Annual Report
2006-'07

Kerala Forest Research Institute

ANNUAL REPORT
2006-07

Kerala Forest Research Institute
An Institution of Kerala state Council for Science, Technology and environment
Peechi – 680 653, Thrissur District, Kerala

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Kerala Forest Research Institute
Peechi - 680 653
Thrissur district, Kerala

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DIRECTOR'S REPORT

The global concern over deteriorating environmental quality and depleting forest resources and biodiversity, particularly in the tropics, has put greater responsibility on forestry-related institutions in identifying socially acceptable and environmentally viable means of conservation and sustainable development. KFRI, with over thirty years experience in this line, is geared up to face the challenging situation and fulfil its obligations of support to the society that dreams of a safe and healthy environment. Over the years, our thrust of research and related activities has widened to address the diverse aspects of environment. biodiversity and societal development.

Thus, the research and extension projects undertaken by the Institute have not only been of local relevance but also of global importance. During 2006-07 there have been about 100 ongoing research/extension projects covering different aspects mentioned above. More than half of these projects were supported from plan grants and the rest were funded by various agencies like Ministry of Environment and Forests, CSIR, Department of Biotechnology, Department of Science and Technology, State Department of Planning and Economic Affairs, State Medicinal Plants Board, Coconut Development Board, Hindustan Newsprint Ltd. and Kerala Forest Department. Overseas funding was also obtained from Department for International Development (DFID), UK.

There have been a few projects at various stages of completion. Final reports of 13 research projects and three extension projects were brought out during the period. For the rest, final reports were under preparation or finalisation. Most of the completed projects were related to biodiversity documentation and conservation including wetland and mangrove ecosystems besides ethnozoological studies, management of teak, bamboos and identification of tree flora. There have also been ongoing studies on RET species, ex-situ conservation of various forest species and bamboos, conservation of specialized ecosystems such as mangroves, *Myristica* swamps and sacred groves.

During the reporting year, the Institute received Rs. 850.00 lakhs as grant-in-aid from the Council (Govt. of Kerala) of which Rs. 490 lakhs was under Plan Grant and the rest under Non-Plan. The funding obtained from external agencies towards specific projects was to the tune of 194.07 lakhs. The funds from Plan grants were utilized for research and extension projects and also for infrastructure development.

Dr. K.V. Sankaran

Director

THE INSTITUTE

The Kerala Forest Research Institute (KFRI) established in 1975 by the Government of Kerala under its Science and Technology Department, is an organization dedicated to research in tropical forestry and biodiversity. During 2003, when the Kerala State Council for Science, Technology and Environment (KSCSTE) was constituted, KFRI became a part of the Council along with five other R&D Centres of the State. KSCSTE is an autonomous body under the Science, Technology & Environment Department of the Government of Kerala.

The administration and management of KFRI are vested with the Management Committee (MC) chaired by the Institute's Director. The Committee approves and monitors research activities besides managing administrative and financial matters. Another vital body responsible for overseeing and guiding the formulation and implementation of various research programmes is the Research Council (RC) comprising eminent scientists of the Country in forestry research. Research Council also monitors the quality and content of research undertaken and provides guidance for improvement.

The scientific manpower of KFRI is organized into six Programme Divisions encompassing different Disciplines and three supporting divisions for the effective implementation of multidiscip-linary research programmes in forestry and to disseminate the research findings to the stakeholders. Each Programme Divisions is headed by a Programme Coordinator. The six Progra-mme Divisions are: 1. Sustainable Natural and Plantation Forest Management, 2. Forest Ecology and Biodiversity Conservation, 3. Forest Protection, 4. Forest Utilization, 5. Forestry and Human Dimensions, and 6. Forest Information Management System. The supporting Divisions include: 1. Instrumentation, 2. Extension and Training, and 3. Library and Information. A Research Monitoring and Evaluation (RME) Unit is also functioning to facilitate and monitor research in various Disciplines.

Sustainable Natural and Plantation Forest Management (SNPFM)

The Division comprises Silviculture, Biotechnology, Genetics, Tree Physiology and Soil Science Disciplines. The thrust areas of research of the Division are: improved nursery and silvicultural practices, production of better clones and quality planting stock of plantation species, and sustainable forest management. Devel-opment of cost-effective micropropagation protocols as well as vegetative propagation of important forestry species, DNA finger-printing, marker assisted selection, gene mapp-ing and population genetics, assessment of genetic diversity of forest species, selection of plus clones and genetic improvement, studies on breeding system and gene flow have been some aspects of research in the Division. Besides, studies have also been under-taken on eco-restoration and afforesta-tion of degraded sites, evaluation of factors affecting growth, enhancement of plantation productivity, soil nutrient management for different forestry species and environmental physiology, especially water use, photosynthesis and micro-climate.

Forest Ecology and Biodiversity Conservation (FEBC)

The thrust areas of research of the Division are ecosystem and landscape analysis, rehabilitation and restoration, population ecology and dynamics, biodiversity evaluation and conservation of fragile ecosystems, traditional knowledge system analysis and biodiversity-informatics. Inventorisation of biodiversity of different forest types and protected areas, evaluation of below-ground biodiversity, taxonomic studies and conservation of RET species of flora have been some areas of research in the Division. Besides, the Wildlife Biology Discipline deals with inventorisation of fauna, endangered animals, man-wildlife interaction and wildlife census. Nursery and plantation technology of selected indigenous timber species and rattans and ethno-biological studies are other activities of the Division. A Herbarium representing the forest flora of the State, an Arboretum of rare and characteristic species of moist deciduous forests of Kerala, a Palmetum with about 80 species of palms, a Canetum with about 30 species of rattans, a bio-resource nature trail, etc. are the major facilities of the Division.

Forest Protection (FP)

The Division with its Forest Entomology and Forest Pathology diciplines undertakes research on various aspects of microbes and insects in the forest ecosystem. Further, eco-friendly technologies are being developed to manage the pests, diseases and weeds in forest plantations, mainly through biological means. The Division maintains authentic collections of microbes and insects of Kerala forests and also of microbial pathogens of forest insects. Management of nursery and plantation diseases, diversity of plant pathogenic fungi in different forest ecosystems, VA and ectomycorrhizal fungal diversity and biological control of weeds are the main areas of research in Pathology Discipline. In Entom-ology Discipline, the thrust areas include monito-ring of forest insect diversity, control of termites in plantations, wood damaging insects and teak defoliator, traditional methods of post-harvest protection of bamboo from insect borers, etc. The mass production technology of the bio-pesticide Hyblaea puera Nucleo Polyhedrosis Virus (HpNPV) has been standardized, and the appli-cation technology has been transferred to stake-holders. The concept of butterfly garden has been popularized and technical advice provided to various agencies for the establishment of butterfly parks.

Forest Utilization (FU)

Research and extension activities related to wood structure, properties and utilization, consumption and bio-prospecting of non-wood forest products with reference to medicinal plants, their quantita-tive inventory and sustainable extraction are the major activities of the Division of Forest Utilization. The Division has facilities like wood preservation plant, drying kiln, xylarium, medicinal plants garden and instruments like Universal Testing Machine (UTM), image analyzer, NIR spectroscope, etc. The Division has undertaken extensive studies on wood structure, properties and preservative treatments for various timber species like teak, eucalypt and rubber wood. Also, anatomical and utilization studies of bamboos, reeds and canes have been undertaken. The Division has developed implements helpful for bamboo extraction.

Forestry and Human Dimensions (FHD)

The Division consisting of Forest Economics, Agro-forestry, Sociology and Urban Forestry Disciplines undertakes research on human

dimensions of forestry, including livelihood and recreation, environmental conservation and linkages between social and natural sciences. The major areas of research are natural/forest resource management, economic valuation, sustainable utilization of non-timber forest products, policy issues and strategic planning, sustainable forest management, participatory role of local communities in the conservation and sustainable management of forest ecosystem, resource use conflict and livelihood issues and agro-forestry systems. Assessment of supply-demand position of wood for the state, estimation of availability of bamboo in home gardens, evaluation of the livelihood conditions of bamboo workers in Kerala and establishment of a model watershed with people's participation are some of the recent achievements of the Division.

Forest Information Management System (FIMS)

The Division aims to meet the information needs of the stakeholders of forestry sector using modern tools of statistics, GIS and remote sensing. Creation of a database on biophysical and socio-economic aspects pertaining to forests, forest sector analysis and projections, mapping forest cover and biodiversity and modeling the growth dynamics of plantations and natural forests for effective forest management are some of the major works carried out in the Division. The Division has also developed a growth simulator for teak plantations in Kerala. Ecological studies on the Shola forests of Kerala based on remote sensing data and simultaneous calibration of allometric relations in teak stands were achieved using multilevel models. Stand modeling, biodiversity mapping, ecosystem analysis, GIS, forest resource mapping, population analysis and organization of a data bank of forestry in Kerala are programmes in various stages of implemen-tation.

Instrumentation

This central facility caters to the material / chemical analysis needs of research, within and outside the Institute. The Division provides advanced instrument facilities for analysis and measurement to users from industries, R&D establishments and academic institutions, co-operates with professionals and academic staff and undertakes training and services for personnel from industries, R&D establishments and academic institutions. The Division is equipped with highly sophisticated laboratory facilities to carry out spectroscopic measurements, material/chemical characterization and structure analysis.

Extension and Training

The Division liaises 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.

Technical support is provided to the Kerala Forest Department, other governmental and non-governmental agencies and farmers on site-species matching, site selection and nutrient status, fertiliser dosage, pest and disease control and conservation, utilization and marketing of timber of forest species. Advice on resource survey and estimation as well as wildlife management and census are also provided. The Institute undertakes identification of plants, insects, animals and timber.

Library and Information

An automated library with a core collection of 16,000 books and 9,000 back volumes of journals on the subject caters to the the information requirements of the scientists and research scholars of the institute. The collection includes several valuable reference books, doctoral theses and back volumes of periodicals, databases in CD-ROMs, etc. Online Public Access Catalogue of books and back volumes is available. Subscription of more than 90 journals with more than 40 foreign journals in the subject was continued during 2006-07. As the Institute is a member of international bodies like APAFRI, IRGWP, IUCN and IUFRO, the library has in its collection the publications from these organisations. A CD-server is provided to access the CD-ROM collections of the library. Bibliographical databases developed on specialised topics such as bamboo and teak in the library are made available in CD-ROM. Annotated bibliographies on teak, bamboo and rattan, both in print and CDs are also available. The library provides literature search facilities to Scientists from within and outside the Institute, apart from art and photography and LAN facilities. Distribution of all KFRI publications is also carried out by the library.

Bamboo Information Centre - India, established in the library with the support of the International Development Research Centre (IDRC), Canada, provides information on various aspects of bamboo through its documents and databases developed for the purpose. The Centre's publi-cations include four volumes of BIC-India Bulletin, two Information Bulletins, a Directory and the publication 'Bamboos of India'.

Institute Administration

Director is the Head of the institution. The administration and financial matters of the Institute are handled by Administration and Accounts sections respectively, which function under the control of a Registrar. Both the sections have a Deputy Registrar each who is responsible to the Registrar. The financial and expenditure matters of the Institute are scrutinised by an Internal Auditor.

RESEARCH PROJECTS

The various intra-and inter-disciplinary projects undertaken in different Divisions, both completed and ongoing during 2006-07 are given below.

COMPLETED PROJECTS

Management of soils of teak plantations for sustainable productivity. *KFRI Research Report No. 279* (Balagopalan, M. and Rugmini, P., 2006).

This study was undertaken to examine the physical and chemical properties of soils of teak planta-tions of different site quality classes in various age groups and also to evaluate the soil properties affecting the site quality class. Teak plantations belonging to three age groups, 5-25 years, 25-45 years and more than 45 years and upto 60 years in Forest Divisions of Achencoil, Konni, Ranni, Thenmala, Nilambur (North & South) and Wyanad (North & South) were selected for the study. In each of the selected plantations, plots were marked along randomly laid out transects running through the centre of the plantations. Girth at breast height of all trees in the plots was measured. Trees having the largest height, smallest height and three trees in between the range were selected for measurement of height in each plot. Soil analyses were carried out for particle-size separates, bulk density (BD), particle density (PD), soil pH, organic carbon (OC), maximum water holding capacity (WHC), available N, P, K, Ca and Mg and $CaCO_3$. Discriminant analysis was done to identify the factors by which the soils under different site quality classes differed significantly under each age group.

It was observed that there was no general trend with respect to the variation in soil properties in relation to different site quality classes. Particle density, bulk density, available P and Ca in the age group 5-25 years and $CaCO_3$, organic carbon, available K and silt in the age group 25-45 years discriminated the soils under different site quality classes. In the age group >45 years, $CaCO_3$, available P, Ca and Mg and particle density discriminated the soils under different site quality classes. In other words, in the age group 5-25 years, soil physical properties and nutrients were the discriminating factors by which the soils belonging to various site quality classes differed significantly. Soil texture, alkalinity, nutrient and fertility status were the discriminating factors by which the soils under the four site quality classes differed significantly in the age group 25-45 years. In the age group >45 years, soil alkalinity, nutrients and physical properties discriminated the soils belonging to various site quality classes.

It was also noticed that available Ca was the common discriminating soil variable in the age groups 5-25 and >45 years while $CaCO_3$ was the common discriminating soil variable in the age groups 25-45 and >45 years. Since calcium content in the soils was the discriminating factor between site quality classes, retaining calcium in the soil at optimum level by constant application is required for management of soils of teak plantations for sustainable productivity.

Biodiversity of plant pathogenic fungi in the Kerala part of the Western Ghats. *KFRI Research Report No. 280* (Mohanan, C., Sankaran, K.V. and Yesodharan, K., 2006).

An extensive survey on plant pathogenic fungi in the Kerala part of the Western Ghats carried out during 2001-2004 revealed a rich fungal flora harboured in different forest ecosystems. Of the 4,101 fungal isolates obtained in the study, 60 pathogenic fungi were new species. A total of 151 pathogenic fungi were found to be new records for the Western Ghats, while 104 pathogenic fungi were reported for the first time from India. Altogether 639 plant species belonging to 395 genera were found infected with pathogenic fungi. Of these, 175 plant species were found as new host records for different pathogens.

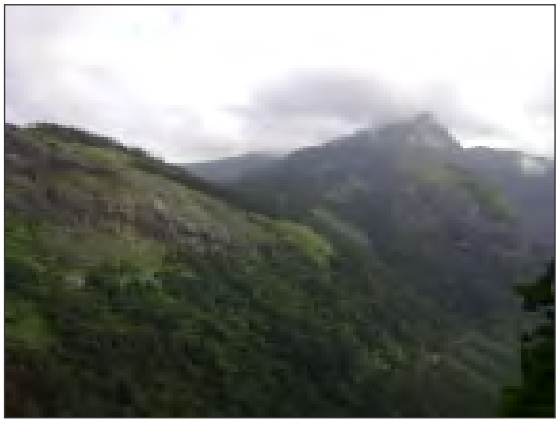
Among the different forest ecosystems studied, forest plantations supported a rich pathogenic fungal flora with plant-pathogenic fungal ratio as high as 1:14. In moist deciduous and semi-evergreen forests, the figures of plant-pathogenic fungal ratio were 1:3.1 and 1:3.48 respectively. Shola forests and wet evergreen forests registered comparatively low plant-pathogenic fungal ratio of 1:1.65 and 1:1.46 respectively. In forest nurseries, though a large number of host plants (154) were found diseased with fungal pathogens, the plant-pathogenic fungal ratio was only 1: 3.77. Monoculture exotic plantations and disturbed natural stands supported a large number of fungal pathogens. Anthropogenic disturbances including forest fires seem to be the major contributing factor for incidence and spread of fungal diseases and thereby build-up of pathogenic fungal populations.

Biodiversity indices for plant pathogenic fungi in different forest ecosystems in the Western Ghats were worked out separately. Fungal species richness indices (Margalef's index and Menhinick's index) ranged from 2.5605 to 5.6652 and 4.0899 to 21.0853 respectively. Among the eight forest ecosystems studied, moist deciduous forests exhibited the highest species richness of fungi. Fungal species diversity indices (Simpson's index and Shannon's index) were deduced for each forest ecosystem, which ranged from 0.0228 to 0.1183 and 1.1026 to 2.4482 respectively.

With regard to the community structure and species composition, almost same fungal flora was observed in moist deciduous, semi-evergreen forests, and forest plantations; however, fungal species dominance and abundance reflected the environmental condi-tions, level of disturbances, as well as host plant status.

Evaluation of plant diversity in unlogged and logged forest stands of varying intensities. *KFRI Research Report No. 281* (Menon, A.R.R. and Balasubramanyan, K., 2006).

The effect of logging on plant diversity and regeneration was studied in three tropical forest sites in Kerala. The sites were at Goodrikal RF in Ranni Forest Division in southern Kerala, Sholayar RF in Vazhachal Forest Division in central Kerala and Kottiyoor RF in Kannur Forest Division in northern Kerala. Statistically designed plots were laid out in unlogged and logged forests of different types in all the three



View of study area in Ranni Forest Division

sites. The vegetation analysis and regeneration evaluation were done by conventional ecological methods. The microclimate was monitored using thermo-hygrographs at various places for one year. Regeneration data were gathered for unestablished and established seedlings, saplings and poles of the area. It is interesting that species, which are highly aggregated, are still present in low numbers as rare species in the same sites. The presence of *Podocarpus* in some parts of Moozh-iyar Reserve (near Urani) indicates that even a species, which is no more than a competitive equal in some areas and at a distinct advantage elsewhere, can persist in the forest for very long periods before going locally extinct. Clumping of species is yet another interesting feature noted in the area. The sparse sub-populations do self-sustain or simply represent accidental establishment of rare individuals, because of favorable site factors.

Illustrated manual on tree flora of Kerala supplemented with computer-aided identification. *KFRI Research Report No. 282.* (Sasidharan, N., 2006)

Identification of trees at sight is often required for biologists, ecologists and foresters. This cannot be achieved with conventional floras, where identification keys are invariably based on floral and fruit characters. Therefore, a computer-aided identification program (*TreeID*) was developed exclusively on easily observable field and vegetative characters. The *TreeID* is a menu driven multi-entry key and all characters are of equal value and one need not follow the sequence or order followed in the case of dichotomous keys. Pictures of all key characters used in the identification program are provided for easy selection and comparison. Photographs depicting diagnostic features of trees such as bark, blaze, leafy twigs with flowers and fruit are provided for easy comparison with the matching characters. Therefore, the chance of misidentification the trees included in the *TreeID* is minimized. Search facility is provided to find out family, genera and species. There is also provision to find trees based on local/trade names. A help menu is provided in the CD on how to use the *TreeID*

The manual and the computer-aided identification package deal with 650 trees of over 4 m height with a clear bole. The 650 trees include 72 common exotics, introduced as agricultural, forestry or ornamental/avenue trees. There are 115 trees belonging to the Red

Flowering and fruiting in *Syzygium palghatense*

Listed Categories and many of them are known only by their type collections made a century ago. Two new tree species discovered during the study and named as *Humboldtia sanjappae* and *Stereospermum colais* var. *shendurunii* are also included. Dichotomous parallel keys based on generative and vegetative characters are provided in the manual for the identification of families, genera, species and infraspecific taxa. The correct botanical name with author(s) name and citation are provided with basionym and synonym(s), if any. References to monographs/ revisions and floristic studies in Kerala are cited. Local name(s) are also given, if known. Description, habitats (vegetation-wise), geographical distribution and district-wise occurrence in Kerala are provided along with flowering and fruiting periods. The species belonging to Red Listed categories are indicated to the IUCN (1994) category to which they are assigned.

Monitoring biodiversity in the selected landscapes in the Kerala part of Western Ghats. KFRI Research Report No. 283 (Mathew, G., Sharma, J.K. and Easa, P.S., 2006).

Biodiversity of selected landscapes at five different locations was studied with the active participation of college teachers and students. In Cheruvathur Grama Panchayath, the study was carried out in different habitats such as lateritic plateau, sacred groves, rice fields and human settlements. A total of 295 species of plants belonging to 239 genera under 82 families were recorded. With regard to the fauna, seven families of butterflies, four families of anurans, six families of reptiles, 30 families of birds and 13 families of mammals were found represented in the study area. In all locations, the natural vegetation supported rich biodiversity. Settlements and paddy fields were relatively poor in biodiversity probably due to pesticide and chemical fertilizer usage.

In the case of Muthur Grama Panchayath, 45 species of plants comprising trees, herbs and shrubs were recorded which included various ornamental and medicinal plants. With regard to fauna, the anurans such as Jerdon's bull frog and Marten's bush frog; the reptiles such as buffer-striped keelback and common ptyas and the birds such as black headed oriole, purple rumbed sunbird and purple sunbird were characteristic to this area. Several species of spiders, 24 species of butterflies, six species of amphibians, five species of reptiles and 30 species of birds have been recorded.

In Paliyamangalam, Ayilamudichi Hills (Nemmara), four species of fungi, crustose lichens growing on rocks and tree trunks, bryophytes, pteridophytes, monocots and

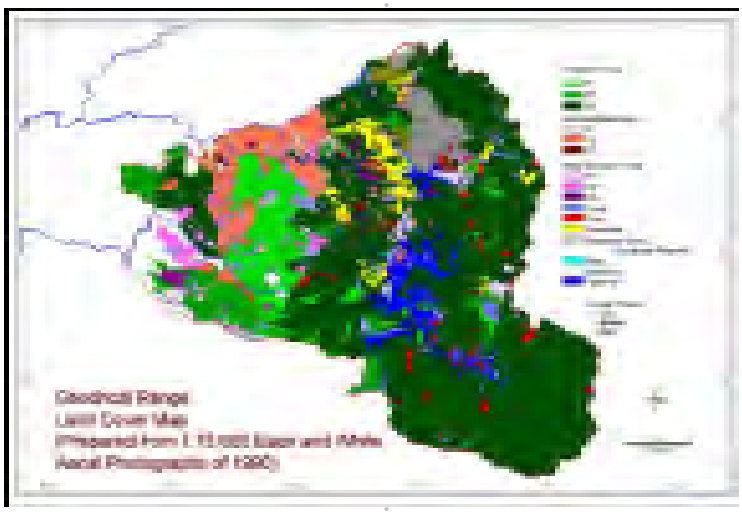
Indian Flapshell Turtle

Pathi Kavu Sacred Grove Karur Panchayat, Kottayam

various aquatic plants have been recorded. With regard to fauna, several unidentified species of beetles, 37 species of butterflies, eight species of primary and secondary freshwater fishes and 23 species of birds were recorded. The faunal elements included several species of rare butterflies including *Phalanta phalanta* and *Castalius rosimon,* exotic mollusks (*Achatina fullica*) and *Vaginulus* sp., birds such as Malabar grey hornbill and wagtails, and mammals such as sambar deer, spotted deer and wildcat. Of the various ecosystems, the moist deciduous forests contained maximum number of species.

Biodiversity characterization at landscape level using satellite remote sensing (DBT-DOS project) Phase-II study. *KFRI Research Report No. 284* **(**Menon, A.R.R., 2006).

Biodiversity characterization at landscape level has been carried out in Kerala using IRS satellite data. The study was undertaken jointly with the Department of Space and is part of a major initiative taken up by the Department of Biotechnology under its Network Programme for Bioprospecting, which commenced in 1997. The programme is a true implementation of 'gene to ecosystem' concept in biodiversity conservation and prospecting. This project is a pioneering effort to create geospatial database on vegetation cover types, disturbance regimes and biological richness. The spatial data have been linked to the species database and field data from different strata of vegetation. Detailed sampling was performed in comparatively undisturbed forests of Goodrikal Reserve in Ranni Forest Division, with an ecological insight to understand the forest dynamics. The information system evolved in the present study through multicriteria analysis in GIS facilitates rapid assessment of biodiversity and its monitoring (loss and/or gain), assessment of nature of habitats and disturbance regimes, evolving species-habitat relationship, mapping biological richness and gap analysis, and prioritizing conservation and bioprospecting. A very detailed land cover map of the area was prepared using aerial photographs and satellite imageries. The density sliced version of the cover map was also generated using digital mapping techniques and is the basis of the sampling site selection. The vegetation data were gathered and analyzed for 25 selected localities representing the different forest types and



density levels. The slope class map, contour map, etc. are also generated from the available terrain information. The structure of the forest vegetation and the distribution of different forest types are described in detail.

Optimization of harvesting and post-harvest technology to economize bamboo resource utilization. *KFRI Research Report No. 285* (Bhat, K.V. and Varma, R.V., 2006).

This study was conducted to examine the possibility of improving the harvesting and post-harvest technology of two common bamboo species, viz., *Bambusa bambos* and *Dendrocalamus strictus*. As an outcome of the study, a simple branch-cutting tool was developed for removing the thorny branches prior to culm extraction. A traditional method to judge the culm age/maturity for harvesting, based on culm tissue colour was examined and was found to be reliable supple-mentary feature for culm age determination.

Branch cutting tool

Difference in tissue colour between young (L) and mature (r) culms

It was found that the susceptibility of bamboo culms to *Dinoderus* beetles was dependent on starch content of culms. The beetles and their larvae were found to prefer the inner, starch-rich portion of the culm wall for more productive feeding. The extent of starch content seemed to depend on locality and favourable growth conditions. Within a year, starch content was found to be low from September to November. The natural borer population and the intensity of infestation were also low during this period. An interesting observation noted during the study was the slow depletion of starch from culms during post-harvest storage due to the activity of amylase enzyme.

Among the traditional methods followed in rural areas for post-harvest protection of bamboo, submersion of harvested culms in water for one to three months was found effective in preventing borer damage. Submersion caused degradation of storage starch in culm tissues due to the action of saprophytic microorganisms, a fungus of the genus *Acremonium* and bacterial species belonging to the genera *Pseudomonas* and *Klebsiella*. Other physical treatments such as heat curing/boiling in water were not effective. Similarly, harvesting trials conducted for one complete lunar month did not indicate any influence of the waning or waxing phases of the moon on the extent of borer damage. Among the traditional biological treatments, a preservative formu-

lation of nine biological ingredients used by local carpenters for protection of wood was found to be effective against bamboo borers. Similarly application of neem oil was also equally effective. Brush application of these preservatives/repellants on the cut ends and branch scars of bamboo culms gave protection from beetles.

Based on the results obtained, an integrated pest management strategy to protect bamboos from *Dinoderus* beetle damage is suggested. This involves cutting the bamboo at low starch period, adopting traditional methods like water soaking, application of preservatives and following improved meth-ods of stacking.

developed local populations. Eight species recorded in this study are protected under the Indian Wildlife (Protection) Act and six species are Western Ghat endemics. The most spectacular result was the multi species aggregation of danaine butterflies (*Danaus genutia, D. chrysippus, Tirumala limniace, T. septentrionis* and *Euploea core*) on *Crotalaria retusa* during June to November with 30-40 butterflies roosting per plant. Exhibits depicting butterfly life stages were set up in the garden for providing information on the life of butter-flies. The research report also contains infor-mation pertaining to the general requirements for setting up a butterfly farm along with a brief discussion

Views of butterfly garden

Development of butterfly farming enterprises *vis-à-vis* conservation and sustainable utilization of biodiversity. *KFRI Research Report No. 286* (Mathew, G., 2006)

The prime objective of this project was setting up of a butterfly house to facilitate education of the public on the significance of nature conser-vation. As a matter of fact, a butterfly garden was established in the KFRI Sub Centre Campus at Nilambur. About 50 species of butterflies were sighted annually, some of which on the problems and prospects of this enterprise.

Tracing the origin and spread of teak defoliator outbreaks through a molecular approach. *KFRI Research Report No. 287* (Sudheendrakumar, V.V., Varma, R.V. and Sajeev, T.V., 2006).

The present study was undertaken in about 8,500 ha of teak plantations at Nilambur, Kerala during 2001-2002. The area was divided into 19 blocks and 189 Observation Units. The

outbreaks of *Hyblaea puera* were monitored at fortnightly intervals. The populations were classified into 'endemic', 'epicenter' and 'epidemic', based on the time of occurrence and size of infestation. Using the duration of each instar (egg- 1 day; instars I and II -2 days each, instars III to V- 3 days each, pre-pupa- 1 day and pupa- 4 days), the temporal data on outbreaks was examined to see whether each subsequent outbreak could be explained on the basis of previous outbreak. The larval samples of the population suspected to be related were subjected to molecular analysis to confirm genetic relatedness.

A novel method of screening for nuclear and mitochondrial DNA polymorphism using (RAGEPs) was standardized for estimating the genetic variation within and between populations. This method is based on PCR technique using single gene specific primers with nil to moderate level of degeneracy. Based on the criteria of polymorphic content and specificity to the teak defoliator genome, 11 nuclear Random Amplified Gene Encoded Primers (RAGEPs) and 11 mitochondrial RAGEPS were selected from a batch of 57 n-RAGEPs and 37 m-RAGEPs. Using this method, the relationship between different populations was traced out.

The ecological data generated suggested a relationship between endemic populations and some of the epicenter populations and similarly between epicenter populations and some of the outbreak populations. However, the molecular studies did not reveal any relationship between endemic and epicenter populations. The study thus gave little evidence to show that the aggregation of moths belonging to the endemic populations causes the epicenter populations. The study reconfirmed the relationship between epicenter populations and some of the epidemic popul-ations (outbreaks) as revealed through ecological studies. This finding is relevant from the point of view of management of the teak defoliator to some extent by managing the epicenter popul-ations, which occupy comparat-ively a small area in large-scale plantations.

Economic valuation of ecotourism development of a recreational site in the natural forests of southern Western Ghats. *KFRI Research Report No. 288* (Anitha, V. and Muraleedharan, P.K., 2007).

The study attempts to estimate the economic potential of ecotourism in Athirappilly-Vazhachal, southern Western Ghats and suggests suitable strategies and action plan. The visitor flow on an average is 2.3 lakh and 5.3 lakh per year at Vazhachal and Athirappilly respectively. The revenue generating potential of the sites indicates a positive relationship between the revenue, number of visitors and

Tourist spots of Athirappally

number of vehicles. The total Affected Forest Area (AFA) is approximately 1.33 km^2. Total estimated value of the AFA is equal to Rs. 509.124 lakhs. The projected life span of Athirappily-Vazhachal is 38 years from 2005, given the present scenario with all things remaining constant, although, there is immense potential for service sector development and private sector involvement. With an average

visitor flow of 5,30,000 per year, the rational fee price arrived at is Rs. 12/-.

