,404,890.00	
II. Grants Received			Expenditure on Interest Corpus Fund	783,842.00	
a) From Government of India			Expenditure on various project	338,527,186.77	392,715,918.77
Plan (G C-General) Project /Revenue	1,031,350,000.00		**III. Investments and deposits made**		
Non Plan (GC-General)	260,000,000.00		a) Out of Earmarked/ Endowment funds	-	-
North East (General Component)	117,250,000.00		b) Out of Own Funds (Investments-Others)		
One Time Special Grant	-	1,408,600,000.00	**IV. Expenditure on Fixed Assets & Capital Work-in-Progress**		
Plan (Research/Creation of Assets)	11,250,000.00		a) Purchase of Fixed Assets		
One Time Special Grant (Capital Assets)	70,882,000.00	82,132,000.00	Scientific Equipments	6,899,534.00	
b) From State Government		-	Office Equipments	1,867,963.00	
c) From other sources (Project Receipts)		337,133,925.15	I.T. Equipments/Services	847,786.00	
III. Income on Investments from		-	Tools & Equipment	-	
a) Earmarked/Endow.Fund		-	Furniture & Fixture	306,282.00	
b) Own Funds (Oth. Investments)		-	Books & Journals	3,024,645.00	
IV. Interest Received			Vehicles	-	
Interest Received from Schedule Banks		9254959	Land	-	
Other Receipts - kvs		8,270.00	Road and Buildings	91,768.00	13,037,978.00
V. Other Income (Specify) - ICFRE - PHS		-	b) Expenditure on North East Plan		23,883,583.00
VI. Amount Borrowed			**V. Refund of surplus money/Loans**		-
VII. Any other receipts (give details)			**VI. Finance Charges (Interests)**		-
Revenue Receipt Payable to own Revenue Account No.	136,193,748.18		**VII. Other Payments (Specify)**		
Revenue Receipt payble to D.G. ICFRE	68,989,891.26		Revenue Received paid to own Revenue Account No.	34,688,529.00	
Securities / EMD (Plan (GC)	7,116,934.00		Revenue Receipt paid to D.G. ICFRE	86,496,928.68	
			Revenue Receipt paid to Controller ICFRE	84,704,745.18	
Shairing Cost Received from Other users	1,089,000.00		EMD/Security Refunded	13,370,838.00	
Reimbursement from PAO (F) New Delhi	1,462,212.00		Sharing Cost	193,250.00	
Reimbursement from Controller, ICFRE	87,781,517.00		**Advance Paid**		
Recoveries from Staff on behalf of PAO(F) New Delhi	1,865,399.00		> CCU/ CPWD	4,582,000.00	
Receipt from Staff on behalf of other Office	9,292,987.00		> Scientific Equipments	34,990.00	
Recoveries from Staff on Behalf of Controller ICFRE	165,319,381.00		Payments made on Behalf of PAO(F) New Delhi	1,430,357.00	
Recoveries of Advances from Staff on behalf of ICFRE	89,571,725.00		Payments made on Behalf of the Controller ICFRE	79,797,633.00	
Recoveries from Staff on behalf of Others	70,383,954.00		Payment made to PAO (F) on behalf of Staff	1,865,639.00	
Inter Unit Transactions	155,720,253.00		Payments made to other offices on behalf of Staff	9,168,741.00	
Recovered from AO FRI from Revenue	-	794,787,001.44	Payments to Controller, ICFRE on Behalf of the Staff	159,578,959.00	
Corpus Fund			Advances paid to Staff on behalf of ICFRE	83,936,472.00	
Advance Account CPWD		-	Payments made to other Offices on behalf of staff	73,202,320.00	
		-	Inter Unit Transactions	136,000,839.00	769,052,240.86
			VIII. Closing Balances		
			a) Cash in hand	412,171.00	
			b) Bank Balances (In Current/Saving Account)	416,496,682.84	
			c) Bank Balances (In Deposit Account)	257,942,868.00	674,851,721.84
TOTAL		3,189,057,241.58	**TOTAL**		3,189,057,241.58

Dr. ASHWANI KUMAR (Director General, ICFRE)

SMT. NEENA KHANDEKAR, (Asstt. Director General, Admin., ICFRE)

Dr. S.P. SINGH (Dy. Director General, Admin., ICFRE)

SMT. VIJAY DHASMANA (Under Secretary, I

AS PER OUR SEPARATE REPORT OF EVEN DATE ANNEXED

FOR P.K.SINGHAL & ASSOCIATES.,
CHARTERED ACCOUNTANTS

(P.K.SINGHAL Partner
Chartered Accountant
Membership No. 73882
DATED: 17TH NOVEMBER, 2015

P.K. SINGHAL & CO. * Chartered Accountants *

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

RECEIPTS & PAYMENTS ACCOUNT FOR THE YEAR ENDING 31st March 2015

RECEIPTS	AMOUNT	TOTAL AMOUNT	PAYMENTS	AMOUNT	TOTAL AMOUNT
OPENING BALANCE AS ON 1-4-2014			**NON PLAN**		
			By Salaries (Technical Staff)	121,760,297.00	
To Cash in Hand			By Salaries (Non Technical Staff)	90,552,390.00	
Name of Component	-		By Salaries (Research KVS)	45,000,000.00	
Plant (GC)	395,656.00		By Salaries sharing cost (KVS)	623,000.00	**257,935,687.00**
Plan (Research)	-		**Plan (General Components)**		
Non-Plan (GC)	-		By Salaries (Technical Staff)	480,644,011.00	
North East	36,468.00	**432,124.00**	By Salaries (Non Technical Staff)	240,611,261.00	
			By T.E. (Technical Staff)	6,562,794.00	
			By T.E. (Non Technical Staff)	4,220,294.00	**732,038,360.00**
To Cash at Bank			**PLAN (NE)**		
A/c No. & Name of Component			By Salaries (Technical Staff)	57,272,596.00	
Plant (GC)	421,073,815.99		By Salaries (Non Technical Staff)	18,789,397.00	
Plan (Research)	1,090,667.00		By T.E. (Technical Staff)	1,307,988.00	
Non-Plan (GC)	29,660,623.00		By T.E. (Non Technical Staff)	1,353,911.00	
			By Salaries (Technical Staff) PLAN	-	**78,723,892.00**
Non Plant (KVS)	534,807.00		Maintenance of Vehicle	-	
North East	19,649,049.00		- Fuel	4,244,814.00	
To Earnest Money	-	**472,008,961.99**	- Repair	1,783,899.00	
			- Road Taxes / Insurance	1,151,009.00	
To FDRs			Electricity Charges	32,095,009.00	
A/c No. & Name of Component	-		Telephone charges	3,102,605.00	
Plant (GC)	84,700,000.00		Maintenance of Equipments	-	
Plan (Research)	-		- Scientific	869,042.00	
LC Account	-		- Office	14,735,733.00	
North East - LC Account	-	**84,700,000.00**	- I.T. Equipments / Services	1,304,130.00	
			- Building	-	
Grants-in-Aid			Others		
To Plan (Salary)	770,000,000.00		- Water Charges	1,833,369.00	
			- Consumables M & S	849,598.00	
Less Paid to Centre	-		- Bank Charges	100.00	
To Plan (General Component)	261,350,000.00		- Stationery	1,781,131.00	
Less Paid to Centre	-		- Contingency Expenditure	102,521,423.51	
To Plan (Creation of Assets)	11,250,000.00		- Audit Fees	114,045.00	
Less Paid to Centre	-		- Legal / Consultancy charges	1,691,387.00	
To Non Plan (Salary)	215,000,000.00		- Municipal Tax	-	
To Non-Plan (KVS)	45,000,000.00		- Medicines / X-ray	9,023,481.00	
To North East (General Component)	32,250,000.00		- Liveries	58,649.00	
To North East (Salaries)	85,000,000.00	**1,419,850,000.00**	- Postal / Stamp Charges	347,184.00	
			- Advertisement	1,188,893.00	
			- Seminar / Conference / HRD	357,652.00	
To Sharing Cost		**1,089,000.00**	- Newspaper Bill	653,500.00	
To Revenue Receipt From D.D.Os		-	- Extension - Normal	478,706.00	
To Revenue Earn Payable to DGICFRE		68,989,891.26	- V.V.K. & Demo Villages	246,596.00	
To Amount Received from DG ICFRE Revenue		-	- Direct to Consumers Project	97,854.00	
			- Rent building / Equipment	1,928,683.00	
			- DOE	-	**182,458,492.51**
To One Time Special Grant (GC)		-	**Plan (Research)**		
To One Time Special Grant (Assets)		70,882,000.00	By Fellowship/Scholarship/cash Awards	13,830,785.00	
			Printings & Publication	1,880,215.00	
			Field Research Expenses	23,687,791.00	
			By M & M (Lab Contingencies)	5,109,466.00	
			By Minor Works/Maintenance	18,441,915.60	
			Conveyance Advances	-	
			HBA	-	
			By Building & Roads	-	
			Others Consumable	588,091.00	**63,538,263.60**
			Expenditure on OTS Grant (Renovation)		**10,941,694.00**
			Expenditure on OTS Grant (Assets)		**42,463,196.00**

