



Executive Summary

The annual report for the year 2015-16 is divided into six thrust areas in view of the people centric consideration and Government's priority for various sectors:

1. Managing Forests and Forest products for Livelihood Support and Economic Growth
2. Biodiversity Conservation and Ecological Security
3. Forest and Climate Change
4. Forest Genetic Resource Management and tree Improvement
5. Forestry Education and Policy Research to Meet Emerging Challenges
6. Forestry Extension for taking Research to people

The overall allotted budget for current financial year 2015-16 for Research, Extension and Education was Rs. 188.28 lakhs and the expenditure incurred was Rs. 174.74 lakhs.

The Annual Report discusses about the projects undertaken by various institutes that have been grouped in the relevant sections of eight chapters. The information related to the Directorate of Administration and Information Technology has been presented in a separate chapter.



Managing Forests and Forest Products for Livelihood Support and Economic Growth

IWST, Bengaluru has found that based on the growth performance *Dendrocalamus brandisii* (Burma bamboo) exhibited best growth, followed by *D. asper* (Sweet Bamboo) in Chikmagalur, whereas *D. stocksii* (Marihal Bamboo) and *D. strictus* (bamboo) exhibited best growth in Hoskote. Significant differences in physiological parameters amongst the 7 species were noticed. Out of the 6 treatments (different combinations of Biochar, NPK, and compost) given for enhanced shoot emergence and size of shoots in six bamboo spp., Biochar+compost has shown promising results.

In Thermal modification of wood for value addition to plantation timbers, darker brown colour of wood was increased due to increasing treatment temperature. Heat treated wood from fast grown plantations may be used for different value-added applications due to low EMC, higher dimensional stability and water resistance.

In Microwave assisted chemical modification of wood, hydrophobic properties and dimensional stability of the acetylated wood were elevated. ASE increased with increase in degree of modification and microwave heating has no adverse influence on anti-swelling efficiency as compared to conventional heating. Modified wood showed more thermal stability as compared to unmodified wood. The significant reduction in reaction time has helped in minimizing generation of by-products.

Evaluation of physical, mechanical, morphological and thermal properties of Bio-thermoplastic composites indicates that Flexural and Tensile strength of bio fibre -PP composites was significantly higher when coupling agent was added (5 wt % based on fibre content) compared to control composites (without any coupling agents) at all the filler loadings. In case of coir-PP and coir-HDPE composites, properties of composites with coupling agents were more than that of uncoupled composites as observed in rubberwood based composites.

Thermo-plasticization of starch with different plasticizers like glycol, glycerol, urea, formamide, poly-vinyl alcohol (PVA), poly ethylene glycol (PEG), water and their

combination indicates the disruption of granulated structure of starch after thermo-plasticization.

Under evaluation and comparison of wood quality of teakwood produced from tissue culture (TC) and seed sources, it has been found that TC grown teak exhibited slightly higher growth rate, wood basic density, bark thickness, while moisture content (air-dry) and shrinkage properties were found to be comparatively higher in teak grown from seed sources.

Solvent free chemical modification for Rubberwood with iso-propenyl acetate (IPA) in presence of anhydrous aluminium chloride and iodine exhibited good dimensional stability and hydro-phobicity. Chemical modification of wood polymers with IPA was effective in reducing light induced colour changes at wood surfaces. Thermo-gravimetric analysis showed that modification with IPA improved thermal stability of wood.

In a study of liquefaction efficiency of different wood fibers like *Melia*, *Eucalyptus*, rubberwood, silver oak, bamboo, Lantana and coir, phenol was found to be the most effective with liquefaction efficiency of up to 90% and 3:1 liquid ratio at 140°C among the liquefying agents. *Lantana* stem meal was found to exhibit the highest liquefaction efficiency in phenol.

M. dubia (Melia/Hebbevu/Malabar neem) wood were thermally modified in the temperature range of 180°C – 235°C in a vacuum oven. Modified wood showed good dimensional stability.

In wood quality assessment of 9-year old plantation of *Melia dubia* (Malabar Neem), average wood density was found to range between 330 kg/m³ to 520 kg/m³ with an average density of 400 kg/m³ (CV- 11%). Based on pilodyn penetration and acoustic velocity, few trees were identified as the potential superior genotypes in the plantation.

To study production of briquettes from invasive forest weeds and its utilization by JFM village, fuel properties analysis of biomass samples of *L. camara* (Lantana) and *P. juliflora* (Vilayati babul/Bellary Jalli) indicate that both the biomass had higher calorific value (19 to 20 MJ/kg), low ash content (< 1.5%), high volatile matter content and high fixed carbon content. Both the species can be used for production of briquettes due to presence of high lignin content.



Under standardization of protocol for extraction of high Camptothecin from *Nothapodytes nimmoniana* (Ghanera/Peenari) using cell culture technique, Phyto-chemicals from the vegetative parts (leaf and twigs) were extracted and camptothecin content were compared using standard camptothecin by TLC. Seed material was used for *in-vitro* culture initiation. Standardization of *in-vitro* germination was optimised by using different combinations of hormones (Auxins and Cytokinins).

New method has been standardized for extraction, evaluation and quantification of Halmaddi from *Ailanthus malabarica* DC (Halmaddi). This method reduces cambial damage and hastens the healing process and no secondary infection by fungus and bacteria extraction was observed. The tapping can be continued after an interval of two years.

In studies on marine fouling and wood boring organisms in five major ports on the east coast of India, viz., Tuticorin, Chennai, Paradeep, Haldia and Kolkata, the causative species were identified as *Lyrodus saffinis* (Little tuna), *L. takanoshimensis*, *L. pedicellatus*, *L. bipartitus*, *T. eredoparksi*, *T. furcifera*, *T. bartschi*, *T. navalis*, *T. clappi*, *Bankia carinata*, *B. brevis* and *B. campanellata*.

Development of coccinellids based bio-control programme for the management of sandal scales and mealy bugs, *Cryptolaemus montrouzieri* (Mealybug Ladybird) and *Chilocorus nigrita* (ladybird beetle) have been identified as potential predatory coccinellids on sandalwood scales and mealy bugs.

In study on microwave assisted direct biodiesel production from *Pongamia pinnata* (Karanj) seed oil by two phase solvent extraction, suggested that density and refractive index of oil remain unchanged in treated and untreated seeds. It was found that TSE was comparatively good at 50°C. Use of bigger size particles was found to be better as compared to small size particles. The oil yield after 30 min extraction time was only 89% in case of conventional heating. The study on MW assisted TSE shows rapid oil extraction and improvement in oil properties.

