

Kerala Forest Research Institute

**ANNUAL REPORT
1997-'98**

**Kerala Forest Research Institute
Peechi - 680 653, Thrissur, Kerala, India**

1. INTRODUCTION

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The Kerala Forest Research Institute (KFRI) was established by the Government of Kerala as an autonomous Institute and registered in July 1971 under the Travancore-Cochin Literary, Scientific and Charitable Societies Act 1955. The main objective of the Institute is to undertake research on all aspects of forestry, ~~industry~~, wildlife management and wood science & technology. The Institute is situated at Peechi, 19 km east of Thrissur town, in an area of 28 ha within the Peechi Forest Range. The Institute has a sub-centre at Nilambur in North Kerala with 43 ha of forest land and a Field Research Centre at Veluppadam in Central Kerala with 38 ha of land.

The control, administration and management of the Institute are vested with the Governing Body (GB) appointed by the Government of Kerala, with 6 members of the GB forming the Executive Committee. The Director, appointed by the Government, is the Head of the Institute.

The Institute is organized into structural units called Divisions. There are 14 disciplines based Research Divisions viz., Agroforestry, Botany, Ecology, Economics, Entomology, Genetics, Non-wood Forest Products, Pathology, Physiology, Silviculture, Soil Science, Statistics, Wildlife and Wood Science. In addition, there is a Library and an Administration Division with separate Finance and Engineering Units.

During the year, Dr. K.S.S. Nair served as Director. List of staff as on 31.3.1998 is given in Appendix II. Appendix III and IV show the members of the Governing Body and Executive Committee, respectively, as on 31.3.1998.

2. FINANCE

During the year, the Institute received a grant-in-aid of Rs.146 lakhs (Rs.21 lakhs under non-Plan and Rs.125 lakhs under Plan) from the State Government and Rs.5 lakhs as contribution from the Forest Department. The Institute generated an internal revenue of Rs.7.57 lakhs, and Rs.22.00 lakhs was realized through project/overheads and consultancies. Thus the total receipt was Rs.180.57 lakhs.

The total expenditure for the year was Rs.179.90 lakhs, with a savings of Rs.0.67 lakhs which was adjusted against previous year's deficit. The accumulated deficit of previous year's was Rs.38.06 lakhs at the end of the current financial year.

A Financial statement for the year 1997-98 (to be audited) is given in Appendix I.

3. RESEARCH HIGHLIGHTS

During the year, final reports of 19 research projects were brought out. There were 77 ongoing research projects and 31 new projects were initiated. Research support was received from the following agencies.

- State : Kerala Forest Department
Science, Technology and Environment Dept.
- National : Department of Environment, Govt. of India
Department of Biotechnology, Govt. of India
Indian Council of Forestry Research and Education,
Dehra Dun.
Sterling Tree Magnum (India) Pvt. Ltd.
Department of Science and Technology
- International : Australian Centre for International Agricultural
Research (ACIAR)
McArthur Foundation, USA
International Development Research Centre, Canada
Department of International Development, UK
FAO Forestry Research Support Programme for Asia
and the Pacific (FORSPA)
Centre for International Forestry Research (CIFOR)

The total research grants received from external sources during the year amounted to Rs.142.90 Lakhs. Brief highlights of some of the research projects completed during the year are given below.

Socio-economic and ecological aspects of developing Bamboo resources in homesteads of Kerala

Ecological and social evaluation of cultivation, management and use of homestead bamboo indicated that the traditional practice of growing short duration rhizomatous crops as undercrops of bamboo is of practical importance for the management of multi-tier crop systems in homegardens of Kerala. Number of farmers who realised that rhizomatous crops can be grown as undercrops of bamboo increased from 8% to 100% during the study period. Participant farmers also realised that more than the influence of bamboos, factors such as the level of management, quality of soil and planting material used and shade of other trees determine the crop yields. However, some of the traditional practices have no scientific basis as demonstrated by the studies on the maturity of bamboo branches. It was recorded that branches are mature and strong when they are of 8-9 months old and can be used for fencing during February-April. An attempt has been to promote bamboo cultivation in a village in the low rainfall dry agroclimatic zone of the State. Considering the usefulness and success of the programme, farmers showed readiness to involve themselves in the cultivation of bamboo at the community level.