To Chair of Excellance (Interest on OTSG)	9,254,959.00	**9,254,959.00**	Expenditure on Chair of Excellance		**783,842.00**
			By Equipments		
			Building	**91,768.00**	
			Scientific Equipments	**6,090,222.00**	
			Office Equipments	**1,804,713.00**	
			I.T. Equipments/Services	**774,836.00**	
			Tools & Equipment	-	
			Furniture & Fixture	**293,482.00**	
			Books & Journals	**2,402,199.00**	
			Vehicles	-	**11,457,220.00**
			North East Plan		
			Scientific Equipments	**809,312.00**	
			Office Equipment	**63,250.00**	
			I.T. Equipments/Services	**72,950.00**	
			Furniture & Fixture	**12,800.00**	
			Books & Journals	**622,446.00**	
			By Building & Roads	-	
			Expenses incurred	23,883,583.00	**25,464,341.00**
			By Grants to Universities		**819,739.00**
			By Advance Payments		
			CCU -North East	4,000,000.00	
			CCU -North East (Plan Account)	-	
			CCU-OTSG(Creation of Assets)	-	
			CPWD	582,000.00	
			KVS A/c	-	**4,582,000.00**
KVS Account	8,270.00	8,270.00			
			By Advance Payments		
			Scientific Equipments	34,990.00	
			Office Equipments	-	
			I T Equipments	-	
			Furniture & Fixture	-	
			Furniture & Fixture	-	**34,990.00**
To Revenue Receipt Payable to own			Interest on TDS		-
Revenue Account No.		**136,193,748.18**			
			To Revenue Receipt paid to own		
			Revenue Account No.		**34,688,529.00**
To Securities / EMD			By Revenue Receipt paid to D.G. ICFRE		**86,496,928.68**
Plan (GC)	7,116,934.00		By Revenue Receipt paid to Controller ICFRE		**84,704,745.18**
Plan (Res)	-	**7,116,934.00**	By EMD/Security Refunded		**13,370,838.00**
			Bank Charges		1,365.00
GRANT TO UNIVERSITY:		-			
To Reimbursement from PAO (F) New			**By Payments made on Behalf of**		
Delhi			**PAO (F) New Delhi**		
GPF Advance	1,462,212.00		GPF Advance	1,430,357.00	
CGEGIS	-		CGEGIS	-	
DCRG	-		DCRG	-	
Provisional Pension	-		Provisional Pension	-	
GPF Part/Final Payments (Group'D')	-	**1,462,212.00**	GPF Part/Final Payments (Group'D')	-	**1,430,357.00**
To Reimbursement from Controller,			**By Payments made on Behalf of the**		
ICFRE			**Controller, ICFRE**		
GPF Advance	30,610,102.00		GPF Advance	31,273,642.00	
DCRG	46,159,243.00		DCRG	41,036,319.00	
Provisional Pension	-		Provisional Pension	-	
GPF Part/Final Payments (Group'D')	3,209,407.00		ICFRE PHS	557,591.00	
GPF Advance Gr,D	220,000.00		GPF Part/Final Payments (Group'D')	2,878,897.00	
ICFRE PHS	3,531,581.00		Gratuity	4,051,184.00	**79,797,633.00**
Gratuity	4,051,184.00	**87,781,517.00**			

To Recoveries from Staff on behalf of PAO (F), New Delhi			**By Payment made to PAO (F) on behalf of Staff**		
GPF Subscription	1,551,860.00		GPF Subscription	1,551,860.00	
Refund of GPF Advance	288,159.00		Refund of GPF Advance	288,159.00	
CGEGIS	13,380.00		CGEGIS	13,620.00	
House Building Advance	-		House Building Advance	-	
Interest on House Building Advance	-		Interest on House Building Advance	-	
Car Advance	12,000.00		Car Advance	12,000.00	
Interest of Car Advance	-		Interest of Car Advance	-	
Scooter Advance	-		Scooter Advance	-	
Interest of Scooter Advance	-		Interest of Scooter Advance	-	
Etc. (Please specify)	-	**1,865,399.00**	Etc. (Please specify)	-	**1,865,639.00**
To Receipt from Staff on behalf of other Offices			**By Payments made to other offices on Behalf of Staff**		
GPF Subscription / Refund	8,059,505.00		GPF Subscription / Refund	8,054,717.00	
CGEGIS	109,688.00		CGEGIS	110,980.00	
H B A	148,000.00		H B A	148,000.00	
Interest on House Building Advance	57,049.00		Interest on House Building Advance	57,049.00	
Car Advance	-		Car Advance	-	
Interest of Car Advance	13,000.00		Interest of Car Advance	13,000.00	
Scooter Advance	-		Scooter Advance	-	
Interest of Scooter Advance	-		Interest of Scooter Advance	-	
LIC	-		LIC	-	
Etc. (Please specify)	905,745.00	**9,292,987.00**	Etc. (Please specify)	784,995.00	**9,168,741.00**
To Recoveries from Staff on Behalf of Controller, ICFRE			**By Payments to Controller, ICFRE on Behalf of the Staff**		
GPF Subscription	113,588,406.00		GPF Subscription	113,843,229.00	
Refund of GPF Advance	15,676,307.00		Refund of GPF Advance	14,600,305.00	
GSLIS	1,423,008.00		GSLIS	1,423,561.00	
Pension Contribution	22,538,152.00		Pension Contribution	15,192,771.00	
New Pension Scheme	7,714,205.00		New Pension Scheme	7,742,893.00	
Employer's Share	4,379,303.00	**165,319,381.00**	Employer's Share	6,776,200.00	**159,578,959.00**
RECEIPTS	**AMOUNT**	**TOTAL AMOUNT**	**PAYMENTS**	**AMOUNT**	**TOTAL AMOUNT**
To Recoveries of Advances from Staff on Behalf of, ICFRE			**By Advances paid to Staff**		
Forest Advance	48,937,348.00		Forest Advance	45,721,990.00	
Festival Advance	3,102,955.00		Festival Advance	4,611,000.00	
Car advance	39,000.00		Car advance	5,400.00	
Interest Car Advance	12,000.00		Interest Car Advance	12,000.00	
Scooter Advance	57,368.00		Scooter Advance	23,237.00	
Interest Scooter Advance	1,590.00		Interest Scooter Advance	1,590.00	
Cycle Advance	-		Cycle Advance	150.00	
Interest Cycle Advance	300.00		Interest Cycle Advance	300.00	
House Building Advance (HBA)	1,029,606.00		House Building Advance (HBA)	157,466.00	
Interest House Building Advance	87,291.00		Interest House Building Advance	47,484.00	
TA Advance	18,997,496.00		TA Advance	17,085,601.00	
LTC Advance	8,454,866.00		LTC Advance	7,842,000.00	
TTA Advance	1,334,190.00		TTA Advance	1,647,619.00	
Medical Advance	6,977,596.00		Medical Advance	6,221,961.00	
Pay Advance	176,869.00		Pay Advance	294,169.00	
Computer Advance	17,000.00		Computer Advance	2,316.00	
			House License Fee	37,495.00	
Etc. (Please specify)	346,250.00	**89,571,725.00**	Etc. (Please specify)	224,694.00	**83,936,472.00**

