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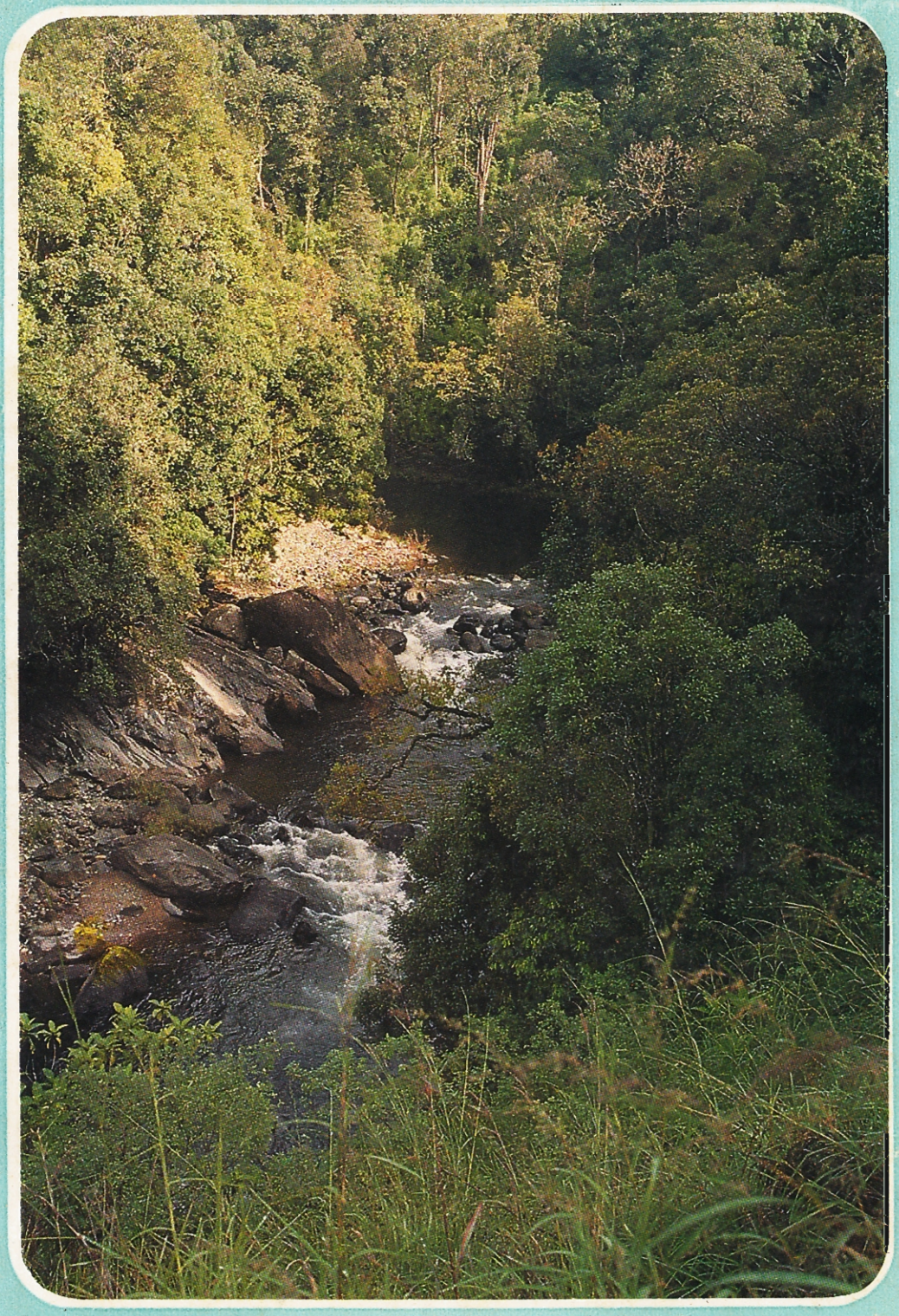

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**kerala forest research institute**

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## CONTENTS



Cover - Silent Valley  Printed at Lumiere  Photo - Subhash Kuriakose

# The fall of a Sparrow

With the death of Dr. Salim Ali on June 20, 1987, the world of science and in particular India lost one of the doyens in ornithology. He was 91. Dr. Ali's career as an ornithologist started when he shot down a sparrow to find out its identity. Through his early association with the Bombay Natural History Society (BNHS) he was able to mould his thoughts into a reality. He was probably the only trainer in field ornithology India has ever produced and a strong fighter to the cause of environmental protection. He was the main force behind popularisation of the philosophy of conservation and succeeded well in convincing the administrators and decision makers, the need for environmental conservation. He preached the idea of living in harmony with nature, at the same time remained as a principled and productive scientist.

Dr. Ali has published a number of research papers and books. His books include Birds of Kerala, Indian Hill Birds, The Book of Indian Birds, Handbook of the Birds of India and Pakistan (10 volumes) coauthored by Dr. Dillon Riply, and a number of others. His latest book 'The Fall of a Sparrow', his autobiography is a thought provoking and inspiring one.

A nominated member to the Rajyasabha, Dr. Ali was the recipient of a number of awards and distinctions, both national and international.

Dr. Salim. Ali, visited KFRI a number of times and shared his thoughts with us. We hope that the scientific community and the environmentally conscious people in India would dedicate their efforts to the cause of conservation and relentlessly pursue issues on scientific objectivity, which will remain as a permanent memorial to this devoted scientist. We pay our respect and homage to the departed soul.

**Divisional Highlights-10**

# Wildlife Biology

The forests of Kerala contain a rich fauna which include a wide variety of birds and mamals. The most endangered animals include Nilgiri tahr, tiger, lion-tailed macaque and Malabar civet. The division is engaged in documenting the distribution and monitoring the population of wildlife in sanctuaries and national parks in Kerala. Detailed studies on the ecology and behaviour of selected species are also being carried out.

The division was initially functioning at Thekkady (1977-1982) and then shifted to the main campus at Peechi. The studies so far were mainly carried out in Silent Valley National Park, Periyar Tiger Reserve, Idukki Wildlife Sanctuary, and at Parambikulam Wildlife Sanctuary.

A study on the impact of the proposed hydro-electric project at Silent Valley was conducted in 1977. The study showed that the area has almost all representatives of peninsular Indian animals. Twenty three species of mamals excluding bats, rats and mice were recorded. This included 3 endangered species viz. the lion-tailed macaque, tiger and Nilgiri tahr. Ninenty nine species of birds including the endangered Great Indian Hornbill was also recorded. This study provided the baseline informatoin on the fauna of this area.

The distribution, ecological requirements and resources availability to selected mamals of Periyar Tiger Reserve was carried out from 1977-1982. The reserve has a rich avifauna of 181 species. Almost all the families of birds reported from Kerala are present in this area. During the study a total of 800 elephants were estimated to be present in the area. The overall density was approximately one elephant

Fig. 1 The Malabar Giant Squirrel

per square km with an ecological density as high as 2 or 3 times in dry season in certain parts of the reserve. Density of animals like sambar, gaur and wild boar showed extreme variation. The distribution of arboreal animals like the Nilgiri langur, lion-tailed macaque, Bonnet macaque and giant squirrel was examined. The availability of prey to carnivores and the competition among them were also studied.

The division was associated with a multidisciplinary study on the long term environmental and ecological impact of multipurpose river valley projects at Idukki. About 75 elephants were located in the study area. The herds were of smaller size indicating disturbance. Tuskers were very low in number. Animals like sambar, barking deer, jackal and wild dog were found in small numbers whereas wild boar and hare were present in moderately good numbers. Gaur, bear, tiger and leopard were totally absent in the area. The study recommended habitat improvement measures for the Idukki Wildlife Sanctuary, need for keeping the forest continuity of crucial Meenmutty region and a few other measures to prevent further deterioration of the habitat.

Eco-behavioural studies on the Malabar Giant Squirrel (Fig. 1), habitat utilization pattern by animals in teak plantations and the movement pattern of elephants are some of the studies which have been successfully carried out at Parambikulam Wildlife Sanctuary.

The division participated in the Nilgiri tahr census at Eravikulam National Park during 1984, 1986 and in 1987. The Kundah Plateau was visited by a group of scientists from the division as part of a multi-institutional team to study the fauna of the Nilgiri Biosphere Reserve and also involved with preparation of an action plan for the Kerala part of the Nilgiri Biosphere Reserve. Systematic count of animals was attempted at Parambikulam Wildlife Sanctuary and Silent Valley National Park to estimate the abundance of different animals. A project report for shifting of zoo from Trichur to Peechi was prepared by the division.

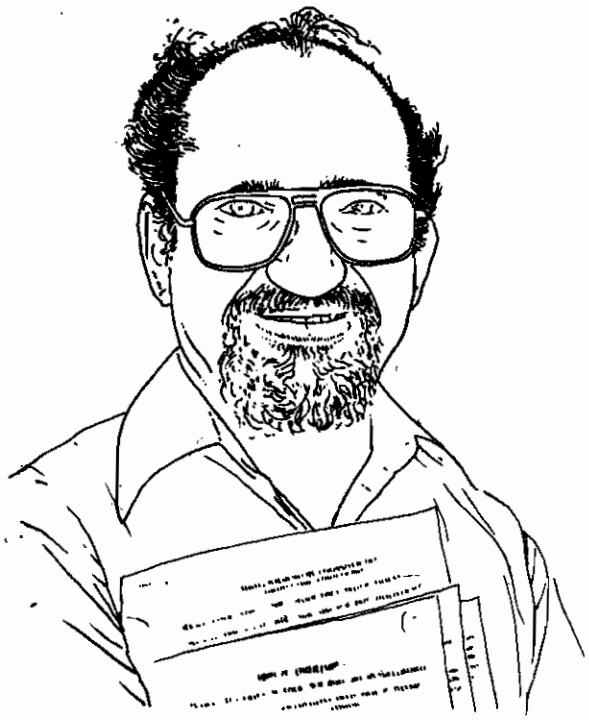
The division is focussing on detailed investigations on selected wild animals. Studies on giant squirrel and elephant have been completed. Two more projects, study on the ecology and behaviour of sambar deer at Parambikulam Wildlife Sanctuary and feeding and ranging patterns of lion-tailed macaque in Silent Valley have been initiated this year. Sambar deer, though comon throughout India, is one of the least studied animal and the present project is taken up to collect information on its population, food and water availability and activity time budget. There has not been any detailed study of the Lion-tailed macaque in the Silent Valley area. Considering the importance of the lion-tailed macaque, the study has been initiated to find the feeding and ranging patterns of the species. The data generated from the above studies will help to evolve better management strategies of the wild life sanctuaries in Kerala.

"Onething I have learned in a long life : that all our science, measured against reality, is primitive and child like — and yet it is the most precious thing we have".

— Albert Einstein.

**Interview**

# On Forests and Forestry



Dr. C. J. Saldanha F. A. Sc. is a leading plant taxonomist of our country. Presently he is attached to the Centre for Taxonomic Studies, St. Joseph's College, Bangalore. Prof. Saldanha has also been actively involved in environmental studies. Prof. Saldanha was interviewed on 4th July, 1987 by Evergreen.

*Evergreen* : What is your opinion on the scope of plant taxonomic studies in forestry research?

*CJS*: Well, in forestry research one should have a background in plant taxonomy to know what plants grow in the forests. If this backgroud is based on scientific knowledge, then the forester can identify these plants with confidence. And this is becoming more and more important because today with the advance in wood technology many more plants have been used than ever before.

*Evergreen* : How best can we club taxonomic aspects with other disciplines in botany?

> IT IS NOT JUST ENOUGH TO KNOW THE IDENTITY OF A PLANT ALONE, BUT WE SHOULD ALSO KNOW WHAT ARE ITS USES, ITS HABITAT AND HOW WE CAN PRESERVE IT.

*CJS* : Many other disciplines of botany which we considered in an isolated fashion till now, are being integrated to provide a better understanding as to how one plant species differs from another. For example, today we have cytotaxonomy, chemotaxonomy, numerical taxonomy and manyother branches by which we can understand the species better. The next point is, it is not just enough to know the identity of a plant alone, but we should also know what are its uses, its habitat and how we can preserve it.

*Evergreen* : In natural forests an important activity is selective felling operations. Could you explain how is the selection felling system being implemented in Karnataka?

> CERTAIN FORESTS ARE ECOLOGICALLY SO FRAGILE THAT TAMPERING WITH THEM WOULD IMMEDIATELY CAUSE SOME TYPE OF DEGRADATION, IF NOT, AN IRREVERSIBLE DEGRADATION.

*CJS*: In Karnataka except for the western ghat region, there is scarcely any other area where natural forest has survived. Certain forests are ecologically so fragile, that tampering with them would immediately cause some type of degradation, if not an irreversible degradation. In Karnataka, the felling schedule in the evergreen forests is to fell not more than 2 trees per ha. It is quite a different story when it comes to practice. As we all know working plans are very good on paper, but at the stage of implementation several other factors come into play.

*Evergreen* : About conserving the flora in the Western Ghat region, is there any option to avoid felling altogether?

> THE BEST THING WOULD BE NOT TO EXTRACT TIMBER FROM THE EVERGREEN FORESTS. YET ONE HAS TO BE REALISTIC AND KNOW THAT THERE ARE OTHER PRESSURES AND SOME TYPE OF REASONABLE COMPROMISE HAS TO BE ADHERED TO.

*CJS* : I could just repeat what was said by Mr. Shyam Sundar, Principal Chief Conservator of Forests, Karnataka in one of the meetings. 'It would be worthwhile closing all fellings in the evergreen forests on the leeward side of the Western Ghats, because the damage done is not commensurate with the advantages'. Clearing or felling a tree in a closed canopy area especially when the tree is a large one, causes a lot of damage to the neighbouring trees. The best thing would be not to extract timber from the evergreen forests. Yet one has to be realistic and know that there are other pressures and some type of reasonable compromise has to be adhered to.

*Evergreen* : Could you please enlighten us on the selection felling system being practised in Andamans?

*CJS* : In Andamans, they follow a system of working called the Andaman Canopy Lifting System. At the time of felling a certain number of trees above a particular girth are extracted leaving a number of trees as mother trees. Regeneration is obtained from the seeds of the mother trees. In addition, poles and saplings are not felled, and retained as advance growth to form part of future crop. This system has been evolved to suit the situation that exists in the islands. But over time the intensity of felling has increased and we cannot say anything about the long run sustainability of the system.

*Evergreen* : In Andamans, have you come across any area that has been worked for the second cycle?

*CJS* : I was shown an island which I am told was felled about 50 years ago. Again I was told that when you go a second time to these areas (because in the Andamans there was forestry operation for over a hundred years or more) they do not find the old giant trees. This is bound to happen.

*Evergreen* : It is a fact that there is a sharp decline in the area under forest. Do you have any concrete suggestions to improve the situation in India ?

> WE HAVE TO INCREASE THE FUELWOOD RESOURCE THROUGH ORGANISED PLANTING OF FIRE WOOD SPECIES IN AVAILABLE AREAS. ANOTHER THING IS TO IMPROVE THE FUEL WOOD UTILIZATION EFFICIENCY.