IFGTB, Coimbatore under a collaborative project expanding carbon sinks through sustainable tree biomass energy production in semi-arid areas of Tamil Nadu has introduced

28 species of Eucalyptus 'mallees' that produce multiple stems from the ground level and amenable for multiple harvests for biomass production.

Under value addition of *Acacia mearnsii* (wattle) resources of the Nilgiris for employment generation and livelihood support, a commercially viable extraction protocol for the aromatic oil of the flowers has been developed. With appropriate fortification, the species has high potential use in development of food / feed products.

In a study of exploration of Potential Beneficial Microbes in different Forest and Agriculture Ecosystems in Kolli Hills, Tamil Nadu, the population density of PGPR isolates was observed high as compared to Actinomycetes. It was also observed that all the rhizosphere soil and root samples had AM fungal spores colonization particularly in three different species viz., *Acaulospora*, *Gigaspora* and *Glomus*.

Insect pest complexes on medicinal plants and the influence of pest damage on their active principles were carried out. Plant based extracts were identified for safe management of selected insect pests of the reported medicinal plants and comparative biochemical analysis showed variation in the level of metabolites with insect damaged and undamaged medicinal plant species.

AFRI, Jodhpur established field experiments for productivity enhancement of Kair (*Capparis decidua*) fruit to generate livelihood in rural areas of Thar Desert. Out of three organic manures, application of LCM in combination with various inorganic fertilizers has enhanced the number of fruiting plants and fruit yield significantly, followed by VAM application.

Nursery practices for raising quality seedlings of three important forest tree species *Prosopis cineraria* (Khejri), *Tecomella undulata* (Rohida) and *Azadirachta indica* (Neem) for arid and semi-arid areas have been refined. *Azadirachta indica* seedlings grown with compost and vermi-compost performed better in comparison to other treatments. Similarly, *Tecomella undulata* seedling grown in compost performed better in terms of height.

Hardwickia binata (Anjan) and *Colophospermum mopane* (mopane) trees based agro-forestry experiment were



established using four treatments. Photosynthetic Active Radiation (PAR) was high in sole crop and grass plots as compared to different treatments. PAR increased with the distance from tree trunk. Soil water content (SWC) was higher with increasing soil depth and distances among the treatments in *C. tetragonoloba* (Guar) grown with *H. binata*.

Size and pattern of cuts for non-destructive harvesting practices of *Commiphora wightii* (Guggal) gum Oleogum resin in Rajasthan revealed that there is significant difference in the average gum production by different sizes of cuts and also in different pattern of cuts. The gum production was also found to be proportional to the girth size.

In optimization of processing methods for *Prosopis cineraria* (Khejri) and *Capparis decidua* (Kair) fruits for their improved utilization in Western Rajasthan, slight change in sugar content was found after 10 days of soaking in buttermilk (9-11%). Pre-heated solar drying was found to be best among all the other methods for ash content. Kair fruits and sangri pods preserved in refrigerator, deep freezer (-22° C), brine and vinegar, remained in good condition upto 10 months of storage.

RFRI, Jorhat standardized nursery techniques for selected fruit-plants of North East India such as *Rhus semialata* (Nogatenga), *Flacourtia jangamos* (Ponial) and *Dimocarpus longan* (Asphol, Nagalichi) for their effective conservation and development of value added products for inclusive growth.

Planting materials of six cane species i.e. *Calamus nambareinsis* (Teng-yer, Hnah-bawr), *C. latifolius* (Teng-yer, Hnah-bawr), *C. guruba* (Phil-te), *C. flagellum* (Tor, Hruipui), *C. gracilis* (Pre-lude, Kawr-tai) and *C. tenuis* (Pre-shek, Chang-dam) has been found useful for raising in fringe villages of Assam and Mizoram to sustain rural livelihood.

The most common species used by Nepali community based on the traditional knowledge of the medicinal plants are *Aloe vera* (Salkuwari, Indian Aloe, Gheekumari), *Cuscuta reflexa* (Akasilata), *Ocimum sanctum* (Tulsi), *Centella asiatica* (Manimuni), *Leucas aspera* (Durun), *Tagetes erecta* (Narji), *Alternanthera brasiliensis* (Bishoiyakarani), *Psidium guajava* (Guava, Amrood), *Drymeria cordata* (Laijabari) and *Ananas comosus* (Anannas, Mati Kothal,) in

Assam. The medicinal plants are used most commonly for fever, cough, blood pressure, jaundice, diabetes, worms in children, injury or cut and piles.

Out of total of 77 plant samples collected from different parts of North- Eastern States leaves, flowers, seeds and bark of *Actinodaphne obovata* (Pati-chanda), *A. angustifolia* (Petarichawa), *Litsea sebifera* (Indian Laurel, maidalakri, Neluka), *Hibiscus rosa-sinensis* (Gurhal, Jobaful), etc. were found suitable for use as adhesive material for agarbatti.

Out of 97 species of mushroom collected from forest areas of Meghalaya, four important wild edible mushrooms have been selected for cultivation trials based on their potential market demand.

Under lab and field conditions, *B. bassiana*, *M. anisopliae*, *V. lecanii* and *Paecilomyces* sp. were found very effective against *H. vitessoides* and *C. leayana*. The concentration of 2.4×10^{10} spores/ml was found promising in achieving high levels of larval mortality. The potential isolates were also tested and found safe for the beneficial insects like egg parasitoids *Trichogramma chilonis* and *Samia ricini* (Eri silkworm).

Leaf spot and blight were observed as two major diseases of *Michelia champaca* (Champa, Tita sopa) nursery and the pathogen was identified as *Colletotrichum gloeosporioides*.

In natural stand, plantation and nursery, *Pestalotiopsis calami*, *Colletotrichum gloeosporioides* and *Fusarium* sp. were observed to cause severe spotting and blight of leaves in *Calamus* species of Mizoram and Tripura.

Based on the studies on *Trichoderma* isolates inhabiting different forest ecosystem of North East India, three *Trichoderma* isolates were deposited in National Fungal Culture Collection of India (NFCCI), Pune and identified as *T. asperellum* and *T. virens* using DNA sequence data analysis of ITS rDNA.

HFRI, Shimla studied seed germination and Longevity of *Abies spectabilis* (Talishpatra) from 39 natural populations in various forest divisions of Himachal Pradesh. The effect of seed size on germination of *A. spectabilis* revealed that large sized seed recorded maximum 40% germination whereas, in small seeds germination per cent



was as low as 12%. The seeds collected from trees having 40-50 cm dbh recorded maximum 46.40% germination. The effect of depth of seed sowing on germination of seeds revealed that seeds sown at a depth of 1.50 cm recorded maximum 44.50 % germination.

