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Restoration of *Dipterocarpus bourdillonii* and *Humboldtia bourdillonii*, two Critically Endangered Endemic Trees of the Western Ghats

Aimed at restoration of RET species in the Western Ghats, a major recovery study of *Dipterocarpus bourdillonii* and *Humboldtia bourdillonii* was taken up by the Institute. The main objective of the study was to enhance the genetic base of the natural populations of the species by enrichment planting of seedlings in their natural habitats. After reconnaissance visits to potential sites for field planting, eleven locations adjacent to the natural habitats of the plants were selected for planting. Planting stocks of the two species derived from the propagation studies were utilized for the restoration activities. Two-year old, 30 to 45 cm tall seedlings established in polybags were used for planting. The planting was carried out during the rainy season, (July-September) in 2010. Altogether, 1200 seedlings of *D. bourdillonii* and 300 seedlings of *H. bourdillonii* were planted *in situ*.

Seedling of *D. bourdillonii* transplanted at Karipponi (Mannarkad Range)

The seedlings of *Dipterocarpus bourdillonii* were planted in eight locations:

1. Urulamthanni (Neriamangalam Range)
2. Meenvallam (Mannarkad Range)
3. Karipponi (Mannarkad Range)
4. Kulamavu MPCA (Nagarampara Range, Idukki)
5. Valayamchal (Aralam WLS)
6. Azhuthakadavu, Ezhukumon, Periyar Tiger Reserve (W)
7. Ponnampara, Plappally (Goodrikkal Range)
8. Velithodu-Kochukoickal - Moozhiyar, (Goodrikkal Range)

The three *in situ* locations where seedlings of *Humboldtia bourdillonii* were planted were:

1. Kulamavu MPCA (Nagarampara Range, Idukki)
2. Azhuthakadavu, Ezhukumon, Periyar Tiger Reserve (W)
3. Ponnampara-Plappally (Goodrikkal Range)

In addition, seedlings of both the species were also planted in three *ex situ* locations as alternate genetic stock for the species: a) KFRI Arboretum at the Main Campus, Peechi, b) KFRI Field Research Center (FRC), Velupadam, and c) KFRI Sub centre,

Seedling of *D. bourdillonii* transplanted at the Arboretum at Peechi

Seedling of *H. bourdillonii* transplanted at Azhuthakadavu PTR (W)

Seedling of *H. bourdillonii* transplanted at FRC, Palappilly campus

Nilambur. Altogether, 150 seedlings of *D. bourdillonii* and 150 seedlings of *H. bourdillonii* were planted *ex situ*. Both in the *in situ* and *ex situ* sites, the establishment and survival of the seedlings were recorded six months after the planting. The seedlings of *D. bourdillonii* showed 60-65 % survival and a height increment from 5-20 cm in different locations *in situ*, compared to 75-80 % survival and 5-10 cm in height increment *ex situ*. On the other hand, seedlings of *H. bourdillonii* have shown 80-85 % survival both in *situ* and *ex situ*. The seedlings have shown moderate growth both *in situ* and *ex situ* conditions with a height increase of 5 to 12 cm. The growth of the seedlings is being monitored at frequent intervals.

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IMPORTANT VISITS

Dr. K. Kasturirangan, renowned Space Scientist, former member of the Rajya Sabha and member of the Planning Commission , Govt. of India visited KFRI on 30th January 2011. He visited various Laboratories, and had discussions with the Director on the research activities of KFRI.

Seed Treatment and Seedling Production in White Cedar

Dysoxylum malabaricum Bedd. ex Hiern in Hook.f. (White cedar-family Meliaceae) commonly known as Vellakil is endemic to the Southern Western Ghats. It is a canopy tree species of evergreen and semi-evergreen forests and attains an average height of 35 m and a girth of 57 cm. The wood is very useful for construction work, cooperage, railway carriages, oil casks, paneling, furniture, carts, etc. The decoction of the wood is used as medicine to treat rheumatism. It is also used in ayurvedic, folk and Sidhha medicines. Seeds of white cedar are recalcitrant. They have relatively high moisture content (30-50 %) at the time of maturity and possess a characteristic feature of losing viability during desiccation. Since the recalcitrant seeds are desiccation and chilling sensitive, they have serious storage problems. Flowering and fruiting season of white cedar extends from February to June. The right time for fruit collection is when the longitudinally furrowed capsules attain a bright yellow colour. Fruits falling on the forest floor are often affected by a Dipteran pest. Fruits are also consumed by wild animals and birds mainly Malabar giant squirrel and hornbill. Hence there is a need to collect seeds at the optimum maturation time from the tree itself and store them for the production of propagules for regeneration programs.

Fruit collection and germination

Fruits of white cedar should be collected from the standing trees and the extraction of seeds should be done immediately. Carefully remove the dark brown coloured fleshy seed-coat (de-coating) before sowing. The seeds are then sown in vermiculite medium and kept in germination chamber maintained at a temperature of 30°C and 85 % humidity. The germination medium should be provided with sufficient moisture. In order to control fungal infection, a suitable fungicide (Bavistin-1g/ 1L water) may be sprayed on the germination trays. Seed germination is epigeal in which the cotyledons are forced above the ground by the elongation of the hypocotyl. We observed that, the germination of de-coated seeds commenced 17 days after sowing and continued up to 45 days with 97 % germination. While in seeds with seed-coat, the germination commenced 34 days after sowing and continued up to 113 days with 14 % germination. The very low germination in seed-coat bearing seeds might be due to the fleshy coat itself. The freshly collected mature fruits with timely processed seeds are desirable for the production of saplings. The main step in seed processing is the removal of its seed-coat i.e., de-coating. The seed-coat bearing seeds are therefore not advised for the production of seedlings.

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DM- fruit

De- coated seeds

Seeds with seed coat

Sapling of *D. malabaricum*

KFRI Research Reports

Establishment of a butterfly garden in the Teak Museum Complex, Nilambur for promoting eco-tourism and public awareness on nature conservation

KFRI Research Report No. 344 (George Mathew, Sajeev, T.V. and Mohanadas, K. 2010)

The role of Butterfly Gardens as a conservation cum environmental educational programme is well appreciated. With a view to achieve these objectives, a Butterfly Garden was set up in a 0.5 ha area of degraded moist deciduous forest patch in the Teak Museum campus of the KFRI sub center at Nilambur. As a result of introduction of butterfly host plants and enrichment of habitat, there was a tremendous enhancement in the butterfly population in the garden. Altogether, 50 species of butterflies were recorded from the area which included 8 species having protected status under the Indian Wildlife Act and another 6 species which are endemic to the Western Ghats. The beautifully landscaped garden with its rich butterfly fauna was an attraction to the public, particularly the students. Besides conserving the butterfly fauna, the garden was also a success in generating conservation awareness among the public.

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

KFRI Research Report No. 348 (Balasundaran, M. and Jayson, E.A. 2010)

DNA fingerprinting using microsatellite markers and genetic characterization of 43 captive Asian elephants (*Elephas maximus*) of Guruvayoor temple was carried out after standardizing a non-invasive method of DNA extraction from dung samples. Population genetics studies on wildlife community structure using DNA markers have been constrained in the past due to difficulties in obtaining tissue or blood samples for DNA extraction. The congregation of 65 elephants of Guruvayoor temple at Punnathur Elephant Camp was utilized for the study. These elephants of various geographic origin offered to the temple by devotees came from different regions of India. Dung samples collected from elephants within six hours after defecation gave complete success in DNA extraction, while 88 – 96 per cent success was obtained from three-day-old dung. Pure DNA was extracted using QIAamp DNA stool mini kit. Polymerase chain reaction (PCR) was carried out for amplifying three microsatellite loci, namely EMX 1, EMX 2 and EMX 3 using specific primers reported by Fernando for Asian elephants of Sri Lanka. Amplification products were electrophoresed on 6 per cent denatured polyacrylamide gel (PEG) and data were analyzed using the population genetics analysis software POPGENE.

Though DNA was obtained from dung samples of 62 elephants, we could amplify all the three microsatellite markers from 43 animals only. Five alleles were recorded for EMX 1 and EMX 2, while EMX 3 showed only two alleles. The genotypes of the 43 elephants were assigned as homozygous dominant, heterozygous and homozygous recessive. The geographic origins of only 27 animals were known. The 43 animals were grouped as populations of South India, Assam, Bihar and of unknown origin, and those brought from Andaman and Nicobar Islands. The genetic distance between the five populations ranged from 0.0044 to 0.3595. UPGMA dendrogram constructed

using genetic similarity showed that Bihar, Assam and unknown origin populations clustered into one group conforming to the geographic proximity of Bihar and Assam populations. The elephant populations from Andaman and Nicobar Islands and Assam origin showed the highest genetic distance while the elephants from Assam and those grouped as unknown origin showed the lowest genetic distance. South Indian population joined with the cluster comprising Assam, Bihar and unknown origin elephants. The Andaman population stood out as a separate group. The elephant population of Andaman was reported to be a mixture of various geographic origins. The mean observed heterozygosity is almost half that of expected heterozygosity indicating very high occurrence of inbreeding. Since the temple elephant population is not a natural population and the elephant identity is not based on documentary evidence, detailed analysis of the result has not been done.

Improving sandal population in Marayur sandal reserves through assisted natural regeneration

KFRI Research Report No. 349 (Balasundaran, M. 2010)

A field experiment was carried out for enhancing regeneration of sandal in Nachivayal II Sandal Reserve (NSR II) under Marayur Sandal Division. The mean number of seedlings of size 5-15 cm which appeared during a period of 12 months was 2.9 per plot. But, most of them perished during the one year period of observation itself due to disease and pest attack, browsing by cattle and excessive shade caused by weeds such as Lantana which smothered such natural seedlings. The average intensity of photosynthetically active radiation (PAR) at mid-day under Lantana thickets was 16.6 µmol $m^{-2}s^{-1}$ while in open area it was 1061 µmol $m^{-2}s^{-1}$ and in diffused sunlight i.e., under miscellaneous trees it was 127 µmol $m^{-2}s^{-1}$. Apparently light under Lantana is too low for plants to carry on photosynthesis and survive.

In sub-plot I having 853 mounds sown with seeds during 2006, the mortality of seedlings was 32.36 per cent during the first month, 10.15 per cent (of the surviving seedlings) during the second month, 44.35 per cent during the third month and 26.45 per cent during the fourth month. The cumulative per cent mortality at the end of second year was 95.4 per cent. The mean number of seedlings per mound was 1.76 at the end of second year in sub plot I. Seedling mortality was higher in subplot II having large number of miscellaneous trees with near closed canopy. The higher mortality was due to excess shade, severe insect and fungal attack, and water drops dripping from trees which displaced the sandal seeds and the germinating seedlings. The thorny bamboo fence erected around each mound could not deter deer, goats and gaur completely. Barbed wire fence fixed around 100 mounds using granite poles gave a better protection to the seedlings; but seedling growth above the height of such fence was also eaten by the large animals.

Seedling survival was more in open areas. Sandal required 75 to 25 % shade up to one year starting from germination (75%) till one year (25%) growth. Thereafter it required good sunlight. Host plants were needed from 3-5 months onwards; seedlings grew fast once they got connected with good host plants and optimum shade combination. The method of raising sandal seedlings on mounds and providing shade and host at appropriate time in localities free of browsing animals is a better option for enhancing sandal regeneration. In places with thick Lantana and other weed growth along with sandal trees, strip weeding and sowing seedlings on mounds, regulating shade and providing complete protection from animals through chain link fence will only promote regeneration.

Profuse flowering occurred in the seed stand; however, the seed set was poor. Lack of genetic diversity in seed stand was suspected as the probable reason for poor seed set. Therefore, ISSR marker profiling of sandal genotypes was carried out. DNA finger printing using ISSR markers showed identity of genotypes of closely located trees indicating that the trees were actually clones. Seventy per cent of trees were clones in one plot and 47 per cent in the other plot. The mean genetic diversity was poor (0.15 and 0.17 respectively) in the two plots. The clones might have arisen through root suckers induced by the Forest Department for enhancing regeneration. The practice of root sucker induction reduced genetic diversity and enhanced clonality in the plot. As sandal is a cross pollinated tree, clonality caused inbreeding and reduced seed setting. Lower genetic

diversity observed in the sandal reserve has long- term adverse effect on adaptability of sandal in the changing environment. Hence, this practice of root sucker induction in reserve forests has to be discontinued.