*CJS* : According to the data available through National Remote Sensing Agency, between 1975 and 1980, India has lost about 2 percent of its forest cover. Now the question is can we make up for this loss and can we increase the forest cover in the country. I think this needs a very massive effort on the part of the people. Afforestation of wasteland is also attempted by the Wasteland Development Board. There is a real crisis as far as fuelwood and timber are concerned. Timber, of course can be imported, but it is not the case with fuel wood. So, we have to increase the fuelwood resource through organised planting of fire wood species in available areas. Another thing is to improve the fuel wood utilization efficiency. A group in the Indian Institute of Science, Bangalore known as ASTRA (Application of Science and Technology to Rural Areas) has devised a new stove which shows 25-30 percent utilization efficiency under practical situations. The success of this is also partly because, the Govt. of Karnataka took interest in propagating these stoves.

*Evergreen* : How far our social forestry programmes have helped in solving the firewood/timber problem in the country?

> WE SHOULD GIVE PRIORITY FOR SPECIES THAT ARE OF USE TO THE COMMON MAN THAN RAISING INDUSTRIAL PLANTATIONS UNDER SOCIAL FORESTRY.

*CJS* : A good number of species were planted; for eg: *Eucalyptus* in the name of social forestry. This raised hue and cry in Karnataka. The criticism was that social forestry is being used to supply wood to the industry and not to cater to the needs of the people. I would appreciate the argument and condemn eucalypts being planted in the name of social forestry. I would say, we should give priority for species that are of use to the common man than raising industrial plantations under social forestry.

*Evergreen* : Would you elaborate on the programmes and policies, particularly related to conservation as well as eco-development of the Western Ghats?

> BY INVOLVING A RANGE OF SCIENTIFIC INSTITUTIONS FROM NORTH TO SOUTH A NEW CLIMATE HAS BEEN CREATED AND THE SCIENTISTS HAVE COME OUT OF THEIR LABORATORIES INTO THE FIELD TO STUDY THE ACTUAL PROBLEMS.

*CJS* : In the Western Ghat Development Programme which is a massive programme involving the states and there is a committee in each state which takes a comprehensive view of the development of the hill range. What it was supposed to do was to enlist the scientific community to undertake piolet scale research project to suggest methods of development without ecological damage. By involving a range of scientific institutions from north to south, a new climate has been created and the scientists have come out of their laboratories into the field to study the actual problems. They have also been encouraged to interact with local people to find out concrete solutions to these problems.

*Evergreen* : What are the thrust areas you envisage under the Nilgiri Biosphere programme?

*CJS* : As you know it is a very complex area which has been put to very bad ecological uses. Some of the problems like pollution of Ootty lake, potato cultivation on steep slopes etc. have to be considered under the Hill Area Development Programme which is part of the Nilgiris District programme. In the Nilgiri Biosphere Reserve we have core zones and manipulation zones, distributed in the three states of Kerala, Karnataka and Tamil Nadu. The core areas will be a kind of laboratories to study wild life survival, growth rates etc. on a long term basis and we hope that these areas will be preserved because they come under special administrative set up. The manipulation zone is sometimes very much degraded. For instance, the Attappady area is a very good example of bad land use. So, the manipulation zone and the core zone are excellent places to study various ecological aspects on a long term basis.

*Evergreen* : You were involved with the preparation of the state of environment report of Karnataka. How was it received by people at different levels? Did the government in any way influence the freedom of your work?

*CJS* : The government of India asked all the states to prepare a state of environment report for each state. In Karnataka I was asked to organise the whole thing. I do not know whether any other state has yet prepared the state of environment reports. We identified certain problems, collected data on these aspects and I feel the reports are well taken by the administrators, scientists and the people. Now what we are interested in is to chalk out action programmes, with the help of government departments to solve problems like energy demand, water logging, drought etc. To be frank, there were absolutely no pressures from the government in one way or the other. I think such studies will ensure a better life for our people.

*Evergreen* : What in your opinion are the research needs to be focussed in forestry?

*CJS* : What we need today is dedicated type of silviculturists and fortunately in the last few years a tremendous revolution has occurred in the forest departments of our country, especially in the south. We have to increase the wood production without further destruction of the forests. Only the science of forestry will come to our rescue, Wood utilisation, tree breeding programmes, ecological studies, etc. are some of the areas in which we have to concentrate.

# Diseases of Forest Trees in Kerala

*2. Ailanthus triphysa*

*Ailanthus triphysa* (Dennst.) Alston (Malayalam-*matti*) occurs naturally in South East Asia. It was introduced as a plantation species in Kerala during early 1960s for its soft wood used in match industry. *A. triphysa* is raised either in pure plantations or mixed with *Bombax* or teak under the category of 'soft wood plantations'. Due to increasing demand of *Ailanthus* it is commonly grown in home-steads, farm yards, etc. Now it is also being popularised under social forestry programme in the State. So far about 350 ha of pure plantations of *A. triphysa* have been raised by the Kerala Forest Department.

Since no information was available on disease of *A. triphysa* in Kerala, a survey was conducted during 1982-85 in numerous nurseries and plantations in the State. The survey has revealed the occurrence of six diseases (damping off, collar rot, seedling blight, bacterial leaf spot, shot-hole leaf disease, pink disease, stem canker and dieback, and mosaic disease of unknown etiology). Shot-hole leaf disease and sooty mould, common to both nurseries and plantations are described under diseases of plantations where they were more prevalent.

## NURSERY DISEASES

### 1. Damping off :

*Causal organism: Pythium* sp.

Occurrence: Damping-off of *A. triphysa* seedlings was observed at Peechi (Trichur Div.) and Thirunelli (Wynad Div.). At both places the disease occurred within two weeks of germination of seeds, when the first pair of leaves was just emerging and caused upto 50-60 per cent mortality. Dark shade over the seedbeds and excess watering favoured the disease development.

The disease appeared in the form of irregular patches in seedbeds. These patches enlarged rapidly from the periphery affecting the neighbouring healthy seedlings under high soil moisture regimes.

*Symptoms* : Initially water-soaked lesions measuring 5-10 mm across, appeared on the hypocotyl near the ground level. The lesions turned brown in colour and the affected area got shrunken due to rapid collapse of cells, resulting into a prominent constriction (Fig. 1). At this stage the seedlings fell over the ground and eventually died.

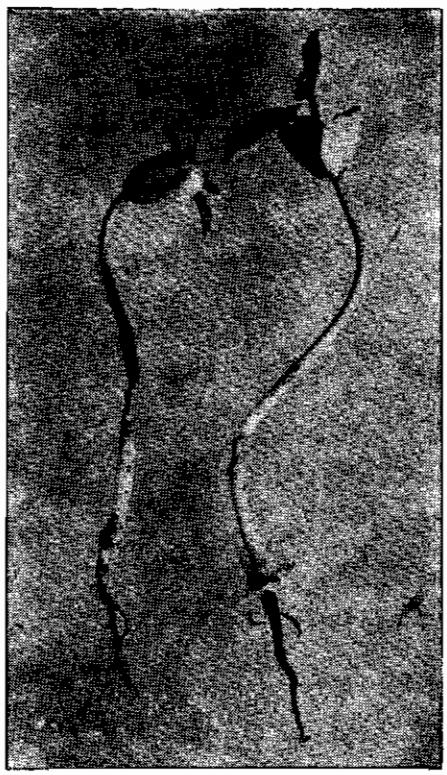


Fig. 1 Damping-off of 1-wk-old seedlings

*Control measures* : As the disease occurs during warm weather under high soil moisture and dark shade, it is advisable to minimise watering frequency and quantity and open up the shade pandal to get dispersed light as soon as the damping-off is noticed. This will facilitate in checking the rapid spread of the disease.

At Peechi the damping-off of *A. triphysa* was effectively controlled by two soil drenches of Dithane

M-45 (0.05% and 0.02% a. i.) applied at a week's interval.

## 2. Collar root

*Causal organism: Rhizoctonia solani* Kuhn. state of *Thanatephorus cucumeris* (Frank.) Donk.

*Occurrence* : This is the most widespread and serious disease among all the nursery diseases of *A. triphysa* recorded throughout Kerala. The disease was first noticed affecting one-month-old seedlings in small irregular patches which spread fast from the periphery, damaging large areas of the seedbeds within a few days (Fig. 2). The disease often continued to affect even 3- to 4-month-old seedlings causing 30-60% mortality during April/May, if seedlings had not been pricked out into containers or proper control measures were not adopted earlier.

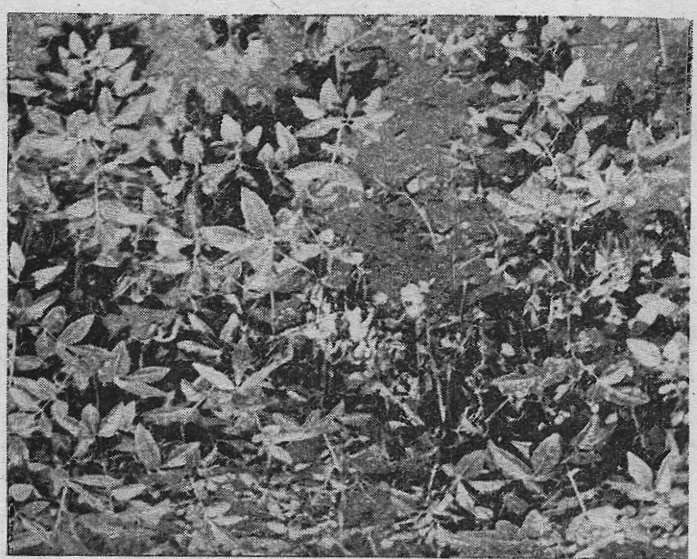


Fig. 2 A patch of seedlings affected with collar rot

*Symptoms* : First symptom of the disease was the appearance of water-soaked lesions at the collar region. These lesions developed into light brown necrotic area and the tissue got decayed, which resulted in a constriction at the collar region and consequently death of seedlings. Young seedlings (1-month-old) usually collapsed from the decayed region and fell over the ground; old seedlings (> 2-month-old) showed only wilting.

Occasionally infection of hypocotyl region in emerging seedlings was also observed. Affected seedlings either failed to emerge or emerged only partially, which died later.

*Control measures* :As the disease caused high mortality of seedlings in various nurseries, studies were taken up on chemical control measures for ensuring healthy stock. In trials, the disease was effectively controlled by two applications of 0.005% (a. i.) of Emisan-6 given as soil drench at the rate of 30 litres of solution per standard bed at an interval of 10-15 days depending upon the age of seedlings. Since the diseases is manifested under high soil moisture it is recommended to avoid overwatering and high seedling density in seedbeds.

## 3. Seedling blight

*Causal organism : Colletotrichum dematium* (Pers ex. Fr.) Grove.

*Occurrence* : The seedling blight disease, prevalent after the onset of South-West monsoon, was observed in 4-to 6-month-old seedlings. The survey of the affected nurseries revealed that the incidence of the disease was high where seedlings older than 4-month-old were pricked into containers, though in some nurseries the disease was also found in seedbeds. The incidence of the disease was negligible or absent where 1-to 2-month-old seedlings were pricked.

*Symptoms*: Initially the infection appeared on the stem near the apex in the form of elongated brown spots, which soon coalesced to form large necrotic area. Thereafter, the shoots showed typical symptoms of seedling blight i.e., wilting and drying up of leaves followed by death of the terminal bud (Fig. 3). The necrosis extended downwards which

Fig. 3 Seedling affected with *Colletotrichum* blight

eventually killed the seedling. During the monsoon, on the affected stem the pathogen produced numerous splash dispersed conidia in acervuli, which helped in the spread of infection.

*Control measurers* : Foliar spray of Fytolan or Thiride (0.02% a. i.) applied twice at a week's interval was found to be effective in controlling the disease. During the rainy season it is recommended to use systemic fungicide, Bavistin (0.01% a. i.) instead of Fytolan or Thiride.

Development of the disease can be avoided to a considerable extent by means of proper nursery practices, such as raising the nursery at proper time, avoiding crowding of seedlings and pricking out 45- to 60-day-old seedlings into containers.

### 4. Bacterial leaf spot

*Causal organism* : *Pseudomonas* sp. (possibly *P. solanacearum* (E. F. Smith) E. F. Smith).

*Occurrence* : Though the bacterial leaf spot disease was found in almost all the nurseries surveyed, it did not appear to cause any concern as the incidence and severity were low. However, at Peruvannamuzhi (Kozhikode Div.) the disease caused severe foliage infection in 5-month-old container seedlings resulting in defoliation during the South-West monsoon. Almost 75 per cent of the container plants were found to be affected with bacterical leaf spot.

*Symptoms* : The first symptom of the disease was the appearance of water-soaked transluscent amphigenous round to irregular lesions, which soon turned light brown. The lesions enlarged and coalesced to give rise to larger irregular spots, which occasionally covered a considerable part of the lamina. The spots were shiny and sticky to touch and the necrotic tissue of the spots became thin and somewhat elastic. Severely infected leaflets were defoliated prematurely and seen sticking on other healthy leaves or stem.

*Control measures* : The bacterial leaf spot disease was controlled by a foliar application of plantamycin (0.01% a. i.).

## PLANTATION DISEASES

### 1. Sooty mould

*Causal organism* : *Meliola ailanthii* sp. nov.

*Occurrence* : The sooty mould was quite common in nurseries and plantations during hot and warm period following North-East monsoon. The incidence of the disease was generally high even when the severity was low. Though the disease is of minor importance, it may become a serious problem in nurseries.

*Symptoms* : The disease appeared in the form of superficial black irregular to round patches initially on the upper surface (Fig. 4). Under warm and humid conditions these patches enlarged and coalesced to give rise to large patches. In severe cases the infection also extended to the lower surface. Severely infected leaves turned yellow and defoliated prematurely.

### 2. Shot-hole leaf disease

*Causal organism* : *Colletotrichum* state of *Glomerella cingulata* (Stonem.) Spauld & Sehrenk.

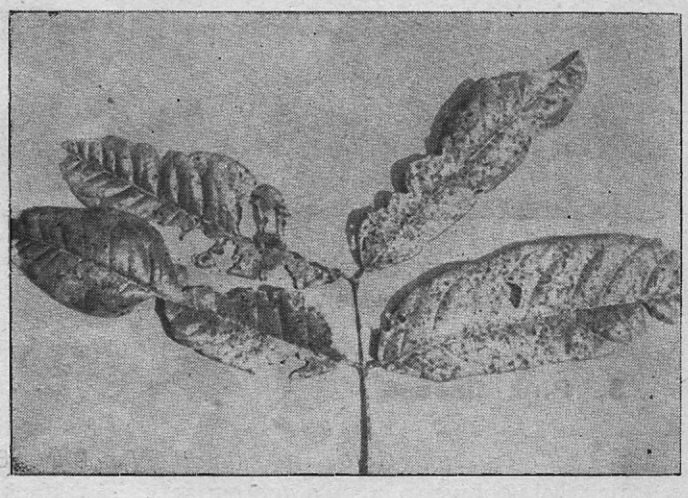


Fig. 4 Adaxial surface of leaflets severely infected with sooty mould.