The positive impacts of tourism in Athirappilly-Vazhachal measured through employment and income multipliers highlighted that labour intensive investment in tourism will ensure employment security. The economic linkages in the economy indicate higher linkages between the business and recreation sector in the study area. The tourism sustainability assessment highlights that Athirappily-Vazhachal is fast emerging as a potentially sustainable region for ecotourism development and a viable alternative to the conservation of forest and enhancing the standard of living of the dependent communities.

The strategies for sustainable tourism in Athirappilly-Vazhachal recreation sites focus on the Pro-Poor Tourism strategy as laid down in second World Earth Summit on Sustainable Tourism (2002) giving due weightage the to economic benefits, non-economic benefits and policy reform in the area with special reference to the poor. The study further recommends a site-specific programme, 'One Tourist-One Rupee-Ten trees Program', towards action plan for ensuring environmental and economic security in the ecotourism-based economy.

Demonstration of mass production, formulation and application of a baculovirus for management of the teak defoliator, *Hyblaea puera.* *KFRI Research Report No. 290* (Sudhee-ndrakumar, V.V., Varma, R.V. and Sajeev, T.V., 2007)

The study addressed mass production of HpNPV and field-testing of an effective virus formulation. One of the preliminary actions in the project was the establishment of a laboratory for HpNPV mass production. The laboratory design incorpo-rated the concept of spatial separation of experi-ment and HpNPV production space. Separate routes of entry for field collected and laboratory reared larvae were provided. In connection with refining the method for rearing the host insect (*H. puera*), a novel insect rearing tube with a detachable diet cup was designed and evaluated.

In standardizing the mass production, virus productivity was quantified with reference to different larval instars, dosage, incubation period and temperature. Of the three larval stages, *i.e.,* third, fourth and fifth instars studied, the maximum POB yield per unit diet (3.3 x 10^9 POBs) was obtained from fourth instar larvae dosed at 10^5 POBs per larva and incubated for a period of 72 h p.i. The harvestable larvae obtained were as high as 98%. The temperature turned out to be one of the major factors determining the productivity of the virus. The maximum POB yield was registered at the dosage 1 x 10^5 POBs per larva and the temperature 25 ± 2 °C.

The method of inoculation played an important role in virus mass production. Upon considering the yield/larva from both sources, the cost of HpNPV required for spraying in one hectare at the rate of 1.63 x 10^{11} POBs worked out to be Rs. 279/- and Rs. 317/- in the case of LR and FC respectively. A marginal difference in the virus yield was found affecting the cost of the virus produced. Seven formulations were developed and tested, of which six were with additives.

Regarding ultraviolet stability, the unformulated HpNPV retained the original activity of 37.8 % after exposure to sunlight for a period of 9 hours. The study indicated that formulation increased the viability of HpNPV under natural sunlight by 2.34 folds. It was also possible to deduce that the WP-FD formulation was more stable to different periods of exposure than the rest of the formu-lations. Out of the seven formulations developed, WP-FD was field-

tested, the performance of which was as good as or even better than the unformulated HpNPV.

The study also gave an opportunity to understand genetic variation within HpNPV population. Eight HpNPV isolates could be characterized using Restriction Endonuclease analysis wherein Hind *III* was used as the restriction enzyme. The estimated molecular weights of the genome of HpNPV isolates ranged from 79.37 kbp to 112.14 kbp.

Bamboo sector in Kerala: baseline data gener-ation for developing an action plan. *KFRI Research Report No. 291* (Muraleedharan, P.K., Anitha, V., Krishnankutty, C.N., Gnana-haran, R., Vijayakumaran Nair, P., Sankar, S. and Seetha-lakshmi, K.K., 2006).

The basic information on bamboo sector in the State is inadequate. The study has generated baseline data relating to resources, consumption pattern, socio-economic and livelihood conditions of the bamboo dependents, marketing, techno-logy and product development.

The study has used both primary and secondary data. The total standing crop of bamboo in homesteads in Kerala is estimated as 13.61 million culms and its green weight is 0.331 million tonnes. There are six species of bamboo available in homesteads including reed of which *Bambusa bambos* is the dominant species, accounting for 96 per cent. This is followed by *B. vulgaris* and reed, constituting 2.23 per cent and 1.38 per cent respectively. There has also been a reduction in growing stock in homesteads from 0.408 million tonnes during 1987-88 to 0.331 million tonnes during 2004-05. Based on 1997 imagery, bamboo resource in forest areas was estimated as 2.63 million. The total consumption of bamboo and reed in the State is estimated as 0.256 million tonnes. The per capita income of the artisans is estimated as less than Rs. 6,000 which is significantly lower than that of the State average (Rs. 24,053) and thus they live below the poverty line. The traditional bamboo based industry, which was an important source of employment to Marginalized Bamboo Dependents (MBDs), is now on a decline.

Bamboo is sold through primary and wholesale depots in Kerala. There are 95 primary depots located in various districts catering to the local requirements, whereas the 35 wholesale depots located in Palakkad District fulfill the demand mostly from the neighboring State of Tamil Nadu. Of the total quantity of 74,000 metric tones, green weight of bamboo marketed through the depots in Kerala during 2004-05, primary depots account for 48% and wholesale depots, the remaining 52%. It is evident that quantity of bamboo exported to Tamil Nadu has been declining considerably.

The main problems in bamboo handicraft/ furniture sector are: lack of adequate raw materials, low level of adoption of improved technology, low investment, inadequate marketing facilities, etc. There is scope for using improved technology in handicraft sector without affecting employment. The study upholds the view that a holistic approach is required for overall development of the bamboo sector in the State and this requires formulation of a bamboo policy and proper planning.

Ethno-zoological studies on the tribals of Palaghat and Malappuram Districts of Kerala. *KFRI Research Report No. 292* (Padmanabhan, P. 2006).

In Kerala, there are about 3 lakhs of tribals, who continue to use various wild and domesticated animals and plants for food, drugs, customs, game and religious purposes. Ten tribal groups in Palaghat and six groups in

A Kadar tribal group

Euphlyetis hexadactylis (Indian green frog)

Malappuram were subjected for the study. They hunt the animals for food out of bare necessity without tilting the balance of the ecosystem. The tribals are hardly selective in their animal food except for those connected with religious customs, folklore and myths and this varies widely from one community to another. On the other hand, some of the common animals like wild boar, chital, sambar, cow, tortoise, frog, crab, prawn, insects, mollusks, etc. are in great demand. As regards the use of animals drugs, there are remarkably similar practices among the tribals depending on the availability of specific animals around their habitats. This indicates indirectly the authenticity of usage of such drugs that evolved through ages in the health care systems of the tribals. About 108 species of animals form the vital source of tribal medicine. Of these, 16 species are invertebrates like insects, crustaceans, arachnids, mollusks, etc. and 60 species are vertebrates, which include six Pisces, one amphibian, five reptiles, 16 aves and 29 mammals. The diseases cured with the help of animal drugs include tuberculosis, rheumatic and joint pain, asthma, piles, pneumonia, night blindness, impotency, paralysis, weakness, cholera, body ache, etc. Different body parts of various animals are widely used by tribals for a variety of domestic purposes.

Status, distribution, food and feeding of Malabar Spiny Dormouse (*Platacanthomys lasiurus* Blyth) in the Western Ghats of Kerala. KFRI *Research Report No. 293* (Jayson, E.A., 2006).

An investigation was conducted to determine the status, distribution, food and feeding of Malabar Spiny Dormouse (*Platacanthomys lasiurus*), in Kerala. The species was recorded from 10 protected areas in Kerala and from 21 Forest Ranges. It was newly recorded from nine protected areas namely Neyyar, Periyar Tiger Reserve, Thattekkad, Idukki, Chinnar, Eravikulam, Chimmony, Parambikulam and Aralam Wildlife Sanctuaries. The density of the species was found extremely low in the protected areas. Intensive studies on the species were conducted in the Peppara Wildlife Sanctuary, Thiruvananthapuram District. Twenty-three nests were located in the study area at Peppara Wildlife Sanctuary.

The Dormouse is completely arboreal. The home range of the species is about 5 ha and home range of the colonies overlaps. The

animal depends on 25 species of plants for food. The more common food plants are *Terminalia bellirica, Persea macrantha*, *Hydnocarpus pentandra, Tamarindus indica, Bombax ceiba* and *Schumanianthus virgatus*. Its favourite food items include *Piper*, *Theobroma cacao* and *Anacardium occidentale*. Sexual dimorphism exists in the anti-predator behaviour and females are bolder than males. Two distance-dependent foraging movements are observed; less than 30 m from the nest and more than 30 m. Females display long feeding bouts during foraging movements. The feeding range of the species is about 1 km. The animal spends short periods at a point when the foraging is within 35 m from the nest. But when long periods are utilized for foraging,

Malabar spiny dormouse

they intermittently change the feeding points or move to areas with thick canopy. Only the males carry out the nest-hole maintenance. All the nests are vertical hollows opening at the bottom. The behaviour of nest-hole maintenance can be attributed to the anti-predator behaviour. *Lagerstroemia microcarpa* is the preferred nesting tree. Birds of prey and owls are the main predators recorded.

Modeling the microhabitat preference of the species indicates that it inhabits not only the evergreen forests but also the riverine patches of the moist deciduous forests. The animal is highly selective in choosing the nesting site. Preference for canopy cover is an antipredator strategy. GIS modeling showed that the Dormouse preferred the riparian forest at Peppara Wildlife Sanctuary. The species is being used in tribal medicine, for preparing drugs for the cure of acute asthma, and the practice is detrimental to its survival.

2. Extension/Consultancy Projects

Conservation and afforestation of the Kottuli Wetland, Kozhikode. *KFRI Extension Report No. 89*. (Swarupanandan, K., Pandalai, R.C. and Menon, A.R.R., 2006).

The Kottuli wetland is a 103 ha (262-acre) aquatic landscape situated within the city limits of Kozhikode and its suburbs, inundated by seawater through Canolly canal. It is a natural habitat for estuarine flora and fauna including migrant birds and a few endangered animals. Of the 103 ha of the wetland, 65 ha are in private possession and 39 ha, Government-owned. Despite the fact that the Kottuli wetland provides a variety of enviro-nmental services to the entire public, encroachment of the wetland is very active there. Recently, traders have targeted this environmentally fragile ecosystem for tourism resorts and water theme park.

The multi-disciplinary conservation plan proposed for the wetland by CWRDM has been approved and financed by the Ministry of Environment and Forests. An important component of the conservation programme is mangrove affore-station. The plants currently

growing in the wetland are characteristic of the mangroves; therefore, the area is suitable for afforestation with mangroves. A list of suitable mangrove species and strategies for affore-

Typical landscape of Kottuli wetland

Investigation team

station are given in the report. In the recent past, the extent of saltwater incursion to the Kottuli wetland has been limited due to obliteration of its connectivity to the Canolly Canal. Maintenance of the Canolly Canal and creating a number of culverts in specified locations across the canal bund would facilitate growth of mangroves.

The ownership of 39 ha of the wetland is now vested with the Kerala Water Authority. Unfortunately, it did not implement any wastewater management programme there; instead, it reclaimed a portion of the land, thus limiting the seawater incursion to the wetland. The Water Authority does not have any ongoing programme or any permanent structure there. The Kerala Forest Department has established a temporary aid-post there recently.

The Kottuli wetland is right in the heart of the Kozhikode Corporation and it is best suited for establishing a Mangrove Information-cum-Study Centre. By virtue of the environmental expertise and the experience in mangrove afforestation, the Kerala Forest Department is the most suitable agency that can establish and sustain the Study Centre. Ownership transfer of the Government-owned wetland to the Forest Department would facilitate the effective implementation of the venture.

Mangrove afforestation in five areas of reclaimed backwater along the proposed Vallarpadam-Cheranellor Link Road, Kochi. *KFRI Consultancy Report No. 105* (Swarupanandan, K., Pandalai, R.C., Menon, A.R.R., Chacko, K.C. and Sharma, J.K., 2006).

A high-speed road has been proposed for connecting the International Container Transhipment Terminal (ICTT), Kochi and the National Highways NH17 and NH47 - the Vallarpadam-Cheranellur Link Road (the Link Road). As per the request of the National Highway Authority of India (NHAI), KFRI prepared a plan for mangrove afforestation in an area of 3.5 ha. of reclaimed backwater, in compensation to the natural mangrove patches that would be lost during the construction of the Link Road. The study recommends that the species for affore-station should be selected from the mangroves of Kochi. The species suggested are *Rhizophora mucronata, Avicennia officinalis, A. marina, Bruguiera cylindrica, B. gymnorhiza, Sonneratia caseolaris, Kandelia candel,* etc. A mangrove nursery has to be raised in or around the afforestation sites, to produce the required planting stock. The afforestation sites have to be provided with at least two sluice culverts in order to maintain the regular inundation of brackish water required for the growth of mangroves. The identified back-

Vallarpadam backwaters

Investigation team on visit

water areas adjoining the proposed road should be reclaimed by filling before planting. One-year-old seedlings are ideal for planting and a spacing of 1.5 x 1.5 m is suggested. Causality replacements will be carried out in the second and third year to ensure total stocking. The afforested sites will be protected against human and animal interference through fencing and regular watch and ward. Targeted awareness programmes are to be extended focusing the households in the neighbourhood of the afforestation sites. The sanitation facilities and the solid waste disposal in the neighbourhood have to be managed for bringing about the congenial environment required for the successful mangrove afforestation. The NHAI may facilitate the afforestation work and monitor the progress through annual reviews and interaction with the implementing agency. A consolidated final report of the afforestation work may be brought out for the use of NHAI and other agencies.

Biodiversity of Thrissur District, Kerala State. *KFRI Extension Report No. 20* (Nair, K.K.N., Ansari, R., Ramachandran, K.K., Jigi K. Joseph, Francis Xavier, Rajasekaran, R. and Neelakandan, V.N., 2007).

Thrissur District covers an area of about 3030 km^2, extending from seashore to an altitude of approximately 1420 m asl, in the Western Ghats of India. The District represents all the three physiographic zones of the State, namely the lowlands, midlands and the highlands. Kole wetlands, mangroves and the forest ecosystems represented by moist deciduous, semi-evergreen, evergreen and southern montane wet temperate forests and the grasslands are the major chara-cteristic habitats of biodiversity in the District.

In this documentation of biodiversity, available data were gathered from various sources including floras and faunas, scientific papers, research reports, doctoral theses, livestock registers, records of various departments, handbooks, and so on. Primary data were also generated to a limited extent, especially with regard to distribution of species, conservation status, traditional and indigenous knowledge, etc. Accordingly, 3,003 taxa of plants and 2,672 taxa of animals are reported from the District with up-to-date nomenclature, synonyms, local names, habit, habitat, conservation status, indigenous/traditional knowledge, uses, etc., wherever available, along with basic references pertaining to the datasheet of each taxon.

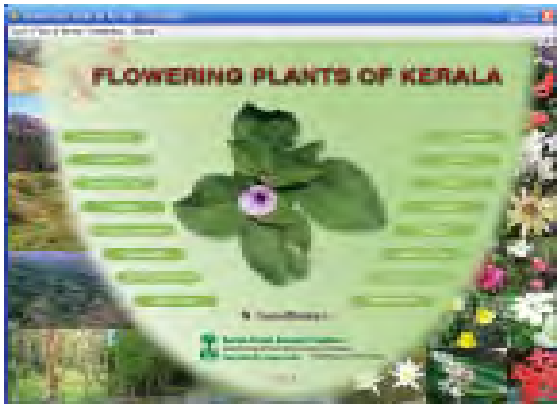
The data sheets designed for organizing the dynamic database included taxonomic, environmental and administrative modules with

their ramifications, which can be improved further based on more data inputs. For more than 60 per cent of the species included in the database, photographs are also provided, either taken during the study or as downloaded from the Internet. Combined map outputs for total biodiversity, animal diversity and plant diversity separately and various other aspects of the District like Grama Panchayats, Block Panchayats, Forests Divisions, Forest Ranges, bioclimate, landuse pattern, river basins, soil, geology, land form, altitude, and so on. The map outputs of one indigenous plant species (*Vateria indica* L.) and one wild animal species (*Elephas maximus* L.) on various types of map outputs mentioned, are also provided as examples, and similar map outputs can be generated for all the plants and animals included in this documentation. Data deficiencies, mainly with regard to species locations within the District, traditional knowledge, conservation status, etc. need to be addressed in detail during the preparation of People's Biodiversity Register (PBR).

Checklist of flowering plants of Kerala. *KFRI CD No. 6*. (Sasidharan, N., 2006).

The CD contains brief write-ups on location and phytogeography of the State including geology and soil, climate, characteristic features and typical species of vegetation types, important agricultural and horticultural crops. The correct name of the species with author citation and literature is followed by basionyms and synonyms, if any. Reference to Flora of British India and Flora of the Presidency of Madras are cited along with relevant monographs and revisions. The habit, habitat, status, geographical distribution, district-wise distribution (map) and images of species are also included in the CD.

There are 4,801 taxa in the checklist which include 619 exotics introduced as well as naturalized. There are 940 taxa recorded from Kerala after the publication of the Flora of the Presidency of Madras of which 327 are new and 613, new records of occurrence. The checklist includes 483 taxa belonging to the Red Listed Category. Nomenclatural changes of 1,259 species in the Flora of the Presidency of Madras have been incorporated. There are 5,150 colour photographs of 2,225 species belonging to endemic, red listed as well as interesting plants. There are 10,822 botanical names (4,801 valid names + 6,021 basionym/synonym) and 5,915 common/local names. There is search facility in the CD with family-wise, genus-wise, habit-wise, habitat-wise, locality-wise and common name-wise quick search.



ONGOING PROJECTS

Taxonomy of microlepidoptera

Investigator(s): George Mathew

Objectives

- Survey, collection, identification of micro-lepidoptera of southern India
- Maintain collections and a taxonomic data bank
- Prepare an identification manual
- Train college teachers, students and local communities in parataxonomy

Date of Commencement : 2000 April
Date of Completion : 2007 March
Budget : Rs. 12.71 lakhs
Sponsoring Agency : Ministry of Environment and Forests, Govt. of India

Insect specimen maintained in the databank

Altogether, 79 species of Microheterocera belo-nging to the families Psychidae, Pyralidae, Tortricidae, Tineidae (Tineoidae), Oecophoridae, Ethmiidae, Lecithoceridae, Gelechiidae, Blasto-basidae, Cosmopterigidae (Gelechioidea), Plutellidae, Yponomeutidae, Lyonetiidae, Glyphipterigidae and Heliodinidae (Yponomeutoidea) have been recorded. A major share of moths collected in the study belonged to Gele-chiidae, Tineidae, Oecophoridae and Cosmop-terigidae. The faunal elements were interesting in that they contained several new records for the region: six species were new records for Kerala; 45 species, new records for Southern India; two species were new records for India and three species, new to science. Studies on the morpho-logy of various species with special reference to head appendages, wings and external genitalia have shown that characteristics of the labial palpi, wing venation and parts of external genitalia such as uncus, saccus, gnathos, juxta, tegumen of the male as well as corpus bursae, ductus bursae and signum of the female have diagnostic value in species identification. A comparison of taxa based on genitalial morphology was also made.

Taxonomy of palms

Investigator(s): Renuka, C.

Objectives

- To survey and prepare quantitative inventory of palms in Western Ghats, North-

eastern India and Andaman and Nicobar Islands.

- To study the distribution pattern, identify the most threatened palms and to develop conservation programmes for their sustai-nability.
- To prepare a handbook for general public interest (a) Field Key for the Identification of Palms of India, (b) A Handbook on Palms of India
- To establish a Palmetum in three regions namely, Kerala, Arunachal Pradesh and Port Blair (Andamans)
- To study the reproductive biology of selected palm species
- To develop a database for palms of India

Date of Commencement : 2000 May
Date of Completion : 2007 April
Budget : Rs. 25.00 lakhs
Sponsoring Agency : Ministry of Environment and Forests, Govt. of India

The Herbarium and Botanical garden at BSI, Kolkota and the Herbarium of BSI, Coimbatore were visited. The palm collections were studied and necessary photographs to be included in the database were taken. Population ecological studies showed that conservation efforts should be concentrated on the seedling as well as on the juvenile stages. The population of *C. vattayila* is decreasing and the conservation efforts should be made to protect the juvenile as well as the adult palms. A field identification key on Indian palms was prepared. The live collection consists of about 50 indigenous palms. Study classes on palm taxonomy were conducted for college teachers during their UGC refresher courses in Kerala, Tamil Nadu and Karnataka.

Micropropagation of three selected species of bamboo

Investigator(s): Muralidharan, E.M., Pandalai, R.C.

Objectives

- To develop efficient tissue culture procedures for mass clonal propagation of three species ozf bamboo, viz., *Bambusa tulda, Dendrocalamus brandisii* and *Thyrsostachys oliveri* using material collected from mature field growing clumps

Date of Commencement : 2003 April
Date of Completion : 2007 March
Budget : Rs. 11.12 lakhs
Sponsoring Agency : KFRI Plan Grants

Protocol was developed for regeneration of *B. tulda* from adult field growing clumps through proliferation of axillary buds. For *D. brandisii,* plantlet regeneration through somatic embryo-genesis was achieved. High shoot multiplication rates were achieved in shoot cultures of *D. brandisii* and *T. oliveri.* Shoot cultures could be maintained successfully in polypropylene bags. *Ex vitro* rooting in *B. tulda* was not satisfactory. Poor rooting of shoots was found in *D. brandisii* and *T. oliveri.*

Standardization of nursery and plantation techniques of mahogany with particular reference to soil, nutrition and shoot borer incidence

Investigator(s): Thomas P. Thomas, Mohanadas, K., Rugmini, P.

Objectives

- To conduct manurial trials in pots, root trainers and nursery beds to get tall healthy seedlings.
- To standardize management practices (spacing, shade and manuring regimes)

that can boost biomass production as well as reduce shoot borer incidence.

- To identify the comparative resistance of the two species of mahogany, namely, *Swietenia macrophylla* King and *S. mahogany* (L.) Jacq. to the shoot borer attack and to conduct provenance trial of *S. macrophylla* against *Hypsipyla robusta.*

Date of Commencement : 2003 April
Date of Completion : 2008 March
Budget : Rs. 13.29 lakhs
Sponsoring Agency : KFRI Plan Grants

Experimental plantation of mahogany at Palappilly

Measurements of growth were made in the 2 ha trial plots of *Swietenia macrophylla* established at FRC, Palappilly in 2003. Periodic observations on shoot borer incidence were recorded. Additional plots laid out in 2004 with *S. macrophylla* and *S. mahogany* in about 4 ha were also maintained and monitored for growth as well as for comparative resistance of these species to shoot borers.

Mass production of HpNPV, a biopesticide for teak defoliator management

Investigator(s): Sudheendrakumar, V.V., Varma, R.V., Sajeev, T.V.

Objectives

- To mass produce the baculovirus, HpNPV as a biopesticide for use in teak nurseries and plantations
- To evaluate the acceptance and commercial viability of HpNPV biopesticide

Date of Commencement: 2003 April
Date of Completion : 2006 March
Budget : Rs. 10.05 lakhs
Sponsoring Agency : KFRI Plan Grants

The methodology for mass production of HpNPV was developed and standardised. Trai-ning programmes were conducted to demonstrate the technology for management of the teak defoliator. In a joint demonstration programme with Forest Department, HpNPV was applied in infested teak plantations in Nilambur and the effectiveness of the biocide was evaluated.

Demonstrating the effect of controlling the teak defoliator on volume increment in teak in the permanent plots established at Nilambur

Investigator(s): Varma, R.V., Sudheendrakumar, V.V.

Objectives

- To generate data to ascertain the age up which teak plantation should be protected against the teak defoliator
- To serve as a permanent demonstration plot to show the forest managers/ students / policy makers / farmers, the impact of protecting teak against teak defoliator on growth increment

Date of Commencement : 2003 April
Date of Completion : 2007 March
Budget : Rs.2.40 lakhs
Sponsoring Agency : KFRI Plan Grants

Measurement of height and diameter of trees in protected and unprotected plots were recorded. The protected trees had put forth 59% additional volume increment than the unprotected trees.

Productivity and growth studies on sympodial bamboos and establishment of a monopodial Bambusetum

Investigator(s): Pandalai, R.C., Rugmini, P.

Objectives

- Culm productivity and growth assessment
- Maintenance of bambusetum at F.R.C., Veluppadam.
- Setting up and management of a monopodial bambusetum at Devikolam
- Establishment of a bamboo collection in the Institute campus

Healthy growth of bamboo clumps in bambusetum at FRC, Palappilly

Date of Commencement: 2003 April
Date of Completion : 2007 March
Budget : Rs. 17.89 lakhs
Sponsoring Agency : KFRI Plan Grants

The bambusetum at FRC, Velupadam was maintained with periodic weeding. Periodic growth measurements were also made. Although permission from the Forest Department was obtained for establishing a monopodial bambu-setum at Devikulam, planting work could not be initiated since the Department is yet to harvest the eucalypts from the plot. The nine bamboo species planted in the Peechi campus are surviving and have started producing fresh culms and are growing well in the nursery.

Establishment of an arboretum of rare and characteristic species of the moist deciduous forests of Kerala

Investigator(s): Nair, K.K.N., Yesodharan, K., Unni, K.K.

Objectives

- To collect propagules of about 100 characteristic and rare tree species of the moist deciduous forests of Kerala from different parts of the State and establish nursery to raise about 5000 seedlings, along with collection of preliminary data on fruits, seeds and nursery practices.
- To outplant the seedlings and establish the Arboretum with a suitable planting design based on available gaps and ecological requirements of various species, and to generate data on the survival and growth of the field planted seedlings.
- To prepare name boards, sign boards, plot charts, etc. for the existing and newly planted tree species in the Arboretum.
- To record phenological details (flowering, fruiting, flushing, etc.), growth, natural regeneration, etc. of tree species maintained in the Arboretum.
- To prepare an illustrated Handbook of the tree species in the Arboretum.

Seedlings planted in the arboretum

Date of Commencement: 2003 April
Date of Completion : 2007 March
Budget : Rs.22.21 lakhs
Sponsoring Agency : KFRI Plan Grants

The 5 ha arboretum plot in the Peechi Campus was grided at 25x25 m and locations of all existing trees were identified, labelled and marked. The positions of all the existing trees in the plot were marked in the grids and gaps for planting were identified. More than 10,000 seeds of about 150 species were collected and their seed data were gathered. The nursery was established at KFRI Field Research Station at Velupadam where more than 5,000 seedlings were generated and maintained. A total of 2,714 seedlings were planted in the plot at 4m spacing. The survival and growth of seedlings were recorded. At present the total holding of the Arboretum is 3569 accessions of 170 species belonging to 122 genera and 46 families. An addition of 137 species was made to the species holding during the project period. All the existing trees and planted seedlings in the Arboretum were provided with permanent boards containing details like species and family names, local names, source locality, date of planting and accession numbers. A computerized database of the Arboretum was developed with details of existing and planted species available, and their exact location details with in all the eighty 25x25 m quadrats.

Growth and yield studies in species trial plots established by KFRI

Investigators: Chandrashekara, U.M., Nandakumar, U.N.

Objectives

- To monitor survival, growth and yield of different species established as trial plots by KFRI and assess their suitability to planting programmes.
- To maintain the trial plots in good condition.

Date of Commencement: 2003 April
Date of Completion : 2007 March
Budget : Rs.11.87 lakhs
Sponsoring Agency : KFRI Plan Grants

KFRI has established trial plots of several tree species in different parts of Kerala. These can be broadly divided into two types namely, trial plots of individual species and those of multi-species. Trees of each species were monitored

for the tree height and girth and tree crown width and height. Collected data have been processed. In the KFRI Sub centre, experiments to study annual litter production and litter decomposition patterns were completed. A comparative study on the unders-torey biomass distribution in different tree species trial plots is in progress.

Development of conservation strategies for selected, endangered rattan species of the Western Ghats

Investigator(s): Renuka, C., Rugmini, P.

Objectives

- To study the population dynamics of two selected endangered species of rattans of the Western Ghats
- To study their reproductive biology and to come up with suitable conservation strategies

Calamus brandisii

Date of Commencement: 2003 April
Date of Completion : 2007 March
Budget : Rs. 5.22 lakhs
Sponsoring Agency : KFRI Plan Grants

Two endangered rattan species of W. Ghats, *Calamus travancoricus* and *C. brandisii* were selected for the studies. The demographic studies showed that there was an annual decrease of nine percent in the population of *C. travancoricus* at Arienkavu and 61 per cent decrease in the population of *C. brandisii* at Agasthyamalai. Sensitivity and elasticity studies revealed that juveniles in *C. travancoricus* and sub adult stage in *C. brandisii* are important from conservation point of view. The adult survival rate is very low in *C. brandisii*. This along with long stage duration and low annual reproductive success is detrimental to the population.

Phytochemical characterization and evaluation of the medicinal plant Moovila for resource enhancement

Investigator(s): Sasidharan, N.

Objectives

- Qualitative and quantitative characterization of phytochemicals in *Pseudarthria viscida* and other related species.
- Study the macroscopic, microscopic chara-cters, physical constant values, extractive values, ash values, etc. of the principal drug species and its substitutes for pharmaco-gnostical parameters.
- Prepare the phytochemical profile of *Pseudarthria viscida* and other related species.
- Evaluation of the ingredients with respect to plant parts

Date of Commencement: 2003 April
Date of Completion : 2006 March
Budget : Rs.28.17 lakhs
Sponsoring Agency : KFRI Plan Grants

Analysis of antioxidant property *U. hamosa* was completed. The activity of the extracts in scavenging of free radicals was measured. Fifty percent inhibition of super oxide radical was found at concentrations of 200µg/ml with

acetone fraction. The results obtained show that *Uraria hamosa* has no significant antioxidant activity compared to *Pseudarthria viscida*. Even though the same chemical profiles were obtained in *P. viscida* and *U. hamosa*, only the former exhibited significant antioxidant properties.

Appropriate technology for production of charcoal and activated carbon from bamboo

Investigator(s): Dhamodaran, T.K., Thulasidas, P.K., Gnanaharan, R.

Objectives

- To characterize the nature of the resource by investigating their properties.
- To investigate the different methods of production of charcoal from bamboo in order to identify an appropriate method suitable for local conditions.
- To assess the yield and quality of charcoal produced from bamboo.
- To develop a suitable method for the pro-duction of activated carbon from bamboo
- To prepare a Handbook on bamboo charcoal and its potential applications.