In a study to determine Nursery Requirements and Initial Planting Performance of *Diploknema butyracea* (Cheura) and *Myrica esculenta* (Kaphal) under Mid-hill Conditions of Himachal Himalayas, it was observed during last two winters that Cheura plants are frost sensitive and Cheura plantation had around 44% survival after two winters in the field with special plant protection care.

In a study of biology and management of Insect pests of seeds of *Juniperus polycarpus* (Juniper, Devidyar), *Homaloxestis cholopis* Meyrick was recorded for the first time on berry and seeds of the Juniper causing maximum damage during the month of June to October and ceases its activities up to the arrival of favourable conditions (May-June) next year. *Plodia interpunctella* was also observed on the seeds during storage. Fursa treatment followed by Robust was found most effective and had shown maximum control of insect-pests damage.

The study on the Influence of Climate on bionomics of *Pityogenes scitus* revealed that this insect passes through four generations in a year and the fifth remains partial. Impact of seasonal climatic variation on population of egg, larva, pupa and adult stage of the insect was found statistically significant in their abundance and survival. The Institute is working on extension of protection technology for biological Control of *Thysanoplusia orichalcea* F., a potential insect-pest of *Saussurea costus* (Kuth) in North-Western Himalayas to local communities.

FRI, Dehradun has developed tools, techniques and methods for enhancing REDD+ forest management in states of MP, HP and Sikkim. The institute has done monitoring and evaluation of PUNCAMPA plantations and GPM plantations of the year 2013-14 in all the Forest Divisions of Punjab and has prepared management plan for Asola Bhatti Wildlife Sanctuary. Data on existing agro-forestry and socio-economic status of total 107 villages from Punjab, Haryana, Uttarakhand and North-West region of Uttar Pradesh have been compiled and

analyzed. The institute has developed agri-silvi-medicinal agro-forestry model of some important medicinal plants with *Melia dubia* (Malabar Neem, Burma Drak) and *Embllica officinalis* (Aonla) in degraded land of Punjab and Uttarakhand. The suitability of combi-ply from *M. dubia* and poplar combination plywood of 3-ply, 5-ply, 7-ply, and 9-ply have been developed and tested. Five fire retardant-cum-preservative compositions were developed and three bamboo species viz. *Bambusa nutans* (Burmese timber bamboo), *Dendrocalamus strictus* (Calcutta bamboo) and *Bambusa polymorpha* (Betwa) were treated. After 12 months of exposure, they did not show any attack on all the treated samples, but the control samples of *B. polymorpha* and *B. nutans* showed slight attack whereas the control samples of *D. strictus* showed no attack. Preliminary reports based on reconnaissance survey of ten wood carving centres indicate that in Nagina, Uttar Pradesh approximately Rs. 30 crore worth wooden products are exported and USA, Canada, Spain, Japan, Taiwan, Philippines and Gulf countries are the main export destination countries. Phyto-chemical screening of selected wild edible plants viz. *Callicarpa macrophylla* (Dahiya, Priyangu, Beautyberry) leaves, *Prunus armeniaca* (Chulu, Khubani, Urumana, Armenian plum or Tibetan apricot) fruits and *Myrica esculenta* (Kaphal) fruits for exploration of new sources of Luteolin has been undertaken. Process was refined for extraction of quality fibre and optimal isolation of bio-active constituents from *Agave sisalana* (Sisal). In a study to evaluate antifungal properties and chemical characterization of active principle (s) of *Berberis aristata* (Indian beriberi, Daru Haldi) from different provenances of Himachal Pradesh, maximum yield was obtained in methanol extract of sample collected from Khadralla, Sungri at an altitude of 2864 m. Superior germplasms of *Andrographis paniculata* (Kalmegh) and *Bacopa monnieri* (Brahmi) have been collected from various places and are being maintained in the nursery as mother plants. Methods for estimation of andrographolide and bacoside from *A. paniculata* and *B. monnieri* respectively were standardized. Protocols for producing various shades on silk, wool and cotton fabrics were standardized using *Xylaria polymorpha* (Dead man's fingers) dye. For control of hispine



bamboo borer- *Estigmene chinensis* damaging green standing bamboo systemic insecticides has been found approximately 60-70% effective against the contact insecticides which showed average control of approximately 30-35% only. In a study of biological control of *Eucalyptus* gall wasp, *Leptocybe invasa*; parasitoids of *Megastigmus* sp. has been found effective in reducing the gall infestation from 26% to 2.5% between 2013 and 2015. Under enrichment field trials of *Aconitum heterophyllum* (Atis), *Nardostachys grandiflora* (Jatamansi) and *Picrorhiza kurrooa* (Kutki) in Khuliya and Kandara MPCA area, survival percentage of Kutki and Atis was found maximum when propagated by seedlings as compared to rhizomes and seeds.

TFRI, Jabalpur in a study of standardization of plantation techniques for major forest plant species in Madhya Pradesh has recorded the maximum average height by *Dendrocalamus strictus* (Calcutta bamboo) (294.25 cm) at spacing 3x3m, pit size 60x60x60 cm followed by *Dalbergia sissoo* (Sissoo) (242.13 cm) at spacing 2x2m, 45x45x45 cm and minimum in case of *Terminalia bellerica* (Behera) (77.50 cm) at spacing 5x5 m, 60x60x60 cm under irrigated condition. The rapid appraisal during development of Silvi-agri-medicinal and agri-medicinal system in vidharbha region of Maharashtra has revealed that communities are in need of mandi (Bazar) to sale their medicinal plant products and they are keen to grow fast growing and short rotation timber yielding species like *G. arborea* (Gamhar) in their farms. Under empowering Tribal Community through Lac Cultivation in Madhya Pradesh, experiments were conducted to cultivate 'baisakhi' crop of 'rangini' strain of Lac. From the yield of lac, it was observed that the crop gave maximum yield from the host trees (*Butea monosperma* (Palash) and *Zizyphus mauritiana* (Ber)) existing nearby the water stream. The total maximum antioxidant activity of *Asparagus speciosa* (Elephant creeper) and *Curculigo orchoides* (Kali Musli/black gold) was observed in samples collected in the month of October and January respectively. Out of different containers used for storage of seeds of Malkangni, Baividung and Baheda, polythene containers at room temperature were found best suitable amongst jute, polythene, markin cloth, tin, glass and plastic. Carrier based (activated charcoal

powder, saw dust, grinded and filtered soil, vermi-compost, calcium carbonate) packets of different selected bacterial bio-fertilizers were prepared for distribution to forest department. In disease and insect survey in *Gmelina arborea* (Gamhar) plantation to record mortality status in Madhya Pradesh and Chhattisgarh, 83.5% trees showed low to heavy infestation at different sites. Eight insects and 8 fungi were identified as associated with mortality of the tree. The predatory insect *Chrysoperla carnea* (common green lacewing), which feeds on egg and larvae; has been found as promising biological control agent against major insect pests like *Hyblaea puera* (Teak defoliator), *Eutectona machaeralis* (Teak skeletonizer), and shisham defoliator, *Plecoptera reflexa*.

