ANNUAL REPORT 2014-2015

Kerala Forest Research Institute

Annual Report

2014-2015

Kerala Forest Research Institute

An Institution of Kerala State Council for Science, Technology and Environment

Peechi - 680 653, Thrissur, Kerala

Cover Image :
Mangroves
(Rhizophora species)
at Chettuva Islands, Thrissur
By Dr. P Sujanapal, Silviculture Department

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KFRI

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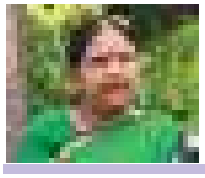
CONTENTS

- DIRECTOR'S NOTE
- THE INSTITUTE
- PROGRAMME DIVISIONS
  - Sustainable Forest Management
  - Forest Genetics and Biotechnology
  - Forest Management Information System
  - Forest Ecology and Biodiversity Conservation
  - Wood Science and Technology
  - Forestry and Human Dimensions
  - Forest Health
  - Extension and Training
  - Library and Information
  - Support Sections
- FACILITIES
  - Asia–Pacific Forest Invasive Species Network (APFISN)
  - International Teak Network (TEAKNET)
  - NBM-Bamboo Technical Support Group
  - Arboretum
  - Bambusetum
  - Bioresources Nature Park
  - Butterfly Garden
  - Central Instrumentation Unit
  - Central Nursery
  - Herbarium
  - Kerala Forest Seed Centre
  - Medicinal Plant Garden
  - Orchidarium and Fernery
  - Palmetum
  - Seismic Observatory
  - Teak Museum
  - Tree Health Helpline
  - Wildlife Museum
  - Xylarium
- RESEARCH AND EXTENSION ACTIVITIES
  - Completed Research Projects
  - Ongoing Research Projects
  - Ongoing Extension Projects
  - Publications
  - Endowment Awards
  - Training Programmes
  - Exhibitions / Visitors
- ACADEMIC PROGRAMMES
  - Doctoral Degree Awarded
  - Ongoing Programmes
    - Post-Doctoral / Young Scientist Programme
    - Doctoral Programmes
    - Post Graduate Attachment Programme
- BALANCE SHEET
- INCOME AND EXPENDITURE STATEMENT
- INTERNAL COMMITTEES
- STAFF LIST

Kerala Forest Research Institute



Director's Note

The forestry sector has been undergoing important changes largely in response to a number of developments outside the sector. In the absence of a clear understanding of the nature of the changes and their implications on forestry, the sector has not been able to respond effectively and adapt to the changes. During the coming years the economic, social, institutional and technological changes are expected to accelerate, and it will be critical for the forestry sector to identify the driving forces and the scenarios that are emerging, the major changes with regard to forest resources, the demand for goods and services and the options available considering probable alternative scenarios. In a country like India with a steadily increasing population, where about 68.84 per cent of people live in rural areas and 26.4 per cent is below the official poverty limit there is an immediate need to provide a solution to the problems of poverty and hunger by providing food security and nutrition.

The United Nations General Assembly has emphasized on 'family farming', which is a predominant form of agriculture that encompasses agriculture, forestry, fisheries, pastoral and aquaculture production and supports sustainable development by protecting and managing natural resources. The unique combination of forest and farm resources permits complex agro-ecological systems which are the reservoirs of nutrition, genetic materials, fuel and energy, fodder and building materials, water retention and recharge, pollination and pest control, green manure and biological and cultural diversity all over the world. The report by State of World's Forest 2014 highlights the potential of well managed forest in contributing to sustainable development and food security, global climate change mitigation, conservation of soil and water in fragile ecosystem, poverty alleviation through employment generation from forest goods and services. Creation of a low carbon economy has already begun as part of the climate change mitigation activity through activities like private and public investment with well-defined policies, laws and regulations to ensure sustainable economic and social benefits to the country. Investment policy with public ownership of forest along with REDD+ relating financing mechanisms, tax incentives and low interest loans has greatly improved the conservation activities in many countries. The Kerala Forest Research Institute via research and extension is continually attempting to articulate strategies for the development of the forestry sector.

During 2014-15 KFRI has had a total of 125 ongoing research, extension and training programmes. Financial support for these projects has been obtained from KFRI plan grants as well as from different international, national and state agencies. We have received 1869.5 lakhs financial support from the Kerala State Council for Science Technology and Environment, Government of Kerala, both as plan and non-plan grants. Financial support received from external agencies for specified projects was 309.69 lakhs. All these accomplishments of KFRI is due to the timely guidance of the Research Council and Management Committee and the untiring work carried out by scientists, staff and students of KFRI. The contributions from all are duly acknowledged.

Dr. PG Latha

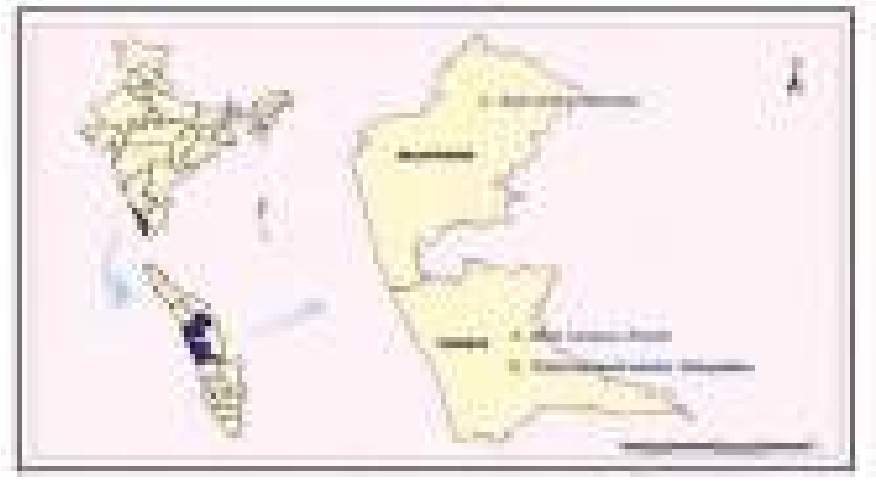
THE INSTITUTE

The Kerala Forest Research Institute (KFRI) established in 1975 by Government of Kerala as an autonomous organization under the Travancore-Cochin Literary, Scientific and Charitable Societies Act (1955), is a premier forestry research institute dedicated to research in tropical forestry and biodiversity. KFRI undertakes research and consultancy programmes for national and international agencies on various aspects/issues related to biological conservation and management of natural resources. KFRI became a part of the Kerala State Council for Science Technology and Environment (KSCSTE), an autonomous body under the Department of Science and Technology, Government of Kerala, along with other Science and Technology institutions of the State when the latter was constituted in 2003.

The Institute is envisioned to become a centre of excellence in tropical forestry to provide scientific backbone for effective decision making on forestry, with particular emphasis on conservation, sustainable utilization and scientific management of natural resources ensuring benefits to the society. KFRI has been instrumental in evolving strategies for conservation and sustainable use of forest resources of the State. The mission being to provide technical support to facilitate scientific management and utilization of forests for social benefits. Accordingly, the Institute envisages to:

a. conduct inter/multidisciplinary research on priority areas of tropical forestry including wildlife management, socioeconomics, indigenous knowledge, value addition of forest products, participatory forest management and livelihood improvement of forest dwellers/dependents by scientific management of forest resources,
b. provide technical advice and solutions to practical problems related to forest conservation and sustainable utilization of forest resources, and
c. disseminate knowledge and information on forest-related matters to end-users, farmers, general public and transfer of technology to stakeholders for social benefits.

KFRI has three campuses, the main campus at Peechi is in a 28 hectares Reserve Forest area located 20 Kms east of Thrissur city and adjacent to Peechi-Vazhani Wildlife Sanctuary. This houses the Director's Office, the Institute's administrative wing, the Programme Divisions/Departments, sophisticated research facilities, live collections, and plant propagation facilities. Besides, it also has centralized facilities including library, central instrumentation unit, local area network, training facilities, stores, seminar and conference facilities, staff accommodation, guest house and a research scholars' hostel. A seismic observatory operated and maintained by the National Centre for Earth Sciences is also housed in the KFRI main campus.



Sub-centre, Nilambur

The KFRI sub-centre campus at Nilambur has laboratory facilities, field trial plots of several tree species, a bambusetum with 21 species of bamboos, teak museum, a bioresources nature park, medicinal plant garden and a model butterfly garden. This campus is spread over an area of 43.36 hectares and is about 140 Kms away from the main campus.

Field Research Centre, Velupadam

The Field Research Centre (FRC) at Velupadam in Thrissur District situated 36 Kms away from Peechi main campus is spread over an area of 47.43 hectares. Mainly field trials are conducted at the FRC campus. The FRC has a nursery of

forest plant species and also an arboretum with plant species from Western Ghats. A bambusetum, one of India's largest live collections of bamboos, is the main attraction of Velupadam campus.

Organization

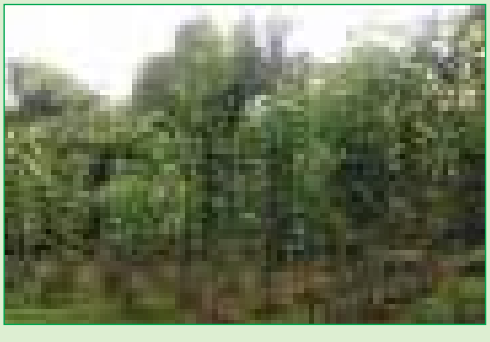
The scientific activities/manpower of KFRI are organized under nine Programme Divisions each comprising different Departments for effective implementation of multidisciplinary research in forestry and to disseminate the research findings to the stakeholders. The Research Council a vital body comprising of eminent scientists in the field of forestry research in the country is responsible for overseeing and guiding the formulation and implementation of various research programmes of KFRI. A Research Monitoring and Evaluation Unit is also functioning to facilitate and monitor various research activities in the Institute. The routine administration of the Institute is looked after by the Director. The administrative policies of the Institute are taken care by a Management Committee chaired by Institute's Director and the same oversees the administration and management of KFRI. The Committee approves and manages both administrative and financial matters. Administrative and Accounts Sections, coordinated by the Registrar, assists the Director in managing the day-to-day functioning of the Institute. The financial and expenditure matters of the Institute are scrutinized by an Internal Auditor. The total staff strength of the Institute is 107 which include 33 scientists, 64 administrative staff and 10 technical staff. In addition, there are persons working on contract basis, project staff working in different research/extension projects and security staff on contract basis.

The Institute is accredited as a research centre of the Forest Research Institute University, Dehradun; Cochin University of Science and Technology, and University of Calicut for enrolling students for research programmes leading to the award of doctoral degree. Secretariat of two international Networks funded by the Food and Agriculture Organization of the United Nations, namely, the Asia-Pacific Forest Invasive Species Network (APFISN) and TEAKNET (International Teak Information Network) are housed in KFRI.

PROGRAMME DIVISIONS

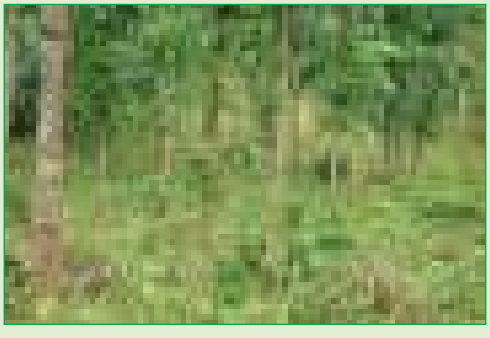
Sustainable Forest Management

The Division comprises of Tree Physiology, Silviculture and Soil Science Departments. The mandate is to derive modes and strategies for the sustainable management of forests. Seed technology, improved nursery and silvicultural practices, production of better clones and quality planting stock of plantation species are the key research areas of the Division. In addition, studies have also been undertaken on afforestation and eco-restoration of degraded sites, raising green belts in coastal areas, control of river bank erosion by planting, evaluation of factors affecting plantation productivity, soil nutrient management for important forestry species, composting technology for soil amelioration, and environmental physiology, especially water use, photosynthesis and microclimate. The Division is engaged in different social awareness programmes like medicinal plant conservation plans, soil erosion prevention programmes, weather parameters monitoring, among others.



Forest Genetics and Biotechnology

Departments of Genetics and Tree Breeding, and Biotechnology are the components of the Division. Tissue culture of important forestry species and medicinal plants and low cost micro-propagation technology are carried out in the Division. Other research activities of the Division include genetic improvement of teak, marker-assisted selection, DNA finger printing, DNA barcoding, Population genetics, genomics and transcriptomics. The Division also undertakes evaluation of genetic diversity of forest species, selection of plus trees and genetic improvement, studies on breeding system and gene flow.

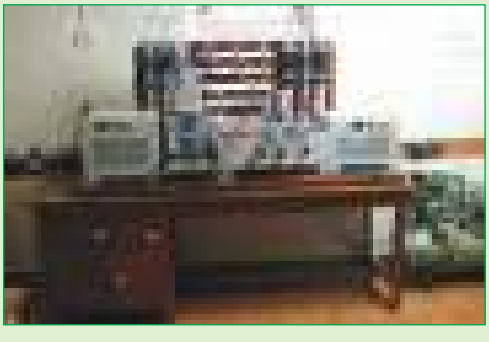


Forest Management Information System

The Division caters to the information needs of the stakeholders of forest sector using modern tools of statistics, GIS and remote sensing. Forest sector analysis and projections, creation of databases on biophysical and socioeconomic aspects pertaining to forests, mapping forest cover and biodiversity, modeling the growth dynamics of plantations and natural forests for effective management are the major activities of the Division. Ecological studies on the Shola forests of Kerala based on remote sensing data and simultaneous calibration of allometric relations in teak stands using multilevel models were carried out by the Division. Stand modeling, biodiversity mapping, ecosystem analysis, GIS, forest resource mapping, population analysis and organization of a data bank of forestry in Kerala are other programmes undertaken. The Division has also developed a growth simulator for teak plantations in Kerala.

Forest Ecology and Biodiversity Conservation

The Division comprises of the Departments of Forest Ecology, Botany, Wildlife and Non-Wood Forest Products (NWFPs). Major research areas of the Division are biodiversity evaluation and conservation of fragile ecosystems, rehabilitation and restoration of degraded ecosystems, ecosystem and landscape analysis, population ecology, traditional knowledge system analysis and biodiversity-informatics. Botany Department undertakes documentation and inventorisation of biodiversity of diverse forest types and protected areas, evaluation of below-ground biodiversity and taxonomic studies and conservation of Vulnerable species of flora. Wildlife Department attempts various aspects on inventorisation of fauna and endangered animals, man-wildlife interaction, wildlife census and also houses a wildlife museum. The NWFP Department works on isolation, characterization and bioactivity studies of molecules from medicinal plants of Western Ghats, and the studies on environmental impact of pesticide application is ongoing. Phytochemical analysis of medicinal plants, nursery and plantation technology of selected indigenous timber species, ethnobiological studies and cultivation of medicinal plants and other NWFPs, such as, bamboos and rattans, are other activities of the Division.

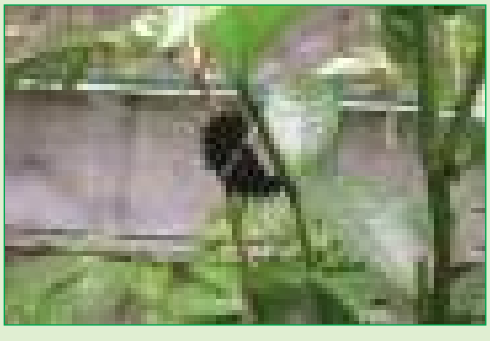


Wood Science and Technology

Research and extension activities related to wood structure, wood properties and utilization, timber processing technology for increased durability and value addition are undertaken by the Division. Wood identification for commercial and judicial purposes are one of the major activities of the Division. In addition, anatomical studies, utilization modalities and value addition of products on bamboos, reeds and canes have been undertaken. Many studies on wood structure, properties and preservative treatments for high value timber species like teak, eucalyptus and rubberwood were undertaken by the Division. Division has facilities for wood preservation, drying kiln and has instruments like Universal Testing Machine (UTM), image analyzer and NIR spectroscope.

Forestry and Human Dimensions

The Division consisting of Forest Economics and Sociology Departments undertakes research on human dimensions of forestry including livelihood and recreation, environmental conservation and linkages between social and natural sciences. Participatory role of local communities in conservation and sustainable management of forest ecosystem, resource use conflict and livelihood issues and development experiences of Scheduled Tribes are some focus areas of the Division. This Division gives emphasis on economic valuation, sustainable utilization of non-timber forest products, natural/forest resource management policy and strategic planning. Evaluation of the livelihood conditions of bamboo workers in Kerala, continuous assessment of supply-demand position of wood for the State, role of bamboo in sustainable livelihoods, structure and functioning of bamboo sector and policy studies are some of the key achievements of the Division.