To Recoveries from Staff on behalf of Others			**By Payments made to other Offices on Behalf of Staff**		
By Receipts:			**By Payments:**		
By Recoveries Income Tax (Salary)	56,664,857.00		By Recoveries Income Tax (Salary)	56,691,872.00	
TDS (Contractor/Firms, Service Tax)	3,672,107.00		TDS (Contractor/Firms, Service Tax)	3,675,879.00	
Professional Tax	1,042,756.00		Professional Tax	1,043,854.00	
PPF	-		PPF	-	
LIC	4,039,009.00		LIC	4,038,879.00	
EMD / Securities	77,000.00		EMD / Securities	112,000.00	
Court Attachment	564,986.00		Court Attachment	594,653.00	
Hindi Translation	-		TDS DEDUCTED ON PROJECT RECEIPTS	-	
Quarter Rent	319,393.00		Quarter Rent	319,393.00	
Staff Association	19,832.00		Staff Association	13,560.00	
Etc. (Please specify)	3,984,014.00	**70,383,954.00**	Etc. (Please specify)	6,712,230.00	**73,202,320.00**
				-	-
Recovery from Revenue A/c		-	Any other Payment (Shairing Cost)		**193,250.00**
Inter Unit Receipts		**155,720,253.00**	Inter Unit Payment		**136,000,839.00**
			Other Misc. Transfer		-
To Project Receipts / Revenue Receipt		**337,133,925.15**	**By Project Payments/Revenue**		**338,527,186.77**
Amount Received by Controller ICFRE			**Amount paid by Controller ICFRE**		
Amount received from PAO (F) on account of GPF transfer		-	By GPF reimbursement to DDO's	-	
			By GPF Part Final payment	-	
			By GPF Final payment	-	
Amount received from Various DDO'S on account of GPF Subscription		-	Death Claims paid	-	
			Saving fund paid	-	
			Amount of premium to LIC for GSLIS Subscription	-	
Amount received from Others on account of refund of excess GPF Payments		-	Pensionary benefit paid	-	
			Reimbursement of DCRG, Pension to	-	
			Various DDO's	-	
			Amount paid to NSDL on a/c of New Pesion Sch	-	
			ISO Charges	-	
Closer of New Pension Accounts			Miscellenous Payments(GPF A/c)	-	-
Bank & FDR Interest		-			
Amount received on account of Saving			**By Closing Balance**		
Funds under GSLIS		-	Cash-in-hand	**412,171.00**	
Amount received on account of Death			Name of Component		
Claim under GSLIS		-	Cash at Bank with different institutes/units.		
Subscription from variuos DDOs		-	Plan (GC) / Revenue / Project	389,263,708.84	
Pro-rata Pensionary benefit received			Plan (North East)	24,660,284.00	
from PAO (F)		-	Plan (Research)		
Amount received from Various DDO's on		-	Non Plan A/c	2,571,883.00	
account of Pension Contribution			Non Plan A/c KVS)	807.00	
Amount recovere on account of ecvess			Name of Component		
payment of pension by bank		-	FDR's	257,942,868.00	
Amount received from other Departments			EMD		
on account of Pensionery benefits (LSPC)		-	L.C.Account		674,851,721.84
Govt. Securities		-			
FDR Interest / SB interest		-			
Misc.		-			
GRAND TOTAL:		**3,189,057,241.58**	**GRAND TOTAL:**		**3,189,057,241.58**

Dr. ASHWANI KUMAR (Director General, ICFRE)	"AS PER OUR SEPARATE REPORT OF EVEN DATE ANNEXED" FOR P.K.SINGHAL & CO., CHARTERED ACCOUNTANTS Chartered Accountant Membership No. 73882 DATED: - 17.11.2015 PLACE: DEHRADUN
Dr. S.P. SINGH , (Dy. Director General, Admin., ICFRE)	
SMT. NEENA KHANDEKAR, (Asstt. Director General, Admin., ICFRE)	
SMT. VIJAY DHASMANA (Under Secretary, Budget, ICFRE)	

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION
SCHEDULES FORMING PART OF ACCOUNTS
FOR THE YEAR ENDING 31ST MARCH 2015

SCHEDULE 25 SIGNIFICANT ACCOUNTING AND MANAGEMENT POLICIES.

1. **Method of Accounting**:- The financial statements have been prepared as of going concern under historical cost convention. Only salary has been recognized on accrual basis of accounting. The remaining items including TDS portion of Interest/Grant received, of the financial statement have been recognized on receipt/cash basis.

2. **Fixed Assets**:-

   (i) The fixed assets are carried at cost of acquisition or book value less accumulated depreciation.

   (ii) Depreciation is being charged in written down value basis and depreciation is routed through Income and Expenditure Account. For assets acquired after 30.09.2014, depreciation has been charged for half year only.

3. **Transaction in Foreign Exchange**:- Transaction in Foreign Currencies are recorded at exchange rates prevailing on the date of transaction.

4. **Employees Retirement Benefits**:- Pension, leave encashment etc. are being accounted on cash basis. Accordingly no provision for the same is being made in the books of Accounts.