Qualitative and quantitative analysis of biologically active principles, baicalein, luteolin and psoralen from *Oroxylum indicum, Premna serratifolia, Aegle marmelos* and their allied species

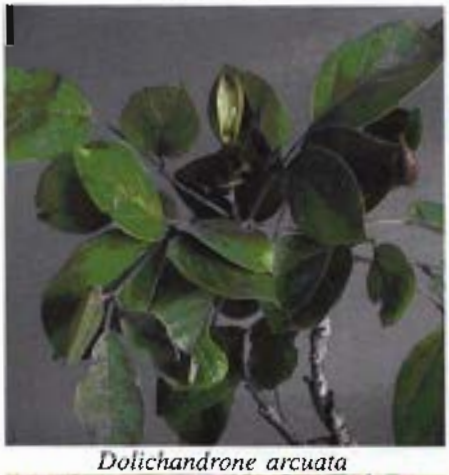
KFRI Research Report No. 350 (Sasidharan, N. 2010)

Analyses were made to detect the presence of baicalein, in *Scutellaria colebrookiana* and *S. violacea* (Lamiaceae), *Oroxylum indicum, Stereospermum colais, Stereospermum suaveolens, Dolichandrone arcuata, Radermachera xylocarpa* and *Millingtonia hortensis* (Bignoniaceae). *Premna serratifolia* (Verbenaceae) was analysed for the presence of luteolin. *Aegle marmelos, Clausena indica, Glycosmis pentaphylla, Murraya koenigii* and *Paramignya monophylla* (Rutaceae) were also subjected to phytochemical analysis to detect the presence of Psoralen. Among the plants studied, the baicalein content was detected in *Scutellaria colebrookiana, S. violacea* and *Oroxylum indicum*. As per the procedure followed, luteolin was not detected in *Premna serratifolia*. Among the five Rutaceae species screened, psoralen was detected in *Aegle marmelos* and *Murraya koenigii*. The presence of baicalein and psoralen was confirmed through Column chromatography, Spectrophotometry, Thin Layer Chromatography (TLC) and High Performance Liquid Chromatography (HPLC) analyses. Antioxidant properties of the selected species were analysed by scavenging the free radicals such as superoxide, hydroxyl radicals and lipid peroxidation generated by *in vitro* assay systems. Among the four species studied for antioxidant properties, *Scutellaria colebrookiana* and *S. violacea* showed significant free radical scavenging activities. Further, the stable

Oroxylum indicum

Stereospermum colais

Stereospermum suaveolens



Dolichandrone arcuata

Radermachera xylocarpa

Millingtonia hortensis

Scutellaria colebrookiana

Scutellaria colebrookiana

Scutellaria colebrookiana

free radical 1,1Diphenyl2 Picrylhydrazyl (DPPH) was effectively scavenged by chloroform and acetone extracts of the roots. The data obtained from *in vitro* antioxidant studies indicate that *Scutellaria colebrookiana* and *S. violacea* possess significant antioxidant properties. This preliminary data suggests the wide spectrum biological potentials of the two *Scutellaria* species. Though luteolin content in *Premna serratifolia* was reported earlier, it was not detected in the present study as per the procedures followed. However, the plant extracts showed significant antioxidant properties in *in vitro* assays.

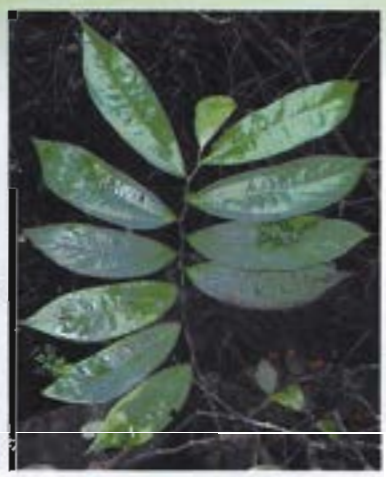
Ethnobotanical studies on the tribals of Palakkad and Malappuram Districts of Kerala, South India

KFRI Research Report No. 355 (Yesodharan, K. 2010)

Field surveys were carried out to study the ethnobotany of the tribals of Palakkad and Malappuram districts during the years 2003-2006. The aim of the study was to explore, collect, identify and preserve the wild and domesticated plants used by the tribals as food, fodder, medicine, oil, tannin, gum, small timber, fuel,

Piper longum

Ravuolfia serpentina



Thottea siliquosa

fibers, furniture, tools, musical instruments, etc. The data were collected from the tribals through participatory rural appraisal, questionnaire survey and interview. The eldest person and also tribal medicine men (Vaidyas) were contacted to collect data. Local names, plant parts used, botanical names of the plants, etc. are included in the report with regard to each plant. The specimens collected were identified with the help of floras and taxonomic revisions, monographs and other available field keys and incorporated in the herbarium of Kerala Forest Research Institute (KFRI), Peechi, Thrissur, Kerala, South India.

Establishment of *ex-situ* gardens of species of Dalbergia and monocotyledons in a bioresources nature trial in the Kerala part of Western Ghats

KFRI Research Report No. 356 (Chandrashekara, U.M. and Sasidharan, N. 2010)

The project was taken up to develop *ex-situ* gardens of monocotyledons and species of *Dalbergia* in the Bioresources Nature Trail located at Kerala Forest Research Institute Sub Centre campus, Nilambur. In a span of five years, about 1.5 ha area adjacent to the Teak Museum in the KFRI Sub centre has been transformed into a palm and rattan garden which harbors 14 indigenous and 30 exotic species. Among indigenous species planted in the garden, *Calamus vattayila* is endemic to the South India whereas species like *Arenga wightii*, *Calamus lakshmanae*, *Calamus metzianus* and *Pinanga dicksonii* are endemic to the Western Ghats. *Bentinckia condapanna*, *Calamus dransfieldii*, *Calamus nagbettai* and *Calamus travancoricus* are endemic to the Southern Western Ghats. Species lilke *Arenga wightii*, *Calamus longisetus*, *Calamus nagbettai and Pinanga dicksonii* fall under the category of vulnerable in the IUCN Red List. Similarly, species like *Bentinckia condapanna*, *Corypha umbraculifera* and *Korthalsia lacioniosa* fall under the category of rare species. Over 198 species belonging to monocotyledon families (other than palms and rattans) were planted in different theme areas such as bamboo garden, orchid house, medicinal plant garden, hydrophyte garden, and xerophyt and succulent gardens. Among them, species like *Ochlandra travancoria*, *Pseudoxytenanthera ritcheyi*, *P. stocksii*, *Gastrochilus flabelliformis* and *Curcuma neilgherrensis* are endemic to the Western Ghats. On the other hand, species such as *Ochlandra scriptoria*, *Anoectochilus elatus*, *Bulbophyllum rosemarianum*, *Seidenfia intermedia* and *Trichopus zeylanicus* are endemic to the Southern Western Ghats. Under this project, species of Dalbergia viz. *D. beddomei*, *D. candenatensis*, *D. horrida*, *D. lanceolaria*, *D. latifolia*, *D. melanoxylon*, *D. paniculata*, *D. rubiginosa*, *D. sissoides*, *D. sissoo* and *D. volubilis* were planted. Among these eleven species, *D. beddomei* and *D. horrida* are endemic to the Peninsular India, while *D. candenatensis* and *D. rubiginosa* are endangered species.

The success of this project was assessed by recording the visitors to the gardens within two years (April 2008 to March 2010) of the completion of the Project. It was evident by the fact that on an average, every month, 11,485 visitors from the general public and 1,785 students have visited these gardens. These gardens help to increase awareness on the ecological, economic and cultural significance of the wild plant species and their potential value as genetic resources. The students from local schools and colleges visit the gardens as it enable them to observe variability and adaptive modifications in the plant world, literally in their hometown.

Conservation and sustainable management of belowground biodiversity in the Kerala part of Nilgiri Biosphere Reserve – Phase II

KFRI Research Report No. 359 (Chandrashekara, U.M., Balasundaran, M. and Sujatha, M.P. 2010)

The objective of the project was to demonstrate certain below ground biodiversity BGBD management practices to the farming community through on-farm experiments. The demonstration

experiment on cultivation of three leguminous cover crops viz. *Arachis pintoi*, *Calpogonium mucunoides* and *Sesbania aculeata* was carried out in the coconut plantation of the BGBD benchmark site. This experiment demonstrated that growing leguminous cover crops in suitable microsites in farms can help farmers to suppress weeds, improve soil fertility and also enhance the population of beneficial soil flora and fauna. Another experiment was conducted to characterize decomposition and nutrient release pattern of single and mixed species mulch. Mixing the mulch material of different species can reduce the initial N:P ratio and provide required quantity of P to the crops. When equal quantity of mulch of individual species and mixture of species is considered, the mulch materials of *Chromolaena odorata* and *Terminalia paniculata* are unable to fulfill the P_2O_5 - fertilization recommended for coconut. Similarly, the mulch materials of species like *Calycopteris floribunda* and *Terminalia paniculata* are unable to fulfill the K_2O fertilization recommended. On the other hand, the mulch of mixed species, consisting of nutrient rich and poor foliages of different species, is able to fulfill the recommended dose of N, P_2O_5 and K_2O at an intermediate rate.

An attempt was made to compare the composts that are prepared in a conventional way and by adding microbes and earthworms for their quality as well as their influence on crop growth and yield. A significant increase in nitrogen content was observed in green foliage added with different inocula; it was highest for decomposing microbial and earthworm inoculated compost and lowest for control compost. In terms of ability to enhance plant growth, treatments added with biofertiliser-enriched DMIE compost consistently outperformed the treatments added with other kinds of compost. An analysis was done to compare the earthworm abundance in paddy fields and plots of landuse systems which were transformed from paddy fields. Results indicated that mean abundance of earthworms in areca mixed with perennials, coconut mixed with perennials, coconut and areca plantations were significantly higher than in paddy fields. Comparison of paddy fields and other landuse systems for AM fungal spore density revealed that the values are not significantly different; exception being in polyculture home gardens and arecanut mixed with perennial cropping system. The AM fungal spore density in polyculture home gardens was more than that in paddy fields. On the other hand, significantly low spore density was recorded for arecanut mixed with perennial cropping system.

Establishment of three model Bioparks for promoting awareness on nature conservation

KFRI Research Report No. 360 (George Mathew and Yesodharan, K. 2010)

With a view to promote conservation awareness among students and the public, two Bio-parks were established- one in a School (Trichur Model Boys H.S.S., Trichur) and the other in an Academic Institution (Centre for Water Resources, Development and Management, (CWRDM) Kozhikode). The park comprised distinct functional themes such as star forest, medicinal plants garden, butterfly garden, rock garden, ferns and epiphytes as well as an aqua garden. Constraints in the establishment and maintenance of Bio-parks are also briefly discussed.

The main enterance of the Bio-park in the Model Boys H.S.S., Thrissur

The main enterance of the Bio-park established at CWRDM, Kozhikode.

Protection of tsunami affected coastal areas by establishing bio-shield through people's participation

KFRI Research Report No. 362 (Seethalakshmi, K.K., Raveendran, V.P and Balagopalan, M. 2010)

The occurrence of a tsunami on 26th December 2004 which affected the coastal areas of Kerala was the first of its kind that affected the property and life of people. Different projects for rehabilitation of the affected people and mitigation measures to reduce the ill effects of tsunami were launched in coastal areas by the Disaster Management Division, Government of Kerala. One of the project under mitigation measures was the establishment of bioshield with suitable species. It was undertaken by Kerala State Council for Science, Technology and Environment (KSCSTE) and Kerala Forest Research Institute implemented the project.

A bio-shield consisting of 30 km length of varying width was established in the coastal areas of Thrissur District. Ten Panchayaths starting from Kadappuram to Eriyad participated in the programme. Seedlings of *Casuarina equisetifolia* which is known as one of the suitable species in coastal areas was mainly used for planting. An experimental plot with 14 species was planted for screening the suitability of other broad leaved species for bio-shield. Of the 14 species planted, five species that recorded higher survival rate (above 50%) were *Terminalia catappa* (80), *Dendrocalamus strictus* (100), *Bambusa vulgaris* (80), *Samadera indica* (68) and *Terminalia tomentosa* (52). Four species were not able to survive (*Artocarpus hirsutus*, *Swietenia mahogany*, *Terminalia bellerica* and *Syzygium jambos*. The project was implemented in association with the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) of the Panchayaths. KFRI provided seedlings, soil for filling the pits, stakes, nursery implements, sources for water and technical know-how while the Panchayaths undertook planting, maintenance and watering. The major threats during the establishment phase of the bioshield can be grouped into two categories – biotic and natural. The biotic factors (man made reasons) included damages due to the construction of sea wall, removal of planted seedlings by the land owners etc. while the natural factors were inundation with salt water, water logging, deposit/removal of sand from the planted areas etc. A shift in the planting season from July-August to September - October reduced the frequency of inundation with salt water and water logging. Awareness programmes organized in the Panchayaths and involvement of Panchayaths in the programme reduced the damages due to human interference. Nothing could be done with natural calamities like sand erosion, damage to sea wall, etc.