*Occurrence*: The disease, recorded throughout Kerala in nurseries as well as in plantations, was prevalent during June to November when high humidity (85-95 per cent r. h.) and moderate temperature (22-25°C) occur. The incidence of the disease varied greatly from one location to another. The affected leaflets were shed prematurely leaving the bare rachii attached to the trees. Young and mature leaves were equally affected.

*Symptoms:* Initially symptoms developed on the leaflets as dark green areas lined with a yellowish green margin. The colour of these areas changed to light yellowish to reddish orange and finally light brown. The necrotic areas of the leaf became thin

and got detached very easily either by wind or due to impact of rain drops, thus leaving a prominent hole in the lamina (Fig. 5 a). The severely infected leaflet got completely deformed with irregular cuts due to separation of a large part of the lamina after the infection (Fig. 5b).

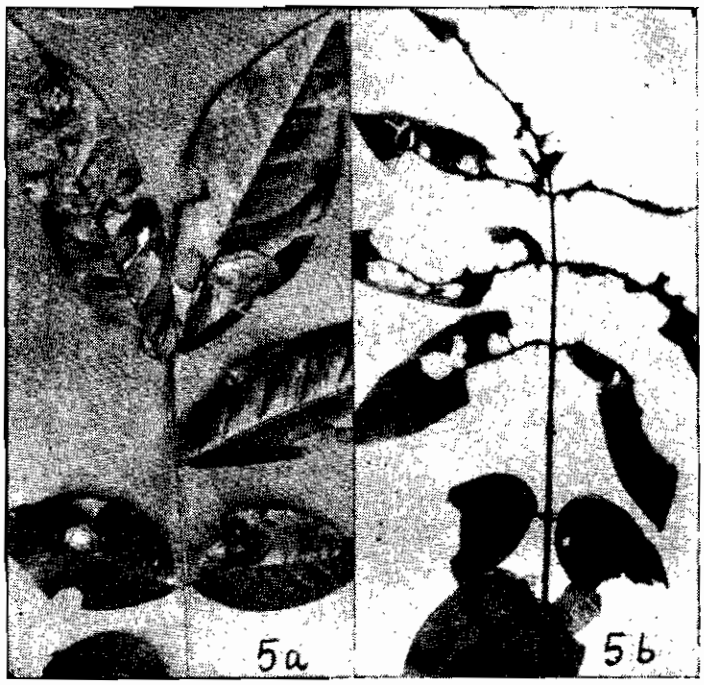



Fig. 5. Shot hole disease. a, shews typical shot holes; b, severely infected leaf.

### 3. Pink disease

*Causal organism: Corticium salmonicolor* Berk. & Br. Only cobweb, pustule and perfect (pink) stages were observed.

*Occurrence* : The pink disease of *A. triphysa* was recorded only in central Kerala with low incidence. In serve cases the top of the diseased tree died due to complete girdling of phloem.

*Symptoms* : The disease was characterised by a canker formed on the upper half of the stem which resulted in the girdling of phloem thus killing the stem above the canker. The stem got constricted at the canker region and bark showed longitudinal splitting.

### 4. Stem canker and die-back

*Causal organism: Botryodiplodia theobromae* Pat.

*Occurrence* : The disease was observed only in Trichur area in a plantation (4-year-old, 40.98 ha) at Pothuchadi, Paravattani Hills, (Trichur Div.) and in a homestead at Mullakkara. At Pothuchadi the disease was spreading in patches, killing the infected plants. However, at Mullakkara where the trees were 2-year-old, no mortality occurred. Infection was also recorded on the stem of young seedlings which were killed outright.

*Symptoms* : The symptoms of stem canker at Pothuchadi appeared to be significantly different from those at Mullakkara. At Mullakkara initially small longitudinal cracks appeared on the main stem from which occasionally a dark gummy substance oozed out. These cracks developed into large cankers, measuring 30-60 cm in length. The tissue under the canker turned greyish. Due to the infection numerous epicormic shoots developed just below the canker. The epicormic shoots also got infected in due course due to spreading canker, on which numerous fructifications of the causal organism produced.

At Pothuchadi, the infection started near the ground at the root collar and rapidly spread upwards (Fig. 6). Due to the infection, which was several millimeters deep, the plants showed decline symptoms with a weak crown having fewer and yellowed leaves. The weakened main shoot as well as

Fig. 6 Development of canker at the collar area near the ground.

the branches got infected and died slowly and gradually. As a result, numerous epicormic shoots were produced. In the meantime the basal stem canker had also spread downwards, decaying the root system. Complete girdling of the outer bark killed the trees outright.

### 5. Mosaic disease of unknown etiology

*Occurrence* : A mosaic disease, similar to mosaic virus disease, was noticed in nurseries. Incidence of the disease was very low and no stunting or abnormal growth of seedlings was observed. The affected seedlings gradually became weak and dried up.

*Symptoms* : The leaves of the affected seedlings had off-white to yellow, irregular patches. These chlorotic patches could even be found on the youngest leaves.

**J. K. Sharma,**
**E. J. Maria Florence,**
**C. Mohanan**
Division of Plant Pathology

### IDRC Grant to KFRI

The International Development Research Centre, Canada has given a total grant to the tune of 24 lakh rupees towards the following two research projects for a period of three years.

1. Silviculture, Management and utilisation of Bamboo resources of Kerala.
2. Rattan Management and utilisation in Kerala.

# Silviculture, Management and Utilisation of Bamboo Resources

Bamboo is a very important natural resource of India. Out of nearly 1250 species of bamboos reported in the world, about 140 species comprising of 21 genera are found to occur in India, distributed throughout its entire length and breadth. The occurrence of different species of bamboos in a given area depends on locality factors. Annual output of bamboos in India is estimated to be about 3.23 million tonnes, of which about 2 million tonnes are used by pulping industries.

In Kerala, about 15 species of bamboos are known of which *Bambusa arundinacea* is the most important species. Information on the total growing stock of bamboos including reeds at present in Kerala is not available. They form an important forest resource of Kerala contributing a lot to the economy of the state by supporting traditional and modern sectors. There is a large gap between the supply and demands of bamboos to these industries. While demand is increasing progressively, the availability is decreasing due to a number of factors, such as reduction in forest areas, loss due to biotic factors, etc. There has been a general lack of efforts to raise bamboo plantations, probably because of insufficient knowledge on their silviculture, management and propagation techniques. To augment the bamboo resources in Kerala, the KFRI has taken up a detailed project on its silviculture, management and utilisation. This is an inter-disciplinary project involving the divisions of Management, Physiology, Genetics, Botany, Silviculture and Wood Science.

The following are the main objectives of this project.

a. To carry out a market study to identify the nature of demand, supply and price;

b. To develop suitable propagation techniques;

c. To establish a germ plasm collection for bamboos and reeds;

d. To carry out detailed ecological studies on reeds;

e. To determine methods for establishment of bamboo plantations in the state as a monoculture and in mixed crop;

f. To develop simple low cost bamboo preservation techniques and to determine physical and mechanical properties.

**K. Shanmughanathan**
Division of Silviculture

'To be among growing bamboo in a grove is to be surrounded by a sense of peace'

Austin and Ueda

# Rattan Utilisation and Resource Management

As rattan (cane) has so far been a neglected forest resource, no adequate data is available on either the resource base or the rattan industry and employment potential in Kerala. In the report of the High Level Expert Committee appointed by the Government of Kerala, rattan has been identified as an important resource for the rural economy of the state.

## Resource base

One of the recently completed projects (KFRI Research Report 46) has updated the knowledge on cane and has shown that of the 46 Indian cane species, 13 are distributed in Kerala, constituting a significant part of the genetic base of Indian rattans. The following three categories of canes exist in Kerala forests:

1. Large-diameter canes (Mean diameter > 18mm): *Calamus thwaitesii* and *C. dransfieldii* (new species)

2. Medium-sized canes (Mean diameter 10-18 mm): *C. gamblei, C. hookerianus, C. pseudotenuis* and *C. vattayila* (new species)

3. Small-diameter canes (Mean diameter < 10mm): *C. metzianus, C. rotang; Calamus* sp. (yet to be identified) and *C. travancoricus.*

The non-availability of formerly recorded species in Kerala viz. *C. brandisii, C. huegelianus* and *C. rheedii* during the recent botanical collection (KFRI Research Report 46) calls for evolving suitable strategies for the conservation of resource base.

## Managing the resources

The current knowledge of taxonomy and growing stock of canes in Kerala is inadequate for the management of the resource. A recent study by KFRI showed that two new species occur in Kerala, one being a thick cane (*C. dransfieldii*) comparable to *C. thwaitesii*, a commonly occurring species for furniture items. *C. metzianus*, a species known to be located in its natural habitat was recorded only from Karnataka until very recently when its extended distribution was recorded in Nilambur forests of Kerala. Thus, there is a need for an extensive survey involving the collection of botanical specimens together with cane samples for commercial testing and ecological and ethnobotanical data. Such data will be essential for regeneration and establishing pilot-scale plantations of commercially important species.

The present system of management is not based on an understanding of the growth and development of canes. A felling cycle of 4 years is fixed arbitrarily. The right of collection and removal of canes is leased out usually for one year. Information on appropriate harvesting technology of different species is also lacking.

## Utilisation of resources

Rattans are used in the manufacture of a variety of items in Kerala. Non-availability of commercial species in sufficient quantities poses the problem of raw material shortage. Many useful species such as *C. gamblei, C. pseudotenuis* and *C. travancoricus* have become infrequent in the accessible areas. In order to meet the raw material demands, unprocessed canes are being imported to Kerala from other states like Assam and Karnataka. But Karnataka has now imposed a ban on export of canes in order to improve the raw material supply to industrial units within the state. Ultimately the raw material supply could be maintained only through artificial regeneration by raising plantations. Due to uncertainty over seed availability, vegetative propagation methods using suckers, rhizomes and stem cuttings need to be standardised for plantation programmes.

The present system of cane processing does not involve methods to improve the market qualities such as sheen and colour. Although it is stated that in Kerala some procedure like boiling the canes in a mixture of coconut milk and turmeric was practiced in earlier days, at present preliminary processing involves only drying under sun. Furthermore, because canes are also imported from North Eastern part of

the country, the raw material gets deteriorated with staining fungi during the long distance transport.

There is also an immediate need for improving conversion technology as it involves important aspects such as product quality, safety and working conditions of the workers. At present, peeling and splitting of canes are performed using ordinary knives, attached to wooden frames, where even peeling is a difficult task Cane bending is done using blow-stoves which cause burn marks and reduce the aesthetic value of the finished products.

## Current research programme

Considering the immediate research needs for improved management and utilisation of cane resources in Kerala, KFRI has initiated a multidisciplinary project with the following objectives.

- To complete botanical survey of South Indian rattans and establish a live collection of different indigenous and exotic species.
- To evolve inventory methods of rattan resources in Kerala.
- To develop suitable regeneration techniques.
- To determine morphological, anatomical, physical, chemical and mechanical properties of popular and lesser-known species.
- To undertake a technical and socio-economic analysis of harvesting and processing industry in Kerala.
- To improve harvesting and processing techniques.
- To evolve protective measures against pathogenic fungi to preserve the post-harvest rattans.

**K. M. BHAT**
Division of Wood Science

Nature is cruel, man is sick of blood;
Nature is stubborn, man would fain adore;
Nature is fickle, man hath no need of rest;
Nature forgives no debt, and fears no grave.

MATHEW ARNOLD

# Plantations of indigenous species - The need of the day

During the last two decades, the area of forest plantations in the tropics has almost trebled and a major share of it come under different exotic species aimed mainly at producing wood for industrial uses. India also is no exception to this, eventhough forests of the country is abound with very valuable indigenous species of plantation potential. In fact, one of the reasons why exotics were preferred for raising plantations in the past was that there existed adequate research and experimental background on them and hence they can be grown with certainty. Lack of such documented information on indigenous species is one of the major constraints why they were ignored in earlier plantation programmes. The environmental degradation and the consequent ecological hazards resulted from the monoculture of exotics had attracted much attention, and at present a stage had already been reached where both the planners and forest managers are facing much resistance from the public in any attempt to bring more areas under the exotics. It is in this context that the relevance of indigenous species for plantation forestry becomes important.

Primarily, indigenous species that grow naturally in a country form part of its ecological equilibrium. Further, their raising in a large scale is not obstructed by political or quarantine problems which is common with the introduction of exotics. Added to that there are some important biological advantages like :

a. Growth of natural stands may provide some indication on their possible performance in plantations.

b. Indigenous species are well adapted to the environment and they are already filling an ecological niche. This will render them less susceptible to damages from diseases and pests.

c. Indigenous species even in monoculture are generally considered ecologically more suited than exotics for the conservation of native flora and fauna.

d. The timber of indigenous species will be well known to local wood consumers and industries.

For such reasons, if the plantation potentials of indigenous species of an eco-climatic or phytogeographical zone can be worked out and demonstrated, they will certainly be considered for future plantation programmes in that region. To support this strategy, there are well known examples in different countries like *Pinus merkusii* in Indonesia, *Araucaria hunsteinii* in Papua New Guinea, *Tectona grandis* in India and Burma, *Terminalia ivorensis* in West Africa, *Cordia alliodora* in Central America and so on.

In order to promote the idea of raising plantations of indigenous species, the first and the foremost requirement is to build-up adequate research background on their silvicultural, utilisation and protection aspects and to survey their distribution and variation in natural populations. Once their potentiality for large scale propagation is established by way of raising experimental plantations, aspects like genetic improvement should be initiated to identify promising provenances and better seed sources. As it will take some time to identify such genetically more potential strains, it is essential to establish arboreta of those species in the initial stage itself so that the local variants in their natural populations can be preserved. Such arboreta will also provide material and data for the identification of disease and pest resistant trees at one location.

As a first step in this direction, a research project has been formulated by the working Group for Indigenous species of the Kerala Forest Research

Institute, to evaluate the plantation potential of six selected indigenous species of well known timber value in Kerala namely, *Albizia odoratissima* (L. f.) Benth., *Grewia tiliifolia* Vahl, *Haldina cordifolia* (Roxb.) Ridsl., *Lagerstroemia microcarpa* Wt., *Pterocarpus marsupium* Roxb. and *Xylia xylocarpa* (Roxb.) Taub. In this multidisciplinary project it is envisaged to study the natural variation and distribution of each of the species in the State and to work out their silvicultural and ecological aspects and also to study their pest and disease problems both in natural conditions as well as in monocultures and mixed plantations. Specific recommendations will also be made to effectively manage both nurseries and plantations free of diseases and pests. Suitable rhizobia will be identified to enhance the growth of seedlings of those leguminous species selected for the study. It is also a major component of the project to scientifically assess the wood quality variations within each species in relation to site factors. As a part of this programme a germplasm bank and a trial plantation of the said species will also be established.

**K. K. N. Nair**
Division of Botany

A meal should have meat, but a house must have a bamboo, without meat we become thin; without bamboo we loose serenity and culture in itself.

Su Dong Po—(10th century Chinese Poet).