DR ASHWANI KUMAR
(Director General, ICFRE)

Dr. S.P. SINGH,
(Dy. Director General [Admin], ICFRE)

Smt. NEENA KHANDEKAR
(Assistant Director General [Admin], ICFRE)

Smt. VIJAY DHASMANA
(Under Secretary [Admin], ICFRE)

FOR P. K. SINGHAL & CO.
CHARTERED ACCOUNTANTS

P. K. SINGHAL & CO. Chartered Accountants

PARTNER
Membership No.: 073882
Dated: 17.11.2015
Place: Dehradun

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION
SCHEDULES FORMING PART OF ACCOUNTS
FOR THE YEAR ENDING 31ST MARCH 2015

SCHEDULE:26 CONTINGENT LIABILITY AND NOTES ON ACCOUNTS:-

1. **Contingent Liabilities**:- No provision for contingent liabilities has been made in the books of accounts.

2. **Taxation**:- ICFRE is registered u/s 12AA of Income Tax Act, 1961 and exempt from Income Tax as per the provision of the act.

3. **Project Balance**:- The opening balance of units, balance outstanding under various projects and inter unit balances are subject to confirmation and reconciliation.

4. **Pension Fund**:- The amount recoverable from controller has been arrived on the basis of data produced by the units after reconciliation of the same with the books of the controller Pension Cell.

5. The advances given to external agencies such as KV is treated as expenditure in the year of advance itself irrespective of non-receipt of utilization certificate. Generally UCs are received in the next financial year.
   (a) Corresponding figures for the previous year have been regrouped/rearranged\rectified suitably as far as practicable in the new format of Financial Statement for the Central Autonomous Bodies. Figures have been regrouped/rounded off/adjusted.
   (b) GPF, Pension and GSLIS accounts are annexed at schedule 24.

6. The entries on accrual basis for salary have been incorporated in the financial statements at Head Office Level during Consolidation of Account.

7. The grant is recognized in the books of receipt basis. The grant received by the organization has been accounted for in following manners during the year:-
   (a) The grant under Plan (GC) "General", Non-Plan (GC) "General", "KV" and Plan (North-East) [GC] "General" amounting to total of **Rs.14086.00 Lacs** is routed through Income and Expenditure Accounts.
   (b) The grant received as contribution towards capital/corpus totaling **Rs.112.50 Lacs** (Plan & North-East) is directly transferred to Corpus Account in Balance Sheet.
   (c) The grant received as One Time Special Grant during the year of **Rs.708.82 Lacs** has been shown as One Time Special Grant under Earmarked/Endowment fund in the Balance Sheet.
   (d) Interest on Corpus Fund (OTSG) of **Rs.92,54,959/-** has been shown in Schedule 3 with Earmarked and Endowment Fund.

8. Schedule 1 to 26 are annexed to and from an integral part of the balance sheet as at 31.03.2015 and the Income and Expenditure Account for the year ended on that date.

DR ASHWANI KUMAR
(Director General, ICFRE)

Dr. S.P. SINGH,
(Dy. Director General [Admin], ICFRE)

Smt. NEENA KHANDEKAR
(Assistant Director General [Admin], ICFRE)

Smt. VIJAY DHASMANA
(Under Secretary [Admin], ICFRE)

FOR P. K. SINGHAL & CO.
CHARTEREDACCOUNTANTS

PARTNER
Membership No.: 073882
Dated: 17.11.2015
Place: Dehradun

P.K. SINGHAL & CO. Chartered Accountants

P. K. Singhal & Co.
Chartered Accountants

E-24, IInd Floor, Jawahar Park,
Laxmi Nagar, Delhi-110092
Ph. : 011-22013773, Fax: 011-22013772
Mob. 09313088386

AUDITORS' REPORT

To,
The Members,
Indian Council of Forestry Research & Education.
Dehradun.

1. We have audited the attached Balance Sheet of Indian Council of Forestry Research & Educations at 31st March, 2015 and the Income & Expenditure Account with Receipts & Payment Account for the year ended on that date annexed thereto. The accounts of various units/projects of the Institute were consolidated while preparing the Financials Statements.

2. **MANAGEMENT'S RESPONSIBILITY FOR THE FINANCIAL STATEMENTS**

The Management is responsible for the preparation of these financial statements that give a true and fair view of the financial position and financial performance of the ICFRE. This responsibility includes the design, implementation and maintenance of internal control relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

3. **AUDITORS' RESPONSIBILITY**

Our responsibility is to express an opinion on these financial statements based on our audit. We have conducted our audit in accordance with the Standards on Auditing issued by the Institute of Chartered Accountants of India. Those Standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and the disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Council's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of the accounting policies used and the reasonableness of the accounting estimates made by the Management, as well as evaluating the overall presentation of the financial statements.

P.K. SINGHAL & CO. Chartered Accountants

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

P. K. Singhal & Co.
Chartered Accountants

E-24, IInd Floor, Jawahar Park,
Laxmi Nagar, Delhi-110092
Ph. : 011-22013773, Fax : 011-22013772
Mob. : 09313088386

4. Further to our comments given above & 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) In our opinion proper books of accounts as required by the law have been kept by the Council so far as it appears from our examination of the books.

   (iii) The balance sheet& profit and loss account dealt with by this report are in agreement with the books of account.

5. In our opinion and to the best of our information and according to the explanations given to us, subject to :-

   a. The society is not capitalizing the Fixed Assets purchased from the Fund received for Projects since its inception. During the year 2014-15, the society purchased a total fixed assets of Rs.1,91,09,379/- out of the Grant received for projects.

      However, it is worthwhile to mention here that the Fixed Assets Registers of the projects for the current year have been maintained and for the previous year(s) the preparation of the Fixed Assets Registers of the projects are under process.

   b. The FRI (Account Officer), a Division of the ICFRE, is maintaining a Bank Account with Union Bank of India, Dehradun (A/c no. 49690201008444) for Service Charges, not appearing in the Books of Account and for which no records were produced before us.

   c. The FRI (Projects), a Division of the ICFRE, has two FDRs of Rs. 10.00 Lacs each at Revolving Fund (Bank A/c no. 87058) and Rest House (Bank A/c no. 86875). In this respect our observations are as under :-

      i. Interest on the above FDRs is being utilized for their normal expenditure and is not being transferred to their Revenue Account, which is against the rules and regulations and General Practice of ICFRE.

      ii. The purpose of investing the fund in Fixed Deposits has not been explained to us.

P. K. SINGHAL & CO. Chartered Accountants

P. K. Singhal & Co.
Chartered Accountants

E-24, IInd Floor, Jawahar Park,
Laxmi Nagar, Delhi-110092
Ph. : 011-22013773, Fax : 011-22013772
Mob. : 09313088386

d. The Shimla Division of the ICFRE received a total Grant of Rs. 7,20,000/- for the Inspire Project (Bank Account no. 68031) during the financial year 2013 - 14 but the same was not recorded in the Books of Account for the year the Financial Year 2013-14. Now the same has been recorded in the current year Books of Account as Grant received during the financial year 2014 - 15.

e. The Himalayan Forest Research Institute, Shimla, a Division of the ICFRE, have their own separate PAN (AAABH0131R) which is against the provisions of the Income Tax Act, 1961.

It is also worthwhile to mention here that the Nodal Officer of CAMPA, HP State, Shimla has deducted a Total Tax of Rs. 1,39,163/- on Grant of Rs. 13,91,630/- during the 4th quarter ended 31st March, 2015 for the above PAN. The said Grant amount does not match with the Books of Account of the said project.