Forest Health

Forest Entomology and Forest Pathology Departments together form the Forest Health Division. The focal point is on development of eco-friendly biological technologies for management of pests, diseases and weeds in forest ecosystem. Authentic collections of microbes and insects of Kerala forests and also of microbial pathogens of forest insects are maintained in the Division. Other areas of research include management of nursery and plantation diseases, diversity of plant pathogenic fungi in different forest ecosystems, Vescicular-Arbuscular and ectomycorrhizal fungal diversity and biological control of weeds.

Monitoring of forest insect diversity, control of termites in plantations, wood damaging insects and traditional methods of post-harvest protection of bamboo from insect borers are some of the major thrust research areas of Entomology Department. The Department has popularized the concept of butterfly garden and technical advice is being provided to various agencies for the establishment of butterfly parks across the State and outside.

Extension and Training

The Division communicates with the users /stakeholders, facilitates transfer of technology to various stakeholders and conducts training programmes in different aspects of tropical forestry like forest management, forest seed management, medicinal plant cultivation, environmental impact assessment, biodiversity monitoring and evaluation, remote sensing and GIS, root-trainer technology, clonal propagation, tree improvement and statistical application in forestry. The crucial role of transferring the expertise and technologies to stakeholders is with this Division. The Division also liaisons and coordinates technical support to the various stakeholders and departments, researchers, student community and general public. The two Departments of this Division functions dedicatedly to its mandated roles in training and extension. The Division has excellent facilities for conducting training programmes including lecture halls, trainees' hostel and vehicles for field trips.

Library and Information

KFRI Library with a core collection of books, journals and back volumes of journals on forestry caters to the information requirements of scientists and researchers in the field of forestry. A total number of 115 books have been added to the collection of books during this period. Catalogue of the books have been migrated from Libsoft, a proprietary package to KOHA, an open source integrated library management system. Online Public Access Catalogue (OPAC) of books was made available for searching the collection of books in the library. From its beginning, importance was

given to subscribe journals than purchasing books. Journals subscribed during this period include both printed and online journals. A total of 35 foreign journals and 87 Indian journals were subscribed during this period. Most of the foreign journals were subscribed in online. Out of 87 Indian Journals 51 were printed and 36 were subscribed in online. A total of 110 number of back volumes of journals have been added to the back volume collection. Subscription to EBSCO database on Environmental Science, which provide the abstracts of a number of journals and other documents in Environmental Science and CABI Abstracts, which provide the contents of a number of journals and other documents in Agriculture and Forestry, were continued. A digital collection of very rare and important books in the field of forestry and allied subjects were built up and made available to search and retrieve. Back volume collection of journals in the library is a precious collection covering core journals especially many foreign journals. Contents of very core journals in the collection were made available for searching by author, title or subjects.

Digital archives of KFRI Research Reports, Scientific Papers, theses and dissertations, issues of KFRI Newsletter Evergreen were built up and made available to access by the scientists and research fellows. Work of organizing a digital library for the teak museum at Nilambur was started. A digital collection of books, seminar proceedings, eprints, etc. were also built up during this period. Information collected on forests of Kerala were regularly updated and added to the existing collection. Dspace, an open source digital library software is used for organizing the digital collections in the library. Facility to search the book catalogue, online journals subscribed in the library, digital collection of documents, bibliographical databases, important websites, etc. were provided from the library portal developed for the purpose.

The two websites, Bamboo Information Centre – India (BIC – India) and Indian Forestry Abstracts (IFA) maintained by the library, are periodically updated.

Support Sections

The research activities in KFRI are well supported by its Administration, Accounts and Engineering Sections. The day to day administrative activities of the Institute is looked after by the Administrative Section of the Institute. Registrar heads the Administrative Section and helps Director in smooth management of the Institute. All administrative procedures in connection with project implementations are handled at Administrative Section. Accounts Section looks after the financial accounting management of the Institute. All financial transactions related to projects implemented by the Institute are handled at the Accounts Section. The Accounts Section is responsible for all payments, including payroll. It is also responsible for maintenance of relevant records and accounts and for ensuring effective financial management practice in place. The Engineering section comprises of civil and electrical sections. The civil section looks after the implementation of new constructions and maintenance of existing infrastructure. The electrical section is responsible for the installation and maintenance of electrical infrastructure and uninterrupted power supply.

Facilities

KFRI houses offices of many International and National Networks, highly sophisticated laboratory facilities, live collections and plant propagation facilities. Networks and Offices include Asia-Pacific Forest Invasive Species Network (APFISN), TeakNet, Bamboo Technical Support Group (BTSG) (south zone) of the National Bamboo Mission and the Tree Health Helpline. Laboratories include tissue-culture, clonal multiplication, physiology, wildlife biology, soil science, molecular biology, wood science and technology, biochemistry, forest pathology, entomology, silviculture and Geographic Information System and remote sensing. These research laboratories are designed to serve staff scientists and research scholars as well as researchers from universities, industry, foreign institutions, and other government laboratories. Collections include, arboretum, bambusetum, palmetum, herbarium, medicinal plants garden, orchidarium, xylarium, wildlife museum, teak museum, butterfly garden and insect collections. For plant propagation, there are nurseries, green house, mist chamber and the Kerala Forest Seed Centre. The monitoring facilities are the established permanent plots and weather stations. Library, Central Instrumentation Unit, Local Area Network training facilities, stores, seminar and conference facilities, field work support (vehicles), staff accommodation, guest house and research scholars hostel are the centralized facilities of KFRI. A Seismic Observatory operated and maintained by the National Centre for Earth Sciences is located in the KFRI main campus.

Asia-Pacific Forest Invasive Species Network (APFISN)

The APFISN has been established as a response to the immense costs and dangers posed by invasive species to the sustainable management of forests in the Asia-Pacific region. APFISN is a cooperative alliance of 33 member countries in the Asia- Pacific Forestry Commission (APFC) - a statutory body of the Food and Agriculture Organization (FAO) of the United Nations. It publishes a bimonthly newsletter covering the major issues and challenges in managing the forest invasive species across the world.

During the year APFISN conducted an inception workshop on '*Control and Management of Destructive Forest Invasive Species in South Asian natural and plantation Forests*' (May 2014); National training on 'Forest Health Surveillance and Early Detection of Forest Invasive Species' and on '*Control measures for already introduced forest invasive species and application of biological control*' during November 2014, at Kerala Forest Research Institute, Peechi. Dr. Humphrey Elliot, Forest Health specialist, Australia provided training on forest health surveillance and early detection of invasive species and Ms Melanie Newfield, Weed – Ecologist and Risk assessment specialist from New Zealand provided training on the use, biological control for weed management. The Network conducted a National Training Programme on Quarantine Control and International Standards for Phytosanitary measures during 18 – 20 February 2015. Mr. Gillian Ellard, provided the training on the various quarantine regulations practiced. APFISN supported Republic of Maldives to contain the fruit fly attack caused by *Batocera invadens* on mango trees, by shipping pheromone lure traps based on the request from Fisheries and Agricultural Ministry, Maldives.

TEAKNET (International Teak Information Network) FAO

TEAKNET is an international network of institutions and individuals interested in teak. Teaknet addresses the interests of all the categories of stakeholders related to teak. From time to time, the organization formulates action plans focusing on the short term and long term needs of the global teak sector. TEAKNET was established to address the issues of the global teak sector. TEAKNET is basically manned by an International Steering Committee and its headquarters is currently located at the Kerala Forest Research Institute (KFRI), Peechi, India which acts as the host institution for the functioning of Teaknet. The Secretariat of Teaknet was established in KFRI with the support

of FAO Regional office for Asia-Pacific, Bangkok. TEAKNET in association with Plant Genetic Conservation Project under the Royal Initiative of Her Royal Highness Princess Maha Chakri Sirindhorn (RSPG), Thailand, International Union of Forest Research Organizations (IUFRO), Austria and FAO of the United Nations, Rome organized a Project Formulation Workshop with an aim to formulate and implement a program for the genetic conservation of teak resources on a global level in order to conserve the existing native teak resources and to widen the genetic resource base

of planted teak forests in view of new challenges from climate change and extreme weather events. The two-day workshop was held during 26-27 May 2014 at RSPG premises, Bangkok. A total of 20 invited delegates from the selected seven Asian countries participated in the two-day workshop being hosted by RSPG. The same was formally inaugurated by Prof. Dr. Tira Sutabutra, Former Minister of Agriculture and Cooperatives and Vice-President of RSPG Foundation. The workshop was sponsored by IUFRO under the Special Programme for Development of Capacities (IUFRO-SPDC) and moderated by SPDC Coordinator, Dr. Michael Kleine of IUFRO Headquarters, Vienna.

National Bamboo Mission
Bamboo Technical Support Group
(South Zone)

Bamboo Technical Support Group (BTSG)-South Zone is hosted at KFRI and supported by the National Bamboo Mission (NBM), Ministry of Agriculture and Cooperation, Government of India, to serve as a unit providing support to the National Bamboo Cell in technical and research matters. BTSGs, of which there are three in the country – the other two being at FRI, Dehra Dun and CBTC, Guwahati, cater to the different regions and offer training in resource enhancement though propagation technology, establishment and management of plantations, value addition of bamboo produce through preservative treatment and proper utilization for various end uses, advice to farmers and State Bamboo Missions on suitability of species for different regions and land types. The BTSG at

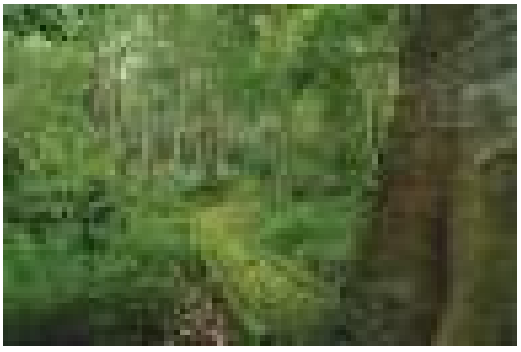
KFRI caters to the requirements of the six southern states of Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, Goa and Maharashtra. The support group conducts various training programmes for different stakeholders of these states. Field functionaries and farmers involved in cultivation and utilization of bamboo have been imparted training on diversity of bamboo species, their biology, diverse range of uses, methods of propagation, establishment, management of plantations, harvesting and utilization, economics, institutional arrangements and policy in bamboo sector. A Bamboo Information Centre supported by NBM functioning at KFRI Library is a source of published literature on bamboo world over.

The Bamboo Processing Centre (BPC) was established in the Field Research Centre of KFRI at Velupadam, Thrissur, under the Bamboo Technical Support Group – KFRI, with the support of the NBM. The BPC was proposed as a means of reviving traditional bamboo sector by demonstrating the benefits of mechanized primary processing of bamboo. A set of bamboo processing machinery consisting of bamboo cross cutting machine, bamboo hydraulic splitter, bamboo internal knot removing machine, bamboo external knot removing machine, bamboo multiple slicing machine along with a set of tools were procured in its initial phase. Additionally bamboo fine slivering machines for producing fine slivers suitable for mat weaving/basketry works, bamboo LASER engraving machine for producing engraved bamboo souvenir items, bamboo preservative treatment (Vacuum–Pressure Impregnation) plan for pressure treating bamboo, and bamboo curtain weaving machine for producing bamboo curtain blinds were also procured and installed. Various training programmes were conducted for different stakeholders including artisans, students, women groups and common people in bamboo primary processing methods for work experience, traditional production processes, manufacturing various bamboo products like rice cake maker, natural flask, among others, and preservative treatments. The bamboo products of the Centre were displayed in an exhibition conducted by Oruma Cultural Organization, Thrissur, and in the Curio shop, Nilambur Teak Museum, KFRI. The BPC can also act as a Common Facility Centre for the industry for generating primary processed bamboo raw material like poles, split bamboo and slivers for various end products.

Arboretum

An arboretum, a live collection of evergreen and moist deciduous trees was established in the Peechi campus during 2003-2008 in an area of about five hectares. It is maintained with grid maps with markings of the location details of

each of the live collection. It presently has 3220 accessions belonging to 180 species under 50 families and 128 genera, with more than 50 taxa endemic to southern Peninsular India. Different accessions of IUCN redlisted species like *Dipterocarpus bourdilloni*, *Dipterocarpus indicus*, *Drypetes wightii*, *Dysoxylum malabaricum*, *Gluta travancorica*, *Hopea erosa*, *Hopea parviflora*, *Hopea racophloea*, *Vatica chinensis,* among others are conserved in the Arboretum. A collection of wild nutmegs, key components of '*Myristica swamps*,

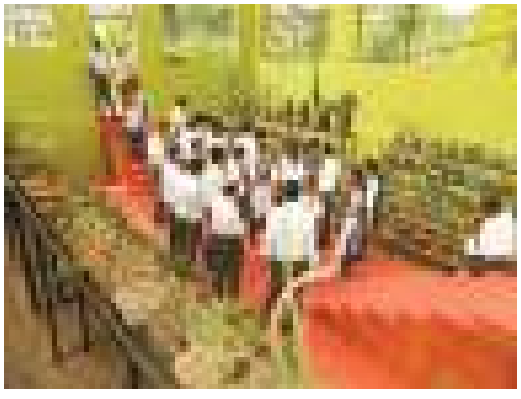


characterized by evergreen, water-tolerant trees considered as the most primitive of the flowering plants or "*living fossils*" are also represented in KFRI Arboretum. *Myristica fatua* (Kotthapanu) *Myristica beddomei* (Pathiripoovu), *Myristica malabarica* (Ponnampayin), *Gymnacranthera farquhariana* (Undappayin) are few among them. The Arboretum is also recognized internationally by Index Seminum with ID No. 1518 and is also enlisted in the National Network of Botanical Gardens in India

Bioresources Nature Park

KFRI Nilambur campus houses a Bioresources Nature Park, established with the financial support from Department of Biotechnology and Ministry of Environment and Forests, Government of India, and Department of

Planning and Economic Affairs, Government of Kerala. The Bioresources Nature Park with a live



collection of over 1500 species of plants assembled in different theme areas has education and recreation values. Here, conservation themes for the lower groups of plants, such as, algae and bryophytes, pteridophytes, plants found in specialized ecological niche, such as, xerophytes (cacti and succulents) and hydrophytes (aquatic plants), beneficial plants (medicinal plants), ornamental and aesthetic plants (orchids), with special reference to endemic and rare, endangered and threatened (RET) species can be seen. The Orchid House, with more than 70 species which represent both epiphytic and ground orchids, is a floral paradise in the Bioresources Nature Park. Here, some of the rare orchids, south Indian endemic species, medicinal orchids and commercially important orchids including some of the prettiest orchids in south India are displayed. The Fern House features around 80 species of ferns, including endemic, rare, endangered and ornamental ferns. The ferns are displayed along paths inside the plus-shaped house, which is provided with sufficient shade, sprinkler and mist facilities for their luxuriant growth. The Hydrophyte Garden in the Bioresources Nature Park is an assemblage of more than 70 species which represent different forms, such as, floating hydrophytes, submerged and rooted hydrophytes, emergent rooted hydrophytes, and floating leaved, anchored or rooted hydrophytes. The Xerophytes and Succulents Garden has both outdoor landscaped rock garden and a greenhouse to display over 90 species including those with medicinal and ornamental values. In the garden, one can also familiarize with bio-fence and the bio-fuel species. In the Palm Garden, besides the 40 ornamental palm species many palms which have economic, ecological and cultural significance are grown. The Medicinal Plants Garden in the Park is an assemblage of more than 285 species of medicinal plants, many of which are mainly drug-producing plants. The butterfly garden in the Park has been developed by planting over 60 larval and adult host plants and subtle modification of the habitat whereby one gets to see the entire life cycle of variety of butterflies. In addition, a Taxonomic Garden with plants belonging to 127 angiosperm families

planted in individual family beds is also located here. Priority has been given to families that are generally taught in graduate and post-graduate degree classes in subjects like Botany and Forestry in Indian Universities.

