



Newsletter of Kerala Forest Research Institute

Evergreen

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- Flora of Kerala**



Pecteilis gigantea

A tall growing orchid (butterfly orchid) native to India and SE Asia habitat - montane grasslands



Lilium wallichianum

Erect unbranched herbs, habitat - grasslands and endemic to Southern Western Ghats



Ipsea malabarica

Terrestrial tuberous endangered herb habitat - grasslands, endemic to Southern Western Ghats



Grasslands of Wayanad

Western Ghats is one of the world's 34 biodiversity hotspots and Wayanad is one of the Hot-specks in this Hotspot. This view of scenic Grasslands with heart shaped lake (*Hridayasaras*) is from the Chembra Hills of Wayanad District in Kerala located at an elevation of 2,100 m asl. Being a part of the Nilgiri phytogeographical region of the Western Ghats the landscape harbours several endemic, rare and threatened plants and many species which are new to the science. The Malabar Ornithological Survey 2010-11 has reported 200 species of birds, including 14 of the 16 endemic species and two critically endangered species from the region. The lake and the shola-grassland habitats along with the montane forests together form ideal grounds where complex prey-predator relations are staged. We know very little about the limnology of such insularised-high altitude-water bodies and the vegetation history of the region as could be revealed by a palynological stratigraphic study of sediments on the lake bed.

Life Underground: Critical to Terrestrial Ecosystem

Biological diversity - or biodiversity - is a term we use to describe the variety of life on Earth. It refers to the wide variety of ecosystems and living organisms: animals, plants, their habitats and their genes. Ever since the first use of the term by wildlife scientist and conservationist Raymond F. Dasmann in his book *A Different Kind of Country* in 1968, the term has achieved widespread use among biologists, environmentalists, political leaders and civil society.

Ironically, most of the biodiversity studies during that time were focused especially on aboveground plant and animal species (Wardle, 2006). This could be probably because, scientists were largely unaware about the fascinating world belowground and its role in ecosystem functioning, as quantification of soil biodiversity was a tedious task owing to the technical and methodological problems. But it is now realized that soil communities represent the major chunk of terrestrial biodiversity (Decaëns, 2010). As Wolters (2001) opined, "though not apparent to the naked eye, soil is actually one of the most diverse habitats on earth", and is probably one of the species rich habitats of the terrestrial ecosystem which represent a necessary substrate for a large part of global biodiversity.

Belowground Biodiversity?

Soil biodiversity (=Belowground Biodiversity-BGBD) is a collective term referring to all the living forms present in the soil and litter which includes the flora and fauna. Though, it is difficult to give an accurate definition for soil organisms, because there are "fulltime" (earthworms, macro-invertebrates and many micro and meso arthropods, microbes) and "part-time" (insect larvae, mound building insects) inhabitants in the soil (Wolters, 2001). It is better to adopt a *sensu lato* definition because the limit of 'soil habitat' is difficult to discriminate.

How diverse is it?

The question of how many belowground organisms exist world-wide remains open, and there is probably no soil where we are able to identify or even quantify all the resident invertebrates or microorganisms. Majority of terrestrial animals are soil inhabitants for at least one stage of their life cycle and it was estimated that about one-fourth of described living species are strictly soil or litter dwellers (Decaëns *et al.*, 2006). Of the 1,500,000 described living species, soil animals represent 23 per cent (i.e., ~360,000); of which 80 per cent are insects and 12 per cent arachnids.

For this reason, soils have been described as the third biotic frontier after oceanic abysses and tropical forest canopies!

Importance of soil fauna as an ecosystem component

Soil fauna play critical role in the biological turnover and nutrient release from plant residue. This include mounding, mixing, forming voids, back filling voids, forming and destroying peds, regulating soil erosion, movement of water and air in the soil, plant and animal litter, nutrient cycling, and producing special constituent through process of regurgitation and mixing of saliva or excreta with soil materials. Besides, soil organisms actively participate in breaking down pollutants, carbon, nitrogen and phosphorous compounds, stabilizing soil, enabling water percolation and incorporating organic matter. All these activities serve to protect soil against erosion, aid in restoration of degraded land, maintain water quality and increasingly, influence carbon sequestration and reduction of trace gas emissions.

In fact, different types of organisms have different activities in the soil. For example, some of them are predators (protozoa, nematodes, centipedes) and some organisms are litter transformers (earthworms and enchytraeids) and another group of organisms are called "ecosystems engineers" (earthworms, termites, ants) due to their ability to modulate the activities of other organisms. The interaction between these organisms (animals, plants, microbes) is a recent priority programme in soil ecology, but it is a complex field of activity.

Spatial segregation of soil fauna

The soil fauna are distributed unevenly in the soil. The factors causing non-randomness is presumably related to the patchy distribution of food or water, which cause aggregation (Usher, 1976; Usher *et al.*, 1982). In soil biodiversity studies, it is essential to know which species are present and where the species occur in relation to one another (Coleman and Whitman, 2005). Whether species occur together at every micro-site, or do they occur individually in separate sites is a matter of great relevance. This aspect of species distribution has an important bearing on competition and interaction between different taxa, ecosystem functioning etc.

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Aboveground vs. belowground biodiversity

Aboveground diversity consists of plants and nearly all groups of animals and microbes. Plants play a dominant role in providing the 'infrastructure', as well as providing the foundations of the food web by capturing energy from sunlight and sequestering CO₂ into energy-rich carbohydrates, proteins and other organic substrates.

The aboveground and belowground components are thought to be independent, but there is now increasing recognition of the influence of these components on one another and of the fundamental role played by aboveground-belowground feedbacks in controlling ecosystem processes and properties (Wardle *et al.*, 2004, see Fig. 1). There are mounting evidences for the complex suite of interactions existing between plants and both their associated 'aboveground' organisms (herbivores, pollinators, parasites and disease agents), and 'belowground' organisms (soil biota such as decomposers, soil engineers, root herbivores and root disease

agents). Understanding this linkages (between the organisms aboveground and that of organisms belowground) constitute an important challenge in ecology (Hooper *et al.*, 2000; Sylvain and Wall, 2011).

Aboveground-belowground feedback

Soil-plant interactions form one of the most exciting challenges of scientific endeavours of the present century. Most plants live only partly aboveground – their belowground organs (roots) are essential for survival and functioning. We may expect a strong linkage between above and belowground diversity, primarily because plants and plant diversity determine the functioning of the belowground ecosystem via factors such as: plant litter quality, quantity and timing, the soil water balance and microclimate in the surface layer, and root activity that may change the rhizosphere (the area around the roots) by exudation of soluble

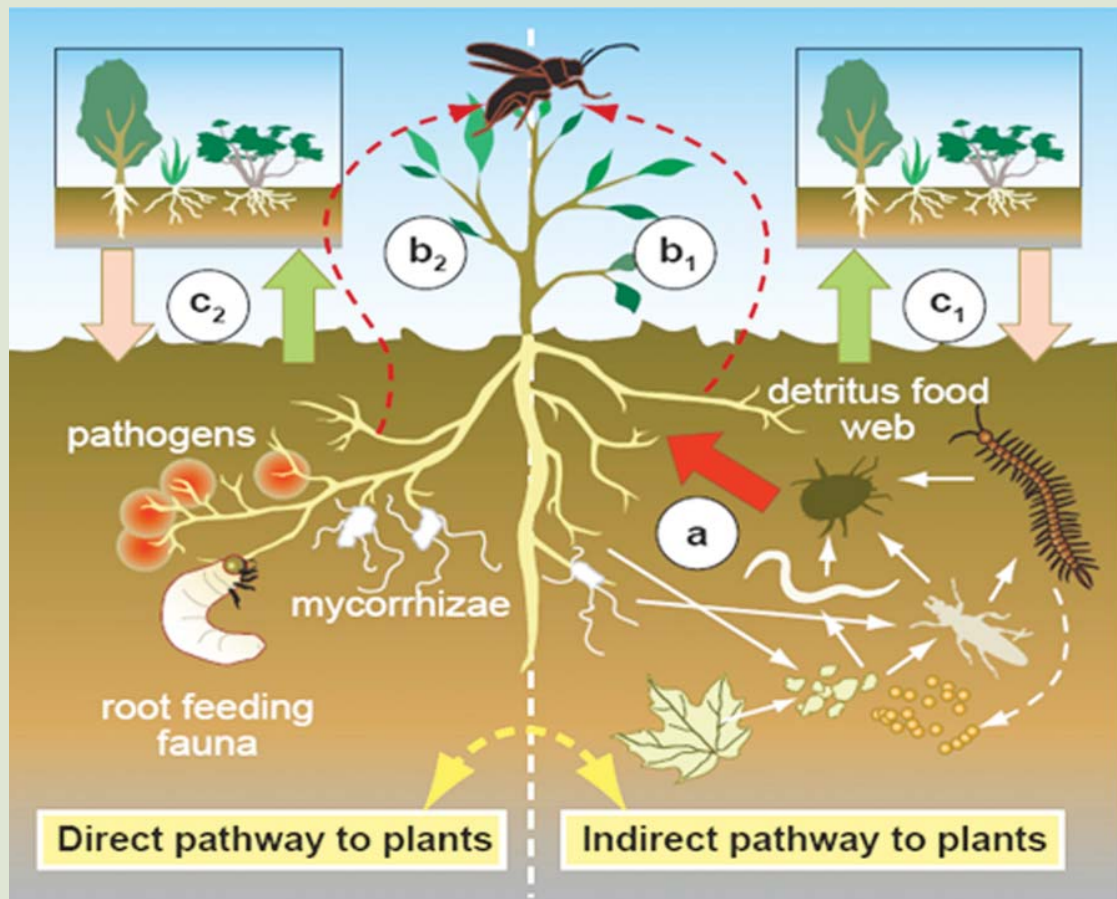


Fig. 1. Aboveground communities are affected by both direct and indirect consequences of soil food web organisms. (Right) Feeding activities in the detritus food web (slender white arrows) stimulate nutrient turnover (thick red arrow), plant nutrient acquisition (a), and plant performance and thereby indirectly influence aboveground herbivores (red broken arrow) (b1). (Left) Soil biota exert direct effects on plants by feeding on roots and forming antagonistic or mutualistic relationships with their host plants. Such direct interactions with plants influence not just the performance of the host plants themselves, but also that of the herbivores (b2) and potentially their predators. Further, the soil food web can control the successional development of plant communities both directly (c2) and indirectly (c1), and these plant community changes can in turn influence soil biota.

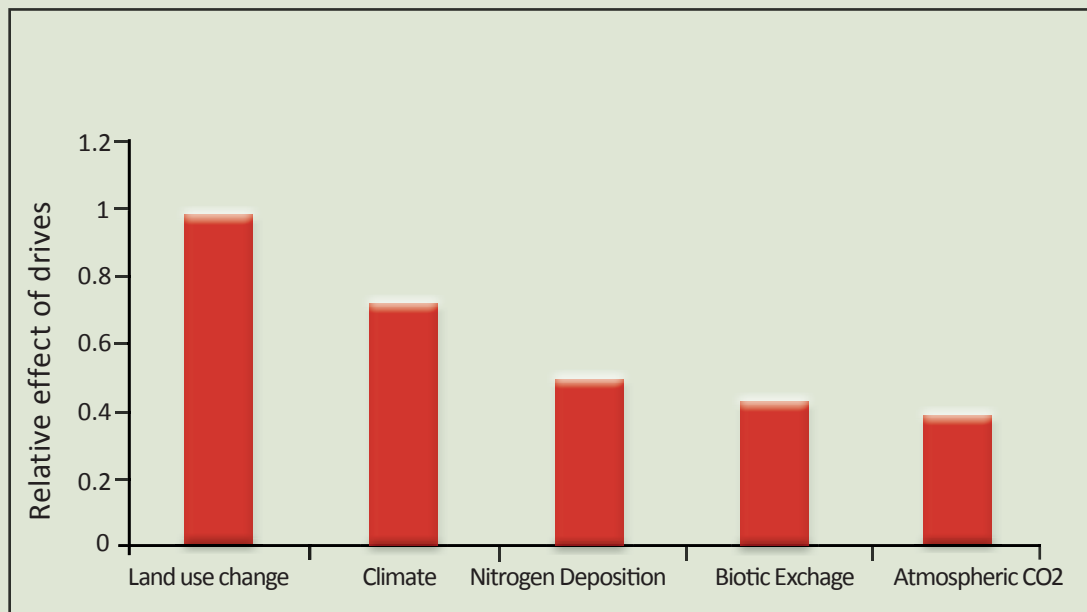


Fig. 2. Landuse change is an important dimension of global change, intimately linked to the changes in biodiversity in space and time (Sala *et al.*, 2000)

organics and decay of structural material (van Noordwijk and Swift, 1999).

Even though differentiating between simple correlation and causation is problematic: the aboveground-belowground relations have multiple dimensions, the relation between aboveground and belowground biodiversity is correlated as either positive or negative. The top-down and bottom-up feedbacks make the system more complex and novel. Thus the question remains open: How aboveground communities drive the belowground subsystem and how belowground biota drives the aboveground subsystem? How this feedback mechanism affects ecosystem services like nutrient cycling, soil fertility, and ultimately the human well being?

Threats on belowground biodiversity

Landuse change and associated phenomenon are major threat to soil biodiversity (indeed to the aboveground biodiversity as well!). Belowground organisms which are soft-bodied and relatively immobile are the immediate victims. Major reasons may include habitat loss (35.6%), human interference (21.8%), pollution (17.3%) and pesticides (10.9%).

While comparing the relative effect of different drivers, landuse change and habitat fragmentation rank first and have strong influence than climate change, invasive animals and plants on biodiversity (Fig. 2). Associated phenomenon's like stress and disturbances, chemical fertilizers and pesticides, exotic plantation and invasive species and other global change etc. also have adverse effect on the soil biodiversity.

Economic aspects of soil biodiversity

Ecological economics is not totally a new field of study. However, economic evaluation of ecosystem goods and services provided by soil fauna is seldom studied. Recently, economic valuation of these services has created interest among scientists. According to Huguenin *et al.* (2006), degradation of soil fauna indicates a 'market failure'. For example, increased pesticide usage which has negative impact on soil fauna also lead to undesirable changes in the cropping system. These changes have negative economical impact.

Soil fauna have intrinsic as well as instrumental value (De-caëns *et al.*, 2006). The instrumental value refers to the potential use of a species by human beings. Based on this, soil fauna have both direct and indirect uses. Consumptive value is the main direct economic value of the soil fauna, while aesthetic value, scientific and educational value, recreational value, value of ecosystem goods and service by soil fauna are the important indirect economic values.

Conservation needs of soil biodiversity

It is a fact that soil organisms have not received much attention from the conservationists. The Red Data Book of threatened animals (1996) by IUCN lists 1891 invertebrates as threatened, of which 193 are from India. An assessment of the status of 94 soil invertebrate fauna from India by Daniel *et al.* (1998) showed that 64 per cent of fauna are threatened. This may be rather exaggerated, because most of the species mentioned were rare by distribution and low in population. Further the taxa reported from a single location

with few or no record after their initial studies were among the list. Nevertheless, the situation seems to be alarming and further attention is required to save at least some of the taxa facing extinction in course of time.

There is an urgent need to create a database on different organisms occupying different soil types and climatic zones. Technological and scientific knowledge gained during the past few years provided effective scientific tools for characterization of belowground biodiversity. Theoretical advancement in belowground ecology also provided clues to the nature of interactions among various organisms, the structure of soil food web, nutrient movement etc.