It appears to be a matter of suspicious nature and needs an enquiry in detail.

f. The Jorhat Division of the ICFRE is maintaining a Bank Account no. 393102010004921 under the name - "Suspense Account" with the Union Bank of India, Jorhat since 11th April, 2001, not appearing in the Books of Account.

Since opening the said bank account a total fund of Rs. 1,16,68,265/- was received for Grant, Bank Interest and Other Income in the said account since 31st March, 2015 as under :-

S.N.	NATURE OF INCOME	AMOUNT RS.
1	GRANT FOR PROJECTS	1,14,38,146
2	BANK INTEREST	1,99,558
3	OTHER INCOME	30,561
TOAL		1,16,68,265

Neither this amount has been shown in the Books of Account nor any records/vouchers except Bank Statement and Receipts and Payment Account, were produced before us.

P.K. SINGHAL & CO. Chartered Accountants

P. K. Singhal & Co.
Chartered Accountants

E-24, IInd Floor, Jawahar Park,
Laxmi Nagar, Delhi-110092
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As on 31st March, 2015 the Bank Account has a debit balance of Rs. 10,70,267. The rest amount of Rs. 1,05,97,998/- was withdrawn and incurred out of the Books of Account of the said division till 31st March, 2015 since opening of the Bank Account for which no expenses vouchers were produced before us.

It appears to be a matter of suspicious nature and needs a detailed enquiry/investigation.

g. The TDS deducted by the payee on the Grant and Interest Received is being accounted for in the Books of Account of the ICFRE after receiving the Refund from the Income Tax Department. During the financial year 2014 – 15 a total amount of Rs. 16,16,320/- was deducted towards TDS.

The said accounts read together with the Significant Accounting & Management Policies and Contingent Liability and Notes on Accounts in Schedule 25 & 26 respectively give the information required by the law in the manner so required and give a true and fair view in conformity with the accounting principles generally accepted in India : -

i) In the case of the Balance sheet, of the state of affairs of the Council as at 31.03.2015; and

ii) In the case of the Income and Expenditure Account, of the deficit for the year ended on that date.

For P. K. SINGHAL &CO.
Chartered Accountants

P. K. Singhal
(Partner)
M. No. 073882
Firm Reg. No. 05051C

Place: Dehradun

Date: 17/11/2015

BALANCE SHEET OF CONTROLLER,PENSION CELL, OF
(GPF, GSLIS, PENSION SCHEME AND NEW PENSION SCHEME,)
INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN
AS ON 31ST MARCH, 2015

SCHEDULE 24

(Amount-Rs.)

CORPUS/CAPITAL FUND AND LIABILITIES	SCHE-DULE	CURRENT YEAR AS ON 31.03.2015		PREVIOUS YEAR AS ON 31.03.2014	
PENSIN CELL FUND ACCOUNT					
GENERAL PROV.FUND A/C	24 -A	619,034,895.80		549,628,885.38	
GSLIS A/C	24 -A	662,309.96		851,866.96	
PENSION A/C	24 -A	1,178,640,972.17		1,188,118,975.99	
NEW PENSION FUND A/C	24 -A	4,550,677.00		3,410,584.00	
ICFRE PHS		17,807,272.00		8,352,423.00	
			1,820,696,126.93		1,750,362,735.33
TOTAL		1,820,696,126.93	1,820,696,126.93	1,750,362,735.33	1,750,362,735.33
FIXED ASSETS			-		-
CURRENT ASSETS LOANS & ADV.		1772738298.00	-		1,685,689,289.00
INVESTMENTS-OTHERS					
CASH & BANK BALANCES:		47957828.93	1,820,696,126.93		64,673,446.33
TOTAL		1820696126.93	1,820,696,126.93	-	1,750,362,735.33
SIGNIFICANT ACOUNTING POLICIES		25			
CONTINGENT LIABILITIES AND NOTES ON		26	-		-

Dr. ASHWANI KUMAR (Director General, ICFRE)

Dr. S.P.SINGH, (Dy. Director General, Admin., ICFRE)

SH. NEENA KHANDEKAR, (Asstt. Director General, Admin., ICFRE)

SMT. VIJAY DHASMANA (Under Secretary, Budget, ICFRE)

CHARTERED ACCOUNTANTS

FOR P.K.SINGHAL & CO.,
CHARTERED ACCOUNTANTS

(P.K.SINGHAL)Partner
Chartered Accountant
Membership No. 73882
DATED: 17TH NOVEMBER, 2015
PLACE: DEHRADUN

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN
DETAILS OF PENSION FUND AS ON 31ST MARCH 2015

SCHEDULE - 24-"A"

(As Per Annexure 'B')	GPF	GSLIS	PENSION	NEW PENSION	ICFREPHS	TOTAL
Opening	549,628,885.38	851,866.96	1,188,118,975.99	3,410,584.00	8,352,423.00	1,750,362,735.33
Add : Excess Of Income Over Expenditure	55,800,828.42	32,527.00	193,152,600.18	181,094.00	10,779,970.00	259,947,019.60
Add : Tfd.from General Fund		0.00	0.00	0.00	0.00	0.00
Saving Fund under GSLIS		1,642,782.00				1,642,782.00
Death Claim		970,836.00				970,836.00
Received from PAO	88,013.00		956,951.00			1,044,964.00
Subscription/contribution	124,574,394.00	1,577,970.00	29,493,412.00		2,371,900.00	158,017,676.00
New Pension Scheme/LSPC			165,351.00	13,375,721.00		13,541,072.00
Misc. receipts	0.00	0.00	129,986.00	0.00	0.00	129,986.00
TOTAL:	124,662,407.00	4,191,588.00	30,745,700.00	13,375,721.00	2,371,900.00	175,347,316.00
Less :						
Advances to instt.					3,000,000.00	3,000,000.00
Death Claim Paid		1,145,439.00				1,145,439.00
Saving Fund		1,731,891.00				1,731,891.00
Subscription to LIC		1,536,342.00				1,536,342.00
GPF Advance Reimbursement	34,780,488.00					34,780,488.00
GPF Part/Final Payment	46,997,901.00					46,997,901.00
GPF Final Payment	29,278,836.00					29,278,836.00
Pensionary Benefit paid			182,079,280.00			182,079,280.00
Paid to NSDL on A/c of NPS Contr.			112,586.00	12,384,810.00		12,497,396.00
DCRG			51,017,433.00			51,017,433.00
Medical reimbursement					696,759.00	696,759.00
ISO Charges/Miscellenous Payments	0.00	0.00	10.00	31,912.00	262.00	32,184.00
Transfer to revenue			166,995.00		0.00	166,995.00
TOTAL:	111,057,225.00	4,413,672.00	233,376,304.00	12,416,722.00	3,697,021.00	364,960,944.00
TOTAL:	619,034,895.80	662,309.96	1,178,640,972.17	4,550,677.00	17,807,272.00	1,820,696,126.93

DR. ASHWANI KUMAR (Director General, ICFRE)

Dr. S.P.SINGH, (Dy. Director General, Admin., ICFRE)

SH. NEENA KHANDEKAR, (Asstt. Director General, Admin., ICFRE)

SMT. VIJAY DHASMANA (Under Secretary, Budget, ICFRE)