IFB, Hyderabad has established an agro-forestry system based on red sanders + *Flemingia semialata* and a total of 1200 farmers were trained on medicinal plants based agro-forestry techniques during the year. Seedlings of various species have been raised and all materials have been procured for establishment of Herbal Garden.

IFP, Ranchi has multiplied clones of Karanj from five Plus tress for Tree Borne Oil seeds (TBOs) in community lands for improved livelihoods of vulnerable groups of Jharkhand. The clonal trial established at Mandar was evaluated and growth data recorded. Vegetative propagation technique of Nisoeth has been standardized for commercial seedling production. Preliminary chemical analysis of roots of Nisoeth (*Operculia turpethum*) and Sheonak (*Oroxylum indicum*) depict the presence of flavonoides, terpenoides and sugars.

Biodiversity Conservation and Ecological Security

ICFRE, Dehradun has conducted a 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 national consultation meeting of the project regarding finalization of draft final report of the project was also organized.

TFRI, Jabalpur has documented information regarding use of indigenous flora for health care needs from vaidraj and local community from various districts of Madhya Pradesh and has also enumerated the overexploited species. Out



of total 714 plant species recorded from buffer zone of Tadoba Andhari Tiger Reserve, Maharashtra, 98 species were used by traditional healers for preparation of various herbal formulations. It has been found that seeds from Mul population of *Uraria picta* (Dabra) and Nimelda population of *Andrographis paniculata* (Kalmegh) can be used for artificial propagation as these populations showed high seed production and viability. Four families of spiders reared in the laboratory, viz. Pisauridae, Araneidae, Oxyopidae and Lycosidae, were released in the Arachnarium. *Nilus phipsoni* of family Pisauridae has been documented as new record to the state of Madhya Pradesh. In a study of preparation of user-friendly data-base of phyto-diversity in Satpura plateau agro-climatic zone of Madhya Pradesh, a user-friendly interface for 1,335 species for data entry, editing and retrievals was developed using Dot net technology. An average of 0.88% soil organic carbon was found in 200 soil samples collected from Rourkela Steel Plant, and soil carbon content was 32.19 t C/ha. A two days training on 'Carbon Sequestration' for the staffs of Steel Authority of India Limited was conducted at Rourkela Steel Plant.

FRI, Dehradun has taken up *ex-situ* conservation of threatened species such as *Ilex pseudo-odorata*, *Catamixis baccharoides* (Vishpatri), *Sophora mollis*, *Pittosporum eriocarpum*, *Indopiptadenia oudhensis*, *Mahonia jaunsarensis* and *Trachycarpus taki*. Qualitative and quantitative survey of 10 districts of Bihar for knowing floral biodiversity revealed that *Bauhinia scandens* var. *horsfieldii*, *Cycas pectinata*, *Drypetes assamica*, *Ficus benjamina*, *Ficus saemocarpa*, *Pterospermum acerifolium*, *Trevesia palmata* and *Xantolis tomentosa* were rediscovered after a lapse of 93 years. Plants raised in co-inoculation of *Pseudomonas fluorescens* and *Glomus etunicatum* performed better in terms of growth. *Termitoloemus marshalli* has been found to be a possible bio-control agent of mound-building termites. Two parasitic Hymenoptera species (*Paraphaenodiscus udayveeri* and *Oligosita ferozepurensis*) new to the science have also been described. Digitization of valuable authentic herbarium specimens (22,850) has been carried out. Web-based plant database of ligneous flora with digital images along with identification key has been completed for forest

flora of Manipur. In a study of allelo-pathic potential in regeneration of Sal (*Shorea robusta*) forests, *Ardisia solanacea* (Bisi), *Eupatorium adenophorum* (Snake Root or Kalo banmara), *Lantana camara* (Lantana, Phool Lakarhi, raimunia) and *Ageratum conyzoides* (Goat weed) have been found to have inhibitory effects on seed germination and growth of seedlings of *Shorea robusta* (Sal) under nursery stage. The best regeneration of Sal was found in Thano Forest Range, followed by Lachhiwala, Timli, Langa, Asarori and Choharpur Forest Ranges in a study of impact of Sal ANR in Shiwalik forests of Dehradun and Kalsi forests. Working plan for bamboo forests of Karanpur, Bindraban and Nandbir Ranges of Dasuya Forest Division of Punjab has been prepared. In ecological restoration study in coal mines of NCL, Singrauli, Madhya Pradesh, under site quality amelioration for different tree plantations after 29 years, sand percentage was found reduced maximum from 84.67% to 69.33% in *Pongamia pinnata* (Karanj) and *Azadirachta indica* (Neem) plantations, and silt percentage was found increased maximum from 13.33% in recent Over Burden dumps to 24.67% in mixed plantation of *Prosopis juliflora* (Vilayati babul/Bellary Jalli) and *Holoptelea integrifolia* (Chirol). The available amount of river bed material was calculated for rivers of Dehradun, Pauri, Udham Singh Nagar and Nainital districts of Uttarakhand. In an assessment of hydrological services imparted by forest of Kempty watershed (Mussoorie), watershed maps have been digitized for geo-morphological analysis and Soil and water quality parameters have been analyzed.

HFRI, Shimla has done floristic and phytosociological studies for developing conservation strategies for important species in Shimla Water Catchment Sanctuary, and for long term ecological monitoring in Shikari Devi Wildlife Sanctuary of District Mandi, Himachal Pradesh. The institute has done awareness programme for revival, recharging, sanitation and hygiene of natural water resources through adoption of scientific intervention in model village Lanabanka, Sirmour. A total of 170 specimens of 58 moth species were collected from selected sites of cold deserts and identified. In ecological studies on distribution patterns and food plant resources of butterflies along altitudinal gradients in different ecosystems of Western



Himalayan Sub-Alpine Forests of Himachal Pradesh, 59 species of butterfly out of 63 species collected were identified and characterized.