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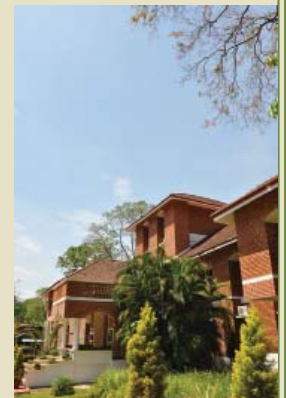
V.V. Sudheendrakumar and P. Mujeeb Rahman
Department of Forest Entomology

Training Programmes

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 course in the past. Overseas participants from Myanmar, Sri Lanka, China, Nepal, Ethiopia and Uganda have attended different training course.

For further details please contact:

Programme Co-ordinator	Ph: +91 487 2690100
Extension and Training Division	+91 487 2690330
Kerala Forest Research Institute	Fax: +91 487 2699249
Peechi-680 653, Thrissur, Kerala, INDIA	Email: training@kfri.org



Propagation Technique of Palmyra Palm



Fig. 1. Palmyra palm

Palmyra palm or sugar palm or (*Borassus flabellifer* L.), commonly known as *Karimpana* (Fig.1) which belongs to the family Arecaceae, is a multipurpose tree of great utility and occurs extensively in the Tamil Nadu and Palakkad District in Kerala. It is a tall, erect, magnificent dioecious (rarely hermaphrodite) palm, 20-31 m height and 1.0-2.2 m in girth with a crown of 30-

40 large fan-shaped fronds. A variety of products of economic and subsistence value are obtained from palmyra: its fruits and tuberous seedlings are edible, beverage and sugar is obtained from the sap, fibre from the leaf and leaf base is used for weaving and plaiting and for making brushes and cordage. Wood from the trunk of the palms used for construction and as fuelwood. Apart from these numerous other minor products are also obtained from palmyra palm. Thus it has an important role in the subsistence economy of the rural population. Nevertheless, overexploitation and lack of concerted efforts in planting threatens the species. Propagation of the species becomes crucial in this context.

Palmyra is generally propagated through seeds. Although polyembryony and twin-seedlings have been reported, in general only one seedling emerges. In the early stages of germination only the underground portion grows downward, and later the aerial portion of the seedling elongates and develops into stem. The palm usually starts flowering at the age of 15 years after the commencement of aerial growth, but in some cases flowering is delayed even up to 30 years. Flowers appear during the months of March-May

in some areas and fruits will ripe by August through September. Alternatively, in some other areas, flowers appear during the months of November through February. The fruit is a fleshy drupe, spherical with a flat bottom and it weighs about 1-3 kg (Fig.2). The ripe fruit varies in colour from light gold at the end attached to the spadix, to brown and nearly black towards the other end.

Although the fruit develops from three fused carpel, the number of pyrenes within the mesocarp varies one to four (Fig.3). The endocarp is hard and covers each seed, which has a brown testa (Fig.4). The endosperm is gelatinous when the seed is young, filling the entire cavity after 60-70 days of fertilization. As the fruits mature, the endosperm hardens, forming a cavity at its center. The endosperm has fats, oils, and proteins, but no starch. The embryo is positioned below the germ-pore and embedded within the endosperm. The germ-pore is situated at the stigmatic end of the fruit.



Fig. 2. A bunch of palmyra fruits

Germination

Germination of palmyra palm is different from other related genera of the family Arecaceae. Palms usually show two distinct types of germination; with or without extension of the cotyledonary sheath (apocolon). The palmyra palm is typically one where the sheath grows downward before the first leaf sprouts up from a considerable depth in the ground. The cellulosic endosperm is progressively digested to simpler carbohydrates by the cotyledon and furnished to the developing plumule and radicle.

Seeds of palmyra palm germinate within 15 to 20 days of

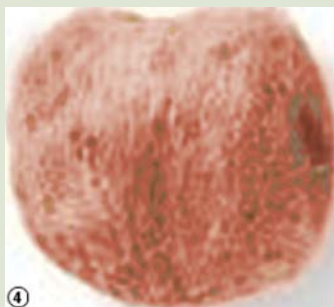
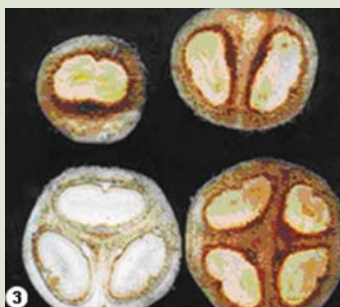


Fig. 3. Cross-section of 1-, 2-, 3- and 4-seeded fruits; Fig. 4. Pyrene of palmyra palm; Fig.5. Seed germination Fig. 6. Elongation of apocolons from three-seeded fruit during tubular germination

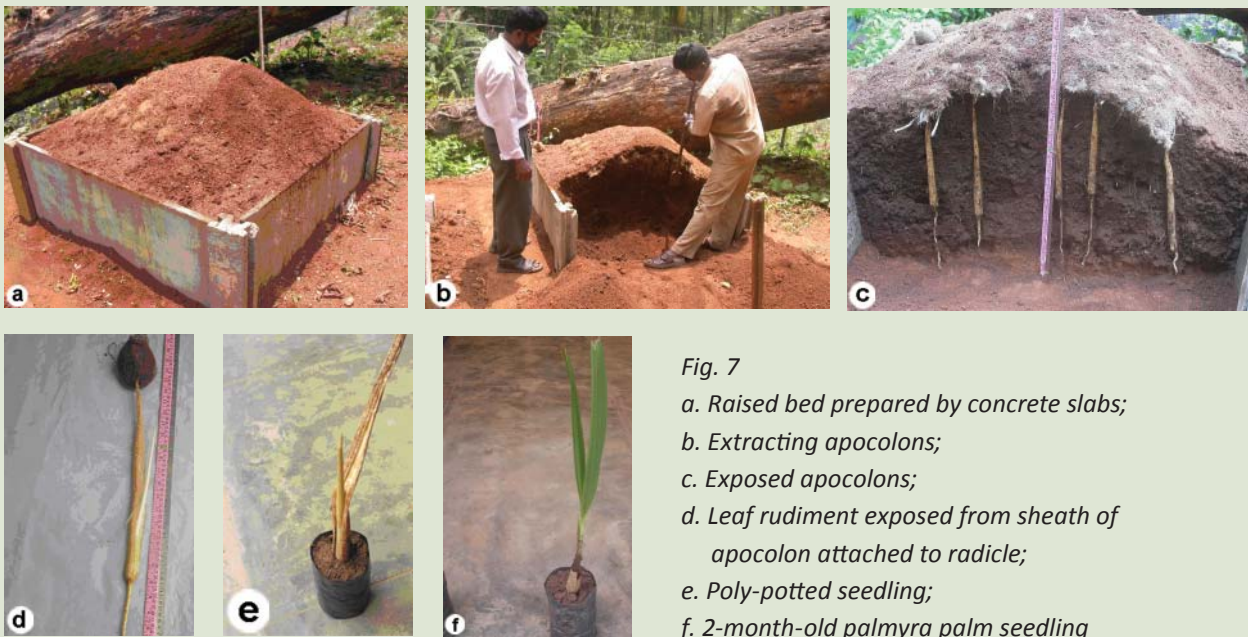


Fig. 7
a. Raised bed prepared by concrete slabs;
b. Extracting apocolons;
c. Exposed apocolons;
d. Leaf rudiment exposed from sheath of apocolon attached to radicle;
e. Poly-potted seedling;
f. 2-month-old palmyra palm seedling

sowing (Fig.5). During germination of the seed, the single cotyledon enlarges and emerges as a germ tube breaking the endocarp. The germ tube elongates as a pale yellow sheath enclosing the embryo and carries it down. This hypocotyl is referred as the “apocolon”, a storage organ of the first rudimentary leaf, which gets initiated at the center of the apocolon (Fig.6). The apocolon, although referred to as a “tuber” is neither a modified stem nor a root. It is a modified hypocotyl enclosing the coleoptile and coleorhiza. During early stages of apocolon formation, the spongy haustorium that is formed in the center of the seed stores the hydrolyzed sugars of the endosperm.

As days advance during apocolon maturity, the stored metabolites and nutrients from the endosperm of the seed are mobilized, leading to an increase in weight of the apocolon. This results decrease in weight of the pyrene, leading to an empty endocarp, which detaches from the apocolon. As the apocolon matures, the sheath, which initially carried the apocolon down, loses its weight gradually and becomes thin and leathery. When the apocolon reaches optimum maturity, radicle comes out of the apocolon base leading

to formation of roots. Finally, plumule comes out of the apocolon and grows from the soil, forming spindle-shaped first leaf. It takes about 150-160 days for the first leaf of the seedling to come out of soil. At this time, the root grow deep in to the soil and it will be very difficult to transplant the seedling without damage of root system.

To overcome this problem, we developed a nursery technique to produce seedlings of palmyra palm. Initially, raised bed was prepared using concrete slabs/heap of soil, with 1.5-2 m height (Figs.7a & 8a-c) and the cleaned pyrenes were kept on top of the heap and covered with a layer of soil. After one month the soil was removed vertically with care using a crowbar (Figs.7b-c & 8b-c) and the apocolon with roots was carefully separated (Fig.7d). The exposed spindle-shaped rudimentary leaf from the sheath of apocolon with attached radicle was ploy-potted in a mixture of soil, sand and cow dung in the ratio of 2:1:1 (Fig.7e). After one month of growth, it becomes a quality plantable seedling (Fig.7f).

Dr.PK Chandrasekhara Pillai and R Varun Menon
Silviculture Department, Kerala Forest Seed Centre



Fig. 8. Cost effective method for producing palmyra palm seedling (a) Palmyra seedssown on soil heap; (b) Extracting apocolon; (c) Exposed apocolons

Flowering Plants of Kerala – DVD ver. 2.0.

The DVD on Flowering plants of Kerala ver. 2.0 is a compilation of the flowering plants so far recorded from the state of Kerala. The DVD has two sections, section-1 includes introduction, location, geology, soil, climate, phytogeography, vegetation, literature review and discussion. Section-2 deals with search categories. The main search categories are species, local names and advanced search (Fig. 1).

The Species Search has two options viz., starting with and anywhere. By selecting starting with option, plants can be sorted out with generic name. The anywhere option is to sort out plants based on their species name. For example, under this option if you type the letters 'malab' all the scientific names with specific epithets malabaricum, malabaricus, malabatum, malabarica will be displayed with full citation of publications and images of the plants (Fig. 2). For viewing further details, click the button View Details. Then, another window will appear in which the family name, habit, conservation status (if any), endemic status (if endemic), flowering and fruiting period, habitat, distribution and buttons such as citation, description, localities and local names are displayed (Fig. 3). For enlarged view, click over the images of the plants. The second search option is with Local Names. By clicking over the button Local Names, a new window will appear. From this window, plants can be searched by typing the local name in the space provided or by selecting the local names displayed in alphabetical order. When a local name is selected, its correct scientific name

and other local names (both Malayalam as well as English) will appear (Fig. 4). By clicking over the button View Details, further details can be viewed.

The third search option is the Advanced Search. By clicking over this button a new window will appear. In this window, there is provision to search plants based on family, genus, monocotyledons, dicotyledons, gymnosperms, leaf type (simple, compound, leafless), flowers (single, group), fruit (fleshy, dry), habit (climbers, shrubs, herbs, trees), flower colour (blue, brown, creamy, green, orange, pink, red, rose, violet, white, yellow), conservation status (extinct, extinct in the wild, critically endangered, endangered, vulnerable, near threatened, least concern, data deficient, not evaluated, all threatened species), habitat (aquatic/marshy plants, evergreen forests, semi-evergreen forests, deciduous forests, mangroves, grasslands), districts (Thiruvananthapuram, Kollam, Pathanamthitta, Idukki, Kottayam, Alappuzha, Thrissur, Palakkad, Malappuram, Kozhikkode, Wayanad, Kannur, Kasaragode), garden plants, medicinal plants, edible fruits, poisonous plants, exotic plants, endemic plants, vegetables, epiphytes, saprophytes, stem parasites, root parasites and weeds (Fig. 5). All the above categories can be searched in a family, habitat or district. When a search category or categories are selected, the plants belonging to the search category or categories will be displayed. Then the click the button View Details, for further details. The DVD is designed to identify plants by selecting a few easily ob-