FOR P.K.SINGHAL & CO.,
CHARTERED ACCOUNTANTS

(P.K.SINGHAL) Partner
Chartered Accountant
Membership No. 73882
DATED: 17TH NOVEMBER, 2015
PLACE: DEHRADUN

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

SCHEDULE 24-"B"

PENSION-INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH 2015

INCOME	AMOUNT
GRANT IN AID	
Received through DDG(ADMIN)	-
Received from Revenue ICFRE	74,835,995.18
Interest	118,316,605.00
TOTAL:.....	193,152,600.18
EXPENDITURE	**AMOUNT**
Expenditure	-
Excess Of Income Over Expentiture	193,152,600.18
TOTAL:.....	193,152,600.18

GPF-INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH 2015

INCOME	AMOUNT
Interest & Dividend	55,800,828.42
TOTAL:.....	55,800,828.42
EXPENDITURE	**AMOUNT**
Excess Of Income Over Expentiture	55,800,828.42
TOTAL:.....	55,800,828.42

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION, DEHRADUN

SCHEDULE 24-"B"

GSLIS-INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH 2015

INCOME	AMOUNT
Interest	32,527.00
TOTAL:.....	32,527.00
EXPENDITURE	**AMOUNT**
Excess Of Income Over Expentiture	32,527.00
TOTAL:.....	32,527.00

NEW PENSION ACCOUNT INCOME & EXPENDITURE A/C FOR THE YEAR ENDING 31ST MARCH, 2015

INCOME	AMOUNT
Interest	181,094.00
TOTAL:.....	181,094.00
EXPENDITURE	**AMOUNT**
Excess Of Income Over Expentiture	181,094.00
TOTAL:.....	181,094.00

ICFREPHS INCOME & EXPENDITURE A/C FOR THE YEAR ENDING 31ST MARCH, 2015

INCOME	AMOUNT
Received from Revenue ICFRE	9,868,750.00
Interest	911,220.00
TOTAL:.....	10,779,970.00
EXPENDITURE	**AMOUNT**
Excess Of Income Over Expentiture	10,779,970.00
TOTAL:.....	10,779,970.00

P.K. SINGHAL & CO. Chartered Accountants

Annexure - I

Members of Board of Governors

Chairman:
Shri Ashok Lavasa, IAS
Secretary to the Government of India and
Ministry of Environment Forests & Climate Change,
Indira Paryavaran Bhawan,
Jor Bag Road, New Delhi- 110 003

Vice Chairman:
Dr. S.S. Negi,
Director General of Forests and Special Secretary to the Government of India,
Ministry of Environment Forests & Climate Change,
Indira Paryavaran Bhawan,
Jor Bag Road, New Delhi- 110 003

Member Secretary:
The Director General,
Indian Council of Forestry Research and Education,
Dehradun

Members:

The Vice Chancellor
Swami Keshwanand Rajasthan Agriculture University,
Bikaner, Rajasthan

The Vice Chancellor
Kumaun University,
Sleepy Hallow,
Nainital, Uttarakhand 263 001

Shri Gopal Krishn Agrawal
S.T. No.2, Near Shiv Mandir,
Fafadih,
Raipur, Chhatishgarh

The Principal Chief Conservator of Forests
Government of Andhra Pradesh
Aranya Bhawan
Hyderabad – 500 004

The Principal Chief Conservator of Forests
Government of Uttarakhand,
Secretariat,
Dehradun – 248 001

The Director
Tropical Forest Research Institute,
P.O. Regional Forest Research Centre,
Mandla Road
Jabalpur – 482 001

The Director
Rain Forest Research Institute,
Post Box No.133, Deovan, Sotai Ali
Jorhat – 785 001

Dr. T.S. Rathore
Director,
Institute of Wood Science & Technology,
Bangalore

Dr. N.S.K. Harsh
Scientist 'G'
Forest Research Institute,
Dehradun

Annexure

Annexure - II

Right to Information

A Public Information Officer and Appellate Authority are functioning in Public Authority, ICFRE under the RTI Act 2005. During the year 2014-15, RTI application (366) and RTI Appeals (19) are disposed off. Consolidated Quarterly RTI returns of the Public Authority are regularly uploaded by the ICFRE. A Transparency Officer under the RTI Act functioning in ICFRE.

RTI Applications/ Requests transfer from	**No. of applications received as other P/As u/s6(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	09	82	02	--	88
2nd Quarter	14	89	03	--	84
3rd Quarter	35	74	00	--	103
4th Quarter	24	67	00	--	91
Total	82	312	05	--	366
			--	–--	
RTI First Appeals			**--**	**–--**	
1st Quarter	N/A	08	N/A	--	08
2nd Quarter	N/A	04	N/A	--	04
3rd Quarter	N/A	03	N/A	--	02
4th Quarter	N/A	04	N/A	--	05
Total	**--**	**19**	**--**	**--**	**19**

NAME AND ADDRESS OF PUBLIC INFORMATION OFFICERS AND APPELLATE AUTHORITIES UNDER THE RIGHT TO INFORMATION ACT 2005 IN ICFRE AND ITS INSTITUTES

Headquarters / Institutes	Appellate Authorities	Public Information Officers	Subject matter(s) allocated
Indian Council of Forestry Research and Education (ICFRE Hq.), P.O. New Forest Dehradun-248 006	Dr. N.S. Bisht, Director (IC) Phone (O) : 0135-2224831, 0135-2756497 E-mail : nsbisht@icfre.org, dir_pic@icfre.org	Shri R.C. Dwivedi, Phone (O) :0135-2224818, E-mail : dwivedirc@icfre.org	All matters related to ICFRE Hqrs., Dehradun
Forest Research Institute, P.O. New Forest, Dehradun-248 006	Dr. P.P. Bhojvaid, Director Forest Research Institute P.O. New Forest Dehradun- 248006 Phone: 0135-2224444, 2755277 Fax: 0135- 2756865 E-mail: dir_fri@icfre.org	Dr. N.K. Upreti Group Coordinator (Research), FRI P.O. New Forest Dehradun- 248 006 Phone : 0135-2752670	All Research & Account matters
		Shri Shashikar Samanta, Registrar, FRI Phone: 0135-2752678 (O)	Establishment, Administrative & all other matters
		Dr. Salil Dhawan, Registrar Deemed University, FRI Phone: 0135-2224439 (O) 0135-2751826 (O) Email: sdhawan@icfre.org	University matters
Centre for Social Forestry and Eco-Rehabilitation (CSFER), 3/1, Lajpath Rai Road, New Katra, Allahabad-211 002	Dr. P.P. Bhojvaid, Director Phone: 0135-2224444, 2755277 E-mail: dir_fri@icfre.org	Dr. Kumud Dubey Scientist and Director CSFER Phone: 0532-2440796 Fax :0532-2440795 E-mail: dir_csfer@icfre.org	All matters related to CSFER, Allahabad
Institute of Forest Genetics and Tree Breeding, P.B.No 1061 R.S.Puram, Coimbatore - 641 002	Shri R.S. Prashanth, Director, IFGTB, Coimbatore, Phone: 0422-2484101 (O) Fax. 0422-2430549 E-mail: dir_ifgtb@icfre.org	Dr. B. Gurdev Singh, Scientist 'F', IFGTB, Coimbatore Phone: 0422-2484102 (O)	All matters related to IFGTB, Coimbatore
Institute of Wood Science & Technology, 18th Cross Malleswarum, Bengaluru -560 003	Shri V. Ramakantha, Director, IWST Bengaluru Phone : 080-23341731, E-mail: dir_iwst@icfre.org	Dr. K. Murugesan, Coordinator (Fac.), IWST Bengaluru Phone: 080-22190192 (O)	All matters related to IWST, Bengaluru
Tropical Forest Research Institute, Jabalpur P.O. – R.F.R.C, Mandla Road, Jabalpur – 482 021	Dr. U. Prakasham, Director TFRI, Jabalpur Phone : 0761-2840483/4044002 E-mail: dir_tfri@yahoo.co.in	Shri Raja Ram Singh, TFRI Jabalpur. Phone: 0761-284010 (O)	All matters related to TFRI, Jabalpur