AFRI, Jodhpur has identified pathogens like *Fusarium*, *Colletotrichum*, *Phytophthora* and *Macrophomina* that cause diseases in neem seedlings and the loss caused by them was approximately 3-5%. *Piriformospora indica*, a root endophyte, known for its ability to promote growth in many plant species was tested alongwith a plant growth promoting bacteria in combination and alone on four different plant species in nursery viz. Neem, Khejri, Senna and Isabgol. In a study on phyto-remediation of soil for productivity enhancement during land disposal of effluent, growth in *Azadirachta indica* (Neem), *Eucalyptus camaldulensis* (Senna), *Prosopis cineraria* (Khejri), *P. juliflora* (Vilayati babul/Bellary Jalli), *Tamarix aphylla* (Farash), *Salvadora persica* (Khara Jhal) and *Salvadora oleoides* (Meetha Jhal) indicate that they can be utilized to produce biomass utilizing effluent water. Check list of trees both exotic and indigenous species, shrubs, grasses and climbers associated with *Prosopis juliflora* in seven different agro-climatic zones has been prepared.

IFGTB, Coimbatore has assessed population structure, regeneration status and pollination ecology of *Dalbergia latifolia* (Rose wood) and *D. sissooides* (Malabar black wood/ Kala-shisham) in four Forest Divisions in Tamil Nadu. The populations in these divisions were dominated by trees of higher girth classes/ old trees. The natural regeneration was also very poor, and in most of the cases, it was less than one per 100/m². A study on the Shola forests of Nilgiris, the institute generated bench mark information on the floristics, community ecology and forest dynamics of three Shola patches. In a study on reclamation of laterite lands using beneficial microbes in Kasargod District, with a view to reclaim laterite lands with suitable tree species inoculated with suitable beneficial microbes such as mycorrhizal fungi and nitrogen fixing bacteria like *Azospirillum* and phospho-bacterium on selective plant species like *Butea monosperma* (Palasham), *Swietenia macrophylla* (Mahogany), *Ailanthus triphysa* (Perumaram / Mattipal), *Holoptelea integrifolia* (Elm / Aaya) and *Gmelina arborea* (Gamhar,

Kumil) were raised on laterite soil collected from Kannur laterite areas of Kerala. Based on the finding from the field experiment it is understood that *A. triphysa* and *S. macrophylla* are the suitable tree species with bio-inoculants for planting in laterite lands.

RFRI, Jorhat has studied a total of 54 soil profiles from 225 soil samples collected from Natural forests, tea gardens and Jhum lands of Mokokchung, Wokha, Mon, Dimapur and Kohima districts of Nagaland. In a study on impact of *Mikania micrantha* (Japanilata) on micro-environment of native species in Bherjan-Borjan-Padumoni Wildlife Sanctuary, Dilli Reserve Forests and Abhayapur Reserve Forests of Upper Assam, infestation of *Mikania* was recorded mainly in periphery than in core areas. Maximum species richness was documented in Abhyapur Reserve Forests. Highest regeneration of *Dipterocarpus retusus* (Hollong), *Mesua ferrea* (Nag champa, Nahar) and *Vatica lanceifolia* (Morsal) was observed in un-infested areas of Dilli Reserve Forests and Abhayapur Reserve Forests, whereas seedling population of *Terminalia* species and *Phoebe goalparensis* (Bonsum) was high in Bherjan-Borjan-Padumoni WLS. Fifty Bambusicolous macro-fungi were collected from 23 sites in Jorhat, Golaghat and Sibsagar districts of Assam, identified on the basis of macroscopic and microscopic characteristics, and host-fungus relationship was also worked out. Two new macro fungal species (*Lysurus habungianus* and *Gelatinomyces conus*) have been collected and described. In a study on diversity and dynamics of the soil seed bank in Nambor Reserve forest, a tropical semi-evergreen forest of Assam, species richness among the seed banks was recorded as Mixed forest > Sal dominated forest > Teak dominated forest > *Lagerstroemia speciosa* (Azar) dominated forest.

IFP, Ranchi has developed agro-techniques for organic cultivation of *Tribulus terrestris* (Gokru, Gokrusura) and *Cissus quadrangularis* (Hadjor, Harjor) medicinal plants that are extensively used in traditional system of medicine i.e. Ayurveda, Unani and Chinese.

Forest and Climate Change

FRI, Dehradun in a study on Elevated CO₂ has found that maximum biomass under elevated CO₂ (800 ppm) was recorded for *Eucalyptus*



citriodora (Safeda) (Seedling - F2 progeny) whereas minimum for *Populus deltoides* (Poplar) (Clone – G48) followed by *Eucalyptus* hybrid FRI-PH4 (Clone - FRI-PH4), *Eucalyptus tereticornis* (Seedling - F2 progeny), *Dalbergia sissoo* (Shisham) (Clone 18), *Melia dubia* (Burma Drak) [Seedling (progeny) – 64] and *Melia dubia* [Seedling (progeny) – 75]. Overall, seedlings of *Eucalyptus citriodora* were found to have higher biomass compared to efficient *Melia dubia*.

IFGTB, Coimbatore has assessed soil organic carbon under different land uses in Tamil Nadu and it was found that soil organic carbon storage was found to be highest under agro-forestry land use and the clay + silt sized fraction (<53 µm) retained the highest amount of organic carbon at 0-30 cm soil depth in the Southern Agro-climatic zone. On the basis of rooting ability, 33 clones of teak have been short-listed and being multiplied for studying intra-specific variation in teak for carbon sequestration potential under elevated CO₂ levels.

IWST, Bengaluru has assessed decay of wood in the forests and its impact on methane release contributing towards climate change. The CH₄ concentration was estimated to be 1976.73 ppm during summer and 152.84 ppm during winter in *Carallia brachiata* (Andipunar) indicating the influence of seasonal factors. The anaerobic culturing of core wood samples and gas samples revealed that *Methanogenium* species was responsible for Methanogenesis.

RFRI, Jorhat had studied the changes in soil quality and carbon build-up under different land- use systems (forest, jhum lands, fallow jhum lands, plantations and tea gardens) in Nagaland. There was not much significant difference in the value of pH and EC under the studied land uses, while the value of available N and K were significantly better under the plantation areas. In assessment of diversity and carbon sequestration potential of above ground woody biomass of Semi -evergreen Forests in Assam, above ground carbon was estimated as 77.36 t/ha. The total AGB carbon stock of all the tree species was estimated as 38.7 t/ha.