Bioshield

Bioshield

Effect of waves on shore

Studies on the effect of fire on moist deciduous forests

KFRI Research Report No. 369 (Surendran, T., Bhat, K.V. and Swarupanandan, K. 2009)

Seasonal fire occurrence is a common phenomenon in the moist deciduous forests. In order to study the impact of fire on moist deciduous tree species, a study was carried out in an area located in the moist deciduous forest (MDF) of Thrissur Forest Division. Important moist deciduous tree species were selected and their

fire hardiness in respect of bark thickness, moisture content and tissue composition was studied in various age groups *viz.*, seedlings and trees. Branching pattern, canopy structure and bole nature were also studied to understand their fire resistance capacity. The results reveal that the nature of bark or moisture content do not directly contribute to the fire resistance of the individual species. As an effort to find out fire resistant species for regeneration and afforestation activities in the fire prone areas, a series of nursery studies on stump regeneration, using stumps of MDF species having different collar diameter was carried out. In order to understand their fire survival efficiency and regeneration capacity, a field trial using stumps of the same species was also carried out. The results obtained indicated that thicker stumps, having a diameter range of 2-3 cm at their collar region is better than thinner ones (diameter 1-2 cm) for survival and regeneration. *Gmelina arborea* and *Pterocarpus marsupium*, which are more fire resistant in terms of survival after fire, were found to be suitable for re-vegetation activities.

In order to understand the response of tree seedling populations to fire, two set of controlled burning experiments were carried out during two different seasons *viz.*, immediately after monsoon and during early summer. The studies revealed that the tree seedlings show increased fire survival with corresponding increase in their age and that higher intensity and higher frequencies of fire are detrimental to the regeneration of populations, in terms of their survival. Systematic fire ecological research on the moist deciduous forest ecosystem is very essential to evolve economically viable low-risk fire management strategies.

Identification of Satyrine butterflies of Peninsular India through DNA barcodes component: Morphological and taxonomic studies

KFRI Research Report No. 371(George Mathew. 2010)

Studies pertaining to morphology of the external genitalia of twenty-five species of satyrine butterflies collected from different locations in the Kerala part of Western Ghats were made. Based on an evaluation of resemblances of genitalial parts, these species were categorised under five separate groups. The first group contained *Melanitis leda, M. phedima, Mycalesis anaxias, M. oculus, Lethe drypetis, L. rohria* and *Zipoetis saitis*. Of these, *Mycalesis anaxias, M.oculus* and *Lethe rohria* formed a subgroup distinct from the others. The second group contained *Mycalesis perseus* and *M. igilia*. These species shared resemblance with *Lethe rohria, Mycalesis oculus, M. perseus, M. subdita, M. igilia* and *M. adolphei*. Each of the remaining species *viz.*, *M. patina, M. subdita* and *Ypthima baldus* showed distinctness in their identity. Among these, *Ypthima baldus* stood out separately from all the rest in the structure of valvae, uncus and phallus. The component pertaining to the determination of appropriate markers for DNA barcoding and molecular systematics of satyrine butterflies was carried out by Centre for Ecological Science, Indian Institute of Science, Bangalore.

Y. avanta

L. rohria

M. igilia

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

KFRI Research Report No. 372 (Menon, A.R.R. 2010)

The project aims at quantitative assessment, geographic distribution, conservation status evaluation and phytogeographic studies of plant resources of Western Ghats. The data sets and the spatial maps generated in this project will be useful for the conservation, sustainable utilization and management of the plant resources of Western Ghats. Based on the data collected, it was concluded that the rare, endangered and threatened (RET) plant species in the Western Ghats have gone up from 25 to 40%. It has been found that 1600 species of plants come under the RET category. Majority of these endangered species of plants have been found in Kerala and Karnataka parts of the Western Ghats. The entire Western Ghats region was divided into 3000 grids of 40 km^2 each and surveyed. Under the project 4000 species of plants have been surveyed, 1500 of them were trees and the rest were shrubs and herbs. There were about 900 species with well known medicinal use in the Western Ghats. The survey shows that diversity is abundant particularly, in central and southern parts of Western Ghats, thus making it possible to calculate the economic value of the Western Ghats and also to identify the economically rich areas.

Standardization of technology for edible bamboos in Kerala

KFRI Research Report No. 373 (Muktesh Kumar, M.S. 2010)

The multifarious uses of bamboo that contribute to the income of the rural people throughout the world, especially in the tropics, are well known. Bamboo shoot production is one of the major sources of income for farmers in China, Thailand, Japan, Philippines, Laos and Korea. Bamboo shoot industry is thriving well and fast expanding in Asian countries. In Kerala, nine species are known to be edible. *Bambusa bambos* and *Dendrocalamus strictus* are widely used in the northern part of Kerala. Other species such as *Bambusa balcooa, B. polymorpha, B. tulda, Dendrocalamus asper, D. brandisii, D. giganteus, D. hamiltonii* and *D. longispathus* are cultivated in farm lands. Mostly the tribal communities in Kerala utilize bamboo shoot. Though usage of bamboo shoot in urban areas, especially in Chinese food is gaining popularity, all the demand is met through canned products from North Eastern states. The bamboo shoots based food industry is thriving and fast expanding in the Asian countries. Bamboo shoots are rich in vitamins, cellulose and amino acids. At harvest, a shoot may contain as much as 90 per cent water. The edible content is only about 50 per cent. Shoots have a high nutritive value and low fat content and a good fiber source. Nutritional studies on edible bamboo have indicated that it is a good source of energy. Bamboo shoot contains protein, fiber, minerals like potassium, calcium, phosphorous, ascorbic acid, and tryptophan, besides fat and carbohydrates. The present study has indicated that bamboo shoot farming has immense potential in Kerala. This can provide job opportunities to women and additional income to farmers/entrepreneurs who take up bamboo shoot production. Popularization of bamboo shoots as food and their commercial production for local market need to be encouraged. An industry based on edible bamboo shoot production definitely has a great potential as an emerging rural industry.

Edible shoots extracted from the field

Edible portions being cut into desired shapes

Edible portions being cut into desired shapes

Fresh cut edible shoot in poly bag

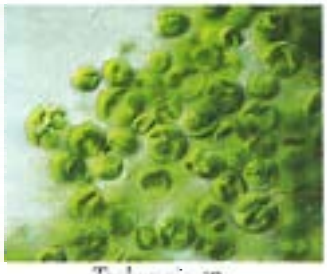
Fresh shoot ready for market

Illustrated keys to the macrolichens of Kerala

KFRI Research Report No. 374 (Muktesh Kumar, M.S. 2010)

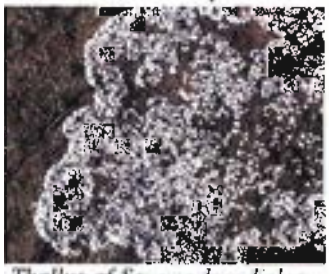
Lichens are one of the most widely distributed and dominant group of organisms in the world. These are the most successful symbiotic organisms on earth and they can grow on anything and anywhere. The lichen flora of the Kerala part of the Western Ghats is inadequately known since only fragmentary work has been done in the past. In a study on the macrolichen flora of Kerala undertaken by KFRI during 1997-2000, 254 species of macrolichens under 43 genera belonging to 18 families were collected and enumerated. From among them commonly

occurring macrolichens are included in the present report. The present compilation of 105 species representing 32 genera belonging to 13 families is only to stimulate lichenological research and give insight into the knowledge of lichens for the naturalists, students and teachers of botany at college level and provide a know how to identify the macrolichens occurring in the Kerala part of the Western Ghats. In this manual, sequential dichotmous keys are provided for identifying any known lichen species occurring in Kerala part of the Western Ghats. Artificial keys to the families and genera are also given. The species keys are dealt with under the respective genera. The species included are arranged in an alphabetical order for easy reference. The line drawings accompanying the keys are intended to identify salient features of the species. They are only diagrammatic representation and are not to scale. The drawings illustrate the upper surface of the species.



Trebouxia sp.

Thallus of Crustose lichen



Thallus of Squamulose lichen

Radiate fruitcose thallus

Radiate fruitcose thallus

Enriching live collections of wild Orchids and Pteridophytes of Kerala and preparation of a manual

KFRI Research Report No. 381 (Muktesh Kumar, M.S. 2011)

Conservation of endangered species, both *in situ* and *ex situ* preservations, is important in several respects. The *in situ* conservations, as in National Parks and Bioreserves, provide natural protection and intact environment, the *ex situ* conservation as in the green houses and botanical gardens can give material for closer observations and detailed studies, both for academic purposes and economic utilization. Considering the rapid decline in the natural resources there is an urgent need to conserve and manage the existing rare and endangered species for posterity. The present project was taken up with the objectives to enrich the live collections of ferns and orchids maintained in the pteridophyte/orchid house at KFRI campus to facilitate education for the students, teachers, researchers and even the common man to know the diversity of pteridophytes and orchids. The list of pteridophytes and orchids collected is given. From among the useful pteridophytes collected, 66 species known to be highly useful have been included in this manual in order to highlight the importance of pteridophytes and their medicinal value and to create awareness among the public for conservation of this beautiful group of plants. Each species is dealt with a short description, distribution, medicinal uses, parts used, chemical constituents and other known uses from India and elsewhere.

Acrostichum aureum

Adiantum philippense

Angiopteris evecta

Asplenium nidus

Blechnum orientale

Marsilea minuta

Ecology and behavior of the arboreal mammals of the Nelliampathy forests

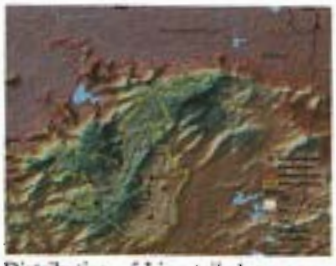
KFRI Research Report No. 382 (Ramachandran, K.K. 2011)

Eleven arboreal mammal species were recorded from the evergreen forests of the Nelliampathy. They include five primates, five rodents, and one mustelid (small carnivore). The nocturnal Malabar slender loris, Malabar spiny tree mouse and

Nilgiri marten are the rare and endemic arboreal mammal species recorded. Apart from this, the endangered lion-tailed macaque and the Nilgiri langur were also recorded. The Nilgiri langur (NL) was the most sighted species, followed by Malabar giant squirrel, lion-tailed macaque and bonnet macaque. The relative abundances of diurnal arboreal mammals were ranging from 1.2 to 12.6 individuals per 10 km and the mean group sizes of primates ranges from 3.5 to 6.9.

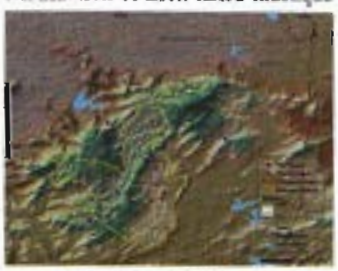
A total of 13 lion-tailed macaque (LTM) troops with 200 individuals and 23 Nilgiri langur troops with 150 individuals were recorded and mapped. The overall troop sizes of all primates were ranging from four to 39 individuals with an average of 15.5. Troop sizes for lion-tailed macaques ranged from four to 39 individuals with an average of 15.5. There were 8% of adult males, 34% of adult females, 16% of sub adult males and females and 12% of juvenile lion-tail macaques in Nelliampathy forests. The adult male to female ratio was 1:4.36 and the overall adult to immature ratio was 1:0.71. The ratios of overall adult females to immature and infants were 1:0.85 and 1:0.52 respectively. The troop sizes of Nilgiri langurs ranged from three to 12 with a mean group size of 7. The adult males constitute 14% of the total population and the adult females were 29%. Twenty per cent were sub adults of males and females and the immature, which includes the juveniles and dependant infants, were 19% of all the total age sexed troops. A total of around 300 hours was spent in observing the feeding behaviour of lion-tailed macaques and Nilgiri langurs. The food and feeding behavior of these two species were studied and niche breadth and overlap indices were calculated. Lion-tailed macaques fed on a total of thirty eight plant species that includes 1 moss and 2 species each of lichens and mushrooms.

Lion-tailed macaque



Distribution of Lion-tailed macaque

Nilgiri langur



Distribution of Nilgiri langur

Malabar giant squirel

Distribution of Malabar giant squirel

Nilgiri langurs fed on fifty three species of plants including a moss and mushroom species. For both LTM and NL, *Cullenia exarillata* is the maximum utilized food species. Fruits and seeds were relatively more fed by the macaques where as langurs prefer leaves and more flowers. Macaques fed a fair amount of mushrooms but langurs were never seen feeding on mushrooms. The Malabar giant squirrels have the larger proportion of (about 94%) areas suitable followed by Nilgiri langur having 73%. The Nilgiri marten and lion-tailed macaques have only 46 and 40 %, respectively of the total geographic areas under suitable category. The GIS based habitat suitability analysis showed that the plateau region with potential evergreen forests is the most ideal habitat for these arboreal animals.

Developing know-how for the improvement and sustainable management of teak genetic resources.

KFRI Research Report No. 383. 79p. (Indira, E. P., Balasundaran, M. and Mohanadas, K. 2010).

Seven paired populations of natural teak forests (undisturbed and disturbed) were selected in Kerala, Orissa, Madhya Pradesh and Gujarat. One plantation was also selected in Kerala. Co-dominant DNA markers namely nuclear gene markers and microsatellite markers were used to study the long term dynamics and short term dynamics of the populations and to estimate the population genetic parameters, such as the number of alleles, allelic richness, expected and observed heterozygosity and gene diversity in these teak populations. The impact of human disturbances was also assessed on the above genetic parameters. The results of the nuclear gene marker studies showed the undisturbed population at Konni to be the most diverse population having maximum number of alleles, allelic richness, expected and observed heterozygosity and gene diversity where as both populations at Khurda (Orissa) had lower number of alleles, allelic richness and lowest gene diversity. Generally, Kerala populations had higher gene diversity followed by Valsad (Gujarat) and Jabalpur (Madhya Pradesh). With regard to undisturbed populations, Orissa was genetically far distant from all other populations.