Headquarters / Institutes	Appellate Authorities	Public Information Officers	Subject matter(s) allocated
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ANNEXURE-IV List of Abbreviations

ACIRD	-	Avantha Centre for Industrial Research & Development
ADG	-	Assistant Director General
AFRI	-	Arid Forest Research Institute
AICP	-	All India Co-ordinated Project
AICTE	-	All India Council for Technical Education
AM Fungi		Arbuscular Mycorrhizal Fungi
AMB	-	Ambient
AMF	-	Arbuscular Mycorrhyzal Fungi
AMS	-	Agro Meteorological Stations
ARCBR		Advanced Research Centre for Bamboo and Rattan
ARS	-	Agricultural Research Station
ASE	-	Anti Swelling Efficiency
ASEM	-	Asia-Europe Meeting
AWS	-	Automatic Weather Stations
AYUSH	-	Department of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy
BAIF	-	Bhartiya Agro Industries Foundation
BAP	-	Benzyl-aminopurine
BCC	-	Biodiversity and Climate Change
BCCL	-	Bharat Coking Coal Limited
BGEM	-	Bamboo Growers & Entrepreneurs Meet
BMS	-	Building Management System
BT	-	Bacillus thuringiensis
BTSG	-	Bamboo Technical Support Group
BTTL	-	BILT Tree Tech Limited
CA	-	Citric Acid
CAEMS	-	Computer Association Enterprises Management System
CAMP	-	Conservation Assessment and Management Prioritization
CAMPA	-	Compensatory Afforestation Fund Management and Planning Authority
CaMV	-	Cauliflower Mosaic Virus
CAZRI	-	Central Arid Zone Research Institute
CBD	-	Convention on Biological Diversity
CC&FI	-	Climate Change and Forest Influence Division
CCA	-	Copper Chrome Arsenate
CCB	-	Copper Chrome Boron
CDRI	-	Central Drug Research Institute
CEC	-	Cation Exchange Capacity
CEIA	-	Cumulative Environment Impact Assessment
CFC	-	Chlorofluorocarbon
CFCBPT	-	Center funded by BTSG-NBM for Bamboo Processing and Training
CFLE	-	Centre for Forest- based Livelihoods and Extension
CFRHRD	-	Centre for forestry Research & Human Resource Development
CG	-	Chhattisgarh
CITIES	-	Convention on International Trade in Endangered Species of Fauna and Flora
CHEMCON	-	The Indian Chemical Engineering Congress

CIAB	-	Center of Innovative & Applied Bioprocessing
CLNs	-	Community Livelihood Nurseries
CMA	-	Clonal Multiplication Area
CMC	-	Carboxymethyl Cellulose
CMS	-	Content Management System
CNSL	-	Cashew Nut Shell Liquid
CPT	-	Candidate Plus Trees
CRD	-	Completely Randomized Design
CRIDA	-	Central Research Institute for Dryland Agriculture
CSFER	-	Centre for Social Forestry and Eco-Rehabilitation
CSIRO	-	Commonwealth Scientific and Industrial Research Organisation
CTRTI	-	Central Tasar Research & Training Institute
DBH	-	Diameter at Breast Height
DDG	-	Deputy Director General
DDNPTM	-	Drug Discovery from Natural Products and Traditional Medicines
DG	-	Director General
DHCP	-	Dynamic Host Configuration Protocol
DLDD	-	Desertification Land Degradation and Drought
DNA	-	De-oxyribo Nucleic Acid
DNS	-	Domain Name System
DPPH	-	Diphenyl-1-picrylhydrazyl
DST	-	Department of Science and Technology
DTC	-	Direct to Consumer
DU	-	Deemed University
DUS	-	Distinctness, Uniformity and Stability
DV	-	Demo Village
EAPs	-	Externally Aided Projects
EAS	-	East Asia Summit
EC	-	Electrical Conductivity
EDMS	-	Electronic Documentation System
EIA	-	Environmental Impact Assessment
ENVIS	-	Environmental Information System
EPRED	-	Environment Protection and Renewable Energy Development
F&CC	-	Forest and Climate Change
FAS	-	Financial Accounting System
FIS	-	Forest Invasive Species
FRA	-	Forest Right Act
FRC	-	Forest Research Centre
FRI	-	Forest Research Institute
FTIR	-	Fourier Transform Infrared Spectroscopy
FTP	-	File Transfer Protocol
FYM	-	Farm Yard Manure
GBH	-	Girth at Breast Height
GCA	-	General Combining Ability
GC-MS	-	Gas Chromatography-Mass Spectrometry
GEF	-	Global Environmental Facility

GIS	-	Geographic Information System
GIZ	-	Deutsche Gesellschaft für Internationale Zusammenarbeit,
GOI	-	Government of India
GPS	-	Global Positioning System
HATZ	-	High Altitude Transition Zone
HEP	-	Hydro-Electric Project
HFRI	-	Himalayan Forest Research Institute
HIV	-	Human immunodeficiency virus
HKT	-	High-affinity Potassium Transporter
HNDS	-	hexamethyldisilazane
HP	-	Himachal Pradesh
HPLC	-	High-performance liquid chromatography
HPPCL	-	Himachal Pradesh Power Corporation Limited
HPSFD	-	Himachal Pradesh State Forest Department
HPTLC	-	High Performance Thin Layer Chromatography
HQ	-	Headquarter
IAA	-	Indole Acetic Acid
IAAT	-	Indian Association for Angiosperm Taxonomy
IARI	-	Indian Agricultural Research Institute
IASR	-	International Agency for Standards and Ratings
IBA	-	Indole butyric Acid
IC	-	International Cooperation
ICAR	-	Indian Council of Agricultural Research
ICFRE	-	Indian Council of Forestry Research & Education
ICIMOD	-	International Centre for Integrated Mountain Development
ICMP	-	International Conference on Medicinal Plants
ICRTC	-	International Conference on Recent trends in Computing
ICT	-	Information Communication Technology
IFB	-	Institute of Forest Biodiversity
IFGTB	-	Institute of Forest Genetics and Tree Breeding
IFP	-	Institute of Forest Productivity
IFRIS	-	Indian Forestry Research Information System
IFS	-	Indian Forest Service
IGBP	-	ISRO-Geosphere Biosphere Programme
IGFRI	-	Indian Grassland and Fodder Research Institute
IIFM	-	Indian Institute of Forest Management
IIM	-	Indian Institute of Management
IINRG	-	Indian Institute of Natural Resins and Gums
IIRS	-	Indian Institute of Remote Sensing
IITDM	-	Indian Institute of Information Technology, Design and Manufacturing
IMTECH	-	Institute of Microbial Technology
INTAC	-	Indian National Trust for Art & cultural heritage
IPA	-	Isopropenyl Acetate
IPIRTI	-	Indian Plywood Industries Research & Training Institute
IPM	-	Integrated Pest Management
IQF	-	Individual Quick Freezing
ISO	-	International Organization for Standardization
ISRO	-	Indian Space Research Organisation
ISS	-	Internet Security System
ISSN	-	International Standard Serial Number
ISTS	-	Indian Society of Tree Scientists
IT	-	Information Technology