# Human Ecology in Attappady - Research Needs

Attappady, lying between 10° 55' and 11° 14' N latitude and 77° 22' and 76° 48' E longitude is situated in Western Ghats of Kerala State. This region has a rugged terrain with elevation ranging from 250 m to 1700 m. Primarily two rivers, the Bhavani in the northern half and the Siruvani in the southern half, together with their tributaries control the drainage. A wide range of rainfall regimes is observed in Attappady from extremely wet (3000 mm) in the west to dry (700 mm) in the east and north-east, with intermediate regions in between in the western half.

Tribal people constituted the majority of the population in Attappady till 1960. Because of high influx of settlers both from Central Travancore and Tamil Nadu during the period from 1965 to 1983, tribal population has now been reduced into a minority. Three ethnic groups viz. Kurumbas, Irulas and Mudugas can be identified among the 30,000 tribals. Irulas form the largest tribal community followed by Mudugas and Kurumbas. The ethnic groups, who are spread out over 140 hamlets, inhabit more or less three distinct geographic and ecological units - Kurumbas in high rainfall forests, Mudugas in medium rainfall areas and Irulas in areas with less rainfall. The Kurumbas are shifting cultivators while the other two groups practice sedentary agriculture, although their methods of cultivation are similar to shifting cultivation.

Forest vegetation which cover about 80 per cent of the total geographical area, is the most important natural resource in Attappady. Net area under cultivation is 12,900 hectares, accounting for 17 per cent of the geographical area. Because of low rainfall in farming tracts, cropping pattern is dominated by rain fed crops such as millets and pulses. However, in the western parts where rain fall is high, wet land crops such as rice, sugar cane and plantation crops are grown.

Agriculture is the main source of livelihood of the tribal communities in Attappady. Traditionally they had enjoyed the right to cultivate as much areas as they could manage, paying a nominal rent to the landlord. With the increased influx of settlers, the tribal land has been encroached and taken possession of by the settlers. The dispossessed tribals are forced to migrate either to reserve forests or to the arid regions in the eastern parts of Attappady. This has undermined their economic base and has resulted in acute poverty in the hamlets of tribals. In some areas where alternative job opportunities are limited, many tribals have been reduced to the level of beggars.

With the increased influx of settlers, deforestation has accelerated, causing high soil erosion in Attappady. The Malayalee and Tamil settlers introduced ecologically unsuitable cropping system to which they were accustomed in their original niches. Areas of human settlements have become extremely degraded, resulting in nonsustainability of agriculture, acute water shortage, unemployment and non-availability of raw materials for basic needs. Thus in Attappady, socio-economic problems are intermingled with ecological problems and to a great extent, they are complementary too.

In a degraded area like Attappady, any attempt for ecodevelopment has to encompass critical issues like forest utilisation, water shed management, soil fertility, improvement and revival of traditional (tribal) production and utilisation systems. As the human (tribal) system has close interaction with land system in Attappady, an understanding of various components of these two systems and their reciprocal influences, is essential for formulating suitable policies for sustainable resource management and eco-restoration. Thus, a research project-Human ecology and Socio-economic interactions in tribal communities of Attappady - has been taken up by KFRI to evaluate different types of human interactions with forests and to identify the important causes of degradation and to prepare a data base for developing improved land use pattern in the area.

**P. K. Muraleedharan**
Division of Management

**S. Sanker**
Division of Soil Science

# Wood - Some Common Queries - VI

## 1. What is the difference between juvenile wood and mature wood?

The wood produced in young trees, the wood formed during the early years of older trees which includes the tree top and entire tree core, and the wood of most branches - generally referred to as juvenile wood - differ from the wood formed in the outer trunk of the same tree when the tree is more mature - generally referred to as mature wood or outerwood. The differences include cell size, wall thickness and microfibril orientation, varying proportions of cell types, ring width, etc.

Generally, juvenile wood is of low density, has wider growth rings and shrinks more. Many hardwoods show a rapidly increasing density in the radial direction, levelling out or gradually increasing in mature wood. Though both softwoods (conifers) and hardwoods are affected by juvenility, it is well marked in softwoods.

## 2. What is the significance of density?

It may be possible to learn more about the nature of wood by determining its density than any other property. Density of wood varies with cell size, cell wall thickness, and the volume proportion of cells of a given type. It affects shrinkage, machinability, surface texture, penetrability of fluids and gases. Also it governs the degradation of wood by chemicals, fire, and microorganisms. The strength of wood is highly correlated with density for most of the species.

## 3. What is the significance of different strength properties like tensile strength, bending strength, compression strength, etc. ?

*Tensile strength parallel to the grain*

Clear, straight-grained timber is at its strongest in this mode of testing. Tensile strength assumes greater significance in knotty timbers since these defects have a marked influence in lowering the strength of wood.

*Compression strength parallel to the grain*

High strengths in longitudinal compression is required of timber used as columns, props and chair legs. Depending on the length and cross-sectional areas of these items, they may buckle at high stresses. The strength of a piece of wood in compression is closely related to its density.

*Compression strength perpendicular to the grain*

Resistance to crushing is an important property in a few selected end uses such as railway sleepers, wedges and bearing blocks. Timbers with high density, generally, have high compression strength across the grain.

*Bending strength*

Timber is probably stressed in bending more than in any other mode. The common examples where timber is used as a beam are floor and ceiling joints, roof truss members, table tops and chair bottoms.

*Shear strength parallel to the grain*

This is a most important property in the structural use of timber especially so in the region of joints. The area surrounding the mortise or bolt hole can be subjected to very high longitudinal shear stresses. There is a fairly good correlation between shear strength and wood density.

*Impact Bending*

Resistance to impact is an essential requirement of timber for hammer handles, shafts and many sports goods. Timber must be tough to resist suddenly applied loads.

## 4. What is meant by heat value of wood?

Like any organic material, wood is also combustible. Under suitable conditions it will burn, and its constituents undergo oxidation with the liberation of energy in the form of heat. The fuel value of a timber depends largely on the density and on the chemical

composition of the wood substance and on the moisture content of wood. If resin is present, the fuel value will increase. The fuel value of resin is about twice that of wood substance, and other things being equal, resinous wood have a higher fuel value than non-resinous woods. The influence of moisture content will readily be understood: wet wood has a much lower heating value than dry wood of the same species, because much heat is lost in transforming the moisture into steam. Dense woods burn more slowly, and with less flame, than light woods. The low density woods tend to flare up and burn away quickly. Decayed wood has a lower heating value than the same volume of sound wood of the same species.

## 5. Is the electrical property of timber treated with preservative chemicals different from that of untreated timber?

Electrical conductivity varies with moisture content of wood. Drywood is a very poor conductor of electricity but its conductivity will increase rapidly on becoming wetter. When treated timber is used for railway sleepers or to carry electrical cables for power transmission or telephone communications, possible effects of the preservative on the conductivity have to be considered.

Creosote and organic solvent preservatives have no effect, whereas water-borne preservatives do change the conductivity slightly: nevertheless, it is generally agreed that for practical purposes any differences are small and can be ignored.

## 6. Can treated wood be painted?

Wood treated with water-borne preservatives, after drying it below 20% moisture content, can be painted. Creosoted timber, however, must be left for some time for the surface to dry, then it can be coated with an aluminium sealer; other paints are usually discoloured. If all the solvent has evaporated, wood treated with organic solvent preservatives can be painted within a day or so. Wood treated with heavy oil based preservatives is usually unpaintable.

## 7. What are some of the fire-retardant chemicals? How do they give protection against fire?

Fire retardant chemicals include phosphates, nitrogen compounds, borates, silicates, and more recently, amino-resins. Several theories have been proposed for the mechanism of fire retardants.

a) Barrier theories : Fire-retardant chemicals prevent the escape of volatile products by forming a glassy barrier. This barrier also prevents oxygen from reaching the substrate and insulates the wood surface from high temperatures. Common barriers include sodium silicates and coatings that intumesce. Intumescent systems swell and char on exposure to fire to form a carbonaceous foam.

b) Thermal theories : Fire retardants may cause chemical and physical changes so that heat is absorbed by the chemical to prevent the wood surface from igniting. This thermal absorption theory is based on chemicals that contain much water of crystallization.

c) Dilution by non-combustible gases theories: Nonflammable gases released by the decomposition of the fire-retardant chemicals dilute the combustion gases and form a nonflammable gaseous mixture. Agents such as dicyanidanoxide and urea release non-combustible gases at temperatures below the temperature at which active pyrolysis begins.

d) Increased char/reduced volatiles theories : Fire-retardant chemicals lower the temperature at which combustion occurs, directing the degradation pathway towards more char production and fewer volatiles.

In most cases, a given fire retardant operates by several of these mechanisms. Also, the effect of two compounds together is greater than the summed effect of each individual compound put together.

**R. Gnanaharan**
Division of Wood Science

# Computerisation at KFRI Library

Information is becoming the most sought after and valuable of all resources. The advent of micro-computers is revolutionising the organization of knowledge and in-house operations in libraries. Therefore, information scientists are now more optimistic than ever before in harnessing the immense flow of information. The barriers to communication such as distance, the prodigiousness of information, language etc. have been successfully overcome by combining advances in the field of computer, communication and printing technologies.

India, being one of the forerunners of theoretical contributors in the field of Library and Information Science, is trying to cope with this changing scenario. National Information System for Science and Technology (NISSAT) is a national network of information envisaged by the Department of Science and Technology of the Government of India. NISSAT is making an all out effort for improving the quality of service of science libraries in the country. One of its efforts is to popularise the computer software called CDS/ISIS (Computerised Documentation Service/Integrated Set for Information Systems), the best available bibliographic data base management package developed by UNESCO. The new version of CDS/ISIS is still more versatile and easier to manipulate, that it is expected to meet most of our requirements.

## FIRE An Integrated Data Base

The data base envisaged for the KFRI library is called FIRE (Forestry Information Retrieval). FIRE will be a major data base comprising all essential data related to documents, persons, projects, institutions and events. Being an integrated data base FIRE will structure all these aspects into a single module and channelise the inter flow of information in the most efficient manner. Coding of data in FIRE is based on Common Communication Format (CCF) developed by UNESCO which will facilitate international exchange of information. Still more ambitious projects, of the type described below, will be formulated so that FIRE becomes an indispensable data base in the field of forestry.

## Indian Forestry Database

In India, forestry literature is in abundance. But locating a required piece of information is very difficult for want of proper organisation of available information. A concerted effort towards organising Indian Forestry literature has never been taken up by any agency. As KFRI has the necessary infrastructure and institutional impetus, it is appropriate to take up this task and develop as a sub-module of FIRE. The programme envisages document delivery service in addition to providing bibliographic access by collecting all publications. With the present collection of books, journals and other documents, work can be initiated. FIRE will be sought and exchanged by other agencies, eventually enhancing our information retrieval capability by gaining access to other data bases.

## Factual Database

Information retrieval is replacing the traditional practice of document retrieval by providing actual primary data to the researchers. Speedy decision making and a more fruitful utilisation of information are possible only if a factual data base is existing. Project taken up by subject specialists and information handlers jointly aimed at amassing facts and figures of forestry practices and text of key classics in the field ought to be formulated initially. This ever updated data bank will become a powerful ready reference tool, minimising time and effort of researchers considerably.

KFRI library is now equipped with the Computer facility and hope to work towards the above objectives.

**— KFRI Library**

# Agroforestry Systems in China - An Overview

Since the formation of the Peoples Republic of China, concerted efforts have been made to bring more area under forest cover and to increase the timber availability. A number of afforestation programmes have been initiated with the idea of rural development. The author visited over 10 counties in different parts of China, as a participant in the International Farm Forestry Training Programme sponsored by IDRC, Canada and the article is based on the field observations made during the visit.

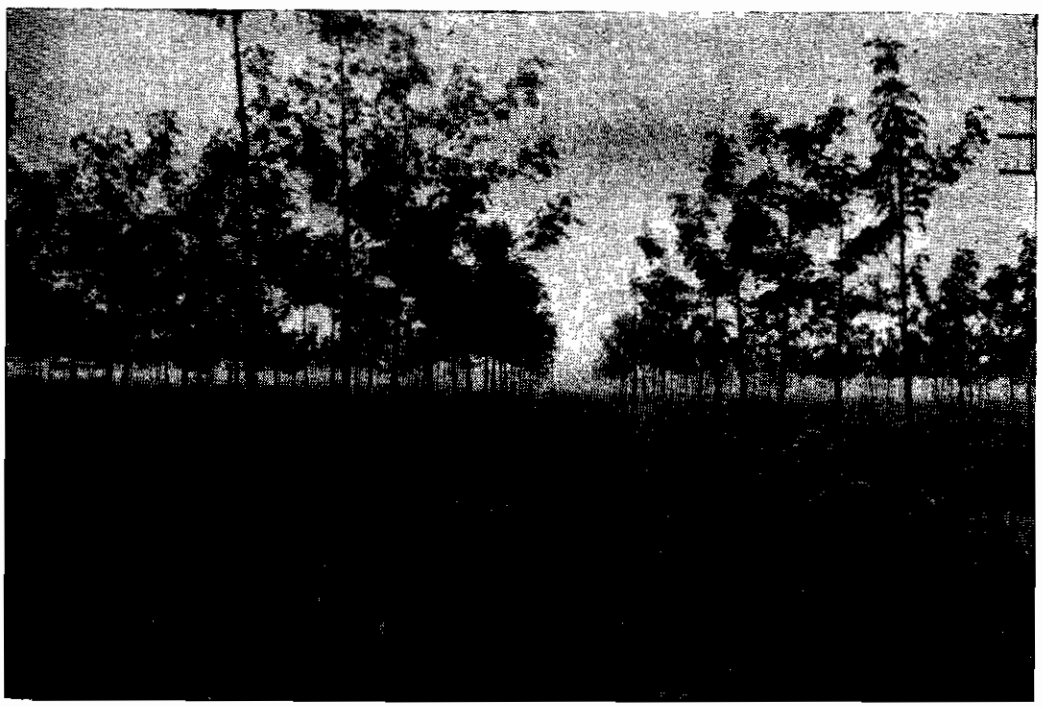


Fig. 1 Paulownia and wheat intercropping shelterbelt in Luyi county.

As a result of the intensive afforestation programmes, the present forest coverage in China has gone up from 8.6% to 14 %. In a span of 14 years, efforts have been made to plant 5.9 million ha for various purposes leading to the establishment of farmland shelterbelts (12.8%), sand dune fixing forest (23.2%) soil and water conservation forest (55.3%) and the remaining made up of other types of forest in arid and semi-arid region in northern parts of China (8.7%). About 7.2 billion trees have been planted in the plains including those planted in homesteads and villages. While formulating the forest policies much attention has been paid to the peasant's initiative and involvement in developing forestry resources individually. About 175,000 co-operative forest farms are set-up throughout the country, with a total managed area of 16.67 million ha. About 4065 state owned forest farms with an area of 46 million ha are also set up.

The importance of involving people in successfully implementing the governmental policies has been well recognised in China. Chinese farmers together with scientists are working to identify appropriate species combination, management techniques, agronomic practices and protective measures to increase the yield from the land. Several systems of intercropping agricultural crops with trees are practised in the plains over extensive areas. Seven such

agroforestry systems which were found promising are mentioned below.