Quantification of Soil Loss from Teak and Eucalypt Plantations

Soil loss through surface run-off from a 3-year old teak plantation on 8-12% slope was 4-15 metric tons per hectare per year while that from a 2-year old eucalypt plantation on 15-20% slope was 31-46 metric tons per hectare per year. Both the sites had soil of lateritic nature. Most of the soil loss occurred during the south west monsoon season.

Vegetation mapping and analysis of Eravikulam Wildlife Sanctuary using Remote Sensing Techniques

Vegetation of Eravikulam National Park was mapped using remote sensing techniques and maps were prepared in 1:25,000 scale using Black and White aerial photographs and in 1:50,000 scale using IRS IB Geocoded satellite imagery. A set of supplementary maps viz. physical, digital, drainage and slope maps were also prepared. Vegetation of the area was analysed and structural data presented.

Effects of faster growth on timber quality of teak

The results indicate that: (i) faster growth, due to genetic reasons or judicious fertilizer application, can be advantageous in terms of heartwood yield per tree, timber weight and strength in short rotation plantations (25years) and (ii) teak can produce timber of optimum strength from 21 years onwards.

Sustainable use of non-Wood Forest Products in the Western Ghats, Kerala

Altogether 229 NWFPs were recorded from three study areas of moist forests in Wayanad, Nilambur and Attappady of which less than 50 species were commercially exploited. The study indicated that high rate of extraction of NWFPs by the gatherers resulted depletion of biodiversity. It also revealed that certain socio-economic and institutional factors are responsible for the the present state of unsustainable extraction and depletion of biodiversity of NWFPs. The review of present management practices of NWFPs in the State was revealing. The study has suggested a participatory management action plan for sustainable management of NWFPs in Kerala.

Insect Biodiversity in Disturbed and undisturbed forests

Incidence of fire (Silent Valley), plantation programmes (Nelliampathy and Parambikulam) and tree removal for fodder and firewood (Sholayar) caused ecological disturbances. All these had an adverse effect on insect diversity as manifested by the reduction in the diversity indices obtained for the disturbed sites. Based on the extent and nature of disturbance, site specific conservation strategies involving fire protection (at Silent Valley), raising of fuelwood plantations and pasture areas (at Sholayar) and practices favouring recolonisation of altered habitats (at Nelliampathy and Parambikulam) were suggested for protecting the biodiversity in the study areas.

Water relations and rooting depth of selected eucalypt species

The study revealed that the root systems of *Eucalyptus tereticornis*, *E. camaldulensis*, *E. urophylla*, *E. brassiana*, *E. pellita* and *E. deglupta* go very deep in the soil because of the continuous dry period for 4-5 months. *Eucalyptus urophylla*, showed higher water use efficiency; *E. tereticornis* and *E. deglupta* did not show this character. Root excavation studies in *E. tereticornis* showed that the roots in a 20-year-old plantation were traceable down to 9.3 m depth. The report recommends planting of *E. camaldulensis* in very dry locations. From the point of view of water conservation, *E. urophylla* appears to be a promising species.

Cambial activity and juvenile wood formation in teak

Growth periodicity (seasonal cambial activity) and wood formation studies in teak of different ages and locations in Kerala show that : (a) wood formation in teak is between March and April and October and November, with a peak period of wood production being June-July coinciding with highest amount of rainfall. (b) premonsoon showers, irrigation and drought intervention have significant effects on wood production including false ring formation in juvenile trees/seedlings. (c) teak matures in 20-25 years, depending on location/growth rate, in terms of wood properties including strength (d) although properties of juvenile wood are slightly different from those of mature wood, the former is not so inferior to be unsuitable for structural uses.

Soil Nutrient Management for Teak Plantations in Kerala

The study showed that there was significant effect on the increment in height of trees in younger plantations due to different nutrient treatments while increment in height, basal area and volume of trees in older plantations showed non-significance. Among the different treatments, application of 163 kg/ha of Urea, 375 kg/ha of Mussorie rock phosphate, 145 kg/ha of Muriate of potash, 105 kg/ha of Quick lime and 375 kg/ha of Magnesium sulphate was found to be the best.

Structural dynamics of teak stands in Kerala

Thirty six permanent sample plots established during 1992-93 in teak plantations in the State were re-measured in 1997. Efforts were made to work out an optimum thinning schedule for teak based on computer simulation indicated that two silvicultural thinnings in practice after 10 years of planting teak are not necessary. Investigation on maximum sustainable yield from teak plantations in the State indicated that with the existing land base, the current harvest levels can be increased manifold.

Methods for estimating the abundance of herbivores in the forests.