Butterfly Garden

The half a hectare area in KFRI Peechi main campus designated as butterfly garden is an effort for *in-situ* conservation of butterflies. Butterflies are attracted into semi-natural garden

space where food plants of butterflies and their caterpillars are carefully selected and grown. Micro-habitats are created in the garden for attracting butterflies belonging to various groups. Regular sightings of Common Rose (*Pachliopta aristolochiae*), Malabar Rose (*Pachliopta pandiyana*), Common Mormon (*Papilio polytes*), Southern / Sahyadri Birdwing (*Troides minos*), Asian Cabbage White (*Pieris canidia),* Common Grass Yellow (*Eurema hecabe*), Red Pierrot

(*Talicada nyseus*), Common Castor (*Ariadne merione*), Common Crow (*Euploea core*), Dark Blue Tiger (*Tirumala septentrionis*), Glassy Tiger (*Parantica aglea*), Blue Tiger (*Tirumala limniace*), Chocolate Pansy (*Junonia iphita*), Great Eggfly (*Hypolimnas bolina*), Water Snow Flat (*Tagiades litigiosa*), Chestnut Bob (*Iambrix salsala*) among others are made in the garden.The garden has 58 host plants of butterflies, among which 47 are larval host plants and the other 11 nectar plants. Some butterflies breed here, some are regular visitors with definite times for their visit and some visit the garden occasionally. There are also butterflies like the Southern Birdwing which are highly territorial. Total number of species recorded in 2014-15 is 16525 belonging to the family Papilionidae, Pieridae, Lycaenidae, Nymphalidae, and Hesperiidae.

Central Instrumentation Unit

The Central Instrumentation Unit established in 2006 with an assemblage of sophisticated analytical instruments is a centralized facility used by scientists and researchers of different departments of the Institute. Many instrum-

ents have been added to the facility and now it caters to the demand of researchers outside KFRI also. The major instruments include high performance liquid chromatography, gas chromatography, GC-mass spectrometer, CHNS elemental analyzer, autoanalyzer, real time PCR machine, spectrophotometer and soil CO_2 exchange system, among others. The CIU also has a sample preparation laboratory and other minor instruments like, muffle furnace, precision water bath, analytical balance, rotary shaker and ultrapure water system. Researchers from different universities, research institutes and colleges regularly utilize these facilities on payment basis.

Central Nursery

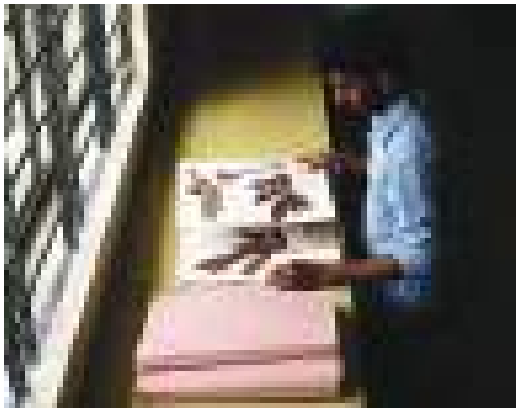
The Central nursery of KFRI is located in the main campus, Peechi. The nursery has a collection of planting materials of around 125 species having

high demand under timber yielding, fruit bearing, medicinal and endemic categories of plants. The nursery guarantees the timely availability of planting material to the farmers, general public and other departments. In addition to above aspects, the nursery is engaged in handling a number of rare and threatened plant species from Western Ghats, associated

with many research programmes conducted by the Institute. Establishing the nursery techniques of different forest tree species in association with KFRI Seed Centre is the other major task of the Central nursery. The data generated in the nursery is used in the ongoing research programmes and is useful for all future research.

Herbarium

KFRI herbarium, established in 1982, is recognized by the International Association of Plant Taxonomists (IAPT), and is known by the acronym KFRI by Index Herbarium. Presently, the herbarium holds over 11000 specimens



representing more than 2140 species from 203 families. It holds wide collection of medicinal plants in South India and a pan Indian collection of rattans, palms and bamboos of India including those from Andaman and Nicobar Islands. In addition, the existing specimens accession

process is underway especially for the completed regional floras such as Flora of Parambikulam Tiger Reserve, Flora of Aralam, Flora of Shendurunii WLS, Flora of Chinnar, Flora of Periyar Tiger Reserve, Flora of New Amarambalam Reserve, Flora of Shola forests and Lichens of Kerala. This will strengthen the herbarium to become one of the major centers representing a repository of the dried specimen collection of both lichens and flowering plants in South India. KFRI herbarium data can be accessed at the data portal at http://kfriherbarium.org/

Kerala Forest Seed Centre

The Kerala Forest Seed Centre (KFSC) was established in 2003 jointly by the Kerala Forest Research Institute (KFRI) and the Kerala Forest & Wildlife Department (KFD) under the World Bank assisted Kerala Forestry Project. KFSC is

under the direct administrative control of the Director, KFRI. Functioning of the KFSC is

monitored by an Advisory Committee comprising of officials from both the establishments. KFSC is lead by a Senior Scientist of KFRI having professional training and experience in the field of Forestry/Silviculture/ Seed Technology. A Range Forest Officer and a Section Forest Officer on working arrangement is deputed to KFSC from KFD. The Centre caters the requirement of certified seeds of forestry species to the KFD, other Government Departments, NGOs and farmers in and outside State. The Centre collects seeds of superior trees/stands, processes, grades, stores and distributes the certified seeds to the stakeholders. Quality of seed is assessed through the procedures of International Seed Testing Association (ISTA). Healthy, viable seeds are stored at optimum storage conditions. Depending on the storage physiology, seeds are stored in plastic bins/gunny bags/plastic bags. These stored seeds are subjected to routine viability tests in order to ascertain the quality. About 20,000 kg certified seeds of 57 forestry species were supplied to different stakeholders during 2014-15. In addition to distribution of certified seeds, facilities are also used to undertake research in seeds of tropical forest species and provide training on seed technology to the forestry professionals, researchers, students and others interested in seeds.

Medicinal Plants Garden

The medicinal plants garden is established in an area of 0.5 hectare in the Peechi Campus and is maintained as a reference collection of authentic medicinal plants of Kerala forests. It consists of around 280 species of medicinal plants

comprising of herbs, shrubs, climbers and trees. The plant collection in the garden is improved by adding new plants collected from the wild or through exchange with other botanic gardens. The garden is visited by school, college students, researchers and general public regularly. In 2014-15, 102 accessions of medicinal plants were collected as part of enrichment of the existing germplasm of which 21 spp. are new to the garden viz., *Hydnocarpus longipeduculatus, Morinda citrifolia, Acacia chundra, Terminalia chebula, Holoptelea integrifolia, Eryngium foetidium*, *Aristolochia indica*, *Piper* sp., *Simarouba glauca, Neolamarckia cadamba, Bixa orellana*, *Annona squamosa, Alangium salviifolium* ssp. *salvifolium*, *Borassus flabellifer, Dendrocalamus strictus, Bambusa bambos, Jatropha gossypifolia Rubia cordifolia, Hibiscus sabdariffa, Maranta arundinacea* and *Annona muricata.* In addition, 19 species were planted in the newly developed area of the garden. Plant labels for 200 spp. were prepared in duplicates for display purpose.

Orchidarium and Fernery

Orchids and ferns are peculiar group of plants

with wide range of economic and conservation importance. The Orchidarium and Fernery are meant to provide artificial conditions similar to their habitats and helps in the *ex-situ* conservation and their multiplication, besides providing materials for study purposes. Orchidaceae, one of the largest families of flowering plants, consists of about 700 genera and 30,000 species and with untold number of hybrids. Pterdophytes are the earliest vascular plants which first colonised on land with broad biological spectrum. At present, the Orchidarium

and Fernery of KFRI have 263 species including rare, threatened, terrestrial and epiphytic species of orchids and ferns, and also maintain some rare ornamental orchids and Ferns. Though about 268 species of orchids have been recorded from Kerala, some species are known only by their type collections and few are presumed to be extinct. Among the orchids of Kerala, thirteen species are used for their medicinal properties. KFRI provide materials and know-how on various aspects of orchids and ferns to Kerala Forest Department related to various *ex-situ* conservation programmes initiated by them.

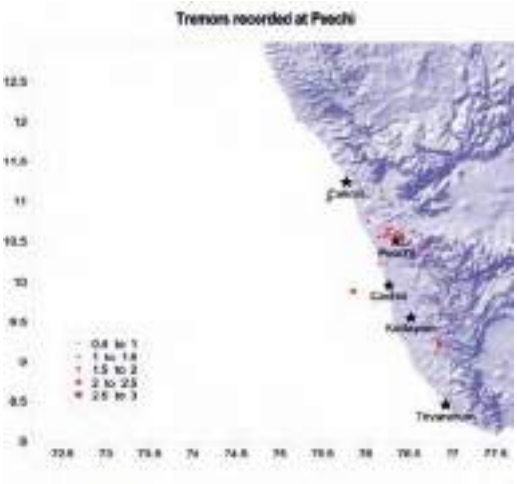
Palmetum

One of the most important attractions in the KFRI campus is the Palmetum, live collection of palms with 135 species under 52 genera which includes wild and ornamental accessions. KFRI Palmetum was established in 2000. There are 32 rattan palms, 43 coryphoid palms and 27 arecoid members. The mangrove associates like *Nypa fruticans* and *Phoenix paludosa* are also

represented from Andaman and Nicobar Islands. Palmetum serves as a facility for educating the public about taxonomy, economical importance and conservation of palm resources. IUCN redlisted palms like *Arenga wightii*, *Bentinckia condapanna*, *B. nicobarica*, *Plectocomia himalayana*, *Rhopaloblaste augusta*, among others, are conserved in KFRI Palmetum.

Seismic Observatory

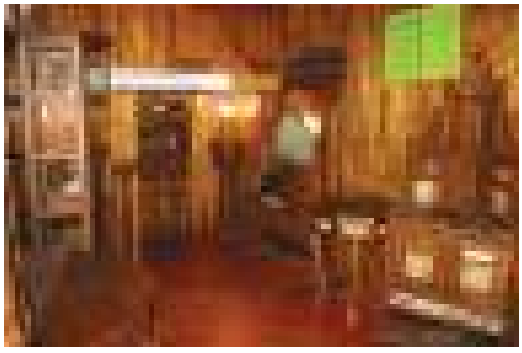
Established in 1999, a Broadband Seismic Observatory in the Peechi main campus is being operated by the National Center for Earth Science Studies, in the campus of KFRI as a part of strengthening earthquake monitoring in peninsular India and improving the detection and location capabilities of earthquakes in the shield region. The facility is monitoring Indian shield seismicity with 10 BBS to understand seismotectonics of the region using Vsat connectivity-(MoES-12) and is funded by Ministry of Earth Science, Government of India. A total of 2018 local, regional and global events



were recorded during 2014- 2015. There were 1856 global events, 15 events from other parts of India and 55 from Andaman-Nicobar region. India events are mainly from Koyna, Assam, Manipur, Mizoram, and Arunachal Pradesh-Myanmar border. The 8.2 magnitude earthquake of Chile, 7.6 of Solomon Islands, 7.9 near Alaska and 7.1 near Fiji were some of the major teleseismic earthquakes recorded during the period. Among the regional events, 7 events are from the neighboring areas of Karnataka and Andhra Pradesh. Seismic activity in India was relatively low this year. Seismic Observatory recorded 85 tremors from Kerala, from Thrissur, Palakkad, Malappuram, Pathanamthitta districts and two from Lakshadweep sea. No damage was recorded on accord of this. Continuous archiving of data, phase picks, wave form files and catalogue of events recorded in the observatory are being routinely carried out and the details are regularly sent to the Indian Meteorological Department (IMD) on a half-yearly basis. Data up to December 31, 2014 was transmitted online to National Seismic Database Centre of IMD, National Geophysical Research Institute and Indian National Center for Ocean Information Service, Hyderabad through V- Sat connectivity. The data has also been shared with the Kerala State Electricity Board, Indian Institute of Science, Geological Survey of India and National Institute of Rock Mechanics on their request.

Teak Museum

The teak museum was established in the sub-centre campus of KFRI in collaboration with the KFD in 1995 owing to the historical significance of the region. The world's first Teak (*Tectona grandis*) plantation was raised in Nilambur way back in the 1840s. This museum is the first of its kind in the world dedicated to a single species–Teak. The museum offers information on several aspects of teak, such as history, cultivation management, utilization and socio economics. The ground floor of the double-storied museum exhibits a translite of Kannimara Teak, the oldest naturally growing teak tree located at the Parambikulam Wildlife Sanctuary and the life-size replica of the trunk of the largest known teak tree growing in the Malayattoor Forest Division. Another translite of a giant tree present in the oldest teak plantation in the Conolly's Plot at Nilambur offers the visitors a glimpse into the teak plantation activities undertaken 160 years ago. Some of the other attractions here are the traditional granary and a miniature model of sailing vessel called Uru made of teak wood. Teak poles of varying sizes



and qualities obtained during the process of 'thinning' of teak plantations are also displayed along with the necessary details of standard classification of teak poles. The depiction of foliage, flowers, fruits and bark of the tree gives us a deeper insight into other characteristics of teak. Here, one can also find the large stump of a 480-year-old teak tree brought from Nagarampara forest range in Kottayam Division. A Teak Information System (touch screen facility) in the Museum helps the visitors to get information on various aspects of teak tree, such as, habit and distribution, history, morphology, cultivation, harvesting, timber and utilization. In addition, various educational, extension and programmes like orientation programmes, workshops, nature study programmes and summer training course are also organized for various stakeholders. Other activities like contests, field trips and exhibitions, and documentary fests are also conducted for the students and the general public. The Museum attracts large number of visitors including students, farmers and teak users. Approximately 192118 Visitors from different walks of life visited the Teak Museum in 2014 -15.

Tree Health Helpline

The Tree Health Helpline at KFRI is an outreach initiative mechanism tapping the accumulated expertise of the scientific community in KFRI. Problems faced at single tree level to those at nurseries and plantations are attended through the helpline. Tree growers of both private and public sectors are expected to be the beneficiaries of this initiative. Tree health helpline caters to queries related to all aspects of tree like species–site matching, planting, thinning, soil testing, fertilizer application, pest, disease and weed management and multi-species interactions. It also provides consultancy service for landscape level afforestation programmes. In 2014–15, a total of 224 queries multidisciplinary in nature, including pest attack, fungal problems, species–site matching, species identification, species information, fertilizer application, calculating the volume of timber, harvesting time, planting techniques, wood quality, physiological problems, micronutrient deficiency, parasitic issues, suitable intercrops, seeds, seedling availability, among others, were recorded. The major tree species queried about were *Tectona grandis*, *Swietenia mahagoni, Albizia* spp., *Mangifera indica* and garden plants. Pest and disease attack, seedling availability, physiological and species-site matching are some of the most frequently asked queries.

Wildlife Museum

The wildlife museum has a comprehensive collection of well preserved specimens belonging to various taxa from different locations across Western Ghats, a collection from different projects undertaken by KFRI since 1978. It has variety of preserved specimens including many mammals, invertebrates, amphibians,

fishes, birds and reptiles. More than 1000 specimens were collected as study materials, for awareness creation and reference materials for research students. Majority of the collection are identified and labeled. The collection has 76 amphibians including rare and endangered living fossil *Nasikabatrachus sahyadrensis*, 90 reptiles including rare coral snakes, Kraits and

many more reptiles, 49 mammals include rare little Indian porpoise, flying squirrel, spiny dormouse and 8 aves. Other than vertebrates there are a number of preserved invertebrate species including molluscs, meretrix species and spiders from various regions of the State. The specimen collection at the museum is used for graduate and undergraduate training, species identification workshops and educational programs by State and local agencies. The major objective is to support and encourage morphology based taxonomy and research and education which will establish KFRI as a key reference facility in Kerala addressing environmental issues, such as, wildlife conservation, endangered species recovery, native fish decline, landscape ecology, systematics and biodiversity studies.

Xylarium

Xylarium is a collection of authenticated wood samples that is well-curated and accessible to the scientific community for research, teaching, environmental education and other programmes. KFRI xylarium was established in the year 1979, and has a collection of 587 specimens, 133 samples representing 68 genera and 114 species from Kerala / India and the rest are from 13 foreign countries. It has been indexed in Kew Royal Botanic Garden, UK in its Index Xylarium 4 - a directory of Institutional Wood Collections from around the world. The dimension of the KFRI xylarium sample is: 10 x 6 x 1 cm for small specimens and 16 x 10 x 2 cm for large specimens following international standard. The xylarium database has detailed records, covering, family name of the tree from which the wood was collected, species name, original wood specimen No., date of collection, collector(s) name, herbarium No. of the voucher specimen, country, altitude, latitude, longitude, habit, habitat, and note on collection or accession. For each wood specimen, there will be a corresponding voucher herbarium specimen deposited in the KFRI Herbarium with the same accession number. KFRI offers few Indian species for mutual exchange of xylarium samples.

Research and Extension Activities

Completed Research Projects

KFRI Research Report No. 482

Early selection and mass multiplication of eucalyptus inter-specific hybrid crosses

(Balasundaran M, Florence EJM)

This study describes standardization of methods for the development of eucalyptus inter-specific hybrid clones using mini-cutting technique and evaluation using microsatellite markers. Fast growing, disease and pest resistant putative hybrids were identified through field planting in clonal testing area. The best trees were felled when they were about 18 months-old and coppice shoots arising from stumps were utilized for standardizing a mass propagation technique using mini-cutting. Mini-cutting technique is adopted for production of plantlets through rooting of second generation cuttings produced from axillary sprouts of first generation rooted cuttings of coppice shoots origin. Intensive selection with combinations of as many desirable characters as possible was carried out for development of heterotic inter-specific hybrid clones.