Date of Commencement	: 2003 April
Date of Completion	: 2007 March
Budget	: Rs. 8.98 lakhs
Sponsoring Agency	: KFRI Plan Grants

The effect of the method of production and the carbonization temperature on the yield and quality (volatile matter content, ash content and fixed carbon content) of bamboo charcoal were evaluated and compared with wood charcoal from different sources. The results were tested in a commercial pilot plant. The yield and quality bamboo charcoal were comparable with that of wood charcoal. A temperature of 400° C in the self-firing system was ideal for the commercial scale production of bamboo charcoal in retorts. Bamboo charcoal had a pH of 9-10. A pilot plant for charcoal making and a fluidized bed reactor (FBR) for activation of the charcoal installed at Perambra, Kozhikode for another project was used to test the potential of bamboo for charcoal and activated carbon.

Standardization of bamboo cultivation pract-ices for homesteads of Kerala

Investigator(s): Nandakumar, U.N., Thomas P. Thomas, Unni, K.K.

Objectives

- To standardize the bamboo cultivation practices for homesteads of Kerala
- To work out cost of cultivation and rate of culm production under different site conditions, cultivation practices and mana-gement regimes.

Date of Commencement	: 2003 April
Date of Completion	: 2008 March
Budget	: Rs. 23.5 lakhs
Sponsoring Agency	: KFRI Plan Grants

Thirty species of bamboos suitable for homesteads of Kerala were identified. A cluster different 'Kudumbasree' units of Panancherry Panchayat was assigned the work of establishment of bamboo nursery for supplying planting stock to homesteads, provide assistance for bamboo planting and maintenance, harvesting and marketing of bamboo. The cluster along with its labour bank was also equipped to undertake other activities such as paddy cultivation, animal husbandry and floriculture, management of coconut gardens, rubber estates, vegetable farming, nursery and composting.

Commercial volume tables for selected home garden trees of Kerala

Investigator(s): Krishnankutty, C.N.

Objectives

- To develop commercial timber and fuel wood volume prediction equations for *Thekku, Plavu, Anjily, Matty* and *Mavu* in home gardens and thereby to prepare commercial volume tables.

Date of Commencement : 2003 April
Date of Completion : 2006 December
Budget : Rs. 7.55 lakhs
Sponsoring Agency : KFRI Plan Grants

The trees (Anjily, Matty, Mavu, Plavu and Thekku) felled in home gardens were measured and data on gbh, length and girth (under bark) of each log were recorded. For each species, data on at least 3 trees each in about 10 diameter classes were collected. Using the volume and gbh, different regression equations were fitted for each species. Based on the best prediction equations, the volume tables were prepared.

Development of bamboo sector in Kerala: Resource enhancement

Investigator(s): Seethalakshmi, K.K., Muralidharan, E.M., Sankar, S., Pandalai, R.C., Raveendran, V.P.

Objectives

- Establishment of Bamboo Multiplication Areas (BMA) in selected Panchayats
- Popularization of cultivation of bamboo in private and community lands.

Date of Commencement: 2003 April
Date of Completion : 2006 December
Budget : Rs.20.00 lakhs
Sponsoring Agency : Director of Industries and Commerce, Thiruvananthapuram

Planting stock of *Bambusa bambos*, *Ochlandra travancorica*, and *Melocanna baccifera* was distributed to four clusters of artisans. Evaluation of the performance of seedlings planted during last year was done. An experiment was initiated in coastal areas to find out suitable species for bio-shield planting.

Maintenance of provenance trial plots of eucalypts and acacia and development of new clones for establishment of Clonal Multipli-cation Area (CMA)

Investigator(s): Maria Florence, E.J., Balasundaran, M.

Objectives

- Identification of new candidate plus trees (CPTs) of *Eucalyptus tereticornis, E. camaldulensis, E. globulus, E. grandis, Acacia auricu-liformis* and *A. mangium.*
- Vegetative multiplication of the candidate plus trees of *Eucalyptus* and *Acacia* species and their evaluation for growth and disease resistance for selection of new clones
- Planting and maintenance of new clones produced in the year 2003
- Supply of new clones of *Eucalyptus* and *Acacia* species to the Kerala Forest Department for establishing clonal multiplication area and clonal plantation

Date of Commencement: 2003 August
Date of Completion : 2007 March
Budget : Rs. 7.24 lakhs
Sponsoring Agency : KFRI Plan Grants

The Kerala Forest Department was assisted in identifying new hybrid clones of *E. urophylla, E. grandis, E. tereticornis* and *E. pellitta* from among open pollinated progenies. The Department was also assisted in production of establishing clonal seed orchard for *E. tereticornis*

and *E. grandis* at Wadakkancherry. The clones were supplied and technical help was provided.

Classical biological control of *Mikania micrantha* with *Puccinia spegazzinii*

Investigator(s): Sankaran, K.V., Anitha, V.

Objectives

- To test the host specificity of *Puccinia spegazzinii* against a number of economically important plants
- To attempt biocontrol of *Mikania* using the fungus

Luxuriant growth of *Mikania micrantha*

Date of Commencement : 2003 July
Date of Completion : 2006 December
Budget : £27,715
Sponsoring Agency : Department for International Development (DFID), UK

The host specificity of the biocontrol agent, *Puccinia spegazzinii*, was tested against a number of economically important plants. It was found that the fungus was very specific to mikania and not other agricultural plants. The fungus was released in agricultural systems in Kerala and it got established on natural population of mikania and is spreading.

Water and light use characteristics of the vegetation in the different strata of a tropical moist deciduous forest

Investigator(s): Kallarackal, J., Chandrashekara, U.M.

Objectives

- To study the availability and efficiency of light usage by the lower strata seedlings in a moist deciduous forest.
- To study the water consumption of the different species of trees belonging to the three strata in a moist deciduous forest.
- To study the water use by some dominant tree species such as teak, *Terminalia, Xylia* etc. that are used in plantations and afforestation programmes.
- To study the phenological features of some of the species of trees belonging to the three strata in a moist deciduous forest.
- To evolve a model for evapotranspiration from a moist deciduous forest so that it can be used in calculations of the water balance from a catchment.

Date of Commencement: 2004 January
Date of Completion :2007 April
Budget :Rs. 19.20 lakhs
Sponsoring Agency :Ministry of Environment and Forests, Govt. of India

Observations on leaf area index, soil moisture, leaf litter area, SLA and phenology were comple-ted in nine experimental plots established at Pattakarimba in Nilambur. Sap flow was meas-ured in twelve tree species namely, *Xylia xylocarpa, Wrightia tinctoria, Stereospermum colais, Gmelina arborea, Tectona grandis, Dalbergia latifolia, Cleistanthus collinus, Sterculia guttata, Terminalia crenulata, Terminalia paniculata, Bauhinia malabarica and Dillenia*

pentagyna. The data showed much variation in water use by different species. It was found that even though some growing species such as *Gmelina*, used more water, had a good stomatal closure mechanism during times of high VPD. The leaf area index showed much seasonal variation varying from 1.5 to 4.2 during the year.

Landuse change and its impact on selected biophysical and socio-economic aspects of Karuvannur river basin in Thrissur District of Kerala

Investigator(s): Muraleedharan, P.K., Kallarackal, J., Balagopalan, M., Menon, A.R.R., Sasidharan, N., Rugmini, P.

Objectives

- To examine landuse change and its effects on eco-hydrology and socio-economic conditions of the people.
- To examine the extent of forest degradation and its effect on sediment production and water discharge rate.
- To measure the rate of surface runoff and to model a suitable land use system.

Date of Commencement : 2004 February
Date of Completion : 2007 January
Budget : Rs. 15.40 lakhs
Sponsoring Agency : Ministry of Environment and Forests, Govt. of India

This study was conducted in Manali watershed of Karuvannur river basin to examine landuse change and its effects on eco-hydrology and socio-economic conditions of the people in the area. The major focus of the study was the landuse changes, particularly conversion of forest land to agricultural land in the study area during the analysis period 1960-61 to 2004-05. In addition, it attempted to assess total economic valuation of the Peechi wetland. Proper pricing of water from the Dam to generate more funds to meet cost of supply and water resource development was also attempted.

Establishment of butterfly garden at Nilambur

Investigator(s): George Mathew, Sajeev, T.V.

Objectives

- To develop a butterfly garden and to generate conservation awareness among public and to generate revenue

Date of Commencement: 2004 January
Date of Completion : 2007 March
Budget : Rs. 5.89 lakhs
Sponsoring Agency : KFRI Plan Grants

View of butterfly garden at Nilambur

Introduction of butterfly host plants and creating suitable habitats were undertaken. Information pertaining to the life history patterns, host range and habitat associations of various butterflies was gathered. *Ixora, Citrus, Albizia, Cassia, Cinnamomum, Aristolochia* and *Mussaenda* were identified as the common larval host plants that can be introduced for attracting several butterflies found in Kerala. *Ixora, Lantana, Mussaenda*, marigold, zinnia and

Clerodendron were listed as some common nectar plants. Common mime, common rose, crimson rose, lime butterfly, blue mormon, Southern birdwing, glassy blu tiger, blue tiger, dark blue tiger, emigrants and grass yellows are some butterflies that can be easily sustained in the butterfly garden.

Development of transgenic teak resistant to lepidopteran defoliators

Investigator(s): Muralidharan, E.M., Sudheendrakumar, V.V., Sajeev, T.V.

Objectives

- To screen *Bt* strains and endotoxins against *Hyblaea puera* and other major leaf feeding pests of teak to select suitable genes for genetic transformation.
- Development of efficient protocols for genetic transformation and regeneration of transgenic plantlets from cells and tissue cultures of teak.
- To carry out assays with the transgenic plants *in vitro* or in lab and controlled green house experiments.

Date of Commencement : 2004 February
Date of Completion : 2007 January
Budget : Rs. 30.68 lakhs
Sponsoring Agency : Department of Biotechnology, Govt. of India

Bioassay on the teak defoliator - *Hyblaea* and *Eutectona* using Bt toxins was carried out with protein extracted from Cry1AC and Cry1C (Cloned in plasmid pUC19) by a 10 hr incubation. It was found that both the toxins were effective in *Hyblaea* and *Eutectona*.

Somatic embryogenesis and repetitive embryogenesis was induced in immature zygotic embryos of teak cultured on a media containing picloram and maintained through regular subcultures. Plantlet regeneration was also obtained but at a low frequency by transfer to hormone free media. Genetic transformation of the somatic embryos was attempted by cocultivation with Agroba-cterium containing Cry I Ac gene but the putative transformed embryos survived in hygromycin selection media but showed inhibition in growth and development.

Establishment of a Bioresources Nature Trail in the Kerala part of Western Gats

Investigator(s): Chandrashekara, U.M., Sasidharan, N.

Objectives

- To establish a live collection of different taxonomic groups of plants with special reference to endemic and RET species for conservation along a Bioresources Nature Trail
- To promote nature education and ecotourism
- To develop interactive information system for nature education and ecotourism to depict the diversity of bioresources in the state

Bioresources Nature Park at Nilambur

Date of Commencement: 2004 March
Date of Completion : 2007 February

Budget : Rs. 43.11 lakhs
Sponsoring Agency : Department of Biotechnology, Govt. of India

A Bioresources Nature Trail has been established with the financial assistance form the Department of Biotechnology, Government of India at the KFRI Sub Centre, Nilambur. The Bioresources Nature Park has 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. Propagules of over 700 species of plants have been collected and introduced in the thematic areas of the nature trail. The orchid house now has some rare, endemic, medicinal and commercially important orchids. The fern house contains almost 75 species of ferns. The aquatic plant area possesses different forms such as floating hydrophytes, submerged and rooted hydrophytes, emergent rooted hydrophytes, and floating leaved and rooted hydrophytes. The xerophytes and succulents garden has both outdoor landscaped rock garden and a green house to display medicinal and ornamental plants. A gymnosperm garden with five native gymno-sperm species and certain exotic species, which are of academic interest is being established in the Nature Trail. Thallophyte and bryophyte specimens are also displayed in a specially designed shade house with mist and drip irrigation facilities. In the palm garden, apart from over 40 orna-mental palm species many palms which have economic significance and ecological and cultural significance are assembled. The butterfly garden in the park has been developed by planting larval and adult host plants and subtle modification of the habitat.

Conservation of critically endangered tree *Syzygium palghatense* Gamble (Myrtaceae) of the Western Ghats of Kerala

Investigator(s): Yesodharan, K., Mohanadas, K., Chandrasekhara Pillai, P.K.

Objectives

- To assess the population status of *Syzygium palaghatense* by appropriate sampling and to identify constraints, if any, in natural regeneration.
- To study the reproductive biology of the species, i.e., flowering, pollination, seed set and germination.

Date of Commencement: 2004 April
Date of Completion : 2007 March
Budget : Rs. 2.90 lakhs
Sponsoring Agency : Planning and Economic Affairs Dept., Govt. of Kerala.

Field collection of insects during flowering period and their laboratory examination indicated the role of insects in the pollination of the species. The fungal infection in trees in the form of leaf spot disease disappeared due to fungicidal spraying. However, a severe infestation by an insect borer was noticed in most of the fruits (ripened and premature). The infestation caused by Hymen-opteran fruit boring insects resulted in failure of seed setting. A small number of propagules were produced vegetatively and also from seeds and were planted in the Arboretum and KFRI Campus.

Computerized database on Kerala forest resources and data retrieval system

Investigator(s): Sivaram, M.

Objectives

- To modify and revise an existing computerized database and information

retrieval system on forest resources of Kerala.

- To develop prediction models useful for forest resource management in the State based on statistical analysis of data.
- To host the database on a website so that specific data are made available to the real users.

Date of Commencement : 2004 April
Date of Completion : 2007 March
Budget : Rs. 3.10 lakhs
Sponsoring Agency : Planning and Economic Affairs Dept., Govt. of Kerala.

Data on different themes were gathered and a data retrieval system was developed using Visual Basic program. Further updating of the database is underway. Using the data available in the database, two major analyses were carried out.

The projection of availability of teakwood from forest plantations was undertaken under different scenarios, taking into account the factors such as age structure, rotation age, thinning and produ-ctivity. The comparison of projected availability of teakwood with the projected demand revealed that the existing level of teak plantations is potential enough to meet the future demand up to the period 2030 to 2040.

Based on the current prices of teakwood from the year 1942 to 2006, the short-term price forecasts were made using Artificial Neural Network and Auto Regressive Integrated Moving Average models. The price forecasts indicated that the export class (mid girth of 185 cm and above) and Girth Class I (150-184 cm) would fetch higher prices than the lower girth classes in the year 2007, might be due to high demand for quality teak wood.

Potential of using coir geo-textiles in a highly degraded area in the Western Ghats for improving the soil and productivity

Investigator(s): Balagopalan, M., Rugmini, P., Balan, K. (Coir Dev. Corp., Alapuzha)

Objectives

- To estimate the quantity of soils eroded and the loss in soil nutrients in degraded areas as brought about by coir geo-textiles
- To find out the changes in soil physical properties
- To evaluate the economics of using coir geo-textiles in degraded lands
- To conduct a workshop for Kerala Forest Department on the significance of using coir geo-textiles in degraded areas

Date of Commencement : 2004 April
Date of Completion : 2007 March
Budget : Rs. 4.75 lakhs
Sponsoring Agency : Planning and Economic Affairs Dept., Govt. of Kerala.

An area of 3 ha was selected at Vettukkad in the Wadakkancherry Range for planting root trainer seedlings (2.5m x 2.5m spacing) and stumps (2m x 2m spacing). Two nutrient combinations - Control and High input management (T_1 and T_2) were followed with three coir geo-textile size levels, viz., Without coir geo-textiles (A), 1 cm x 1cm size and (B) and 2 cm x 2 cm size (C). There were three replications and plots. This was done in two localities, the total number of plots being 36. Traps were placed at different places to evaluate the quantity of soil eroded. The soils in the traps were weighed and the N, P, K, Ca and Mg contents were found out. Soils were collected from different plots and characterized. Soil temperature and moisture contents were recorded at different periods. Growth

measurements were made in the case of root trainer seedlings. The height of root trainer seedlings varied from 16 to 19.8 cm. The fourth growth measurement was recorded June 2006. It was found that the growth of root trainer seedlings was better than that of stumps. The survival percentage was higher in the case of root trainer seedlings than that of stumps.

Modeling the growth of teak in relation to soil conditions in the Kerala part of Western Ghats

Investigator(s): Rugmini, P., Balagopalan, M., Jayaraman, K.

Objectives

- To evaluate the growth increment of teak stands, in the Kerala part of the Western Ghats, of different age groups belonging to different site quality classes
- To study the interrelation between the soil properties, foliage nutrient content and the growth of teak.
- To develop a model on growth of teak in relation to soil conditions and leaf nutrient status.

Date of Commencement: 2004 April
Date of Completion : 2007 March
Budget : Rs. 4.95 lakhs
Sponsoring Agency : Planning and Economic Affairs Dept., Govt. of Kerala.

Fifty-two sample plots in teak plantations distri-buted in different parts of Kerala were considered for the study. The sample plots belonged to different age, site quality and stocking classes. The plots were of size 50m x 50m except a few, which were 40m x 40m or 20m x 20m. The plots were established during 2000-2001 and re-measured during 2004. Girth at breast height (1.37 m above ground) was recorded on all the trees in the plots. Height was measured on a sub-sample of less than ten trees covering the range of diameters in each plot. Diameter increment was computed for all the 52 plots. From each of the 52 plots, soil samples were taken from pits at three depth layers, *viz*., 0-20, 20-40, 40-60 cm and leaf samples were also collected. The soils were subjected to analysis for determination of particle size separates, bulk density (BD), particle density (PD), water holding capacity (WHC), soil pH, organic carbon (OC), exchange bases (EB), exchange acidity (EA), cation exchange capacity (CEC), base saturation (BS), Total N, available P, K, Na, Ca and Mg. Leaf samples were also analyzed for N, P, K, Ca and Mg.

Two major modeling approaches, *viz*., empirical and process-based, were tried to characterize the interrelation of tree growth *vs* soil properties and tree growth *vs* nutrient status of leaves observed in the sample plots. It was proposed to study the relationship between the leaf and soil attributes through canonical correlation analysis. The different analyses are underway.

Establishment of *ex-situ* gardens of species of *Dalbergia* and monocotyledons in Bio-resources Nature Trail in the Kerala part of Western Ghats

Investigator(s): Chandrashekara, U.M., Sasidharan, N.

Objectives

- To establish a live collection of species of *Dalbergia* and monocotyledons with special reference to palms, rattan and bamboo along a Biosphere Nature Trail
- To promote nature education and ecotourism
- To develop interactive information dissemination system for nature education and

ecotourism to depict the diversity of bio-resources in land use

Date of Commencement : 2004 April
Date of Completion : 2009 March
Budget : Rs. 9.88 lakhs
Sponsoring Agency : Planning and Economic Affairs Dept., Government of Kerala

Landscaping and preparation of planting designs was done. Propagules of bamboos, reeds, cane and *Dalbergia* were collected. They were planted in pots/polybags and were maintained in the green house of KFRI Sub Centre. Establishment of palms and rattan gardens was completed.

Micropropagation of superior clones of teak for the Western Ghats of Kerala

Investigator(s): Muralidharan, E.M., Surendran, T.

Objectives

- Rapid propagation of teak clones selected for faster growth through enhanced proliferation of meristems and rooting of microshoots.
- Attempt cost reduction through innovation in the culture system and equipment.
- Develop methods for long-term storage of shoot cultures

Date of Commencement : 2004 April
Date of Completion : 2007 March
Budget : Rs. 3.88 lakhs
Sponsoring Agency : Planning and Economic Affairs Dept., Government of Kerala

Clones of superior teak from Kerala have been established in culture. The clones were raised from nodal explants collected from trees or epicormic shoots induced in greenhouse from branch cuttings. Further shoot multiplication of 5 clones (T1, T9, T10, T11 and T36) was undertaken. Clonal differences in morphology of shoots and multiplication rates observed. The T1 plantlets were planted in a small field trial plot and their growth and performances were periodically monitored.

Vegetative propagation of selected medicinal plants for enrichment of resources

Investigator(s): Surendran, T., Sasidharan, N.

Objectives

- To prepare a state of the art report on the propagation methods and techniques of the selected medicinal plants
- To standardize propagation techniques for the selected medicinal plants

Date of Commencement : 2004 April
Date of Completion : 2007 March
Budget : Rs. 5.00 lakhs
Sponsoring Agency : KFD (Social Forestry)

Successful rooting was obtained and the method standardized for *Saraca asoka, Terminalia arjuna, Oroxylum indicum, Adhatoda zeylanica, Rauvolfia serpentina, Gmelina arborea* and *Aegle marmelos*. Rhizome splitting as a successful propagation method was tried in *Gloriosa superba* and *Asperagus recemoses*. The project is being continued.

The raw drug requirement of Ayurvedic medicine manufacturing industry in Kerala

Investigator(s): Sasidharan, N., Muraleedharan, P.K.

Objectives

- To assess the raw drug requirement of the Ayurvedic medicine industry in Kerala

- To find out the sources of supply and the respective quantity
- To study the marketing and trade of medicinal plants

Date of Commencement : 2004 April
Date of Completion : 2007 March
Budget : Rs. 3.50 lakhs
Sponsoring Agency : State Medicinal Plants Board, Govt. of Kerala

A list of licensed Ayurvedic medicine manufacturing units in Kerala was obtained. Based on the annual turnover, the medicine manufacturing units were divided into small (below one crore), medium (between 1 to 3 crores) and large (above 3 crores). The data was analysed to find out the annual consumption of the various raw drugs used in the manufacture of ayurvedic medicines in Kerala. District-wise analysis on the consumption of raw drugs reveals that Thrissur and Malappuram are the dominant. *Kurumthotti, Nellikka, Kadukka, Sathavari, Kattarvazha, Amruthu, Chukku, Kayyunni, Thathiri* and *Cheruvazhuthina* are the most heavily consumed raw drugs.

Development of equipment suitable for low cost micropropagation

Investigator(s): Muralidharan, E.M.

Objectives

- To develop simple, low cost equipment for micropropagation

Date of Commencement : 2004 April
Date of Completion : 2006 March
Budget : Rs. 1.28 lakhs
Sponsoring Agency : KFRI Plan Grants

Polypropylene bags were successfully tested as inexpensive culture containers for micropropagation of bamboo and teak. Different container shapes and sizes were found to be effective. Venting devices using various materials were

Bamboo shoot culture in polypropylene bag

tested for culture vessels and two layers of surgical paper tape were found to be effective in the case of rigid plastic containers. Shoot cultures of teak and bamboo were tested

Low cost tissue culture rack

successfully using these devices. An improved design of tissue culture rack was tested successfully. This design permitted considerable savings in cost of lighting. LED lamps commonly available commercially were found to be unsuitable for lighting for cultures due to the low intensity of light produced. Further

experiments with the new generation bright LEDs need to be carried out.

Improvement of teak through genetic evaluation

Investigator(s): Indira, E.P.

Objectives

- To maintain the progeny trial plot at Nilambur
- To establish another progeny trial plot (multi locational trial) to have an early genetic evaluation

Date of Commencement: 2004 April
Date of Completion : 2007 March
Budget : Rs. 6.25 lakhs
Sponsoring Agency : KFRI Plan Grants

The progeny trial plot raised at Nilambur was maintained. Growth measurements were made.

Growth of field planted teak clones at Karulai

Investigator(s): Surendran, T.

Objectives

- To study growth and field performance of rooted ramets of plus trees of teak planted at Kalkulam, Karulai.
- Maintenance of the clonal garden at Kalkulam

Date of Commencement: 2004 April
Date of Completion : 2007 March
Budget : Rs. 3.00 lakhs
Sponsoring Agency : KFRI Plan Grants

Periodic observations were made on growth of planted ramets and data recorded. Weeding and other input operations required were carried out as and when necessary. The project is being continued.

Enriching of live collections of wild orchids and ferns of Kerala and preparation of an illustrated manual

Investigator(s): Muktesh Kumar, M.S.

Objectives

- To set up a Fern/orchid house at KFRI campus to facilitate education of the public.
- To maintain rare, endangered and endemic pteridophytes/orchids in live condition by reintroduction of these plants from their original locality.
- Preparation of an illustrated manual

Orchid house

Date of Commencement: 2004 April
Date of Completion : 2007 March
Budget : Rs. 6.67 lakhs
Sponsoring Agency : KFRI Plan Grants

Fresh collections of ferns particularly epiphytic species were added to the fern house collections. Seventy species of useful pteridophytes of Kerala were selected and the details of all the species were compiled for the preparation of the manual. Some of the Fern house collections were transferred to the Nature Study Centre, at Nilambur. Steps were initiated for the repair work of Orchid/Fern House.

Enrichment of insect and microbial culture collections at KFRI

Investigator(s): George Mathew, Mohanan, C.

Objectives

- To index the identified species and to prepare a list of identified species for easy information retrieval.
- *Ex-situ* conservation of microbial culture collections especially the fungal cultures and to prepare a compendium of identified species

Date of Commencement: 2004 April
Date of Completion : 2007 March
Budget : Rs. 6.00 lakhs
Sponsoring Agency : KFRI Plan Grants

Inventory of insects recorded from Kerala was prepared listing 4200 species. Number of insects in the KFRI Insect collection was 13,000. Identified species were 1,742. Work on preparation of a database of identified species in the collection is in progress.

Habitat enrichment in the butterfly garden at KFRI campus, Peechi

Investigator(s): George Mathew

View of the butterfly garden at KFRI, Peechi

Objectives

- To maintain the butterfly garden at Peechi campus and to introduce new themes to make it more attractive to the visitors

Date of Commencement : 2004 April
Date of Completion : 2007 March
Budget : Rs. 3.00 lakhs
Sponsoring Agency : KFRI Plan Grants.

Additional host plants were planted and maintained in the garden. Information boards were also set up. Several batches of school and college students visited the butterfly garden.

Strengthening and computerisation of KFRI Herbarium

Investigator(s): Yesodharan, K., Nair, K.K.N.

Objectives

- To computerize the herbarium with more than 25,000 plant specimens of about

Areca triandra planted in the palmatum

  2000 species along with their respective data sheets and images.
- To develop a search facility so that data and images can easily be retrieved

Date of Commencement: 2004 April
Date of Completion : 2007 March

Budget : Rs. 3.72 lakhs
Sponsoring Agency : KFRI Plan Grants

Specimen details were recorded in the Herbarium label of 1885 specimens and all the 1885 species were included in to the Delta software. A standard format of 33 characters was prepared and data of 410 species were gathered and included into the Delta software.

Strengthening and enriching the Palmetum

Investigator(s): Renuka, C.

Objectives

- To strengthen and enrich the existing Palmetum

Date of Commencement : 2004 April
Date of Completion : 2007 March
Budget : Rs. 9.00 lakhs
Sponsoring Agency : KFRI Plan Grants

More species were added to the Palmetum and maintenance operations were regularly undertaken. At present about 50 indigenous and 35 exotic species are available in the Palmetum. Some palms have started flowering.

Strengthening medicinal plants garden in the Peechi campus

Investigator(s): Sasidharan, N.

Objectives

- Enriching the existing collection of medicinal plants in the garden
- Preparation of a handbook on the medicinal plants in the medicinal plants garden

Date of Commencement : 2004 April
Date of Completion : 2007 March
Budget : Rs. 7.26 lakhs
Sponsoring Agency : KFRI Plan Grants

Medicinal plants in the Garden were further enriched by adding plants such as *Salacia beddomei, Zingiber macrostachya, Ixora sp. Ophiorrhiza mungos*, *Crotalaria laburnifolia, Hibiscus sabdariffa, Abelmoschus moschatus,* etc. were introduced. Details of medicinal properties and uses of 125 more species in the medicinal plant garden were compliled.

Ecology and behavior of arboreal mammals of Nelliampathy forests

Investigator(s): Ramachandran, K.K.

Objectives

- To assess the distribution of the arboreal mammals in Nelliampathy forests
- To study the population structure of the arboreal mammals
- To study the food habits of the arboreal mammals
- To study the behaviour of selected arboreal mammals

Date of Commencement: 2004 April
Date of Completion : 2007 March
Budget : Rs. 8.04 lakhs
Sponsoring Agency : KFRI Plan Grants

A total of 11 arboreal mammals were recorded from the evergreen forests of the Nelliampathies. The Malabar slender loris *Loris lydekkerianus malabaricus* and the Malabar spiny dormouse *Platocanthomys lasiurus* were recorded for the first time from the study area. A total number of 13 lion-tailed macaque (LTM) troops with around 200 individuals were sighted. LTM troop sizes ranged from 4 to 39 individuals with an average of 15.5. Twenty-three Nilgiri langur troops with a total of about 150 individuals were recorded and their distribution marked in the map. The troop sizes of Nilgiri langur ranged from 3 to 12 with a mean group size of 7 individuals. Density of the major arboreal mammals is being worked out.

A handbook of lesser known timbers

Investigator(s): Bhat, K.M., Thulasidas, P.K., Hussain, K.H.

Objectives

- To collate technical information and/or investigate properties and uses of lesser-known timbers of Indian market including the farm /agro forestry and imported species.
- To prepare user friendly handbook and CD-ROMs with coloured illustrations as ready sources of reference for timber processors, traders and users.

Date of Commencement: 2004 April
Date of Completion : 2007 March
Budget : Rs. 4.35 lakhs
Sponsoring Agency : KFRI Plan Grants

Draft was prepared for editorial scrutiny, on a total of 77 lesser known timbers including the imported species. After incorporating appropriate changes suggested by the Editorial Committee, the draft was finalized and the printing work was initiated. The handbook is expected to be ready by March 2008.

Participatory Forest Management and ecodevelopment alternatives: Initiatives and challenges in Kerala

Investigator(s): Mammen Chundamannil, Hussain, K.H., Unnikrishnan, P.N. (KFD)

Objectives

- To develop a framework for evaluation of PFM programmes.
- To bring out case studies of PFM experience in Kerala.
- To bring out a bibliography of literature on PFM in electronic form

Date of Commencement : 2004 April
Date of Completion : 2007 March
Budget : Rs. 9.09 lakhs
Sponsoring Agency : KFRI Plan Grants

Review of literature on PFM was carried out. Field survey initiated.

Comparison of prediction models developed by statistical and neural network techniques in applied forestry research

Investigator(s): Sivaram, M.