The four microsatellite loci employed to examine the short term dynamics showed that Khurda from Orissa to be the richest in number of alleles. Populations in Wayanad and Nilambur had the least number of alleles. Other populations from Kerala were rich in number of alleles. Maximum gene diversity was seen in undisturbed Khurda population followed by Valsad, while populations at Khurda (Orissa) were found to exhibit lowest

gene diversity on employing nuclear gene markers as noted earlier. Populations from Kerala, including the plantation were found to have high gene diversity. Out of the total 15 populations, inbreeding (*Fis*) was significant in all the populations from North India and in particular, the undisturbed populations from North India showed higher inbreeding. With respect to Kerala populations, disturbed populations had more inbreeding than undisturbed populations except in Nilambur.

The structure analysis showed geographical patterns based on the allele frequencies. The analysis using nuclear gene markers showed three clusters, the first cluster comprised of all the populations from Kerala, second included the populations from Gujarat and Madhya Pradesh and the third being the populations from Orissa. To compare the contemporary gene flow through pollen and seed dispersal and the mating system in teak populations with different levels of human interference, two natural teak forests, one highly disturbed and the other one undisturbed, were selected in the Peechi-Vazhani Wildlife Sanctuary of Thrissur District in Kerala State. The studies revealed that more than 50 per cent of the fruits were without embryos in both the two populations selected. The pollen dispersal was mainly in the distance of below 200 m which indicates that the pollen dilution zone must be at least 200 m in seed orchards to restrict the entry of pollen from outside.

Genetic diversity and conservation of Teak

KFRI Research Report No. 384. 86p. (Indira, E. P., Bhat, K.M. and Thulasidas, P.K. 2010)

The project evaluated the genetic diversity in twenty three natural teak (*Tectona grandis* L.f.) populations in ten States in India (Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, Gujarat, Rajasthan, Madhya Pradesh, Chattisgarh and Orissa) with respect to growth, tree form, leaf and seed characters. Observations showed that Hudsa (Teli variety) from Dandeli, Karnataka, is the provenance with best tree form having first place for many of the tree form traits. Branching mode without double limbs had highly significant positive correlation with persistence of axis, straightness and less twisting. Hence, branching mode (which can be assessed at an early age) can be an indicator for axis persistence and straightness of a tree.

The results showed that at higher altitudes, trees had a tendency to grow double limbed, and twisted with less axis persistence. Rainfall had highly significant positive correlation with small branch size with horizontal branching pattern. On evaluation of the physical properties of the wood samples, significant variations were noted between provenances. Tree diameter at breast height (DBH) showed a positive correlation with age and heartwood percentage. Higher growth rate with mean ring width of above 4.7 mm and greater heartwood content (>90%) were noted in trees grown in southern states like Kerala, Tamil Nadu and Karnataka. Hudsa (Teli variety) from Dandeli (Karnataka) attained highest heartwood percentage (93%) in age class II (25-34 years) and III (35 to 44 years) in spite of small log size. On the whole, Nilambur provenance also showed high heartwood proportion along with wider growth rings indicating high growth rate.

Ring width differed significantly between the provenances and it varied within the age classes with maximum values recorded from Nilambur provenance followed by other provenances from Kerala and then Tamil Nadu, Karnataka, Maharashtra and Gujarat. The densest wood was recorded from age class III in Banaswara provenance (Rajasthan). Lightest wood was obtained from age class I in Khariar provenance (Orissa). The longest fibers were obtained from Konni. Teak wood collected from drier localities of central parts of India were darker in colour than South Indian provenances. The Basthar provenance (Chattisgarh) possessed high amount of extractive content, which is almost at par with that reported from Nilambur provenance) and more attractive colour. Lignin content was found high in Burgi provenance from Madhya Pradesh. *Ex situ* conservation of germplasm was established at Nilambur with 25 provenances. Konni, Arienkavu (Kerala) and Mandagadde (Karnataka) were found to be the best performers for early growth. The study revealed that the South Indian teak provenances showed superior tree form, wood quality as well as growth characteristics suitable for future genetic conservation programmes. Development of hybrids between best performers for growth and excellent provenances for better tree form and other characters like extractive contents would help the improvement of planting stock.

Extension Projects

Report of inspection of the teak log prepared for installation as Dwajam at Ettumanur Mahadeva Temple.
KFRI Extension Research Report No. 35 (Krishnankutty, C.N. and Thulasidas, P.K. 2010)

Assessment of ecologically fragile land in Seetharkundu of Kollangode Range, Nemmara Forest, Forest Division
KFRI Extension Research Report No. 36 (A.R.R. Menon 2010)

Workshop on Lichens diversity, significance and taxonomy (KSBB)
KFRI Extension Research Report No. 37 (Muktesh Kumar, M.S. 2010)

Conventional and molecular methods of tropical tree improvement for higher productivity
KFRI Extension Research Report No. 38 (Indira, E.P. 2010)

Joint investigation for enhancing seed production capability of teak seed production areas
KFRI Extension Research Report No. 39 (Pandalai, R.C. 2010)

The International Workshop on Production and Marketing of Teak: Future scenarios
KFRI Extension Research Report No. 40 (Jayaraman, K. 2010)

Ecological importance of the scheduled property Sy. No. 2268/Part Meenvellam, Palakkayam Village, Mannarkad Taluk by expert commission from Kerala Forest Research Institute
KFRI Extension Research Report No. 41 (Nandakumar, U.N. 2010)

Voluntary relocation of settlements in Wayanad Wildlife Sanctuary
KFRI Extension Research Report No. 42 (Sankar, S. 2010)

Potential of afforestation programmes of Attappady Hills Area Development Society (AHADS) for obtaining carbon credits - A feasibility study
KFRI Extension Research Report No. 43 (Sankar, S. 2010)

Development of hill highway - Environmental appraisal of a new road connection between Trivandrum and Tirunelveli via Ambasamudram
KFRI Extension Research Report No. 44 (Sankar, S. 2010)

NEW RESEARACH PROJECTS

KFRI 592/2010: Growing stock of timber and industrial wood outside forests in Kerala (C.N. Krishnankutty, April 2010)

KFRI 594/2010: Handbook on common trees of Kerala (N. Sasidharan, April 2010)

KFRI 595/2010: Handbook on invasive species of Kerala (K.V. Sankaran, April 2010)

KFRI 596/2010: Handbook on mushrooms of Kerala (C. Mohanan, April 2010)

KFRI 597/2010: Protection and conservation of sacred groves in Kerala (U.M. Chandrashekara, May 2010)

KFRI 598/2010: Identification of phytochemical insect attractants in teak (T.V. Sajeev, October 2010)

KFRI 599/2010: Spatial distribution and invasion dynamics of invasive alien weed, *Mimosa diplotricha*, in the Kerala part of Western Ghats (T.V. Sajeev, October 2010)

KFRI 600/2010: Digital archival of rattan information (K.F. George, October 2010)

KFRI 601/2010: Handbook on Indian palms (C. Renuka, October 2010)

KFRI 602/2010: Standardization for enhanced production of antagonistic principle by *Bacillus subtilis* and *Streptomycete* for the control of sapstain on rubber wood (E.J. Maria Florence, October 2010)

KFRI 603/2010: Use, management and nutritive value of edible non-crop plants in agroforestry and tribal landscapes of Kerala (U.M. Chandrashekara, October 2010)

KFRI 604/2010: Testing of viability and germination percentage of stored seeds and assessment of planting stock quality (R.C. Pandalai, October 2010)

KFRI 605/2010: Seed handling in selected forest tree species and medicinal herbs of Kerala (R.C. Pandalai, October 2010)

KFRI 606/2010: Analysis of soil samples from major tree crops and agroforestry systems of Thrissur District, Kerala (M.P. Sujatha, November 2010)

KFRI 607/2010: A decision support system for monitoring and forecasting timber prices of Kerala State (M. Sivaram, December 2010)

KFRI 608/2010: Impact of invasive weeds on the below ground communities in the forest landscapes of Kerala (V.V. Sudheendrakumar, December 2010)

KFRI 609/2010: Conservation through restoration of two endemic endangered trees of Western Ghats of Kerala (P.A. Jose and P.K. Chandrasekhara Pillai, December 2010)

NEW EXTENSION PROJECTS

KFRI Ext. 179/2010: DBT Task Force Meeting on Biopesticide and Crop Pest Management (V.V. Sudheendrakumar, May 2010)

KFRI Ext. 181/2010: 11th Programme Advisory Committee (PAC-DST) Meeting on Plant Sciences (E.J. Maria Florence, June 2010)

KFRI Ext. 183/2010: One-week compulsory training course on collection, compilation, validation and dissemination of forestry statistics for Indian Forest Service Officers. (M. Sivaram, August 2010)

KFRI Ext. 184/2010: Training on tropical timber identification through macroscopic and microscopic features (K.V. Bhat, July 2010)

KFRI Ext. 185/2010: Ecological importance of the ecologically fragile land (EFL) at Meenvellum, Mannarkad Forest Division (U.N. Nandakumar, April 2010)

KFRI Ext. 186/2010: Conservation awareness programme for the Madayi Hill, Kannur District (M. Amruth, October 2010)

KFRI Ext. 187/2010: Workshop on strengthening the science and technology base of forestry in Kerala (K.V. Sankaran, September 2010)

KFRI Ext. 188/2010: One-week compulsory training course on conservation and development of medicinal plants and its benefits sharing with local communities (N. Sasidharan, December 2010)

KFRI Ext. 189/2010: Development of package for office automation (A.R. Rajan)

KFRI Ext. 191/2010: System study to develop a manual for collection, compilation, validation and dissemination of forest statistics of Kerala (M. Sivaram, December 2010)

KFRI Ext. 192/2010: A multi-disciplinary database of RET plants of the Kerala State (K. Yesodharan, P.A. Jose and C.K. Soman, December, 2010)

KFRI Ext. 193/2010: One-day training workshop on collection and transportation of seeds of teak and miscellaneous species for VSS Members (R.C. Pandalai, December 2010)

KFRI Ext. 194/2010: Training on watershed management for watershed committee members of Thalappalam (S. Sankar, E.J. Maria Florence January 2011)

KFRI Ext. 195/2010: One-day program on "Career advancement for women scientists" (E.J. Maria Florence, January 2011)

KFRI Ext. 196/2010: Environmental impact assessment of the proposed Thekkady-Chemmanampathy road in Parambikulam Tiger Reserve, Kerala (S. Sankar, January 2011)

KFRI Ext. 197/2010: Ninth meeting of the Western Ghats Ecology Expert Panel (WGEEP) (E.J. Maria Florence, January 2011)

KFRI Ext. 198/2010: International training programme on innovations in the management of planted teak forests (K. Jayaraman, January 2011)

KFRI Ext. 199/2010: Training course on priority species, plantation development, post harvest technology and socio economic livelihood potential of bamboos (S. Sankar, February 2011)

KFRI Ext. 200/2010: Statistical analysis of elephant census of Kerala – 2010 (M. Sivaram, March 2011)

KFRI Ext. 201/2010: Training Course on collection, compilation, validation and dissemination of forest statistics (M. Sivaram, March 2011)

KFRI Ext. 202/2010: Workshop on conclave of Ayurveda (E.J. Maria Florence, January 2011)

KFRI Ext. 203/2010: Estimation of volume and value of trees and logs in the KINFRA small industries park at Koratty (U.N. Nandakumar, January 2011)

PUBLICATIONS

Papers in Journals

Biji, C.P. and Sudheendrakumar, V.V. 2010. Baculoviruses as biopesticides and their use in forestry. *Scientia*, 6 (10) : 7-16.

Raveendran V.P., Seethalakshmi K.K. and Jijeesh C.M. 2010. Effect of season, position of node and growth regulating substances on adventitious root induction in giant bamboo, *Dendrocalamus giganteus* (Wall) Munro. *Advances in Plant Sciences* 23: 125-127.

Sasidharan K.R. and Varma R.V. and Sivaram M. 2010. Impact of *Indarbela quadrinotata* on the growth of *Casuarina equisetifolia*. *The Indian Forester* 136(2): 182-186.

Seethalakshmi K. K, Jijeesh C. M, Beena V. B and Raveendran V.P. 2010. Flowering and post flowering reversion to vegetative phase of the giant bamboo, *Dendrocalamus giganteus* Wall ex. Munro in Kerala. *Journal of Non- Timber Forest Products* 17(1): 1-6.

Seethalakshmi K.K., Jijeesh C.M. and Raveendran V.P. 2010. Flowering, seed production and natural regeneration of thorny bamboo, *Bambusa bambos* (L.) Voss after gregarious flowering in Wayanad, Kerala. *Advances in Plant Sciences* 23(II): 597-600.