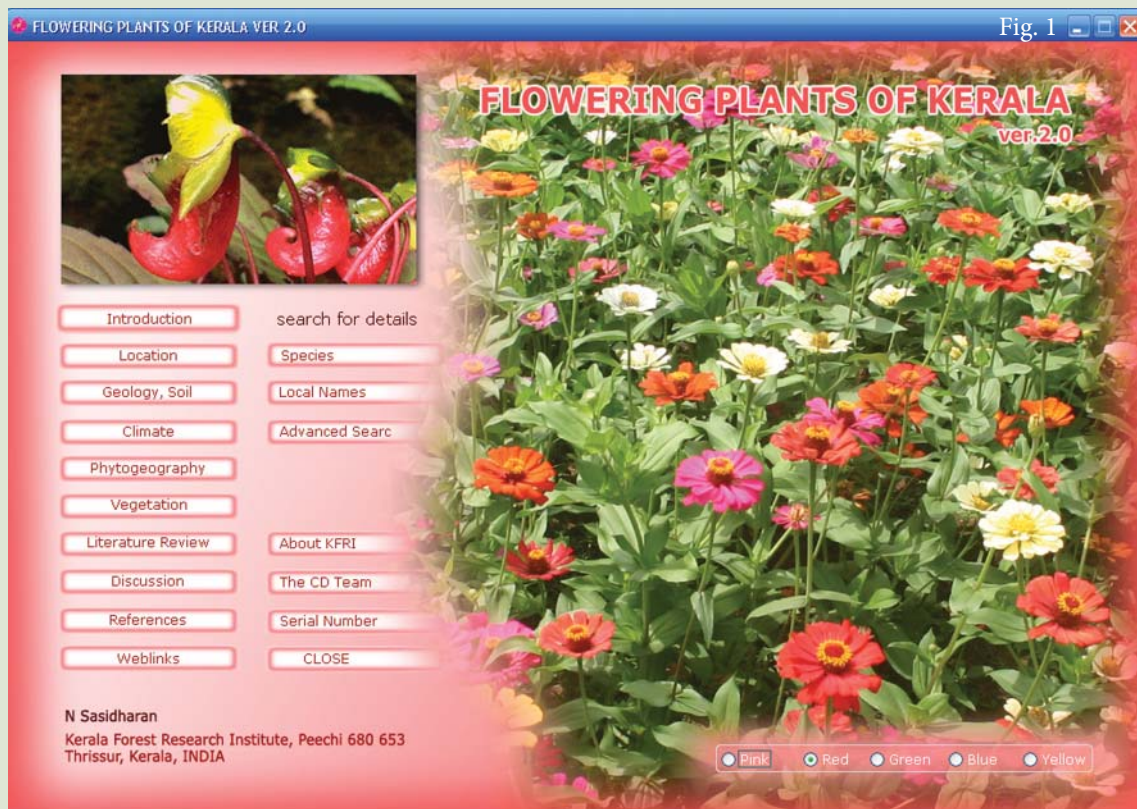


Fig. 1

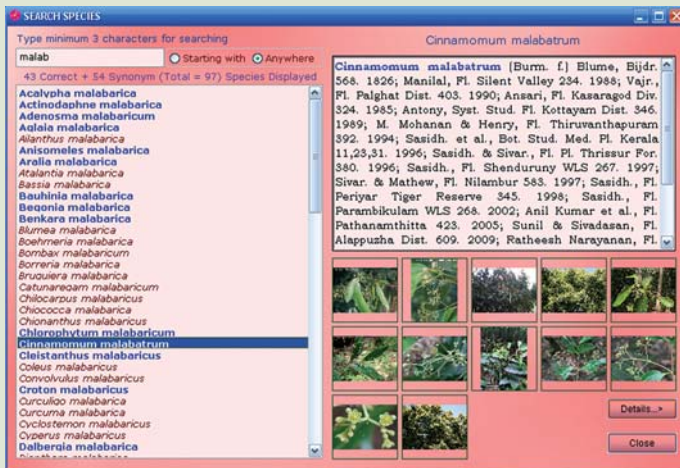


Fig. 3

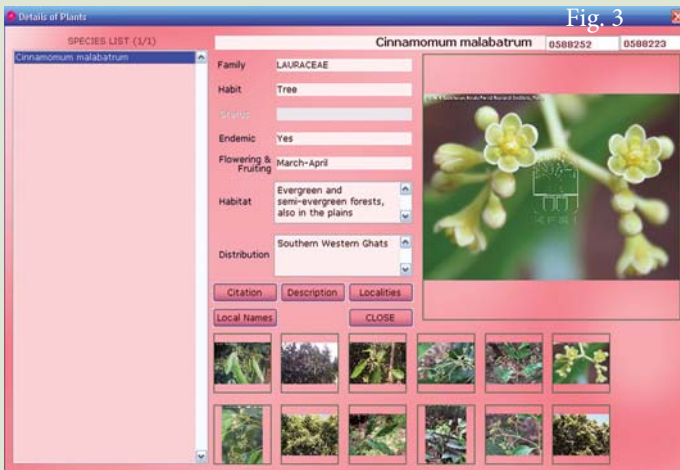


Fig. 4

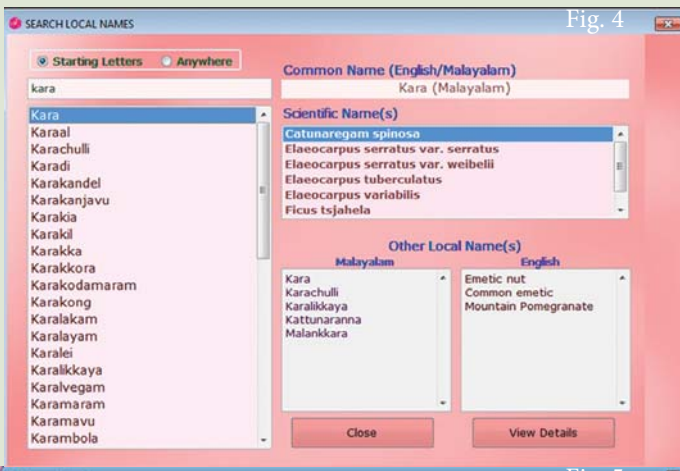
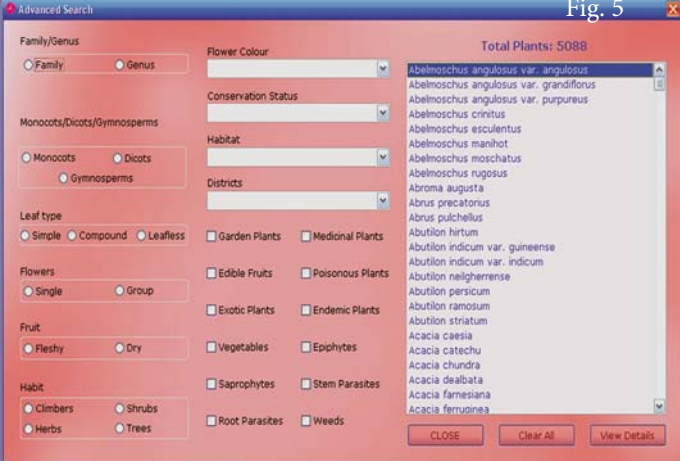


Fig. 5



servable features or user categories even for people not familiar with the botanical terms. All permutations and combinations are possible among the search categories. For example, if a garden plant is to be identified, select the garden plant option. On clicking more search categories such as leaf type, flower colour, habit, etc. the number of plants sorted out will get reduced to one or a few. The plants selected with the identification characters can be confirmed with the pictures and description by clicking the View Details button.

The families are arranged following the Classification system of Bentham & Hooker with delimitation to certain families according to their recent concepts. The correct botanical name with author(s)'s citation, basionyms and important synonyms, if any, reference to Flora of British India, Flora of Presidency of Madras, Flora of India (Revised), Monographs, Revisions, Flora of Kerala, Flora of Districts/Protected Areas of Kerala, etc. are also cited. District wise occurrence (map) is provided along with images of the species (up to 14). There are 5,094 taxa (4606 species; 110 subspecies; 370 varieties; 8 forma) under 1537 genera belonging to 221 families in the Checklist. Out of the 5094 taxa, 880 are exotics introduced as agriculture, forestry, horticulture, garden plants as well as accidentally entered species. As many as 1,418 taxa are additions to the Flora of Presidency of Madras, of which 355 are new and 1,063 new records of occurrence. The Conservation Status is also indicated for taxa belong to the Red Listed Category. In the DVD, there are 18,570 images of plants including RET as well as interesting species, 11,437 scientific names (5,094 correct names + 6,343 synonyms) and 6,768 local/trade/common names.

Dr N Sasidharan
 Scientist-G & Programme Co-ordinator
 FE & BC Division

Dr. B.P. Pal National Environment Fellowship Award for Biodiversity

Dr N Sasidharan, Programme Coordinator, Division of Forest



Ecology and Biodiversity Conservation, bagged the prestigious **Dr. B.P. Pal National Environment Fellowship Award for Biodiversity** for his outstanding contribution to the field of Plant Taxonomy and Biodiversity conservation. This National Fellowship is given each year to one scientist and is instituted in recognition of significant Research and Development contributions

made by the scientist and to encourage him to continue R&D pursuits in the area of environmental sciences and biodiversity. Dr Sasidharan was awarded this fellowship for 2 years from January 2012, to work on the taxonomy, conservation and utilization of *Salacia (Celastraceae)* in Kerala

Abstracts of KFRI Research Reports

KFRI Res. Rep No. 385

Improvement of infrastructural facilities in the Botanical gardens of Bioresources Nature Trail at Nilambur

UM Chandrashekara

The Kerala Forest Research Institute has developed about 10 ha of land into a Bioresources Nature Park at its Sub Centre at Nilambur. The Bioresources Nature Park has conservation themes for the lower groups of plants such as algae, bryophytes and pteridophytes, plants found in specialized ecological niche such as xerophytes (cacti and succulents) and hydrophytes (aquatic plants), beneficial plants (eg. medicinal plants) and ornamental plants (eg. orchids), with special reference to endemic and rare, endangered and threatened (RET) species. Ministry of Environment and Forests, through its Botanical Garden Scheme financed a short-term project to the KFRI to improve the facilities in the Bioresources Nature Park; specifically for theme areas such as Fern House and Bryophyte House by collecting plant propagules of endangered and endemic ferns, bryophytes and angiosperms and to assemble them in appropriate theme area in the Bioresources Nature Trail, thereby help in increasing public awareness of the value of biodiversity conservation needs. Propagules of endangered and endemic ferns, bryophytes and angiosperms were collected and assembled in appropriate theme area in the Bioresources Nature Trail. As part of the scheme, twenty-one rare and endemic bryophyte species, forty-eight fern species (twenty-five rare and twenty-three common species) and seventeen angiosperm species belonging to different conservation status have been planted in the Bioresources Nature Trail. In addition significant measures were taken to increase the appearance and presentation of the collections.

KFRI Res. Rep No. 386

Pink disease in teak plantations in Kerala and its management

C. Mohanan

Young teak plantations in Kerala are affected by pink disease caused by *Erythricium salmonicolor* and outbreak of disease very often results in heavy damage to the stands. An assessment of the disease situation in young teak plantations in

different Forest Circles of the State was carried out to work out possible disease management measures. The study was carried out in selected 26 teak plantations of the age group 2-to 7-years-old in the Central, Southern and Northern Forest Circles of the State. Observations on disease incidence and severity, measurements of tree height, girth, etc. were recorded. Causal organism, *Erythricium salmonicolor* was isolated from disease specimens and growth studies were carried out. Fungicides, Calixin (Tridemorph), Contaf (Hexaconazole) and Fytran (Copper oxychloride) at different concentrations were screened against selected isolates of *E. salmonicolor* employing poisoned food technique.

High rainfall together with persistence of very high atmospheric humidity for a long period in the teak stands, possible high genetic variability and coexistence of genetically different strains of pathogen in the same locality are possible factors for high incidence, development, and fast spread of the disease. Presence of large stretches of plantations of *Hevea brasiliensis*, *Acacia mangium*, *A. auriculiformis* or *Eucalyptus tereticornis* on the peripheral areas of teak stands possibly influences the microclimate, especially the relative humidity of the area. As these plantation species are potential hosts of *Erythricium salmonicolor*, there is also possibility of existence of genetically different strains of pathogen and also build up of inoculum potential of the pathogen. Presence of heavy weeds and undergrowths in the teak stands further contributes in maintaining the conducive environment for the growth and development of the pink disease pathogen.

Results of laboratory screening of fungicides showed that both the systemic fungicides, Calixin 80 EC (Tridemorph) @ 0.01 % a.i. and Contaf 5 EC (Hexaconazole) @ 0.001 % a.i. are highly effective in arresting the colony growth of *E. salmonicolor*. The contact fungicide Fytran (Copper oxychloride) was also effective @ 0.3% a.i. For managing the pink disease in plantation, application of Calixin @ 0.1% a.i. or Contaf @ 0.001 % a.i. as spray on main stem will be effective. However, to avoid or reduce the incidence of pink disease in young teak plantations, the scheduled silvicultural operations including weeding have to be carried out timely and promptly. Moreover, for achieving best result on disease management in teak plantation, more information on the genetic variability of pink disease pathogen and disease etiology is warranted.

KFRI Res. Rep No. 391

Planting stock production of selected commercial species of bamboos.

CK Somen , KK Unni, KK Seethalakshmi,
VP Raveendran

Andaman & Nicobar islands, the largest archipelago system consisting of 306 islands, and more than 300 islets and is one of the hotspots of biodiversity surveyed for bamboos. Extensive collection of specimens was made from both Andaman & Nicobar group of islands. Eight species of bamboos belonging to five genera are known to occur in Andaman & Nicobar islands alone. Five species viz. *Dinochloa nicobariana*, *Pseudobambusa kurzii*, *Schizostachyum andamanicum*, *S. kalpongianum*, and *S. rogersii* are endemic to these islands. Recent report on the occurrence of *Dendrocalamus calostachys*, *Schizostachyum dulloa* and *S. polymorphum* from the wild is to be re-examined. Probably the said species might have been recently introduced to the Island and cultivated. Description of all the naturally occurring bamboos in Andaman and Nicobar Islands is made as part of the study. The illustrations are provided for the newly described species and critical comments or notes are provided.

Planting stock of 25 commercial species of bamboos listed below belonging to 10 genera was produced using macro and micro-propagation techniques: 1. *Bambusa balcoa*, 2. *B. bambos*, 3. *B. nutans*, 4. *B. polymorpha* 5. *B. striata*, 6. *B. tulda*, 7. *B. vulgaris*, 8. *B. wamin*, 9. *Dendrocalamus asper*, 10. *D. brandisii*, 11. *D. giganteus*, 12. *D. hamiltoni*, 13. *D. longispathus*, 14. *D. sikkimensis*, 15. *D. strictus*, 16. *Gigantochloa atrovioleacea*, 17. *Gigantochloa rostrata*, 18. *Guadua angustifolia*, 19. *Melocanna bambusoides*, 20. *Ochlandra scriptoria*, 21. *O. travancorica*, 22. *O. travancorica* var. *hirsuta*, 23. *Oxytenanthera stocksii* 24. *Thyrsostachys oliveri* and 25. *Teinostachyum dulloa*.

The propagules were produced in the Institute nurseries. Seedlings of *Bambusa bambos*, *B. tulda*, *Dendrocalamus hamiltonii*, *D. strictus*, *Melocanna bambusoides*, *Ochlandra travancorica* and *O. scriptoria* were raised in nursery beds and potted in polythene bags. Macro-proliferation of seedlings of *Bambusa tulda* previously raised in the nursery was carried out by splitting the rhizome portion bearing two or more shoots. Vegetative propagation of *Bambusa balcoa*, *B. vulgaris* (green), *B. vulgaris* var *striata* (yellow), *Dendrocalamus brandisii*, *D. giganteus*, *D. longispathus*, *D. stocksii*, *D. sikkimensis*, *Gigantochloa atrovioleacea*, and *Thyrsostachys oliveri* was done by treating culm cuttings with growth regulators viz. naphthalene acetic acid (NAA) and indole butyric acid (IBA). The proliferation capacity was about 2.5 times (1000 seedlings to 2500 propagules). A total of 83,570 propagules were produced of which 24,336 plants were supplied to farmers, voluntary organisations, schools and Government Departments for different types of planting activities such as boundary or block planting, strip planting on river banks and bio-shield in coastal areas, landscaping, establishment of bambusetum, explants for

tissue culture laboratories etc. The remaining planting stock is maintained in the nurseries at FRC, Velupadam and KFRI Campus, Peechi. Macro-proliferation is continued and the planting stock is being distributed on demand.

KFRI Res. Rep No. 394

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

UM Chandrashekara

The Nilgiri Biosphere Reserve (NBR), the first Biosphere Reserve of India constituted under the Biosphere Reserve Programme has an area of 5520 Km², encompassing parts of the states of Kerala, Karnataka and Tamil Nadu Western Ghats. The Kerala part of NBR covering an area of 1455 km² is rich in biological diversity due to the presence of a wide range of biophysical and climatic conditions. Like most other protected areas, the NBR is also facing the threat of forest degradation and natural resource depletion at a landscape level, particularly in village-fringe forests. A study to analyse the vegetation structure and composition in village-adjacent forests and in the relatively undisturbed forests of the Biosphere Reserve and also to determine the causes and level of disturbance in the village-adjacent forests was made. Changes in cropping pattern in the villages and their impact on forest resource flow into the village landscape units was also attempted as part of the study to identify the forest rehabilitation strategies.

The village-adjacent forest plots were secondary forests experiencing different levels of disturbance. In these forest plots, litter collection and other anthropogenic disturbances have reduced the number of species in the seedling community. However, in the forest plots adjacent to villages like Kadasseri and Manikunmala, the species number increased due to invasion of exotic species from the adjoining landuse systems. In general, the tree density in village-adjacent forest plots was significantly lesser than that in the undisturbed forest plots. Landuse and land-cover in the villages adjacent to 10 forest plots were analyzed with a view to understand their impact on the forest plots. The area under agriculture ranged from 65 to 81 per cent of the total village area, dominated by farms of coconut, areca nut and rubber. Quantity of fuel wood collected from the adjacent forest plot ranged from 3.9 to 18.9 kg ha⁻¹ of forest area. On an average, about 1,000 kg of free seeds/fruits ha⁻¹ were also removed from the forest floor in four months period and thus the tree seedling abundance in the litter collected plots was significantly low. In all the ten villages, livestock is an integral part of agriculture and grazing in forest plots is common with the number of Adult Cattle Units (ACUs) ranging from 3 to 78 individuals day⁻¹ km⁻¹.

The study indicated that despite prohibition, the resource collection in different forms, magnitude and frequency is continuing in the village-adjacent forest plots. The resultant ecological changes have profound effects on the forest spe-

cies composition and structure. For accelerating progressive succession in the forest plots, silvicultural practices such as, assisted natural regeneration and enrichment planting are to be adopted. Species suitable for such programmes are also listed. The need for a Village-Forest Committee, comprising of the representatives of all stakeholder groups, to each village-adjacent forest plot and a Village-Forest Committee Fund as a long-term measure to ensure continuous support for sustainable management of village-adjacent forests in the Nilgiri Biosphere Reserve has been highlighted here.