Objectives

- To review NN algorithms which are comparable with the statistical techniques suitable for various prediction and classification problems.
- To apply NN and statistical techniques to certain datasets emerged out in applied forestry research and evolve prediction models.
- To compare the performance of NN models with statistical models

Date of Commencement: 2004 April
Date of Completion : 2007 March
Budget : Rs. 4.38 lakhs
Sponsoring Agency : KFRI Plan Grants.

In this study, the performance of ANN model was compared with traditional statistical models for certain datasets in forestry. The nature of statistical problems that could be considered for the investigation was of regression type (functional approximation) and time series prediction using Auto Regressive Integrated Moving Average (ARIMA) model. For regression problem, three data sets were used. The first two data sets were related to the prediction of bark thickness using diameter measurements of two species *Lager-stroemia reginae* and *Acacia caesia*. The third dataset was related to the prediction of the ratio of germination percentage to the viability percentage

at different days of germination of teak seeds (*Tectona grandis*). With regard to time series prediction problem, the prices of teakwood in different girth classes were considered. The architecture of ANN used was MLP with one hidden layer for all the problems. The activation function used in the hidden neuron was sigmoid. The error minimization algorithm used was Levenberg-Marquardit algorithm. While the performance of ANN with regression was assessed by the root mean square error, the performance of ANN with ARIMA was assessed by mean absolute percentage error. The perfo-rmance statistics suggest that ANN is comparable with that of regression and ARIMA models.

Mapping biodiversity of the *Myristica* swamps in southern Kerala

Investigator(s): Vijayakumaran Nair, P., Ramachandran, K.K., Swarupanandan, K., Thomas P. Thomas

Objectives

- To survey and map the swamp forests in Southern Kerala and to organize the information into a dynamic GIS.
- To document and compare the animal and plant wealth including the rare and threa-tened species across different *Myristica* swamps of Southern Kerala and to analyze the dependencies among them.
- To characterize the soil, to understand the hydrological importance and their probable linkages in these forests
- To associate the variables of climate, topography and biodiversity.
- To use the Geographical Information System in registering and analyzing the data obtained and to develop conservation strategy for the swamp forests of the region.

Date of Commencement : 2004 April
Date of Completion : 2007 March
Budget : Rs. 14.62 lakhs
Sponsoring Agency : Ministry of Environment and Forests, Govt. of India.

This was the first attempt to map 60 patches of highly endangered *Myristica* swamp forests which constitute 1.5 km^2, which hardly make up 0.004% of the total land area of and 0.014% of the total forest area of Kerala. Eighty-two trees and ninety-four species of herbs/shrubs constituted the vegetation. Forty-nine lianas have been recorded. Twelve of

A view of *Myristica* swamp

A viper in the *Myristica* swamp habitat

these plants have been red-listed and up to 28 plants are endemic to Western Ghats. Faunal biodiversity was also documented for the first time, consisting of 10 species of molluscans, 281 species of insects belonging to 83 identified families, 54 species of arachnids, 14 species of fishes, 56 species of amphibia (more than 50% reported from Kerala), 55 species of reptiles (more than 22% found in Kerala), 129 species of birds and 27 species of mammals.

Micropropagation of *Bambusa balcooa* and *Dendrocalamus giganteus*

Investigator(s): Muralidharan, E.M., Seethalakshmi, K.K.

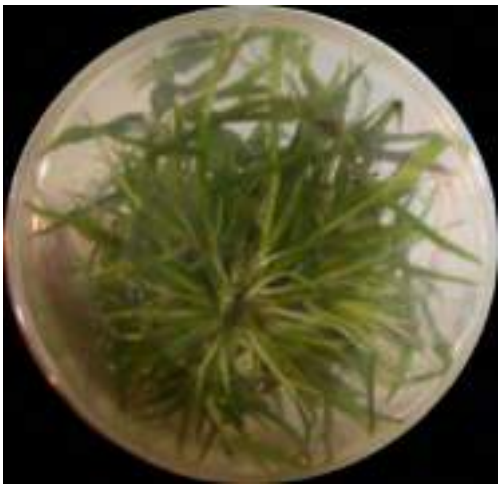
Objectives

- To develop *in vitro* culture techniques for micropropagation of *Bambusa balcooa* and *Dendrocalamus giganteus* using tissues collected from culms of mature clumps.

Date of Commencement : 2004 April
Date of Completion : 2009 March
Budget : Rs. 12.16 lakhs
Sponsoring Agency : Department Of Biotechnology, Govt. of India

Protocol for micropropagation of *Bambusa balcooa* from field grown clumps was standardized. Shoot cultures were established from nodal explants 10-20 shoots per explant/ sub-culture were obtained on a media supplemented with BAP (1.75 – 3 mg/l) + NAA (0.1 mg/l). Liquid media and stationary cultures were suitable for shoot multiplication and rapid subcultures were found to be beneficial for maintaining healthy shoots. Culture in polypropylene bags was carried out successfully.

Seasonal variation in sprouting response in *Dendrocalamus giganteus* was noticed. Vigorous sprouting was observed in January – February



Multiple shoot formation in B. balcooa

in 30 % of nodal explants and survival up to 3 subcultures. Systemic antifungal and antibiotic pretreatment was used to control endogenous contamination. Multiplication rates were low. Browning and senescence of shoots was observed beyond 3 passages.

Ecology and biodiversity of mangrove forest: A case study from northern Kerala

Investigator(s): Sharma, J.K., Swarupanandan, K., Kallarackal, J., George Mathew, Mohanan, C., Ramachandran, K.K., Thomas P. Thomas, Jayson, E.A., Mohanadas, K., Somen, C.K., Mohammed Kunhi, K.V.

Objectives

- To inventorise the biodiversity of the mangrove ecosystem including angiosperms, ferns and fungi from the plant world and mammals, birds, fishes, mollusks and arthropods from the animal world and to examine whether the poor diversity of the plant world is actually compensated by the animal world there.
- To study the abiotic environment, including seasonal changes in the micro-

Deforestation in Mangroves of Kannur

Fish diversity in Mangroves

climate, soil substratum and compositional changes in the aquatic component including tidal dynamics and water quality, and to use this information for framing strategies for rehabilitation

- To analyze the community structure of the mangrove vegetation including zonation and characterization of the vegetal mosaics, phenological studies aiming to understand the seasonality of growth and reproduction and the stress physiology of the plants which in turn would be of practical value in conserving them.

Date of Commencement : 2004 April
Date of Completion : 2007 March
Budget : Rs. 15.42 lakhs
Sponsoring Agency : Ministry of Environment and Forests, Government of India.

Field visits were made. Aerial photographs were obtained. The map preparation work was continued. Data on temperature, RH and rainfall were monitored. Samples of soil from one study plot have been collected. Altogether 30 plant species were collected from two locations of study. Jackal, grey mongoose and bats were the mammals sighted in the study area. Sixty-one species of birds were also recorded. Six species of prawns, five species of crabs and 48 species of fishes were collected. Data on seasonal abundance of fishes have been generated. Six species of mollusks were also recorded.

Forests and agricultural ecosystem analysis to assess ecosystem health and to identify rehabilitation strategies in the Kerala part of Nilgiri Biosphere Reserve

Investigator(s): Chandrashekara, U.M.

Objectives

- To identify ecological and economic strengths and weaknesses of traditional and modern agricultural practices and evolve appropriate strategies for their sustainable management
- To analyse the impact of different agricultural practices on the adjacent forests in terms of their vegetation structure, species composition, regeneration patterns and overall ecosystem health
- To identify suitable strategies for the forests affected by different cropping practices in the region.

Date of Commencement : 2004 April
Date of Completion : 2007 March
Budget : Rs. 12.00 lakhs
Sponsoring Agency : Ministry of Environment and Forests, Government of India.

In each forest patch, transects were laid from the forest boundary to the interior of the forest. In each transect, quadrats of 20m x 20m were established at 200m interval. Vegetation analysis in the quadrats was carried out separately for herbs, shrubs, tree seedlings and mature trees. The data obtained was further analyzed in order to determine the extent of disturbance to the forest and also the successional status of forest patch. Schematic diagram of each patch depicting the level of disturbance at different distance from the forest boundary was prepared. PRA exercises were conducted in the villages around each forest patch in order to collect information on 1. Causes for forest disturbance, 2. Impact of changes in cropping pattern on the forest patch, 3. Historical changes in forest resource utilization, and 4. Preparation of landuse and land cover change map based on senior citizen interview method.

Quantification of different resources (leaf litter, understorey biomass, pruned materials, small poles and fuelwood) from the forest was initiated. Tree seedling density prior to and after the collection of leaf litter and understorey biomass was quantified in order to estimate the loss of tree seedlings from the forest due to collection of leaf litter and understorey biomass for mulch in agricultural lands. Meetings of forest officials (Biosphere managers) and villagers were conducted in order to present the data so far obtained and also evolve strategies for sustainable management of forest patches.

Field performance of mirco and macro propagated planting stock of selected five commercially important bamboo species

Investigator(s): Seethalakshmi, K.K., Muralidharan, E.M., Unni, K.K.

Objectives

- To evaluate field performance of micro and macro propagated planting stock of five commercially important species of bam-boo, viz., *Bambusa bambos, Dendrocalamus strictus, D. asper, Pseudoxytenanthera stocksii* and *Ochlandra travancorica* in multilocational demonstration plots to be established in Kerala, Tamil Nadu, Karnataka and Andhra Pradesh

Date of Commencement : 2004 July
Date of Completion : 2007 June
Budget : Rs. 43.79 lakhs
Sponsoring Agency : Department of Biotechnology, Government of India.

For testing the performance of species, planting stock was prepared from rooted cuttings. TC plants were outsourced from different private and public sector tissue culture units. Forty hectares of plantation was established in collaboration with two beneficiaries at Moolagangal, Attappady. The plantation was established with two species *Bambusa balcooa* and *Dendrocalamus asper*. The survival has been more than 70 per cent. Observations on growth are being recorded. A field nursery has been established in the plantation site. The demonstration plot will serve to show the performance of TC and VP plants. Intensive cultivation of bamboo is taken up here by two progressive planters providing solar fencing for protection and drip irrigation for better survival and growth of plants.

Biotechnological approaches for improvement of plant species with special reference to pulp and paper

Investigator(s): Bhat, K.M., Muralidharan, E.M., Pandalai, R.C., Thulasidas, P.K.

Objectives

- Region-wise sample collection and inventorisation of *Leucaena leucocephala* and *Ochlandra travancorica*
- Screening of the samples for chemical parameters, viz., lignin, cellulose and hemi-cellulose content
- Screening of the selected samples from objective 2 above for physical parameters viz. internodal length (in case of *O. travancorica*) and fiber characteristics (in case of *L. leucocephala* and *O. travancorica*)
- Screening of the selected samples from Objective 2 above for molecular biological parameters, viz., DNA fingerprinting
- Collation of the data generated for objectives 2 to 4 above and identification of the elite germplasm by correlating physical, chemical and molecular biology related parameters with lignin, cellulose, hemi-cellulose and silica content
- Region-wise development of repositories, documentation, registration and obtaining of the IC numbers for the selected elite germplasm for IPR protection
- Development of *in vitro* methodologies for large scale multiplication of the selected elite germplasm
- Isolation and characterization of lignin biosynthetic pathway genes: cinnamyl alcohol dehydrogenase (CA), 4-coumarate-CoA-ligase (4CL), coniferyl aldehyde-5-hydroxylase (Cald5H), caffeoyl-3-O-methy-ltransferase (CCoAOMT), O-methyltra-nsferase (OMT), cinnamoyl-CoA-reductase (CCR) and coniferin-b-glucosidase (CBG)
- Isolation of a xylem specific promoter
- Cloning of the genes, isolated as in Objective 8 above, in transformation vectors und the control of an appropriate gene promoter
- Development of transformation protocols for *Leucaena leucocephala*
- Single event transformations of *Leucaena leucocephala* with genes isolated in Objective 8 above.
- Transfer of transgenic plants to containment facilities and analysis for expression of genes, lignin content / composition, cellulose content and pulp characteristics

Date of Commencement	:	2004 September
Date of Completion	:	2006 August
Budget	:	Rs. 73.90 lakhs
Sponsoring Agency	:	CSIR-(NMITLI) Project, Govt. of India.

A total of 373 (including 136 collected by CIMAP) accessions of *Ochlandra* were made from 20 major reed growing areas of Kerala, Karnataka and Tamil Nadu. The Passport data and descriptors prepared for *Ochlandra* were deposited in NBRI. Soil samples from 19 *Ochlandra* locations were sent to NBRI. Digital photos of 159 accessions of *Ochlandra* from 12 locations were also sent to NBRI. Samples of 25 trees of *Leucaena* were collected from Tamil Nadu and Kerala; wood samples were supplied to FRI and passport data to NBRI. All 373 accessions, including duplicates, were planted and maintained in the Field Germplasm Collection at the Field Research Centre of KFRI at Velupadam, Palapilly. 250 accessions (67%) are surviving in the field. A total of 11 accessions were lost due to flowering.

Microtechnique procedure was standardised for anatomical study of reed bamboos. NIR protocols were developed for chemical characterisation of reed bamboos and validated by inter-lab testing. Benchmarks defined for selection of lead plants of superior quality pulping raw material based on physical, chemical and anatomical (fibre) properties of 373 samples of *Ochlandra*. Elite plants /populations of low lignin / high cellulose with low silica content, acceptable fibre length and physical properties were located from the natural habitats. Low lignin elites along with medium and high lignin reed bamboos were identified for multi-location trials to be conducted in Phase II.

Production of quality planting material for rare medicinal plants of commercial importance

Investigator(s): Sasidharan, N., Muraleedharan, E.M., Chacko, K.C.

Objectives

- Production of quality planting materials and develop agrotechnology for medicinal plants such as *Trichosanthes cucumerina*, *Merremia turpethum*, *Salacia oblonga*, *Saraca asoca* and *Ipomoea mauritiana*.

Date of Commencement : 2004 November
Date of Completion : 2007 October
Budget : Rs. 12.0 lakhs
Sponsoring Agency : National Medicinal Plants Board, Ministry of Health and Family Welfare, GOI.

The vegetative propagation of *Saraca asoca* was standardized. The mature (1 to 2 year old) stem cuttings excised at the nodal region treated with 1000 ppm of IBA gave the maximum rooting percentage (96 %). Whereas mature stem cuttings excised at the internode gave 90% of rooting when treated with 5000 ppm of IBA. The juvenile (less than 1-year-old) stem cuttings excised at the nodal region treated with 1000 ppm of IBA gave a maximum 92 % rooting success, while juvenile stem cuttings excised at the inter node gave 94 % of rooting with 5000 ppm of IBA which were planted in the month of May. Sprouting of buds from the upper nodes was observed after 15 days in the case of juvenile cuttings and in mature cuttings it took 20-25 days. In air layering, both IBA (5000 ppm) and Rootex-treated layers showed 100 percent rooting response during the months of August – September.

Micropropagation of *Aegle marmelos* and *Malaxis rheedii*

Field planting of *Ipomoea mauritiana*, *Trichosanthes cucumerina* and *Merremia turpethum* were carried out and their growth performance is under observation. The performance of field planted propagules will be evaluated after one year. Agro-technology standardization trials of *Ipomoea mauritiana*, *Trichosanthes cucumerina* and *Merremia turpethum* are in progress.

Use of bioprotectant against fungal deterioration of rubber wood

Investigator(s): Maria Florence, E.J., Balasundaran, M.

Objectives

- Isolation of various microorganisms (fungi, bacteria and actinomycetes) antagonistic to common fungal growth on rubber wood and other soft wood species.
- Laboratory evaluation of different biocontrol organisms against major wood degrading organisms
- Testing the efficiency of the bioprotectant in different seasons
- Extraction and characterization of the antagonistic principle produced by the biocontrol organism

Date of Commencement	:	2004 December
Date of Completion	:	2007 November
Budget	:	Rs. 10.36 lakhs
Sponsoring Agency	:	Department of Science and Technology, GOI.

Among the microbes screened, 11 actinomycetes, 3 bacteria and 1 fungus showed antagonism and the very effective antagonists are Bacteria - 2 (Compost and wood) - B2 & B8; Actinomycetes - 3 (Soil) - SA 4, SA 14 and SA 18. Laboratory evaluation of antagonists on wood blocks was attempted and was very effective in controlling fungal growth. Culture filtrate of each antagonist was also effective in controlling the stain and decay fungi.

Mapping and quantitative assessment of geographic distribution and the population status of plant resources of Western Ghats

Investigator(s): Sharma, J.K., Menon, A.R.R., Renuka, C.

Objectives

- Quantitative assessment of the geographic distribution and population status of the plant resources of the Western Ghats
- Identifying threats on the plant resources and enlisting the threatened species
- Setting up of a Western Ghats Eco-region specific database on plant resources.

Date of Commencement	:	2004 December
Date of Completion	:	2008 November
Budget	:	Rs. 13.27 lakhs
Sponsoring Agency	:	Department of Biotechnology, Govt. of India.

This was a multi-institutional project and the Institute was assigned the task of collecting data from the Kerala Part of Western Ghats. The Western Ghats area was divided into 6.25 km^2 grids and systematic sampling procedure was adopted using appropriate sampling strategy. Vegetation data from 5 m x 1000 m strips of the grids were gathered for structural and species distribution analysis. So far, more than 160 grids covering Thrissur, Nemmara, Chalakkudy, Vazhachal, Malayattoor, Kothamangalam, Sholayar, Munnar, Kottayam, Idukki, Thekkady (PTR) Forest Divisions and Chimmony , Peechi-Vazhani and Parambikulam Wildlife Sanctuaries have been completed. The major forest vegetation types covered were Tropical wet-evergreen, Semi-evergreen, Moist deciduous, Scrubs, Grasslands and Forest plantations.

Ecology and behavior of owls in the Western Ghats and developing a habitat model for their conservation

Investigator(s): Jayson, E.A., Sivaram, M.

Objectives

- Inventory of forest owls in the southern Western Ghats
- To find out the factors that influence the owl distribution and abundance
- To characterize the microhabitat parameters of forest owls
- To develop statistical model utilizing the habitat parameters to predict areas of forest that have high value for owls

Date of Commencement: 2005 February
Date of Completion : 2008 January
Budget : Rs. 16.45 lakhs
Sponsoring Agency : Ministry of Environment and Forests, Govt. of India.

Brown fish owl

Twelve species of owls were recorded from fifteen protected areas surveyed in Kerala and Tamil Nadu. One hundred and sixteen locations were surveyed for recording the habitat parameters of the owls from Kerala and Tamil Nadu. Among the four ground parameters measured, three (herb cover, grass cover, litter cover) were significantly different between the lesser owl and large owl habitats, whereas the shrub cover showed no significant difference between the habitat utilization. Thematic maps relating to different eco-geographical variables, which determine the distribution of owls were prepared.

Developing appropriate technology for community level production of charcoal and activated carbon from coconut stem wood and shell for industrial use

Investigator(s): Dhamodaran, T.K., Gnanaharan, R.

Objectives

- Develop appropriate method for community level production of charcoal and activated carbon from coconut shell and stem wood
- Assess the yield and quality of charcoal and activated carbon
- Design, fabricate and install pilot plant suitable for the demonstration of the concept of community level production of charcoal and activated carbon from coconut shell and stem wood and transfer the technology to entrepreneurs for taking up commercialization.

Date of Commencement : 2005 June
Date of Completion : 2008 May
Total Budget : Rs. 29.67 lakhs
Sponsoring Agency : Coconut Development Board, Kochi, Kerala

Fluidized Bed Reactor (FBR) technology was found appropriate for the community level production of activated carbon from charcoal. An FBR for the production of activated carbon

Verticle Carboniser

Inside view of Carboniser

from charcoal was designed, fabricated and installed. The plant is installed at SUBICSHGA Project site, Perambra, Kozhikode.

Regeneration study of selected Terminalias in Kerala

Investigator(s): Chandrasekhara Pillai, P.K., Chandrashekara, U.M.

Objectives

- To survey and analyze the regeneration status of selected species of *Terminalia* (*Terminalia crenulata* Roth, *Terminalia paniculata* Roth and *Terminalia travancorensis* Wt. & Arn.) in Kerala.
- To study phenology, seed characteristics and germination pattern of the species.
- To develop a package of nursery practices of the species.

Date of Commencement : 2005 April
Date of Completion : 2008 March
Budget : Rs. 1.83 lakhs (1st year)
Sponsoring Agency : KFRI Plan Grants

The project envisages to look into the regeneration status of *Terminalia* species in natural populations on the first hand, and also to evolve a package of nursery practices for subsequent enrichment programmes in the natural stand. A reconnaissance survey was conducted for regeneration enume-ration in Northern, Olavakkode, Central, Southern and High Range Circles of Kerala State. Nursery trials showed that germination for *T. paniculata* was 0.75 percent and that for *T. crenulata*, 40 percent.

Genetic diversity and conservation of teak

Investigator(s): Indira, E.P., Bhat, K.M.

Objectives

- to identify population/ individual variations
- to study the genetic diversity with respect to morphological and wood characteristics
- to establish a germplasm bank
- to compare different ecotypes under uniform conditions

Date of Commencement : 2005 April
Date of Completion : 2008 March
Budget : Rs. 6.0 lakhs (1st year)
Sponsoring Agency : KFRI Plan Grants

Explorations were carried out in natural teak populations in different states of India and 23 populations were selected for in-depth studies. Thirty-one morphological characters related to tree height, GBH, tree form and leaves were measured or observed to study the phenotypic variations. The data collected were computerized. All the characters related to tree form were recorded as per the recommendations of international teak provenance trials of DANIDA Forest Seed Center. Seeds and leaf samples were collected from these 23 provenances to establish a germplasm bank as well

as to study the genetic variations including DNA level variations. Wood samples in the form of discs/ core samples were also collected from all the locations to study the wood characteristics.

Recording of weather data at different centers of KFRI

Investigator(s): Kallarackal, J., Chandrasekhara Pillai, P.K.

Objectives

- To record the daily weather data at KFRI centres at Peechi, Veluppadam, Nilambur and Devikolam
- To feed the data into the existing database of the Institute

Date of Commencement : 2005 April
Date of Completion : 2008 March
Budget : Rs. 69,000 (1st year)
Sponsoring Agency : KFRI Plan Grants

Six numbers of Automated Weather Stations were acquired for SNPFM division to monitor the weather parameters at hourly intervals. The weather stations have been established at remote locations in different parts of Kerala. Weather data collected automatically by the stations is transmitted through satellite communication network. These data are then uploaded into the KFRI website for public use.

Establishment of a Clonal Multiplication Area for teak

Investigator(s): Surendran, T.

Objectives

- To establish a clonal multiplication area (CMA) of promising superior teak clones in the Institute campus

Date of Commencement : 2005 April
Date of Completion : 2008 March
Budget : Rs. 1.5 lakhs (1st year)
Sponsoring Agency : KFRI Plan Grants

As envisaged in the project a CMA (Clonal Multiplication Area) was raised in the Institute Campus near the Silviculture Nursery. Rooted ramets of promising plus trees were planted in a linear design. A total of 750 rooted cuttings cloned from ten different Plus Trees of teak were planted in the area. Growth and field perfor-mance of these clonal ramets were now conti-nuously monitored.

Genetic diversity assessment of captive Asian elephant (*Elephas maximus*) population at Guruvayur elephant camp using microsatellite DNA markers

Investigator(s): Balasundaran, M., Jayson, E.A.

Objectives

- To assess the genetic diversity of the captive elephant population at Guruvayur using microsatellite markers.
- To extrapolate the diversity of the population to that of the natural elephant populations to which the elephants originally belonged.
- To develop breeding strategies to maintain the genetic diversity in the captive elephant population of Guruvayur.

Date of Commencement : 2005 April
Date of Completion : 2006 March
Budget : Rs. 75000/-
Sponsoring Agency : KFRI Plan Grants

This project aims at standardizing a non-invasive technique of extracting animal DNA from dung and genotyping the animals using microsatellite DNA markers. Dung samples from the 65 domesticated elephants of Guru-

vayur temple were used for standardization of the technique. It was possible to extract pure DNA from elephant dung using QIAamp DNA stool mini kit (Quiagen, Germany). The endothelial cells sloughed off from the gut lining during the passage of the dung bolus were the source of the small quantity of the DNA. It was also possible to standardize DNA fingerprinting of elephants using microsatellite marker technique. The analyses of the results are in progress.

Improving sandal population in Marayur sandal reserves through assisted natural regeneration and planting improved seedlings and clones

Investigator(s): Balasundaran, M.,
Dy. Conservator of Forests, KFD

Objectives

- To provide optimum eco-physiological conditions for survival and growth of natural seedlings through shade and host plant manipulation in 10 ha area of fenced Nachivayal Reserve.
- To identify candidate plus trees (CPTs) in Marayur reserves and planting superior seedlings in reserves.
- To estimate the extent of clonality and inbreeding caused by root suckers and polyembryony using molecular markers.
- To provide technical expertise to the Forest Department for raising and planting seedlings.

Date of Commencement : 2005 April
Date of Completion : 2008 March
Budget : Rs. 4 Lakhs (1st year)
Sponsoring Agency : KFRI Plan Grants

Attempts to improve sandal regeneration in Marayur reserves have not met with adequate success. Besides identifying problems associated with seed setting, this project aims at establishing a 10 ha demonstration plot for improving sandal regeneration through manipulation of host plant availabilty and regulation of shade.

One of the reasons for low seed setting was found to be inbreeding caused by natural crossing of genetically related plants and seed production. Sandal regenerates through root suckers also. Most of sandal trees found in groups in seed stands proved to be of identical genotypes through DNA fingerprinting technique using ISSR markers. All the trees arising from a single mother tree through root suckers will have the same genotype.


Sandal seedlings planted and protected

About 150 kg of sandal seeds were sown in mounds and protection was provided to the

growing seedlings from browsing animals. Shade was regulated in 10 ha area in Nachivayal sandal reserve. About 15,000 seedlings of 15cm to 1 m height have established in the plot. The project work is being continued.

Studies on the growth performance of the rattan species under plantations

Investigator(s): Renuka, C.

Objectives

- To monitor the growth of different species of rattans in the permanent plots
- To study the flowering and fruiting pattern of flowering species if any.

Date of Commencement : 2005 April
Date of Completion : 2008 March
Total Budget : Rs. 1 lakh (1st year)
Sponsoring Agency : KFRI Plan Grants

Observations on growth characteristics like height, diameter, number of suckers, sucker height, number of new leaves, survival, etc, were recorded from the 1998 plantations of *Calamus thwaitesii* raised by the Forest Department at Pattikkad, Kottiyoor, Kannavam and Thodupuzha ranges. Soil samples were collected from all the plots and analysis completed.

Documentation and conservation of small mammals of the sacred groves of Kerala State, Peninsular India

Investigator(s): Padmanabhan, P.

Objectives

- To identify and enlist small mammals of sacred groves in Kerala.
- To document endemic and endangered species.
- To record threats to the groves like fragmentation, habitat alteration, grazing, poaching, modernization of the temple associated with the groves, etc. which serve as animal corridors.
- To measure and compare disturbance to groves.
- To formulate conservation strategy and action plan for economically and environmentally important all small mammals through partici-patory management practices.

Date of Commencement : 2005 April
Date of Completion : 2008 March
Budget : Rs. 1.98 lakh (1st year)
Sponsoring Agency : KFRI Plan Grants

View of a sacred grove

Sacred groves from the districts of Thrissur, Ernakulam, Palakkad and Malappuram were visited. They include Irringole Kavu in Ernakulam and Adiparambilkavu, Pipoth-Karuppily Kavu, Neeliammakavu and Kaliyarakkal Kavu in Thrissur district. It was observed that many of the plant and animal species have disappeared from the neighboring areas and even from the forest. The identified causes for the depletion include degradation of forests, spread of agriculture, introduction of weeds and other exotic species, cattle grazing, poaching, weakening of faiths, beliefs, and taboos relating to the sacred groves, collection and removal of biomass, mining of china clay and laterite bricks.

Status of critically endangered species, Malabar civet (*Viverra megaspila civettina)* Blyth, 1862 in the South Western Ghats

Investigator(s): Jayson, E.A.

Objectives

- To locate the critically endangered Malabar civet in its habitat.
- Identify and locate the Malabar Civet in the potential natural habitats.
- To survey the captive civet populations in Kerala for identifying the Malabar civet.

Date of Commencement : 2005 April
Date of Completion : 2007 March
Budget : Rs. 2.29 lakhs (1st year)
Sponsoring Agency : KFRI Plan Grants

Surveys were carried out at different parts of the Kannur District. Leaflets were distributed to locals and NGO's to elicit the information about theMalabar Civet. Repeated field trips were carried out. Respondents from different parts of Malabar region were interviewed. Respondents from Elayur alone were aware of the Malabar civet. Malabar civets were often seen around the Cashew plantations of Elayur in 90s, but now they are not reported. The search did not help in locating the animal.

Enrichment of microbial culture collections at KFRI

Investigator(s): Mohanan, C.

Objectives

- To index the identified microbial cultures and prepare a checklist of identified species for easy information retrieval.
- Ex-situ conservation of microbial cultures collection, especially the fungal cultures and to prepare a compendium of identified species

Date of Commencement : 2005 April
Date of Completion : 2008 March
Total Budget : Rs. 1.50 lakhs (1st year)
Sponsoring Agency : KFRI Plan Grants

Purification and sub-culturing of fungal isolates were continued. More than 670 fungal isolates belonging to Hyphomycetes and Coelomycetes were purified, sub-cultured and identity confirmed. Data entry on host, disease symptoms, substratum, locality, etc. continued.

Bamboo for affordable shelter: Demonstration of appropriate construction practices and construction of durable model bamboo house

Investigator(s): Dhamodaran, T.K., Gnanaharan, R.

Objectives

- Characterize the growth performance of bamboos of Kerala
- Generate basic data on the physical and mechanical properties of different species

Preservative treatment of bamboo

bamboos at different ages, grown in Kerala.

Date of Commencement : 2005 April
Date of Completion : 2008 March
Total Budget : Rs. 5.71 lakhs (1st year)
Sponsoring Agency : KFRI Plan Grants

Construction of bamboo house

Designs for the permanent and modular bamboo houses were developed. The architect was identified; plan and estimate were prepared. Building work of the permanent structure is about to complete. Preservative treated bamboo is used for floor, walls and roof. Cement plaster is applied over bamboo structural layers. Ferro-cement columns and beams are used along with bamboo structural elements. Fabrication of the portable house is in progress.