Seethalakshmi K.K., Jijeesh C.M. and Raveendran V.P. 2008. Seed and seedling attributes of *Melocanna baccifera* and *Ochlandra travancorica*. *Journal of Bamboo and Rattan* 7: 101-108.

Papers in Books/Proceedings/Newsletters

Seethalakshmi K.K., Jijeesh C.M., Raveendran V.P. and Sheik Hyder Hussain 2008. Bioshield for protection of coastal areas- Bamboo planting with people's participation. Poster presentation *In:* Abstracts, International conference on improvement of bamboo productivity and marketing for sustainable livelihood, 15-17 April, National Bamboo Mission, New Delhi pp.110.

Seethalakshmi K.K., Jijeesh C.M., Beena V.B and Raveendran V.P. 2010. Flowering and reproductive biology of selected bamboos of Kerala. *In:* National conference on "Developmental biology". NACON D Bio 2010. Bangalore, September 15 to 17, 2010.

Seethalakshmi K.K., Jijeesh C.M., Raveendran V.P. and Sabeena C.S. 2011. *Thyrsostachys oliveri*, A small clump forming bamboo for urban bioshield, *In:* National seminar on Recent Advances in Bamboo Propagation, Management and Utilization at Institute of Wood Science and Technology, Bangalore, 17-18 February, 2011.

Seethalakshmi K.K., Raveendran, V.P. and Jijeesh C.M 2011. Establishment of bamboo plantations in non-forest areas – opportunities and challenges. *In:* National seminar on Recent Advances in Bamboo Propagation, Management and Utilization at Institute of Wood Science and Technology, Bangalore, 17-18 February, 2011.

Sivaram, M. 2010. A database on forest resources and its applications: A case study of Kerala State, India. Proceedings of the International Workshop on Figures for Forests. Forest Research Institute, Freiburg and University of Freiburg, Germany 23-26, 2008.

Popular articles

Jayson, E.A. 2010. *New Amarambalam Mala Nirakal* (In Malayalam) *Aranyam*, Kerala Forest Department 24: 51.

SEMINAR/WORKSHOPS ATTENDED

Jayson, E.A. attended Interstate workshop conducted at Theni, Tamil Nadu on Preparation of Tiger Conservation Plan on 12th January 2010. He also attended 34th ESI meeting and Colloquium on Ethology from organism down to Ethobiomolecule at Zoology Department, University of Kerala, Trivandrum on 16-18 December, 2010 and presented a paper entitled "Feeding behaviour of Malabar giant squirrel on coconut in Kerala" and also attended Annual Research Seminar of SACON, Anakkatty, Coimbatore during 12-13 December, 2010.

Dr. Jayson and C. Sivaperuman was awarded the First Prize for the Best Poster in a seminar on Tropical Ecosystem: Structure, Function and Services at Institute of Forest Genetics and Tree Breeding, Coimbatore, for the poster entitled, "Seasonal dynamics of bird's assemblages in Kole Wetlands of Kerala" held during 28-29 December, 2010. They also presented the paper entitled "Human-Wildlife Conflicts in Southern Western Ghats" in the National Seminar on "The Conservation of the Ecology of Western Ghats", organized by the Association for Environmental Protection, Aluva on 25th February, 2011.

Jose, P.A. attended a training Workshop on 'Conservation and management of forest genetic resources' at the Institute of Forest Genetics and Tree Breeding, Coimbatore, Tamil Nadu during 5- 9 July, 2010.

Maria Florence, E.J. attended the workshop on preparation of vision document of Extension Training Centre, Mannuthy on 6th April, 2010.

Raveendran, V.P. attended and presented a paper on Flowering and reproductive biology of selected bamboos of Kerala in the National conference on "Developmental biology" at Bangalore University, Bangalore during 15-17 September 2010. He also attended and presented a paper "Milestones and the priority species identified by National Bamboo Mission for Development" in the workshop on Bamboo Cultivation, Exploitation and Marketing organized by National Bamboo Mission Society at Goa on 29th November 2010. He also attended the National seminar on Recent Advances in Bamboo Propagation, Management and Utilization at the Institute of Wood Science and Technology, Bangalore during 17-18 February 2011.

Sivaram M. and Sasidharan N. attended the National Conference on 'Biodiversity for Sustainable Development' held at Madurai Kamaraj University during 25-27 August 2010 and presented a paper entitled "Methods and Software 'Invent NTFP' for the Quantitative Inventory Analysis of Non-Timber Forest Products".

Sivaram M. attended the 64th Annual of the Indian Society of Agricultural Statistics during 03-05 December, 2010 at Bidhan Chandra Krishi Visvavidyalaya, Kalyani, West Bengal and presented a paper entitled "Official forestry statistical database and data mining: A case study of forest sector".

Extension Activities

Dr. E.A. Jayson visited Wayanad South Forest Division to investigate the killing of cattle by Tiger at Mullankolly, Begur Range on 16th September, 2010. He also visited Kannur Division for assessment of crop damage by wild animals on 18th June, 2010 and submitted a report. He participated in the Nilgiri Tahr Census at Munnar as Joint co-ordinator on 26th April 2010. Dr. Jayson also visited Sathyamangalam Wildlife Sanctuary, Tamil Nadu (15-17 April, 2010), Parambikulam Tiger Reserve and Anamalai Tiger Reserve, Tamil Nadu (8-11 October, 2010). He also visited Periyar Tiger Reserve, Thekkady during 13-14 November, 2010. and Kannur Forest Division to study the mongoose attack on children and adults and a report was submitted to the Forest Department.

Dr. P.K. Thulasidas served as a resource person to impart training on Timber identification for two officials from Delhi Test House, New Delhi during 26-31 July, 2010.

GUEST LECTURES/CLASSES

Dr. V. Anitha gave classes on Inter- linkages between environment and economics a theoretical and empirical approach for the B. Sc. Forestry students, KAU on 3rd June, 2010.

Dr. E. P. Indira gave classes to Ph. D. students on "Genetic improvement of forest trees".

Dr. E.A. Jayson gave classes on "ecological crisis and sustainability of biodiversity" at Cherpushpam Girls High School, Vadukumchery (December 14th 2010) on 'nature education' at State Museum & Zoo, Thrissur (October 2nd 2010) on 'environmental awareness' at Peechi Wildlife Division, Vilanganoor (11th December 2010) and on 'wetland ecosystem' at Botany Department, St. Mary's College, Thrissur (31st January, 2011).

Dr. M. Sivaram gave lectures on 'timber markets: database and analysis with special reference to Kerala State' on 3rd June 2010 at the College of Forestry, Kerala Agricultural University, on 'forestry statistical database and data mining- a case study of forest sector' in the training workshop on 'Collection, compilation, validation and dissemination of Forestry Statistics' for Indian Forest Service (IFS) Officers, on 2nd - 6th August 2010 at Kerala Forest Research Institute, Peechi, on 'survey and estimation of medicinal plants' in the one week training course on conservation and development of medicinal plants and benefit sharing with local communities for Indian Forest Officers (IFS) at KFRI during 6th - 19th December, 2010, on 'status of forestry statistics of Kerala State' and on forestry statistical database and data mining - a case study of Forest Sector' in the 3 – Day Training Course on Collection, Compilation, Validation and Dissemination of Forest Statistics for Staff and Officials of the Statistics Wing of the Kerala Forest Department, on 14th - 16th March 2011 at Kerala Forest Research Institute, Peechi. He also delivered a series of lectures in the Training Programme on Statistical Analysis for the researchers of the Andhra Pradesh Forest Department conducted at the Office of the State Silviculturist and Biotechnology Research Centre, Andhra Forest Department, Tirupati during 7th -11th February 2011.

Dr. P.K. Thulasidas served as faculty for the training of Ph. D. students of KFRI and handled classes on Wood Science & Technology during 6th October 2010.

MEETINGS

Dr. E.A. Jayson attended the 17th Meeting of the Expert Group on Conservation and Sustainable Utilization of Natural Resources at Pariyavaran Bhavan, MoEF, New Delhi and presented the Final Technical Report of the Owl Project on 1st March 2011.

Dr. P.A. Jose attended the State Level Expert Committee meeting on sacred groves at Forest Head Quarters, Thiruvanathapuram on 8th December, 2010.

TRAINING IMPARTED

Training courses coordinated

Dr. E.J. Maria Florence coordinated 1) Training for Field Functionaries of Maharashtra State National Bamboo Mission, during 26 - 31 July and 2) training on Priority Species, Resource Estimation, Plantation Development, Post Harvest Technology and Socio-economic Livelihood Potential of Bamboos, for Agricultural Plantation and Forest Officers of Karnataka, Andra Pradesh, Tamil Nadu and Goa during 16-21 August, 2010.

Dr. M. Sivaram coordinated training on 'Collection, compilation, validation and dissemination of forestry statistics' for the officers of the Indian Forest Service (IFS) during August 2- 6 2010, for the Staff and Officials of the Statistics Wing of the Kerala Forest Department during 14 - 16 March 2011, at the Institute.

Training Programme Attended

Dr. V.V. Sudheendrakumar attended the NIAS-DST training programme on "Multidisciplinary perspectives in Science, Technology and Society" jointly organized by Department of Science and Technology, Government of India and National Institute of Advanced Studies, Bangalore during 26th July – 7th August 2010.

MEMBERSHIP IN COMMITTEES

Dr. E.P. Indira served as a member of the Advisory Committee of a M. Sc. (Forestry) student, for PG project work on teak.

Dr. E.A. Jayson visited and evaluated the functioning of the Biligiri Rangaswamy Temple Wildlife Sanctuary, Karnataka (11-13 May, 2010), Netravati Wildlife Sanctuary, Goa (23-26 May, 2010), Shendurney Wildlife Sanctuary, Kerala and Cuthbert Bay Sanctuary, Andaman & Nicobar Island as a member of Southern Regional Committee on 17th – 21st January 2011. He also visited Thiruvizhamkunnu and Mannarkad EFL areas of Palakkad Division as a committee member to assess the area on 27th January -7th February 2011.

Dr. P.K. Thulasidas was nominated to the IUFRO Teakwood Working Party (IUFRO Division 5.06.02-Utilisation of Planted Teak) as its Dy. Coordinator for the period 2010 to 2014.

Dr. C. Chandrasekharan Endowment Award 2010

The Dr. C. Chandrasekharan Memorial Endowment award which carries a Gold Medal, Certificate of Merit and a cash prize of Rs. 20,000/- was awarded to Dr. Joyce Jose of Marthoma College, Thiruvalla for her studies on the "**Animal diversity of Myristica swamps in southern Kerala with emphasis on Herpetofauna**". The award was presented on 15th September 2010 in a function organised at KFRI in connection with the I[st] death anniversary of Dr. C. Chandrasekharan, the founder Director of KFRI. The endowment was instituted by the family of (late) Dr. C. Chandrasekharan for outstanding research contributions in tropical forestry each year. Dr. C.T.S. Nair, Executive Vice President of Kerala State Council for Science, Technology and Environment presented the award and delivered the Memorial lecture.

Dr. K.M. Bhat Memorial Award 2011

The Dr. K. M. Bhat Endowment award which carries a Gold Medal, Certificate of Merit and cash prize of Rs. 5,000/- was awarded to Dr. K. M. Jayahari of Winrock International, New Delhi. The award was presented for his studies on "**Ecology and behaviour of small mammals in the Western Ghats of Kerala, Southern India, with special reference to rodents**". The Endowment was instituted by the family of late Dr. K. M. Bhat for the work done by a Research Scholar of KFRI in any field of forestry. The award was presented to Dr. Jayahari on 3rd January 2011 in a function organised at KFRI in connection with 2nd death anniversary of Dr. K. M. Bhat. Dr. H. Nagesh Prabhu IFS, Managing Director of 'OUSHADHI' presented the award and delivered the Memorial lecture.

Brochures released

Ph. D. AWARDED

Mr. K.M. Jayahari was awarded doctorate by the Forest Research Institute (FRI) Deemed University, Dehra Dun in October 2009 for his work on **Ecology and behaviour of small mammals in the Western Ghats of Kerala, Southern India, with special reference to rodents,** under the guidance of Dr. E.A. Jayson, Scientist – F, Wildlife Biology Division, KFRI, Peechi.