KFRI Res. Rep No. 396

Mass productivity of HpNPV, a biopesticide for teak defoliator management.

VV Sudheendrakumar , TV Sajeev

Mass production of HpNPV, a potential biopesticide against the teak defoliator *Hyblaea puera* (Cramer) was attempted. During the study period HpNPV amounting to a total of 2.2x10¹³POBs was produced which was sufficient for application in BOUT 4000 ha of teak plantation.

As an activity of the project, attempts were made to transfer teak defoliator management technology to the Forest Divisions of Nilambur North and South. Trainings on various aspects of defoliator management using HpNPV biopesticide were conducted for the benefit of the Forest Department field staff including foresters, forest guards and watchers. Defoliator monitoring techniques were included in the first phase of the training. In the second phase training was given on the HpNPV application methods. The trainings helped to create an awareness among the forest staff on the need for adopting control measure against the defoliator attack for increasing the productivity of teak plantations. This model can be practiced in state, national and transcontinental level. Under the research component of the project, the shelf life of the formulated HpNPV product was evaluated. The study showed decrease in activity of the biopesticide formulation with increase in the storage time. The activity ratio of 76 after 18 months storage was found decreased to 11 by 42 months. As one of the achievement of the project, HpNPV technology could be introduced to a private teak grower in Chattisgarh. The effectiveness of HpNPV was well appreciated by the farmer by using the product in his plantation. A documentary on teak defoliator management was also produced for distribution among teak farmers.

KFRI Res. Rep No. 397

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

V. Anitha

This study holds significance in the context of special emphasis being laid by the UNESCO to establish linkages between conservation and forest management with sustainable livelihood in Agasthyamala Biosphere Reserve (ABR), having a potential for being recognized as a biodiversity-rich World Heritage Site. In this study attempt was made to bring together insights from emerging forestry and conservation paradigms and investigates their relevance in establishing the aforesaid linkages in the Kerala part of ABR. In the study area, human-related constraints in management mainly relate to the lack of absolute involvement of primary stakeholders and others in participatory management, the social and economic dependencies of the Kanis/local communities that conflict with the objectives of the BR, and the actual commercial threats. Towards this, the study recommends adopting an integrated landscape livelihood approach in BR management. Land use changes in the study area have been highly complex due to human interactions over a period of time. The land reforms introduced in the State over a period of time have brought about institutional changes leading to drastic transformation in the land holding pattern and subsequent shift in land use and cropping pattern in the study area.

Encouraging scientific agriculture on one side and putting firm action on those converting forest lands on the other will deter further depletion of such a fragile ecosystem. Recreation/ecotourism is a highly significant economic use of the Biosphere Reserve with immense economic potential for development as an important tourist destination. With



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Government and development agencies focusing mainly on poverty alleviation, ensuring good standard of living to people and environment stability, ecotourism could be a viable alternative for the sustainable management of forests and societal welfare at large. For ensuring environmental stability, ecotourism ventures must be followed by adequate forest expansion activities. To this the study recommends a site-specific programme towards action plan for environmental and economic security. The strategies for sustainable recreation emphasizes on the pro-poor tourism strategy on sustainable tourism focusing on economic benefits,



non economic benefits and policy reforms with special reference to the underprivileged. The results of the study have put forth strategies and action plans for conservation, thus adhering to the Seville Strategy of Biosphere Reserves and the Convention of Biological Diversity.

KFRI Res. Rep No. 399

Bamboos of Peninsular India.

MS Muktheshkumar

In Peninsular India, Bambusoideae is represented by 22 species and two varieties under seven genera. *Ochlandra* is the dominant genus of South India comprising eleven species and one variety so far reported from South India and widely distributed. In the present report the species *Ochlandra travancorica* var. *hirsuta* Gamble, *O. sivagiriana* (Gamble) Camus and *O. soderstromiana* Muktesh & Stephen are synonymised under *O. travancorica* (Bedd.) Benth. The following species namely, *Ochlandra beddomei*, *O. scriptoria*, *O. travancorica* and *O. wightii* are typified. Critical and detailed study revealed that true monadelphous condition does not exist in the genus *Ochlandra*. Based on the affinities, the species under the genus *Ochlandra* are grouped as *Travancorica* group and *Scriptoria* group. A new combination under the genus *Dendrocalamus* is proposed. A species from the genus *Oxytenanthera* is transferred to the genus *Den-*



drocalamus. The species *Dendrocalamus strictus* was typified. After a detailed study, the variety *Bambusa bambos* var. *gigantea* is treated as a synonym of *Bambusa bambos*. In the present study, the genus name *Oxytenanthera* is retained. The spelling in the specific epithet of *O. bourdillonii* and *O. ritchiei* are corrected and *O. bourdillonii* typified. The genus *Arundinaria* in South India previously treated under *Sinarundinaria* has been reverted to the genus *Arundinaria* and *A. wightiana* is typified. *Teinostachyum wightii* was previously treated under the genus *Schizostachyum* as *S. beddomei*. The basionym *Teinostachyum wightii* is accepted and typified in the present study.

According to the present study, there are 22 native species of bamboos in South India. Of the 22 species, 20 are





distributed in Kerala, 6 in Karnataka, 5 in Tamil Nadu and 2 in Andhra Pradesh. Among these, 13 species are endemic to this phytogeographic region. In the Southern Western Ghats bamboos form a major component of the biodiversity. They show a high degree of endemism and most of the species have a restricted distribution. Recently, some of the so far known endemic species are found distributed in Sri Lanka. This gives an indication of the affinities of the Sri Lankan flora with the flora of South India.

KFRI Res. Rep No. 400

National Carbon Project: Spatial assessment of vegetation and soil carbon pool of Northern Kerala.

ARR Menon, Thomas P Thomas

In the long term, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fiber or energy from the forest, will generate the largest sustained mitigation benefit. Therefore, it is very much essential to understand and quantify the terrestrial carbon balance of India and its associated uncertainties. Pilot studies have been done in India to estimate forest /vegetation carbon and these estimates are spread over a decade and are based on different approaches viz: historical records, ecological data and population based forest biomass, scales and classification schemes and objectives. In the 11th Five Year Plan

it is planned to provide extra thrust to understanding the terrestrial Carbon Cycle through a “National Carbon Project”. The project has three major components and aims to understand Vegetation Carbon pools, Soil Carbon pools and Soil-Vegetation Carbon fluxes.

The major objectives of the Vegetation Carbon Pool assessment project are:

1. Assessment of terrestrial vegetation biomass in the country using ground sampling and satellite remote sensing data, and
2. Generation of geospatial data of the terrestrial phyto-mass carbon of India along with estimates of uncertainty.

Among these, fulfillment of the first objective in the Northern Kerala region is the major thrust area of the current project.

Under this subproject, determination of soil organic carbon in surface and sub-surface soils of forests of Northern Kerala is covered in the present study. A cluster based sampling using remote sensing data for stratification was suggested at national level by ISRO and the same methodology was adopted in the current work.

Information on trees outside forests (TOF) was generated in three phases: land use classification and mapping; identification of tree-cover classes; and measurement of tree characteristics. Satellite images and aerial photos were suitable for the first two. High-resolution satellite images are likely to allow the identification of single trees (or crowns) and can be a data source for a large-area TOF inventory.

KFRI Res. Rep No. 401

Clonal seed orchard management for higher seed productivity in teak.

KK Seethalakshmi, EM Muralidharan, George Thomas, M Balagopalan, CK Somen

For genetic improvement of planting stock of teak, clonal seed orchards were established in Kerala during 1979- 81 by bud grafting selected plus trees from different geographic origins. Even after 15 years of growth, flowering and seed production in most of the clones were not promising. It was suspected that lack of flowering may be due to any one or more of the following reasons. 1. Growth of root stock instead of scion during the establishment of grafts. 2. Stock - scion interaction 3. Nutritional imbalances. 4. Physiological reasons like hormonal inadequacy, insufficient light, temperature, moisture, etc. To find out the nature of flowering and seed production in existing clones, a study was undertaken in the seed orchard at Kalluvettamkuzhi, Arippa. Observations were recorded on nature of flowering, molecular

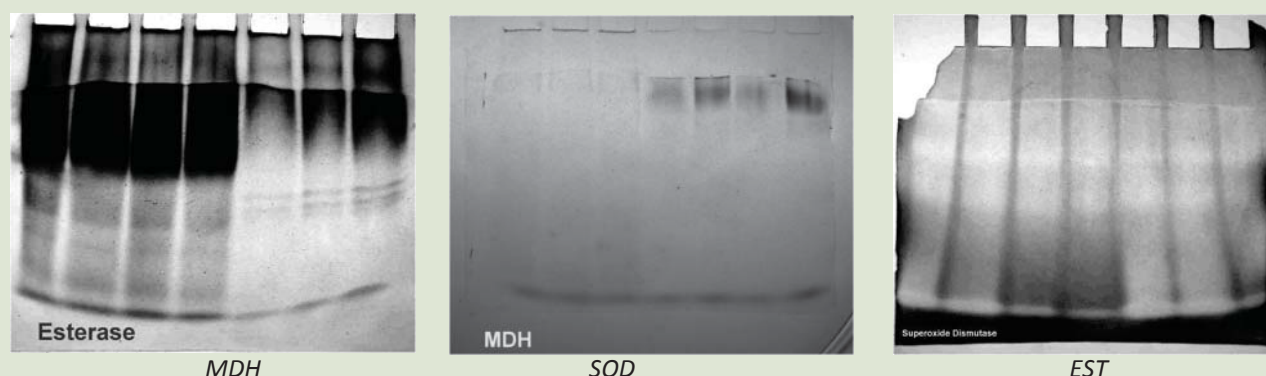


Fig. 1. Banding pattern of seven clones from the seed orchard at Palapilly using three isozyme systems

characteristics of root and shoot DNA of 11 trees belonging to three plus trees, nutritional status and physiological parameters among flowered and non-flowered trees.

The study revealed that the percentage of flowering varied from 2-3 in 1999 and 2000 which increased to 5 in 2001 and 2002. The phenological phase of fruiting were spread over a period of seven months i.e., from June to December. The clones differed in flower production per inflorescence. The fruit production varied from 65g/tree to 300g/tree. The average fruit production was 125g/tree.

Cluster analysis of RAPD data revealed five distinct clusters. Three plus trees stood separate from rametes and formed a distinct cluster. Flowered and non-flowered clones showed a tendency to group together into separate clusters. Two clusters each were obtained for flowered and non-flowered clones. With minor exceptions, the DNA from the scion of a clone clustered with the DNA from its stock. The results indicated that the stock and scion of a clone were highly similar at the DNA level and the scions did not evince any relation to the plus trees from which they were derived. In addition, the flowered and non-flowered clones were genetically distinct. Since the number of samples analysed was limited a definite conclusion could not be drawn from these results. No polymorphism could be found in isozyme analysis in the material collected from seed orchards also.



The foliar nutrient contents N, P, K, Ca and Mg showed considerable variation within clones and between clones. There was a decrease in P and K contents in the leaves of trees flowered from the time of flowering till fruit maturation after which there was an initial increase, though not prominent. If a stress was given to the trees by giving more P and K at the time of flowering and very low N, Ca and Mg, to a certain extent the problem of poor flowering could be solved if all other conditions were conducive to flowering.

Eco-physiological studies in the orchards showed that parameters like light, temperature or rainfall were not a limitation for seed production at Kalluvettamkuzhy. This may be due to the wider spacing (8x8m minimum) given while planting rametes in this orchard.

The results obtained in the study points to the possibility of graft failure in the rametes and the low variability between the clones and rametes used in the study. Use of rooted cuttings of micropropagated plants and adopting a more favourable spacing in future clonal seed orchards is suggested.

KFRI Res. Rep No. 404

Establishment of a tree health helpline for the state of Kerala.

VV Sudheendrakumar, TV Sajeev

The project was initiated to help tree growers by giving them advice on pest and disease management associated with tree crops. Both the private sector and public sector tree growers were expected to be benefited by this service. During the study period most of the queries received were from the Forest Department. The pest and disease problems were associated with teak and eucalypts. The data indicated the need for popularising the activities of the helpline so as to extend the service to more clients.

Ongoing Research Programmes

Project No	Title	Principal Investigator	Proposed Funding agency
KFRI/RP-610/2011	Preparation of a wetland atlas of Kerala	Nair PV	KSBB
KFRI/RP-611/2011	Population evaluation and development of propagation protocol for three Rare, Endangered and Threatened (RET) trees from Kerala part of Western Ghats	Somen CK	Plan Grants
KFRI/RP-612/2011	Detection and eradication of the giant African snail (<i>Achatina fulica</i>) in Kerala	Sajeev TV	KSCSTE
KFRI/RP-613/2011	Growth model for <i>Acacia auriculiformis</i> in relation to soil conditions in Kerala	Rugmini P	Plan Grants
KFRI/RP-614/2011	Genetic diversity and conservation of Teak phase II	Indira EP	Plan Grants
KFRI/RP-615/2011	Large scale propagation of <i>Embelia ribes</i> and <i>Embelia tsjeriam-cottam</i> -two important threatened medicinal plants through <i>in vitro</i> / <i>in vivo</i> techniques and repopulating the forests with participation of tribal groups	Raghu AV	Plan Grants
KFRI/RP-616/2011	Tree flora of Kerala	Sasidharan N	Plan Grants
KFRI/RP-617/2011	Development of institutional capability for DNA barcoding of life forms	Muralidharan EM	Plan Grants
KFRI/RP-618/2011	Pilot scale micropropagation of important forestry species	Muralidharan EM	Plan Grants
KFRI/RP-619/2011	Vetiver system technology for river bank stabilisation	Sandeep S	KFRI-PG
KFRI/RP-620/2011	Population ecology of the Lion tailed macaque in Silent Valley National Park, its buffer zones and Muthikulam High Value Biodiversity Area	Ramachandran KK	Plan Grants
KFRI/RP-621/2011	Appraisal of Forest Rights Act, 2006-Implementation among the primitive tribal groups (PTGs) in Kerala	Anitha V	Plan Grants
KFRI/RP-622/2011	Development experiences of selected groups of Scheduled Tribes in the Kerala part of Western Ghats	Amruth M	Plan Grants
KFRI/RP-623/2011	Taxonomic manual on Indian Palms	Sreekumar VB	Plan Grants
KFRI/RP-624/2011	Development of seed handling technologies for selected bamboo species	Seethalakshmi KK	NBM
KFRI/RP-625/2011	Biosystematics and conservation biology of the genus <i>Cinnamomum</i> in the Western Ghats	Hrideek TK	MOEF
KFRI/RP-626/2011	Genetic status and livelihood trajectories of Cholanaikkan Tribal Women with reference to Sickle Cell Anaemia	Suma TB	DST
KFRI/RP-627/2011	Long term studies on climate change	Sajeev TV	Plan Grants