Developing an innovative industrial technology of shockwave-assisted protection of bamboo against fungi and insect borers

Investigators: Dhamodaran, T.K., Gnanaharan, R., Maria Florence, E.J., Jagdeesh, E. (IISC, Bangalore)

Objectives

- Generate the basic information needed for up-scaling the shockwave-assisted prese-rvative impregnation technology for the treatment of large quantity of bamboos within short time, suitable for industrial scale processing.
- Optimize the shockwave treatment conditions in relation to the physical and mechanical properties as well as the penetration/distribution and retention of preservatives in the treated bamboo
- Evaluate the efficacy of eco-friendly preservative, chitosan against fungi and insect borers in protecting bamboo

Date of Commencement : 2005 April
Date of Completion : 2008 March
Total Budget : Rs. 12.05 lakhs (1st year)
Sponsoring Agency : KFRI Plan Grants

An agreement was reached with the Aerospace Engineering Laboratory of IISc, Bangalore, for using their shockwave generation facility. Preliminary investigation on the efficacy of shockwaves for preservative impregnation of air dry and green round bamboos of *Bambusa bambos* was conducted. Satisfactory penetration of the preservative as per Indian Standards was confirmed. Required loading of the preservative could be achieved by using solutions of appropriate concentration.

Qualitative and quantitative analysis of biologically active principles, Baicalein, Luteolin and Psoralen from *Oroxylum indicum, Premna integrifolia* and *Aegle marmelos* respectively and its allied species

Investigator(s): Sasidharan, N.

Objectives

- Isolation and characterization of Baicalein, Luteolin and Psoralen from *Oroxylum indicum, Premna integrifolia* and *Aegle marmelos* respectively through HPLC/GC.

Oroxylum indicum

Radermachera xylocarpa

- Comparative analysis of the principle with its allied species.
- Screening of biological activities by *in vitro*/*In vivo* assay system.

Date of Commencement : 2005 April
Date of Completion : 2008 March
Total Budget : Rs. 4.5 lakhs (1st year)
Sponsoring Agency : KFRI Plan Grants

Qualitative and quantitative analytical studies were carried out to detect the baicalein glycosides in the allied species of *Oroxylum indicum* and *Scutellaria* growing indigenously. Five close related plants of *Oroxylum indicum* such as *Stereospermum colais*, *S. suaveolens*, *Dolichandrone atrovirens, Radermachera xylocarpa* and *Millingtonia hortensis* belonging to the family Bignoniaceae and two indigenously available species of *Scutellaria* (Lamiaceae) were screened for the baicalein content. Protocol for Baicalein isolation from *Oroxylum indicum* has been standardized. The presence of baicalein in both the species of *Scutelleria* was detected by medium pressure liquid chromatography system and confirmed by spectrophotometry.

The biological activity screening of these plants is under progress.

The presences of luteolin and psoralen were reported from indigenously growing plants, *Premna integrifolia* and *Aegle marmelos, respectively*. Screening for the compounds in indigenously growing related species of *Premna integrifolia* and *Aegle marmelos* and the biological activity screening are under progress.

The conservation of mangroves in Kerala: Economic and ecological linkages

Investigator(s): Muraleedharan, P.K., Anitha, V.

Objectives

- Study the socio-economic and ecological systems of mangrove forests and their linkages for their conservation
- Undertake an economic valuation of mangrove ecosystem

Date of Commencement : 2005 April
Date of Completion : 2008 March
Total Budget : Rs. 6.0 lakhs (1st year)
Sponsoring Agency : KFRI Plan Grants

The study attempts to examine socio-economic and ecological systems of mangrove forests and their linkages for its conservation. It also under-takes economic valuation of mangrove. Data was collected from mangrove areas of Kannur, Kada-lundy, Chettuvai and Puthuvipin.

Forestry sector analysis for the State of Kerala

Investigator(s): Jayaraman, K., Krishnankutty, C.N.

Objectives

- To formulate an econometric model useful for projecting the status of supply, demand and price of various forest products in the State.
- To evaluate the status of forest based industries like sawmilling, pulpwood, plywood, eco-tourism and drug manufacturing units and work out their possible future scenarios to the extent possible subject to the availability of data.
- To analyze the interrelation between forestry and allied sectors in Kerala.

Date of Commencement	:	2005 April
Date of Completion	:	2008 March
Budget	:	Rs. 3.12 lakhs (1st year)
Sponsoring Agency	:	KFRI Plan Grants

A forest sector analysis was carried out in terms of changes in Net State Domestic Product of forest sector over time in relation to other sectors of the State. As this was found inadequate, a better framework was adopted which was based on Criteria and Indicators for Sustainable Forest Management (SFM) formulated as part of Bhopal India Process. Using the relevant data at the State level, progress towards sustainability was assessed. A survey of sawmilling units in the State was conducted and problems and prospects of the industry were examined. The potential of ecotourism in the State was evaluated by gathering data pertaining to the forest-based ecotourism centres. A supply demand model for teakwood in Kerala was formulated and data required for estimating the model parameters were gathered.

Organizing educational programmes at Teak Museum, KFRI Sub centre, Nilambur

Investigator(s): Sani Lookose

Objectives

- To organize different educational programmes to create awareness about teak and its related aspects

Date of Commencement	:	2005 April
Date of Completion	:	2008 March
Total Budget	:	Rs. 40000 (1st year)
Sponsoring Agency	:	KFRI Plan Grants

A written quiz contest was organized on Teak Museum Day (May 21, 2006) for students of high school and higher secondary level. A two day workshop on Teak Cultivation and Management was organized on 23-24 June 2006, for 42 'Prerak' members of Literary Mission, Nodal Continuing Education Centre (NCEC) Wandoor Block. Wildlife Week Programme was organized during the first week of October 2006 for Nature Club members, members of nature education centers and students to create awareness. Two-week long 'One-day Camps' on teak forests and plantations were organized during 17-28 January 2007 for student groups (both for students and teacher trainees). World Forestry Day programme was organized on 21 March 2007 for Literacy Mission members of Edavanna Panchayath, Malappuram. A visitor study on social awareness of traditional teak wood articles used in households of Nilambur and Malappuram

areas of Kerala is in progress among the students, teachers, agriculturists and the general public.

Studies on controlling teak defoliator outbreaks by seeding baculovirus, HpNPV in epicenter populations

Investigator(s): Sudheendrakumar, V.V., Sajeev, T.V., Jayaraman, K.

Objectives

- Modeling of horizontal and vertical transmission dynamics of Hp NPV
- Seeding epicenter populations using formulated Hp NPV and monitoring of NPV disease incidence outbreak populations

Date of Commencement	:	2005 August
Date of Completion	:	2008 July
Total Budget	:	Rs. 24.53 lakhs (1st year)
Sponsoring Agency	:	DBT, Govt. of India

The transmission characteristics of the baculovirus in teak defoliator population were studied. The existence of vertical transmission - transmission through the insect to the next generation will be looked into. This information is highly useful in designing the viral pesticide in the field. Preliminary data based on laboratory studies indicate vertical transmission.

Establishment of a bamboo stand for conservation and sustainable utilization of Araya-mbu (*Pseudoxytenanthera bourdillonii* (Gamble) Naithani (Phase II)

Investigator(s): Muktesh kumar, M.S., Seethalakshmi, K.K.

Objectives

- Establishment of a 2 ha plot of the rare and endangered bamboo (Arayambu) with all the populations available from Nelliampathy and Sholayar for commercial exploitation
- Phenotypic and phonological studies on all the populations including growth perfor-mance of various populations
- Adopt single macro-propagation techniques for large-scale multiplication of the species

Date of Commencement	:	2005 August
Date of Completion	:	2007 July
Total Budget	:	Rs. 3.919 lakhs
Sponsoring Agency	:	Kerala Forest Department (Dev. Fund)

Field work was started to collect the propagules and propagation of the material for field planting. Phenological studies were initiated.

Multilocational field trials for selected bam-boo species in Kerala

Investigator(s): Raveendran, V.P., Unni, K.K., Seethalakshmi, K.K.

Objectives

- To conduct multilocational trials
- Micro and macropropagation
- Spacing trials
- Bamboo-based cropping system
- Clump management

Date of Commencement	:	2005 August
Date of Completion	:	2007 July
Total Budget	:	Rs. 4.66 lakhs
Sponsoring Agency	:	National Mission on Bamboo Applications (NMBA)

The trial plantation raised in December 2005 was maintained and further inputs like fertilizer application were made during August 2006.

Periodic observations in 3-month interval were carried out during March, June and September 2006

Promotion of weed biocontrol in Asia: the *Mikania micrantha* experience

Investigator(s): Sankaran, K.V.

Objectives

- To enhance dissemination of results from the research programmes on the weed Mikania undertaken by KFRI in collaboration with CABI Bioscience, UK

Date of Commencement	:	2005 August
Date of Completion	:	2007 July
Total Budget	:	Rs. 8.00 lakhs
Sponsoring Agency	:	Department of International Development, UK

To create awareness of alien invasive weeds among farmers, plantation owners, foresters, policy-makers and stakeholders of forests and forest products, a brochure on alien invasive weeds in forests of India was prepared both in English and Malayalam. A video film on the subject was also produced.

Estimation of moisture content in bamboo culms for deriving the weight and price conversion factors

Investigators: Krishnankutty, C.N.

Objectives

- To estimate the average moisture content in green culms in bamboo clumps in the forests
- To find out the conversion factors from the weight of green culms to the weight at 50% moisture content and from the weight of harvested bamboo to the equivalent weight of culms in green condition
- To arrive at a price conversion factor for deriving the price of bamboo at 50% moisture content from the notified price

Date of Commencement	:	2005 November
Date of Completion	:	2006 October
Total Budget	:	Rs. 3.0 lakhs
Sponsoring Agency	:	Hindustan Newsprint Ltd. Kottayam

Selling price of bamboo, known as notified price, is fixed annually by the government per

Samples of bamboo cut for determination of weight and moisture content

metric tonne of standing weight of bamboo in the forests. Weight of the utilizable portion of the standing green mature bamboo culms in the forests is referred to as the standing weight, whereas the weight of the harvested

bamboo when weighed at the factory gate is known as the net weight. Conversion factors are required to determine the equivalent standing weight from the weight of harvested bamboo and to derive the selling price of bamboo at 50% moisture content from the notified price. For deriving the weight and price conversion factors, an estimate of the average moisture content in bamboo in the forests was necessary. Data collection is in progress

Preliminary study for conservation and sustainable utilization of Erankol, a rare and endemic bamboo of Western Ghats and Koorankolli

Investigator(s): Mukteshkumar, M.S., Krishnankutty, C.M., Vijayakumaran Nair, P.V., Pandalai, R.C.

Objectives

- To take stock of the quantity of the material available
- Natural regeneration, productivity, growth performance, management strategies including soil working

Date of Commencement : 2006 January
Date of Completion : 2006 December
Total Budget : Rs. 1.986 lakhs
Sponsoring Agency : Kerala Forest Department

Additional field trips were conducted to Nilam-bur and other forest areas to assess the natural regeneration, productivity and growth perfor-mance of both the bamboo species.

Improving livelihood of bamboo artisans and bamboo farmers in ten clusters through technological interventions

Investigator(s): Seethalakshmi, K.K., Sankar, S., Pandalai, R.C., Muralidharan, E.M., Dhamodaran, T.K.

Objectives

- To identify clusters of marginal bamboo dependants and assess current status with regard to income and employment.
- To organize and conduct training programme on bamboo cultivation and man-agement for farmers
- To organize and conduct training programme on designing and manufacture of premium bamboo products to artisans.
- To identify master trainers and provide intensive training in processing, design and development of value-added products.
- To identify species suitable for different value added products jointly with artisans and establish model plantations of selected species with farmers.
- Establish a coordination centre with facilities for purchase and storing of bamboo raw material, mechanized preliminary proce-ssing, preservative treatment and distribution of semi-processed material to artisans for manufacture of value added products and their marketing.

Date of Commencement : 2006 April
Date of Completion : 2011 March
Total Budget : Rs. 15.83 lakhs (for the first year)
Sponsoring Agency : KFRI Plan grants

Various activities of the project such as survey, participatory rural appraisal, present skill assessment, training needs, supply of tools, design and training workshops, linkage of producer and end user of resources, product survey, market identification, outreach and sustainable livelihood analysis were undertaken. The project will be implemented in selected 10 clusters of marginal bamboo dependants of Palakkad district. There are 64 clusters of

traditional bamboo artisans. The homesteads of many farmers contain bamboo and the promi-nent species is thorny bamboo (*Bambusa bambos*).

Training programmes were conducted for artisans in five clusters, viz., Nemmara, Kuthanur, Mundur, Vadakkanchery and Begur. Machinery was selected for primary processing of bamboo. Vadakkanchery was identified as the site for installing. Farmers' meeting was organized and planting stock for model bamboo plantations was produced.

Improving the yield and reducing the rotation age of teak plantations through superior clonal teak

Investigator(s): Surendran, T., Muralidharan, E.M., Chacko, K.C., Sharma, J.K., CCF (Planning KFD), CF (WP& R), DCF Research (North) DCF Research (South)

Objectives

- To carryout clonal propagation of promising plus trees of teak using the technology developed at KFRI and to produce suffi-cient number of rooted ramets.
- To produce sufficient number of tissue cultured plants of 5-7 promising superior teak clones.
- To establish clonal plantations of plus trees of teak at selected locations in Kerala.

Clonal propagation

- To monitor the growth and field perfo-rmance of clones in terms of yield of teak for three years.

Date of Commencement : 2006 April
Date of Completion : 2011 March
Total Budget : Rs. 5.95 lakhs (for the first year)
Sponsoring Agency : KFRI Plan grants

View of misd chamber

Clonal propagation was carried out from sprouted branch cuttings collected from genetically superior trees and the rooted ramjets were transferred to polybags.

Strengthening and enriching Institute Central Nursery

Investigator(s): Pandalai, R.C., Pillai, P.K.C.

Objectives

- To modify the prevailing nursery practices through sprinklers, poly shade nets and larger containers with lighter potting mixtures in the nursery.
- To compare the enhanced growth/ biomass of seedlings achieved through the modified methods.

Date of Commencement : 2006 April
Date of Completion : 2009 March

Total Budget : Rs.3.0 lakhs (for the first year)
Sponsoring Agency : KFRI Plan grants

Fifteen nursery beds were established using Ferro cement slabs. The established nursery beds were sown with seeds for seedling production.

Strengthening and enriching Bambusetum

Investigator(s): Pandalai, R.C., Unni, K.K.

Objectives

- To protect the bamboo clumps growing in areas with poor soil depth inside the Bambusetum.
- To carry out landscaping in essential areas of the Bambusetum to make it more attra-ctive.

Date of Commencement : 2006 April
Date of Completion : 2007 March
Total Budget : Rs. 2.5 lakhs
Sponsoring Agency : KFRI Plan grants

Work connected with establishment of shade-net nursery was initiated for raising bamboo propagules required for planting.

Strengthening the ex-situ conservation of evergreen trees

Investigator(s): Unni, K.K.

Objectives

- To collect propagules and strengthen the collection o f rare and endemic forest tree species in the arboretum
- To outplant the seedlings and strengthen the arboretum with suitable planting design based on ecological requirements of the species
- To prepare name boards, signboards, plot chart, etc. for all the species

Date of Commencement : 2006 April
Date of Completion : 2007 March
Total Budget : Rs.1.0 lakhs (for the first year)
Sponsoring Agency : KFRI Plan grants

Seedlings in the Arboretum protected by tree guards

Eight new species were added to the Arboretum as an addition to 150 species already raised. Seeds of eight other tree species were raised in the nursery for planting. Tree guards were provided for protection of planted seedlings.

Publication of a field guide to the birds of Kerala

Investigator(s): Jayson, E.A., Carl D'Sylva (Pro-fessional, Wildlife Art and Conservation, Goa)

Objectives

- To collect available information on the birds of Kerala.
- To prepare a Field Guide to the birds of Kerala.
- To print and publish a Field Guide on the Birds of Kerala.

Date of Commencement : 2006 April
Date of Completion : 2008 March

Total Budget : Rs. 2.80 lakhs (for the first year)

Sponsoring Agency : KFRI Plan grants

Format of the publication finalized. Basic data of 130 species of birds gathered and typed.

Memorandum of understanding between KFRI and artist Mr. Carl D. Sylva finalized. Research Fellow was recruited and the work is in progress.

Strengthening and documentation of Wildlife Museum

Investigator(s): Ramachandran, K.K., Jayson, E.A., Padmanabhan, P.

Objectives

- Strengthening and documentation of museum specimens
- Preparation of a database
- Preparation of a compendium of Wildlife Museum specimens

Museum specimens

Date of Commencement : 2006 April

Date of Completion : 2009 March

Total Budget : Rs. 4.0 lakhs (for the first year)

Sponsoring Agency : KFRI Plan grants

Nomenclatural, habit and habitat details gathered from literature regarding the specimens available in the museum and were computerized.

Strengthening of floristic diversity in the KFRI Sub centre campus through planting and weed management

Investigator(s): Chandrashekara, U.M.

Objectives

- To revise the flora of KFRI sub centre campus
- To introduce angiosperm species which are absent or poorly represented in the campus
- To adopt water and soil conservation measures for providing suitable habitats for the growth of seedlings/ propagules introduced

Date of Commencement : 2006 April

Date of Completion : 2009March

Total Budget : Rs. 2.10 lakhs (for the first year)

Sponsoring Agency : KFRI Plan grants

Soil conservation measures and weeding were initiated and seedlings of a few arborescent species were raised in the nursery for planting.

Transfer of technology of biological control of the teak defoliator pest to the Kerala Forest Department for field implementation and entrepreneurs for commercial production

Investigators: Sudheendrakumar, V.V., Sajeev, T.V., Varma, R.V.

Objectives

- To establish a state level teak defoliator monitoring and HpNPV application system involving the field level forest staff as part of the technology transfer
- Establishment of a pilot scale HpNPV

mass production and formulation unit at KFRI Sub-center in Nilambur for making avail-able high quality biopesticide for supply to Forest Department and other stake-holders

- Locating potential beneficiaries (teak growers) within India and outside the country and transfer the technology of HpNPV application.
- Provide technical help to any entrepreneur to start HpNPV production unit.

Date of Commencement : 2006 April
Date of Completion : 2009 March
Total Budget : Rs. 4.35 lakhs (for the first year)
Sponsoring Agency : KFRI Plan grants

The objectives include dissemination of the teak defoliator biocontrol technology to the Forest Department and private farmers. Training programmes conducted for KFD staff. The biocontrol product was evaluated in other states too.

Establishment of three model Bioparks through participatory approach for promoting awareness on Nature conservation

Investigator(s): George Mathew

Objectives

- To establish Bio-parks through student participation to generate conservation awareness.
- Promote imagination and creativity of students by enabling them to make observations on plants and animals in the parks established

Date of Commencement : 2006 April
Date of Completion : 2006 December
Total Budget : Rs. 4.50 lakhs
Sponsoring Agency : KFRI Plan grants

Model Biopark established ny KFRI

Three different school premises were identified for the establishment of model bioparks with the participation of school children. Preliminary discussions were held with the school authorities.

Identification of *Santalum album* and *Osyris lanceolata* through morphological and biochemical characteristics and molecular markers to check adulteration

Investigator(s): Bhat, K.V., Balasundaran, M., Balagopalan, M.

Objectives

- To carry out microscopic studies and identify structural features suitable for distinguishing the woods of *Santalum album* and *Osyris lanceolata*
- To compare santalol percentage in the wood dust of *Santalum* and *Osyris* for species identification
- To develop and standardize DNA-based marker techniques suitable for distinguishing *S. album* and *O. lanceolata*

Date of Commencement : 2006 April
Date of Completion : 2006 December
Total Budget : Rs. 5.74 lakhs
Sponsoring Agency : KFRI Plan grants

The study envisages looking for wood anatomical, chemical and DNA fingerprinting methods for distinguishing between *Santalum album* and *Osyris lanceolata*. Woods of *Santalum album* and *Osyris lanceolata* differed in some wood anatomical characteristics such as width and seriation of rays, type of crystal-containing cells and abundance of extractives. Thus they could be distinguished on wood anatomical

Hot water extract of *Santalum album* and *Osyris* spp

basis. Both these woods and an Indian species of *Osyris* (*O. wightiana*) showed difference in colour of the hot water extract. DNA studies and chemical analysis of oil are in progress.

Model watershed: Maintenance, monitoring and outreach

Investigator(s): Sankar, S.

Objectives

- To maintain, monitor, and provide outreach to the water shed

Date of Commencement : 2006 April
Date of Completion : 2007 March
Total Budget : Rs. 2.15 lakhs
Sponsoring Agency : KFRI Plan grants

The outflow from the model watershed and untreated area was monitored. Planting was

Contour trench

continued with stress on Vetiver hedges and alley cropping. Training was provided to stakeholders

Information Compendium on Kerala Forestry Sector

Investigator(s): Jayaraman, K., Krishnankuttty, C.N., Menon, A.R.R., Vijayakumaran Nair, P.V., Sivaram, M., Rugmini, P.

Objectives

- To bring out information bulletins on selected themes of public interest related to forests in Kerala based on relevant facts and figures.
- To consolidate the information bulletins into an information compendium on Kerala forestry sector

Date of Commencement : 2006 April
Date of Completion : 2008 March
Total Budget : Rs. 0.85 lakhs (for the first year)
Sponsoring Agency : KFRI Plan grants

Bulletins were prepared on the following topics, viz., Forest area, Type of forests, Biodiversity,

Wildlife, Sacred groves, Mangroves, Forest plantations, Agroforestry, Social forestry, Non-wood forest products, Bamboo and cane, Ecotourism,

Marketing of forest produce, Wood-based industries, Forest inhabitants, Threats to the forests of Kerala, Forest policy and regulations and Forest Research. Certain additional pieces of information are to be added to the bulletins.

Capability development in instrumental methods of analysis

Investigator(s): Balagopalan, M.

Objectives

- To develop a Central Instrumentation Facility in the Institute.
- To offer training in the use and maintenance of sophisticated equipments as well as in Modern Instrumental Methods of Analyses for the Scientists and Research scholars in the Institute as well as Outsiders

View of the laboratory

Date of Commencement	:	2006 April
Date of Completion	:	2009 March
Total Budget	:	Rs. 2.0 lakhs (for the first year)
Sponsoring Agency	:	KFRI Plan grants

The analytical instruments existing in the Division were established in different laboratories. Research scholars desirous of using the equipments were given guidance in the use of the instruments. Proposals were made for procurement of new equipments.

Developing a safer (biological) preservative against bamboo borer, based on traditional knowledge

Investigator(s): Varma, R.V.

Objectives

- To standardize the product formulation and application technology of the biological preservative
- To study the shelf life of the product
- To evaluate the efficacy of the preservative through an interactive process by providing the material to bamboo artisans, villagers, industries etc., for testing

Date of Commencement	:	2006 April
Date of Completion	:	2007 December
Total Budget	:	Rs. 2.5 lakhs
Sponsoring Agency	:	KFRI Plan grants

Appropriate proportion of ingredients required in the preparation of the preservative in the required consistency was standardized in consu-ltation with persons experienced in the field and by trial and error.

Management and monitoring of growth of coppice crop in the experimental plantations of *Eucalyptus tereticornis* (Kayampoovam & Punnala) and *E. grandis* (Sooryanelli & Vattavada)

Investigator(s): Sankaran, K.V., Pillai, P.K.C.

Objectives

- Maintenance of the experimental plots of

Eucalyptus tereticornis and *E. grandis* at four sites viz. Kayampoovam, Punnala, Surianelli and Vattavada, to promote healthy growth of the second rotation (coppice) crop.

- To evaluate growth in response to applied treatments in the first rotation

Date of Commencement : 2006 April
Date of Completion : 2007 March
Total Budget : Rs. 2.20 lakhs
Sponsoring Agency : KFRI Plan grants

Periodical observations were recorded on height and diameter growth of the coppice shoots at the four experimental sites of eucalypt plantation.

Post-harvest protection of bamboo from insect borers by a technique enhancing starch hydrolysis

Investigator(s): Bhat, K.V., Kallarackal, J.

Objectives

- To determine the rate of amylolytic activity in harvested culms of *Bambusa bambos* and *Dendrocalamus strictus* during different seasons
- To assess the influence of climatic factors on starch degradation in felled culms and to attempt to promote the process by artificial means
- To determine the sites of active metabolic sinks in the culms after harvesting
- To examine the efficacy of application of exogenous amylase and different endcoat formulations in promoting starch depletion in culms, and
- To optimize the technique for utilization and future popularization

Date of Commencement : 2006 May
Date of Completion : 2007 October
Total Budget : Rs. 7.66 lakhs
Sponsoring Agency : NMBA (Dept. of Science and Technology)

Storage starch in harvested bamboo culms has been found to be the major attractant to insect borers damaging bamboo. The investigation aimed at identifying optimum external conditions for enhanced amylase activity to achieve maximum depletion of starch from culms. The study involved monthly collection of culms from *Bambusa bambos* and *Dendrocalamus strictus* and analyzing their extent of starch depletion, moisture loss, amylase activity and activity of the respiratory enzyme succinate dehydrogenase during the post-harvest period. It was found that in both the species amylase activity which was generally low following harvesting gradually increased and reached a peak and then gradually declined. Peak activity was found usually on 6th day from harvesting. Ambient temperature of about 30°C was ideal for the enzyme activity as compared to lower temperature (20°C)

Species recovery of *Dipterocarpus bourdillonii* and *Humboldtia bourdillonii*, two critically endangered endemic trees of Western Ghats

Investigator(s): Swarupanandan, K., Muralidharan, E.M., Indira, E.P., Pandalai, R.C.

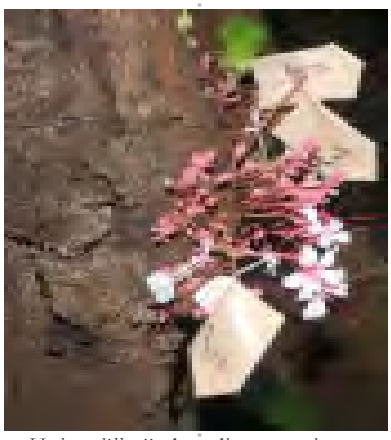
Objectives

- To understand the causes of rarity of *Dipterocarpus bourdillonii* and *Humboldtia bourdillonii,* the two Critically Endangerd trees of the Western Ghats.
- To study the distribution, population structure, variability and reproductive biology with special emphasis on reproductive constraints, if any, such that the output from these studies is available for

framing sound species conservation progr-ammes.

- To evolve appropriate macro or micro propagation techniques and nursery practices for the species so that ample planting stocks of the species reburied for the desired species translocation programmes are available.

Humboldtia bourdillonii



H. bourdillonii - breeding experiment

Dipterocarpus bourdillonii

- To explore the possibility of enhancing the natural population of the two species by appropriate translocation programmes
- To evaluate the post-translocation survival and growth of the planted stocks and eventually the chances of delisting the species from the Red-List.

Date of Commencement : 2006 March
Date of Completion : 2011 February
Total Budget : Rs. 37.13 lakhs
Sponsoring Agency : DBT (Ministry of Science and Technology)

Humboldtia bourdillonii was located at Periyar Tiger Reserve. Seven populations of the species were dentified. *Dipterocarpus bourdillonii* was located in Urulanthanni forests near Kuttampuzha. Floral biology including anthesis, pollen fertility and stigma receptivity, were studied of *H. bourdillonii*. In order to understand the breeding behaviour, selfing and crossing experiments were conducted in the case of *H. bourdillonii*. DNA extracts were prepared from leaves of both the species. As the trees are tall, method of extraction of DNA from bark samples was attempted. The feasibility of vegetative propagation for the production of planting stock is being experimented with branch cuttings in both the species. Standardization of media for micropropagation of the species is in progress. The feasibility of embryo culture has been experimented with *H. bourdillonii*.

A Handbook on the butterflies of Nilgiri Biosphere Reserve

Investigator(s): George Mathew

Objectives

- To prepare a computerized database and illustrated handbook on the butterflies of Nilgiri Biosphere Reserve
- To assess the problems involved in their conservation

Date of Commencement: 2006 April
Date of Completion : 2009 June

Total Budget : Rs. 5.60 lakhs
Sponsoring Agency : Ministry of Environment and Forests, GOI

Information generated on the butterflies of the Western Ghats indicates that the southern part of this range i.e., the Nilgiri Biosphere Reserve had the highest diversity. Over 300 species of butterflies have been recorded from this region. Data pertaining to 300 species of butterflies specifically recorded from the NBR have been compiled and the data being organized into a computer database in a distinct format to include: Scientific Name, Common Name, Plate, Description of species, Expanse, Range, Habits and habitats and Remarks.

Processing storage and supply of forest tree seeds through KFSC

Investigator(s): Pandalai, R.C.

Objectives

- To receive/ collect seeds, perform the cutting and purity tests to assess seed quality
- To store the seeds in appropriate containers and temperatures depending on the storage physiology of each seeds
- To supply quality seeds as per the requirement of the Department/ clients

Date of Commencement : 2006 July
Date of Completion : 2007 June
Total Budget : Rs. 6.0 lakhs
Sponsoring Agency : Kerala Forest Department

Routine collection of seeds, processing, drying and cleaning were carried out for seeds of different forest tree species. The seeds were stored under appropriate condition of storage for supply whenever needed.

Ecosystem structure and dynamics, biodiversity, human dimensions and their linkages of Iringole Sacred Grove in the Western Ghats of India

Investigator(s): Nair, K.K.N., Menon, A.R.R., Ramachandran, K.K., Thomas P. Thomas, Anitha, V., Sivaram, M., Jayson, E.A., George Mathew, Vijayakumaran Nair, P., Yesodharan, K.

Objectives

- To qualitatively and quantitatively analyze the flora and fauna of the Sacred Grove and assess the status of biodiversity
- To characterize the soil with respect to its physical, chemical and biological properties, determine nutrient status, ascertain water availability and monitor the microclimate.
- To generate details on the cultural, religious and traditional background of the Grove and to examine and analyze the human dependencies and management aspects which sustain the ecosystem.
- To organize the data on the vegetation and species distribution pattern on a GIS platform and correlate the same with the physical parameters and human dimensions.
- To establish the Sacred Grove as a permanent sample plot.