Investigations on the suitability of different detection function models using wildlife census data indicated that univariate halfnormal distribution is a good choice for many herbivore species in the forests of

Kerala. Random parameter models were found suitable for calibrating the variation in detection function over different sites and making localized prediction of animal density using the transect sampling. Computer simulation trials indicated that increasing disruption of random nature in distance measurements brings down the density estimate on an average, for a fixed set of detections and transect length.

4. HIGHLIGHTS OF OTHER ACTIVITIES

Training imparted

The Entomology Division gave a 3-months training on teak defoliator research to Dr. T. Senguttavan and Dr. C. Chinniah, Assistant Professors in Department of Entomology, Tamil Nadu Agricultural University under the Domestic short-term training programme of ICAR.

Genetics Division conducted a Training Course on Low Cost micropropagation technique for 10 participants during March 1997.^s

Upgradation of Soil Chemistry Laboratory

As part of the collaborative project between KFRI and the Council of Scientific and Industrial Research (CSIRO) Australia under an ACIAR Funded Project on improving and maintaining productivity of eucalypt plantations. The Soil Chemistry Laboratory was upgraded with new equipments, viz. Atomic absorption spectrophotometer, Auto-Analyser, UV-Visible Spectrophotometer, block digester and other basic sample preparation equipments, to facilitate sophisticated soil and plant chemical analyses.

Newsletter

September 1997 issue of the KFRI Newsletter, Evergreen, was published during this period.

Two Handbooks (i) Forest Trees of Kerala : A checklist including exotics, and (ii) Rare and Endangered Mammals of Kerala were published out during the period.

Research Advisory Committee Meeting

A Research Advisory Committee meeting of the Institute was held on 13 March 1998. In the meeting chaired by Shri M. Govindankutty, Principal Chief Conservator of Forests (Development). Officials of the Forest Department and Director of Research, Kerala Agricultural University and Research Coordinator, Institute of Forest Genetics and Tree Breeding, Coimbatore participated, in addition to the scientists of KFRI.

5. RESEARCH PROJECTS

5.1 RESEARCH PROJECTS COMPLETED

During the year under report, the following 19 Research Projects were completed and Final Reports were published/submitted to the sponsoring agencies.

KFRI 131/90 - Distribution of mammals and birds in Chinnar Wildlife Sanctuary

Investigators : P. Vijayakumaran Nair
K.K. Ramachandran
E.A. Jayson

KFRI Research Report No. 131

KFRI 147/92 - Structural dynamics of teak stands in Kerala
Investigator : K. Jayaraman

KFRI Research Report No. 141

KFRI 151/92 - Soil nutrient management for teak plantations of Kerala

Investigators : M. Balagopalan,
P. Rugmini
S. Chand Basha

KFRI Research Report No. 138

KFRI 154/92 - Status, food and feeding of larger mammals in Idukki Wildlife Sanctuary
Investigator : P.S. Easa

KFRI Research Report No. 134

KFRI 161/92 - Studies on man-wildlife conflict in Peppara Wildlife Sanctuary and adjacent areas
Investigator : E.A. Jayson

KFRI Research Report No. 140

KFRI 163/92 - Studies on the flora of Shendurni Wildlife Sanctuary with emphasis on endemic species
Investigator : N. Sasidharan

KFRI Research Report No. 128

KFRI 167/92 - Vegetation mapping and analysis of Eravikulam National Park using remote sensing techniques
Investigator : A.R.R. Menon

KFRI Research Report No. 130

- KFRI 170/92 - Quantification of soil and water loss from teak (*Tectona grandis*) and eucalypt (*Eucalyptus tereticornis*) plantations
Investigators : Thomas P. Thomas
S. Sankar
M.P. Sujatha
- KFRI 184/93 - Studies on the epiphytic flora in the tropical forest ecosystem of Western Ghats with special reference to Nilgiri Biosphere Reserve
Investigators : M.S. Muktesh Kumar
- KFRI Research Report No. 139
- KFRI 203/93 - Cambial activity and juvenile wood formation in Teak
Investigator : K.M. Bhat
- KFRI Research Report No. 137
- KFRI 208/94 - Water relations and rooting depth of selected Eucalypt species
Investigators : Jose Kallarackal
C.K. Somen
- KFRI Research Report No. 136
- KFRI 215/94 - Socio-economic and ecological aspects of developing bamboo resources in homesteads of Kerala
Investigators : U.M. Chandrasekara
S. Sankar
R. Gnanaharan
- KFRI Research Report No. 125
- KFRI 218/94 - Insect biodiversity in disturbed and undisturbed forests in the Kerala part of Western Ghats
Investigators : George Mathew
P. Rugmini
V.V. Sudheendrakumar
- KFRI Research Report No. 135
- KFRI 219/94 - Evaluation of methods for estimating the abundance of herbivores in the forests of Kerala
Investigators : K. Jayaraman
P.S. Easa
E.A. Jayson
- KFRI Research Report No. 142