KFRI/RP-627.1/2011	Reinvestigating study plots established by KFRI during 1975-2010 to measure forest migration, range shifts of species and compositional changes in the context of climate change	Sreejith KA	Plan Grants
KFRI/RP-627.2/2011	Establishment of permanent plots in all forest types along the elevation gradient for continuous monitoring of climate change induced variations	Sreekumar V B	Plan Grants
KFRI/RP-627.3/2011	Seed ecological and regeneration studies on key stone species of the evergreen and moist deciduous forest ecosystems	Pillai PKC	Plan Grants
KFRI/RP-627.4/2011	Preparation of protocols for availing carbon finances for forests of Kerala	Sankar S	Plan Grants
KFRI/RP-628/2011	Population structure, carbon sequestration, litter dynamics, propagation, economics and livelihood potential of <i>Pseudoxanthera ritcheyi</i> and <i>Ochlandra setigera</i> -Two rare bamboo species of Kerala	Kuruvilla Thomas	KFDF
KFRI/RP-629/2011	DNA Barcoding of selected bamboo species of India	Suma TB	DST
KFRI/RP-630/2011	Mass production of <i>Bacillus subtilis</i> for biocontrol of sapstain on rubber wood	Florence EJM	DBT
KFRI/RP-635/2011	Establishment of herbal gardens in selected 100 schools of Palakkad and Malappuram districts of Kerala	Sujanapal P	NMPB
KFRI/RP-632/2011	Environmental impact of Pesticide application in Cardamom Hill Reserves (CHR) of southern Western Ghats	R. Jayaraj	DST
KFRI/RP-631/2011	Soil and water quality status of Kadukutty region	Thomas PT	Plan Grants
KFRI/RP-636/2011	Inventory of wetlands of kerala	Nair PV	ESD
KFRI/RP-638/2011	Handbook on mangroves and mangrove associates of Kerala	Sujanapal P	KSBB
KFRI/RP-637/2011	Rehabilitation of two industrially important endangered species, <i>Santalum album</i> (chandanam) and <i>Saraca asoca</i> (Asokam) in homesteads of Palakkad and Malappuram districts of Kerala	Sujanapal P	SMPB
KFRI/RP-639/2011	Improvement of taxonomic botanic garden at the sub-centre, Nilambur kerala	Chandrasekhara UM	MOEF
KFRI/RP-640/2011	Establishment of district medicinal plants demonstration garden at KFRI sub centre, Nilambur Malapuram district, Kerala	Chandrasekhara UM	SMPB

KSBB Kerala State Biodiversity Board

SMPB State Medicinal Plant Board

MOEF Ministry of Environment and Forests, Govt. of India

DST Department of Science and Technology, Govt. of India

DBT Department of Biotechnology, Govt. of India

NMPB

NBM

KSCSTE

KFDF

ESD

National Medicinal Plant Board

National Bamboo Mission

Kerala State Council for Science, Technology and Environment

Kerala Forest Development Fund

Environmental Sciences Division, Govt. of Kerala

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18. Ratheesh Narayanan. M. K., Sujanapal P., Anil Kumar N., Sivadasan M., Ahmed H. Alfarhan and Jacob Thomas. 2012. *Miliusa gokhalei*, a new species of Annonaceae from India with notes on interrelationships, population structure and conservation status. *Phytotaxa* 42: 26–34
19. Kiruthiga, K., Saranya J., Eganathan P., Sujanapal P and Parida A. 2011. Chemical composition, antimicrobial, antioxidant and anticancer activity of leaves of *Syzygium benthamianum* (Wight ex Duthie) Gamble. *JBAPN* 1 (4): 273- 278
20. Saranya, J., Eganathan P., Sujanapal P. and Parida A. 2012. Chemical Composition of Leaf Essential Oil of *Syzygium densiflorum* Wall. ex Wt. & Arn. A Vulnerable Tree Species. *JEOBP* 15 (2) 283 – 287
21. Sasidharan N, Muraleedharan PK and Sreekanth Sreedhar. 2011. Consumption of raw drugs by the Ayurvedic Medicine Manufacturing Industry in Kerala. Journal of Non-Timber Forest Products 18(3): 205-220

23. Rekha T, Kottackal Poulose Martin, Sreekumar V.B and Joseph Madassery. 2011. Genetic Diversity Assessment of Rarely Cultivated Traditional Indica Rice (*Oryza sativa* L.) Varieties. Biotechnology Research International (Article ID 574983, doi:10.4061/2011/784719).
24. Manju, C.N., Martin, K.P, Sreekumar, V.B, Rajesh, K.P. 2011. Morphological and molecular differentiation of *Aerobryopsis eravikulamensis* sp. nov. (Metoriaceae: Bryophyta) and closely related taxa of the Western Ghats of India. Bryologist.115 (1): 42-50
25. Sugantha Sakthivel R. and Sreekumar V.B. 2012. Biodiversity significance, landuse pattern and conservation of Malayattur forests in the Western Ghats of Kerala, India. Indian Journal of Fundamental and Applied Life Sciences. 1(3): 247-254
26. Juliya R.F., Sankaran K.V.and Varma R.V. 2012. Diversity of entomopathogenic fungi in the Kerala part of Western Ghats. Indian Forester 138: 182-188

Papers in Books/ Proceedings/Newsletters

1. Jose, P.A., Swarupanandan, K. and Pandalai, R.C. 2011. Restoration of *Dipterocarpus bourdillonii* and *Humboldtia bourdillonii*, two critically endangered endemic trees of the Western Ghats. Evergreen, No. 65-66, March 2011. Half yearly News letter, KFRI, Peechi.
2. Jayson, E.A. 2011. Structure and composition of birds in the New Amarambalam tropical forests of Kerala, Southern Western Ghats, India. In (Kaul, B.L. Ed.) Advances in fish and wildlife Ecology and Biology, Daya Publishing house, Delhi, India. Vol. 5, 139 – 155
3. Suresh, K. Govind and Jayson, E.A. 2011. Human–elephant interactions in Thrissur District Kerala. In Elephant – The Heritage Animal of India (Ed. Sasankasekhar N.R.). Society for Friends of Elephants, Thiruvananthapuram. 69-70
4. Chandrasekhara Pillai, P.K. and Sankaran, K.V. 2012. High input forest plantations are carbon sinks. In: Rajasekharan Pillai, V.N. (Ed.) Proceedings of the 24th Kerala Science Congress, 29-31 January 2012, RRII, Kottayam. 412-413
5. Chandrasekhara Pillai, P.K., Sowmya, M.M. and Hareesh, V.S. 2012. Terminalias: a major tree component of moist deciduous forests in Kerala. In: Rajasekharan Pillai, V.N. (Ed.) Proceedings of the 24th Kerala Science Congress, 29-31 January 2012, RRII, Kottayam. 495-497
6. Sankaran, K.V., Chandrasekhara Pillai, P.K. and Pandalai, R.C. 2012. Impact of weeds on productivity of *Eucalyptus tereticornis* plantations in Kerala. National Seminar

on 'Forest Health Management (FHM-2012)' held at IFGTB, Coimbatore, during 21-22 March, 2012

7. Chandrasekhara Pillai, P.K. and Subin, S. 2012. Regeneration status in the central forest circle of Kerala. In: Nagarajan, B., Kunhikannan, C., Sasidharan, K.R. and Krishnakumar, N. (Eds.) Tropical Ecosystems: Structure, Function and Services. Institute of Forest Genetics and Tree Breeding, Coimbatore, PRDAG PRINT, Coimbatore: 214-220
8. Sujanapal. P., Salim P.M., Anil Kumar N. and Sasidharan N. 2010. Observations on the *Snake Vines* of Nilgiris. Evergreen 64:1-3

Books Published

1. Renuka C. and Sreekumar.V.B. 2012. A Field guide to the palms of India. Kerala Forest Research Institute, Peechi, Thrissur, Kerala. ISBN 81-85041-74.
2. Sujanapal. P., Nagesh Prabhu H., Rajithan K.S. and Pius O.L. 2011. Grihanganathil Oru Oushadhodhyanam (Malayalam). State Medicinal Plants Board, Ministry of Health & Family Welfare, Government of Kerala.

Seminars/Workshops/Training attended

Dr. V Anitha

One day workshop-on the preparation of the Peechi-Vazhani-Chimmony management plan (2012-2022) , February 18th 2012

One day Workshop– Man and Environment: Biosphere Reserve study, Anthropological Survey of India (ASI). Presented a paper on the '*Macro scenario of the situation in Agasthyamala Biosphere Reserve*', at Jawaharlal Nehru Tropical Botanical Garden Research Institute, January 19th 2012

DST sponsored National Training under the Management Development Programme on '*Role of scientists in natural resources and environment management*' at Indian Institute of Forest Management, Bhopal, 4-10, 2011

Dr. PK Chandrasekhara Pillai

Workshop on "Academic Writing" held at Kerala University Library Building, Thiruvananthapuram during 12-13 May 2011, organized by the Kerala State Council for Science, Technology & Environment and Centre for Information Literary Studies, University of Kerala.

24th Kerala Science Congress held at RRII, Kottayam during 29-31 January, 2012

National seminar on 'Forest Health Management (FHM-2012)' held at IFGTB, Coimbatore, during 21-22 March, 2012 organized by IFGTB, DBT & DST, Ministry of Science & Technology, Govt. of India.

'Open source Quantum GIS training Workshop' at KFRI during 16-20 May 2011 by KCUBE Consultancy Services Pvt. Ltd., Chennai.

International training programme on "Innovations in the Management of Planted Teak forests" held at KFRI, Peechi during 31st August – 3rd September 2011 organized by TEAKNET (International Teak Network), KFRI, FAO and KSCSTE.

Training programme (Management Development Training) on "Roll of scientists in Natural Resources and Environment Management" held at IIFM, Bhopal during 5-9 December 2011 organized by DST, Govt. of India, New Selhi.

Dr. EA Jayson

Human–elephant conflict conference at Palghat organized by the Kerala Forest Department and presented a paper on the subject on 27th July 2011

International Ornithological Congress on Indian Ornithology at SACON Coimbatore on 20-22 November 2011

Management plan workshop at Aralam Wildlife Sanctuary on 06-01-2012

Workshop on "Vegetation types of India" at IFGTB, Coimbatore on 02 Feb 2012

Two day workshop (09-10 Feb 2012) on "Environmental clearance to developmental Projects" at Mascot Hotel Thiruvananthapuram organised by the Stat Environmental Impact Assessment Authority.

Management plan workshop at Peechi-Vazhani Wildlife Sanctuary on 18 February 2012.

Dr. PA Jose

5 days open source Quantum GIS training Workshop at KFRI, Peechi from 16-20 May, 2011

Dr. P Rugmini

International training programme on Innovations in the planted teak forests held at KFRI during 31 August- 3 September 2011

Dr. PK Thulisidas

International Conference and Exhibition on "*The Art and Joy of Wood- Rediscovering Wood: The Key to a Sustainable Future*" organised by the FAO of the United Nations in association with Institute of Wood Science & Technology, Bangalore during 19-22 October 2011.

Dr. TV Sajeev

UGC sponsored National Seminar at Morning star home science college, Angamaly on 12th August 2011. Presented a paper entitled 'Playing god? Designer Genes and the ethics in biotechnology'

Asia Pacific Forest Invasive Species Network conference on Forest health and phytosanitary standards at Beijing, China on 10th november 2011. Presented a paper on Public Engagement tools in invasive species management

Dr. N Sasidharan

National Seminar on Biodiversity Conservation and Climate change during 2-4 December at Institute of Minerals and Materials Technology, Bhubaneswar. Presented a plenary lecture *Flowering Plants of Kerala – A checklist ver. 2.0*

National Seminar: New Vistas in Plant Sciences during 14-15 March 2012 at Goa University, Goa. Gave a lecture on Flowering Plants diversity of Kerala.

Dr. VB Sreekumar

National seminar on Geospatial solutions for Resource Conservation and management. 18-19 January 2012, IISC Bangalore. 49-50. Presented a paper titled "Geographical modeling for the conservation and management of rattan resources in Western Ghats".

XXI Annual Conference of IAAT and National Seminar on Biodiversity Conservation and Climate Change. (BCCC – 2011). December 2-4 CSIR-IMMT, Bhubaneswar, Odisha, India. Presented a paper titled "Morphological, genetic and geospatial characterization of the genus Calamus L. (Arecaceae) in the Western Ghats"

Dr. MP Sujatha

National seminar on Forest Health Management conducted during 21-22 March 2012 at IFGTB Coimbatore and presented a paper titled "Green technology for soil health management in teak nurseries and plantations of Kerala"

National training under NAIP on predicting soil carbon sequestration in view of global warming and climate change conducted during 24 Feb to 8 March at NBSS and LUP, Nagpur.

Dr. TB Suma

National training course organized by IPR cell KAU on 'Protection and Management of Intellectual Property Rights in Agriculture during 20 -29 September, 2011 at KAU, Trichur.

Mentorship workshop organized by Department of Biotechnology (DBT), Govt. of India at National Center for Biological Sciences (NCBS), Bangalore on 22-23 November, 2011

'Next generation DNA sequencing and Bioinformatics for Genomics' workshop at Rajiv Gandhi Center for Biotechnology, Trivandrum on 16-17 December 2011

Extension activities

Dr. UM Chandrashekara

Conducted class on Phytosociological analysis for understanding the forest qualities for the Officials of the Research Wing of the Maharashtra Forest Department during the Training Course on Modern Trend in Forestry Research organised at KFRI, Peechi (11 August 2011).

Organized an In-House Training at KFRI Sub Centre Nilambur during 19-31 May 2011 and 11-22 December 2011 for the Forest Guard Trainees of Kerala Forest School, Walayar

Took classes on 20 September 2011 on forest types of Kerala and forest ecology for the Forest Guard Trainees of Kerala Forest School, Walayar

Dr. PK Chandrasekhara Pillai

Participated in a discussion on eco-restoration of Kulangattu Mala of Cheruvathur Grama Panchayat, Kasaragod District, in connection with 'Smruthi Vanam' project organized by the District collector, Kasaragod on 21 February 2012

Dr. EA Jayson

Received applications for Wildlife Census from volunteers and posted them into different Forest Divisions, which was required for the Wildlife Census 2011

Reviewed one project proposal entitled "Ecological investigation of woody vegetation and nest tree use by birds in the riverine Forest of Athilkkadavu Valley, River Bhavani, Western Ghats" for Ministry of Environment, Government of India.

Visited Idukki as member of the EFL committee to evaluate the designated areas (15 - 16 September 2011).

Involved in the identification of one tortoise engaged in a case to Athirappally Range Office on 30 August 2011

Inspected the EFL areas at Nemmara in Palghat District along with other committee members to evaluate the area on 24 November 2011

Visited TBGRI, Palode to advice on the mitigation measures to stop elephant damage in their gardens on 13 January 2012

Visited Gandhi Smirithi Vanam at Alleppy along with other scientists to evaluate the area and to prepare a programme for the area on 01 February 2012

Dr. EJ Maria Florence

Recommended control measures for the mortality of seedlings of Mahogany in Kallekkad in Pirayiri Panchayat reported by Kerala Forest Department.

Evaluated the cause of the poor performance of the Eucalypts clonal plantations raised in Trivandrum and Punalur Divisions from 2001 onwards by KFDC.

Evaluated the poor performance of KFDC sandal plantations and nursery seedlings at Vettiyl, Malampuzha, Palakkad, District raised by KFDC and suggested measures to improve the plants and nursery.

Dr. P Rugmini

Functioned as Course Coordinator for the Training course on Statistical Techniques in Forestry Research for a Research Scholar from Andhra Pradesh Forest Department for 5 days (during 10- 14 October 2011).

Dr. N Sasidharan

Evaluated 10 Ecologically Fragile Land (EFL) notified properties in the Palakkad Forest Division on 19 August 2011 as a member of the evaluation committee.