Date of Commencement : 2006 August
Date of Completion : 2009 July
Total Budget : Rs.11.98 lakhs
Sponsoring Agency : Ministry of Environment and Forests, GOI

The 10.53 ha area of Iringole Kavu was demarcated into 26 full plots of 50x50 m size and 26 partial plots of varying sizes along the boundary. Major part of floristic and faunal

data collection and generation of taxonomic, structural/population data on the biodiversity was completed. Soil samples from all the plots and microclimatic data from within and outside the Grove area were collected, which are under processing/analysis. Reconnaissance surveys were conducted, and various aspects of human dime-nsions examined and the multiple stakeholders were identified. Proforma for data collection was designed and the preliminary data gathering almost completed. Also, major part of the historical data was generated. About 235 macrofungi (Basi-diomycetes and Ascomycetes) were collected. Spore prints for mushrooms were prepared and morphological characters were studied. Fungal specimens were dried and processed for further studies.

Linking conservation and forest management with sustainable livelihoods and resource use conflict in Agasthyamalai Biosphere Reserve

Investigator(s): Anitha, V.

Objectives

- To study and examine land use changes and its impact on different production systems and socio-economic status of the resident population
- To study human interaction, identify and enumerate resource use conflicts and livelihood issues of the resident population
- To estimate the recreation and cultural tourism value of ABR and its income generating potential
- Examine the existing management practices and develop strategies for better manage-ment of the natural resources.

Date of Commencement : 2006 August
Date of Completion : 2009 July
Total Budget : Rs.6.90 lakhs
Sponsoring Agency : Ministry of Environment and Forests, GOI

Reconnaissance survey was conducted in the entire study area covering the territorial Divisions of Thiruvananthapuram, Punalur, Thenmala, Achankovil and Konni and the Wildlife Sanctuaries Neyyar, Peppara and Shendurney. Methodology has been finalized and questionnaires for detailed surveys on various aspects are under preparation.

Species recovery plan for *Semecarpus kathalakanensis*: a critically endangered fresh water swamp species of the Western Ghats

Investigator(s): Vijayakumaran Nair, P., Pandalai, R.C.

Objectives

- Identifying and mapping populations of as well as critical habitats of *Semecarpus kathalakanensis* and developing spatial recovery maps for this species in the Western Ghats using predictive tools such as DIVA-GIS and GARP

Date of Commencement : 2006 September
Date of Completion : 2009 August
Total Budget : Rs.7.56 lakhs
Sponsoring Agency : Department of Biotechnology, GOI

This project is a part of multi- institutional project funded by DBT, Government of India. Seed germination studies and planting trials of *Semecarpus kathalekanensis* and associated species were carried out.

Tolerance of indigenous forest species to degraded lateritic soils of Kerala

Investigator(s): Sujatha, M.P., Suresh Kumar (KAU), Thomas P. Thomas

Objectives

- To study the nutrient efficiency and rate of absorption of nutrients in *Ailanthus triphysa, Bambusa bambos, Dalbergia latifolia, Haldina cordifolia, Pterocarpus marsupium, Terminalia crenulata* and *Xylia xylocarpa*.
- To study the tolerance of above species to soil moisture, soil compaction, exchangeable Al and Mn.
- To study the cation exchange capacity of roots of selected species and to find out the relation, if any, with their adaptability to degraded soil.
- To categorize the above species in the order of their tolerance to degraded lateritic soil based on the above.

Date of Commencement : 2006 October

Date of Completion : 2009 September

Total Budget : Rs.12.24 lakhs

Sponsoring Agency : Ministry of Environment & Forests, GOI

Nutrient efficiency of selected species was assessed by monitoring their growth performance in degraded soil through pot trial. Rate of absorption of nutrients was studied using labelled P. Tolerance to Al and Mn toxicity is determined by growing the plants in hydroponic cultures as well as pot trials at different levels of Al and Mn. The tolerance to moisture stress and soil compaction was found out by monitoring the growth of species at different levels of soil moisture and bulk density.

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PARTICIPATION IN SEMINARS/ WORKSHOPS/SYMPOSIA

Dr. K M Bhat was invited to deliver keynote address on *Fast growing plantation resources for sustainable wood processing as an option for revival of plywood sector in India* at the Annual Conference of South Indian Plywood Manufacturers' Association, held in Western India Plywoods Ltd., Kannur on 5 Aug. 2006

Dr. K.K.N. Nair acted as Programme Coordinator, Biodiversity Technical Programme Committee of Kerala State Biodiversity Board at KFRI, attended various meetings of the Board as a special invitee and contributed to chalking out and implementation of various programmes of the Board.

E.A. Jayson attended the two day Symposium of Taxonomists organized by the State Biodiversity Board at Trivandrum from 22 - 24 March 2007.

E.A. Jayson attended the National Seminar on the Management and Conservation of Nature-Nilgiri Biosphere Reserve (NBR) at Emerald Heights College Ooty, Tamil Nadu and delivered a plenary lecture entitled *Endangered animals of the Western Ghats* and also presented a paper entitled *Status of the critically endangered Malabar Civet* Viverra megaspila *civettina in the southern Western Ghats*.

Dr. E.A. Jayson attended the 4th World Congress on Mountain Ungulates at Munnar (12-15 Sept. 2006). He also attended the workshop for preparing the Management Plan for the Mangalavanam Bird Sanctuary in the Cochin Corporation Office, Ernakulam and presented a paper on the *Birds of the Mangalavanam mangroves* (27 July 2006).

U. M. Chandrasekhara presented an invited lecture on *Sacred grove of Iringole* in the Conference on Environment and Heritage in Kerala organized by Regional Museum of Natural History (Mysore) and Centre for Heritage, Environment and Development, Cochin held on 18-19 May 2006 at Ernakulam

P. Padmanabhan participated in a workshop on Dissemination of Latest Technology in Beekeeping under Honey Mission Programme at Marthandam organized by CKVI, Madurai and SBEC, Nagercoil.

P. Padmanabhan participated in National Seminar on Wildlife Biodiversity Conservation during 13-15 Oct. 2006 held at Pondichery University and presented the paper entitled *Mammalian diversity in Kerala.*

P. Padmanabhan participated in final review meeting on Scientific Evaluation of Sree Rama Taraka Mahayaga on 3-4 Dec. 2006 and presented a paper on *Scientific evaluation of animal behavior* during Sree Rama Taraka Mahayaga at Sree Rama-chandrapura.

P. Padmanabhan participated in the Training Programme on Good Quality Honey organized by Kerala Agricultural University, sponsored by APEDA (Agricultural and Export Development Authority), Ministry of Commerce and Industry, Government of India.

Dr.T. Surendran participated in the National Workshop on Rural Development through Integration of Agro-forestry and Wood-based Indu-stries organized at New Delhi on 11- 12 Oct. 2006 and presented a paper on *Clonal technology of teak*.

Dr. N. Sasidharan participated in the programme advisory committee meeting at MS Swaminathan Research Foundation, Kalpetta. He also served as Expert Member for selecting Research Fellows for the project on the Conservation of 80 RET species in Kerala on 08 April 2006.

Dr. N. Sasidharan participated in the Workshop organized by the State Medicinal Plants Board regarding cultivation and marketing of medicinal plants at Thrissur on 26 June 2006.

Dr. N. Sasidharan participated as resource person in the Workshop on Plant Taxonomy organized by the Kerala Chapters of Indian Botanical Society at Kerala University, Kariavattom on 24 Aug. 2006. He gave lectures on *Plant taxonomy concepts and practices* and *Herbarium techniques*.

Dr. N. Sasidharan participated in the Regional Seminar on Flowering Plants Diversity at SNM College, Moothakunnam on 27 Sept. 2006 and resented a paper *Plant diversity and taxonomy*.

Dr. A.R.R. Menon attended the 19th Kerala Science Congress as Co-chair person for Ecology and Environment session, on 30 Jan. 2007.

Dr. N. Sasidharan participated in the International Seminar on Recent Trends and Future Prospects of Angiosperm Taxonomy at Agarkar Research Institute, Pune during 04-06, Oct. 2006 and presented a paper *Computer aided tree identification package for the trees of Kerala*.

Dr. N. Sasidharan participated in the Regional Workshop Modern Trends in Angiosperm Taxonomy at St. Thomas College, Kozhencherry on 22 Nov. 2006 and delivered the Keynote address *Computer aided identification of trees*.

Dr. N. Sasidharan participated as a resource person in the Seminar on Cultivation of Medicinal Plants organized by Kozhikkode District Floriculture and Medicinal Plants Co-operative Society at Kozhikkode during 11-12 Dec. 2006. He gave a talk on the *Prioritized medicinal plants of National Medicinal Plants and their sustainability for cultivation in Kerala*.

Dr. N. Sasidharan participated in the Progrramme Advisory Committee meeting of CABC, MSSRF Kalpetta held at Kottakkal Arya Vaidyasala as an invited member on 21 Jan. 2007.

Dr. N. Sasidharan participated in the meeting of State Medicinal Plants Board for preparing the strategy and action plan of the board as a member of the board at Thrissur on 12 March 2007.

Dr. N. Sasidharan participated in the workshop on Preparation of Biodiversity Register, organized by the State Biodiversity Board at Trivandrum on 23 March 2007. He was the Convenor of the group for suggesting resource persons for diffe-rent plant groups at district level for the Biodi-versity Register Programme of the State Biodi-versity Board.

Dr. N. Sasidharan participated on 24 March 2007 in the meeting as an expert member of the Committee for Establishing a Biodiversity Park at Nedumbassery Airport Area, Cochin.

Dr. C. N. Krishnankutty acted as a resource person in a National Workshop on Creative Research in Social Sciences: Qualitative and

Quantitative Analysis held during 15-16 March 2007 organized at Vimala College, Thrissur.

Dr. A.R.R. Menon participated in the training programme on Space Enabled Geoinformation for Disaster Management organized by Dept. of Space, Govt. of India, at National Remote Sen-sing Agency, Hyderabad, during 22-27 Nov. 2006.

Drs. K. Jayaraman and N. Sasidharan attended the 19th Kerala Science Congress 2007 held during 29-31 Jan. 2007 at Kannur.

Dr.R.C. Pandalai attended the Management Development Programme on Forest Certification for Sustainable Forest Management at Indian Institute of Forest Management, Bhopal during 29 Nov.-1 Dec. 2006.

OUTREACH PROGRAMMES

Extension Services

R.C. Pandalai

delivered lectures on *Increasing the productivity of plantations and site preparation* and *Management of coppice forests/plantations* at BIOTRIM, Tirupati during 12-13 Dec. 2006 in connection with the APCFM Project-Interactive seminars by Research wing for the officers of the Andhra Pradesh Forest Department.

Co-coordinated the training course on Cultivation and Management of Teak (Second Edition) from 16-25 May 2006 at Kerala Forest Research Institute. Lectures were delivered on *Containers and potting mixtures*, and *Methods of plant production.*

delivered a lecture on Nursery Practices and Seedling Production in the Training course on Tree Farming in Agro forestry Systems and Wastelands conducted at KFRI during 4-11 Feb. 2007.

gave lecture on *Tropical forest management* at Kerala Forest School, Arippa in connection with the short refresher course on Tropical Forest Management by MoEF, Govt. of India on 4 Feb. 2007.

participated in the training programme (B2/06-07) on Propagation, Cultivation, Management and Post-harvest Technology of Bamboos and Rattans during 3-12 Jan. 2007 and took a class on *Nursery, plantation and harvesting techniques of bamboos.*

acted as Co-coordinator for the training course on Modern Trends in Teak Cultivation and Management from 13-22 Feb. 2007 at Kerala Forest Research Institute. Lectures were delivered on *Containers and potting mixtures* and *Methods of plant production.*

delivered a lecture on the silvicultural aspects of *Bamboo with particular reference to their management and harvesting in nurseries and plantations* at RCDC Centre for Forestry and Governance at Bhubaneswar, Orissa during 15 -16 March, 2007

Dr. E.A. Jayson

visited the Kadalundy area, in the Malappuram District, as per the request of DFO, to study the damage done by the birds on the windows of houses. After a survey, detailed report was submitted to the DFO.

delivered three lectures in Sept. 2006 on *Wildlife Census Methods* to Forest Department staff under-going in-service training at Arippa Forest School and at Walayar

offered a training class to the field staff of the Parambikulam Wildlife Sanctuary as per the request of the Wildlife Warden (Dec. 2006).

surveyed the Juvenile Home at Cherur, Thrissur to study the human-snake problems and advised solutions to reduce the menace (10 Jan.2007).

took class on *Ecotourism* to the students of tourism clubs from colleges and to students

who were attending the Wildlife week celebrations organized at the Teak Museum, KFRI

offered a class to IFS officers on *Methods to assess faunal diversity* on 11-09- 06 and also to Panchayath presidents in KILA for the course sponsored by the Biodiversity Board.

delivered a lecture at Vimala College, Thrissur on the *Animal Biodiversity* in the Seminar on Biodiversity Conservation and Sustainable Development organized by the Zoology and Botany Depart-ments of the College.

Dr. C. Mohanan

attended disease problems in teak, rosewood, and anjily reported to the Division by farmers and appropriate suggestions to control the diseases were made.

attended to an enquiry on alleged irregularities about sale of a tree from the campus of HSD Government Hospital, Thripunithura. He provi-ded expert comments on possible decay of Melia *dubia* (Malavepu) and *Sweitenia mahogany* (Maha-gony).

visited the medicinal gardens of The Pharmaceutical Corporation (IM) Kerala Ltd. (Oushadhi) at Kuttanellur and provided recommendations for managing the diseases of medicinal plants.

performed peer review of many scientific papers for Indian Journal of Forestry and Journal of Non-timber Forest Products.

Dr. C. Renuka

gave details of rattan identification to Mr. V.D. Singh, IFS Gujarat.

reviewed two project proposals submitted to MOEF by other Scientific Institutions and comments were sent.

gave classes on the *Forest plant diversity* during the Open Day at KFRI.

gave a talk on *Forest biodiversity conservation* in the Seminar organized during Peechi Ulsav.

gave a radio talk on *Biodiversity conservation – the need of the day* (in Malayalam) on 22 May 2006.

participated in the Regional Consultation Meeting on the Draft Approach Paper on the 11th five year plan of Kerala at Kochi organized by the State Planning Board on 26 September 2006.

Dr. K.K.N. Nair

gave details on plantation technology of indigenous tree species to Energy Plantations India Ltd., Chennai.

took classes on Biodiversity to trainees from Indian Institute of Public Administration, New Delhi, teachers of Irinjalakuda Subdistrict and students of Forestry College, KAU, Mannuthy.

coordinated classes for more than 750 Grama Panchayath Presidents on Biodiversity in collab-oration with Kerala Institute of Local Admini-stration (KILA).

Dr. M. Balasundaran

took class on *Genetic improvement of teak* during the training programme on Cultivation and manag-ement of teak conducted by KFRI

took class on *Genetic improvement of seeds* during the training programme on seed technology condu-cted by KFRI

took class on *DNA markers for mating system analysis and seed orchard management* during the training programme on Biotechnology conducted by KFRI

Dr. K. M. Bhat

Served as resource person, for the training course at KFRI on Cultivation and Management of Teak' 16-23 May 2006

Dr. K. M. Bhat, K. V. Bhat and P. K. Thulasidas

gave a one- week training a Researcher from ITC Bhadrachalam on Wood micro techniques and pulpwood quality

Dr. N. Sasidharan

gave a talk on *Botanical keys and Computer Aided Plant Identification* to the B.Sc. Botany students of Sree Kerala Varma College, Thrissur during their visit to KFRI on 25 Aug. 2006.

gave a lecture on *Cultivation and marketing of medicinal plants* to the participants of Induction Training for Foresters and Forest Guards held at Social Forestry Complex, Kannur on 26 July 2006.

inaugurated the one month Traditional Alternative Medicine Diploma Course organized by the SNA, Oushdasala, Thrissur for the Divehibeys Health Practitioners from Maldives on 02 Aug. 2006.

inaugurated the Botany Association of St. Thomas College, Pala and gave a talk on *Diversity of the tropical forests of Kerala* on 30 Oct. 2006.

Took class on *Medicinal plants of Kerala* to 50 Doctors from Italy during their visit to KFRI on 27 Nov. 2006.

Gave a talk on *Plant identification techniques* to the M.Sc. Botany Students of Govt. Sanskrit College, Pattambi during their visit to KFRI on 15 Feb. 2007.

identified the plant specimens referred from Arya Vaidya Sala, Kottakkal on 26.06.2006 and from National Chemical Laboratory, Pune on 30 Jan. 2007.

Dr. K. Jayaraman, Smt. P. Rugmini, Dr. C. N. Krishnankutty and Dr. M. Sivaram delivered a series of lectures in the training course on Experi-mental Designs in Forestry Research for the officers of the Tamil Nadu Forest Department at KFRI during 19-28 April 2006.

Dr. A.R.R. Menon

participated as Resource person in the seminar on Panchayat Resource Mapping Programme, at Pazhayannur, Thrissur- on 27 Feb.2007.

participated as subject expert for pre-PhD viva-voce at IFGTB, Coimbatore- on 19 Feb. 2007.

participated as Resource person for the training programme on *Application of Geographical Information Systems and Remote Sensing in Environmental Management* at Bharathiar University, Coimbatore during 2-3 June, 2006.

delivered a lecture on *Forest degradation and it's implications* for KSSP seminar on Environmental Issues, at Kottayam on 13 January 2007.

gave a talk on *Environmental conservation, resource evaluation and application of remote sensing, GIS and GPS technology* to students of Polytechnique at Thrissur, on 17 January 2007.

took classes on *Application of GIS in forest resource management* at Govt. College Chitoor, Palakkad (12 Feb. 2007), Rajagiri College of Social Science, Kalamassery(19 Feb. 2007), Sree Sankara College, Kalady (23 Feb. 2007). and Alphonsa College, Pala (28 Feb. 2007).

Dr. M. Sivaram

delivered a lecture on *Survey and estimation of medicinal plants* in the training course on Conservation and development of medicinal plants and benefit sharing with local communities for Indian Forest Officers at KFRI during 13-17 Nov. 2006.

delivered a lecture on *Calculation and interpretation of biodiversity indices* in the One week training

programme on the Biodiversity documentation, evaluation and monitoring for Indian Forest Service Officers at KFRI during 11-15 Sept. 2006.

delivered lectures on EXCEL program in the in-house Computer Training programme conducted during May-June 2006 at KFRI, Peechi.

Dr. U.M. Chandrashekara

coordinated the preparation and installation of a Touch Screen Teak Information System in the Teak Museum

took part in promotion of tree cultivation in farmlands by providing plant propagules and technical know-how. Over one lakh plant propagules of different trees and bamboo species were made available to farmers on nominal price. For all the farmers who purchased plant propa-gules, necessary technical guidance for cultivation, management and harvest of crops was provided

took several classes on topics related to forests, agro forestry and biodiversity conservation to the Forest Department officials, trainees, NGO groups, school and college students who visited the Teak Museum and KFRI Sub Centre.

Dr. P. Padmanabhan

conducted a class on *Mammalian Diversity of Kerala* during a one-day refresher course for Higher Secondary School teachers in Zoology of Thrissur on 21 Nov. 2006 at Kerala Forest Research Insti-tute, Thrissur, Kerala.

Dr.T. Surendran

imparted training and a demonstration on Clonal propagation of teak to a team of three Forest Officials of KFD at KFRI on 12 July 2007

delivered a lecture on *Clonal propagation of teak* to a batch of 40 officers of the Kerala Forest Depart-ment as part of a training programme on 19 July 2006 at the Institute of Management in Government, at Calicut.

served a resource person and Convener of the committee for briefing the activities of the Institute to visitors for the Open Day Progr-amme condu-cted a KFRI on 11 May 2006

delivered a lecture and gave a demonstration on *Clonal propagation of forest trees* on 15 Feb. 2007 to a team of trainees from Andhra Pradesh.

delivered a lecture on 'Modern trends in teak cultivation and management' on 12 March 2007 to a batch of IFS trainees.

NOMINATION TO NATIONAL/ INTERNATIONAL COMMITTEES

Dr. K.K. Seethalakshmi was nominated as Member of the Expert Committee on Science and Technology for Women, Department of Science and Technology, Government of India

Dr. C. Renuka was nominated as Member of the Executive Committee and Research Advisory Council of IRTC, Palakkad

Dr. C. Mohanan was nominated as Member of Board of Examiners for II and 1V semester M.Sc. Plantation Development (Calicut Univ.)

E.A. Jayson was selected as Member, Board of Studies in Wildlife, Kevampu University, Shimoga, Karnataka.

Dr K.M. Bhat served as External Expert in the Assessment Committee Meeting held for asse-ssing the scientists of Rubber Research Institute of India (RRII), Kottayam on 22 Sep. 2006.

E.A. Jayson visited Wayanad Wildlife Sanctuary for evaluating the protected area for the Management Effectiveness Evaluation Programme of the Ministry of Environment, Govt. of India (09-10-2006 to 10-10-2006).

E.A. Jayson visited the Mudumalai National Park, Tamil Nadu for evaluating the protected area for the Management effectiveness evaluation progra-mme of the Ministry of Environment, Govt. of India (18.09.2006 to 20-09-2007).

Dr. M. Balagopalan has been a Fellow Member, International Congress on Chemistry and Environment - FICCE

Dr. P. Padmanabhan was elected as a Member of South Asian Regional Network of the International Zoo Educators Association and associate of Zoo Outreach Organization, 2007.

Dr. E.A. Jayson visited the Gulf of Mannar National Park, Manpadam, Tamil Nadu for evaluating the management effectiveness as a Committee member, appointed by the Ministry of Environment, Govt. of India. 21-01-2007 to 24-01-2007).

Dr. K.M. Bhat was elected Board Member of International Academy of Wood Science for the period 2006-2012.

Dr. K.M. Bhat was nominated as Member of Editorial Advisory Board, Journal of Tropical Forest Science, Malaysia (since 2006)

Dr. A.R.R. Menon participated in the KSREC Governing Body meeting at Trivandrum, on 25 January 2007.

EXTENTION AND TRAINING ACTIVITIES

Technical support is provided to the Kerala Forest Department, other governmental and non-governmental agencies and farmers on site-species matching, site selection and nutrient status, fertiliser dosage, pest and disease control and conservation, utilization and marketing of timber of forest species. Advice on resource survey and estimation as well as wildlife management and census are also provided. The Institute undertakes identifi-cation of plants, insects, animals and timber. Quality seeds and seedlings are also supplied at reasonable cost. The following arethe different activities of the Division during the year.

Extension activities attended

Sl. No.	Year & Month	Problem attended	Client	Persons involved
1.	2006 April	Drying up of Casuarina plants in plantations	Divisional Manager, Kerala Forest Development Corporation Ltd.,	Dr. C. Mohanan
			Divisional Office, Thalicode	
2.	2006 April	Wood sample testing	Civic Building Materials,TC-29/309, Pazhamukku Road, Ollur, Thrissur	Dr. K. M. Bhat
3.	2006 April	Wood sample testing	Neyveli Lignite Corporation Limited, Neyveli	Dr. K. M. Bhat
4.	2006 April	Wood sample testing	Neyveli Lignite Corporation Limited, Neyveli	Dr. K. M. Bhat
5.	2006 May	Wood sample testing	Neyveli Lignite Corporation Limited, Neyveli	Dr. K. M. Bhat
6.	2006 May	Wood sample testing	The Assistant Engineer, Central Public Works Dept., Pallipuram P. O., Thiruvananthapuram	Dr. K. M. Bhat
7.	2006 May	Wood sample testing	Shri. P. Sankaranarayanan, Puthanpurayil veedu, Chelakkara	Dr. K. M. Bhat
8.	2006 May	Wood sample testing	The Assistant Engineer, LIC of India, Branch Office Kannur	Dr. K. M. Bhat
9.	2006 May	Wood sample testing	The Assistant Engineer, Central Public Works Dept., Pullazhy, Thrissur	Dr. K. M. Bhat
10.	2006 June	Collar and root rot of *Acacia mangium* seedlings	Divisional Manager, Kerala Forest Development Corporation Ltd., Divisional Office, Thrissur	Dr. C. Mohanan
11.	2006 June	Wilt and root rot of *Tectona grandis*	Dy. Range Officer, Ezhattumugham Forest Station, Ayyampuzha	Dr. C. Mohanan
12.	2006 June	Wood sample testing	The Addl. Chief Manager, Township Administrative Office, Neyveli	Dr. K. M. Bhat

13.	2006 June	Wood sample testing	The Addl. Chief Manager, Township Administrative Office, Neyveli	Dr. K. M. Bhat
14.	2006 June	Classification of panel doors and flush doors	The Managing Director, Feroke Boards Ltd., Malappuram	Dr. K. M. Bhat
15.	2006 June	Wood sample testing	The Addl. Chief Manager, Township Administrative Office, Neyveli	Dr. K. M. Bhat
16.	2006 July	Wood sample testing	The Addl. Chief Manager, Neyveli Lignite Corporation Ltd., Township Administrative Office, Neyveli	Dr. K. M. Bhat
17.	2006 July	Wood sample testing	The Addl. Chief Manager, Neyveli Lignite Corporation Limited, Township Administrative Office, Neyveli	Dr. K. M. Bhat
18.	2006 July	Wood sample testing	The Addl. Chief Manager, Neyveli Lignite Corporation Limited, Township Administrative Office, Neyveli	Dr. K. M. Bhat
19.	2006 July	Wood sample testing	The Divisional Forest Officer, Timber Sales Division, Punalur P. O.	Dr. K. M. Bhat
20.	2006 August	Wood sample testing	M/S Romko Umas Enterprises, 158, Valayamdevi Road, Neyveli- 607 802	Dr. K. M. Bhat
21.	2006 August	Wood sample testing	The Addl. Chief Manager, (Civil), Civil/MTCE/South Zone, Neyveli Lignite Corporation Limited, Township Administrative Office, Neyveli	Dr. K. M. Bhat
22.	2006 August	Wood sample testing	The Engineering Assistant (Civil), LIC India, Branch No.2, Thalassery, Kerala	Dr. K. M. Bhat
23.	2006 August	Wood sample testing	The Assistant Executive Engineer, Kerala State Housing Board, T.B.Road, Palakkad	Dr. K. M. Bhat
24.	2006 August	Wood sample testing	The Addl. Chief Manager, (Civil), Civil/MTCE/South Zone, Neyveli Lignite Corporation Limited, Township Administrative Office, Neyveli	Dr. K. M. Bhat
25.	2006 August	Wood sample testing	The Addl. Chief Manager, (Civil), Civil/MTCE/South Zone, Neyveli Lignite Corporation Limited, Township Administrative Office, Neyveli	Dr. K. M. Bhat
26.	2006 August	Wood sample testing	Oushadhi, The Pharmaceutical Corporation (India Medicines) Kerala Limited Kuttanellore, Thrissur 680014	Dr. K. M. Bhat
27.	2006 August	Wood sample testing	The Addl. Chief Manager, (Civil), Civil/MTCE/South Zone, Neyveli Lignite Corporation Limited, Township Administrative Office, Neyveli	Dr. K. M. Bhat
28.	2006 August	Wood sample testing	M/s. Jyothi ConstructionsE.15, A. Srinivasan Salai, Block – 20 Neyveli, Tamil Nadu	Dr. K. M. Bhat

29.	2006 August	Wood sample testing	The Assistant Engineer, Central Public Works Department, Trichur Central Sub Division No.1 Mundassery Memorial Building, Chembukavu, Thrissur – 680 020	Dr. K. M. Bhat
30.	2006 August	Wood sample testing	M/s. Romko Umas Enterprises, 158, Valayamadevi Road, Neyveli- 607 802	Dr. K. M. Bhat
31.		Wood sample testing	M/s Jothi Constructions, G. K. G. Road, Block – 20, Neyveli-3, Tamil Nadu	Dr. K. M. Bhat
32.	2006 August	Wood sample testing	Shri. V. K. Diksit, Assistant Director(WLP), Wildlife Sub-Regional Office, Southern Region, Kakkanad- 682 037, Cochin	Dr. K. M. Bhat
33.	2006 August	Wood sample testing	Dr. K. Gopalan, Dy. Production Manager, Quality in charge, Oushadhi, Kuttanellur	Dr. K. M. Bhat
34.	2006 August	Wood sample testing	M/s Sree Balaji Timbers, 119, Meenakarai Road, Zamin Uthukuli, Pollachi – 642 004	Dr. K. M. Bhat
35.	2006 September	Wood sample testing	The Assistant Engineer, Central Public Works Department, Kottayam Central Sub Division No.IV, Building No. 311, Ward No.VIII, Pathanamthitta, Kollam 691 008	Dr. K. M. Bhat
36.	2006 September	Wood sample testing	The Assistant Engineer, Central Public Works Department, Trichur Central Sub Division No.1, Mundassery Memorial Building, Chembukavu, Thrissur 680 020	Dr. K. M. Bhat
37.	2006 September	Wood sample testing	Shri. Jayamadhavan, A. Forest Range Officer, Wadakkanchery	Dr. K. M. Bhat
38.	2006 September	Wood sample testing	The Asst. Executive Engineer, Kerala State Housing Board, T. B. Road, Palakkad – 678 014	Dr. K. M. Bhat
39.	2006 October	Wood sample testing	OushadhiThe Pharmaceutical Corporation (India Medicines) Kerala Limited, Kuttanellore, Thrissur 680 014	Dr. K. V. Bhat
40.	2006 October	Wood sample testing	The Addl. Chief Manager (Civil), Civil/MTCE/South Zone, Neyveli Lignite Corporation Limited, Township Administrative Office, Block -10, Neyveli – 607 801, Tamil Nadu	Dr. K. M. Bhat
41.	2006 October	Wood sample testing	OushadhiThe Pharmaceutical Corporation (India Medicines) Kerala Limited, Kuttanellore, Thrissur 680 014	Dr. K. M. Bhat
42.	2006 October	Wood sample testing	Mr. K. RajuEngineering Contractor, No. 7, 100 Feet road, Ellaipillaichavadi, Pondichery – 605 005	Dr. K. M. Bhat