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- KFRI 176/93 - Evaluation of parasitoids for biological control of the teak defoliator
Investigator : V.V. Sudheendrakumar
KFRI Research Report No. 129
- KFRI 182/93 - Effects of faster growth on timber quality of teak
Investigators : K.M. Bhat
E.P Indira
KFRI Research Report No. 132
- KFRI 190/93 - Evaluation of newer termiticides including plant products for forest plantation establishment
Investigators : R.V. Varma
K.S.S. Nair
KFRI Research Report No. 127
- KFRI 230/94 - Biodiversity in tropical moist forests : A study of sustainable use of non-wood forest products in the Western Ghats, Kerala
Investigators : P.K. Muraleedharan
N. Sasidharan
K.K. Seethalakshmi
KFRI Research Report No. 133
- KFRI 234/94 - Flora of Kerala Forest Research Institute campuses Peechi, Nilambur and Velupadam in Trichur and Malappuram districts
Investigators : K.K.N. Nair
K. Yesodharan
K.K. Unni
KFRI Research Report No. 124

5.2 ONGOING RESEARCH PROJECTS

During the year under report, 77 research projects were under operation in the following broad areas.

Plantation Forestry

- KFRI 104/87 - Tree improvement of eucalyptus for disease resistance and higher productivity
Investigators : J.K. Sharma, E.J.M. Florence,
M. Balasundaran, E.P. Indira,
K.M. Bhat and T. Surendran

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- KFRI 143/92 - Enhancement of productivity in *E. grandis* through fertiliser inputs and other cost effective treatments
Investigators : M. Balagopalan and P. Rugmini
- KFRI 151/92 - Soil nutrient management for teak plantations in Kerala
Investigators : M. Balagopalan and P. Rugmini
- KFRI 158/92 - Green belt development at Cochin Refineries Ltd.
Investigator : K.C. Chacko
- KFRI 175/93 - Tracing epicentres of teak defoliator outbreak in Kerala
Investigators : K.S.S. Nair, K. Mohanadas,
V.V. Sudheendrakumar, R.V. Varma
and Santhosh K. John
- KFRI 177/93 - Establishment of permanent plots to demonstrate the effect of protecting teak plantations from the teak defoliators
Investigators : R.V. Varma, V.V. Sudheendrakumar,
K.S.S. Nair, K. Mohanadas and
Santhosh K. John
- KFRI 194/93 - Underplanting rattans in rubber plantations
Investigator : R.C. Pandalai
- KFRI 199/93 - Growth of teak in successive rotations in relation to soil condition
Investigator : M. Balagopalan
- KFRI 216/94 - Management of the shoot borer *Hypsipyla robusta* in Mahogany plantations
Investigator : K. Mohanadas
- KFRI 227/94 - Provenance trial in *Acacia*
Investigator : E.P. Indira
- KFRI 228/94 - Status of *Acacia mangium* in Kerala
Investigators : T.K. Dhamodaran and K.C. Chacko
- KFRI 236/95 - Generation and transfer of silviculture and harvesting technology of selected medicinal plants
Investigators : K.K.N. Nair, U.M. Chandrasekhara,
R.C.Pandalai and E.M.Muralidharan
- KFRI 239/95 - Atlas of teak soils in Kerala
Investigators : M. Balagopalan and S. Sankar

- KFRI 242/95 - Tissue culture of rattans (canes) for clonal propagation
Investigators : E.M. Muralidharan and R.C. Pandalai
- KFRI 245/95 - Use of baculovirus control agents within an integrated pest management strategy against the teak defoliator, *Hyblaea puera* in India
Investigators : K.S.S. Nair, V.V. Sudheendrakumar
R.V. Varma and K. Mohanandas
- KFRI 247/96 - Development of spike disease resistant sandal seedlings through biotechnology involving ELISA technique and tissue culture
Investigators: M. Balasundaran and
E.M. Muralidharan
- KFRI 250/96 - Productivity of teak and Eucalyptus Plantations in Kerala
Investigators : K.S.S. Nair, K.C. Chacko,
K. Jayaraman.
(Kerala Forest Department)
- KFRI 255/96 - Seed handling and nursery practices for selected forest trees of Kerala
Investigators : K.C. Chacko, K.K. Seethalakshmy,
C. Mohanan, George Mathew