IT&FS	-	Information Technology & Forestry Statistics
ITC	-	Indian Tobacco Company
ITTO	-	International Tropical Timber Organization
IUFRO	-	International Union of Forestry Research Organisation
IWST	-	Institute of Wood Science and Technology
J&K	-	Jammu and Kashmir
JNV	-	Jai Narain Vyas University
JRF	-	Junior Research Fellow
KFD	-	Karnataka Forest Department
KVK	-	Krishi Vigyan Kendra
LAN	-	Local Area Network
LCM	-	Leaf Compost Manure
LISS IV	-	Linear Imaging Self-Scanning IV
MAI	-	Mean Annual Increment
MAPP	-	Maleated Poly Propylene
MAPs	-	Medicinal and Aromatic Plants
MCT	-	Mid Carrier Training
MLHCT	-	Multi Locational Hybrids Trials
MoEF&CC	-	Ministry of Environment, Forests & Climate Change
MoU	-	Memorandum of Understanding
MP	-	Madhya Pradesh
MPCA	-	Medicinal Plant Conservation Areas
MPDDNP	-	Molecular Pharmacology, Drug Discovery and Nano-pharmaceuticals
MPOWER	-	Mitigating Poverty in Western Rajasthan
MPSBM	-	Madhya Pradesh State Bamboo Mission
MPTs	-	Multipurpose Tree Species
MS Medium	-	Murashige and Skoog medium
MW	-	Mega Watt
NAA	-	Naphthalene Acetic Acid
NABARD	-	National Bank for Agriculture and Rural Development
NATCOM	-	National Communication
NCERT	-	National Council of Educational Research & Training
NCL	-	Northern Coalfields Limited
NCP	-	National Carbon Project
NCT	-	National Capital Territory
NFIC	-	National Forest Insect Collection
NFLIC	-	National Forest Library and Information Centre
NGO	-	Non Governmental Organization
NGS	-	Next Generation Sequencing
NHM	-	Natural History Museum
NHX1	-	Sodium Proton Exchanger 1
NKN	-	National Knowledge Network
NMPB	-	National Medicinal Plant Board
NMR	-	Nuclear Magnetic Resonance
NPC	-	National Productivity Council
NPK	-	Nitrogen Phosphorus Potassium
NTFP	-	Non-Timber Forest Produce
NTPC	-	National Thermal Power Corporation
NWFP	-	Non Wood Forest Product
OBC	-	Other Backward Class
OPERON	-	Functional Unit of genomic DNA consisting cluster of genes under control of a single promoter

OTC	-	Open Top Chambers
P&HD	-	Panchayat & Human Dimension
P&RD	-	Department of Panchayats & Rural Development
PA System	-	Public Address System
PEC	-	Project Evaluation Committee
PGPR	-	Plant Growth Promoting Rhizo- bacteria
PIMS	-	Personnel Information Management System
PMES	-	Performance Monitoring and Evaluation System
PMS	-	Payroll Management System
PPFMs	-	Pink Pigmented Facultative Methylotrophs
PRA	-	Participatory Rural Appraisal
PRAIS-2	-	Performance Review and Appraisal Information System
PSB	-	Phosphate Solublizing Bacteria
PSC	-	Project Screening Committee
QTL	-	Quantitative Trait Loci
R&R	-	Reclamation and Rehabilitation
RAC	-	Research Advisory Committee
RAG	-	Research Advisory Group
RAPD	-	Random Amplification of Polymorphic DNA
REDD-Plus	-	Reducing Emissions from Deforestation and forest Degradation
RF	-	Reserve Forest
RFRI	-	Rain Forest Research Institute
RGR	-	Relative Growth Rate
RI	-	Response Index
RIMS	-	Research Management Information System
RO	-	Research Officer
RPC	-	Research Policy Committee
RSP	-	Rourkela Steel Plant
RTI	-	Right To Information
RT-PCR	-	Real Time Polymerase Chain Reaction
SAARC	-	South Asian Association for Regional Cooperation
SADHNA	-	Society for the Advancement of Human and Nature
SAIL	-	Steel Authority of India Limited
SBS	-	Sardar Bhagwan Singh Post Graduate Institute of Biomedical Sciences and Research
SC	-	Schedule Caste
SEA	-	Strategic Environmental Assessment
SEAC	-	State Level Environment Assessment Committee
SECL	-	South Eastern Coalfields Limited
SFD	-	State Forest Department
SG	-	Second Generation
SHAR	-	Sriharikota High Altitude Range
SHGs	-	Self Help groups
SHP	-	Sodium Hypophosphite Monohydrate
SLEM	-	Sustainable Land and Ecosystem Management
SOC	-	Soil Organic Carbon
SOM	-	Soil Organic Matter
SOS	-	Sodium Overly Sensitive
SQI	-	Soil Quality Index
SSP	-	Single Super Phosphate
SSR	-	Simple Sequence Repeat
ST	-	Scheduled Tribe

STPP	-	Super Thermal Power Project
SVC	-	Steam Volatile Creosote
SWC	-	Soil water Content
TATR	-	Tadoba Andhari Tiger Reserve
TDZ	-	Thidiazuron
TFO	-	Technical Facilitation Organization
TFRI	-	Tropical Forest Research Institute
TNAU	-	Tamil Nadu Agriculture University
TNPL	-	Tamilnadu Newsprint and Papers Limited
TOLIC	-	Town Official Language Implementation Committee
TPC	-	Total Phenolic Content
UHF	-	University of Horticulture and Forestry
UNCCD	-	United Nation Convention to Combating Desertification
UNFCCC	-	United Nations Framework Convention on Climate Change
UP	-	Uttar Pradesh
USA	-	United State of America
USAID	-	United States Agency for International Development
USDA	-	United States Department of Agriculture
USSTC	-	Uttarakhand State Science & Technology Congress
VAM	-	Vesicular Arbuscular Mycorrhiza
VCD	-	Video Compact Disc
VCP	-	Vegetation Carbon Pool
VESDA	-	Very Early Smoke Detection Appliance
VFPMC	-	Village Forest Protection and Management Committee
VMG	-	Vegetative Multiplication Garden
VPN	-	Virtual Private Network
VVK	-	Van Vigyan Kendra
WAN	-	Wide Area Network
WB	-	World Bank
WDCD	-	World Day to Combat Desertification
WPC	-	Wood Plastic Composite
WPG	-	Weight percent gain
ZiBOC	-	Zinc, Boron and Copper

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