KFRI Research Report No. 483

Organizing educational programmes at teak museum KFRI Sub-centre, Nilambur

(Sani Lookose)

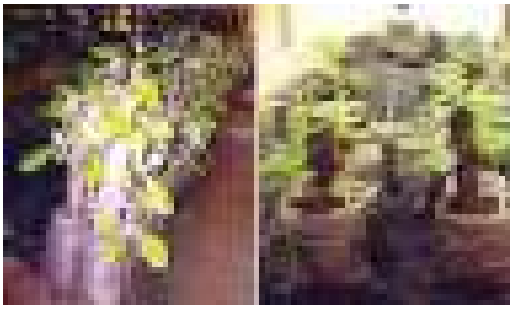
Various educational, awareness and extension programmes viz., workshops, orientation programmes, classes, teak and nature study programmes and summer training course were organized for students, trainee teachers, farmers, and other organized groups. Besides, various other activities for students and general public were conducted on environment significant days. To study the visitors flow, interests and suggestions of the visitors, regular survey of visitors as part of the project activity was conducted. Furthermore, study materials, programme information brochures, worksheets, activity sheets were developed and documentaries on forest and wildlife conservation and topics of environmental significance for conducting educational extension programmes were collected.

KFRI Research Report No. 484

Studies on clonal propagation of plus trees of teak for identifying superior trees for future plantation programmes

(Surendran T)

Studies on clonal propagation of plus trees of teak were carried out in Kerala Forest Research



Institute. The mass production technique was standardized which involves macro-propagation of genetically superior trees. Following

this technique, 30 Plus Trees of teak were cloned successfully, properly rooted and hardened ramets were field planted. Clonal gardens were established at Kalkulam (Nilambur), Decent Mukku (Quilon), and at Chettikulam (Thrissur).

KFRI Research Report No. 485

Growth of field planted teak clones at Karulai

(Surendran T)

Clonal technology for mature teak trees developed at Kerala Forest Research Institute was successfully used to clone 30 plus trees of teak and clonal propagules were produced in sufficient numbers. In order to study the growth

and field performance of these clonal propagules, an experimental plot was established at Kalkulam, Karulai Range, and Nilambur (South) Forest Division incorporating propagules of all the 30 clones. All the clones' survived and initial growth was promising. The results highlighted that the production of teak clones from mature elite teak trees and establishment of clonal plantations are practical propositions for meeting the urgent requirements of tree improvement programme for teak.

KFRI Research Report No. 486

Cost effective soil and water conservation: Establishment of a demonstration area with peoples' participation

(Sankar S, Thomas P Thomas, Unni KK)

A model watershed was established with special emphasis on vegetative control practice along with peoples' participation. The creation of the model watershed led to rejuvenation of few streams in the upstream area due to soil and water conservation efforts. This has also increased the biodiversity status with dramatic increase in number of birds, snakes, deer and the like. As a result of the model watershed, a reduction in the runoff water level by 90 per cent was observed. Stakeholders were sensitized and trained about the good land ethics of watershed management. A GIS based monitoring system for watershed has been created.

KFRI Research Report No. 487

Environmental and social impact assessment of increasing the water level at Periyar lake in Periyar Tiger Reserve

(Sankar S, Easa PS, Menon ARR, Sasidharan N)

The Mullaperiyar dam across the headwaters of Periyar in Thekkady was constructed in 1895 to provide water to Tamil Nadu (erstwhile Madras Presidency). The height of the dam was fixed to store water at a full reservoir level (FRL) of 152 feet from bed level. The total water spread area at this height is 25.527 sq. kms. During 1979, the Central Water Commission instructed the Tamil Nadu PWD to keep the FRL at 136 feet as the dam was weak. During the years from 1979 to 2000 the area below 152 feet but above 136 feet was constituted and wildlife conservation and tourism attained priority. At present, the Tamil Nadu PWD is of the view that the height of FRL can be raised to 152 feet. Both the governments viz., Kerala and Tamil Nadu are negotiating on this issue. The present report determines the impact of raising the water level in Mullaperiyar dam on the land, vegetation, wildlife, tourism and communities.

KFRI Research Report No. 488

Conservation of microfungi: A voice for unprotected and vulnerable organisms

(Sankaran KV, Hussain KH)

Fungi, which play a crucial role in evolution,

ecosystem function and human progress, are under great threat globally due to factors, such as, climate change, habitat loss, pollution and incursion by invasive species. A significant decline in fungal population has already been reported from several parts of the globe. However, fungi remain almost completely unprotected compared to plants and animals. Against this background, this study is a pioneering attempt to:(a) produce a red-list of Ascomycetes to assess their conservation status, (b) provide a Hindi version of the two well known global websites on fungi viz., Cybertruffle's Robigalia and Cybernome, and (c) prepare a database on 'Fungi recorded from India' till date. Of the 1500 species of Ascomycetes (sampled red list) evaluated, 1308 species did not have sufficient data to decide their conservation status. Of the rest (192 species), though data deficient, 51 were evaluated as possibly least concern, 43 probably least concern, 3 probably vulnerable, 6 possibly endangered, 1 possibly critically endangered and 9 possibly extinct. The database on fungi of India is hosted in www.indianfungi.org for search and retrieval. The URL is connected to KFRI website, www.kfri.org. The data contained in the database have been extracted from around 14,000 references. It contains over 75,000 occurrences of fungi.

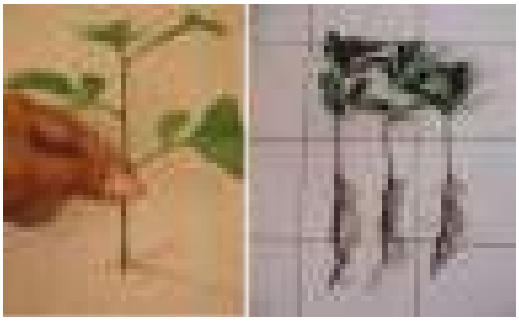
KFRI Research Report No. 489

Vegetative propagation of selected medicinal plants for enrichment of resources

(Surendran T)

Medicinal plants have played a significant role in many ancient traditional systems of medication in both developed and developing countries. Less than 10 per cent of the medicinal plants traded in the country are cultivated, about 90 per cent are collected from the wild, very often in a destructive and unsustainable manner. Over exploitation of the natural resources is quite common and relatively less effort has been made to conserve this valuable natural resource for its sustainable use. Habitat destruction is the major threat for the survival of medicinal plants. The

conventional propagation method takes a long time for multiplication because of a low rate of fruit set, and/ or poor germination and also sometimes clonal uniformity is not maintained through seeds. The present study attempts to



standardize vegetative propagation methods to mass propagate selected medicinal plant species. IBA in varying concentrations (1000-6000 ppm) was suitable for root induction on stem cuttings of the selected species in different seasons. The concentration of hormones and the success varied with the species. The methods were standardized and could be practised for large scale cultivation of these valuable species. The study also provides a brief account of the conventional propagation methods by utilizing seeds or rhizome/ root tubers.

KFRI Research Report No. 490

Vegetative propagation of selected medicinal plants for enrichment of resources-Phase II

(Surendran T)

A study was undertaken for detailed investig-

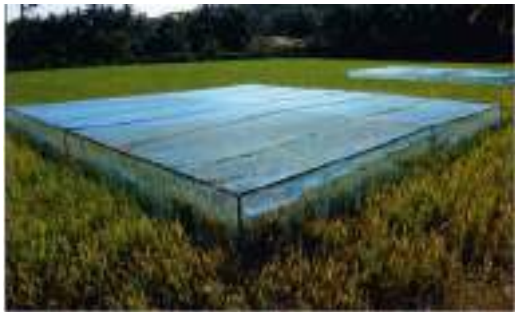
ation on vegetative propagation studies for five medicinal plant species, by rooting of stem cuttings. The results of the investigation clearly showed that four of the selected five species of medicinal plants viz. *Clerodendrum serratum, Coscinium fenestratum, Gloriosa superba and Asparagus racemosus* which are conventionally propagated through seeds, could be propagated by rootings of stem cuttings or pieces of rhizome/ root tubers. IBA is found suitable for induction of the rooting, but at different concentrations, depending on the species and seasons. *Clerodendrum serratum, Coscinium fenestratum,* could be propagated by rooting of stem cuttings by the application of IBA (4000 ppm) during summer months (January-April). *Embelia ribes* also rooted with the application of IBA (4000 ppm) during summer months. In *Gloriosa superba* and *Asparagus racemosus,* attempts were made to root stem cuttings but success was very much limited. For these species, the vegetative propagation methods were standardized by rooting rhizome/ root tuber pieces or by separating tillers. The propagation methods standardized for these species could be used for large scale production of propagules.

KFRI Research Report No. 491

Assessment of crop damage by wild animals in Trichur District, Kerala

(Jayson EA)

Crop damage incidences were recorded from quadrates in each month and the damaged crop species were quantified. Seven species of wild animals, namely, Asian elephant *(Elephas maximus),* wild pig *(Sus scrofa),* Indian crested



porcupine *(Hystrix indica),* Indian giant squirrel *(Ratufa indica),* Indian peafowl *(Pavo cristatus),* bonnet macaque *(Macaca radiata)* and sambar *(Rusa unicolor)* were recorded as damaging the crops. The highest damage was caused by the Asian elephant followed by wild pig and Indian crested porcupine. Highest damage was documented in the Peechi Forest Range, followed by

Machad and Palapilly. Consumption of coconuts by wild animals was highest in the Peechi Forest Range followed by Machad and Palappilly Forest Ranges. Marginal farmers are facing severe

economic loss due to crop damage by wild animals in the District. Highest crop damage by Indian crested porcupine was recorded from Mattathur grama panchayath, followed by Kondazhy, Erumapetty and Kodassery grama panchayaths.

KFRI Research Report No. 492

Developing an information system for the Rare Endangered and Threatened (RET) plants of Southern Western Ghats

(Jose PA, Hussain KH, Sreekumar VB)

Literature from 26 sources was used for the compilation of RET plants in the Southern Western Ghats. The information covers particulars of the species, such as, threat status, references in support of threat status, family, citations, synonym, habit, distribution in the three states covering the southern Western Ghats. A total of 760 RET flowering plants recorded from the southern Western Ghats were included in the database of which 558 species are with 'present status' and 202 species are included under 'needs updation'. Out of the 760 RET plants recorded from the southern Western Ghats, studies were undertaken in 260 species on which publications were available and the same has been provided herewith, whereas, 500 species are yet to be studied. In a simple search, query can be built through the fields, such as, Status, State, Criteria, Species and Habit. The search shows all hits with list of all species. In all the five fields of search, the information regarding viz., Status/ State, Criteria, Reference/ Abstract of publication of each species is made available.

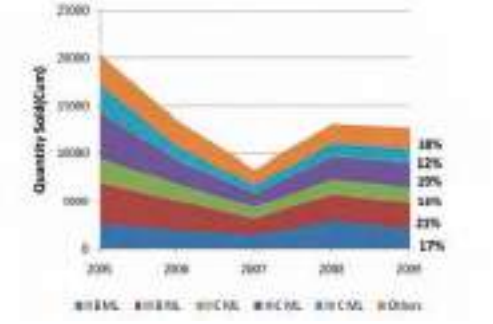
Map of Southern Western Ghats

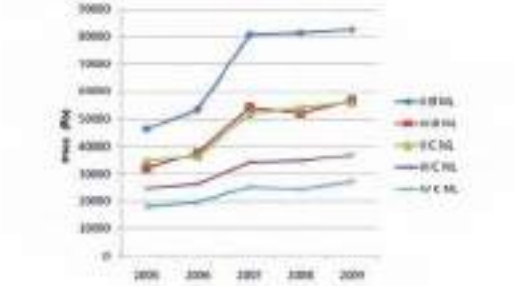
KFRI Research Report No. 493

A decision support system for monitoring and forecasting timber prices of Kerala State

(Sivaram M, Sandeep S)

The timber market in developing countries including India is mostly unorganized. There is no proper statistical system available to track the timber market trends. Timber Market Intelligence System (TMIS) is a computer based decision support system tool to gather, store, search, retrieve and analyze timber price trends. A large number of timber species is available in




Price trends of major quality classes(2005-2009)

the market for sale. Timber quality is assessed mainly based on attributes such as girth, length, straightness and soundness of timber logs. The number of quality classes for a given species is huge. The timber classification system also varies within and across countries. If one wants to know the timber market trends, it is difficult to assimilate the timber prices of so many species across wide range of quality classes. However, it is possible to track the timber market if there is a timber price index summarizing the prices of various timber species and quality classes. In this regard, TMIS enables the user to organize a database on timber prices and develop timber price indices based on a standard methodology for his/ her own region to monitor timber prices. TMIS produces graphs showing trends in timber price indices for decision making. Selected models for forecasting future timber price trends are also integrated in the system. The use of TMIS in monitoring timber prices has been demonstrated through a case study of timber market of Kerala State, India.

KFRI Research Report No. 494

Ecophysiological responses of tree species elevation gradient in the shola forests of Kerala

(Chandrashekara UM)

This study describes changes in the structure and composition of tree community and growth and physiological properties of seven tree species in the shola forests of Anamudi Shola National Park, Kerala, over an altitude range of 1900 m - 2400 m. A total of 61 tree species, belonging to 48 genera and 29 families were recorded. The total number of species per plot decreased as the altitude increased. Density of mature trees, saplings and seedlings and basal area of mature trees and saplings also declined with increase in elevation. Seven species found in all three phases in all elevations were selected to compare their ecophysiological and growth properties along the elevation gradients. In the present study, strong and positive relationships between relative growth rate (RGR), photosynthetic rate (Pn) and transpiration rate (Gs) was observed in cinnamon, whereas, in species like Persea, Syzygium and Turpinia the Gs did not influence their RGR and Pn. However, the other five species showed least response to changing altitude and thus have the ability to acclimatize to a wider range of environmental conditions prevailing in the shola forests.

KFRI Research Report No. 495

Use, management and nutritive value of edible non-crop plants in agroforestry and tribal landscapes of Kerala

(Chandrashekara UM)

The homegardens of Kerala are known for the high diversity of their species in both cultivated and non-cultivated (hereafter, non-crop) plant communities. The non-crop plants can be categorized into edible and non-edible plants. A study was conducted to identify edible non-crop plants in homegardens of a village located in the mid-land agroclimatic zone of the State. Among the 27 edible non-crop species identified six species namely, *Cassia occidentalis, Cassia tora, Centella asiatica, Oxalis corniculata, Phyllanthus urinaria* and *Portulaca oleracea* were found in more than 40 homegardens. In homegardens, all edible non-crop plants are managed at a minimal level by tolerance and protection. Being rich in protein

(19.3 mg g-l to 54.3 mg g-l), fat (0.004 mg g-l to 0.016 mg g-l), fibre (12.6 mg g-l to 49.8 mg g-l), minerals (25.7 mg g-l to 58.3 mg g-l), calcium (3.3 mg g-l to 13.3 mg g-l), phosphorous (0.3 mg g-l to 3.2 mg g-l) and iron (0.2 mg g-l to 0.8 mg g-l), these species are nutritionally comparable to or even better than several cultivated vegetables in the country.

KFRI Research Report No. 496

Storage practices in recalcitrant tropical forest seeds of Western Ghats

(Chandrasekhara Pillai, Pandalai RC)

De-coating of seeds helped to enhance germination potential of the seeds of *Calophyllum inophyllum* and *Dysoxylum malabaricum.* Fresh seeds of *Artocarpus hirsutus* had 49.99 per cent moisture content and its critical moisture level was 40 per cent. However, desiccated seeds of *A. hirsutus* showed higher germination (97 %) than

that of fresh seeds. Seeds in earthen pot kept inside wet vermiculite/ saw-dust at 16°C and 45 per cent relative humidity (RH) was the optimum storage condition for *A. hirsutus* (32 % germination during 8th month and decreased to 11 % at the end of 10th month), *C. inophyllum* (20 % germination at 14th month), *Syzigium cumini* (24 % germination during 3rd month and gradually decreased to 10 % at 6th month).