Among the rodents of Western Ghats, Malabar Spiny Dormouse (*Platacanthomys lasiurus* Blyth 1859) is an endemic rodent found in the Western Ghats of South India. The objectives of his study were (1) To determine the population status, distribution and diversity of small mammals with special reference to rodents and Malabar Spiny Dormouse, (2) To assess the food and feeding behaviour of Malabar Spiny Dormouse and (3) To study the behavioural characteristics of species. Live trapping, questionnaire survey, direct observation, spot lighting and radio telemetry were used to assess the distribution, status, food and feeding behaviour of the species. Altogether 131 Murid rodents belonging to seven species and one insectivore of the genus *Suncus* were trapped from fourteen protected areas of Kerala. Among the trapped rodents 68.7 per cent was the Black Rat (*Rattus rattus*) followed by Blanford's rat (*Cremnomys blanfordi*) 13.7 per cent and Spiny Field Mouse (*Mus platithryx*) constituting 11.4 per cent. The remaining was the nominal capture of *Golunda elioti* (2), *Platacanthomys lasiurus* (3), *Milardia meltada* and *Mus musculus* (one each). The highest rodent species richness was recorded from the Peppara Wildlife Sanctuary. Malabar Spiny Dormouse was recorded from ten protected areas and twenty one territorial Forest Ranges of Kerala. The species was newly recorded from nine protected areas namely Neyyar, Periyar Tiger Reserve, Thattekkad, Idukki, Chinnar, Eravikulam, Chimmony, Parambikulam and Aralam Wildlife Sanctuaries.

The Malabar Spiny Dormouse feeds on a variety of food items and common food plants of the species were *Terminalia bellerica, Persia macrantha, Hydnocarpus pentandra, Tamrindus indica, Bombax ceiba* and *Shumanianthus vigratus*. Favourite food items included endemic genus like Piper and exotic species like *Theobroma cacoa* and *Anacardium occidentale*. The animal was highly selective of the status of the fruits of seeds and different mode of handling of food was observed according to size of edible portion. Twenty five food plants of the species were recorded using location telemetry and other methods. Foraging decisions are influenced by the predator pressure. Sexual dimorphism exists in the anti-predator behaviour and females are bolder than males. Observations indicated that the species is completely arboreal. The home range of the species is 4.91 ha and home range of the colonies often overlapped. *Lagerstroemia microcarpa* is a preferred nesting tree of Malabar Spiny Dormouse and birds of prey and owls are the main predators. Modeling the microhabitat preference of Malabar Spiny Dormouse indicated that the species inhabits not only in the evergreen forests but also in the riverine patches of the moist deciduous forests.

Mr. R. Santhosh Kumar was awarded doctorate by the Forest Research Institute (FRI) Deemed University, Dehra Dun in June 2010 for his work on **Culm structure and properties of two common bamboo species *Bambusa bambos (L)* Voss and *Dendrocalamus strictus* Nees as influenced by age and growth parameters**, under the guidance of Dr. K.V. Bhat, Scientist – F, Research Monitoring and Evaluation Division, KFRI, Peechi.

The study was carried out on culm structure and properties of two common bamboo species viz. *Bambusa bambos* (L.) Voss and *Dendrocalamus strictus* Nees as influenced by age and growth parameters including variations in physical and anatomical characteristics. The morphological features such as diameter and wall thickness of the culm decreased with increasing height levels of the culm in both the species. Culm wall thickness, diameter of the culm and internodal length varied with growing site. Most of the morphological features of bamboo grown in Attappady were similar to that grown in Palappilly but were different from the bamboo grown in Nilambur. There was a decreasing trend in physical properties like moisture content and shrinkage, but the density increased with increasing height levels of the culm. There was an increasing trend in moisture content and shrinkage from the outer to inner position of the culm wall. However, there was a decreasing trend in density from the outer to inner positions. The radial shrinkage was comparatively higher than tangential shrinkage. Density of the culm was positively correlated with age and negatively with moisture content. However, the density increased up to the age of three years and subsequent increase was negligible in both the species. Bamboo grown in Attappady and Palappilly had similar properties but was different from that grown in Nilambur. The anatomical properties varied with

positions of the culm wall and different height levels of the culm in both the species. The lignin content increased with the age of the culm up to three years and later the increase was negligible. However, the age of the culm did not influence the distribution of starch content in bamboo culm. The starch content of the bamboo culm varied with height levels of the culm and positions of the culm wall. The starch content in bamboo culms decreased due to water soaking and gelatinization of starch content in boiling of the culm. The reason for the depletion of starch content during soaking of culm in water was due to the activity of the microorganisms. The amylase activity was another reason for the depletion of starch content in bamboo culm during storage at normal temperature.

Ms. Joyce Jose was awarded doctorate by the Forest Research Institute (FRI) Deemed University, Dehra Dun in December 2010 for her *work on* ***Animal diversity of Myristica*** **swamps in Southern Kerala with emphasis on herpetofauna**, under the guidance of Dr. K.K. Ramachandran, Head of the Wildlife Department, Forest Ecology & Biodiversity Conservation Division, KFRI, Peechi.

A study was conducted to analyse animal diversity, herpetofauna and anthropogenic perturbations in the Myristica swamps of Kulathupuzha Forest Range, Anchal Forest Range and Shendurney Wildlife Sanctuary. The swamps provide habitat for 362 invertebrate species (Platyhelminthes-3 sp., Nemathelminthes-1, Annelida-4, Crustacea-3, Mollusca-10, Insecta-281, Myriapoda-6 and Arachnida-54) and 281 vertebrate species (Picses-14, Amphibia-56 species, Reptilia-55, Aves-129, Mammalia-27). Myristica swamps contain 23% butterflies, 11% spiders, 8.4% fishes, more than 50% amphibians, more than 20% reptiles, 26.6% birds and 6.6% mammals of Kerala State. 16.3% of the animals are endemic to Western Ghats and 24.2% of the vertebrates are red listed. Fifty six amphibian species and 55 reptile species were recorded. Four species, contributed to 80.2 % of the amphibians. Three species, contributed to 34% of the reptiles. Data of herpetofauna indicate that species diversity and species abundance inside the swamps were significantly higher.

Species abundance distributions of the herpetofaunal communities are multimodal in the log scale. Studies using SADs as indicators of anthropogenically disturbed environments show that as opposed to a single distribution pattern in an undisturbed assemblage, distributions move apart under disturbance and enrichment. Though the SADs obtained from the swamps follow the universal inverted J-shaped curve in the arithmetic scale, their multimodal character in log scale indicates that the herpetofaunal assemblages in the naturally fragmented swamps with ample ecotone, high species turnover (for herpetofauna) and anthropogenic disturbances, the swamps are affected by fragmentation. Close associations were observed between *Rana aurantiaca, R. temporalis, Polypedates psuedocruciger, Hoplobatrachus tigerinus* and some *Philautus* species. The most severe alterations to the swamps are not due to the economic or cultural dependence of the local population on the swamps but due to well meaning but unscientific management policies. Uthiran Chira and Muppathady are 'least disturbed' and Emponge and Ammayambalam are 'severely disturbed'. The swamps need immediate attention in the form of scientific conservation, management and monitoring without alienating the local human population.

Mr. V.S. Ramachandran was *awarded doctorate* by the Forest Research Institute (FRI) Deemed University, Dehra Dun in February 2011 for his work "**An ecological study of the vegetal mosaics and conservation options in the Nelliampathy Plateau, Kerala, India**", under the guidance of Dr. K. Swarupanandan, Scientist – F, Research Coordinator, Research Management and Evaluation Division, KFRI, Peechi.

Nelliampathy Plateau, situated south of Palghat Gap, is one of the biodiversity rich segments in the Southern Western Ghats. Since the latter half of nineteenth century large extent of the evergreen forest of the Plateau was converted to cash crops. Opening up the area for plantations made remote forests accessible for timber extraction and were logged for selected timber species during 1950-1985. Nevertheless, some areas escaped logging due to inaccessibility and difficulty in logging and transportation. Thus the present study was undertaken (a) To study and characterise the change in plant diversity following selective logging in the wet evergreen forest of Nelliampathy, with special reference to the recovery of species extracted, and (b) To study the vegetation dynamics in the cardamom and coffee plantations. Sampling was done in the three biotopes, unlogged forest, logged forest and cardamom and coffee plantations. The vegetation was studied in a number of releves (plots) of 0.1 ha size where all plants >10 cm gbh were enumerated and gbh recorded. All plants <10 cm gbh that included regeneration of trees, shrubs and herbs were studied in two sub-samples of 5 m x 5 m in each releve. The data were

analysed for species richness, richness of family, phytogeographic elements, rare species, diversity indices

The study showed that logged forest had not recovered to the level of the unlogged forest even after 40 years of growth and regeneration with respect to density, basal area, species composition and life stage structure. They still contain almost all the species recorded in the unlogged stands; nevertheless the over all importance of species in the stands has changed very much. Post logging forest recovery depended not only on the age of the stands; it was also dependent upon altitude, composition of the stand, species removed and the site conditions. With increasing elevation, the recovery of stands tends to become slower. Regeneration in plantations indicates that if left undisturbed, the area can reverse into an evergreen forest in due course of time. Conservation in Nelliampathy Plateau should thus be at landscape level, encompassing all the vegetal mosaics. Nelliampathy lying close to Parambikulam Wildlife Sanctuary and Anamalai Wildlife Sanctuary is a corridor connecting them and deserves conservation.

Academic Attachment and Ph. D. Programme (April 2010 – March 2011)

Ph. D. Programme

Ph. D. thesis of the following students were submitted during 2010-2011

Name	Topic	University	Supervisor
Remya, R.	Physiological and genetic diversity studies on regeneration of *Santalum album*	CUSAT	Dr. M. Balasundaran
Mujeeb Rahman, P.	Soil macrofaunal assemblage in selected landuse systems in Kerala: Spatial pattern and structural dynamics	CUSAT	Dr. R.V. Varma
Baiju, E.C.	Landuse and Landscape Dynamics in a micro-watershed of Chaliyar River in Kerala part of Nilgiri Biosphere Reserve	FRIU	Dr. U.M.Chandrashekara
Babu, S.	Ecology of Owls in the Southern Western Ghats, India	FRIU	Dr.E.A. Jayson
Chandrasekhara Pillai, P.K.	Effect of site management practices on growth and wood properties of eucalypts in Kerala.	FRIU	Dr. R.C. Pandalai
Suganthasakthivel, R	Ecology and behaviour of selected arboreal mammals in the Western Ghats, India.	FRIU	Dr. K.K. Ramachandran

Pre-submission Thesis seminars were given by the following students

Name	Topic of research	Supervisor
Babu, S.	Ecology of owls in the southern Western Ghats, India.	Dr. E.A. Jayson
Baiju, E.C.	Landuse and landscape dynamics in a micro watershed of Chaliyar River in Kerala part of Nilgiri Biosphere Reserve	Dr. U.M.Chandrashekara
Beena, V.B.	Reproductive biology and biochemical changes associated with flowering of *Dendrocalamus stocksii* and *Ochlandra travancorica*	Dr. K.K.Seethalakshmi
Suganthasakthivel, R.	Ecology and behavior of selected arboreal mammals in the Southern Western Ghats, India	Dr. K.K. Ramachandran

Seminars presented by Ph.D. students

Name	Supervisor	Date	Topic
Bindu,T.N.	Dr. V.V. Sudheendrakumar	21/04/2010	Baculo virus in insect pest management
Jijeesh, C.M.	Dr. K.K. Seethalakshmi	29/09/2010	Clean development mechanism and carbon trading in India
Sumesh, P.M.	Dr. C. Mohanan	28/05/2010	Importance of macro fungi in forestry
Prasanth, K.M.	Dr. Thomas, P. Thomas	25/06/2010	Industrial pollution – An overview
Sabu, R.	Dr. M.P. Sujatha	30/07/2010	Biochar
Suresh, T.A.	Dr. K.V. Sankaran	04/11/2010	Biological invasion – An overview

Academic Attachment (M.Sc.) during April 2010- March 2011

Name	Supervisor	Name of the college to which the student belongs	Subject area
Bincy, E.S.	Dr. M.P. Sujatha	Sree Sankara College, Kalady	Environmental Science
Preeja, P.	Dr. M.P. Sujatha	Sree Sankara College, Kalady	Environmental Science
Basheena Muhammed, A.	Dr. T.V. Sajeev	MES College, Marampally, Aluva	Microbiology
Fasiya, K.M.	Dr. T.V. Sajeev	MES College, Marampally, Aluva	Microbiology