(Indian Council of Forestry Research and Education)
- KFRI 257/96 - Improvement of productivity of pulpwood species.
Investigators : J.K. Sharma, M. Balasundaran,
E.J. Maria Florence, T. Surendran,
M. Balagopalan.
(Indian Council of Forestry Research and Education)
- KFRI 259/96 - Developing a GIS based management information system for forest plantations - a case study of Trichur Forest Division. Wildlife Sanctuary.
Investigator : U.N. Nandakumar.

(Indian Council of Forestry Research and Education)
- KFRI 263/96 - Improvement of productivity of eucalypts through fertilizer inputs and Silvicultural treatments
Investigators : M. Balagopalan, P. Rugmini.

(Kerala Forest Department (Development Fund))
- KFRI 264/96 - Establishment of a pilot scale bamboo stand for edible shoot production in Kerala
Investigator : M.S. Mukteshkumar.

(Kerala Forest Department (Development Fund))

Natural Forests

- KFRI 146/92 - Macrofungual flora of Peechi-Vazhani Wildlife Sanctuary
Investigators : E.J.M.. Florence and K. Yesodharan
- KFRI 163/92 - Studies on the flora of Shendurney Wildlife Sanctuary with emphasis on endemic species
Investigator : N. Sasidharan
- KFRI 165/92 - Vegetation mapping of Peppara Wildlife Sanctuary
Principal Investigator : A.R.R. Menon
- KFRI 166/92 - Vegetation mapping of Aralam Wildlife Sanctuary
Principal Investigator : A.R.R. Menon
- KFRI 167/92 - Vegetation mapping of Eravikulam National Park
Principal Investigator : A.R.R. Menon
- KFRI 168/92 - Vegetation dynamics of the grassland - forest ecosystem in the Western Ghats of Kerala
Principal Investigator : Director
Investigators: K. Swarupanandan, S. Sankar, N. Sasidharan and M. Balagopalan
- KFRI 172/92 - Harvesting and regeneration techniques of reeds
Investigator : R.C. Pandalai
- KFRI 174/93 - Ecological and environmental assessment of forest cover of Kerala with special reference to soil, vegetation and wildlife
Investigator : S. Sankar
- KFRI 179/93 - Studies on the flora of Periyar Tiger Reserve
Investigator : N. Sasidharan
- KFRI 204/93 - Studies on the fern flora of Kerala with special reference to Sylvan Valley, Munnar
Investigator : M.S. Muktesh Kumar
- KFRI 217/94 - Effect of fire on forest soil and vegetation
Principal Investigator : Director
Investigators: K. Swarupanandan, T. Surendran, K.V. Sankaran and Thomas P. Thomas
- KFRI 220/94 - Studies on the Shola Forests of Kerala
Principal Investigator : Director
Investigators: K. Swarupanandan, N. Sasidharan, U.N. Nandakumar and K.C. Chacko
- KFRI 221/94 - Studies on the diversity of selected group of insects in the Parambikulam Wildlife Sanctuary
Investigators : V.V. Sudheendrakumar and George Mathew

- KFRI 223/94 - Soil microflora of shola forests of Eravikulam National Park
Investigators : K.V. Sankaran and M. Balasundaran
- KFRI 225/94 - Evaluating plant diversity in different forest types of Kerala by laying out permanent sample plots
Principal Investigator : K. Balasubramanyan
Investigator : K.K.N. Nair
- KFRI 237/94 - Conservation, management and sustainable utilisation of non-timber forest products in Southern Western Ghats, Kerala, India
Investigator : S. Sankar
- KFRI 241/95 - Eco-restoration of a degraded watershed in Attappady
Investigator : R.C. Pandalai
- KFRI 243/95 - Genetic diversity and conservation of rattans
Investigators : C. Renuka, E.M. Muralidharan and E.P. Indira
- KFRI 244/95 - Biodiversity conservation potential and ecosystem rehabilitation using traditional knowledge at Chinnar Wildlife Sanctuary, the Western Ghats, Kerala, South India
Investigator : S. Sankar
- KFRI 246/95 - Fire related ecosystem dynamics in the moist deciduous forests of the Western Ghats
Investigators : K. Swarupanandan, K.V. Sankaran, T. Surendran and Thomas P. Thomas
- KFRI 251/96 - Monitoring degraded forests of Kerala
Investigators : U.N. Nandakumar, A.R.R. Menon, S. Sankar, K.C. Chacko.
(Kerala Forest Department)
- KFRI 260/96 - Vegetation Mapping and Analysis of Neyyar Wildlife Sanctuary using Remote Sensing Techniques.
Investigators : A.R.R. Menon, Assistant Wildlife Warden, Neyyar
Kerala Forest Department (Wildlife)
- KFRI 262/96 - Prospects of reed bamboo (*Ochlandra travancorica*) for soil conservation in degraded sites
Investigators : M.P. Sujatha, Thomas.P.Thomas, S. Sankar.