43.	2006 October	Wood sample testing	Capt. M. Prathapan, Consulting Engineer, 41, 2nd Cross street, Venkata Nagar, Pondicherry- 605 011	Dr. K. M. Bhat
44.	2006 October	Wood sample testing	Oushadhi, The Pharmaceutical Corporation (India Medicines) Kerala Limited, Kuttanellore, Thrissur 680 014	Dr. K. M. Bhat
45.	2006 November	Wood sample testing	Mrs. K. A. Vivek AyannaKannan Devan Hills Plantations CompanyPrivate Limited, KDHP HouseTea manufacture Department Munnar - 685 612	Dr. K. M. Bhat
46.	2006 December	Wood sample testing	The Assistant Commissioner (SIIB) Office of the Commissioner of Customs Customs House, New Harbour Estate, Tuticorin	Dr. K. M. Bhat
47.	2006 December	Wood sample testing	M/s Sree Balaji Timbers119, Meenakarai Road, Zamin Uthukuli, Pollachi – 642 004 Tamil Nadu	Dr. K. M. Bhat
48.	2006 December	Wood sample testing	The Addl. Chief Manager (Civil) Civil/MTCE/North Zone, Neyveli Lignite Corporation Ltd., Township Administrative Office, Neyveli – 607 801, Tamil Nadu	Dr. K. M. Bhat
49.	2007 January	Plant test	Shri. Somanathan, C.P.Panamketty House, Venmannad PostPavaratty, Thrissur	Dr. N. Sasidharan
50.	2007 January	Information regarding plants	Mr. M. Praveen Pharmacist Gr. II, Primary Health Centre, TholicodeThiruvananthapuram - 695 842	Dr. N. Sasidharan
51.	2007January	Availability of seedling	Mr. R. R. NairRavimangalam, Kuzhimattom P. O, Kottayam 686 533	Dr. R. C. Pandalai
52.	2007January	Wood sample testing	The Addl. Chief Manager/CivilCivil/ Maintenance/North ZoneTownship Administrative OfficeNayveli - 607 801, Tamil Nadu	Dr. K. M. Bhat
54.	2007 January	Wood sample testing	The Asst. Engineer Central Public Works Department Kottayam Central Sub – Division V, CPWD, Kollam – 691 008	Dr. K. M. Bhat
55.	2007 February	Identification of the material object	Sri. Johny A. M (PC 7196) Kothamangalam Police Station	Dr. K. K. Ramachandran
56.	2007 February	Wood sample testing	The Assistant Engineer, Puthenchira Grama Panchayat, Puthenchira P. O. Irinjalakkuda via, Thrissur Dist.	Dr. K. M. Bhat
57.	2007 February	Wood sample testing	The Asst. EngineerCentral Public Works DepartmentKottayam Central Sub – Division No. IIPublic Library Building, Sastri RoadKottayam – 1	Dr. K. M. Bhat

58.	2007 March	Wood sample testing	M/s. Nagpal Builders, NH 47 Bypass, Palarivattam, Kochi – 24	Dr. K. M. Bhat
59.	2007 March	Wood sample testing	The Executive Engineer, Kerala State Housing Board, Palakkad Division, T. B. Road – 678 014	Dr. K. M. Bhat
60.	2007 March	Wood sample testing	The Assistant Executive Engineer, LSGD Sub Division, Vellangallur, Thrissur	Dr. K. M. Bhat
	2007 March	Wood sample testing	The. Addl. Chief Manager / Civil South DivisionTownship Administrative Office, Block – 10, N. L. C. Ltd. Neyveli – 607 801, Tamil Nadu	Dr. K. M. Bhat

Training Programmes Conducted

Sl. No.	Year	Month	KFRI Project No.	Title	Sponsor
1	2006	19-28 April	Ext/83/06	Experimental designs in forestry research	Tamil Nadu Forest Department
2	2006	16-25 May	Ext/85/06	Cultivation and management of teak	ITTO + PRIVATE
3	2006	15-Sept.	Ext/93/06	Biodiversity documentation, evaluation and monitoring	MoEF, New Delhi
4	2006	13- 17 Nov.	Ext/98/06	Conservation and development of medicinal plants and benefit sharing with local communities	MoEF, New Delhi
5	2006	26Nov. 2 Dec.	Ext/100/06	Study tour of two officials from Myanmar under 'Strengthening capacity and upgrading the Forest Research Institute, Yezin'	FAO(India), New Delhi
6	2006	11-20 Dec.	Ext/111/06	Forest seed management for production of superior planting stock	Andhra Forest Department
7	2007	3-12 Jan.	Ext/110 /07	Propagation, cultivation, management and post-harvest technology of bamboos and rattans	Andhra Forest Department
8	2007	4-11 Feb.	Ext/101/07	Tree farming in agroforestry systems and wastelands	Tamil Nadu Forest Department
9	2007	13-22 Feb.	Ext/112 /07	Modern trends in teak cultivation and management	Andhra Forest Department
10	2007	1-10 March	Ext/113 /07	Molecular and biotechnological techniques in tree improvement	Andhra Forest Department
11	2007	29March 7 April	Ext/109/ 07	Propagation, cultivation management and post-harvest technology of bamboos	ITTO-FRI yezin

Training in tree farming in agroforestry systems and wastelands

Visit of the trainees to Bambusetum

Exhibitions conducted

Sl. No.	Title of the exhibition	Period	Name of the Organization
1.	Thrissur Pooram Exhibition, 2006, Pooram ground Thrissur.	5 days (18.4.06 to 22.05.06)	Pooram Committee of Paramekkavu and Thiruvambadi Devaswoms, Thrissur.
2.	Shiva Temple ground, Ernakulam	8 days (10.10.06 to 17.10.06)	Swasraya Bharath Science and Technology Exhibition
3.	Peechi Fest Exhibition	3 days (24.11.06 to 26.11.06)	Govt. Higher Secondary School, Peechi
4.	Christ CollegeIrinjalakkuda	6 days (6.12.06 to 11.12.06)	Jubilee ExhibitionChrist College, Irinjalakkuda
5.	State Animal Husbandry Mela Exhibition	3 days (7.12.06 to 9.12.06)	Engadiyoor Grama Panchayath & State Animal Husbandry Department
6.	Kerala Karshika Mela	10 days (28.12.06 to 06.01.07)	Gandhiji Study CentreThodupuzha
7.	State Bamboo Fest at Malabar Shipping Festival	12 days (20.12.06to 31.01.07)	Swapna Nagari, Calicut
8.	Golden Jubilee Exhibition	5 days (8.01.07to 12.01.07)	GVHSS AlanallurMannarkkad
9.	Kerala Science Congress	3 days (30.01.07 to 01.02.07)	Dinesh Auditorium, Kannur

ACADEMIC PROGRAMME

The following students registered for Ph. D. during the year.

Sl. No.	Name	Guide	Topic	University
1	E. L. Linto	Dr. C. Renuka	Systematics and phylogeny of the tribe: Caryoteae (Fam: Arecaceae) in India.	FRI Univ.
2	K. Smitha John	Dr. M.P. Sujatha	Impact of organic matter management strategies on sequestration of soil carbon and productivity of teak plantations on ultisoils in Kerala.	FRI Univ.
3	S. M. Sujeesh	Dr. E.P. Indira	Breeding system of *Dipterocarpus bourdillonii* and *Humboldtia bourdillonii*- Two endemic tree species of Western Ghats	FRI Univ.
4	Sanjayan Kumar	Dr. P.K. Muraleedharan	Stakeholders' livelihood in Protected area: Economic trade-off in conservation of wildlife	FRI Univ.
5	Sandeep Nair	Dr. E. M. Muralidharan	Genetic diversity and conservation of some *Dipterocarpus* and *Humboldtia* species of the Western Ghats using biotechnological tools	Cochin Univ. Sci. Tech. (CUSAT)
6	Divya K. Das	Dr. K.K.N. Nair	Ecological analysis of the phytodiversity of Iringole Sacred Grove in the Western Ghats of Kerala State Using GIS	Cochin Univ. Sci. Tech. (CUSAT)

The following research scholars were awarded Ph. D. degree during 2006-07

Sl. No.	Name	Guide	Topic	University
1	Durai, V.	Dr. S. Sankar	An assessment of ecological stability and sustainable productivity in home garden agro forestry system in Kerala	FRI University
2	Nagesh Prabhu	Dr. J.K. Sharma	Studies on seed production areas of teak (*Tectona grandis* L. f.) in Kerala for their quality and nursery performance	FRI University
3	Abhilash, E. S.	Dr.A.R.R.Menon	Ecosystem analysis and vegetation mapping of Goodrical Range (Kerala) using remote sensing techniques	FRI University

SEMINARS/WORKSHOPS /SYMPOSIA ORGANIZED

In collaboration with the Institute of Land Management, Thiruvananthapuram, KFRI organized a one day seminar on Conservation and Management of Natural Resources for Environmental Protection of the Coastal Zone

Lighting the lamp

of Kerala. The Seminar was held at Peechi on 28 August 2006. The Seminar was inaugurated by Sri K. P. Rajendran, Hon'ble Minister for Revenue and was presided over by Sri Rajaji Mathew Thomas, MLA. Lectures were delivered by experts from several organizations like National Bureau of Soil Survey and Land Use Planning, Bangalore; Institute of Land Management, Thiruvananthapuram; Kerala and Tamil Nadu Forest Departments; Centre for Earth Science Studies, Thiruvananthapuram; M.S. Swaminathan Foundation, Chennai and KFRI, Peechi.

Address by Mrs. Niveditha P. Haran (IAS)

Dr. N. Sasidharan was the Course Director for the one week training for IFS Officers on Medicinal plant cultivation during 13-17, November 2006 at KFRI, Peechi.

Participants of the training Programme

Dr. N. Sasidharan arranged a three-day orientation workshop for the Research Fellows of MS Swaminathan Research Foundation, Kalpetta at KFRI during 31 May 2006-02 June 2006. Gave lectures on 'Principles of plant taxonomy and Herbarium techniques'.

A one day workshop on 'Water Harvesting' was held on 28 Feb. 2007 as a part of National science Day. The Workshop was organized by KFRI and KSCSTE, Thiruvananthapuram.

Inaugural address

The Workshop was attended by over 100 participants and was inaugurated by Sri. Rajaji Mathew Thomas, MLA, Kerala Assembly.

Training programme on Hpnpv application

A training programme on biological control of the teak defoliator using Hpnpv was organized for the benefit of the Forest Department staff of Konni in June 2006

Bioresource Nature Park in the KFRI Sub Centre

Kerala Forest Research Institute (KFRI) has initiated a programme to establish a Bioresources Nature Park with the financial assistance form the Department of Biotech-nology, Government of India, at the KFRI Sub Centre, Nilambur.

The Park was inaugurated on 12-02-2007 by Shri. Binoy Viswam, Hon'ble Minister of Forests, Government of Kerala, in a public function presided over by Shri. Aryadan Mohammed, MLA. The Park is located adjacent to the Teak Museum in Nilambur.

Inauguration of the park

The Park has conservation themes for the lower groups of plants (such as algae, bryophytes and pteridophytes), plants found in specialized ecological niches such as xerophytes (cacti and succulents) and hydrophytes (aquatic plants), beneficial plants (medicinal), ornamental and aesthetic plants (orchids) and endemic, rare, and threatened (RET) species. Propagules of over 700 species of plants have been collected and introduced in the thematic areas of the Park. Orchids, ferns, gymnosperms, palms, aquatic plants, xerophytes and succulents are assembled in the park.

Added cultural antiquity of the Park is a megalithic burial ground, dating 1800 to 2300 years back in history. Situated at one corner of the Park, these burials provide an opportunity to the visitors to learn more about the Megalithic civilization and the then culture. They also highlight the archeological and historical importance of Nilambur.

Bio-shield for protection of coastal areas - bamboo planting with people's participation

Inauguration of the planting programme

KFRI, Social Forestry Wing of Kerala Forest Department and Eriyad Grama Panchayath jointly initiated a programme for establishment of Bio-shield. Bamboo planting with people's partici-pation was taken up as part of this programme. On an experimental basis, a stretch of 1 km was planted in two rows with seven bamboo species behind the Casuarina belt already established during the previous year at Munackal Beach, Eriyad Panchayath, Trichur District. The progamme was inaugurated by Hon. Minister for Forests and Housing Shri Binoy Viswam at a function presided over by Hon. Minister for Revenue Shri. K. P Rajendran at Munackal, Eriyad Panchayath on 25th August 2006.

MAJOR EQUIPMENTS PROCURED

During the year new facilities were established and some more equipments were procured for different laboratories. The notable among them were the following:

Particle size analyzer

A Particle Size Analyzer was acquired for the Instrumentation Division. The equipment is suitable for measurement of particle size of all types of powders in dry, wet, aerosol and spray modes. The instrument is based on diffraction technique with a parallel beam Optics. It has a multi e semiconductor as the detector. The measuring range is 0.1 to 875 microns.

A sophisticated Leica research microscope (DM2500) with high resolution and image analysis attachment (DFC 420) was acquired for Wildlife Biology laboratory of FEBC Division.

Six numbers of Automated Weather Stations were acquired for SNPFM division to monitor the weather parameters such as temperature, relative humidity, rainfall, solar radiation, wind direction and wind velocity at hourly intervals.

Leica research microscope

The weather stations have been established at remote locations in different parts of Kerala. Weather data collected automatically by the stations is transmitted through satellite communication network. These data are then uploaded

Automatic weather station

into the KFRI website for public use. The uploading and updation of the weather data in the website is done by the SNPFM Division.

A few smaller equipments were also aquired for Non-Wood Forest Products Discipline for establishing facilities for phytochemical analysis. The following are the equipments added.

Gel Electrophoresis: The system is used to isolate and characterize macromolecules depending upon their molecular weight and three dimensional structure.

Fraction collector: Fraction collector will

Rotary Evaporator and Fraction Collector

accurately collect up to 80 fractions, at a flow rate of up to 40 ml/min. Fraction collector is spill-proof and solvent resistant.

Rotary Evaporator: It is used for distillation and vaporization of solvents and recrystallization.

KERALA FOREST SEED CENTRE

The Kerala Forest Seed Centre (KFSC) established during 2002-04 under the the Kerala Forestry Project aided by World Bank has made good progress during the fourth year of its operation. KFSC has been receiving a number of requests from other states and a few from overseas for the supply of quality seeds. There has been greater demand for seeds of teak and a few other medicinal plants.

During 2006-07 teak seeds from all the six research ranges of the Forest Department were

Seed drying shed

brought to KFSC and tested for viability and germination percentage. Simultaneously the seeds were cleaned and size-graded for temporary storage and at a later stage supplied back

Seed drying

to different ranges for their nurseries. Totally around 16 tonnes of seeds were processed and supplied to the Forest Department. Seeds of about 30 different species of forest trees were collected and processed for sale. Visitors and trainees from other organizations as well as students from different universities were briefed about the activities of the Seed Centre and were given hands on training in different seed handling methods.

BALANCE SHEET AS AT 31st MARCH. 2007

KERALA FOREST RESEARCH INSTIIUTE - PEECHI

LIABILITIES	SCH	31/03/2007	31/03/2006	ASSETS	SCH	31/03/2007	31/03/2006
GENERAL FUND	I	52507475.00	52507534.00	FIXED ASSETS	VII	82746953.05	70966088.12
CURRENT LIABILITIES	II	13546812.01	11545181.00	ADVANCE FOR CAPITAL ASSET		4608561.00	0.00
UNSPENT BALANCE OF GRANT FROM GOVT OF KERALA	XV	0.00	16149339.76	CURRENT ASSETS	VIII	38606817.00	35488941.97
BALANCE OF EXTERNAL PROJECT	III	10191315.09	13935149.68	LOANS & ADVANCES	IX	775860.80	889882.80
CONSULTANCY PROJECT	IV	0,00		EXTERNAL PROJECTS:			
				CURRENT ASSETS	X	0,00	0,00
CORPUS FUND	V	0.00	0,00	LOANS & ADVANCES	XI	0,00	0.00
RESERVES & SURPLUS:	VI			CONSULTANCY PROJECTS:			
CAPITAL RESERVE CREATED ON ACQUISITION OF FIXED ASSETS		81813665.99	63081529.17	OVERSPENT BALANCE OF CONSULTANCY CONSULTANCY PROJECTS	IV	164576.50	172128.00
WORK IN PROGRESS		5541849.00	0.00	CURRENT ASSETS	XII	0,00	0,00
OTHER RESERVES & SURPLUS		390423,00	390423.00	LOANS & ADVANCES	XIII	0.00	0,00
				CORPUS FUND:	V		
				TERM DEPOSIT WITH BANKS		5104409.70	4240574.70
				INCOME & EXPENDITURE	XIV	31984361.90	45851541.02
TOTAL		**163991540.09**	**157609156.61**	**TOTAL**		**163991540.09**	**157609156.61**

EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st MARCH, 2007

KERALA FOREST RESEARCH INSTIIUTE - PEECHI

EXPENSES	Sch	31/03/2007	31/03/2006	INCOMES	Sch	31/03/2007	31/03/2006
Salaries Allowances	A	29383898.00	28119734.00	Grant from Government	F	36000000.00	29482614.24
Staff Expenses	B	3832551.00	2078444.00	Receipts from Corpus Fund		0.00	0.00
Establishment Expenses	C	4054237.00	4152782.00	Prior Period Income		0.00	0.00
Administrative Expenses	D	610460.00	628363.00	Other Receipts	G	11386768.16	9396581.51
General Expenses	E	1447049.80	1008710.75				
Expenses of out of Plan fund		5767327.00	2891162.00	Proportionate amount transferred from Plan Fund Account towards Revenue expenditure incurred out of Plan Fund	*	5767327.00	0.00
Revenue expenses for External Projects		20113927.21	43865481.96	Proportionate amount transferred from External projects Grant received Account towards Revenue expenditure incurred for External projects	**	20113927.21	43865481.96
Depreciation w/off		10412391.14	6817136.39	Proportionate amount transferred from Capital Reserve Account towards depreciation w/off. in the Income & Expenditure Account		10412391.14	6817136.39
Excess of Income over Expenditure		8058572.36	0.00	Excess of Expenditure over income		0.00	0.00
TOTAL		**83680413.51**	**89561814.10**	**TOTAL**		**83680413.51**	**89561814.10**

INTERNAL COMMITTEES

To implement various programmes and activities in the Institute various committees have been functioning.

1. CONSULTATIVE GROUP FOR FORESTRY RESEARCH MANAGEMENT (PROGRAMME ADVISORY GROUP)

(vide Council (M) Order No. 45/2003/ KSCSTE dated, Thiruvananthapuram, 12-11-2003 &

Council (M) Order No.104/06/KSCSTE dated, Thiruvananthapuram, 15-3-2006)

1. The Principal Chief Conservator of Forests -Chairman
2. The Additional Principal ChiefConservator of Forests - Member
3. The Chief Conservator of Forests (Planning & Research) - Member
4. The Chief Conservator of Forests (Wildlife) - Member
5. The Chief Conservator of Forests (Tribal Welfare & Economic Development) - Member
6. The Chief Conservator of Forests (World Bank Projects) - Member
7. The Chief Conservator of Forests (Development) - Member
8. The Chief Conservator of Forests (Protection) - Member
9. The Chief Conservator of Forest (FMIS) - Member
10. The Chief Conservator of Forest (HRD) - Member
11. The Chief Conservator of Forest (Administration) - Member
12. The Chief Conservator of Forest (Vigilance) - Member
13. The Chief Conservator of Forest (Social Forestry) - Member
14. The Regional Chief Conservator of Forests (North) - Member
15. The Regional Chief Conservator of Forests (South) - Member
16. The Conservator of Forests Biodiversity) - Member
17. The Conservator of Forests - Member
18. The Deputy Conservator of Forests (Research) North - Member
19. The Deputy Conservator of Forests (Research) South - Member
20. The Managing Director, Kerala Forest Development Corporation - Member
21. The Associate Dean, Forestry Faculty, Kerala Agricultural Univ. - Member
22. The Director, Tropical Botanic Garden & Research Institute, Palode - Member
23. The Director, Institute of Forest Genetics & Tree Breeding, Coimbatore - Member

24. The Managing Director, Oushadi, Thrissur - Member
25. The Director, Centre for Earth Science Studies - Member
26. The Director, Centre for Water Resources Development & Management - Member
27. The Director, Rajiv Gandhi Centre for Biotechnology - Member
28. 'URAVU' Wynad (N.G.O.) - Member
29. The Director, Medicinal Plant Research Centre, Arya Vaidya Sala Kottakkal - Member
30. The Managing Director, Hindustan Newsprint Ltd., Kottayam - Member
31. The Managing Director, Kerala State Wood Industries Ltd., Nilambur - Member
32. The Managing Director, Kerala State Bamboo Corporation Ltd. - Member
33. The Director, Salim Ali Centre for Ornithology and Natural History Coimbatore - Member
34. Director, Kerala Forest Research Institute, Peechi Member - Member
35. Research Co-ordinator, Kerala Forest Research Institute, Peechi - Member
36. Programme Co-ordinator, Training & Extension Division, KFRI -Convenor

Functions:

i. Advise the Institute to address problems of applied value and relevant to the Forest Department and wood based industry.
ii. Consider and recommend appropriate actions and permission required by KFRI scientists from the Forest Department for conducting field studies.
iii. Identify forest officials from the Forest Department in specific research projects where KFD's collaboration is required for successful implementation of a field-based study.
iv. Facilitate transfer of technology from KFRI to Forest Department and other stakeholders.

2. PURCHASE COMMITTEE

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

A Purchase Committee with the following structure is constituted for the purchase of recurring and non-recurring items.

One Scientist For above:
Dr. RV Varma - Chairperson

One Scientist nominated by the Director
Dr. Jose Kallarackal - Member

Registrar - Convener

Procedure:

Each R&D centers will have a Purchase Committee, which consists of two Scientists (one not below the rank of Scientist F Grade) and Administrative Officer/Registrar/Controller of Administration. The Scientist not below the rank of F Grade will head the Committee. The Purchase Committee shall take a decision based on the price quoted as well as the quantity of the item required. The Administrative Officer/ Registrar/Controller of Administration shall sign the purchase order as per the rate approved by the Purchase Committee. A register of suppliers shall be maintained showing the names and address of suppliers and perfor-

mance details shall be recorded in the said register. Enquires in writing shall be send to all the suppliers whose name is listed in the Register of Suppliers. The quotationer should keep the quoted rates form for a period of one year.

The maximum amount that can be incurred for the purchase of a single item is Rs.10 lakh by the Purchase Committee. The Director will be the approving authority of the purchase. For the item above Rs.10 lakh but below Rs.50 lakh the Purchase Sommittee shall have an external member in the Purchase Committee. The Mana-ging Committee will be the approving authority. Any item costing more than Rs.50 lakh, should be referred to the Executive Committee of the Council for approval.

Any amendments to Financial Rules shall be made with the approval of the Executive Committee of the Council.

3. COMMITTEE TO PREVENT SEXUAL HARASSMENT ON WOMEN AT KFRI

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

1. Dr. KK Seethalakshmi, Scientist, KFRI - Chair Person
2. Dr. EJ Maria Florence, Scientist, KFRI - Member
3. Mrs. K Annapoorni, Confidential Asst., KFRI - Member
4. Dr. K Jayaraman, Scientist, KFRI - Member
5. Dr. KC Chacko, Scientist, KFRI - Member
6. Mrs. Seetha Sadanandan - Member
   C/o Kudumbasree State Poverty Eradication Mission
   Ward 16, Cheenikkadavu, Kannara
   Panancherry Panchayath, Trichur Dist.
7. Mrs. VK Leela, Section Officer, KFRI - Member Convener

Functions:

1. To receive complaints from the staff on sexual harassment.
2. To examine and enquire into the matter and report the findings to the Director for necessary action.

4. FOREST SEED CENTRE ADVISORY COMMITTEE

Director	- Chairperson
Conservator of Forests (WP & RC), KFD	- Member
Conservator of Forests (Central Circle), KFD	- Member
Research Coordinator, KFRI	- Member
Silvicultural Research Officer (North), KFD	- Member
Silvicultural Research Officer (South), KFD	- Member
Silviculturist, KFRI	- Member
Charge, FSC	Scientist-In- - Convenor

Functions

1. To monitor the working of the FSC, and advise on smooth functioning of the Seed Centre.
2. To fix price for seeds.
3. To promote sale and export of seeds

5. COMMITTEE OF PROGRAMME COORDINATORS (CPC)

Chairperson	Director
Members	All Programme Coordinators
	Scientist-in-charge, Nilambur Sub Centre
	Officer-in-charge, FRC, Veluppadam
Invitees	Dy. Registrar (Admn.)
	Dy. Registrar (Fin.)
	Engineer
Convenor	Registrar

Functions

i. Discuss common issues related to research and administration and issues pertaining to Programme Divisions/Sub Centre.
ii. Any other matter relating to the conduct and administration of research in the Institute.

Procedure

i. Meetings will be held once a month, preferably in the first week provided there are agenda items to be considered.
ii. The Convenor will prepare the agenda and minutes and have them approved by the Chairperson.

6. INTERNAL RESEARCH GROUP (IRG)

Director	- Chairperson
Dr. KC Chacko	- Convenor
Dr. UM Chandrasekhara	- Associate Convenor
All scientific staff	- Members

Functions

i. Presentation and Discussion on concept notes/ new project proposals
ii. Review of Research Projects under implementation
iii. Presentation and discussion of final report of completed projects
iv. Discussion of any other matter concerning research projects, subject to prior approval of the agenda item by the Chairperson.

Procedure

i. Normally, meetings will be held once a month, preferably during the first week, but special meetings may be convened whenever required, on due notice. The Convenor may also invite other interested persons to attend the meeting.
ii. The Convenor will prepare minutes of the meeting and circulate to all the members with the approval of the Chairperson.

7. BUSINESS DEVELOPMENT GROUP

Director	- Chairperson
Dr. KM Bhat	- Working Chairperson
Dr. KC Chacko	
Dr. S Sankar	
Dr. VV Sudheendrakumar	
Dr. M Balagopalan	
Dr. KK Seethalakshmi	
Dr. KV Sankaran	- Convenor

Functions

The main functions of the Group will be to facilitate transfer of technology to end users as well as commercialization of technology through entrepreneurs for generating revenue for the Institute.

As a result of problem solving research carried out in KFRI the outcome of quite a few of the research investigations (root trainer technology, composting technology, suitability of a clone or tree species, fertilizer dosage, fungicide/pesticide dosage for controlling diseases/pests, wood preservative treatment, etc.) find field applications for the benefit of Forest Department as well as other end users. Since whatever recommendation or the technology is transferred is very crucial from the point of view of the Institute's credibility, it is essential that all such field based technolo-gies/recommendations are rigorously screened before they are actually transferred or recomm-ended. The Group will evaluate the technol-ogy developed or proposed recommendation.

Procedure

i. The Group will meet as and when required. The Working Chairperson, with prior approval of the Director, will have an authority to call for a meeting of the PIs concerned whose projects have come out with field based recommendations.
ii. The PI will forward all the details (eg. Statistical design, treatments, sample size, data sheets, etc.) pertaining to the proposed recommendation to the Convenor who in consultation with the Chairperson will convene a meeting.
iii. The PI who has proposed the transfer of technology/field based recommendation will also attend the meeting as a special invitee to present the details of the technology developed/ recommendation before the committee.
iv. The Group may also visit field site/experimental areas to ascertain the effectiveness of the proposed recommendation.
v. The Chairperson may constitute a subcommittee including the PI and the Convenor for further rigorous screening of the technology/recommendation.
vi. Based on the recommendations of the Committee, appropriate actions will be taken by the Institute for transferring the technology or field based recommendation to user agencies/entrepreneurs for commercialization.
vii. In the case of commercialization the Group will evaluate the technologies developed, having wider applications for commercialization through entrepreneurs through entrepreneurs and other industrial parties.
viii. The Chairperson may invite expression of interest from entrepreneurs through media/ website and negotiate and shortlist the parties who are interested to taken up the technology for commercialization.
ix. The Group will prepare a draft MOU in consultation with the party taking into account the financial aspects and IPR aspects.
x. The draft MOU will be placed in the Management Committee of the Institute for approval.
xi. The final MOU will be sent to the Council for final approval.
xii. The Director will be authorized to sign the MOU on behalf of the Institute.
xiii. The Convenor will prepare minutes of the meeting and circulate to all the members with the approval of the Chairperson.

8. PROGRAMME PLANNING AND EVALUATION GROUP (PPEG)

Director	- Chairperson
Dr. R Gnanaharan	- Working Chairperson
Dr. K Jayaraman	
Dr. Jose Kallarackal	
Dr. PK Muraleedharan	
Dr. RV Varma	
Dr. KC Chacko	
Dr. George Mathew	- Convenor

Functions

i. To plan activities, programme of the Centre as per the approved priority areas of research in coordination with RME and forward the proposals to the Director for necessary clearance/appro-val of CGFRM and RC.
ii. To have interface with development agencies and sponsors to secure financial assistance.
iii. To facilitate formulation and submission of research proposals to appropriate sponsoring agencies.

iv. Prepare a detailed database on state, national and international sponsoring agencies, including their priority areas of research, proforma for submission of the proposal, type of funding and funding limit, contact person/Department and any other specific requirements for submission of proposals and share the information with the scientists through LAN and internal workshops.
v. Organise project cycle management workshop involving scientists concerned and other Stakeholders/Forest Department and undertake objective analysis, output analysis, stakeholder analysis to develop project proposals and identify project coordinators.
vi. To assess the workload of scientists giving thrust to sponsored projects, and monitor and evaluate progress of work in coordination with RME and suggest corrective measures to the Director.

Procedure

i. The Working Chairperson will have an authority to call for a meeting with the prior approval of the Director.
ii. The Group will meet as and when required but atleast once in a quarter and keep the Director informed of the meeting through the minutes of the meeting.
iii. The database generated on sponsoring agencies will be provided to scientists through LAN.
iv. The Group will hold discussion with the Scientist individually or in group for activities related to project identification and development and monitoring and evaluation of progress of work.

The Convenor will prepare minutes of the meeting and circulate to all the members with the approval of the Chairperson/Working Chairperson.