Prepared a report along with Dr . P Sujanapal on the Mangrove in Chettupuzha and adjacent areas of Chavakkad Taluk, Thrissur was submitted to Divisional Forest Officer, Thrissur as per his request in February 2012

Dr. KK Seethalakshmi

Participated in the mid-term evaluation of the technology development extension and training project "Wasteland Development with Sustainable Livelihoods based on Bamboo Plantation and Value Added Products for Housing, Food, Fodder and Bio-fuels funded by Department of Land Resources, Ministry of Rural Development, implemented by IIT Delhi in collaboration with Institute for Social Advancement, Kerala. During April-May 2011

Dr. MP Sujatha

Evaluated a thesis titled " Suitability of azolla (*Azolla pinna-ta*) for biogas slurry enrichment submitted by Mr. Bishnu Prasad Paudel as part of the MSc (Ag) programme in the Dept. of Soil Science and Agrl. Chemistry, College of Horticulture, Vellanikkara, KAU.

Dr. TV Sajeev

Gave talks on :

Biological invasions: Tales and science of a losing battle for college teachers at Academic Staff College, University of Calicut on 8th March 2011

Research as a career for the students and faculty of MES College, Mampad on 8th March 2011

Chemistry of Biological Invasions to MSc Applied Zoology students of Kannur University at Mananthavady Campus on 11 March 2011

Deforestation and its impact at Apollo Tyres on 4 June 2011 as part of the Corporate Social Responsibility initiative.

Legal dimensions of environmentalism was given at Nilambur on 5 June 2011 organized by the Green Advocate Collective of Malappuram District.

Nature – Forest at your service at Centre for Water Resource Development and Management, Calicut on 6 June 2011

'Impact of invasive alien species on biodiversity' during National Academy of Science conference at Thiruvananthapuram on 24 November 2011

Insect pests of bamboo and their management at the KFRI extension centre on 13 March 2012 in the training programme on Priority species resource estimation, plantation development, post harvest technology and socio economic livelihood potential of bamboo supported by national bamboo mission.

Biodiversity: why is it easy to misuse and abuse than to use or conserve at a National Seminar at St. Joseph's college, Irinjalakuda on 2 March 2012

Dr. P Sujanapal

Prepared a report along with Dr . N Sasidharan on the Mangrove in Chettupuzha and adjacent areas of Chavakkad Taluk, Thrissur was submitted to Divisional Forest Officer, Thrissur as per his request in February 2012

Guest Lectures/Classes

Dr. V Anitha

Resource person in field functionaries for the Bamboo Technical Support Groups for South zone on 'economic and livelihood potential of bamboo' (January 10th 2012, February 14th 2012, March 13th 2012).

Resource person in the training programme "Modern Trends in Forestry Research" for Forest Officials in the Research Wing of the Maharashtra Forest Department (11 – 13 August 2011).

Resource person in Quantification of recreational value of a natural ecosystem (data requirements, economic tools and techniques).

Resource person in Non timber forest products - data requirements, tools & techniques and data gaps.

Resource person for Scientists/Officials of ICFRE institutions in the 'Effect of invasive species/weeds on productivity of forest plantations and natural forests and different cost effective methods for their control' on Weed invasion in forests -economic dimensions & socioeconomic relevance 13-17 December, 2011

Dr. PK Chandrasekhara Pillai

Resource person on a training programme 'Priority Species, Resource Estimation, Plantation Development, Post Harvest Technology and Socio-economic Livelihood Potential of Bamboos' during January 17-22, 2011; February 14-19, 2011; February 22-26, 2011; January 9-13, 2012

Resource person on a training "Collection, Compilation, Validation and Dissemination of Forest Statistics" during March 14-16, 2011 for the Statistical Assistants of Kerala Forest Department.

Resource person on a training "Modern Trends in Forestry Research" during April 19-20, 2012 for the Forest Guards of Kerala Forest Department.

Dr. EA Jayson

On Environmental education at Wadakkencherry on 6 August 2011 for college students – Shah Tower

On "Conservation of Biodiversity" was offered at Government Tribal L.P. School, Poovanchira, Thrissur for the volunteers of Kerala Sahasika Samskarika Sangam, Ollur, Thrissur on 14 August 2011.

Lecture on Human –wildlife interaction in the Christ College, Irinjalakuda on 07-12-2011 while inaugurating the Zoology Association.

Class on "Protection of environment" was offered to the students who were attending environment education camp at Peechi Wildlife Sanctuary on 14 December 2011 and on 30 December 2011

Workshop on "Biodiversity Conservation" in Govt. College, Chittoor on 19 January 2012 and presented Key note address.

Dr. KK Seethalakshmi

Participated as a resource person and delivered a talk on "Bamboo cultivation, Management and Value addition" at Karshakamela, Kerala Fine Arts Society, Ernakulam 31 January 2011

Was honoured as Chief Guest, World Environment Day celebrations of the Association of Engineers and Architects (AEA) Thrissur on 5th June 2011 and gave a speech on Forests - Nature at your service

Served as Technical Expert, Farm Forestry Meeting of Hindustan Newsprint Ltd. Vellore, Kottayam on 23 June 2011. Gave a presentation on Potential of Bamboo and Species suitable for cultivation with emphasis on *B. balcooa* and *B. tulda*.

Dr. TB Suma

'Emerging trends in Forest Biotechnology' for Forest Officials in the Research wing of the Maharashtra Forest Department during the 'Training on Modern Trends in Forestry Research 11 -13 August 2011

Lecture at the Biotech Dept., Sahradaya College of Engineering & Technology on 4 October 2011 on 'DNA methylation and its significance in functional genomics'

Dr. PK Thulisidas

Guest Faculty for the Basic Forestry course work and taken classes on Wood Science and Technology component for the 5 Ph.D students of KFRI during 12-14 December 2011

Meetings Attended

Dr. V Anitha

Two meetings of the Board of Studies in forestry & wood, Techn-ology 30th November and 12 December 2011.

Two joint meeting of the State Impact Assessment Authority (Authority Kerala) & State Expert Appraisal Committee (SEAC, Kerala), Thiruvananthapuram, 11th January and 10th February 2012

Two day Induction Workshop, (Orientation Program for SEIAA & SEAC Members) Thiruvananthapuram, 9th -10th February 2012.

Two meetings of the State Expert Appraisal Committee (SEAC, Kerala), dated 03rd March & 7th April 2012.

Dr. UM Chandrashekara

19th meeting of Expert Group-A in the broad thematic area of Conservation and Sustainable Utilisation of Natural Resources of Ministry of Environment and Forests, New Delhi on 25th July 2011 and presented a concept note for the All India Coordinated Research Project on Sacred Forest Ecosystem Service Assessment.

Dr. EA Jayson

Meeting to present the outcomes of the Independent management effectiveness evaluation of Tiger Reserve in India on 9th May 2011 at New Delhi, which was organised by Ministry of Environment and Wildlife Institute of India as a member of Southern regional expert committee.

State level steering committee meeting of Nilgiri Biosphere Reserves on 25-10- 2011 at Thiruvananthapuram.

Technical Committee meeting convened by the Chief Wildlife Warden at Thiruvananthapuram on 07-11-2011

Peechi-Vazhani wildlife sanctuary advisory committee meeting convened by the local MLA at Pananchery Panchayath Office on 12December 2011

Zoo advisory committee meeting at Ramanilayam, Thrissur on 13 December 2011 regarding the establishment of new Zoological Park at Puthur.

State Environment Impact Appraisal Committee (SEIAC) meeting at Thiruvananthapuram on 12 January 2012

Technical Committee meeting convened by the Chief Wildlife Warden at Thiruvananthapuram on

08 February 2012 to review the final report on Malabar Ornithological Survey.

Dr. N Sasidharan

Meeting on Exploitation of Bioresources of the State with particular reference to medicinal plants at Trivandrum organized by the Kerala State Biodiversity Board.

Expert Committee to select Vanamitra Award Winners for 14 districts of Kerala, as a member of the Committee.

Meeting of the sub-committee constituted by SMPB to study the 'problems and prospects' of medicinal plants cultivation, storage and distribution in Kerala and to submit a report to SMPB for further action. Govt. Ayurveda Research Institute, Poojappura, Thiruvananthapuram on 13 February 2012

Membership in Committees

Dr. V Anitha

Member of State level Expert Appraisal Committee (SEAC) Kerala and Board of studies, Forestry and Wood Technology, Kannur University

Dr. EA Jayson

External examiner

1. M. Sc. dissertation of School of Environmental Studies, CUSAT, Cochin on 27th June 2011.
2. Viva-voce - M.Sc. Forestry (Wildlife), Forestry College, KAU on 17th June 2011

Dr. KK Seethalakshmi

Examiner for evaluation of the thesis entitled "Strategizing an eco-friendly rural housing alternative using bamboo parabolic infill arches as load bearing elements". Thesis submitted to Indian Institute of Technology, Delhi.



Dr. KM Bhat Memorial Award 2012



'The Dr. KM Bhat Endowment' award carrying a Gold Medal, Certificate of Merit and cash prize of Rs. 5,000/- was awarded to Dr. P Mujeeb Rahman, Research Associate, Forest Entomology Division of KFRI, Peechi. Dr. Mujeeb Rahman was selected for the award for his doctoral work on "*Below ground biodiversity of soil macrofauna in selected landuse systems, its spatial pattern and structural dynamics*". The Endowment was instituted by the family of late

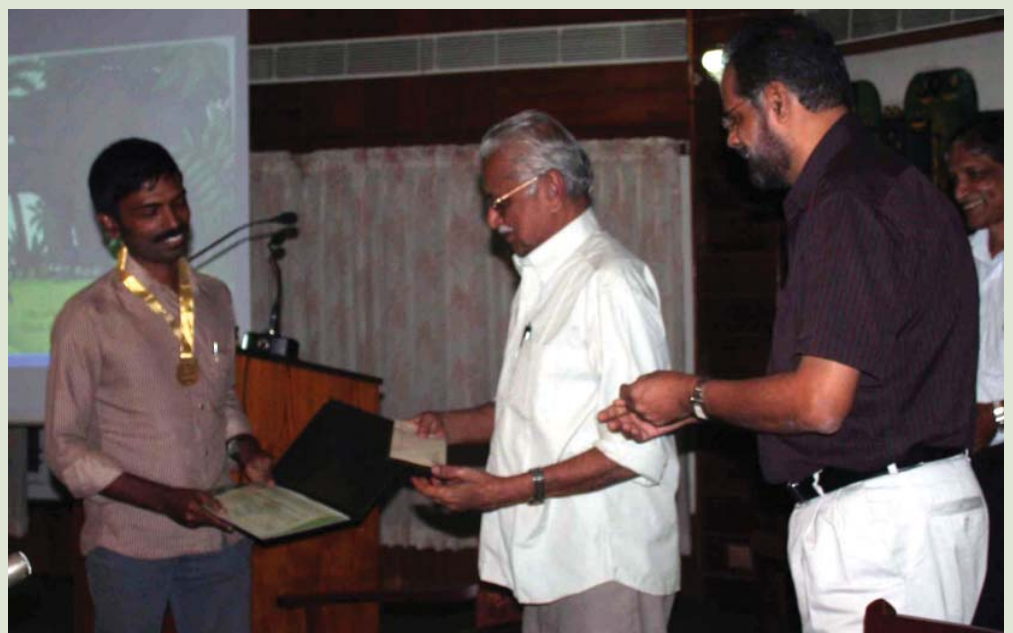
Dr. KM Bhat for the best outstanding Research Scholar of KFRI. The award was presented to him on 2nd January 2012 in a function organised at KFRI in connection with 3rd death anniversary of Dr. KM Bhat. Dr. K. Sudhakara, Professor, College of Forestry, Kerala Agricultural University, Vellanikkara presented the award and delivered the Dr. KM Bhat Memorial lecture.

Dr. C Chandrasekharan Memorial Award 2011

The award was constituted in memory of Dr C Chandrasekharan, an eminent researcher and former Director of KFRI, who retired from FAO after an illustrious career. He was involved in various programmes with organizations such as ITTO, Asian Development Bank, World Bank, Ford Foundation, CIFOR, WWF and IDRC. The family of Dr. C Chandrasekharan constituted an award in his name to honour outstanding young researchers in field of forest management and conservation in Kerala.

The second Dr. C Chandrasekharan Memorial Award was bagged by Dr. KH Amitha Bachan, an ecological enthusiast with a decade of experience in forest research, conservation and education. His PhD thesis was on the Riparian Flora and its ecological significance in the Chalakkudy River Basin, probably the first such study on the flora and community composition

of riparian vegetation from India. Along with study he initiated a study on 'Participatory conservation and monitoring of Hornbills and their habitat in the Parambikulam - Vazhachal region' involving the primitive tribe, Kadar. This has been regarded one of the successful participatory species monitoring and conservation program from the Western Ghats. The State Govt. and Forest Department have recognized it through accepting it as a regular programme of the Forest department through tribal participation.



PhD Awarded



Mr. T.J. Roby was awarded doctorate degree by the Forest Research Institute (FRI) University, Dehradun in April 2011 for his work on “**Floristic structure and diversity of *Myristica* swamps at Kulathupuzha in a GIS perspective**” under the guidance of Dr. P. Vijayakumaran Nair, GIS & Remote Sensing Division.

This study attempts delineation of *Myristica* swamps as a unique phyto-geographical entity to aid its conservation and restoration through surveying/mapping of the area, examining topology/climatological factors, studying floristic structure and examining reproductive phenology. Sixty swamp patches with total land area of 149.75 ha were mapped in the study area and GIS simulation revealed that 148.57 km² area of Kerala's forest area has a potential to support *Myristica* swamps. Fifty eight trees species and 2246 individuals were recorded in sample plots (19) inside the swamps. The two dominant trees, *Gymnacranthera farquhariana* and *Myristica fatua* var. *magnifica* constituted 33.84 percent and 30.77 percent of total number of trees respectively. Phenological study of five tree species in the *Myristica* swamps reflects the evergreen nature of the two Myristicaceous species and *Vateria indica*, devoid of a distinct leaf fall period. Germination studies indicated that trees of the swamps still retain the regenerative ability. The *Myristica* swamps contain 4.58 percent (220 species) of the angiosperms recorded from Kerala of which 22.27 percent (49 species) are endemic to the Western Ghats and 6.36 percent (14) are red listed. Contemporary studies bring to light many disturbances threatening the existence and health of the swamps; these studies have also suggested methods for conservation and management of these swamps. Dr Roby works as a Research Associate in KFRI.



Ms. V.B. Beena was awarded doctorate degree by the Cochin University of Science and Technology (CUSAT), Kochi in January 2012 for her work on “**Reproductive Biology and biochemical changes associated with flowering of *Dendrocalamus stocksii* and *Ochlandra travancorica***” under the guidance of Dr. K.K. Seethalakshmi. Emphasis of this work is on reproductive biology and biochemical changes in bamboos.

Bamboos are woody perennial plants belonging to the fam-

ily Poaceae. Due to its versatility it has been a raw material for numerous applications and a viable replacement for wood. The demand for bamboos is growing more than its production and hence seeds/propagules are required in abundance for large scale cultivation of desired species. Based on post flowering behaviour bamboos are divided into two groups viz., profuse/sparse flowering followed by reversion to vegetative phase and profuse flowering and seed formation followed by death. Reproductive biology and biochemical changes associated with flowering of two bamboo species showing different post flowering behaviour viz., *Dendrocalamus stocksii* and *Ochlandra travancorica* were observed. *D. stocksii* flowering was observed during 2003-2006 in northern Kerala, and *O. travancorica* during 2004-2006 in southern Kerala. From the observations, the sterility in *D. stocksii* could be attributed to the less quantity of pollen produced, viability of pollen, percentage of anthesis, short receptivity of stigma etc.