Extension activities during the April 2010- March 2011

Wood identification and Testing

No.	Date	Client
By Dr. K.V. Bhat		
1	30.09.10	Mr. M.T. Harilal, Forest Range Officer, Thamarassery Range, Kozhikode.
By Dr. T.K. Dhamodharan		
1	17.12.10	Mr. G.S. Tomar, Assistant Engineer(Civil), Office of the AGE B/R (P) No.2, Ezhimala Naval Academy, Naval Academy, Ezhimala P.O. Kannur - 670 310.
By Dr. P.K. Thulasidas		
1	19.04.10	M/s. Sree Balaji Timbers, 119 Meenkarai Road, Zamin Uthukuli P.O. Pollachi -642 004, Tamil Nadu.
2	25.05.10	The Assistant Engineer, CPWD Calicut Central Sub Division No:1 Kunnamangalam, Kozhikode.
3	25.05.10	Mr. Anand Kumar S. Deputy General Manager, Cochin Shipyard Ltd, Kochi-15.
4	28.05.10	The Manager, M/s Nemat Engineering Pvt .Ltd No.15, Vannier Street, Chennai- 600 001, Tamil Nadu.
5	31.05.10	M/s. Sree Balaji Timbers, 119 Meenkarai Road, ZaminUthukuli P.O. Pollachi -642 004, Tamil Nadu.
6	05.06.10	Mr. P. Prasad, Senior Intelligence Officer, Directorate of Revenue Intelligence, Govt. of India, Palarivattom, Kochi.
7	05.06.10	The Assistant Executive Engineer, Kerala State Housing Board, Azheekode Tsunami Site, Kodungallur.
8	21.06.10	The Manager, Nemat Engineering Pvt .Ltd Chennai- 600 001, Tamil Nadu.
9	29.06.10	M/s. Sree Balaji Timbers, 119 Meenkarai Road, ZaminUthukuli P.O. Pollachi -642 004, Tamil Nadu.
10	07.07.10	M/s. Sree Balaji Timbers, 119 Meenkarai Road, ZaminUthukuli P.O. Pollachi -642 004, Tamil Nadu.
11	14.07.10	Mr. G.S. Tomar, Assistant Engineer(Civil), Office of the AGE B/R (P) No.2, Ezhimala Naval academy, Naval Academy, Ezhimala P.O., Kannur - 670 310.
12	14.07.10	The Assistant Engineer, CPWD Calicut Central Sub Division No:1 Room No.2/17 & 2/18, Faculty Block, IIM Campus, Kunnamangalam, Kozhikode.
13	15.07.10	Mrs. K. N. Saradamani, Kurumadathil Neduvilm Puthanpurayile, Perumpadavam P.O. Ernakulam-686 665.
14	30.07.10	The General Manager, SME/MINE/A Neyveli Lignite Corporation Ltd, Neyveli -607 801, Cuddulore Dt., Tamil Nadu.
15	10.08.10	The Assistant Engineer, CPWD Trivandrum Central Sub Division III, CRPF Campus, Pallipuram P.O., Thiruvanathapuram - 695 316.
16	18.08.10	The Manager (Technical), KINFRA, NIFT, Site Office, Near Engineering College Women's Hostel, Dharmasala, Kannool P.O. Kannur.
17	27.08.10	M/s Ramko Umas Enterprises, 158, Valayamadevi Road, Neyveli-607 802, Cuddulore Dt., Tamil Nadu.
18	27.08.10	The Manager, M/s Nemat Engineering Pvt. Ltd., No.15, Vannier Street, Chennai- 600 001, Tamil Nadu.
19	04.09.10	Prof. Cherian, Director, KCHR,P.B.No.839, Vyloppilly Samskrithi Bhavan, Nalanda, Trivandrum-695 003.
20	16.09.10	Mr. T.R. Asok Kumar, Forest Range Officer, Kottiyoor Range, Edayal P.O., Kannoth, Kannur.
21	16.09.10	The Judicial First Class Magistrate, Kuthuparamba, Kannur.

No.	Date	Client
22	17.09.10	The Assistant Executive Engineer, Kerala State Housing Board, Trip Site, Moothrikkara, Mayyanad, Kollam.
23	23.09.10	The Proprietor, M/s Varghes & Sons Wood Industries, P.O. Mundoor, Thrissur.
24	25.09.10	The Assistant Executive Engineer, Kerala State Housing Board, Kollam Attukal Puthuval Site, G.S.Road, Kollam.
25	27.09.10	Capt. Sudhakaran P.R., AGE B/R (P) No.1 Ezhimala Naval academy, Kannur 670 310.
26	28.09.10	The Assistant Engineer, LIC of India, Branch Office -2, Kollanur Devassy Building, Thrissur-680 020.
27	30.09.10	Mr. M.T. Harilal, Forest Range Officer, Thamarassery Range, Kozhikode.
28	04.10.10	Mr. Binoy Chhajer, Director, ARCKCAC Forgecast Ltd, P.B. No. 9210, Kolkata 700 071.
29	11.10.10	The Assistant Engineer, CPWD Trivandrum Central Sub Division III, CRPF Campus, Pallipuram P.O., Thiruvanathapuram- 695 316,
30	15.10.10	Mr. Robert Augustine, Vaztakkad, Mannanthala P.O., Thiruvanathapuram-15
31	15.10.10	Mr. C. Babu Rajendran AE(Civil), Assistant Garrision Engineer, B/R No.4 Ezhimala Naval Academy, Kannur - 670 310.
32	20.10.10	M/s. Sree Balaji Timbers, 119 Meenkarai Road, ZaminUthukuli P.O. Pollachi -642 004, Tamil Nadu.
33	21.10.10	Mr. K.B.Pillai, Asharaya Apartments B-1, Dinnur Main Road, 5th Cross Ganesha block, RT Nager, Bangalore.
34	08.11.10	Mrs. Princy Mathew, Site Engineer, KITCO Ltd., Nila Campus, Kerala Kalamandalam, Cheruthuruthy, Thrissur.
35	08.11.10	Mr. Shaji Thomas, Payyanur Saw Mills, Perumba, Payyanur, Kannur.
36	08.11.10	M/s Ramko Umas Enterprises, 158, Valayamadevi Road, Neyveli-607 802, Cuddulore Dt., Tamil Nadu.
37	08.11.10	The Assistant Executive Engineer, TRP-CHRP, Sakthikulangara, Kollam.
38	08.11.10	The Assistant Executive Engineer, TRP-CHRP, Payyalakkavu.
39	10.11.10	Lt. Col. S.S. Juneja, Garrision Engineer, (P) No.1 Ezhimala Naval Academy, Kannur - 670 310.
40	04.12.10	The Site Engineer, KITCO Ltd, Kozhikode.
41	09.12.10	Mr. Anu P., Project Engineer, KITCO Ltd, Ravipuram, Kochi.- 682 016.
42	13.12.10	Mrs. Princy Mathew, Site Engineer, KITCO Ltd, Nila Campus, Kerala Kalamandalam, Cheruthuruthy, Thrissur.
43	13.12.10	Mr. Anu P., Project Engineer, KITCO Ltd, Ravipuram, Kochi.- 680 016.
44	17.12.10	Mr. G.S.Tomar, Assistant Engineer(Civil), Office of the AGE B/R (P) No.2, Ezhimala Naval Academy, Kannur - 670 310.
45	28.12.10	The Assistant Engineer, CPWD Calicut Central Sub Division No.1, Room No.2/17 & 2/18, Faculty Block, IIM Campus, Kunnamangalam, Kozhikode.
46	18.01.11	Mr. T. Anandan, Asst. Director-in-Charge, Sidha Research Institute, Arumbakkam, Chenni-600 106.
47	11.02.11	The Asst. Engineer, Kadappuram Tusnami RP Site, Project Consultant Division, KSHB, Ayyanthole, Thrissur.
48	21.02.11	The Assistant Executive Engineer, TRPSite, Kallukunu, Paravur, Kollam.
49	28.02.11	Mr. Manikant Prasad, Project-in-Charge, Era-Infra-Engg. Ltd., Mega Hostel Project NM, Kozhikode 673 601.
50	10.03.11	The Assistant Engineer, CPWD Sub Division No:III, Kallai, Kozhikode -673 003.
51	11.03.11	Mr. Manikant Prasad, Project-in-Charge, Era-Infra-Engg. Ltd., Mega Hostel Project NM, Kozhikode 673 601.
52	11.03.11	Mr. N.K. Sharma, JE (Civ), Office of the AGE B/R (P) No.3, Ezhimala Naval Academy, Kannur 670 310.
53	18.03.11	The Assistant Engineer, CPWD Thrissur Central Sub Division No:1, Thrissur -680 020.
54	19.03.11	Prof. Cherian, Director, KCHR, Vyloppilly Samskrithi Bhavan, Nalanda, Thiruvananthapuram -695 003.
55	24.03.11	M/s Ramko Umas Enterprises, 158, Valayamadevi Road, Neyveli-607 802, Cuddulore Dt. Tamil Nadu.
56	26.03.11	Mr. Y.S. Badrinath, JE/ (Civ) Office of the AGE B/R (P) No.3, Ezhimala Naval academy, Kannur.670 310.
57	28.03.11	Lt. Col. Sachin Oka, Garrison Engineer(NB), Military Engineer Service, Gandhigram Post. Visakhapatnam, Andhra Pradhesh.

Upcoming events

31 October - 2 November 2011
5th International Woodfibre Resources and Trade Conference: "*Woodchips and biomass for global markets*", Grand Copthorne Waterfront Hotel, Singapore. Organised by DANA Limited, Pike & Co and Wood Resources International. For more information contact: E-mail: enquiry@prcc.com.au

31 October - 5 November 2011
Planted Teak Forests – a Globally Emerging Forest Resource" Guanacaste, Costa Rica. CATIE in cooperation with FAO and TEAKNET of KFRI is organising the conference and will focus on planted teak forests as a globally emerging forest resource. The details of the conference is available in the website: http://www.catie.ac.cr/conferencia_teca/home.htm

6 - 11 November 2011
***Asia- Pacific Forest Invasive Species (APFISN) Workshop on "Forest Health Technologies and Phytosanitory Standards* to held at Beijing, China.** For details contact: sankarn@kfri.org Website: www.apfisn.net

7 - 11 November 2011
***24th Session Asia- Pacific Forestry Commission*, Beijing, China.** For details contact: FAO Regional Office for Asia-Pacific (RAP), Dr. Patric Dust, patrick.durst@fao.org
Website: http://www.fao.org/forestry/33587/en/

15 - 18 November 2011
Research Priorities in Tropical Silviculture: Towards New Paradigms? IUFRO International conference, Montpellier, France. Under the framework of the International Year of Forests, CIRAD, CIFOR and ECOFOR are organizing this International Conference under the auspices of IUFRO. Registration Fee: •150; Deadline for Registration: March 30th 2011; For details contact: Plinio Sist, sist@cirad.fr

21-23 November 2011
Providing the Scientific Basis for Fungal Conservation India - UK Colaborative Workshop, KFRI Peechi. For details contact: sankaran@kfri.org

8-13 July 2012
***2012 IUFRO All Division 5 Conference*, Estoril, Lisbon, Portugal.** This conference, organized by IUFRO Division 5 (Forest Products) once in 5 years, in conjunction with the Technical University of Lisbon, will provide a mechanism for the exchange of knowledge and experience in forest products research at both the national and international level. Participants will discuss recent research progress, exchange information, and collaborate on research related to the conference theme of "Forest Products". Registration has begun. For details, log on http://www.iufro2012.org

10-13 April 2012
World Bamboo Congress Belgium 2012. The 9th World Bamboo Congress is to be held in Antwerp, Belgium on 10-13 April, 2012. The theme of the Congress is: Bamboo Biosciences, Bioengineering and Agroforestry Potentials. This WBC will be a catalyst for dissemination of the most current scientific and field research information available worldwide in order to promote the sustainable and realistic utilization of bamboo for myriad of potentials, as well as to effectively promote the expansion of species-specific bamboo plantations for regional production and modern opportunities. The website is up and running, and registration has begun! Go to http://www.worldbamboocongress.org Deadline for paper submission is 1 November 2011.

Welcome to the new Scientists, Administrative, and Technical staff who joined KFRI recently

Name	Position	Date of joining
Dr. Raghu, A.V.	Scientist – B	7 Dec., 2010
Dr. Hrideek, T.K.	Scientist – B	8 Dec., 2010
Dr. Suma, T.B.	Scientist – B	8 Dec., 2010
Dr. Sujanapal, P.	Scientist – B	9 Dec., 2010
Dr. Mallikarjuna Swamy, G.E.	Scientist – B	20 Dec., 2010
Dr. Sreekumar, V.B.	Scientist – B	1 Mar., 2011
Dr. Sreejith, K.A.	Scientist – B	1 Mar., 2011
Dr. Amruth, M	Scientist – B	1 Mar., 2011
Dr. Sandeep, S.	Scientist – B	9 Mar., 2011
Dr. Jayaraj, R.	Scientist – B	28 Mar., 2011
Shri. Shereef, P.I.	Tech. Officer	10 Aug., 2010
Smt. Raji, M.K.	Tech. Officer	18 Aug., 2010
Smt. Sindhumole, C.K.	Office Assistant	9 Aug., 2010
Smt. Rajina, V.V.	Office Assistant	17 Aug., 2010
Smt. Tintu, R.	Office Assistant	18 Aug., 2010
Smt. Raseena, V.	Office Assistant	20 Aug., 2010
Shri. Krishnanunni, V.S.	Office Assistant	28 Aug., 2010
Shri. Abdul Jaleel, K.	Helper	16 Aug., 2010
Smt. Sheeja, S.	Helper	18 Aug., 2010
Shri. Hamsa, E.	Helper	19 Aug., 2010
Smt. Ashamole, S.	Helper	19 Aug., 2010
Smt. Sujatha, C.	Helper	21 Aug., 2010

FAREWELL

Dr. P.K. Muraleedharan

Dr. P.K. Muraleedharan retired as Scientist F and Programme Coordinator of Human Dimensions Division of KFRI. He has completed his M.A. (1976) and Ph.D. in Economics (1983) from the University of Calicut. He received advanced training in Forest Economics from the Ohio State University, USA during 1989-1990. He also received short term training in Forest and Environmental Economics from the following Institutions: Oxford Forestry Institution and Natural Resource Institute, UK in 1995, Indian Institute of Forest Management, Bhopal in 2000, G.B. Pant Institute of Himalayan Environment and Development, Almora in 2001 and International Agricultural Centre, Wageningen University, Netherlands in 2002. Dr. Muraleedharan was appointed as Scientist, in the Division of Economics in 1982. He was appointed as Forest Economist and Scientist – in – Charge in the Division of Economics and promoted to the post of Programme Coordinator. He received fellowships of the Ford Foundation (USA) and ITTO (Japan) for Post Doctoral work and training. He successfully guided six students to Ph. D. in Forest Economics from FRI Deemed University and CUSAT. He was investigator of 27 research projects and published 27 research reports, 50 research papers and edited 2 books. He was successful in attracting funds from International Agencies like FAO, World Bank, IDRC, INBAR, Ford Foundation, TRADA Technology, Ltd., UNDP-GEF, DFID and National Agencies like Department of Environment and Forests, Department of Science and Technology, National Bamboo Mission and Department of Industries. His main areas of research were sustainable utilization of non-wood forest products, socio-economic aspects of depletion of areas under mangrove, bamboo and bamboo handicrafts, sustainable livelihood of tribals and other weaker sections and economic valuation of natural resources.