9. FORESTRY TRAINING ADVISORY COMMITTEE

Director	- Chairperson
Dr. KC Chacko	- Working Chairperson
Dr. CN Krishnankutty	
Dr. KK Ramachandran	
Dr. EA Jayson	
Dr. P Vijayakumaran Nair	
Dr. V Anitha	- Convenor

Functions

i. Evaluate the training needs of various stakeholders in India and other underdeveloped/developing countries.
ii. Prepare a database of various training pogrammes offered by various agencies in forestry/tropical forestry, their course content, fee structure, duration, etc.
iii. Identify appropriate training programmes with yearly schedule, course content, fee structure, duration, etc., which can be offered at KFRI; develop a format for application.
iv. Take necessary steps to publicise the training programmes to be offered by KFRI globally through internet, Newsletter, newspapers, personal invitation, etc.
v. Contact the sponsoring agencies for tieups for providing financial assistance to prospective participants/trainees.
vi. Screen and process requests/applications for training programmes.
vii. Evaluate the training programmes offered by KFRI for their quality and effectiveness.
viii. Identify qualified resource persons and co-ordinators and take necessary action to obtain their willingness.
ix. Oversee the preparation of course materials by the resource persons.

Procedure

i. The Committee will meet as and when required but at least twice a year.
ii. The Committee will take appropriate necessary actions to facilitate implementation of effective training programmes in the Institute, including infrastructure development.
iii. The Convenor will prepare minutes of the meeting and circulate to all the members with the approval of the Chairperson/Working Chairperson.

10. INTELLECTUAL PROPERTY RIGHTS, PATENT AND MATERIAL TRANSFER COMMITTEE

Dr. VV Sudheendrakumar - Chairperson
Dr. Muktesh Kumar
Dr. N Sasidharan
Dr. EM Muralidharan - Convenor

Functions

i. Acquire all available information/literature/procedures on IPR and patenting and make them available to scientists as and when required.
ii. Keep scientists abreast of new developments in the field of IPR and patenting.
iii. Identify new technologies developed by KFRI which can be patented with the help of scientists concerned.
iv. Facilitate filing of patent applications by the Institute.
v. Pursue patent applications at national or international level.
vi. Facilitate material transfers for research purposes to other research organizations through agreements/memorandum of understandings to safeguard Institute's interests.

Procedure

i. The Committee will meet as and when required and identify the new technologies which possibly can be patented.
ii. The Committee may also include a new technology for consideration for patenting as suggested by a scientist.
iii. The Committee will hold detailed discussions with the scientists concerned about the technology to be patented and gather details of the technology.
iv. The Chairperson will make a presentation on the technology/technologies tentatively selected in a special IRC. The scientists concerned will be present to provide details and clarifications.
v. The Committee will submit the final list of new technologies to Director for his approval.
vi. After Director's approval the Committee will obtain the necessary details of the technology in the prescribed format from the concerned scientist(s) and submit to Director for onward transmission to Patent Office.
vii. The Committee will pursue the application with the patent office and keep the Director informed of developments.
viii. The Convenor will prepare minutes of the meeting and circulate to all the members with the approval of the Chairperson.

11. TEAK MUSEUM & NATURE TRAIL ADVISORY COMMITTEE

Dr. RC Pandalai - Chairperson
Dr. KM Bhat
Dr. George Mathew
Dr. C Mohanan
Dr. K Swarupanandan
Dr. TV Sajeev
Scientist-In-Charge,
KFRI Sub Centre, Nilambur
Mrs. Sani Lookose, - Convenor
Teak Museum Curator

Functions

i. Review the overall activities and performance/functioning of the Teak Museum including Nature Trail.
ii. Consideration of requests from the Teak Museum Curator for implementing various activities/programmes.
iii. Advise the Teak Museum Curator with regard to functioning or taking up new activities and programmes.
iv. Make recommendations to Director for taking necessary actions with regard to functioning/improvements or new activities and programmes.

Procedure

i. The Committee shall meet as and when necessary but at least once in six months.
ii. Minutes of the Meeting along with observation/recommendations will be submitted to the Director for consideration and approval.

12. BUILDING COMMITTEE

Director - Chairperson
Registrar
Dr. R Gnanaharan
Dr. KC Chacko
Dr. RV Varma
Dr. Jose Kallarackal
Dr. S Sankar
Dr. C Mohanan
Mr. KR Mukundan, Engineer - Convenor

Functions

i. The Committee will take decisions on selecting the contractors after evaluating the expression of interest, work tenders, quotations, etc. A separate sub committee will be made responsible for this purpose, for reporting to the Committee.
ii. Before executing the agreements with the contractors the Committee will scrutinize the work plan, estimates, etc. and satisfy the conditions incorporated in the agreement.
iii. Committee will monitor the construction as well as infrastructure requirements of proposed works.
iv. In case any dispute arises during the course of planning and execution the Committee will take appropriate action deemed necessary.

Procedure

i. The Committee will meet bi-monthly or as and when necessary.
ii. The Convenor will prepare minutes of the meeting and circulate to all the members with the approval of the Chairperson.

13. EQUIPMENT/INFRASTRUCTURE DEVELOPMENT COMMITTEE

Dr. M. Balagopalan - Chairperson
Dr. Jose Kallarackal
Dr. M Balasundaran
Dr. P Vijayakumaran Nair
Dr. EM Muralidharan
Mr. ARR Rajan
Mr. KR Mukundan, Engineer
Mr. PP Sunny
Mr. UY John
Dy. Registrar (Admn)/ - Convenor
Supdt./OA (Purchase)

Functions

Equipment

i. Screening of requisitions for major items of equipments, computers and accessories,
ii. Examine necessity for the equipment/ furniture for the project and fund allotment in the project.
iii. Scrutiny of quotations and recommendation for acceptance.

iv. Recommendations for proper maintenance, upkeep and use of equipments.
v. To fix up charges for the use of equipments by outsiders

Infrastructure:

i. Screening of infrastructure needs of the staff, for civil works, furniture, phone, e-mail connection, furnishings, air conditioners, phone, e-mail connection, etc.
ii. To assess and evaluate infrastructure requirement of the Institute (Peechi, Nilambur, Palappilly)
iii. To give suitable recommendations to Director for his consideration and approval.

Procedure

i. Meetings may be arranged by the Convenor as and when necessary.
ii. The Convenor will prepare the minutes of the meeting including the decisions taken and communicate to the Director for consideration.

14. CONSULTANCY ADVISORY COMMITTEE

Dr. K Jayaraman - Chairperson
Dr. RV Varma
Dr. ARR Menon
Dr. Mammen Chundamannil
Dr. EP Indira
Registrar
PI of the proposed Consultancy project
Other scientists co-opted depending upon the subject requirement.
Dr. RC Pandalai - Convenor

Functions

1. To keep up to date records/database of Consultancies/Extension projects offered to the Institute by various clients.
2. To screen consultancy requests from clients and make recommendations to the Director, in due consideration of the Guidelines of the Council.

Procedure

i. The Committee shall meet as and when necessary. Four members shall make up the quorum.
ii. Recommendations will be submitted to the Director for consideration and approval.

15. Ph.D. PROGRAMME AND M.Sc. STUDENTS ATTACHMENT ADVISORY COMMITTEE

Dr. R Gnanaharan - Chairperson
Dr. RV Varma
Dr. M Balasundaran
Dr. EA Jayson
Dr. TK Dhamodaran - Convenor
Invitee(s) - Respective guide(s)

Functions

Ph.D.

i. Screen applications received for Ph.D. registration in due consideration of the guidelines issued by KFRI and the Universities concerned in this matter and make recommendations to the Director.
ii. Organize and approve course work of students
iii. Approve the schedule of attachment of part-time students at KFRI.
iv. Advise the Director on policy matters related to Ph.D. programme.
v. Organize Seminars by Ph.D. scholars every month in consultation with the Guides and Chairperson, Seminar Committee.

M.Sc.

i. Screen applications/requests for specialized trainings to fulfil M.Sc. degree in

specialized areas and select the candidates depending upon merit/interview.

ii. Assign the students to the scientists concerned and coordinate their activities.

iii. Evaluate the performance after the attachment and send the report to the College/University concerned.

Procedure

The Committee shall meet as and when necessary. Three members shall make up the quorum.

16. NEWSLETTER COMMITTEE

Dr. VV Sudheendrakumar - Editor
Dr. K Swarupanandan
Dr. TK Dhamodaran - Associates
Dr. M Sivaram
Mr. Subhash Kuriakose

Functions

i. Assembling and editing relevant material for the Newsletter

ii. Publication of the Newsletter once in six months

iii. Review of policies for publication and dissemination of the Newsletter.

Procedure

Information relating to the activities of the Institute, interim results of research projects, and other material of interest to practising foresters originating from research in KFRI or elsewhere, should be assembled, edited and published in the Newsletter on a regular basis during March and September of each year. All members of the staff may send materials to the Editor for consideration for publication in the Newsletter. Recommendation for imprving the effectiveness of the newsletter, based on periodic review of the policies and proce-dure, shall be sent to the Director for approval.

17. BIODIVERSITY TECHNICAL PROGRAMME COMMITTEE

Director - Chairperson
Dr. C Renuka - Working Chairperson
Dr. KKN Nair - Technical Programme Coordinator and Convener
Dr. Muktesh Kumar
Dr. K Yesodharan
Dr. KK Ramachandran
Dr. EA Jayson
Dr. P Padmanabhan
Dr. RV Varma
Dr. George Mathew
Dr. VV Sudheendrakumar
Dr. K Mohanadas
Dr. C Mohanan
Dr. EJM Florence
Dr. KV Sankaran
Dr. N Sasidharan
Dr. M Balasundaran
Dr. K Swarupanandan
Dr. ARR Menon
Dr. P Vijayakumaran Nair
Dr. PK Muraleedharan

18. BAMBOO AND RATTAN JOURNAL COMMITTEE

Director - Chairperson
Dr. R Gnanaharan - Editor-in-Chief/ Working Chairperson
Dr. C. Mohanan - Editor/Member
Dr. EM Muraleedharan - Editor/Member
Dr. K Sankara Pillai - Circulation Officer/Member
Dr. N Sarojam - Associate Circulation Officer/Member/ Convener

Functions

i. Maintain a database of Advisory Board members, peer reviewers, subscribers, etc.
ii. Correspond with Authors, Advisory Board Members, Peer reviewers and Printer.
iii. Call for articles and get them peer reviewed, edit them technically and send them to the authors for correction and forward the corrected copies to the printer for publishing.
iv. Maintain international quality and punctuality in bringing out four issues in a year.
v. Oversee the dispatch of the copies, off prints, etc.
vi. Get new subscribers and advertisers.
vii. Prepare annual budget during August/ September for the following year and forward to the Director.
viii. Submit a report of the activities to the Director six monthly and annually, including receipts and expenditure statements.
ix. For all purchase, printing, etc., follow Institute procedure and Rules of KS CSTE.
x. All the receipts and expenditure will be booked under a separate head "Bamboo and Rattan Journal"

Procedure

i. The articles received shall be assigned registration numbers and new files opened.
ii. The editorial team will meet regularly to decide the peer-reviewers to whom the manuscripts should be sent for review.
iii. The accepted articles will be edited, pages set and sent to the press.
iv. Galley proof will be sent to the authors along with copy right permission and off prints requests.
v. Each issue will be dispatched through bulk mailing system/operator.
vi. Invoices will be sent to the subscribers for renewing the subscriptions.
vii. The Committee will decide the tariff for advertisement and periodically review the tariff and subscription rate.

19. SEMINAR COMMITTEE

Dr. George Mathew - Chairperson
Dr. CK Soman
Mr. KH Hussain
Mr. PP Sunny
Mr. PK Thulasidas - Convenor

Functions

i. Organise lectures by scientists/research fellows of the Institute as well as invited experts on various subjects related to forestry.
ii. Organize debates and discussions on topics of multi-disciplinary interest.
iii. Organise presentation of talk by scientists who are proposing to attend national and international meetings.
iv. Suggest improvements and modifications in the presentation material.
v. Custodian of all audio-visual equipments in the Institute and their maintenance.
vi. Supervise maintenance and upkeep of Auditorium, Seminar Hall and Conference Hall and suggest modifications/ changes, if any required.
vii. Assist the organization of various Workshops, Meetings in the Institute.

Procedure

i. There shall be at least one Seminar once in three months.
ii. Invited speakers may be paid travel expenses and local hospitality when necessary, and a token honorarium, on prior approval of the Director.

iii. Seminar presentations by the participating Scientists will be organized as and when required.

20. LIBRARY & INFORMATION NETWORKING ADVISORY COMMITTEE

Mr. K Sankara Pillai - Chairperson
Dr. Jose Kallarackal
Dr. PK Muraleedharan
Dr. P Rugmini
Dr. C Mohanan
Mrs. N Sarojam
Mr. KH Hussain
Mr. AR Rajan - Convenor

Functions

i. Recommendations on general management policies of the Library.
ii. Review of the library and information services and recommendations.
iii. Review of requests and recommendations for purchase of books and documents and subscription to journals.
iv. Periodic check on the upkeep of the Library independently and report to Librarian/Director on actions needed.
v. Periodic updation of the website with new research activities, training programmes, human resource requirements/ positions available, tender notices, etc.

Procedure

i. Meetings may be arranged by the Convenor as and when necessary, but at least once in three months.
ii. The Chairperson shall communicate the minutes/recommendations to the Director for information/action.

21. AUDITORIUM, CONFERENCE/ LECTURE HALLS COMMITTEE

Engineer - Chairperson
Dr. CK Soman - Working Chairperson
Mr. PP Sunny
Mr. UY John

Functions

i. To oversee the upkeep, maintenance/ cleaning of Auditorium/all the Conference Halls/ Lecture Halls (including in the Extension & Training Centre) and their facilities (Airconditioning, Projectors and Public Address System).
ii. Keep a register for booking and allotting Conference/Lecture Halls on priority basis. The Auditorium and Main Conference Hall in the Administration will be booked only with the prior permission of the Director. No booking will be done for outside agencies without prior sanction of the Director.
iii. Mr. PP Sunny will be responsible for switching on of A/C units at least once a week with a log book (separately for Administration/ Conference Hall/ Lecture Halls).
iv. Dr. CK Soman will be custodian of LCD Projector and Mr. PP Sunny, of Public Address System.
v. Undertake repairs and annual maintenance as and when required; any damage noticed should be reported to the Director.
vi. Mr. UY John will be responsible for the cleanliness of premises of all the facilities (Auditorium, Conference Halls, Lecture Halls).
vii. The Booking Register and Log Book of airconditioner will be under the custody of Dr. CK Soman.

viii. To ensure that these facilities are not misused such as Conference Secretariat or meeting with visitors or lounge for eating food, etc.

22. ANNUAL REPORT COMMITTEE

Dr. N. Sasidharan - Chairperson
Dr. R. Gnanaharan
Dr. VV Sudheendrakumar
Dr. KV Bhat
Mr. PK Chandrasekhara Pillai
Registrar
Dr. CK Soman - Convenor

Functions

i. To compile information on progress of work in each research project, various aspects of research and other activities in a prescribed format for all the Divisions from RME, and Nilambur Sub Centre and Field Research Centre, Palappilly.
ii. To collect relevant information on Budget, fund allocation, expenditure, etc. from RME and Administration.
iii. Prepare a draft Annual Report by 30th June each year for approval of the Managing Committee.
iv. To get the Annual Report printed after the approval of the Managing Committee for circulation.

23. PUBLIC RELATIONS AND EXHIBITION COMMITTEE

Dr. Thomas P. Thomas - Chairperson
Dr. KV Mohammed Kunhi - Co-Chairperson
Dr. MP Sujatha
Dr. UN Nandakumar
Mr. P. Padmanabhan
Mr. PK Thulasidas
Mr. V Asokan
Mr. Subash Kuriakose
Mr. A Ramakrishnan
Mr. KK Ahmad
Mr. Antony
Mr. VP Ravindran - Convenor

Functions

i. Organize and participate in exhibitions to disseminate the research results generated in the Institute.
ii. Organize public lectures by eminent persons/scientists.
iii. Arrange press release, reports, TV interview, radio talks to publicize the research results/sanction of new projects and other matters of interest to forestry sector with the permission of the Director.

24. CAMPUS DEVELOPMENT COMMITTEE

Dr. RV Varma - Chairperson
Dr. RC Pandalai
Dr. C Mohanan
Dr. KK Ramachandran
Dr. UM Chandrasekhara
Mr.Chandrasekhara Pillai
Dr. UN Nandakumar
Dr. KV Bhat
Dr. K Yesodharan
Mr. KK Unni
Mr.V Asokan
Mr.T Prabhakaran
Mr.CK Vincent
Mr.KR Mukundan, Engineer - Convenor

Functions

i. To advise the Director on matters related to upkeep of the campus buildings,

gardens and surroundings at Peechi, Nilambur and Palappilly.

ii. To propose development plans for the Institute campuses.

iii. To scrutinize proposals put up by others and make recommendations to Director for approval.

Procedure

i. Meetings will be organized and site visits made as and when necessary.

ii. Recommendations of the Committee will be forwarded to the Director for consideration with a copy to Equipment & Infrastructure Development Committee for inputs/ observations.

25. SPORTS COMMITTEE

Dr. K Mohanadas - Convenor
Mr. KR Mukundan
Mr. K Sankara Pillai
Mr. CK Vincent

Functions

i. To organize sports and games.

ii. To coordinate with the State Forest Department in sports events.

26. CAFETARIA COMMITTEE

Dr. KV Sankaran - Chairperson
Dr. T Surendran
Dr. EJ Maria Florence
Mr. Thulasidas
Mr. PP Sunny
Mr. MC Mohandas
Dy. Registrar (Accounts)
Mrs. Mary Kuruvilla - Convener

Functions

1. Overall supervision of efficient functioning of the Institute Cafetaria, including maintaining hygiene and leanliness.
2. Oversee the pricing and quality of food.
3. To suggest menus depending upon requirement and demand.
4. To keep an inventory of all the items such as kitchen equipments, cookware, crockery, cutlery, etc. belonging to the Institute.
5. To facilitate repairs and maintenance work in Cafetaria.
6. To make suggestions and recommendations for improving the working of the Cafetaria.
7. To ensure prestigious ambience in the Cafetaria to suit the Research Institution.

LIST OF STAFF

There are 58 Scientific, 9 Technical, and 68 administrative staff in the Institute. Apart from this there are persons working on contract basis, project staff working for different research projects and security staff on contract basis.

Scientific Staff

Dr. R Gnanaharan, *Director*

No.	Name	Designation	Date of joining
1.	Dr. R. Gnanaharan, *Director*	Scientist –G	14-09-1979
2.	Dr. J. K. Sharma *Director till Jan 2007*	Scientist - G	13-11-1978
	Research Monitoring & Evaluation Unit		
3.	Dr. C.K. Soman	Scientist –B	06-12-1978
	Sustainable Natural and Plantation Forest Management		
4.	Dr. Jose Kallarackal, *Programme Coordinator*	Scientist –F	14-12-1987
5.	Dr. M. Balasundaran, *Scientist I/C(F), Biotechnoloy*	Scientist –EII	12-04-1979
6.	Dr. E.P. Indira, *Scientist I/C(F), Genetics and Tree Breeding*	Scientist –EII	28-02-1979
7.	Dr. K.K.Seethalakshmi, *Scientist I/C(F), Tree Physiology*	Scientist –EII	13-09-1979
8.	Dr. T. Surendran	Scientist –EII	30-07-1979
9.	Dr. R. C. Pandalai, *Registrar I/C Scientist I/C(F), Silviculture*	Scientist –EI	14-03-1983
10.	Dr. U.N. Nandakumar	Scientist –EI	23-03-1983
11.	Dr. E.M. Muralidharan	Scientist –EI	27-05-1991
12.	Dr. M.P. Sujatha	Scientist –EI	11-12-1987
13.	Dr. S. Kumaraswamy	Scientist-B	28-09-1998
14.	Mr. P.K. Chandrasekhara Pillai	SSA	18-10-1983
	Instrumentation		
	Dr. M. Balagopalan, *Programme Coordinator* *Scientist I/C(F), Soil Science*	Scientist –EII	14-03-1978
	Forest Ecology and Biodiversity Conservation		
15.	Dr. Renuka, C, *Programme Coordinator*	Scientist –EII	10-06-1977
16.	Dr. K.K.N. Nair, *Scientist I/C(F), Forest Botany*	Scientist –EII	26-08-1982
17.	Dr. P. S. Easa	Scientist –EII	16-08-1978
18.	Dr. K.K. Ramachandran, *Scientist I/C(F), Wildlife*	Scientist –EII	17-08-1978
19.	Dr. M.S. Mukteshkumar	Scientist –EII	18-09-1980
20.	Dr. E.A. Jayson	Scientist –EII	16-12-1981

21.	Dr. K. Swarupanandan, *Scientist I/C(F), Forest Ecology and Conservation*	Scientist –EI	20-07-1979
22.	Dr. U.M. Chandrashekara, *Scientist I/C, Nilambur Sub Centre*	Scientist –EI	15-07-1992
23.	Mr. P. Padmanabhan	Scientist –B	07-02-1979
24.	Dr. K. Yesodharan	Scientist –B	18-04-1980
25.	Mr. K.K. Unni	SSA	11-12-1978
	Forest Protection		
26.	Dr. R.V. Varma, *Programme Coordinator*	Scientist –F	28-10-1976
27.	Dr. George Mathew, *Scientist I/C(F), Entomology*	Scientist –EII	08-07-1977
28.	Dr. C. Mohanan, *Scientist I/C(F), Forest Pathology*	Scientist -EII	16-05-1979
29.	Dr. V.V. Sudheendrakumar	Scientist –EII	19-02-1979
30.	Dr. K.V. Sankaran	Scientist –EII	21-05-1982
31.	Dr. K. Mohanadas	Scientist –EI	01-06-1982
32.	Dr. T.V. Sajeev	Scientist -C	06-02-1997
	Forest Utilization		
33.	Dr. K. Mahabala Bhat, *Programme Coordinator*	Scientist –F	12-01-1979
34.	Dr. N. Sasidharan, *Scientist I/C(F), NWFP*	Scientist –EII	25-02-1977
35.	Dr. T.K. Dhamodaran	Scientist –EI	02-08-1982
36.	Dr. K.V. Bhat, *Scientist I/C(F), Wood Science and Technology*	Scientist –EI	31-05-1982
37.	Mr. P.K. Thulasidas	SSA	28-06-1984
	Forestry and Human Dimensions		
38.	Dr. P.K. Muraleedharan, *Programme Coordinator (In-Charge)*	Scientist –EII	24-05-1982
39.	Dr. S. Sankar	Scientist –F	19-09-1981
40.	Dr. C.N. Krishnankutty	Scientist –EII	24-09-1981
41.	Dr. Mammen Chundamannil	Scientist –EI	29-05-1982
42.	Dr. V. Anitha	Scientist –B	07-09-1998
	Forest Information Management System		
43.	Dr. K. Jayaraman, *Programme Coordinator*	Scientist –F	02-05-1984
44.	Mrs. P. Rugmini	Scientist –EII	17-11-1978
45.	Dr. P. Vijayakumaran Nair, *Scientist I/C(F), GIS*	Scientist –EII	01-11-1980
46.	Dr. A.R. R. Menon, *Scientist I/C(F),Remote Sensing*	Scientist –EII	19-09-1979
47.	Dr. M. Sivaram	Scientist –B	04-12-1998
	Extension and Training		
48.	Mr. K.C. Chacko, *Programme Coordinator*	Scientist –F	22-09-1977
49.	Dr. Thomas P. Thomas	Scientist –EII	31-12-1979
50.	Dr. E.J. Maria Florence	Scientist –EII	22-09-1980
51.	Dr. K.V. Mohammed Kunhi	Scientist –B	24-10-1994
52.	Mrs. Sani Lookose, *Curator, Teak Museum*	Scientist –B	07-08-2002
53.	Mrs. V.P. Raveendran	SSA	25-02-1993

	Library and Information		
54.	Mr. K. Sankara Pillai, *Librarian, Programme Coordinator (In-Charge)*	Scientist –C	05-07-1980
55.	Mr. A.R. Rajan, *Scientist I/C(F), LAN*	Scientist –EI	01-12-1978
56.	Mrs. N. Sarojam, *Asst. Librarian*	Scientist –B	06-07-1981
57.	Mr. K.H. Hussain	SSA	28-12-1981
58.	Mr. K.F. George	SSA	23-12-1994

Technical staff

No.	Name	Designation	Date of joining
1.	Mr. K.R. Mukundan	Spl. Grade Engineer	17-11-1980
2.	Mr. P.P. Sunny	Sr. Spl. Grade Technical Officer	23-04-1979
3.	Mr. U.Y. John	Spl. Grade Technical Officer	09-01-1981
4.	Mr. C.A. Jose	Sr. Spl. Grade Technical Assistant	07-05-1982
5.	Mr. D. Skariah	Spl. Grade Technical Assistant	01-09-1983
6.	Mr. K.C. Subramanian	Spl. Grade Technical Assistant	22-07-1985
7.	Mr. K.M.Velayudhan	Spl. Grade Technical Assistant	10-03-1986
8.	Mr. M.R. Anilkumar	Spl. Grade Technical Assistant	30-01-1989
9.	Mr. P.B. Sajeeva Rao	Spl. Grade Technical Assistant	30-01-1989

Administrative staff

No.	Name	Designation	Date of joining
1.	Mr. K. Thulaseedharan Nair	Registrar (on deputation leave)	15-03-2002
2.	Mr. P. Achuthankutty	PS to Director	03-01-1983
3.	Mrs. V.K. Leela	Sr. Section Officer	02-07-1979
4.	Mrs. K.N. Rajamma	Sr. Section Officer	02-07-1979
5.	Mr. M. Achuthan kutty	Internal Auditor	On Deputation
6.	Mr. A. Ramakrishnan	PA to Registrar	16-11-1977
7.	Mr. M.S. Sukumaran	Section Officer	09-01-1980
8.	Mr. V. Asokan	Sr. Office Superintendent	16-10-1976
9.	Mrs. K.M. Suseela	Sr. Assistant Office Manager	18-04-1980
10.	Mr. K. Rajendran	Assistant Office Manager	01-07-1986
11.	Mr. P.A. Sulaiman	Assistant Office Manager	12-08-2003
12.	Mr. K.A. Gopalan	Assistant Office Manager	20-05-1987
13.	Mrs. Mary Kuruvilla	Sr. Assistant Office Manager	07-07-1980

14.	Mrs. Sabitha Balakrishnan	Office Assistant	03-09-1999
15.	Mrs. Shirly Issac	Office Assistant	26-08-2003
16.	Mrs. K. Annapoorni	PA to Research Coordinator	12-07-1982
17.	Mrs. Grace Andrews	Spl. Grade Confidential Assistant	27-01-1987
18.	Mrs. T.V. Chandrika	Sr. Spl. Grade Typist	28-04-1980
19.	Mr. P.M.Venugopalan	Spl. Grade Typist	22-05-1978
20.	Mr. E.O. James Tidode	Spl. Grade Typist	31-01-1979
21.	Mr. M. Cherukunhan Nair	Sr. Typist	20-10-1976
22.	Mr. K.P. Manoj	Sr. Typist	28-08-1992
23.	Mr. T.M. Abdul Vahab	Sr. Word Processing Assistant	27-01-1989
24.	Mr. K.S. Karunakaran	Sr. Clerical Assistant	01-12-1978
25.	Mr. T. Prabhakaran	Sr. Clerical Assistant	23-10-1976
26.	Mr. T. Chandran	Sr. Spl. Grade Driver	19-10-1976
27.	Mr. P.I. Madhavan	Sr. Spl. Grade Driver	22-10-1976
28.	Mr. K. Girijavallabhan	Sr. Spl. Grade Driver	22-03-1977
29.	Mr. S. Shahul Hameed	Sr. Spl. Grade Driver	06-06-1977
30.	Mr. P. Mohandas	Spl. Grade Driver	06-08-1979
31.	Mr. T.C. Paul	Senior Driver	01-07-1994
32.	Mr. V.C. Chandran	Senior Driver	01-07-1994
33.	Mr. K.M. Mathen	Driver	31-03-2001
34.	Mr. M.C. Mohandas	Sr. Attendant	24-10-1977
35.	Mr. P.A. Sankarankutty	Sr. Attendant	30-01-1978
36.	Mr. K.R. George	Sr. Attendant	18-07-1978
37.	Mr. K.R. Sevaraman	Sr. Office Messenger	22-01-1979
38.	Mr. A.V. Velayudhan	Sr. Attendant	13-06-1979
39.	Mr. K.K. Ahammad	Sr. Attendant	02-08-1979
40.	Mr. P.S. Raman	Sr. Attendant	02-04-1980
41.	Mr. M.C. Reghunathan	Sr. Attendant	08-04-1980
42.	Mr. V.N. Balakrishnan	Attendant	24-07-1981
43.	Mr. K.C. Subramanian	Attender	06-10-1982
44.	Mrs. N. Baby	Attender	24-11-1995
45.	Mr. A.C. Antony	Sr. Attender	10-11-1982
46.	Mrs. Ricy Eliner Varkey	Computer LAN Assistant	02-03-2006
47.	Mrs. K.K. Vanaja	Helper	26-08-2003
48.	Miss. N. Aparna	Helper	23-08-2004
49.	Mr. P. Rajeesh	Helper	14-06-2000
50.	Mr. K. Syed Mohammed	Spl. Grade Watcher	24-07-1985
51.	Mr. K. Nanu	Spl. Grade Watcher	12-06-1986

52.	Mr. T.P. Padmanabhan	Sr. Cook	06-01-1981
53.	Mr. K.Mohanan	Sr. Ticket Vendor	09-11-1981
54.	Mr. C.K. Vincent	Sr. Gardener	17-12-1991
55.	Mrs. A.M. Lalitha	Sr. Helper	01-08-1986
56.	Ms. T.G. Chandrika	Sr. Helper	01-03-1988
57.	Mr. V.K. Mohandas	Sr. Helper	01-01-1992
58.	Mr. N.I. Thankappan	Sr. Helper	01-01-1992
59.	Mr. E.P. Ulahannan	Sr. Helper	01-01-1992
60.	Mrs. A.K. Ammini	Helper	03-01-1986
61.	Mrs. E.V. Thanka	Helper	03-11-1986
62.	Mrs. K.V. Bharathy	Helper	03-11-1986
63.	Mr. C.J. John	Sr. Helper	01-08-1986
64.	Mr. V. Mohammed Ali	Sr. Helper	01-08-1986
65.	Mr. P. Mohammed	Sr. Helper	01-08-1986
66.	Mr. C.P. Shoukathali	Sr. Helper	01-03-1986
67.	Mr. K. Mohammed	Sr. Helper	01-01-1992
68.	Mr. K.K. Mohammed	Helper	05-07-1994

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