Mr. P. Mujeeb Rehman was awarded doctoral degree by the Cochin University of Science and Technology (CUSAT), Kochi in April 2011 for his work on “**Soil macrofaunal assemblage in selected land use systems in Kerala: spatial pattern and structural dynamics**” under the

guidance of Dr. R. V. Varma. Major objectives of the study was (1) to study the diversity of the major soil macrofauna (ant, earthworm and termite) in selected agroecosystems and natural forests, (2) to analyze the distribution pattern of soil fauna in relation to land use systems and (3) to evaluate the impact of edaphic and climatic conditions of the habitat on the diversity and abundance of soil fauna. Detailed study was conducted in a micro-watershed of Chaliyar River in the Kerala part of NBR. In total, 15 land use practices under four main ecosystems-agricultural, agroforestry, plantations and forest ecosystems were sampled. Altogether, 17 parataxonomic units were recorded in the study. The overall result indicted that habitat heterogeneity and landscape structure greatly influenced the spatial distribution of soil fauna. Although, agroforests and plantations had slightly higher number of taxa than annual crop fields, the difference between these ecosystems were not significant. The lowest number of taxa was recorded in coconut monocul-

ture (CO) plantations, while the highest was in moist-deciduous (MDF) and semi-evergreen forests (SEF), respectively. It is shown that diversity and abundance of soil macrofauna increased with increasing habitat heterogeneity, resource availability and decreasing disturbance. Maintenance of adequate organic matter, wood remnants, mulching etc., facilitate micro-habitats for a vast array of soil organisms and can be employed as good strategy for ecosystem recovery, improving soil fertility and ecosystem functions. Moreover, for rapid biodiversity inventory, higher taxonomic orders or species surrogacy is generally considered as a good tool, substantially reducing the time and cost factors. Currently, Dr Mujeeb Rehman works as a Research Associate in KFRI.



Ms. R Remya was awarded doctoral degree by the Cochin University of Science and Technology (CUSAT) in 2011 for her work on **“Physiological and genetic diversity studies on regeneration of *Santalum album* L.”** under the guidance of Dr. M. Balasundaran.

Sandal, *S. album* L., is the source of highly priced and fragrant heartwood among the timber trees. IUCN had categorized *S. album* as ‘vulnerable’ species due to the over-exploitation and illegal felling coupled with low amount of natural regeneration of the species. In this context, the objective of the present work is to study the autotrophic and parasitic phase of sandal seedling growth through studies on chlorophyll content and chlorophyll fluorescence, genetic diversity of sandal populations in seed stands using ISSR markers and diversity of *Fusarium oxysporum* isolates causing sandal seedling wilt using RAPD markers. Seedling dependency on seed reserve (cotyledonary) showed that sandal seedlings need to be transferred to containers with



potting mixture within 26 days after germination for proper growth and development. *Vigna unguiculata* was identified as the better primary host and *Pongamia pinnata* was the appropriate long term host. Fifty to seventy five per cent shade was optimal for growth of sandal seedlings up to one year after germination. ISSR marker study showed identity of DNA profiles of nearby sandal trees indicating that such trees could be clones which might have arisen from root suckers. Low percentage of polymorphism and low genetic diversity showed very high chance of inbreeding in the seed stand which could be the major reason for poor seed production in the seed stands. A wide range of genetic variation was detected using RAPD markers among the *F. oxysporum* genotypes from wilt affected sandal seedlings indicating the ability of the pathogen to adapt to different eco-climatic conditions.



Mr. S Babu was awarded doctorate degree by the Forest Research Institute Deemed University, Dehradun in November 2011 for his work on **“Ecology of owls in the southern Western Ghats, India”** under the guidance of Dr. E. A. Jayson. The work addressed few issues pertain-

ing to distributional range and factors influencing the distribution of owls in the southern Western Ghats with the support of GIS and landscape level modeling tools. Based on the occurrence and non-occurrence of owls in a sampling point, two modelling approaches viz., presence only and presence-absence model were applied to predict and quantify the extent of suitable sites available for six species of owls in the southern Western Ghats. Altogether, 276 points across 24 forest stations were surveyed. Six hundred and eighty five owls belonging to 13 species were documented. Short-eared owl in Peechi-Vazhani Wildlife Sanctuary and Ceylon bay owl in Idukki and Neyyar Wildlife Sanctuaries were new records from the study. Extent of suitable sites available in southern Western Ghats to Jungle owl (24% of southern Western Ghats), Indian scops owl (24%), Oriental scops owl (25%), Brown hawk owl (26 %), Brown fish owl (31%) and Indian eagle owl (7%) were quantified by employing free spatial data and open source software. Large tracts of deciduous with undisturbed riparian forests are needs to be secured for sustaining current population of owls in the southern Western Ghats. Further, forest areas falling over the juncture of wet (rain fed) and dry zones (rain shadow) support a wide array of owl species as a result of diverse eco-climatic zones and therefore, conservation of these unique patches is suggested. Dr S. Babu works as Scientist (Ornithology) at Sálím Ali Centre for Ornithology and Natural History, Coimbatore.

Academic attachment and Ph.D. Programme

(April 2011-March 2012)

Ph.D. thesis submitted

Candidate	Topic	University	Submitted	Guide
Bindhu T.N.	Dynamics of Baculovirus epizootics in teak defoliator (<i>Hyblaea puera</i>) populations	FRI-DU	Jan. 2012	Dr. VV Sudheendrakumar
Bindhu K. Jose	Diet and dietary requirements of Teak Defoliators - <i>Hyblaea puera</i> and <i>Eutectona machaeralis</i>	FRI-DU	Feb. 2012	Dr. VV Sudheendrakumar
Maghesh G.	Ecological studies of the Parambikulam Tiger Reserve in the Western Ghats of India, using remote sensing and GIS	CUSAT	Feb. 2012	Dr. ARR Menon
Sujesh S M	Breeding system of <i>Dipterocarpus bourdillonii</i> and <i>Humboldtia bourdillonii</i> , two endemic trees of Western Ghats.	FRI-DU	Feb. 2012	Dr. EP Indira

Ph.D. Course Work

Course work of following students were co-ordinated during the year April 2011-March12 (Computer Application, Statistics & Basic Forestry)

S.No.	Name	Supervising Guide	S.No.	Name	Supervising Guide
1	Lathika C	Dr. MP Sujatha	4	Sajitha KL	Dr. TB Suma
2	Kavitha C	Dr. MP Sujatha	5	Maneetha TK	Dr. TV Sajeew
3	Dantas KJ	Dr. N Sasidharan	6	Saumya R	Dr. TV Sajeew

Academic attachment of M.Sc. students

Sl.No.	Name of the student	Year	Supervising Guide	Name of College	Subject
1	Greeshma P	Dec. 2011	Dr. EA Jayson	CUSAT	Environmental Technology
2	Shinila K.	Dec. 2011	Dr. MP Sujatha	Kannur University	Environmental Science
3	Deepthy Devanand	Dec. 2011	Dr.TB Suma	RS College, Sulur	Biotechnology
4	Nidha K	Dec. 2011	Dr. MP Sujatha	Kannur University	Environmental Science
5	Hridhya KP	Mar. 2012	Dr. TB Suma	St.Mary's College	Biotechnology
6	Ms. Anjali SN	Jan. 2012	Dr. S Sankar	M G University	Environmental Science and Management
7	Neenu Mary Thomas	Jan. 2012	Dr. MP Sujatha	Sree Sankara College	Environmental Science and Management
8	Sreekala PP	Jan. 2012	Dr. S Sandeep	Sree Sankara College	Environmental Science and Management
9	Geethu Ravindran	Jan. 2012	Dr. R Jayaraj	Sree Sankara College	Environmental Science and Management
10	Stephy Thomas	Mar. 2012	Dr. EM Muraleedharan	St.Joseph's College	Biotechnology

PRICED PUBLICATIONS – 2012

Bamboo		Rs.	US\$
1	Bamboos of India	2250.00	100.00
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3	Information Resources for Bamboo and Cane Development in Kerala	75.00	10.00
4	Policy and Legal Issues in Cultivation and Utilization of Bamboo, Rattan and Forest Trees in Private and Community Lands	400.00	40.00
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8	Field Identification Key for Rattans of Kerala	125.00	15.00
9	Field Identification Key for Indian palms. KFRI CD 8	150.00	15.00
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20	Production and marketing of teakwood: Future scenarios. KFRI CD 10	200.00	20.00
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MONTHLY WEATHER DATA FOR 2011 AT PEECHI								
LATITUDE-10° 31'47" N LONGITUDE- 76° 22'7.5" E ALTITUDE- 45 msl								
Month	Max. Temp	Avg. Temp	Min. Temp	Max. rh	Avg. rh	Min. rh	Rainfall	Avg. wind Velocity
	°C	°C	°C	%	%	%	mm	km/h
Jan	31.50	25.04	18.30	100.00	74.40	19.25	0.00	0.6220
Feb	33.18	25.53	18.58	100.00	65.50	18.60	35.00	0.6657
Mar	36.60	28.99	22.40	100.00	80.43	26.30	14.00	0.7019
Apr	38.00	29.20	22.40	100.00	84.61	42.20	126.40	0.6221
May	37.00	29.67	21.80	100.00	86.41	54.50	252.40	0.5852
Jun	33.50	26.23	22.70	100.00	97.74	67.40	835.20	0.4041
Jul	33.90	25.76	21.80	100.00	95.84	65.90	514.20	0.3733
Aug	33.50	26.06	21.80	100.00	95.90	67.40	478.00	0.3873
Sep	33.90	26.40	21.80	100.00	94.44	62.10	424.00	0.4546
Oct	33.90	27.11	22.40	100.00	91.90	61.60	177.20	0.4884
Nov	32.60	26.13	19.50	100.00	86.09	44.90	207.80	0.4768
Dec	33.00	26.60	20.20	100.00	81.67	49.80	4.40	0.4902
Total/ Average	34.22	21.14	26.89	100.00	48.33	86.24	3068.60	0.5226

Dr. CK Somen, Dept. of Tree Physiology, SFM Division

Price list of Seedlings/ Propagules for sale

from Kerala Forest Research Institute (KFRI), Peechi, Thrissur-680653
As on: 01 August 2012

Sl..	Botanical name	Common name	(Rs.)
1	<i>Abelmoschus moschatus</i>	Kasthurivenda	10
2	<i>Acacia mangium</i>	Mangium	10
3	<i>Adenantha pavonina</i>	Manchadi	10
4	<i>Aegle marmelos</i>	Koovalam	10
5	<i>Ailanthus triphysa</i>	Matti	10
6	<i>Alpinia ecalcarata</i>	Chittaratha	10
7	<i>Anthocephalus cadamba</i>	Attuthekke	10
8	<i>Aphanamixis polystachya</i>	Chemaram	20
9	<i>Araca triantra</i>	Palm	25
10	<i>Areca concinna</i>	Cylon areca	25
11	<i>Artocarpus heterophyllus</i>	Plavu	10
12	<i>Artocarpus hirsutus</i>	Ayini	10
13	<i>Asparagus racemosus</i>	sathavari	10
14	<i>Azadirachta indica</i>	Ariyavepu	10
15	<i>Bauhinia racemosa</i>	Mandaram	10
16	<i>Berrya cordifolia</i>	Berrya	10
17	<i>Bixa orellana</i>	Kukumachedi	10
18	<i>Bridelia retusa</i>	Mullankaini	10
19	<i>Butea monosperma</i>	Plasu	10
20	<i>Caesalpinia coriaria</i>	Divi divi	10
21	<i>Caesalpinia sappan</i>	Chappangam	10
22	<i>Calamus thwaitesii</i>	Thadiyan chooral	20
23	<i>Calamus travancoricus</i>	Ari chooral	20
24	<i>Calophyllum calaba</i>	Punna	10
25	<i>Cassia fistula</i>	Kanikkonna	10
26	<i>Castenospermum australe</i>	Australian chestnut	15
27	<i>Chrysophyllum cainito</i>	Star apple	10
28	<i>Cinnamomum verum</i>	Karuva patta	10
29	<i>Cissus quadrangularis</i>	Changalamparanda	10
30	<i>Citharexylum spinosum</i>	Parijadam	20
31	<i>Cleistanthus collinus</i>	Oduku	10
32	<i>Clitoria ternatea</i>	Sankupushpam	10
33	<i>Cullenia exarillata</i>	Vediplavu	15
34	<i>Dalbergia latifolia</i>	Vetti	10
35	<i>Dendrocalamus strictus</i>	Kallan mulla	10
36	<i>Desmodium gangeticum</i>	Orilla	10
37	<i>Dilonix regia</i>	Gul mohur	10
38	<i>Dysoxylum malabaricum</i>	Vellakil	20
39	<i>Ficus benghalensis</i>	Peral	10
40	<i>Garcinia gumi-gutta</i>	Kudampuli	10

41	<i>Gluta travancorica</i>	Chenkurinji	10
42	<i>Gmelina arborea</i>	Kumizhu	10
43	<i>Grewia tiliifolia</i>	Chadachi	10
44	<i>Holoptelia integrifolia</i>	Aval	10
45	<i>Hopea parviflora</i>	Thambakam	10
46	<i>Indigofera tinctoria</i>	Neelayamari	10
47	<i>Kaempferia galanga</i>	Kacholam	10
48	<i>Knema attenuata</i>	Chorapathi	15
49	<i>Lagerstomeia microcarpa</i>	Ventheak	10
50	<i>Lagerstomeia speciosa</i>	Manimaruthu	10
51	<i>Licuala grandis</i>	Garden palm	15
52	<i>Limonia acidissima</i>	Vilankai	10
53	<i>Mangifera indica</i>	Mavu	10
54	<i>Melia azedarach</i>	Valiayveppu	20
55	<i>Mentha arvensis</i>	Mint	10
56	<i>Mimusops elengi</i>	Elengi	10
57	<i>Oroxylum indicum</i>	Palakapayyani	15
58	<i>Palaquium ellipticum</i>	Pali	15
59	<i>Pandanus amaryllifolius</i>	Rambha	10
60	<i>Piper longum</i>	Thippali	10
61	<i>Plectranthus ambonicus</i>	Panikkoorkka	10
62	<i>Plumbago indica</i>	Chethikoduveli	10
63	<i>Polyalthia fragrans</i>	Nedunar	10
64	<i>Pongamia pinnata</i>	Ungu	10
65	<i>Pterocarpus marsupium</i>	Venga	10
66	<i>Samadera indica</i>	Karinjota	10
67	<i>Santalum album</i>	Chandanam	15
68	<i>Sapindus trifoliata</i>	Soap nut	10
69	<i>Saraca asoca</i>	Ashokam	15
70	<i>Schleichera oleosa</i>	Poovam	10
71	<i>Simaruba glauca</i>	Simarooba	20
72	<i>Strobilanthus ciliatus</i>	Karimkurinji	10
73	<i>Strychnos nux-vomica</i>	Kanjiram	10
74	<i>Swietenia macrophylla</i>	Mahogany	10
75	<i>Syzygium aqueum</i>	Chamba	10
76	<i>Syzygium cumini</i>	Njaval	10
77	<i>Syzygium travancoricus</i>	Poriyal	
78	<i>Tamarindus indica</i>	Kolpuli	10
79	<i>Tectona grandis</i>	Teak	10
80	<i>Terminalia arjuna</i>	Neeramaruthu	20
81	<i>Terminalia bellirica</i>	Thani	10

82	<i>Terminalia catappa</i>	Bedham	10
83	<i>Terminalia crenulata</i>	Karimaruthu	10
84	<i>Trichopus zeylanicus</i>	Aarogypacha	50
85	<i>Vateria indica</i>	Vellappain	15
86	<i>Wrightia tinctoria</i>	Dandapala	10
87	<i>Xylia xylocarpa</i>	Irul	10
88	<i>Zanthoxylum rhetsa</i>	Mullilam	10

For more information, please contact:

Dr P Sujanapal

Scientist-in-charge

KFRI Central Nursery, Peechi, Thrissur

Kerala, India 680 653

Phone: 0487 2690218, 2690100

E-Mail : sujanapal@kfri.res.in

Retirements

Dr. George Mathew



Dr. George Mathew, Scientist G and Programme Coordinator, Forest Health Division, superannuated on 31 October, 2011 after 34 years of service. Dr. Mathew joined the Entomology Division of KFRI in 1977 after completing his PhD on the taxonomy of Indian pyralids from IARI. Initially, he has worked on the management of insect pests associated with various forest tree species and has rendered excellent support to the Kerala Forest Department and other agencies in identifying insect pest problems and managing the pests. During the second half of his career, Dr. Mathew concentrated more on forest insect diversity of timber beetles, moths and butterflies on forest locations in Kerala such as Silent Valley, New Amarambalam, Parambikulam and Nelliyamapathy. The reference insect collections of Western Ghats at KFRI comprising of over 2000 identified species belonging to 187 families under 10 orders was set up by him. Another remarkable contribution of Dr. Mathew is the effort towards *in situ* conservation of butterflies and butterfly gardens set up at Thenmala, Peechi

and Nilambur which served as major educational cum tourist attraction. Dr. Mathew is an approved research guide of the FRI deemed University and University of Calicut, has produced 7 Ph.Ds and has published over 100 scientific papers, 28 Research Reports, 7 popular articles including brochures and CDs on the life and survival of butterflies. He was selected as 'Green Hero of Conservation' by CNN-IBN in 2008 and by 'Jade' magazine in 2009. The Films Division of India has produced a documentary on Butterfly Gardens which is also a tribute to the contributions made by Dr. Mathew in the area of butterfly conservation. Currently, Dr. Mathew is attached to KFRI as an Emeritus Scientist (KSCSTE).