HFRI, Shimla has assessed carbon stock in various forest types of Shimla Forest Circle, such as Chirpine forest, Ban oak, Kail, Deodar,

Silver fir-Spruce, Kharsu oak, Mohru oak, Alder, Cypress forest, Northern dry mixed deciduous forests and alpine pasture. For long term study to assess the effect of global warming in High Altitude Transition Zone (HATZ) in Himachal Pradesh, germplasm of threatened medicinal plants collected from the HATZ for *ex-situ* conservation is being maintained in the nursery beds at Potters Hill, Shimla.

IFB, Hyderabad has created database of surveyed plots that included vegetation and biomass parameters under Vegetation Carbon Pool Assessment (VCP).

Forest Genetic Resource Management and Tree Improvement

FRI, Dehradun has recorded oil content from 95 designated plus trees of Karanja (*Pongamia pinnata*) from the states of Punjab, Haryana, Uttar Pradesh and Uttarakhand. Oil content was the highest in accession 81 (41.4%) and such high yielding genotypes have been planted at various locations to reconfirm their performance in terms of growth as well as seed production and also to evaluate stability. 55 bamboo-based SSR primers have been synthesized and screened for their transferability in targeted species. Out of these, 30 primers were positively amplified in *Dendrocalamus hamiltonii* (Bamboo) and 15 were polymorphic. The experimentation on creation of polyploids among 41 progenies (from individual plus trees in the states of Gujarat, Haryana, Punjab, and Rajasthan) germinated in the laboratory using various combinations of colchicine were initiated as well as LD₅₀ has been worked out. The experimentation on tissue culture was initiated with the successful culturing of nodal cuttings from 3-year old accessions maintained in the green house as well as from 5-15 years old trees using cytokinins and auxins. Tissue culture protocol for propagation and conservation of *Ginkgo biloba* (Maidenhair tree, Ginkgo) is being developed. Under All India Co-ordinated Project for genetic improvement of *Melia dubia* (Malabar Neem, Burma Drak), Candidate Plus Trees have been selected in natural forests of Assam and Arunachal Pradesh and plantations of Uttarakhand, Punjab and Haryana and superior accessions have been shortlisted as plus trees based on ranking of economically important traits. A total of 357 superior clumps of ten



species of bamboos (*Bambusa bambos*, *B. vulgaris*, *B. tulda*, *B. nutans*, *B. balcooa*, *Dendrocalamus strictus*, *D. hamiltonii*, *Pseudoxytenanthera stocksii* (syn. *Dendrocalamus stocksii*), *D. brandisii* and *D. somdevai*) were identified by the five institutes. Out of the selected 357 clumps, 177 clumps have been picked up for their multiplication in consultation with NABM based on their previous record of flowering. Propagation technique has been standardized and multiplication of selected clumps is in progress.

IFGTB, Coimbatore selected 200 superior trees of *Eucalyptus* from Coimbatore, Kuruchi, Kandiur, Udumalpet and Chennai progeny trials. They have been coppiced and coppice shoots have been used for mass multiplication. Three clonal trials of *Melia dubia* (Malabar Neem) were established in Tirupati, Dharwad and Chennai. 30 clones of *Ailanthus excelsa* (Indian Tree of Heaven) have been assembled for mass multiplication for clonal evaluation of *A. excelsa* in different agro-climatic zones of Tamil Nadu. Periodical assessment of two progeny trials of Red sanders (*Pterocarpus santalinus*) planted at Chennai and Neyveli Research stations are being done. Mapping and monitoring of Casuarinas and Eucalyptus plantations in selected districts of Tamil Nadu using RS and GIS are in progress. A composite transgenic system with a transformation efficiency as high as 61% was developed in *Eucalyptus* for functional analysis of genes in transgenic roots that develop on non-transgenic shoots. A bar-coding primer Ribulose-1, 5-bisphosphate carboxylase oxygenase (rbcL) with a product size of 650bp was optimized in *P. santalinus*. Preparation of draft DUS guidelines for indigenous forest tree species (*Tectona grandis* (Teak) and *Melia dubia*) is under preparation. Genetic improvement of *Casuarina* species through second generation orchards is in progress and under this all trees in progeny tests older than five years have been ranked and inferior families and trees were removed for conversion into seedling seed orchards (SSO) for seed collection and supply. Pulp improvement with emphasis on disease resistance was attempted through full-sib breeding of *Corymbia torelliana* X *C. citriodora* through controlled pollination. Through genetic improvement of *Eucalyptus* through mapping and tagging of QTLs/genes, dihybrid

combinations of *E. camaldulensis* X *E. tereticornis*, *E. tereticornis* X *E. camaldulensis*, *E. camaldulensis* X *E. grandis* and *E. tereticornis* were developed. Thirty four seedlots of *Leucaena* have been collected for germplasm assemblage and improvement of *Leucaena leucocephala* (Subabul) for industrial biomass productivity. Seedlings and clones have been produced from 40 seedlots of *Casuarina* from CSIRO, Australia for improvement of *Casuarina* and *Leucaena* for enhancing pulpwood production from farm forestry plantations. Molecular characterization of high yielding clones of *Pongamia* has been done using RAPD markers under selection and evaluation of high yielding clones of *Pongamia pinnata* (Karanj). 139 plus trees of *Thespesia populnea* based on growth and tree form were selected in Tamil Nadu, Kerala and Puducherry for screening of germplasm of *Thespesia populnea* for improving productivity. 25 high oil yielding CPTs, based on oil content were assembled in germplasm bank for establishing trials for improvement of *Calophyllum inophyllum* (Punnai), a potential tree borne oil species of Karnataka. Based on isozymes studied in *Swietenia macrophylla* (Mahogany) and *S. mahagoni* (Mahogany); Formaldehyde dehydrogenase, Iso-citrate dehydrogenase and Glutamate dehydrogenase have been found suitable for species discrimination.