1. Intercropping agricultural crops with Paulownia.

Paulownia is a fast growing tree indigenous to China and belong to the family Scrophulariaceae. It possesses some traits which are advantageous for inter-cropping. It has a deep root system with which vertical leachate of fertilizers and water applied to the agricultural crop is available to Paulownia and during dry season it absorbs underground water from the deeper layers. Paulownia leaves and crown do not interfere with the light requirements of the agricultural crops.

2. Intercropping agricultural crops with Chinese date *(Zizyphus jujuba)*.

Mixed planting of the date with wheat tend to increase the yield of both, thus the economic benefit increases over 100 per cent. This system is practised in about 7000 ha.

3. Artificial agroforestry multiple ecosystem in flat lands.

This system is being practised on the banks of the Yangtze river and the Huai river, extending over 1165 Sq. km., most of which will be flooded during monsoon. At present flood resistant species like *Taxidium ascendus* and *T. distichum* are being planted in these areas. It has also been demonstrated that practices such as forestry with agriculture and fisheries and forestry with animal husbandry are appropriate methods for effective utilization of land resources in this region.

4. Multiple layer artificial population in Yunnan tropical area.

The centre for tropical forest research has developed stereo-population models based on the studies on ecological and economic profiles of various trees and agriculture crops. It has been demonstrated that in a mixed cropping of tea with medicinal plants, the yield of tea increased. So also intercropping of rubber with tea, and rubber with tea and camphor was found to be suitable combinations and in such cases, rubber yield was higher than that from pure rubber stands.

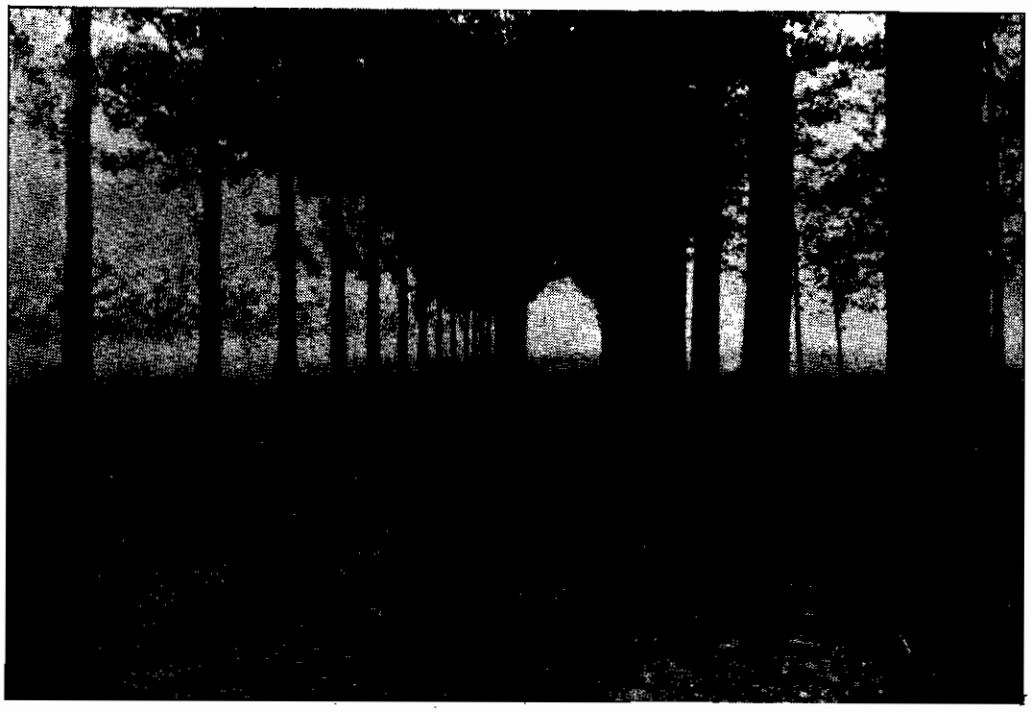


Fig. 2 Shelterbelt area in Yanzhou county

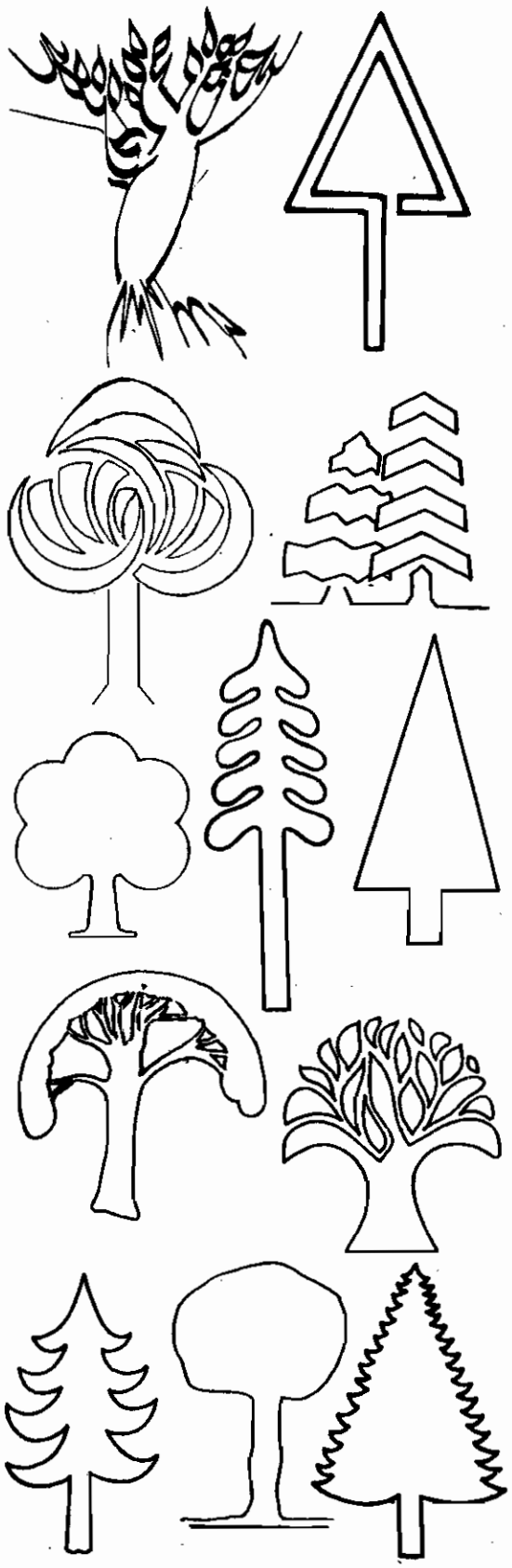
5. Forest-grass system in west-northern hoessial plateau and desert areas.

This is an arid zone and serious damage has been done to the vegetative cover. To prevent this and to tide over the short supply of fire wood and timber, a combination of high forests, shrubs and grasses is adopted which helps to conserve the soil and maintain the soil fertility. The tree species tried

# Unity in Diversity

The goal is the same although the methods are different. And without such variety - differences in approach, methods and details and sometimes the resultant quarrels and fights-it would be a very dull world indeed ! like this column with just one tree symbol.

— Assembled from various sources by Dr. K. S. S. Nair and redrawn by Mr. Subash Kuriakose.



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in this area include *Elacognus augustifolia*, *Lycium turcomanicum*, *Populus* sp., *Tamarix chinensis* and grass species like *Astragalus* and *Medicago* sp.

6. Intercropping model in subtropical region

Chinese fir, (*Cunninghamia lanceolata*) is one of the main timber species used for afforestation in this area. During the first three years certain agricultural crops such as corn, potato, banana or peanuts are intercropped with this tree species. When the canopy of the tree closes, the agri/horticultural crops are replaced by traditional medicinal plants.

7. Garden type agroforestry

Depending on the ecological and socio-economic conditions, various agroforestry models are being practised in various counties. The Sun Yat Sen memorial in Nanjung could be taken as an example, with a large number of trees around it. Planting of timber, fruit and ornamental trees in homesteads and villages also come under this.

During the various field trips, it was observed that by adopting suitable agroforestry systems, the Chinese could utilise the land in a better way and also maintain a stable ecosystem. Tha active involvement and co-operation of farmers in such programmes was quite noteworthy.

**M. S. Muktesh Kumar**
Division of Plant Taxonomy

# A Note on the Kuruva Reserved Forest

The Kuruva RF (11° 48' to 11° 50' N, 76° 5' to 76° 6' E) of Wynad is situated in the Padiri North Section of Chedaleth Range of Calicut Forest Division (Fig. 1). A large and several small islets covering an area of about 146 ha, formed due to the bifurcation of the river Kabani near Mattankara and Vikkalam and rejoining at Pannikkal, was constituted as a Reserved Forest in 1938 and assigned to the protection working circle with the provision for removal of dead and fallen trees of saleable sizes and allowing licensed cattle to graze and collection of minor forest produce. The islets are easily approachable from

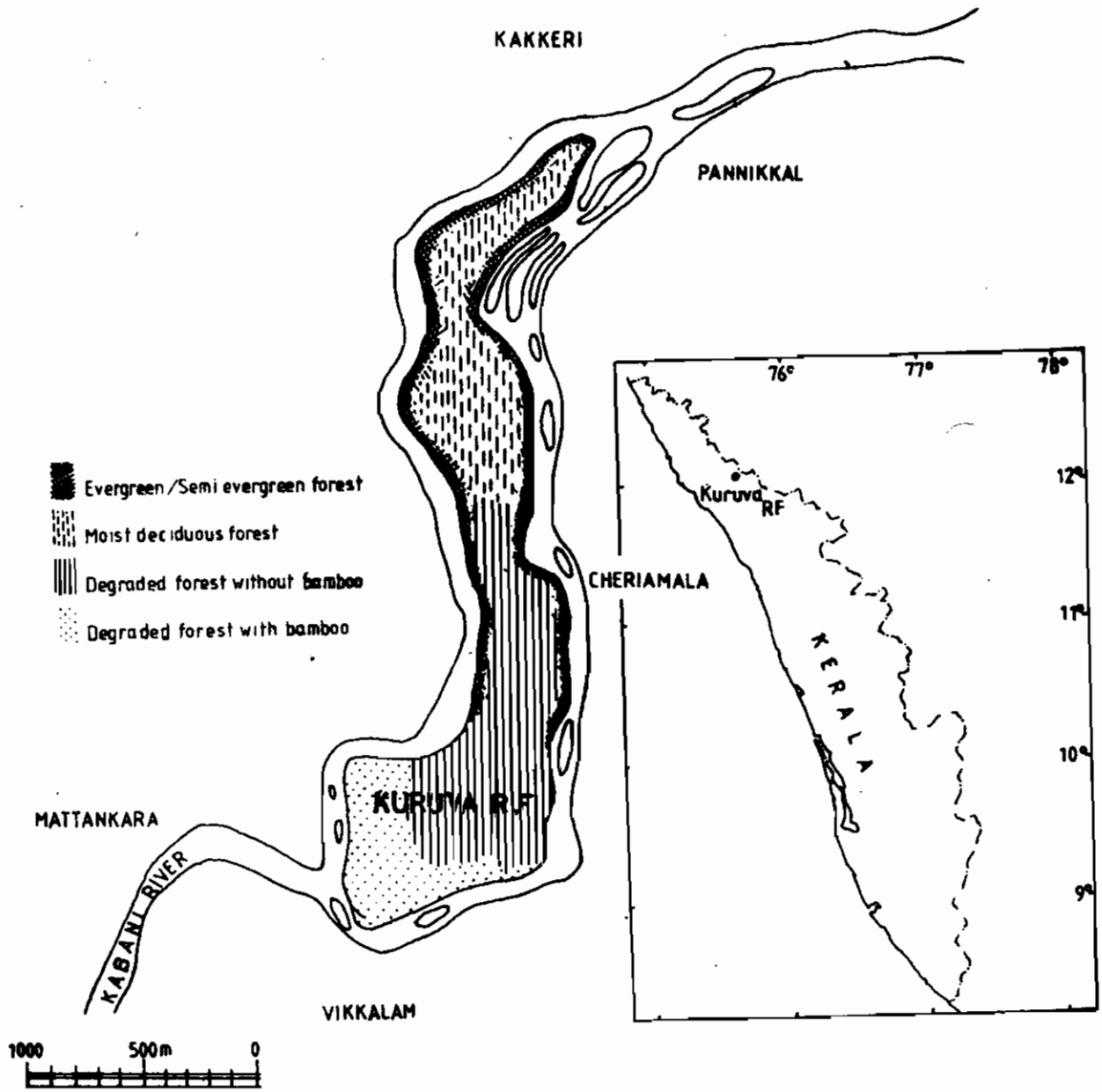


Fig. 1 Map of Kuruva Reserved Forest

Pulpally and Manantoddy during dry season. A raft (locally called pandi) is required to cross the river during rainy season. From Manantoddy, the north-west portion of the islet is 16 km by road (via Palvelicham).

The main islet lies north-south, through the river Kabani, flowing north-west into Karnataka. The boundary of the RF is about 9 km in extent;the maximum length and breadth of the islet are 3 km and 0.9 km respectively. Situated at 700 m above mean sea level, the islets receives a mean annual rainfall of 2400 mm distributed over 135 rainy days. The temperature varies between 13 to 32° C. The main rock formations are hornblende - biotite-gneisses interbanded with garneticferrous amphibolites. The soil is sandy loam along river banks to loamy sand in areas with poor drainage.

On the basis of the species composition the vegetation can be grouped into four types.

### Evergreen/semievergreen forest

This type is seen along the banks of the river to a width of 10-15 m and confined to the northern two third of the RF and occupies about 5% of the land (Fig. 2). The average height of the trees is about 20 m. Marked canopy differentiation is absent. The lower storey trees are very few. The trees abode a luxurient growth of orchids, ferns and other epiphytes. The dominant trees are *Mangifera indica, Hopea ponga, Diospyros malabarica, Lophopetalum wightianum. Vateria indica, Artocarpus hirsutus, Hydnocarpus pentandra, Vitex leucoxylon, Syzygium zeylanicum, Madhuca neriifolia, Vepris bilocularis, Aporusa lindleyana, Syzygium gardeneri, Cinnamomum malabathrum, Garcinia morella, Holigarna arnottiana, Ficus tsahela, Crateva magna* etc.

The undergrowth is very few and mostly composed of the seedlings of the trees.