KFRI Research Report No. 497

Bamboo resources development and utilization in Karassery Grama Panchayath

(Raveendran VP, Sankar S, Seethalakshmi KK, Mohammed Kunhi KV)

The project aimed at creating a bamboo resource base in Karassery Grama Panchayath, which could be primarily used for stabilizing the river bank of two rivers - lruvanjipuzha and Cherupuzha - draining the Panchayath. KFRI provided technical support and material assistance and further provided training and capacity building in developing and managing bamboo resources. Training programmes on Bamboo planting stock production, cultivation management and utilization of bamboos, bamboo crafts were organized in Karassey Grama Panchayath. Field visits and exposure visits were conducted for farmers, Kudumbasree members, stakeholders and ward members of the panchayath to bamboo industries, KFRI bambusetum, bamboo nurseries and handicraft units in Kerala to create awareness on bamboo

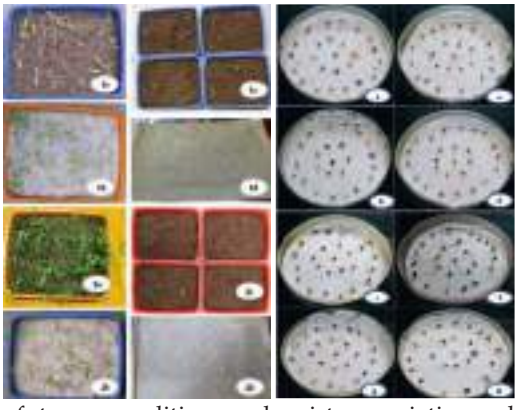
resources, value addition and uses of bamboos. The bamboo species namely *Bambusa bambos, Bambusa tulda, Bambusa vulgaris, Dendro-calamus asper* and *Ochlandra travancorica* were planted along a stretch of about 8 Kms on both sides of the rivers. Bamboos were also planted in other potential areas in the panchayath with peoples' participation and growth and survival of bamboo species were monitored.

KFRI Research Report No. 498

Development of seed handling technologies for selected bamboo species

(Chandrasekhara Pillai, Seethalakshmi KK, Raveendran VP, Mallikarjunaswamy GE)

Seed attributes, such as, seed weight, length, width, thickness, moisture content and physical purity were determined. Rapid viability tests (tetrazolium & hydrogen peroxide tests) and germination tests were carried out for assessing seed viability. Periodical viability tests and moisture analysis were carried out to study the effect



of storage condition, seed moisture variation and seed longevity. Mycoflora associated with seeds under storage were also studied. Seed moisture content significantly influenced seed viability and germination; an increase of moisture content from 8-12 per cent resulted in complete loss of germination (0 %) for *D. brandisii* and *D. sikkimensis*. Thirteen fungal species were identified on stored seeds. Seeds stored at 4°C and 45 per cent RH had minimum fungal incidence.

KFRI Research Report No. 499

Computerization of KFRI Herbarium - Phase II

(Sreekumar VB, Hussain KH, Renuka C)

Computerization or digitization of herbarium material is a process of capturing data and images and storing them in digital form. This is also known as 'Virtual Herbarium' which helps to improve the longevity and availability of specim-

ens to a wider audience. KFRI herbarium was recognized in 1982 by the International Association of Plant Taxonomists (lAPT), and is known by the acronym KFRI in Index Herbariorum. KFRI herbarium holds over 10,306 specimens representing more than 2040 species belonging to 203 families.

Ongoing Research Projects

1. Population evaluation and development of propagation protocol for three Rare Endangered and Threatened (RET) trees from Kerala part of Western Ghats (*Dr. Soman CK)
2. Detection and eradication of the giant African snail *(Achatina fulica)* in Kerala (*Dr. Sajeev TV)
3. Large scale propagation of *Embelia ribes* and *tsjeriam-cottam*-two important threatened medicinal plants through in-vitro / in-vivo techniques and repopulating the forests with participation of tribal groups (*Dr. Raghu AV)
4. Development of institutional capability for DNA barcoding of life forms (*Dr. Muralidharan EM)
5. Pilot scale micro-propagation of important forestry species (*Dr. Muralidharan EM)
6. Vetiver system technology for river bank stablilisation (*Dr. Sandeep S)
7. Population ecology of the Lion tailed macaque in Silent Valley National Park, its buffer zones and Muthikulam High Value Biodiversity Area (*Dr. Sreekumar VB)
8. Appraisal of Forest Rights Act 2006-Implementation among the primitive tribal groups (PTGs) in Kerala (*Dr. Anitha V)
9. Taxonomic manual on Indian Palms (*Dr. Sreekumar VB)
10. Biosystematics and conservation biology of the genus *Cinnamomum* in the Western Ghats (*Dr. Hrideek TK)
11. Genetic status and livelihood trajectories of Cholanaickan tribals with reference to sickle cell anaemia (*Dr. Suma TB)
12. Mass production of *Bacillus subtilis* for biocontrol of sapstain on rubberwood (*Dr. Suma TB)
13. Environmental impact of pesticide application in Cardamom Hill Reserve (CHR) of Southern Western Ghats (*Dr. Jayaraj R)
14. Rehabilitation of two industrially important endangered species *Santalam album* (chandanam) and *Saraca asoca* (Asokam) in homesteads of Palakkad and Malappuram districts of Kerala (*Dr. Sujanapal P)
15. Establishment of district medicinal plants demonstration garden at KFRI Sub Centre, Nilambur, Malapuram district, Kerala (*Dr. Chandrasekhara UM)

*Principal Investigator

16. Establishment of a green belt and mosaic planting for phytoremediation in the Campus of Nitta Gelatin, Koratty (*Mr. Raveendran VP)
17. Assessment of ecosystem services for conservation and management of sacred groves in Kerala part of Western Ghats (*Dr. Chandrasekhara UM)
18. Wild animal kills and its causative factors in selected forest roads in Kerala (*Dr. Easa PS)
19. Evaluation of indigenous methods of nursery techniques for medicinal plants (*Dr. Pandalai RC)
20. Soil organic carbon pool and its dynamics in the managed teak plantations of Kerala Western Ghats (*Dr. Sandeep S)
21. Impact of bioshields in combating wind and salt spray and carbon sequestration along the coastal areas of Kerala (*Mr. Raveendran VP)
22. Phenology & seed dispersal of trees in the wet evergreen forests of Silent Valley, Western Ghats (*Dr. Sreekumar VB)
23. Influence of fungal disease on phytochemical composition of selected medicinal plants with special reference to secondary metabolites (*Dr. Mallikarjuna Swamy GE)
24. Vegetative propagation of selected medicinal plants for enrichment of resources phase III (*Dr. Hrideek TK)
25. Developing strategies for bio-cultural restoration conservation and management of lateritic biotopes in north Kerala (*Dr. Sreejith KA)
26. Assessment of human-wildlife conflict and mitigation measures in northern Kerala (*Dr. Jayson EA)
27. Ecology of anuran communities of Agasthyamalai Biosphere Reserve with special focus on reed inhabiting frogs (*Dr. Easa PS)
28. Structure, composition, dynamics and management of vayal ecosystem in Periyar Tiger Reserve (*Dr. Sreejith KA)
29. Regeneration dynamics, propagation and restoration of selected rare and threatened rattans in the Kerala parts of Western Ghats (*Dr. Sreekumar VB)
30. Conservation through restoration of wild nutmeg tree populations of Western Ghats of Kerala (*Dr. Jose PA)
31. Assessment of medicinal plant resources of Northern Kerala (*Dr. Sujanapal P)
32. An information system for forests of Kerala (*Dr. Sarojam N)
33. Genetic improvement of teak Phase - II Establishment of clonal hedge gardens and seed orchard (*Dr. Hrideek TK)
34. Population analysis, seed biology and restoration of *Hopea erosa* and *H. racophloea,* two critically endangered trees of Western Ghats (*Dr. Chandrasekhara Pillai PK)
35. Forest programme for KFD in teak, bamboo and other important forestry species (*Dr. Muralidharan EM)
36. Ex-situ conservation of wild orchids of Western Ghats, India (*Dr. Sreekumar VB)
37. Development and management of Research and Office Information System- facility development (*Dr. Jayson EA)

*Principal Investigator

38. Introducing biochar for enhancing the quality of degraded soils of plantation forestry sector in Kerala (*Dr. Sujatha MP)
39. Popularisation of weed composting technology for soil carbon sequestration and livelihood improvement of rural poor (*Dr. Sujatha MP)
40. Evaluation of *Ochlandra* germplasm, mass propagation and field trials of elites-phase 2 (*Dr. Thulasidas PK)
41. Digital archiving of PhD, reprint collection of KFRI Library using an open source content management software (*Smt. Sarojam N)
42. Digitisation of selected books in KFRI library-Phase2 (*Dr. George KF)
43. Information system on medicinal plant of Kerala (*Dr. George KF)
44. Compilation of Indian Forestry Abstracts Phase 2 (*Dr. Hussain KH)
45. Planning for conservation effectiveness in forest management ways to improve monitoring and community involvement (*Dr. Mammen C)
46. Systematics, phylogeny and biogeography of dipterocorps in the Western Ghats (*Dr. Sreekumar VB)
47. Large scale restoration of *Dysoxylum malabaricum Bedd ex Hietn* and *Coscinium fenestratum* colebr, two endangered and important medicinal plants of the Western Ghats (*Dr. Sujanapal P)
48. Genetic improvement of teak phase - I Locating plus trees and establishment of clonal hedge garden and clonal seed orchards (*Dr. Hrideek TK)
49. Impact of climate change on growth dynamics of tropical tree species in the Western Ghat region as evidenced from dendroecological studies (*Dr Thulasidas PK)
50. Crop health management (*Dr. Sajeev TV)
51. Development of a farming system based cyber extension model for the state of Kerala (*Dr. Sujanapal P)
52. Control and management of destructive forest invasive species in South Asian natural and plantation forests (*Dr. Sajeev TV)
53. Establishment of Bamboo Technical Support Group (BTSG) for south zone under National Bamboo Mission (*Dr. Muralidharan EM)
54. Kerala Forest and Environment Index (Dr. Amruth M)
55. Plant metabolic studies in the genus *Embelia* found in Kerala (*Dr. Raghu AV)
56. Ecology and restoration of *Cynometra beddomei* and *Kingiodendron pinnatum* two endemic and endangered tree legumes of the Western Ghats of Kerala (*Dr. Jose PA)
57. Migration of KFRI-Library management system from Libsoft to KOHA Phase II (*Smt. Sarojam N)
58. Biospectrum analysis of *Cocculus laurifolicus* DC from southern Western Ghats (*Dr. Jayaraj R)
59. Foraging ecology of selected birds in the Kole wetlands of Kerala, India (*Dr. Jayson EA)
60. DNA barcoding and fingerprinting as valuable molecular tools for the certification of planting materials in Bamboo (*Dr. Suma TB)

*Principal Investigator

61. Status, distribution, threat assessment and estimate of abundance of fish species in Chaliyar river system (*Dr. Easa PS)
62. Network project on conservation of lac insect genetic resources (*Dr. Sajeev TV)
63. Fire as a management tool: A case study from selected forest ecosystems in Kerala (*Dr. Sreejith KA)
64. Floristic diversity, structure composition and regeneration in undisturbed and human impacted shola-grassland ecosystems of GEF-Munnar landscape project (*Dr. Sreekumar VB)
65. Studies on pattern of usage of pesticides and their impact on the ecosystem of Cardomom Hill Reserves in GEF-Munnar landscape project area under different cropping systems (*Dr. Jayaraj R)
66. Review of ecological and development history of various sectors in GEF-Munnar landscapes project area (*Dr. Amruth M)
67. Study of tourism in GEF-Munnar landscape project area: patterns of development impacts, carrying capacity and mainstreaming biodiversity consideration and livelihoods in tourism (*Dr. Anitha V)
68. Documentation and compilation of existing information on various taxa (flora and fauna), and identification of critical gaps in the GEF-Munnar landscape project area (*Dr.Sujanapal P)
69. Study on diversity and current status of fish and fisheries in GEF-Munnar landscape project area (*Dr. Jayson EA)
70. Study on the impact of invasive plant species on ecology of GEF-Munnar landscape project area (*Dr. Sajeev TV)

*Principal Investigator

Ongoing Extension Projects

1. Strengthening the ex-situ conservatory at FRC Velupadam with RET tree species of Western Ghats (*Dr. Sujanapal P)
2. Developing an oral history archive as part of establishing a resource centre for policy research (*Dr. Amruth M)
3. Habitat enrichment in the butterfly garden at KFRI campus, Peechi (*Dr. Sajeev TV)
4. Enrichment of the insect collections at KFRI (*Dr. Sajeev TV)
5. Enrichment of microbial culture collection at KFRI (*Dr. Mallikarjuna Swamy GE)
6. Management and monitoring of tree species trial plots in the KFRI sub centre campus (*Dr. Chandrashekara UM)
7. Development of forest nursery at Kottappara and Devikulam (*Dr. Pillai PKC)
8. Strengthening and enriching the palmetum (*Dr. Sreekumar VB)
9. Production of teak clones and maintenance of clonal multiplication area (*Dr. Hrideek TK)
10. Organizing educational programmes at teak museum, KFRI Sub centre (*Smt. Sani Lookose)
11. Maintenance and enrichment of medicinal plant garden at Peechi campus (*Dr. Jose PA)
12. Improving yield and reducing the rotation age of teak plantations through superior clonal teak (*Dr. Hrideek TK)
13. Maintenance of Dalbergia plot established under DBT network project at Nilambur and Velupadam (*Dr. Sujatha MP)
14. Recording of weather data at different centres of KFRI (*Dr. Soman CK)
15. Establishment of a field gene-bank for RET tree species in the KFRI sub centre campus, Nilambur (*Dr. Chandrashekara UM)
16. Strengthening and maintenance of Institute bambusetum (*Dr. Sreekumar VB)
17. Strengthening and maintenance of Institute arboretum (*Dr. Sreekumar VB)
18. Strengthening and enriching Institute central nursery (*Dr. Sujanapal P)
19. Model nursery of medicinal plants at KFRI main campus, Peechi (*Dr. Sujanapal P)
20. Model nursery of medicinal plants at Field Research Centre, Palappilly (*Dr. Sujanapal P)
21. Analysis of soil samples from major tree crops and agro-forestry systems Kerala- Second phase (*Dr. Sujatha MP)

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22. Production and supply of quality seedlings of selected ten medicinal plants (*Dr. Sujanapal P)
23. Effect of fire on soil properties and loss of nutrients in Wayanad forest (*Dr. Sujatha MP)
24. Analyzing various micro and macro nutrients in 384 soil samples as part of crop health management 2013 (*Dr. Sujatha MP)
25. DNA barcoding of life forms (*Dr. Muralidharan EM)
26. Competence building in analytical instrumentation and maintenance of Central Instrumentation Unit (*Dr. Jayaraj R)
27. Strengthening and enriching of KFRI Herbarium (*Dr. Sreekumar VB)
28 Publishing of proceedings of the National Seminar on "Forestry and Agriculture" (*Dr. Hrideek TK)
29. Maintenance of permanent plots establishment by KFRI in natural forest of Kerala- Phase I (*Dr. Sreejith KA)
30. Preparation of an action plan for the mangroves of Kerala (*Dr. Sujanapal P)
31. Establishment of green groves in selected municipalities and panchayaths of Kerala (*Dr. Sujanapal P)
32. Enriching of live collections of orchid (*Dr. Sujanapal P)
33. Regional training on data analysis for the volume, biomass and carbon stock assessment (*Dr. Sandeep S)
34. Monitoring of teak experimental plots, clonal multiplication area (CMA) and production superior clonal plants (*Dr. Hrideek TK)
35. CAT (Conservation Awareness Team) at school for environment education and conservation (*Dr. Raghu AV)
36. Setting up of a small bamboo nursery and supply of bamboo planting material to the Kerala State Bamboo Mission (*Dr. Muralidharan EM)
37. Rural Innovators Meet (RIM) 2015 (*Mr. Raveendran VP)
38. Wetlands, Our Future (*Dr. Raghu AV)

*Principal Investigator

Publications

a) Books

Jayson, E. A. 2014. Avian diversity of Eringole Sacred Grove in the Western Ghats of Kerala. In (Kaul and Verma Ed.) Advances in fish and wildlife Ecology and Biology, Daya Publishing house, Delhi, India. Vol. 6, 142 - 151

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Nirmesh, T.K., Sreekumar, V.B., Sanal, C.V. and Sreejith, K.A. 2014. Conservation of wild orchids in Kerala part of Western Ghats with special reference to endemic and threatened species. Proceedings of 5th National level Paper Presentation Competition, 16th December, Dept. of Zoology, Mercy College, Palakkad

Riju, P. Nair and Jayson, E.A. 2014. Assessment of human-wildlife conflict in northern Kerala. (Abstract) National Symposium on Behavioral Ecology: Molecules to Organisms. Banaras

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Thulasidas, P.K. 2014. Sustainable management and genetic conservation of teak resources- Indian perspective. Proceedings of project formulation workshop on sustainable management and genetic conservation of teak resources, 26th-27th May 2014, RSPG Premises, Bangkok, Thailand

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Lakshmi, C.J., Seethalakshmi, K.K., Chandrasekhara Pillai, P.K., and Raveendran, V.P. 2015. Seed attributes and storage behaviour of *Dendrocalamus sikkimensis* Gamble. In: Buvaneswaran, C., Anandalakshmi, R., Warrier, R.R., Senthilkumar, S., Krishna Kumar, N. and Prashanth, R.S. (Eds.) Advances in Tree Seed Science and Silviculture Institute of Forest Genetics and Tree Breeding (IFGTB), Prdag Print, Coimbatore, pp. 86 - 92

Mallikarjunaswamy, G. E., Sreekumar, V.B., and Hrideek, T.K. 2015. Fungal diseases and their effect on phytochemical constituents of *Cinnamomum* species in Western Ghats of Kerala. Proceedings of GMF seminar Series, Published by Kerala Forest Research Institute, pp. 188 - 121

Pradip Kumar, K., Radhakrishnan, V.V., Hrideek, T.K., Sunil, S., Kuruvilla, K.M. and Sudharshan, M.R. 2015. Shade trees and forage behaviour of honey bees in cardamom plantations. Prospects of Forestry and Agriculture. Proceedings of GMF seminar Series, Published by Kerala Forest Research Institute, pp. 108 - 112

Salish, J.M., Hrideek, T.K. and Sujanapal, P. 2015. Shade tree composition under cardamom cultivation in the Cardamom Hill Reserve area, Western Ghats, India. Prospects of Forestry and Agriculture. Proceedings of GMF seminar Series, Published by Kerala Forest Research Institute. pp. 112 - 118

Sajitha, K.L., Maria Florence, E.J. and Suma Arun Dev. 2015. Scale up production of *Bacillus subtilis* as biocontrol against rubber wood sapstain fungus. Proceedings (abstract) of 27th Kerala Science Congress, 27th 29th January, Alappuzha, Kerala, India

d) Books Published/Edited

Amruth, M., Raghu, A.V. and Mohanadas, K. 2014. Thanal Marangal, Extension and Training Division, Kerala Forest Research Institute, Peechi.