Shri P.A. Sulaiman

Shri. P.A. Sulaiman joined the institute on 29th September 1986 as Office Assistant and retired from service on 31st May 2010 as Assistant Office Manager.

Shri. M.S. Sukumaran

Shri. M.S. Sukumaran joined the Institute on 9th January 1980 as Office Assistant and retired from service on 30th November 2010 as Section Officer.

Shri K.A. Gopalan

Shri K.A. Gopalan joined the Institute on 20th May 1987 as Office Assistant and retired from service on 30th April 2010 as Assistant Officer Manager

Shri. K. Nanu

Shri. K. Nanu joined the Institute on 13th June 1986 as Watcher and retired from service on 31st December 2010 as Clerical Assistant.

Shri K.C. Subramanian

Shri. K.C. Subramanian joined the Institute on 6th October 1982 as Attender and retired from service on 30th April 2010 as Senior Attender.

Shri A.V. Velayudhan

Shri. A.V. Velayudhan joined the Institute on 13th June 1979 as Attender and retired from service on 30th June 2010 as Senior Special Grade Attender.

Shri. C.A. Jose

Shri. C.A. Jose joined the Institute on 7th May 1982 as Binder and retired from service on 30th November 2010 as Technical Assistant.

Shri P.I. Madavan

Shri P.I. Madavan joined the Institute on 22nd October 1976 as Driver and retired from service on 30th April 2010 as Senior Special Grade Driver.

Shri K.M. Mathan

Shri K.M. Mathan joined the Institute on 31st March 2001 as Driver and retired from service on 30th June 2010 as Driver.

Shri P. Mohammed

Shri P. Mohammed joined the Institute on 1st August 1986 as Watcher and retired from service on 31st July 2010 as Helper.

Shri. K. Syed Mohammed

Shri. K. Syed Mohammed joined the Institute on 24th July 1985 as Helper and retired from service on 30th September 2010 as Watcher.

Shri. C.J. John

Shri. C.J. John joined the Institute on 1st August 1986 as Helper and retired from service on 31st October 2010 as Senior Helper.

WEATHER DATA

Monthly weather data for 2010 at Peechi; Latitude-10° 31'47" N **Longitude-** 76 ° 22'7.5" E **Altitude-** 45 msl

Month	Max. Temp °C	Avg. Temp °C	Min. Temp °C	Max. rh %	Avg. rh %	Min. rh %	Rainfall mm	Wind Velocity km/h	Solar Radiation kw m^{-2}
Jan	32.51	25.41	19.43	100.00	74.68	19.05	0.00	6.52	76.42
Feb	36.75	26.06	20.66	100.00	65.48	18.08	0.60	5.14	140.49
Mar	38.06	28.61	21.96	100.00	78.26	32.40	8.20	2.66	156.59
Apr	36.56	28.01	14.67	100.00	83.47	47.60	154.20	1.86	138.47
May	35.08	28.35	22.57	100.00	83.28	54.50	75.80	1.65	124.79
Jun	34.11	24.56	22.08	100.00	81.93	59.60	676.80	1.69	98.15
Jul	31.06	23.78	16.42	100.00	82.01	67.90	610.60	1.11	86.50
Aug	30.90	24.54	19.99	100.00	86.80	67.40	203.60	1.11	87.17
Sep	31.65	25.25	21.38	100.00	85.33	47.60	186.00	1.12	102.54
Oct	32.05	24.65	20.93	100.00	77.84	54.50	524.60	1.08	96.47
Nov	31.30	24.54	11.07	100.00	88.67	67.40	426.00	2.36	87.46
Dec	30.57	24.45	12.61	100.00	88.50	58.20	13.80	5.29	106.99
Total/ Average	**38.06**	**25.69**	**11.07**	**100.00**	**81.36**	**18.08**	**2880.20**	**2.63**	**1302.04**

Somen C. K., Dept. of Tree Physiology

Priced Publications

		Price	
	Bamboo	Rs.	US$
1	An Annotated Bamboo Bibliography. KFRI CD 4	200.00	20.00
2	Bamboo: A Crop (CD-ROM)	250.00	25.00
3	Bamboos of India	2250.00	100.00
4	Edible Bamboo Shoot Recipes	30.00	10.00
5	Edible Bamboo Shoots: Collection and Processing (Malayalam)	10.00	10.00
6	Information Resources for Bamboo and Cane Development in Kerala	75.00	10.00
7	Policy and Legal Issues in Cultivation and Utilization of Bamboo, Rattan and Forest Trees in Private and Community Lands	400.00	40.00
	Rattan (Cane), Palms		
8	A Manual on the Rattans of Andaman and Nicobar Islands	175.00	20.00
9	Annotated Bibliography on Rattans of the World	350.00	35.00
10	Commercial Rattans of Kerala	50.00	10.00
11	Field Identification Key for Rattans of Kerala	125.00	15.00
12	Field Identification Key for Indian Palms. KFRI CD 8	150.00	15.00
13	Nursery and Silvicultural Techniques for Rattans	50.00	10.00
14	Oil Curing Technology for Value-added Rattan (Cane) Products	50.00	10.00
15	Palms of Kerala	200.00	20.00
16	Protection of Rattan against Fungal Staining and Biodeterioration	50.00	10.00
17	Rattan Management and Utilisation	300.00	30.00
18	Rattans of the Western Ghats: A Taxonomic Manual	100.00	10.00
19	Structure and Properties of South Indian Rattans	75.00	10.00
	Teak		
20	Bibliography on Teak. KFRI CD 2	500.00	50.00
21	Processing and Marketing of Teakwood Products of Planted Forests: Proceedings	700.00	50.00
22	Quality timber products of teak from sustainable forest management	1000.00	80.00
23	Teak (Seminar Proceedings)	200.00	20.00
24	Teak Planner. KFRI CD 7	1000.00	80.00
25	Teak Bibliography (Print)	700.00	70.00
26	The Teak Defoliator (CD-ROM)	250.00	25.00
	Plantation Management		
27	Litter Dynamics, Microbial Associations and Soil Studies in *Acacia auriculifomis* Plantations in Kerala	75.00	10.00
28	Plantation Technology: *Calophyllum polyanthum* (Kattu punna)	50.00	10.00
29	Plantation Technology: *Dysoxylum malabaricum* (Vella akil)	50.00	10.00
30	Plantation Technology: *Garcinia gummi-gutta* (Kodampuli)	50.00	10.00
31	Plantation Technology: *Gmelina arborea* (Kumbil)	50.00	10.00
32	Plantation Technology: *Grewia tiliaefolia* (Chadachi)	50.00	10.00
33	Plantation Technology: *Haldina cordifolia* (Maniakaiambu)	50.00	10.00
34	Plantation Technology: *Laerstroemia microcarpa* (Venthekku)	50.00	10.00
35	Plantation Technology: *Melia dubia* (Malaveppu)	50.00	10.00
36	Plantation Technology: *Vateria indica* (Vellaoavin)	50.00	10.00
	Natural Forests		
37	Biodiversity Documentation for Kerala. Part 1: Algae	150.00	15.00
38	Biodiversity Documentation for Kerala. Part 2: Fungi	300.00	30.00
39	Biodiversity Documentation for Kerala. Part 3: Lichens	150.00	15.00
40	Biodiversity Documentation for Kerala. Part 4: Bryophytes	150.00	15.00
41	Biodiversity Documentation for Kerala. Part 5: Pteridrophytes	200.00	20.00
42	Biodiversity Documentation for Kerala. Part 6: Flowering Plants	600 .00	60.00

	Natural Forests	Rs.	US$
43	Biodiversity Documentation for Kerala. Part 7: Insects	300 .00	30.00
44	Biodiversity Documentation for Kerala. Part 8: Freshwater Fishes	800 .00	70.00
45	Biodiversity Documentation for Kerala. Part 9: Amphibians	150.00	15.00
46	Biodiversity Documentation for Kerala. Part 10: Reptiles	150.00	15.00
47	Biodiversity Documentation for Kerala. Part II: Birds	150.00	15.00
48	Biodiversity Documentation for Kerala. Part 12: Mammals	100.00	15.00
49	Ecodevelopment of Western Ghats	200 .00	20.00
50	Field Guide to Animal Signs	100.00	10.00
51	Flowering Plants of Kerala: A Checklist. KFRI CD 6	300.00	30.00
52	Forest Trees of Kerala	75.00	10.00
53	Handbook on Statistical Analysis in Forestry Research	500.00	50.00
54	History of Forest Management in Kerala	150.00	15.00
55	Impact of Diseases and Insect Pests in Tropical Forests	500.00	50.00
56	KFRI Research Reports 1-200. KFRI CD 1	500.00	50.00
57	Manual of Seeds of Forest Trees Bamboos and Rattans	750.00	75.00
58	Shola Forests of Kerala: Environment and Biodiversity	800.00	70.00
59	State Biodiversity Strategy and Action Plan (SBSAP) for Kerala	300.00	30.00
60	Three Decades of Research in KFRI	200.00	20.00
61	TreeID: Tree Identification Key for Kerala. KFRI CD 5	300.00	30.00
62	Tropical Forest Ecosystem Conservation and Development in South and South-East Asia	200.00	20.00
63	Tropical Forestry Research: Challenges in the New Millennium	500.00	50.00
	Wood and Non-Wood Forest Products		
64	Handbook of Lesser Known Timbers (with CD)	500.00	50.00
65	Manual of the Non-Wood Forest Produce Plants of Kerala.	450.00	45.00
66	Upgradation of Rubber Wood	75.00	10.00
	Weeds		
67	Alien Weeds in Moist Tropical Zones: Banes and Benefits	400.00	40.00
68	Field Trials for Controlling *Mikania* Infestation in Forest Plantations and Natural Forests in Kerala	150.00	15.00
69	Integrated Management of the Alien Invasive Weed *Mikania micrantha* in the Western Ghats	150.00	15.00
	Socio-Economics		
70	Basic Readings in Forest Economics	150.00	15.00
71	Socio-economic Research in Forestry	300.00	30.00
	POSTER		
72	Amphibians of Kerala Part. I. Frogs (Counter sale only)	30.00	-

- Postage in India and surface mail charge for abroad are free
- Book Sellers will be given 25% discount for orders of minimum 10 copies of a single title or for Rs. 3,500/US $ 350 and above
- Educational Institutions will be given 10% discount
- Advance payment may be made by M.O./D.D. in favour of the Registrar, KFRI on any Bank in Thrissur, Kerala, India

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Training Programmes

KFRI Main Campus, Peechi

KFRI offers specialized training courses in tropical forestry. It will also be possible to provide tailor-made training depending upon specific needs of the stakeholders. The medium of instruction is English. KFRI is an approved training centre of the Ministry of Environment, Government of India for training the officers of Indian Forest Service. Also, various state forest departments have sponsored candidates for several training courses in the past. Overseas participants from Myanmar, Sri Lanka, China, Nepal, Ethiopia and Uganda have attended different training courses.

Faculty

The Institute has 56 well – qualified and trained scientists with national and international exposure. Apart from the scientists of the Institute, renowned experts from other reputed institutions/ universities are also engaged as resource persons/guest faculty.

Facilities

Training courses are conducted in the Training Extension Centre with modern lecture hall, seminar hall, meeting room and computer hall with internet facility. The Institute has well-equipped laboratories, library, herbarium, insect museum, wildlife museum, nursery and live collection of bamboos, rattans, palms, medicinal plants and tropical tree species. Kerala Forest Seed Center, Teak Museum and Bioresourse Nature Park are other attractions for the visitors. Accommodation is provided in the Trainees Hostel having modern facilities.

Teak Museum, Nilambur

KFRI Main Campus, Peechi

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Bioresourse Nature Park, Nilambur

Evergreen

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