### Moist deciduous forest

This type of forest forms nearly 40% of the land area, The vegetation is dominated by deciduous trees and bamboo (Fig. 3). The bamboos have a very luxurient growth and attain a height upto 30 m. Climbers and epiphytes are few. The ground flora consists of several species with underground tubers, many of which possess medicinal properties. The following are the principal trees found in this forest type. *Terminalia crenulata, Semecarpus anacardium, Pterocarpus marsupium, Butea monosperma, Tectona grandis, Dalbergia latifolia, D. lanceolaria, Dillenia pentagyna, Bombax ceiba, Lannea coromandelica* and *Bambusa arundinacea*. The understorey trees are *Cassia fistula, Careya arborea, Naringi crenulata, Ziziphus glabrata, Xeromphis uliginosa* etc. The common climers are *Butea parviflora, Schefflera*

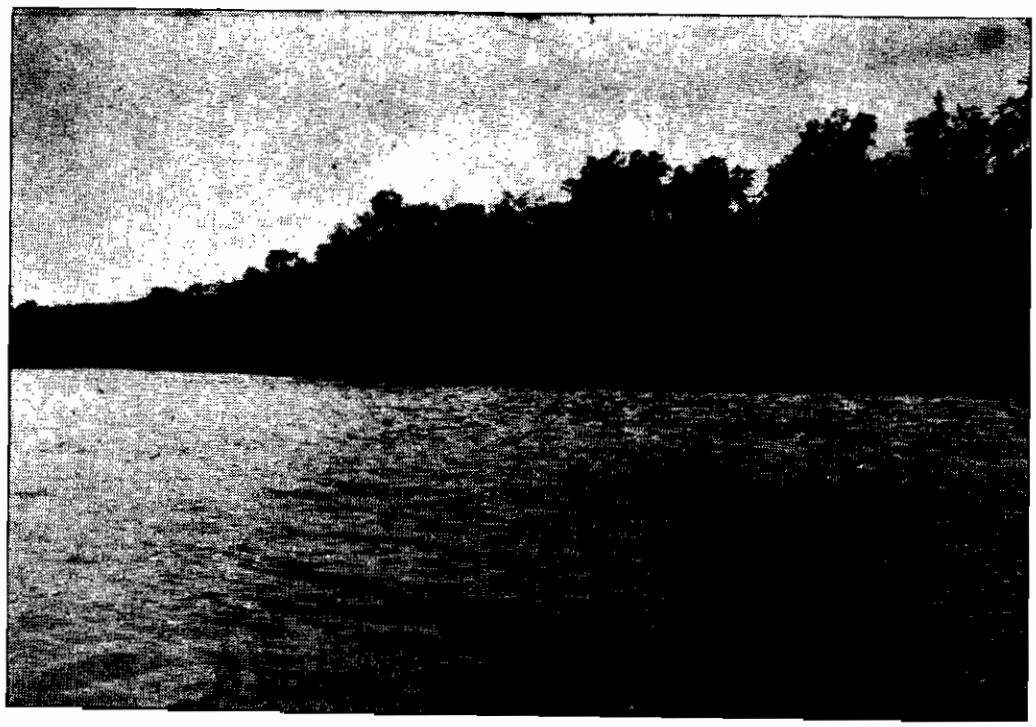

Fig. 2 Evergreen/Semievergreen forests along the banks of the river

Fig. 3 Small islets in the Kabani river

*venulosa, Ziziphus oenoplia, Z. rugosa, Smilax zeylanica* and *Asparagus gonocladus.*

**Degraded forests without Bamboo**

This type is found in places where there is water logging, and forms about 40% of the vegetation. The tree growth is not dense and the height of trees is below 10 m. *Careya arborea, Aporusa lindleyana* and *Syzygium caryophyllatum* are the principal species in this forest type. The shrubby undergrowth is very frequent. The dominant undergrowth are *Ixora*

Fig. 4 Large openings in the degraded Forest

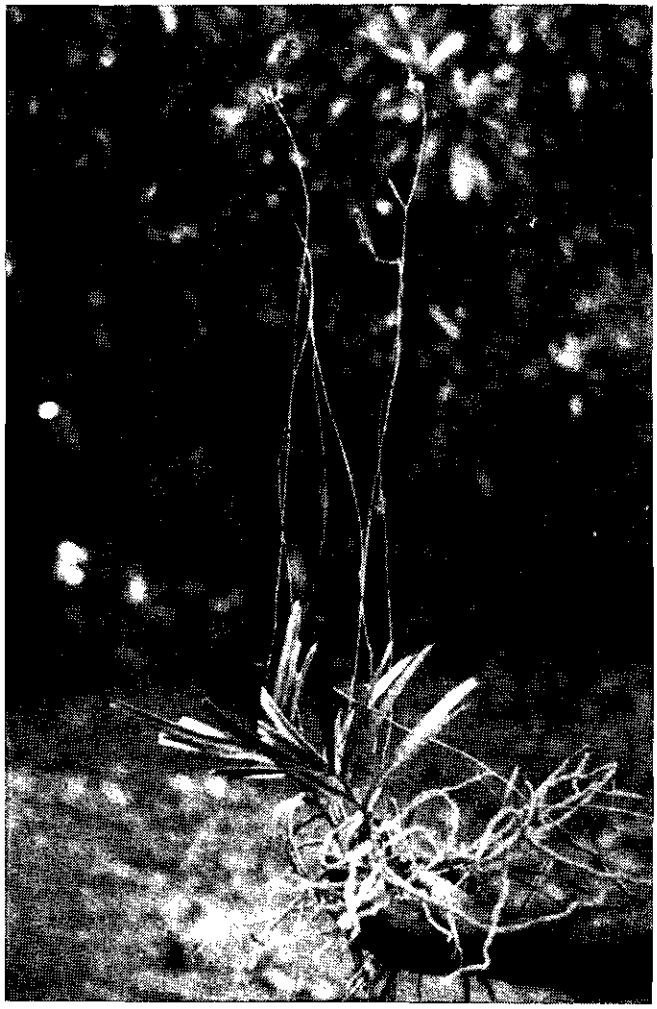

Fig. 5 *Cottonia Peduncularis*, a common epiphytic orchid in the Kuruva RF.

*coccinea, Symplocos laurina, Lantana camera* var. *aculeata, Eupatorium odoratum, Mussanda glabrata, Melastoma malabathricum,* etc.

The herbaceous undergrowth in this area includes several species that are very common in the plains. The occurrence of recently recorded exotic weed *Mecadornia procumbens* is very frequent. Several types of climbers and tuberous orchids are also seen in this area.

## Degraded forest with bamboo

This type of forest forms about 15% of the RF. The dominant trees are *Mitragyna parvifolia, Tectona grandis, Albizia lebbeck, Xeromphis uliginosa, Lannea coromandelica, Ziziphus glabrata, Acacia* sp., *Naringi crenulata, Olea dioica, Cassia fistula, Dillenia pentagyna, Bambusa arundinacea* etc. The undergrowth is mostly of *Ziziphus rugosa, Z. oenoplia, Pavetta indica* and *Ardisia solanacea.* Herbaceous species included several species of medicinal importance.

During our visits in June 1987, herbaceous species were not seen in areas subjected to frequent fire. Many species were just sprouting with the onset of the rains. So complete enumeration of the herbaceous flora could not be done.

Of the 55 species of trees enumerated in the Kuruva RF, 14 species are restricted to Western Ghats, 11 species are found in the South India and Sri Lanka,15 species are Indo-Malaysian and 3 species are found in Indo-Malaysia and Sri Lanka. Six species are restricted to the Indian Subcontinent and 6 species have a paleo tropical distribution.

Among the species enumerated in the RF, *Salacia beddomei* is endemic to the Wynad region and is considered as endangered species. The other noteworthy feature of the Reserve forest is the preponderance of orchids (Fig. 5). Twenty eight species of orchids are identified from this area, of which several species are reported to have medicinal properties.

Regeneration of trees is severely affected by fire and cattle grazing. In deciduous forests, seedlings of *Semecarpus anacardium* and *Terminalia crenulata* could be observed. However, there are no sapling and pole crops. In the degraded forests, *Careya arborea* has good regeneration. In the evergreen forests seedlings, saplings and pole crops could be observed for *Hopea parviflora, H. ponga* and *Holigarna arnottiana.* Though numerous seedlings of *Calophyllum apetalum* and *Diospyros malabarica* could be in some areas, saplings and pole crops are totally lacking.

## Fauna

Evidences confirm the presence of wild pigs in the area. Varanus though not abundant are sighted occasionally. Varieties of frogs also inhabit the area. Elephants from the nearby forests occasionally visit the RF. Surprisingly, the avifauna population, inspite of the availability of fruits of several species like *Aporusa, Diospyros* etc. in abundance, is much less.

## Damage to the forest

Fire caused chiefly by the incendiarists and the cattle graziers during the summer months combined with the illicit cutting of trees by the nearby population are the two main reasons for the degradation of the forest. The existing provision for collection of

# Research Needs of Wood Industries

A meeting of the representatives from wood industries and related institutions in Kerala was held at KFRI on August 26, 1987. This meeting was organised by the Utilisation Working Group and was attended by 23 participants, representing wood based industries and scientists.

In his introductory remarks Dr. C. T. S. Nair, Director, requested the industrialists to air their views and list their technological and scientific problems. He suggested that sufficient input from the representatives of the industries would be helpful to formulate research priorities of KFRI and this would help in taking up problems that are directly relevant to the needs of the industries.

Dr. R. Gnanaharan gave a brief talk on the work carried out by the Wood Science Division of KFRI.

M/s A C. Chummar, C. B. Nayar, A. G. Shah and Dr R. N. Kumar presented papers on various technical and scientific problems faced by the wood industry and the research needs to solve those problems. The paper presentation was followed by a lively discussion.

Most of the speakers stressed the need for modernisation in saw milling and wood working technology in order to reduce wastage and to increase conversion efficiency. Lack of expertise and information on modern techniques on logging, sawing and seasoning was pointed out and KFRI was requested to acquire literature or video films on modern techniques, conduct training courses in wood technology etc.

The participants stressed the need for maximum utilisation of available wood through research on preventing biodeterioration and proper logging/conversion to tide over the present crisis in timber supply. Identification of cheaper and non-conventional timbers for furniture making after suitable pretreatment, utilisation of sawdust and shavings for making useful by-products, etc. were some of the solutions suggested. Improved designs and prescribing definite standards for furniture were also considered important. Yet another suggestion to reduce wastage was by regulating the log length which at present is highly variable.

Biodegradation of wood was another problem faced by the wood industry. Reduction in time lag between felling and processing, use of cheaper and easier preservative treatment methods like handcoating, spraying, etc. were some of the suggestions made. The work done by KFRI on preservative treatment of rubber wood was well appreciated.

Inadequate supply of raw material to wood industries was also discussed. Raising useful timber species in large scale plantation in wastelands/grasslands was suggested. Popularising the use of cheap timbers like rubber wood by creating a public opinion through extension activities by KFRI was felt most essential.

In the plenary session, Director, KFRI suggested a few priority areas which can be considered for implementation by KFRI.

As the necessity of utilizing cheap and less known timber species was emphasised by several participants, research to improve their quality and durability through simple preservative treatments is identified as one of the priority areas.

Biodeterioration is a major cause for timber loss not only in less known timber species but also in hardwoods. This topic was much debated and recognised as another area of research to be considered.

Some of the participants were keen to find a solution to the existing confusion in fixing standard sizes to furniture, and other items like door frame, window frame etc. It was agreed upon to include this under the research priorities of KFRI.

The need of a much more efficient extension service from KFRI was felt in general. This is required to put under use some of the practical oriented findings, particularly those from KFRI.

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bamboo culms from the forests on permits issued by the forest department adds to the damage.

### Activities of the forest department

The social forestry wing of the forest department of Kerala had drawn up a plan for the cultivation of a few medicinal plants over 15 hectares in the area. Though the preliminary works such as clearance of undergrowth and commencement of construction of a water tank were done in early 1987, the programme was subsequently given up because of the objection raised by environmentalists.

### Conclusion and Recommendation

The Kuruva RF is an important patch of forest because it is considered as the only major group of fresh water islets of its type in the whole of Kerala and supports different vegetational types. At present the RF is subjected to serious anthropogenic disturbances. Hence there is urgent need for protecting the area. The bamboo (*Bambusa arundinacea*) crop in the RF is expected to flower within a span of 10-15 years. It calls for drawing up a management plan to protect the vegetation from serious fire hazard and promote regeneration of bamboo. It will be worthwhile constituting the entire area as a permanent preservation plot or bio-reserve and monitor the biological and ecological changes over years.

**N. Sasidharan**
Division of Plant Taxonomy

**K. C. Chacko**
Division of Silviculture

# C. R. Ranganathan

**(1899 – 1987)**

In the passing away of Shri. C. R. Ranganathan, a former President of the Forest Research Institute and Colleges, Dehra Dun, and Inspector General of Forests, Government of India, at Bangalore on 9 July 1987, India has lost one of its most distinguished foresters of the century. He was an outstanding leader of the profession not only in India, or the developing countries, but of the entire family of professional foresters of the world.

After forestry training at Oxford, he joined the composite Madras State as an Assistant Conservator of Forests in 1923, and was promoted as Deputy Conservator of Forests in 1927. His contribution to the management of forests of Madras state has been substantial. The working plans written by him, for the forest divisions of Nilgiris, Coimbatore, North Kollegal and Salem North with original theoretical interpretation of the status of grass lands of Nilgiris, silviculture of sandal etc. are still classical works, the level of which has not been attained by anyone later.

He was the Director of the Northern Forest Rangers College at Dehra Dun for a few years before independence, and when the Madras Forest College at Coimbatore reopened after a long gap, he was the Principal, who organised it as a premier institution for forestry training in South India. Continuing in the field of forestry education and research, in 1947 he was appointed as the first Indian President of the Forest Research Institute and Colleges, Dehra Dun. After a very distinguished tenure during a crucial period, he was elevated as Inspector General of Forests, Government of India in 1954. He guided the course of Indian Forestry in various capacities, very ably, for more than three decades. He brought credit to Indian Forestry and Foresters in international forums by his brilliant exposition at various meetings such as the Commonwealth Forestry Conferences and World Forestry Congresses. Being a highly dignified erudite person, with charming manners and a keen sense of humour, his qualities appealed to every one and won him their respect. In his passing away Indian Forestry has lost a great educationist, forestry scientist and an able administrator and above all, a fine leader, a very rare combination indeed!

**K. K. Nair**
Chief Conservator of Forests (Retd.)

# Recent Publications

Alexander, T. G. 1987. Taungya and soil management during the establishment phase of forest plantations in Kerala, India. In: Vergara, N. T. & Briones, N. D. (eds.) *Agroforestry in the Humid tropics: its protective and ameliorative roles to enhance productivity and sustainability*. EADI, East-West Center, Honolulu & Searca, Los Banos, Phillippines, pp. 125-131.

ABSTRACT

Taungya has been widely used as a low-cost means for establishing forest plantations in Kerala, India. The site shock, including accelerated erosion, generated during the establishment phase by land clearing and preplanting operations can be counteracted through protective and ameliorative measures provided by ground cover. Taungya provides an early soil cover with trees and annual crops badly needed under the highly erosive rains, thus minimising nutrient loss. However, its effectiveness depends on the nature of crops and cultural practices. Among the common taungya annual crops of rice, tapioca, ginger, turmeric, and sesame, site disturbance is least for rice. A case study involving rice, tapioca, rice-rice, and rice-tapioca sequences reveals that changes in soil properties are minimum under the first crop of rice.

Balasundaran, M. and Gnanaharan, R. 1986. Decay resistance of two wood species belonging to Dipterocarpaceae. Mat. und Org 21 : 311-317.