Dr. C Renuka



Dr. C. Renuka, Scientist G, Forest Ecology and Biodiversity Conservation Division superannuated from KFRI after 34 years of meritorious service. Her expertise was in the field of Plant morphology, Taxonomy and Conservation and she has done commendable work on biodiversity and conservation of rattans and palms. Dr. Renuka successfully completed several research projects funded by International and National funding agencies like IDRC (Canada), IPGRI (Singapore), Ministry of Environment and Forests (Govt. of India), Kerala Forest Department, etc. She was Coordinator of the All India Coordinated Project on Taxonomy Capacity building on Palms supported by the Ministry of Environment and Forests, GOI. She was appointed as the Programme Coordinator of the Division Forest Ecology & Biodiversity Conservation in 2004. Her major field of work was on the members of the family Arecaceae, especially on rattans. She conducted extensive field surveys in the forests of Western Ghats,

Eastern Ghats, North eastern states and Andaman & Nicobar Islands. Dr. Renuka described 14 new species of rattans and reported several new records to India and Kerala. Her major published works include a revision of the Indian rattans and Taxonomy of Indian Palms. She has published 7 books, 20 research reports and about 100 research papers in journals/books/proceedings. She guided six Ph.D. students. She established a Palmetum at KFRI which contains about 50 indigenous and 40 exotic species. Dr. Renuka travelled extensively in the forest areas in India and abroad and visited Malaysia, Indonesia, Nepal, Laos, China, Philippines and Italy, in connection with her research. As per the requests from INBAR and IPGRI, she organized training courses on Rattan taxonomy for the Scientists and Foresters of Malaysia, Lao PDR and Nepal. Dr. Renuka is a member of IUCN Palm group, International Palm Society - Canada, International working group for Biodiversity and Conservation of Bamboos and Rattans, Indian Association for Angiosperm Taxonomy and Indian society for Conservation Biology. Dr. Renuka was given the additional charge of the Registrar of KFRI during the last one and a half years of her career.

Dr. C Mohanan



Dr. C Mohanan Scientist - F, Division of Forest Pathology, has more than 32 years of experience in the Institute. Dr Mohanan had his MSc from Calicut University and PhD from Cochin University of Science and Technology. His area of expertise included 1) diseases of forest trees in nurseries and plantations 2) mycorrhizal associations in forest trees 3) biodiversity of macro and micro fungi in the Western Ghats. He has made commendable progress in all the areas. Dr Mohanan has published more than 100 research papers in national and international journals, over 20 research reports and authored and edited several books, handbooks and information bulletins. His published works include : (a) Rust Fungi of Kerala, (b) Mushrooms of Kerala (c) Biodiversity of Plant Pathogenic Fungi of the Western Ghats, (a) Macro Fungi of Kerala, and (e) Diseases of Bamboos in Asia : An Illustrated Manual. He guided several students for M Sc and Ph.D degrees. Currently, Dr. Mohanan is attached to KFRI as an Emeritus Scientist (KSCSTE).

Dr. MS Mukteshkumar



Dr. MS Muktesh Kumar, Scientist F started his career at KFRI in 1980. His areas of research include: Bamboo Taxonomy & Ecology, Orchid Taxonomy & Ecology and Macrolichens and Epiphyte Communities: Tropical Forests Western Ghats. He played a lead role in the preparation of an INBARIS bamboo database for INBAR, Beijing and also documentation on the selection of potential species of bamboo in handicraft industry for UNDP. He is one of the collaborators in the All India Coordinated Project on Taxonomy Capacity building on bamboos, supported by the Ministry of Environment and Forests, GOI and a collaborator in the National Mission Bamboo Applications (NMBA) of TIFAC, Department of Science and Technology, GOI. Presently, he is one of the collaborators in the Bamboo Phylogeny Group supported by the National Science Foundation, USA, Iowa State University. He has described several new bamboo taxa, new records, nomenclatural new combinations and gave amended taxonomic descriptions of bamboos. Apart from bamboos several new taxa, new records and nomenclatural changes have been published representing different plant groups such as, Balsaminae, Orchids, Pteridophytes and Lichens. He is an editorial member on National Academics, SIDA Contribution to Botany, Texas University, USA; American Journal of Botany, INBAR, IDRC, Rheedia and reviewer for six scientific journals of Academic journals, New York, USA. He has over 150 publications to his credit which includes 8 books, 2 information bulletins, 15 chapters in books, 64 research papers, 40 papers in proceedings of symposia/workshops, and 3 popular articles and 20 technical reports. He guided 3 PhD students of Calicut/FRI Deemed University and also had 4 attached MSc students of M.G. University.

clatural changes have been published representing different plant groups such as, Balsaminae, Orchids, Pteridophytes and Lichens. He is an editorial member on National Academics, SIDA Contribution to Botany, Texas University, USA; American Journal of Botany, INBAR, IDRC, Rheedia and reviewer for six scientific journals of Academic journals, New York, USA. He has over 150 publications to his credit which includes 8 books, 2 information bulletins, 15 chapters in books, 64 research papers, 40 papers in proceedings of symposia/workshops, and 3 popular articles and 20 technical reports. He guided 3 PhD students of Calicut/FRI Deemed University and also had 4 attached MSc students of M.G. University.

Dr. ARR Menon



Dr. ARR Menon, Scientist F, GIS and Remote Sensing Department, Forest Information Management System (FIMS) Division, superannuated from service on 31 July 2011. He joined KFRI as Scientist in 1979. Dr Menon was instrumental in setting up the GIS and Remote sensing Division of KFRI. His major activities include geographical mapping of soil-cum-vegetation of forests of Trichur Division, evergreen forests of Kerala, Species relation studies in moist deciduous forests of Trichur Forest Division, insect pest incidence in natural forests, vegetation mapping and analysis of Chimmomy Wildlife Sanctuary using Remote Sensing Techniques, evaluation of the population regeneration and invasion status of selected tree endemics in the Shola forests of Kerala etc. During his tenure at KFRI, Dr Menon functioned as faculty member for the training courses conducted by KFRI. Dr. Menon is active in his scientific contributions even after retirement. He functions as Faculty member at Academy of Climate Change Education and Research, Kerala Agricultural University, Thrissur and ERCS, Thiruvananthapuram.

tributions even after retirement. He functions as Faculty member at Academy of Climate Change Education and Research, Kerala Agricultural University, Thrissur and ERCS, Thiruvananthapuram.

Sri. KK Unni



Sri. KK Unni, Scientist C, Scientist-in-Charge, Field Research Centre, Velupadam, KFRI, superannuated from service on 31 December 2011. He joined the Botany Division of KFRI in 1978 as Technical Officer and associated with the building up of the herbarium and medicinal garden till September 1993. He was then transferred to FRC, Velupadam to look after the newly inaugurated field centre which he continued till retirement. He held the charge of Field research centre and was instrumental in developing the sub Centre to its current status. During that period, he was associated with various scientific projects and promoted as Scientist in 2003. His main contributions include establishment of an arboretum of RET species, Bambusetum, Bamboo nursery for the sale of vegetatively propagated planting stock of different Bamboo species. He also looked after the office administration of the field center.

Dr. T Surendran



Dr. T Surendran, Scientist-F and Head, Tree Physiology Department, Sustainable Forest Management Division, retired from the services of the Institute on 31st January 2012. As a Postgraduate in Botany with specialization in Plant Physiology, he started his career in KFRI in 1979, July and served more than 32 years till his superannuation. His area of specialization is vegetative propagation of tropical forest tree species, bamboos, clonal propagation of teak, eucalypts and medicinal plants. The clonal technology developed for teak is one of his major contributions and he could successfully establish clonal plantations of teak in different locations in Kerala. He has also studied fire survival of species in moist deciduous evergreen and dry deciduous forests and various aspects of major teak seed production areas of Kerala. He has over 30 publications in professional journals, 10 research reports and papers in national and international proceedings of seminars/conferences. He was awarded

British Council's fellowship during 1986-87 under which he successfully completed M.Sc in Environmental Forestry from University of Wales, UK. He had undergone advanced training in vegetative propagation of tropical tree species at Queensland Forest Research Institute (QFRI), Australia in 2001 under the fellowship of ITTO, Japan. He presently serves as member of the Board of studies in forestry and Wood Science of the University of Kannur, Kerala

Dr. K Yesodharan

Dr. K. Yesodharan, Scientist C, Botany Department, Forest Ecology and Biodiversity Conservation Division, superannuated from service on 29 February 2012. He joined KFRI as Senior Scientific Assistant in 1980. He was awarded his PhD on "Taxonomical studies on lignicolous fungi from forests" in 1993. Over the years he has worked on various aspects such as Fungicidal management of quick wilt disease, Macrofungal flora of Peechi and Vazhani Wildlife Sanctuary, Biodiversity of plant pathogenic fungi in the Kerala part of the Western Ghats, Ecosystem structure, biodiversity, human dimensions and their linkages of Iringole sacred groves, Conservation of the critically endangered tree *Syzygium palghatense* Gamble (Myrtaceae) in the Western Ghats etc. He was instrumental in establishing an arboretum of rare and characteristic species of the moist deciduous forests of Kerala. Recently he has created a multidisciplinary database of RET plants of the Kerala State.

Sri. V Asokan

Shri V Asokan joined the Institute on 16 October 1976 as FC superintendent and retired from service on 31 July 2011 as Special Grade Office Superintendent

Sri. A Ramakrishnan

Shri A Ramakrishnan joined the Institute on 16 November 1977 as Stenographer and retired from service on 30 April 2011 as PA to Registrar



Sri. S Shahul Hameed

Shri S Shahul Hameed joined the Institute on 06 June 1979 as Driver and retired from service on 31 May 2011 as Senior Special Grade Driver



Smt. KM Suseela

Smt KM Suseela joined the Institute on 18 April 1980 as Office Assistant and retired from service on 31 May 2011 as Section Officer



Sri. KM Velayudhan

Shri KM Velayudhan joined the Institute on 10 March 1986 and retired from service on 31 August 2011 as Senior Special Grade Technical Assistant



APFISN Workshop on Forest Health Technology and Phytosanitary Standards

Beijing, China on 6,8,10 and 11 November 2011

The Asia Pacific Forest Invasive Species Network (APFISN) organized a workshop on Forest Health Technology and Phytosanitary Standards as a side event during the Asia Pacific Forestry Week held in Beijing, China. The workshop had the following objectives:

1. To assess the current status of phytosanitary standards in the member countries
2. To evaluate the existing legislative and regulatory systems in member countries
3. Presentation and discussion on "Guide to implementation of phytosanitary standards in forestry", and
4. Preparation of protocols for implementation of phytosanitary standards in forests

On the first day of the workshop at the China International

Convention Centre, 37 participants registered for the four day event. The workshop started off with introductory remarks by Mr Patrick Durst, on behalf of FAO. Dr KV Sankaran, Coordinator, APFISN explained the objectives of the workshop. This was followed by the presentation of country reports from Bangladesh, China, Fiji, Indonesia, Maldives, Malaysia, Myanmar, Nepal, Philippines, Samoa, Sri Lanka, Vanuatu and Vietnam. A global review of the forest health scenario was done by Gillian Allard. Sun Jianghua spoke on the use of semiochemicals in invasive species surveys and Methods of plant survey was presented by Gillian Allard. Invasive species mapping techniques using open source software was presented by Sitansu Patnaik and the experience of invasive species surveillance in Vietnam was presented by Pham Quang Thu. An overview on invasive species management techniques like mitigation, control and eradication was presented by Eric Allen.

On the second day, Invasive species risk assessment protocols were presented by Shiroma Sathyapala and methods of early detection and rapid response was presented by Yan Yun and Chris Baddeley. Protocols for long term monitoring of biological invasions was presented by Eric Allen. Public engagement tools in invasive species management were presented by Chris Baddeley and TV Sajeew on the third day.



An introduction on the phytostandards in forestry was provided by Gillian Allard and regional perspectives on phytosanitary standards were presented by Lee Su See. She also gave off questionnaires for needs assessment survey on the Guide to implementation of phytosanitary standards in forestry to the participants. Upon request from the APFISN co-ordinator, the participants presented their needs for better research and management of invasive species in their respective countries. Major areas in which the network can help the member countries were identified.

On the fourth day, Shiroma Sathyapala spoke on the relevance of phytosanitary standards to NPPO sector and Eric Allen further elaborated on the implementation of phytosanitary standards in forestry. Zhao Wenxia introduced the video on phytosanitary standards in forestry followed by the screening of the film. Shiroma Sathyapala presented the results of the needs assessment questionnaire survey.

The member countries were requested to prepare country wise action plans and sent it over to the APFISN secretariat. The workshop came to a close at 3.30 pm on 11 November 2011 with the closing remarks of the APFISN Co-ordinator.

The workshop had the following major recommendations:

1. In the year 2012, each focal point would identify a flagship invasive species in the country and start off awareness programmes in managing it. The purpose is to make the various stakeholders aware of the invasion process and its impact on local economy.
2. Based on the action plans drawn up by the focal points, APFISN secretariate would plan specific regional training workshops in the year 2012.

The workshop was instrumental in reviewing the forest health scenario at the global and country levels, provided training in mapping, surveillance, risk assessment, early detection and long term monitoring of invasive species, deliberated extensively on the implementation of phytosanitary standards in forestry identified knowledge and resource gaps in containing invasive species in the Asia-Pacific region.

Evergreen

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Editorial Committee:

Dr. R Jayaraj

Dr. M Amruth

Dr. TB Suma

Mr. KH Hussain



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Front Cover Image contribution:

Dr. P Sujanapal

Address all communications to:

The Editor, Evergreen

Kerala Forest Research Institute

Peechi-680 653

Thrissur, Kerala, India

Phone: +91 487 2690100

E-mail : evergreen@kfri.res.in

evergreenkfri@gmail.com