Amruth, M., Sajeev, T.V. and Raghu, A.V. 2015. Avasanathae Abhayam, Extension and Training Division, Kerala Forest Research Institute, Peechi.

Mathew, P.J., Mathew Dan, Muraleedharan, C., Prem Kumar, V., Jose, P.A. and Thomson Davis. 2015. Bee's Herbal Garden- A Garden in the Forest @ JNTBGRI. Jawaharlal Nehru Tropical Botanic Garden and Research Institute, Palode. 56p.

Mohanan, K.V., Hrideek, T.K., Raghu, A.V., Amruth, M., Muralidharan, E.M. and Radhakrishnan, V.V.2015. Prospects of Forestry and Agriculture. Proceedings of GMF seminar Series, Published by Kerala Forest Research Institute. (ISBN: 81-85041-80-6)

Raghu, A.V., Amruth, M., Sajeev, T.V., Mohanadas, K. and Mohammed Kunhi, K.V. 2015. Thannirthadagal, Extension and Training Division, Kerala Forest Research Institute, Peechi.

Raghu, A.V., Pillai, P.K.C., Hrideek, T.K., Amruth, M. and Mohanadas, K. 2015. Forest trees: seed treatment and seedling production (Malayalam). Kerala Forest Research Institute, Peechi, 30p.

Raghu, A.V., Amruth, M. and Sajeev, T.V. 2015. Kadanukavalal, Extension and Training Division, Kerala Forest Research Institute, Peechi.

Sajeev, T.V. and Bindu, K. Jose. 2015. Thekku – Keedangalum Asughangalum (Malayalam). KFRI Hand Book No: 30, Kerala Forest Research Institute.

Sajeev, T.V., Bindu, K. Jose and Soumya, R. 2015. Tree Health Problems in Kerala and Their Management. KFRI Hand Book No: 31, Kerala Forest Research Institute.

Sujanapal, P. and Sasidharan, N. 2014. Handbook on mangrove and mangrove Associates of Kerala. Kerala State Biodiversity Board.

Varghese, M.I. 2014. Vanethara Bhumiyininnu Maram Muruch Upayogikkanulla Nadapadi cramagal, Extension and Training Division, Kerala Forest Research Institute, Peechi.

e) Popular Articles

Sajeev, T.V in Mangalam News Paper

Gadgil Thirichuvarumbol-2014. June 12;
Orupaavamchediyaekurichu - 2014. September 5;
Nilkunnavarumodunnavarum2014 - September 18;
Chovayumshasthravum - 2014 October 6;
Mrigangaludesamskaaram - 2014 October 16;
Ellavarkumidamullaboopadangal - 2014 October 30;
Ezhudivasamneelaakasham - 2014 December 11;
Roy baskarmarichu -2015. January 8;
Ammuvinaeaarurakshikum? - 2015 January 22;
Athaevaakoruoushadhamaanu - 2015 March 11;
Kadumatorurajyamanu -2015 March 11

AWARDS

Dr. C. Chandrasekharan Memorial Award

Mr. Sandeep Das, Junior Research Fellow at KFRI, and Dr. V. P. Thomas, Assistant Professor at Catholicate College, Pathanamthitta; are the joint recipients' of the Dr. C. Chandrasekharan Memorial Award 2014 for innovative research in conservation of forests. The award instituted in memory of former KFRI Director Dr. C. Chandrasekharan, an expert in tropical forestry, carries a purse of Rs. 40000, a gold medal and a certificate each. The Award was handed over by Prof. Dr. K.V. Kunjikrishnan, Historian and Former Registrar of Cochin University for Science and Technology and now Syndicate member of Kannur University.

Mr. Sandeep Das is considered for the award for his study on the breeding biology of critically endangered and recently rediscovered species, *Raorchestes chalazodes*. Detailed continuous long term monitoring revealed many novel and unique reproductive behavior of the reed inhabiting *Raorchestes chalazodes*. The temporal nature of anuran behavior is a primary characteristic to take into consideration while planning such projects. For studying reproductive behavior in amphibians, more than equipment a lot of patience and a keen sense of observation are the key requistes. Sandeep Das is also the sub editor to the Malayalam nature magazine "Koodu" and is an active participant in nature awareness programs and conservation initiatives.

Dr. V.P. Thomas is a Member of Indian Association for Angiosperm Taxonomy work on the Taxonomic Revision and Conservation of the Genus *Amomum* Roxb. (Zingiberaceae) in India. A database is prepared for the easy identification of different taxa of *Amomum* in India. A taxon can be searched by valid name, synonyms, common names, IUCN status, endemic status or altitude. The database is developed by using the software Visual FoxPro (Version 6) with the help of a computer programmer.

AWARDS

Dr. K.M. Bhat Memorial Award

The sixth Dr. K. M. Bhat Memorial award carrying a Gold Medal, Certificate of Merit and cash prize of Rs. 5,000/- was awarded to Dr. Roby, T. J., Post-Doctoral Fellow, Department of Zoology, St. Thomas College, Thrissur, for his research work was on "Floristic structure and diversity of Myristica swamps at Kulathupuzha in a GIS perspective". The study is considered a unique piece of work carried out in Kulathupuzha due to the fact that only small remnants of Myristica forests remain and they are highly disturbed due to conversions. The study identified an area of 148.57 sqkm of forest area having the potential to support Myristica swamp. The work focused on developing systematic conservation planning through development of maps for prioritizing area of conservation importance and analyzing the reproductive phenology and regeneration techniques for IUCN red listed species conservation. Two dominant species namely, *Myristica fatuavarmagnifica* and *Gymnacranthera farquhariana* identified. Furthermore, phenological studies and girth class of species were analyzed and the presence of IUCN red listed species were identified from the swamp area. The area was identified as exclusive dominant zone for specialized swamp species. The Endowment award instituted by the family of late Dr. K. M. Bhat for the best emerging Research Scholar of KFRI was handed over by Dr. K.K.N. Nair (Retd.), former Senior Scientist and Programme Coordinator, Forest Ecology and Biodiversity Conservation Division, Division, KFRI.

EXTENSION AND TRAINING ACTIVITIES

TRAINING PROGRAMMES CONDUCTED

1. Field functionaries engaged in bamboo sector-Kerala
   (*Mr. Raveendran V.P., Dr. Muralidharan E.M. & Dr. Raghu A.V.)
2. Training workshop on need for survey, demarcation and consolidation of forest lands and strategies for achieving the objectives
   (*Dr. Pandalai R.C., Dr. Mohandas K., Mr. Raveendran V.P. & Dr. Raghu A.V.)
3. Environmental information training on various environmental issues relevant for Kerala
   (*Dr. Kamalakshan K.K., Dr. Mohanadas K. & Mr. Raveendran V.P.)
4. Management of medicinal plants training programme for officials of Uttarakhand Forest Development Corporation
   (*Dr. Raghu A.V., Dr. Sujanapal P., Mr. Raveendran V.P. & Dr. Mohanadas K.)
5. Captive elephant rules
   (*Dr. Easa P.S., Dr. Pandalai R.C., Mr. Raveendran V.P., Dr. Mohanadas K. & Dr. Raghu A.V.)
6. Cultivation, management and utilization of priority species of bamboo
   (*Dr. Pandalai R.C., Mr. Raveendran V.P. & Dr. Muraleedharan E.M.)
7. Resource enhancement and utilization of bamboo
   (*Mr. Raveendran V.P. & Dr. Muraleedharan E.M.)
8. Hands on training programme on KOHA, as open source software for library automation
   (*Smt. Sarojam N., Mr. Raveendran V.P. & Dr. George K.F.)
9. Regional Workshop on conservation of mangroves (*Dr. Sreejith K.A.)
10. National Workshop on long-term monitoring of forest ecosystem dynamics
    (*Dr. Sreejith K.A.)
11. One-week compulsory training course on collection, compiliation, validation and dissemination of forest statistics
    (*Dr. Mohanadas K., Dr. Sivaram M., Mr. Raveendran V.P., & Dr. Raghu A.V.)
12. Two-days Training workshop on "medicinal plants–role of state forest department in conservation, cultivation, harvesting, marketing and benefits sharing by the communities"
    (*Dr. Mohanadas K., Dr. Sasidharan N., Mr. Raveendran V.P. & Dr. Raghu A.V.)
13. Regional training on data analysis for tree volume, bio mass and carbon stocks assessment
    (*Dr. Sandeep S. & Mr. Raveendran V.P.)

* Training and Course Coordinators

14. CAT (Conservation Awareness Team) at schools for environment education and conservation (*Dr. Raghu A.V., Mr. Raveendran V.P. & Dr. Mohanadas K.)
15. Inception workshop on control and management of destructive forest invasive species in South Asian natural and plantation forests (*Dr. Sajeev T.V., Dr. Hrideek. T.K. & Dr. Sujanapal P.)
16. National Training programme on control measures for already introduced forest invasive species and application of biological control (*Dr. Sajeev T.V., Dr. Hrideek. T.K. & Dr. Sujanapal P.)
17. National Training on forest health surveillance and early detection of forest invasive species (*Dr. Sajeev T.V., Dr. Hrideek. T.K. & Dr. Sujanapal P.)
18. National Training programme on quarantine control and international standards for phytosanitary measures (*Dr. Sajeev T.V., Dr. Hrideek T.K. & Dr. Sujanapal P.)
19. Summer Course for students through prior registration, in teak museum at KFRI Sub centre, Nilambur (*Mrs. Sani Lookose)
20. Teak study training programme for teacher trainees in teak museum (Mrs. Sani Lookose)
21. Two day science camp for students (*Mrs. Sani Lookose)
22. Awareness Programme on World Environment Day for students of Fatimagiri English School, Nilambur (*Mrs. Sani Lookose)
23. One day orientation workshop on 'Biodiversity conservation' for students of Bharath Scout and Guides, Wandoor Education District, Malappuram (*Mrs. Sani Lookose)
24. Orientation Programme on 'Natural forests and plantations in Kerala with special reference to Teak' for Bachelor of Travel and Tourism Management Degree Students of M.E.S College, Perinthalmanna, Malappuram (Dt) (*Mrs. Sani Lookose)
25. Wildlife week activities for nature club members & students from various Educational Institutions (*Mrs. Sani Lookose)
26. One-day Orientation Programme on biodiversity of Western Ghats for student and trainee teachers group (*Mrs. Sani Lookose)
27. Orientation programme on teak cultivation and management for Students of VMHEM School, Makkaraparamba , Malappuram (Dt) (*Mrs. Sani Lookose)

* Training and Course Coordinators

28. Two-day nature study programme association with regional museum of Natural History, Mysore (M/o Envt.& Forests) for the Winter Nature Camp Participants of RMNH, Mysore (*Mrs. Sani Lookose)
29. Two day Orientation Workshop on 'Teak- scientific and historical aspects' for Students of Malabar Special School, Malappuram (*Mrs. Sani Lookose)
30. One day awareness programme for the members of Literacy mission, Nilambur Block Panchayath, Malappuram, on World Forestry Day (*Mrs. Sani Lookose)
31. A Documentary Fest on topics related to Forest, Wildlife & Nature conservation and various environmental issues is organized in Teak Museum at KFRI Sub centre for the public and other organized groups in connection with the Teak Museum Day on 21st May (*Mrs. Sani Lookose)
32. Industrial Training on "Arc GIS and ERDAS" to 3rd Semester M. Tech Students of Govt. Engineering College, Thrissur (*Dr. Mohanadas K.)
33. Workshop on Environmental Journalism (*Dr. Easa P.S.)
34. KVASU- CWS- Classes for MS (WildLife studies) students, Pookkodu, Wayanad (*Dr. Mohanadas K.)
35. Capacity building for the field staff of Kerala Forest Department in Forestry and Forest Management Training Programme on "Captive elephant management (*Dr. Easa P.S., Dr. Mohanadas K., Dr. Raghu A.V. & Mr. Raveendran V.P.)
36. Refresher course in forestry research (*Dr. Jayaraj R., Mr. Raveendran V.P., Dr. Mohandas K., Dr. Sajeev T.V., Dr. Anitha V. & Dr. Suma T.B.)
37. Exposure visit of officials from Department of Forest Research and Survey, Nepal (*Mr. Raveendran V.P.)
38. Orientation Programme for CAT@ School Students (*Mr. Raveendran V.P.)
39. Workshop for preparation of perspective plan for Nilgiri Biosphere Reserve (*Dr. Sreekumar V.B. & Dr. Sreejith K.A.)
40. Workshop on mangrove conservation and management (*Dr. Easa P.S., Dr. Sreekumar V.B., Dr. Sujanapal P. & Dr. Sreejith K.A.)
41. Training cum Exposure visit of Farmers from Karnataka State (*Mr. Raveendran V.P.)

* Training and Course Coordinators

42. Prakruthiyum Madhyamavum (Dr. Raghu A.V.)
43. Tally training for KFRI Assistant staff (Mr. Satheesakumar K.)
44. Propagation, Cultivation and Management of Bamboos (Dr. Muraleedaran E.M. & Mr. Raveendran V.P.)
45. Classes of MS (Wildlife studies) students at KFRI (Dr. Jayson E.A., Dr. Mohanadas K. & Mr. Raveendran V.P.)
46. One day training programme on Teak Cultivation (Dr. Raghu A.V., Dr. Mohanadas K. & Dr. Hrideek T.K.)
47. Orientation training programme IFS probationers of Kerala Forest Department (Dr. Mohanadas K.)
48. Mechanisation and value addition of bamboo for women (Dr. Anitha V. & Mr. Raveendran V.P.)
49. Capacity building of field staff of Kerala Forest Department in Forestry and Forest Management training Programme on Human - Wildlife Conflict (Dr. Mohanadas K. & Mr. Raveendran V.P.)
50. Rural Innovators Meet 2015 (*Mr. Raveendran V.P., Dr. Mohanadas K., Dr. Mohammad Kunhi K.V. & Dr. Raghu A.V.)
51. Sacred groves conservation (*Dr. Amruth M., Mr. Raveendran V.P., Dr. Mohanadas K., Dr. Mohammad Kunhi K.V. & Dr. Raghu A.V.)
52. Refrisher course in forestry research for project staffs of KFRI (*Dr. R Jayaraj & Dr. V.P. Raveendran)

* Training and Course Coordinators

Exhibitions & Visitors

KFRI, being one of the prominent institutes with a long legacy in forestry research is a destination for those interested in tropical forestry research. The visitors KFRI constituted a multi-stakeholder group from the local schools to expert scientists. A total of 3129 visitors from different Institutes, Departments of Non-Govern-ment Organizations and farmers groups visited KFRI during 2014-15.