IWST, Bengaluru has studied the genetic diversity of different natural/plantation grown trees of *Melia dubia* in Karnataka, that reveal that this species has considerable variation which would facilitate in developing further tree improvement strategies. Variability in terms of fruit and seed traits was observed in *Mesua ferrea* (Nag champa, Nahar) and *M. insignis*. Determination of oil content in Sandalwood reveals that oil content was found to be 0.2 to 1% in age class of 9-12 years and maximum of 4% in 30 year old trees. *In vitro* propagation through axillary shoot proliferation using nodal segments from mature plants was used for large scale multiplication and restocking of *Embelia ribes* (Vidanga) populations. The institute has developed demo-plots of sandalwood with red gram as primary host and Indian gooseberry as secondary host in Mohali, Ropar, Mathewada (Ludhiana) and Bhatoli (Talwara) with 60-90 % survival after one year. Based on recorded data from progeny trials planted at Agundapalli and



Megharwali, survival was higher in Agundapalli compared to Megharwali. A total of 102 genotypes of *Dendrocalamus stocksii* (Marihal bamboo) were evaluated in Western Ghats of Karnataka and variation was found for culm and clump characteristics and also for physiological parameters among the populations. Fungal species which have been reported to induce agar wood in north-eastern part of India were selected from the 89 colonies and pure cultures were multiplied. DNA-based identification system for three important timber species viz. *Dalbergia latifolia* (Rosewood), *Tectona grandis* (Teak) and *Lagerstoemia lanceolata* (Nandi) of Karnataka is being developed. Seeds of medicinally and economically important RET species of wet-evergreen forest of Western Ghats such as *Kingendendron pinnatum* (Enne mara), *Oroxylum indicum* (Aanemungu, Bunepale) and *Nothapodytes nimmoniana* (Peenari) have been tested for germination and findings reveal that *O. indicum* seeds germinated in 15 days while, *K. pinnatum* and *N. nimmoniana* seeds had dormancy.

TFRI, Jabalpur has established seed source trial for *Pterocarpus marsupium* (Beeja sal) at Naya Raipur, Chhattisgarh and Chhindwara. The chemical estimation of reserpine content in five genotypes has been completed. The cultivar OR-AG (Odisha) had the maximum reserpine content followed by MP-CW from Madhya Pradesh. Preliminary statistical analysis of morphometric data of six zones out of 15 teak dominated agro-climatic zones revealed that there is significant differences for all the traits studied i.e. height, clear bole height, DBH, wood fibre length, wood density except fibre breadth. In a study of identification of best sources of germplasm of *Madhuca indica* (Mahua) in Chhattisgarh through phyto-chemical evaluation, oil and saponin content in seeds from Bilaspur, Jashpur, Kanker, Surguja and Jagdalpur were estimated. The somatic embryos of *Dalbergia latifolia* (Rosewood) were inoculated on MS medium supplemented with different concentrations of BA for maturation. Shoot formation and elongation was achieved. A germplasm bank for molecular characterization of critically endangered *Litsea glutinosa* (Maida chhal) was established at the Institute and work on the molecular characterization of the germplasm is in progress. The propagated plants of four

species of bamboos such as *Bambusa bamboos* (Katang bans), *B. tulda*, *B. vulgaris* and *Dendrocalamus strictus* (Lathi bans) are maintained by further process of macro-proliferation.

AFRI, Jodhpur has conducted survey to identify the existing production populations of *Azadirachta indica* (Neem) for induction, evaluation and development of polyploides. In assessment of variability, improvement and refinement of cloning techniques of *Tecomella undulata* (Rohida), the progeny of CPT No-36 from Pali district gave the best growth of 128 cm height, and maximum collar diameter of 1.72 cm was found in progeny of CPT No-7 from Nagaur. The genetic diversity studies using ISSR as marker is in progress. Micro-propagation protocol developed for Neem and Bamboos were transferred to State Forest Department, Gujarat. Tissue culture protocol for *Capparis decidua* (Kair) was developed starting from axillary bud culture, *in vitro* shoot multiplication and *in vitro* rooting of shoots. Differences amongst the families were found to be highly significant in the trials for height as well as collar girth of *Melia dubia* (Malabar Neem, Burma Drak).

RFRI, Jorhat has done genetic evaluation of the selected genotypes along with known clones of other *Populus* species in different agro-climatic region for identification of suitable clones of *Populus* species for North-eastern states. DNA samples were extracted from 53 progenies of *Melia dubia* (Malabar Neem, Burma Drak) selected from North East region and the methodology was standardized for optimization of PCR reactions. Based on the observations of pest attack on *Gmelina arborea* (Gamhar) at Naharoni, Jorhat experimental site, 7 clones were identified as less attacked and 24 clones considered as moderately attacked. Out of three variants of *Aquilaria malaccensis* (Sanchi, Agar, Agarwood) identified based on leaf morphology, artificial inoculation of fungi was found successful to induce agar wood formation in two of the variants.

IFP, Ranchi is in process of standardization of vegetative propagation technique for release of superior clones of *Melia dubia* (Malabar Neem). Forty five CPTs have been selected in Jharkhand and Bihar states based on the criteria for plus tree selection, mainly consisting



of traits of timber productivity and disease resistance in *D. sissoo* (Shisham). Molecular characterization of 21 promising clones has been carried out to assess genetic diversity among the selected clones. Culm and culm branch cuttings collected from nine superior clumps of *Dendrocalamus strictus* (Lathi bans) and three of *Bambusa tulda* maintained in IFP Germplasm Bank are being multiplied. A field trial with 36 populations (8 parents + 28 F₁ progenies) of *Jatropha curcas* (Jatropha) has been established and growth data has been recorded. Genomic DNA of plus trees of teak maintained at Chandrapur are being extracted. Meanwhile, PCR assay for amplification of SSRs markers and candidate genes are being standardized.

HFRI, Shimla has maintained the field trials of *Jatropha* established earlier at Majauli, Bhojnagar and Samloe and recorded various parameters in the field. Plantations (0.1ha each) have been established at two locations namely Thakurdwara, Nalagarh and Jawalaji, Kangra during January 2016 with the selected material raised at Nalagarh for future studies.

Forestry Education and Policy Research to Meet Emerging Challenges

FRI (Deemed) University organized Annual Sports Meet from 10 to 18 March 2016. Process of re-accreditation of 14 Universities accredited with ICFRE earlier and accreditation of four new Universities is under progress. The Evaluation Team of ICFRE has visited six Universities to validate the data submitted by the University in their Self Appraisal Report.

Funds were released to Navsari Agricultural University, Navsari, Sher-E-Kashmir University, Srinagar, H.N.B. Garhwal University, Srinagar and Tamil Nadu Agricultural University, Mettupalayam to carry out the network project work to assess the gaps and challenges in Non-Timber Forest Produce sector. Several renowned scientists from foreign countries such as Czech Republic, Germany, Sweden etc visited institutes, delivered special lectures and interacted with students. About 140 scientists and officials of ICFRE and its institutes participated in various seminars/ symposia/ workshops/trainings/meetings organized by various organizations throughout the country on variety of subjects.

Directorate of Education, ICFRE processed 40

cases of the officers & scientists for their foreign visit (abroad) for permitting and issuing them necessary Political/FCRA Clearances to visit abroad. Various training programmes were organized by ICFRE, Dehradun and its institutes for capacity building of scientific and management cadre.