ABSTRACT

Wood of *Hopea parviflora* Bedd. and *Vateria indica* Linn. of the family Dipterocarpaceae was tested for natural resistance against five decay fungi (three white rotters and two brown rotters), adopting accelerated laboratory tests. Wood of *H. parviflora* is classified as highly resistant as the average weight loss of wood exposed to any fungus was less than 10 per cent. The average weight loss of wood of *V. indica* ranged from 13.5 to 18.0 per cent. Wood of *V. indica* is classified as 'resistant' (weight loss range - 11 to 24 per cent). The weight loss caused by decay fungi decreased with increasing density in the case of *H. parviflora* ($r^2 = 0.60$), whereas this relationship was poor in the case of *V. indica* ($r^2 = 0.26$).

Bhat, K. M., Bhat, K.V. and Dhamodaran, T. K. 1986. Thickness and percentage of bark in some timbers grown in Kerala. J. Ind. Acad. Wood Sci., 17: 23-29.

ABSTRACT

The average, minimum and maximum values for the thickness and percentage of bark are reported for nine selected commercial timbers. The lowest values for double bark thickness and bark percentage (by volume weight) were found in *Lagerstoemia microcarpa*. Thickest bark existed in *Grewia tiliifolia*, *Xylia xylocarpa* and *Terminalia paniculata* (average double bark thickness 15 mm). Highest bark percentage was noted in *Erythrina stricta* (coral tree - by weight) and *Grewia tiliifolia* (by volume). Except in *Xylia xylocarpa*, bark thickness decreased and bark percentage increased with the decrease in billet diameter (under bark). Bark percentage varied more with billet diameter than with bark thickness. In *Xylia xylocarpa*, bark thickness was more important than log diameter in the determination of bark percentage by volume.

Bhat, K. M., Bhat, K. V. and Dhamodaran, T. K. 1987. A note on specific gravity difference between dominant and suppressed trees in teak (*Tectona grandis*). Indian J. For. 10: 61-62.

ABSTRACT

The specific gravity of the two dominant 54-year -old trees was compared with that of two suppressed trees of the same age grown in the same plantation. The mean specific gravity was 14.4% greater in dominant trees than in suppressed trees and was significant. As measured by the coefficients of variation, the total variation encountered was 8.8% in the former than in the latter. This specific gravity difference is of interest in timber utilization and tree improvement programmes.

Dhamodaran, T. K., George Mathew, Gnanaharan, R. and Nair, K. S. S. 1986. Relationship between starch content and susceptibility to insect borer in the bamboo reed, *Ochlandra travancorica* Entomon. 11: 215-218.

ABSTRACT

The relationship between starch content and susceptibility to the powder-post beetle, *Dinoderus minutus* in the bamboo reed. *Ochlandra travancorica* was studied in laboratory experiments by infesting reed samples of known starch content with 50 parent beetles and determining the number of progeny produced. The correlation was poor, with only 20% of the variation in the number of progeny being explained by variation in the starch content.

Florence, E. J. M. and Sharma, J. K. 1987. *Corynespora casiicola* a new leaf pathogen for *Gmelina arborea* in India. J. Tropical For. 3: 181-182.

ABSTRACT

During the disease survey in forest nurseries in Kerala, a foliar disease caused by *Corynespora cassiicola* (Berk. & M. A. Curtis) Wei was recorded in 2-year-old plants of *Gmelina arborea* in KFRI campus. This is the first record of *C. cassiicola* on *G. arborea* from India.

Gnanaharan, R., Dhamodaran, T. K. and Thulasidas, P. K. 1986. Physical properties of stem wood of wilt-diseased and non-diseased coconut palms. Indian coconut Journal 16 (10) : 10-15.

ABSTRACT

Stem wood density and volumetric shrinkage of non-diseased senile palms and wilt-diseased palms of different age groups have been reported. Stem wood density of coconut palms increase with age. However, outer core specimens from basal and middle positions of the tree do not differ in density significantly. There was no significant difference in volumetric shrinkage among the groups and between the basal and middle positions of the tree. Fibre saturation point and green to oven-dry volumetric shrinkage of coconut palms have been arrived at from the volume tree shrinkage - moisture content relationship and the values are 23.3% and 9.6% respectively.

Mathew, G. 1986. Insects associated with forest plantations of *Gmelina arborea* Roxb. in Kerala, India. Indian J. For. 9 : 308-311.

ABSTRACT

In a study on the insect pests of *Gmelina arborea* Roxb. in Kerala, 34 specics of insects belonging to Lepidoptera (3 species), Coleoptera (25 species) and Hemiptera (6 species) were collected and identified. Of these the lepidopteran, *Epiplema fulvilinea* Wlk. (Epiplemidae), the hemipteran, *Tingis beesoni* Drake (Tingidae) and the Coleopterans, *Calopepla laeyana* Latr. (Chrysomelidae) and *Syleborus fornicatus* Eichh. (Scolytidae) were found to cause serious damage in plantations. This study also resulted in recording 29 additional insect pests of this tree in India.

Mohammed Ali, M. I., Balasundaran, M. and Ghosh, S. K. 1987. Association of Mycoplasma-like-organisms with little leaf disease of eucalypts in Kerala, India. Indian J. Forestry 10: 159-162.

ABSTRACT

Transmission of little leaf disease symptoms of *Eucalyptus tereticornis* and *E. grandis* was unsuccessful by graft, dodder and rooting of cuttings. Transmission electron microscopy of the diseased material revealed the presence of mycoplasma like organisms (MLOs) in phloem tissues in fairly low concentration. Tetracycline therapy gave temporary remission of disease symptoms. These findings indicate that the little leaf disease of eucalypts may be caused by MLOs.

Mohamed Ali, M. I., Balasundaran, M. and Ghosh, S. K. 1987. Symptom remission in spiked sandal trees by infusion of tetracycline antibiotics. Plant Pathology 36 : 119-124.

ABSTRACT

Spike disease of sandal has recently been recorded in Kerala. For chemotherapy of the diseased trees a gravity- flow infusion technique was used to compare tetracycline compounds. All the compounds including doxycycline and oxytetracycline, were effective when 500 mg per tree was infused in 500ml water, but disease remission lasted for 4 months only. Repeated infusions failed to give complete remission. Increasing the concentration of tetracycline to 4-8 g per tree gave remission for 7-8 months; at 12 g per tree, phytotoxicity was observed.

Mohamed Ali, M. I. and Maria Florence, E. J. 1987. A leaf blight of teak mistletoe, *Dendrophthoe falcata* in Kerala, India. Trans. Br. Mycol. Soc. 88: 275-277.

ABSTRACT

Leaf blight of *Dendrophthoe falcata* var. *pubescens*, a serious mistletoe on Teak *(Tectona grandis)*,

caused by the *Colletotrichum* state of *Glomerella cingulata* is reported. Disease was prevalent after the monsoon (Sept. - Dec.) when high r. h. (>85%) and moderate temperatures (average 25°C) occurred.

Mohanan, C. and Sharma, J. K. 1987. *Phomopsis eucalypti* and *Bartalinia terricola*, new pathogen records on eucalypts from India. Trans. Br. Mycol. Soc. 88 : 125-126.

ABSTRACT

*Phomopsis eucalypti* and *Bartalinia terricola* are reported to cause foliar diseases of *Eucalyptus grandis*, *E. tereticornis*, *E. exerta* and *E. urophylla* in Kerala, India.

Mohanan, C. and Sharma, J. K. 1987. *Phomopsis leucaenae* in Kerala, India. Curr. Sci. 56: 732-733

ABSTRACT

*Phomopsis leucaenae* sp. nov. is reported to cause a severe foliar infection of *L. leucocephala* in nurseries and plantations in Kerala. *Phomopsis* is a new record on *Leucaena*.

Nair, K. K. N. 1987. Additions to Gamble's Flora of the Presidency of Madras (1915-1935) from the States of Kerala, Tamil Nadu, Karnataka and Andhra Pradesh upto 1982. Indian J. Forestry 9 : 204-219.

ABSTRACT

This is the second part of the paper enumerating 342 taxa of flowering plants that form addition to Gamble's Flora. It includes taxa with their botanical names beginning with 'F' and ends in those with 'Z' completing the paper. The first part of the paper published in an earlier issue of the Journal enumerates 242 taxa covering species with their botanical names beginning from 'A' to 'E' and in total, additions to Gamble's Flora since its publications upto 1982 comes to 584 taxa.

Renuka, C. 1987. A new species of *Calamus* Linn. from India. Kew Bull. 42: 433-435.

ABSTRACT

*Calamus dransfieldii* Renuka sp. nov. is described from Kerala, India.

Renuka, C. and Bhat, K. M. 1987. On the occurrence of *Calamus metzianus* Schlecht in Kerala. Curr. Sci. 56: 313-314.

ABSTRACT

*Calamus metzianus* is so far recorded only from Karnataka. A recent collection of this species from the Nilambur forests shows its extended distribution from Karnataka to Kerala. A short description for an easy identification, phenology and habitat are given.

Sankaran, K. V. and Sharma, J. K. 1987, Three new hosts of *Corticium salmonicolor* in Kerala. Indian J. Forestry 10: 198-199.

ABSTRACT

3 new hosts of *Corticium salmonicolor* have been reported from Kerala.

Swarupanandan, K. 1987. Fruits, seeds and seedlings of two Indian Dipterocarps. Indian For. 111 : 218-221.

ABSTRACT

The paper describes and illustrates fruits, seeds and seedlings of two Indian Dipterocarps, viz. *Vateria indica* and *Vatica chinensis*.

Swarupanandan, K 1986. Late embryogenesis and morphology of mature embryos in three species of Dipterocarpaceae. Can. J. Bot. 64 : 2582-2587.

ABSTRACT

Stereoscopic dissection of seeds in different stages of development allows morphological study of late embryogenesis in large seeded spermatophytes. Using this method late embryogenesis is studied in three species of Dipterocarpaceae viz., *Hopea ponga*, *Vateria indica* and *Vatica chinensis*. Configuration of the mature embryo in the seed is largely a result of spatiotemporal growth adjustments in the three species. Thus, the kind of folding of the cotyledons and the position of the embryonic hypocotyl in the mature embryo are largely determined by the position of the embryo inside the ovule (seed) cavity early in development. Late embryogenic studies in other species of Dipterocarpaceae and other angiosperms are desirable. Such studies would help in understanding causal morphology and structural homology of embryos.

# Research Reports

Renuka, C., Bhat, K. M. and Nambiar, V. P. K. 1987. Morphological, anatomical and physical properties of *Calamus* species of Kerala forests. KFRI Research Report No 46. Final Report of the Project Bot. 05/1982-1987, 58 pp.


ABSTRACT

During the survey in Kerala forests, 10 species of *Calamus* were located, of which two are new species and another, a new record to Kerala. Correct botanical name, local names, ecology and phenology are given. Distribution of canes in the Kerala forests and the present status of their availability are discussed. Detailed taxonomical and anatomical descriptions are provided for each species.

Since the plants may not always be with flowers and fruits, a key based on vegetative characters is prepared for field identification. Necessary drawings and photographs are furnished to facilitate easy identification. A key based on physical and anatomical properties is also given.

Based on physical properties, canes of Kerala are classified into three groups and the uses of canes coming under each group are discussed.

In the context of the rapid decline of cane bearing forests, supply can be maintained only through raising plantations of canes. Conservation measures, both *ex situ* and *in situ*, to be taken for a sustained supply of canes, are suggested.


Sharma, J. K. and Sankaran, K V. 1987. Diseases of *Albizia falcataria* in Kerala and their possible control measures. KFRI Research Report No. 47. Final Report of the Project Pathol FO3/1982, March 1987, 50 pp.


ABSTRACT

A total of five diseases were recorded during the survey conducted in numerous nurseries and five representative plantations of *Albizia falcataria* in Kerala. In nurseries only two diseases viz. web blight caused by *Rhizoctonia solani* and seedling wilt caused by *Fusarium solani* were observed. Of these, web blight was recorded commonly and it caused considerable mortality of seedlings in patches, if appeared within a month of emergence; seedlings > 3-month-old resisted the infection as it caused only premature defoliation. Two aerial strains of *R. solani* were found associated with the web blight. In saprophytic phase, the linear growth of the fungus was greatly affected by the moisture content of soil. In parasitic phase, penetration of leaves by the fungus took 12 h after the leaves were covered with the web of mycelium. Studies on incidence and spread of web blight in relation to isolate of *R. solani* inoculum level and age of seedlings, indicated that isolate 783 was more aggressive than isolate 766 as it caused high mortality within a short period; younger (60-day-old) seedlings were found to be more susceptible than mature (75-day-old) seedlings. Disease severity did not differ significantly in two inoculum levels (1:50 and 1:200 on w/w basis, inoculum to soil). Of the 13 fungicides evaluated *in vitro* against two isolates of *R. solani*, Bavistin and Terraclor Super-X gave the maximum inhibition in growth. However, *in vivo* only Bavistin (1000 µg a. i./ml), applied 1 wk before transplanting the seedlings in the infested soil, controlled the disease caused by both the isolates. Bavistin applied after the appearance of the disease was not very effective; Terraclor Super-X did not control the web blight at any stage.

Of the three diseases, namely Botryodiplodia die-back (*B. theobromae*), Phomopsis shoot die-back (*P. mendax*), and bacterial wilt (*Pseudomonas solanacearum*) recorded in plantations, only Botryodiplodia die-back was the most serious disease prevalent in all the *Albizia* growing areas of the state. Large-scale die-back of trees in patches due to girdling of stem by the progressing canker was recorded in Kattilappara-1980 and Nangachee - 1974 (Thenmala For. Div.), Keezhayam-1979 (Punalur For. Div.) and Kollathirumedu-1979 (Vazhachal For. Div.) plantations. The incidence of die-back varied from nil (Vamanapuram-1980) to 66% (Kattilappara-1980) in 1983. It gradually declined to 13 to 25% over the next three years while the severity remained low throughout in these plantations. Intensive observations on progress and spread of die-back in a plot with moderately severe infection indicated that the high incidence occurred during the dry-warm period, but during or just after the monsoon it declined as some of the affected trees recouped partially or completely; thus, the overall incidence gradually declined from 94·3% in June 1983 to 69·8% in May 1985.

However, the percentage of mortality of the affected trees increased from 8.8% to 30.3% during the same period.

Phomopsis shoot die-back, reported from plantations affected by fire and bacterial wilt only from one plantation at Thundathil (Malayattoor For. Div.) were not common diseases.

Balasundaran, M. and Mohamed Ali, M. I. 1987. Root nodulation potentialities of *Leucaena leucocephala* in Kerala. KFRI Research Report No 48 Final Report of the Project Pathol NF 04/1982, 1987, 21 pp.


ABSTRACT

Nodulation and growth of *Leucaena leucocephala* was found to be poor in soils with low pH (< 5.5) and in degraded areas, especially in high ranges. However, it nodulated well in places where other leguminous crops like *Mimosa pudica* and *Sesbania grandiflora* nodulated. Based upon the extent of nodulation and soil pH, *Rhizobium* was isolated from nodules of *Leucaena* growing in six localities of Kerala · Evaluation of these as well as seven strains obtained from abroad, showed that inoculation of *Leucaena* seeds with *Rhizobium* increased seedling biomass and fresh weight of nodules. *Rhizobium* isolates originating from Nilambur, Nandiyode (Palghat) and Trivandrum were equally good to the best exotic isolates. Among the exotic isolates, RCR 3878, RCR 3817 and TAL 582 were promising Low pH (< 5.7) not only reduced the fresh weight of nodules and seedling biomass but also affected root growth and seedling establishment. As the soil pH increased, improvement was noticed not only in the fresh weight of nodules and seedling biomass but also in the efficiency of nodules in increasing the biomass. The *Rhizobium* strain RCR 3817 was found suitable for soil with pH 5 7 and above; below 5 7 TAL 582 was suitable for seed inoculation. The ioslate collected from Nilambur was as good as the above isolates at different pH levels though not superior.