The contributions and credentials of KFRI were exhibited at :IRSHAD Panthavoor English School, Changaramkulam; Community Hall, Pullu, Thrissur; Bamboo Fest Exhibition at Snehatheeram, Thalikkulam, Thrissur; Periyar Tiger Reserve, Thekkady; College of Agriculture, Padannakad, Kasargod; Golden Jubilee Science exhibition, Baselius College, Kottayam; Bamboo fest, Marine Drive, Kochi; Peechi malayora Mahothsavam, Peechi; 37th Flower show, Vada-kkunnatha Temple, Thrissur; Ostendo - 15, Sir Syed College, Taliparamba, Kannur; CETEX 2015, Govt. Engineering College, Trivandrum; 27th Kerala Science Congress National Science expo 2015, Alapuzha; Zoology Department, SN College, Nattika; 2nd National Biodiversity Congress expo 2015, Kanakakkunnu palace, Thiruvananthapuram; and Vadakkunnatha Temple, Thrissur. Among these, KFRI won the State Sector first prize at the 27th Kerala Science Congress and third prize in the Golden Jubilee Science exhibition suvarna Pradarshini-2014, at Baselius College, Kottayam.

KFRI ACADEMIC PROGRAMMES

Doctoral Degree awarded

1. Mr. Sujesh S.M. Breeding system of *Dipterocarpus bourdillonii* and *Humboldtia bourdillonii*, two endemic trees of Western Ghats, India. Kerala Forest Research Institute, Dehradun. May 2014.
2. Mr. Nishad V.M. Effect of cover crops, mulching and organic manure on below ground microbial diversity in different land use systems in the Kerala part of the Nilgiri Biosphere Reserve. Kerala Forest Research Institute, Dehradun. May 2014.
3. Mr. Jijeesh C.M. Litter dynamics and carbon sequestration potential of selected bamboo species of Kerala. Kerala Forest Research Institute, Dehradun. July 2014.

On going Programmes

Post Doctoral / Young Scientist Programmes

1. Dr. Sugantha Sakthivel R. - Ecology and patch dynamics of the endangered grizzled giant squirrel, *Ratuya macroura dandolena* habitats in south India with special reference to its conservation (SERB-DST Government of India programme).
2. Dr. Thulasi G Pillai - Isolation and characterization of fungal endophytes from certain medicinal plants and RET species in Western Ghats and their therapeutic potentials (KSCSTE Fellowship Programme)
3. Dr. Presty John - Risk assessment and development of management protocols for alien invasive ants of Kerala (KSCSTE Fellowship Programme)
4. Dr. Majesh Thomson - Evaluation of bioactive principles from entomofungi for insect pest management (KSCSTE Fellowship Programme)

Doctoral Programmes

Forest Research Institute, Dehradun

1. Smt. Keerthy Vijayan - Tracking the invasion: Molecular phylogeography and phyloclimatic modelling of the giant African Snail *Achatina fulica* in south India.
2. Smt. Maneetha T.K. - Faunal responses to biological invasions: A case study of the giant African Snail (*Achatina fulica* Bowdich) infestation in Kerala.
3. Smt. Soumya R. - Ecology, phenology and social contexts of invasion by selected alien plants in Kerala.
4. Sri. Kuruvilla Thomas - Forest management, population structure, carbon sequestration, litter dynamics and propagation of selected rare bamboos of the Western Ghats.
5. Ms. Sijimol K. - Molecular systematics and phylogeny of the genus *Ochlandra Thw*. (Poaceae) and related genera in the Western Ghats.

6. Ms. Neethu R.S. - Regional differences in phenotypic and phytochemical profiles of selected medicinal plants in Kerala.

Cochin University of Science and Technology

1. Sri. Alex C.J. - Ecology of Kavvai River Basin: A fragmented landscape in Kerala.
2. Ms. Anjali S.N. - Land management practice and rural livelihood: study of a Agro-ecosystem of selected tribal hamlets in Attapady (KSCSTE Fellowship Programme).
3. Ms. Anoja Kurian - Molecular studies on rattans of south India.
4. Ms. Greeshma P. - Foraging ecology of birds in the Kole Wetlands of Kerala, India (KSCSTE Fellowship Programme).
5. Ms. Asheedha K. - Influence of biochar on soil carbon dynamics and growth of teak seedlings (*Tectonagrandis*).
6. Ms. Divya Soman - Assessment of ecosystem services from Parambikulam Tiger Reserve (KSCSTE Fellowship Programme).
7. Smt. Kavitha C. - GIS based soil fertility mapping in agro ecosystems of Thrissur District, Kerala.
8. Smt. Lathika C. - Potential of urban waste compost for organic farming.
9. Smt. Renuka R. - Chemistry of marshy grassland soils in forest ecosystems of southern Western Ghats, India.
10. Smt. Vidhya R. Sankar - Study of the constraints in efficient micropropagation of Bamboo.
11. Sri. Vishnu P.S. - Pedogenesis and geochemical transformations in forest ecosystems of the Western Ghats, Kerala.

Calicut University

1. Sri. Dantas K.J. - Flora of Aralam Wild Life Sanctuary.
2. Sri. Mohammad Anaz K. - Systematic studies, utilization and conservation of the genus *salacia* (Celastraceae) in south India.
3. Sri. Bharath Nair - Biocontrol potential of rhizosphere and rhizoplane fungi of grasses against certain fungal diseases of forest nursery seedlings.
4. Ms. Daisy M.J. - Impact of climate change on the growth patterns of teak (*Tectona grandis*L.f.) in Western Ghats of Kerala as evidenced from dendroecological studies.
5. Sri. Muraleekrishnan - Studies on variability, phenology and management methods of the alien invasive tree, *Senna Spectabilis* (D.C.) Irwin & Barneby in Kerala, India.
6. Sri. Sanil M.S. - Systematics and phylogeny of dipterocarps in the Western Ghats, India.
7. Sri. Sanal C. Viswam - Studies on plus tree selection, variability and seed biology of *Terminalia paniculata* roth. (Combretaceae) in Kerala part of peninsular India.
8. Sri. Riju.P - Assessment of human-wildlife conflict and mitigation measures in Malappuram District, Kerala, India.
9. Ms. Rini Vijayan - Micropropagation of selected species of *Embelia Burm.*f., characterization and *in vitro* production of secondary metabolites.
10. Sri. Dhanesh Bhaskar - Diversity of beetles (Coleoptera: Insecta) and the impact of prescribed fire practices in Eravikulam National Park and Parambikulam Tiger Reserve.
11. Sri. Rajkumar K. - Herpetofaunal diversity in swamp (Vayal) ecosystems in Periyar Tiger Reserve, Western Ghats.
12. Sri. Sandeep Das - Ecology and behaviour of amphibians of Eravikulam National Park, with special reference to bush frogs.

Post Graduate Attachment

1. Ramziya Mohammed Haneefa - Identification of genetic variants in *Cinnamomum malabatrum* using ISSR-PCR.
2. Athira D. - Genetic variation in reed bamboo *(Ochlandra travancorica*) using ISSR (inter simpl sequence repeats) markers.
3. Lulu P.K. - Microbial degradation of pesticides in Cardamom Hill Reserves of Western Ghats in Kerala.
4. Nimmy Antony - Fungal diseases and their effect on phytochemical constituents of *Saraca asoka* (roxb.), de.wild: a legendary and sacred medicinal tree.
5. Simi Peter - Counter mapping of Chilava landscape in contemporary Kerala.
6. Neena R. - Spatial distribution of mangroves along Vembanad lake.
7. Rajitha Nath O. - Response of teak seedlings to the application of boron in acidic soil.
8. Preethi P. - Sorption Kinetics of pesticides in soils of Cardamom Hill Reserves Kerala.
9. Greeshma Gopi - Heavy metal speciation of soils in Kadukutty region.
10. Anju Francis - Pesticide degradation in soils of Cardamom Hill Reserves of Kerala.
11. Aswathy K. - Leaching and adsorption of pesticides in soils of Cardamom Hill Reserves of Kerala.
12. Aleena K.A. - Evaluation of biochar in mitigating cadmium contamination in acid soils of Kerala - A case study.
13. Thasini V.M. - Non crop edible plants and medicinal plants in home garden agroforestry system of Palakkad district.
14. Tijo Agustine - Development of management strategy for *Mucuna bracteata* in Kerala.
15. Cleetus C.J. - Study of distribution and control methods of *Senna spectabilis* (DC.) Irwin and Barneby (Caesalpiniaceae) in Wyanad, Kerala.
16. Rejani N.R. - Allometric studies on *Heliocopris dominus* (Coleoptera: Scarabaeidae).
17. Jinsa E.P. - A study on the interaction between native and alien invasive ant species at KFRI campus, Peechi.
18. Sujith Manavalan - Strategies for control of browning in *in vitro* cultures of teak.
19. Greeshma Thomas - Isolation and characterization of the endophytic bacteria from *in vitro* cultures of *Dendrocalamus longispathus.*
20. Henna M.K. - Genotype diversity of *Calamus nagbettai* thorugh ISSR profiling.
21. Amal Siddique - DNA barcoding of wild nutmegs: an ecologically and economically important group in the Western Ghats, India. KFRI, Peechi.
22. Nisha Ullasan - Curcumin content in *Curcuma longa* from different agro-ecological zones in Kerala: role of abiotic factors.
23. Krisa K. Baby - Synthesis of silver nano-particles and its antibacterial activity of *Hopea parviflora* and *H. racophloea*.
24. Saranya K. - Fungal diseases and their effect on phytochemical constituents of *Desmodium gangeticum* and *Strobilanthus ciliatus:* less known medicinal plants.
25. Arjun B. - Effect of fire on fungal diversity of Parambikulam Tiger Reserve.

Kerala Forest Research Institute, Peechi

(An unit of Kerala State Council for Science, Technology & Environment, Govt. of Kerala)

BALANCE SHEET AS ON 31 MARCH 2015

Liabilities	Sch No.	As at 31.03.2015	As at 31.03.2014	Assets	Sch No.	As at 31.03.2015	As at 31.03.2014
Reserves & Surplus	I	191,343,461	176,193,038	Fixed Assets	IV	155,495,516	140,722,973
Current Liabilities	II	76,891,853	48,743,965	Current Assets	V	148,002,463	99,182,956
Unspent Balance	III	45,552,593	18,792,174	Loans &	VI	10,289,929	3,823,249
Total		**313,787,907**	**243,729,177**	**Total**		**313,787,907**	**243,729,178**

Kerala Forest Research Institute, Peechi

(An unit of Kerala State Council for Science, Technology & Environment, Govt. of Kerala)

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

Expenditure	Sch No.	Year ended 31.03.2015	Year ended 31.03.2014	Income	Sch No.	Year ended 31.03.2015	Year ended 31.03.2014
To Infrastructure Strengthening (Non- Plan)	X	14,248,416	11,310,511	By Grant from Government of Kerala	VII	131,114,676	135,653,773
To Salaries and Allowances (Non-Plan)	XI	120,729,429	119,755,492	By Other Receipts	VIII	39,603,570	51,917,617
To Depreciation	IV	20,333,831	17,558,312	By Depreciation written back	IV	20,333,831	17,558,312
To External Projects Expenses		29,876,568	27,427,028	By Income from Other Projects	IX	29,876,568	27,427,028
To Project Expenses under Plan scheme		35,740,401	56,505,387				
Total		**220,928,645**	**232,556,729**			**220,928,645**	**232,556,729**

INSTITUTIONAL COMMITTEES

RESEARCH COUNCIL

The research council comprising eminent scientists of the country advises in matters concerning research policies and monitors the quality of research undertaken at the Institute

Chairman
Dr. N. Krishnakumar
Director,
Institute of Forest Genetics and
Tree Breeding
(Indian Council of Forestry Research and
Education)
P.B. No. 1061, R.S. Puram P.O.,
Coimbatore-641002

Members
Dr. V.B. Mathur
Director, Wildlife Institute of India,
P.O.Box.18,Chandrabani,
Dehradun-248001,Uttaranchal

Dr. C.K. Sreedharan
Retd. PCCF, Tamil Nadu
Plot No. 06, Sarvaya, Third Main Road,
River view Colony,
Manapakkam, Chennai 600125

Dr. Madhu Verma
Professor-Environment and Developmental
Economics
Coordinator-Centre for Ecological Services
Management
Indian Institute of Forest Management (IIFM)
P.O. Box 357, Nehru Nagar, Bhopal 462 003,
Madhya Pradesh

Dr. R. V. Varma
Former Chairman,
Kerala State Biodiversity Board,
Lakshmipuram, Royal Avenue,
Thrissur-680 020

Additional Principal Chief Conservator of
Forests (Development)Forest Head
Quarters,
Vazhuthacaud,Thiruvananthapuram-
695014

Member & Ex-Officio Convener
Director
Kerala Forest Research Institute,
Peechi – 680653

MANAGEMENT COMMITTEE

The management committee looks after the administrative functions of the institute. Under the chairman ship of Director, the committee takes care of the proper execution of administrative rules, smooth conduct of research activities and welfare of employees

Director, KFRI	…	Chairman
Shri K.B. Santhosh Kumar Addl. Secretary I & Joint Chief Protocol Officer General Administration Department THIRUVANANTHAPURAM	…	Member
Member Secretary, KSCSTE	…	Member
The Executive Director CWRDM Kunnamangalam (P.O) Kozhikode	…	Member
Dr. E.A. Jayson Scientist F, KFRI	…	Member
Registrar, KFRI	...	Convener

To implement various programmes and activities in the Institute the following Committees functioning during the period

1. CONSULTATIVE GROUP FOR FORESTRY RESEARCH MANAGEMENT

(PROGRAMME ADVISORY GROUP)

(Vide Council (M) Order No. 45/2003/KSCSTE, Thiruvananthapuram, dated 12-11-2003 & Council (M) Order No.104/06/KSCSTE, Thiruvananthapuram, dated 15-3-2006 – Modified here).

1.	The Principal Chief Conservator of Forests & Head of Forest Forces	…	Chairman
2.	The Additional PCCF (D&P) & Disciplinary Authority	…	Member
3.	The Additional PCCF (FMIS)	…	Member
4.	The Additional PCCF (Development)	…	Member
5.	The Additional PCCF (WP&R)	…	Member
6.	The Additional PCCF (E&TW)		
	The Additional PCCF (Administration)	…	Member
7.	The Additional PCCF(Southern Region)	…	Member
8.	The Additional PCCF (Protection)	…	Member
9.	The Additional PCCF (Vigilance)	…	Member
10.	The Additional PCCF (Northern Region)	…	Member
11.	The Additional PCCF (BDC)	…	Member
12.	The Additional PCCF (IHRD)…	…	Member
13.	The Additional PCCF (SA&NO)	…	Member
14.	The Principal Chief Conservator of Forests Wildlife &		
	Chief Wildlife Warden	…	Member
15.	The Principal Chief Conservator of Forests (Social Forestry)	…	Member
16.	The Principal Chief Conservator of Forests (Vigilance)	…	Member
17.	The Principal Chief Conservator of Forests (Dev. & PFM)	…	Member
18.	The Chief Conservator of Forests (Protection)	…	Member
19.	The Chief Conservator of Forests (FMlS)	…	Member
20.	The Chief Conservator of Forests (HRD)	…	Member
21.	The Chief Conservator of Forests (Administration)	…	Member
22.	The Chief Conservator of Forests (Vigilance)	…	Member
23.	The Chief Conservator of Forests (Social Forestry)	…	Member
24.	The Regional Chief Conservator of Forests (North)	…	Member
25.	The Regional Chief Conservator of Forests (South)	…	Member
26.	The Conservator of Forests (Biodiversity)	…	Member
27.	The Deputy Conservator of Forests (Research) North	…	Member
28.	The Deputy Conservator of Forests (Research) South	…	Member
29.	The Managing Director, Kerala Forest Development Corporation	…	Member
30.	The Associate Dean, Forestry Faculty, Kerala Agricultural University	…	Member
31.	The Director, Tropical Botanic Garden & Research Institute, Palode	…	Member
32.	The Director, Institute of Forest Genetics & Tree Breeding, Coimbatore	…	Member

33. The Managing Director, Oushadi, Thrissur … Member
34. The Director, Center for Earth Science Studies, Thiruvananthapuram … Member
35. The Director, Center for Water Resources Development and Management … Member
36. The Director, Rajiv Gandhi Center for Biotechnology, Trivandrum … Member
37. The Managing Director, Oushadhi, Thrissur … Member
38. The Director, Medicinal Plant Research Center, Arya Vaidya Sala, Kottakkal … Member
39. The Managing Director, Hindustan Newsprint Ltd., Kottayam … Member
40. The Managing Director, Kerala State Wood Industries Ltd., Nilambur … Member
41. The Managing Director, Kerala State Bamboo Corporation Ltd. … Member
42. The Director, Salim Ali Center for Ornithology and Natural History, Coimbatore … Member
43. Director, Kerala Forest Research Institute, Peechi … Member
44. Joint Director (Science & Technology Promotion), KSCSTE, Trivandrum … Member
45. Research Coordinator, KFRI, Peechi … Member
46. All Scientists of KFRI … Invitees
47. Programme Co-coordinator, Training & Extension Division, KFRI … Convener

2. INTERNAL RESEARCH GROUP (IRG)

(Vide Proceedings G.53/KFRI/79 dated 13 January 2009 – Modified here).