ICFRE is an apex organization dealing with the forestry research and education in the country. A committee, in this regard, was constituted vide letter No. 12-1/2006-FP dated 23 August 2006 and revised on 30 March 2010 to deliberate upon and finalize the issues/subject areas related to economic, social and environmental aspects of forestry & wildlife, and to direct researches on the same through ICFRE Institutes or outsourcing the same from the identified expert agencies/organization. 6th meeting of Policy Research Committee of ICFRE was held on 5 January 2016 at Indira Paryavaran Bhawan, Jor Bag, New Delhi.

Forestry Extension for Taking Research to People

ICFRE, Dehradun published Annual Reports of ICFRE for the year 2014-15, Bi- annuals ICFRE Newsletter and Vaniki Samachar, Taruchintan and several other reports and books were published by its institutes such as *Detailed Project Report (DPR) on Forestry Interventions for Ganga*, Volume I & II, *Advances in Mycorrhiza & Useful Microbes in Forestry*, *Book on Climate change mitigation and adaptation in forestry sector in India*, *Butterflies of Garhwal, Uttarakhand, Western Himalaya, India*, *Pictorial Guide on Shola Trees*, *Statistics in Forestry: Methods and Applications* etc. A total of 412 research articles were published by ICFRE in scientific journals of national and international repute and in the books. A total of 32 research articles were presented in seminars /conferences /workshops and 55 abstracts and 33 popular articles were also published by ICFRE Institutes. A total of 8 books and 23 booklets, brochures/pamphlets were published by the ICFRE during the year.

National Forest Library and Information Centre (NFLIC), Dehradun loaned 25,215 books to the users for outside reading. Besides, 52,590 documents were consulted inside the library. 656 books and other documents were added to the NFLIC during the year. The NFLIC subscribed 26 Indian periodical titles and one



International journal for the year. It also received 491 issues of the periodicals as gratis. 241 books were sold to the State Forest Departments, universities, etc.

ENVIS Centre on Forestry, FRI, Dehradun published books entitled Bamboos in India, Environment and Forests News Digest and Poplar in India. ENVIS Centre on Forest Genetic Resources and Tree Improvement, IFGTB, Coimbatore released posters to commemorate various international days, viz. International Day for Biological Diversity, International Day for the preservation of the Ozone Layer, International Mountain Day and International Day of Forests. It displayed information boards at Palakkad Railway Station to highlight general activity of ENVIS and importance of Forest Genetic Resources and Tree Improvement on 22 and 23 March 2016 during exhibition of the Science Express Climate Action Special.

Various technologies developed by the Council and its Institutes and State Forest Departments (SFDs) were disseminated to the user groups including farmers and forest based industries under Van Vigyan Kendras (VVKs) scheme through various trainings and distribution of literatures. Dissemination of various technologies developed by the Council and its institutes to the user groups including farmers through demonstration were done through Demo Village (DV) and several capacity building programmes and other activities were taken up.

Under Direct to Consumer Scheme, lectures and training-cum-workshops were organized by FRI, Dehradun and RFRI, Jorhat. Several technologies were transferred by FRI, Dehradun, IFGTB, Coimbatore, CFRHRD, Chhindwara-a Centre under TFRI, Jabalpur and RFRI, Jorhat. 37 numbers of Seminars/Symposia/Workshops were organized at various ICFRE Institutes/Hq.

Special Activities were undertaken by ICFRE, Dehradun and its institutes to celebrate Earth Day, National Technology Day, International Biodiversity Day, World Environment Day, World Day to Combat Desertification, Van Mahotsava, Himalayan Day, *Swatchh Bharat Abhiyan*, Wildlife Conservation Week, Vigilance Awareness Week, World Forestry Day, National Forest Martyrs Day, Kisan

Mela/Exhibition/Trade fair etc.

Representatives of RFRI, Jorhat and TFRI, Jabalpur delivered Radio Talks that were broadcasted from All India Radio. Draft final report of Cumulative Impact of Hydro-power Projects on River Yamuna and Tons and its tributaries, Uttarakhand, Cumulative Environmental Impact Assessment Studies (CEIAS) of Hydro-electric Projects on Sutlej River Basin in Himachal Pradesh and Environmental Impact Assessment and Environmental Management Plan for Tosh-Parvati (Nakthan) 460 MW HEP Project, Himachal Pradesh and final report of Carrying Capacity study of Saranda region in West Singhbhum District, Jharkhand were submitted by ICFRE, Dehradun. Several other consultancy projects were undertaken by FRI, Dehradun, IFGTB, Coimbatore and TFRI, Jabalpur.

ICFRE, Dehradun and its institutes celebrated Hindi Week in September 2015. Hindi Workshops were organized by ICFRE, Dehradun; IFGTB, Coimbatore; IWST, Bengaluru; AFRI, Jodhpur; RFRI, Jorhat; IFP, Ranchi etc.

Distinguished Visitors who visited ICFRE, Dehradun and its institutes were Sushri Uma Bharti, Hon'ble Minister for Water Resources, River Development & Ganga Rejuvenation; Shri Prakash Javadekar, Hon'ble Minister of Environment, Forest and Climate Change; Shri Shripad Yesso Naik, Hon'ble Minister, AYUSH, Shri Sarbanand Sonowal, Hon'ble Minister, Youth Affairs & Sports; Shri Harish Rawat, Hon'ble Chief Minister of Uttarakhand and Shri Dinesh Aggarwal, Hon'ble Forest Minister of Uttarakhand, Shri Bali Bhagat, Hon'ble Forest Minister, Govt. of J&K and Shri Kamakhya Prasad Tasa, Hon'ble Member of Parliament, Jorhat, Assam.

Administration and Information Technology

The achievement of the ICFRE Server Farm in terms of availability for 2015-16 was 100%. IT Division, ICFRE has designed and developed the CMS for the Hindi website of ICFRE. It has also designed, developed and implemented the GPF Database and application on live server. With this application, Pension Cell is uploading the data of GPF of employees.

The Directorate of Administration of ICFRE had undertaken preparation of budget estimates,



allocation of budget and preparing annual mandatory financial statements; filing of mandatory financial and administrative returns of ICFRE; stores including inventory management and procurement. The Directorate has also dealt with civil and technical works of the Council and its Institutes.

The Council using the framework of 'Sevottam' is committed to continuously improve quality of service in ICFRE (Hqtrs.) and its Institutes. Under 'Sevottam' framework, ICFRE has implemented the Citizens' Charter, Public Grievance lodging and redressal mechanisms and service delivery capability.