Bhat, K M., Bhat, K. V. and Dhamodaran, T.K. 1987. Effect of age and location on pulp wood quality of *Eucalyptus grandis*. KFRI Research Report No. 49. Final Report of the Project wood 02/1979, 1987, 23 pp.


ABSTRACT

*Eucalyptus grandis* is one of the most promising pulpwood species in Kerala that merits attention under the intensive short rotation management. The present study evaluates the wood quality differences of *E. grandis* among four age groups (3, 5, 7 and 9 years) and three locations in the state. The properties investigated are wood density, percentage of bark and heartwood and fibre length.

Trees attain the minimum wood density requirement of pulp industry at the age of 3 years and there is no significant wood density increase with an increase in age from 3 years to 7 or 9 years. On the other hand, 5-year-old trees produce the wood of lower density. This pattern of wood density variation with age indicates that there is no significant loss in pulp yield per unit volume of wood if 3-year-old wood is pulped as against 5-, 7- or 9-year-old wood. Fibre length and heartwood percentage increase and bark percentage decreases with age from 3 to 9 years. Within each age group, tree growth parameters like height and diameter (DBH) have no marked effects on wood density, fibre length and heartwood percentage. Bark percentage is, however, negatively correlated with tree growth. These results suggest that silvicultural practices aiming at faster growth (higher yield) will not adversely affect the wood quality.

There is no appreciable wood property difference among the three locations of *E. grandis* growing areas in the state (Vandiperiyar, Munnar and Wynad), although fibre length and heartwood percentage are slightly greater in more rapidly grown 3-and 5-year-old trees in Vandiperiyar.

Analysis of variance reveals that both wood density and fibre length variations are significant within the trees but not between the trees. Along the stem, density declines initially from stump to BH level and then gradually increases towards the top while a somewhat reverse trend is noticed in fibre length. Fibre length increases considerably from pith to bark in all the age groups. Average tree density can fairly be predicted using BH density in 5-, 7-and 9-year-old trees while stump density is a better predictor in 3-year-old trees.

Tree-to-tree variation is small in fibre length and wood density, modest in bark percentage and large in heartwood percentage as well as tree height and diameter in each of four age groups.


Surendran, T. and Seethalakshmi, K. K. 1987. Vegetative propagation of some important tree species by rooting cuttings. KFRI Research Report No. 50. Final Report of the project Physiol 01/1979, 1987, 24 pp.

ABSTRACT

Vegetative propagation by rooting stem cuttings is a simple and comparatively less expensive method for clonal multiplication of genetically superior trees. In the present investigation branch cuttings of important timber species, viz., *Tectona grandis, Gmelina arborea, Haldina cordifolia, Hopea parviflora, Melia dubia* and *Swietenia macrophylla* were tried for root induction. The study was extended to *Leucaena leucocephala, Acacia mangium* and *Casuarina equisetifolia* in view of their potential for afforestation programmes in the state. Treatments with five growth regulating substances (GRS) (indole acetic acid, IAA; indole butyric acid, IBA; naphthyl acetic acid, NAA; Coumarin, Cou and boric acid, BA) at two concentrations each (10 and 100 ppm) were given separately to find out the most effective treatment. The influence of season on rooting was studied by repeating the treatments at monthly intervals. Results indicate that all the three factors, i. e., GRS, their concentration and season, have considerable effect on induction of rooting in cuttings. Of the ten species, rooting could be obtained only in *T. grandis, G. arborea, L. leucocephala, C. equisetifolia* and *A. mangium*. A treatment of IBA 100 ppm in May was most effective for *T. grandis* while NAA 100 ppm in April gave best results for *G. arborea*. *L. leucocephala* was comparatively easy to root and a treatment of BA 10 ppm in September gave profuse rooting and sprouting. For root induction in springs of *C. equisetifolia*, treatment with a GRS was essential. Maximum percentage of rooting was in November with a treatment of IBA 10 or 50 ppm; in control only callus formation was observed. In a preliminary trial with *A. mangium* in June, treatment of IAA 1000 ppm (quick dip) appeared promising. The possible reasons for variation in rooting potential between species and within species are discussed.

# Seminars, Symposia, Workshop..... ....

Shri M Balagopalan presented a paper entitled 'Soil properties in selected teak plantations of Trichur Forest Division, Kerala', at the National Seminar on Recent Advances in Soil Research, organised by the Indian Society of Soil Science at TNAU, Coimbatore during 23-25, 1986.

Dr. R. Gnanaharan attended the National Seminar on processing and marketting of coconuts, organised by the Coconut Development Board at Bangalore on April 19-20, 1987. He presented two papers 1. 'Basic structures of coconut wood and its utilisation potential in comparision with other standard woods'. 2. 'Commercial exploitation of coconut wood-prospects'.

Dr George Mathew attended a workshop on 'Bio-systematics of Insects', held at Entomology Research Institute, Madras in April 27-30, 1987 and presented a paper 'Bio-systematics in Lepidoptera and its importance in forest entomological research'.

Shri M S. Muktesh Kumar participated in the International Farm Forestry training programme held in People's Republic of China during May 1-30, 1987 sponsored by IDRC, Canada, Ministry of Forestry of China and Chinese Academy of Forestry. He presented two papers. 1. 'Farm Forestry in the homesteads of Kerala', 2. 'Bamboos in India with special reference to Kerala'. He has been enrolled as a member of the Chinese Bamboo Association.

Dr. K. Balasubramanyan participated in the National Seminar on 'Estuarine Management', held at Trivandrum on June 4-5, 1987. He presented a paper entitled 'The Mangrove Vegetation of Kerala'.

Dr. C.T.S. Nair visited FAO Headquarters, Rome during July 12-20, 1987, in connection with the preparation of a guideline for land evaluation for Forestry Planning at district level.

# Forthcoming Events

11-16 December, 1987. IX International Symposium on Tropical Ecology, Varanasi. India.

Contact : Prof. R. S. Ambasht, Organising Secretary, IX ISTE Symposium, Centre of Advanced Study in Botany, Banarus Hindu University, Varanasi, India. 221 005.

16-17 December, 1987. Symposium on Movement of pests and control strategies, Kuala Lumpur, Malaysia.

Contact : The Director, ASEAN Plant Quarantine Centre and Training Institute, Post Bag 209, UPH Post, 43400 Serdang, Selangor, Malaysia.

7-10 January, 1988. International Conference on Biological Control of Vectors with Predaceous Arthropods. Loyola College, Madras.

Contact : Dr. P. Venkatesan, Organising Secretary, P. G. and Research Dept. of Zoolcgy Loyola College, Madras 600 034.

26-29 January, 1988. Conference on alternatives to Deforestation. Belem-Brazil.

Contact : Anthony Anderson, Museu Goeldi, Caixa Postal, 39966, Belem-PA, Brazil.

1-12 February, 1988. 7th International Symposium on the Biological Control of Weeds, Rome, Italy.

Contact : Laboratories di Entomologia, Symposium VII, Vla Gastone Monaldi 34, 00128 Rome, Italy.

15-19 February, 1988. International Conference on Tropical Micro-Meteorology and Air Pollution, New Delhi.

Contact : Prof. M P Singh, Centre for Atmospheric Sciences, Indian Institute of Technology, Hanz Khas, New Delhi 110 016, India.

15-28 February, 1988. International Congress of Plant Physiology, New Delhi.

Contact : Dr. S. K. Sinha, Secretary General, Water Technology Centre, IARI, New Delhi 110 012.

February 1988. 4th International Round Table Conference on Dipterocarps. Sakaerat Biosphere Reserve, Thailand.

Contact : Maury-Lechon, Laboratoire de Phanerogamie, Paris, France.

25 April to May 1988. The International Forestry Conferencs for the Australian Bi Centenary 1988. Eucalypts, *Casuarina* and Acaceas, Albury, Australia.

Contact : Dr. R. L. Newman, AFDI, PO Box 515, Launceston, Tasmania 7250.

3-9 July, 1988 : 18th International Congress of Entomoloy, Voncouver, BC, Canada.

Contact : Dr. G. G. E. Seudder, Department of Zoology University of British Columbia, Vancouver, BC, Canada, V6T 2A9.

7-13 August, 1988. Tenth International Soil Zoology Colloquium. Bangalore, India.

Contact : Secretary, Tenth Soil Zoology Colloquium, Dept. of Entomology, University of Agricultural Sciences, GKVK, Bangalore 560 065

18-27 August, 1988. International Congress of Plant Pathology, Japan.

Contact : T Kommedahl, Stakman Hall of Plant Pathology, 1519 Gorter Avenue, University of Minnesota, St. Paul, MN, USA.

6-8 September, 1988. Factors Affecting Herbicidal Activity and Selectivity. Wageningen, The Netherlands.

Contact : Dr. Robert R. Schmidt, Bayer, A. G., PF - Zentrum Monheim, Gebaude 6200, D-5090, Liverkusen.

September, 1988. The Forest : Structure, Ecology, Silviculture and Agroforestry, Montpellier, France.

Contact . Colloque sur la Forit, C/o. Institut de Botanique, 163 rue Auguste Broussonet, 34000 Montpellier, France.

16-30 September, 1989 : XII Commonwealth Forestry Conference, Rotorua, New Zealand.

Contact : Secretary Standing Committee, Commonwealth Forestry, 231 Corstorphine Rd., Edinburgh EH 127, Scotland.

# Campus News

Shri M. Mohamed Usman, Registrar left KFRI on 20-4-1987. He was appointed as Registrar, Kerala Agricultural University, Vellanikkara, Trichur.

Shri P. K. Balan took over as Registrar, KFRI with effect from 24-6-1987.

Shri K. Mohanadas, Scientist, Entomology Division has been transferred to Nilambur Sub-Centre for a 3 year period from April 1987 to work on a project on Management of the teak defoliator.

Shri A. Nandakumar, Field Assistant, Management Division got selected to the Indian Statistical Service and left the Institute on 22-7-1987.

Dr. A. R. R. Menon, Scientist, Ecology Division has been deputed for ten months post - graduate diploma course in Forestry and Ecology of the Indian Institute of Remote Sensing, Dehra Dun, commencing from July 13, 1987.

Shri E. A. Jayson, Scientist, Division of Wildlife Biology has been deputed for one year training in Wildlife at the Wildlife Research Institute, Dehra Dun, commencing from August 1, 1987.

**Joined KFRI Recently**

Shri K. A. Gopalan — Office Assistant
Shri Kurian Mathew — Driver

**Visitors**

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|---|---|
| Prof. Stephen P. Hubbell<br>Smithsonian Tropical Research Institute<br>USA | 29-6-1987 |
| Dr. Clive Wing<br>IDRC, New Delhi | 5-7-1987 |
| Dr. Jeffry Campbell<br>Yale School of Forestry & Environment<br>USA | 23-7-1987 |

# New Research Projects taken up by KFRI

| Sl. No. | Code No. | Title of Project | Sponsored by |
|---|---|---|---|
| 1 | KFRI/101/1987 | Development of a management strategy for the teak defoliator, *Hyblaea puera*. | |
| 2 | KFRI/102/1987 | Soil technology packages for enhancing productivity in teak plantations of Kerala. | |
| 3 | KFRI/103/1987 | Spatial and temporal distribution of *Ailanthus* pests, *Eligma narcissus* and *Atteva fabriciella*. | |
| 4 | KFRI/104/1987 | Tree improvement of Eucalypts for disease resistance and higher productivity. | |
| 5 | KFRI/105/1987 | Studies on the lepidopteran fauna (Insecta) of Silent Valley. | Nilgiri Biosphere Reserve Programme, Govt. of India. |
| 6 | KFRI/106/1987 | Decay in standing trees in natural forests. | |
| 7 | KFRI/107/1987 | Soil and Plant Community relationship in wet evergreen forests of Silent Valley | Nilgiri Biosphere Reserve Programme, Govt. of India. |
| 8 | KFRI/108/1987 | Silviculture, Management and utilization of Bamboo resources in Kerala. | IDRC, Canada. |
| 9 | KFRI/109/1987 | Rattan Management and utilization in Kerala. | IDRC, Canada. |
| 10 | KFRI/110/1987 | Diseases of bamboos, reeds and canes in Kerala. | |
| 11 | KFRI/111/1987 | Ecology and behaviour of Sambar deer *Cervus unicolor niger* in Parambikulam Wildlife Sancturary. | |
| 12 | KFRI/112/1987 | Feeding and ranging patterns of Lion-tailed Macaque (*Macaca silenus*) in Silent Valley National Park. | Nilgiri Biosphere Reserve Programme, Govt. of India. |
| 13 | KFRI/113/1987 | Wood properties of some less known tree species of Kerala. | |
| 14 | KFRI/114/1987 | Studies of selected indigenous species for future plantation progamme in Kerala. | Dept. of Environment, Govt. of India. |
| 15 | KFRI/115/1987 | Genetic improvement of *Ailanthus triphysa*. | |
| 16 | KFRI/116/1987 | Human ecology and socio-economic interactions in Tribal Communities of Attappady. | Nilgiri Biosphere Reserve Programme, Govt. of India. |
| 17 | KFRI/117/1987 | Regeneration studies on some important trees in moist deciduous forest. | |
| 18 | KFRI/119/1987 | Demand and supply of wood in Kerala and their future trends. | Social Forestry wing, Kerala, Forest Department. |

# Recent KFRI Publications

## Research Reports

No. 45 Alexander, T. G. Sankar, S , Balagopalan, M. and Thomas, T. P. 1987. Soil in Teak plantations of different site quality. Final report of research project soil 10/84, 17 pp.

No. 46 Renuka, C., Bhat, K M. and Nambiar, V. P. K. 1987. Morphological, anatomical and physical properties of *Calamus* species of Kerala Forests. Final Report of research project Bot. 05/82. 58 pp.

No. 47 Sharma, J. K. and Sankaran, K. V. 1987. Diseases of *Albizia falcataria* in Kerala and their possible control measures. Final report of research project Pathol F 03/82, 50 pp.

No. 48 Balasundaran, M. and Mohamed Ali, M. I 1987. Root nodulation potentialities of *Leucaena leucocephala* in Kerala. Final report of research project Pathol NF 04/82, 21 pp.

No. 49 Bhat, K. M., Bhat, K. V. and Dhamodaran, T. K. 1987. Effect of age and location on pulpwood quality of *Eucalyptus grandis*. Final report of research project wood 02/79, 23 pp.

No. 50 Surendran, T. and Seethalakshmi, K. K. 1987. Vegetative propagation of some important tree species by rooting cuttings. Final Report of research project Physiol 01/79, 24 pp.