1. Director … Chairman
2. Dr. K Mohanadas … Convener
3. Dr. V Anitha … Associate Convener
4. All scientific staff … Members

3. PHD & MSC STUDENTS ATTACHMENT PROGRAMME ADVISORY COMMITTEE

(Vide 6. G.53/KFRI/79 dated 6 May 2006)

1. Dr. TK Dhamodaran … Chairman
2. Dr. MP Sujatha … Member
3. Dr. Mallikarjuna Swamy … Member
4. Respective Research Guide(s) … Invitees

4. EQUIPMENT/ INFRASTRUCTURE DEVELOPMENT COMMITTEE

1. Dr. S Sandeep … Chairman
2. Dr. EM Muralidharan … Member
3. Dr. PK Thulasidas … Member
4. Smt. Ricy Eliner Varkey … Member
5. Mr. VC Jinesh … Member
6. Purchase in charge … Convener

5. PURCHASE COMMITTEE

(Vide Council (M) Order No. 37/2003/KSCSTE Thiruvananthapuram, dated 29-10-2003)

1. Dr. TK Dhamodaran … Chairman
2. Dr. R Jayaraj … Member
3. Registrar … Convener

6. LIBRARY & INFORMATION NETWORKING ADVISORY COMMITTEE

(Vide 6. G.53/KFRI/79 dated 19 July 2008)

1. Librarian … Chairman

2.	Mr. KF George	…	Convener
3.	Dr. Mammen Chundamannil	…	Member
4.	Dr. TB Suma	…	Member
5.	Dr. M Amruth	…	Member
6.	Dr. Mallikarjuna Swamy	…	Member

7. WEBSITE AND SOFTWARE / HARDWARE COMMITTEE

(Vide 6. G.53/KFRI/79 dated 13 October 2008)

1.	Dr. TK Hrideek	…	Chairman
2.	Dr. M Amruth	…	Member
3.	Smt. N Sarojam	…	Member
4.	Smt. Ricy Eliner Varkey	…	Convener

8. KERALA FOREST SEED CENTRE ADVISORY COMMITTEE

(Vide Proceedings G.53/KFRI/79 dated 11 February 2004 – Modified here)

1.	Director	…	Chairman
2.	Principal Chief Conservator of Forests (Working Plan & Research), KFD	…	Member
3.	Conservator of Forests (Central Circle), KFD	…	Member
4.	Research Coordinator, KFRI	…	Member
5.	Silvicultural Research Officer (North), KFD	…	Member
6.	Silvicultural Research Officer (South), KFD	…	Member
7.	Silviculturist, KFRI	…	Member
8.	Scientist-in-Charge, KFSC	…	Convener

9. TEAK MUSEUM AND NATURE TRAIL ADVISORY COMMITTEE

1.	Dr. UM Chandrasekhara	…	Chairman
2.	Dr. EA Jayson	…	Member
3.	Dr. P Sujanapal	…	Member
4.	Smt. Sani Lookose, Teak Museum Curator	…	Convener

10. CAMPUS DEVELOPMENT COMMITTEE

1.	Dr. PA Jose	…	Chairman
2.	Dr. EM Muralidharan	…	Member
3.	Smt. MK Raji (Engineering)	…	Member
4.	Dr. P Sujanapal	…	Convener

11. EDITORIAL COMMITTEE FOR THE JOURNAL OF BAMBOO AND RATTAN

(Vide 6. G.53/KFRI/79 dated 13 October 2008)

1.	Dr. EM Muralidharan	…	Chief editor
2.	Dr. UM Chandrasekhar	…	Associate Editor
3.	Dr. PK Thulasidas	…	Associate Editor
4.	Dr. V Anitha	…	Associate Editor

12. ANNUAL REPORT COMMITTEE

1.	Dr. V Anitha	…	Chairman
2.	Dy. Registrar (Accounts, i/c)	…	Member

3. Mr. K Kamalakaran … Member
4. Dr. R Jayaraj … Member
5. Dr. TK Hrideek … Convener

13. NEWSLETTER COMMITTEE

1. Dr. MP Sujatha … Editor
2. Dr. M Amruth … Associate Editor
3. Dr. TB Suma … Associate Editor

14. COMMITTEE FOR TRANSFORMATION OF OFFICIAL LANGUAGE TO MALAYALAM

(Vide KSCSTE letter no. 38/C6/09 dated 10 Feb. 2009)

1. Registrar … Chairman
2. Dr. UN Nandakumar … Member
3. Dr. TV Sajeev … Member
4. Smt. VK Leela … Convener

15. EXHIBITION ADVISORY COMMITTEE

(Vide 6. G.53/KFRI/79 dated 13 October 2008)

1. Dr. K Mohandas … Chairman
2. Dr. AV Raghu … Member
3 Dr. P Sujanapal … Member
4. Dr. TV Sajeev … Member
5. Mr. VP Raveendran … Convener

16. SEMINAR COMMITTEE

1. Dr. R Jayaraj … Chairman
2. Dr. S Sandeep … Member
3. Dr. VB Sreekumar … Convener

17. COMMITTEE TO PREVENT SEXUAL HARASSMENT ON WOMEN

(Vide No.1763/B6/03/KSCSTE dated 5-12-2003)

1. Dr. MP Sujatha … Chairman
2. Dr. S Sandeep … Member
3. Smt. Seetha Sadanandan (C/o Kudumbasree State Poverty Eradication Mission, Ward 16, Cheenikkadavu, Kannara, Pananchery Panchayath, Trichur Dist.) … Member
4. Smt. Shirly Isac … Convener

18. HOSTEL ADVISORY COMMITTEE

1. Dr. K Mohanadas … Chairman
2. Smt. Sabitha Balakrishnan … Member
3. Smt. MK Raji … Member
4. Dr. VP Raveendran … Convener

19. CAFETERIA COMMITTEE

1. Dr. Mammen Chundamannil … Chairman
2. Smt. Anupa Vasu … Member
3. Dr. Sreejith … Member
4. Mr. PI Shereef … Convener

20. BUILDING COMMITTEE

(Vide Note No. G 53/KFRI/Estt/79 dated 12 April 2010)

1. Dr. PK Thulasidas … Chairman
2. Dr. R Jayaraj … Member
3. Dr. MP Sujatha … Member
4. Dr. AV Raghu … Convener

21. VEHICLE ADVISORY COMMITTEE

(Constituted here)

1. Dr. EA Jayson … Chairman
2. Dr. S Sandeep … Member
3. Mr. VC Jinesh … Member

22. DR. KM BHAT MEMORIAL ENDOWMENT COMMITTEE

1. Director … Chairman
2. Dr. Mammen Chundamannil … Member
3. Dr. EA Jayson … Member
4. Dr. EM Muralidharan … Member
5. Dr. R Jayaraj … Member
6. Dr. PK Thulasidas … Member-Convener

23. DR. C CHANDRASEKHARAN MEMORIAL ENDOWMENT COMMITTEE

1. Director … Chairman
2. Dr. P Sujanapal … Member-Convener
3. Dr. V Anitha … Member
4. Dr. M Amruth … Member
5. Dr. K Mohanadas … Member
6. Dr. Mammen Chundamannil … Member

STAFF LIST

Sl.No	Name	Designation	Date of Joining
1	Dr. P.G.Latha	Director i/c	16-08-1978
	RESEARCH MONITORING & EVALUATION UNIT		
2	Dr. E.A.Jayson	Scientist-F	16-12-1981
3	Shri. A.R. Rajan	Scientist- E II (Superannuated on 31-07-2014 & Head)	01-12-1978
	SUSTAINABLE FOREST MANAGEMENT		
4	Dr. R.C. Pandalai	Scientist F (Superannuated on 30-04-2014)	14-03-1983
5	Dr. U.N. Nandakumar	Scientist F	23-03-1983
6	Dr. M.P. Sujatha	Scientist-EII	11-12-1987
7	Dr. C.K. Soman	Scientist-EI (Superannuated on 30-11-2014)	06-12-1978
8	Dr. P. Sujanapal	Scientist-B	09-12-2010
9	Dr. S. Sandeep	Scientist-B	09-03-2011
	SEED CENTRE		
10	Dr. P.K.Chandrasekhara Pillai	Scientist-C	18-10-1983
	FOREST GENETICS & BIOTECHNOLOGY		
11	Dr. E.M. Muraleedharan	Scientist-EII & Head	27-05-1991
12	Dr. T.B. Suma	Scientist-B	08-12-2010
13	Dr. T.K. Hrideek	Scientist-B	08-12-2010
	FOREST ECOLOGY AND BIODIVERSITY CONSERVATION		
14	Dr. U.M.Chandrashekara,	Scientist-EII and i/c, KFRI Sub Centre, Nilambur	15-07-1992
15	Dr. P.A. Jose	Scientist E I (On Deputation from JNTBGRI)	
16	Dr. V.B. Sreekumar	Scientist-B	01-03-2011
17	Dr. K.A. Sreejith	Scientist-B	01-03-2011
18	Dr. R. Jayaraj	Scientist-B	28-03-2011
	FOREST HEALTH		
19	Dr. T.V. Sajeev	Scientist-EI & Head	06-02-1997
20	Dr. G.E. Mallikarjunana Swamy	Scientist-B	20-12-2010
	WOOD SCIENCE & TECHNOLOGY		
21	Dr. T.K. Dhamodaran	Scientist-F & Head	02-08-1982
22	Dr. P.K. Thulasidas	Scientist-C	28-06-1984
	FORESTRY AND HUMAN DIMENSIONS		
23	Dr. Mammen Chundamannil	Scientist-F & Head	29-05-1982
24	Dr.V. Anitha	Scientist-EI	07-09-1998
25	Dr. M. Amruth	Scientist-B	01-03-2011
	FOREST MANAGEMENT INFORMATION SYSTEM		
26	Dr. U.N. Nandakumar	Additional Charge	

	EXTENSION & TRAINING		
27	Dr. K. Mohanadas	Scientist-F & Head	01-06-1982
28	Shri.V.P. Raveendran	Scientist-C	25-02-1993
29	Dr. K.V. Muhammed Kunhi	Scientist-EI	24-10-1994
30	Smt. Sani Lookose	Scientist C-Teak Museum Curator	07-08-2002
31	Dr. A.V. Raghu	Scientist-B	07-12-2010
	LIBRARY & INFORMATION		
32	Smt. N. Sarojam	Scientist-C- Librarian i/c	06-07-1981
33	Dr. K.F. George	Scientist-C	23-12-1994
	ADMINISTRATIVE STAFF		
1	Shri. K. Satheesakumar	Dy.Registrar Accounts & Registrar i/c	20-12-2013
2	Shri. K. Venugopal	Dy.Registrar Admin (on Deputation to Govt. of Kerala)	27-05-2008
3	Shri. N. Vijayakumar	Dy. Registrar Admin (On deputation from KASRS) (Superannuated on 08-01-2015)	04-06-2014
4	Smt. V.K. Leela	Asst. Registrar	02-07-1979
5	Smt. Mary Kuruvilla	Section Officer (Superannuated on 31-05-2014)	07-07-1980
6	Smt. Sabitha Balakrishnan	Section Officer	03-09-1999
7	Smt. Shirly Issac	Section Officer	16-09-2003
8	Shri. K. Kamalakaran	Section Officer	10-12-2009
9	Smt. K. Annapoorni	P A to Registrar	12-07-1982
10	Smt. Grace Andrews	PA to Director	27-01-1987
11	Shri. V.S. Krishnanunni	Assistant	28-08-2010
12	Smt.V.V. Rajina	Assistant	17-08-2010
13	Smt. P. Anupa Vasu	Assistant	01-10-2011
14	Smt. Anuja Prasannan	Assistant	17-10-2011
15	Smt. K. Keerthy	Assistant	06-01-2012
16	Smt. Maymol Joseph	Assistant	16-08-2011
17	Shri. P.M. Venugopalan	Sr.Spl.Gr.Typist	22-05-1978
18	Shri. K.P. Manoj	Spl.Gr.Typist	28-08-1992
19	Shri. T.M. Abdul Vahab	Spl.Gr.Word Processing Assistant	27-01-1989
20	Shri. P. Rajeesh	Clerical Assistant	14-06-2000
21	Shri. T.C. Paul	Spl.Gr.Driver	01-07-1994
22	Shri. P.K. Rajendran	Driver	09-01-2009
23	Shri. E.O. Mathai	Driver	09-01-2009
24	Shri. C.H. Herald Wilson	Driver	24-02-2012
25	Shri. M.C. Mohandas	Senior Attendant	24-10-1977

26	Shri. T.P. Padmanabhan	Spl. Gr. Cook Cum Attendent	17-12-1991
27	Smt. N. Baby	Office Attendant	24-11-1995
28	Smt. K.K. Vanaja	Office Attendant	26-08-2003
29	Smt. K. Aparna	Office Attendant	23-08-2004
30	Smt. A.M. Lalitha	Office Attendant	01-08-1986
31	Smt. T.G. Chandrika	Office Attendant	01-03-1988
32	Shri. V.K. Mohandas	Office Attendant	01-01-1992
33	Shri. N.I. Thankappan	Office Attendant	01-01-1992
34	Shri. E.P. Ulahannan	Office Attendant	01-01-1992
35	Smt. A.K. Ammini	Office Attendant (Superannuated on 31-03-2015)	03-11-1986
36	Shri. C.P. Shoukathali	Helper Gr.III	01-03-1988
37	Shri. K. Mohammed	Helper Gr.III	01-01-1992
38	Shri. K.K. Mohammed	Helper Gr.III	05-07-1994
39	Smt. P. Deepa	Office Attendant	06-08-2009
40	Shri. I.O. Thomas	Helper	01-12-2009
41	Shri. T.P. Valsan	Helper	11-06-2010
42	Smt. S. Ashamole	Office Attendant	19-08-2010
43	Shri. E. Hamsa	Office Attendant	19-Aug-10
44	Shri. K. Abdul Jaleel	Office Attendant	16-08-2010
45	Smt. C. Sujatha	Office Attendant	21-08-2010
46	Smt. S. Sheeja	Helper (Deputation to JNTBGRI)	17-08-2010
47	Shri. A.V. Chamy	Helper	27-10-2010
48	Smt. C. Rugmini	Helper	29-05-2012
49	Shri. P.V. Santhosh Kumar	Helper	29-05-2012
50	Shri. T.S. Prakash	Helper	29-05-2012
51	Shri. M.S. Santhosh Kumar	Helper	29-05-2012
52	Shri. K. Krishnadasan	Helper	29-05-2012
53	Shri. N. Rajan	Helper	29-05-2012
54	Shri. T.O. Simon	Helper	29-05-2012
55	Shri. C.P. Ummer	Helper	29-05-2012
56	Smt. P.S. Kadeeja	Helper	29-05-2012
57	Smt. V.L. Alphonsa	Helper	29-05-2012
58	Shri. M.K. Suresh	Helper	29-05-2012
59	Shri. K.A. Thankachan	Helper	29-05-2012
60	Shri. C.B. Sajy	Helper	29-05-2012
61	Shri. T.P. John	Helper	29-05-2012
62	Shri. N.K. Rajan	Nuresry Man	31-07-2007

63	Smt. S. Padmavathy	Nuresry Man	27-09-2008
64	Shri. K. Rajan	Nursery Man	29-09-2008
	TECHNICAL STAFF		
1	Shri. U.Y. John	Sr. Special Grade Technical Officer	09-01-1981
2	Shri. D. Skariah	Sr. Special Grade Technical Assistant	01-09-1983
3	Shri. K.C. Subramanian	Sr. Special Grade Technical Assistant	22-07-1985
4	Shri. M.R. Anilkumar	Sr. Special Grade Technical Assistant	30-01-1989
5	Shri. P.B. Sajeeva Rao	Sr. Special Grade Technical Assistant	30-01-1989
6	Shri. P.I. Shereef	Technical Officer (Electrical)	10-08-2010
7	Smt. M.K. Raji	Technical Officer (Civil)	18-08-2010
8	V.C. Jinesh	Technical Officer	04-07-2014
9	Shri. O.P. Ranjith	Technical Assistant (Binder)	03-10-2011
10	Smt. Ricy Eliner Varkey	Computer Lan Assistant	01-03-2006

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