- KFRI 153/92 - Survey of small mammals in Kerala with special reference to endangered species and wildlife census in Chinnar Wildlife Sanctuary
Investigators : P.S. Easa, P. Padmanabhan and James Zacharias
- KFRI 156/92 - Habitat utilisation of animals in Parambikulam Wildlife Sanctuary with special reference to Gaur
Investigators : P.S. Easa and A.R.R. Menon
- KFRI 159/92 - Studies on the ecology and population dynamics of endangered primates in Silent Valley National Park
Investigator : K.K. Ramachandran
- KFRI 162/92 - Status, habitat utilisation and movement pattern of larger mammals in Wayanad Wildlife Sanctuary
Investigator : P.S. Easa
- KFRI 178/93 - A field guide for identification of wild animals based on indirect evidences
Investigator : E.A. Jayson
- KFRI 183/93 - Studies on crop damage by wild animals in Kerala and evaluation of control measures
Investigator : E.A. Jayson
- KFRI 209/93 - Patterns and processes of fish assemblages in Periyar Lake-Valley System
Investigator : L.K. Arun
- KFRI 211/93 - A survey of reptiles and amphibians in Kerala part of Nilgiri Biosphere Reserve
Investigator : P.S. Easa
- KFRI 214/94 - Study on man-wildlife interaction in Wayanad Wildlife Sanctuary, Kerala
Investigators : P.S. Easa and S. Sankar
- KFRI 222/94 - Studies on the flora of Chinnar Wildlife Sanctuary
Investigators : N. Sasidharan and
Asst. Wildlife Warden,
Chinnar Sanctuary
- KFRI 224/94 - Ecological studies on Sloth Bear (*Melursus ursinus*) in Parambikulam Wildlife Sanctuary
Investigator : P.S. Easa
- KFRI 226/94 - Status and distribution of rare and endangered animals of Kerala and publication of a Booklet
Investigator : E.A. Jayson

- KFRI 240/95 - Ecology and behaviour of gaur (*Bos gaurus*) in Periyar Tiger Reserve, Kerala
Investigator : P.S. Easa

Wood Science & Technology

- KFRI 195/93 - Bee keeping - Use of unconventional timbers for hives
Investigator : R.V. Varma
- KFRI 248/96 - Protection of rubber wood from insect borers
Investigators : George Mathew and R. Gnanaharan
- KFRI 258/96 - Evaluation of high input management on growth and timber production in teak
Investigators : K.M.Bhat, K.C. Chacko, M. Balagopalan.
(Indian Council of Forestry Research and Education)
- KFRI 266/97 - Development of appropriate tools for harvesting reed bamboos
Investigators : K.V. Bhat, R.C. Pandalai.
Kerala Forest Department (Development Fund)

General & Environmental Studies

- KFRI 193/93 - Analysis of data from long term trials
Investigators : P. Rugmini and K. Jayaraman
- KFRI 206/93 - Mushroom cultivation using forest litter and waste wood
Investigators : E.J.M. Florence, J.K. Sharma and M. Balasundaran
- KFRI 207/93 - Mass rearing of selected butterflies for possible reintroduction in conservation programme
Investigator : George Mathew
- KFRI 232/94 - Rhizome and root morphology of rattans
Investigators : C. Renuka and K.K. Unni
- KFRI 235/94 - Harvesting trials on bamboos
Investigator : R.C. Pandalai
- BIC/India - Bamboos of India: A Compendium
Investigators : K.K. Seethalakshmi, M.S. Muktesh Kumar, K. Sankara Pillai, N. Sarojam

- KFRI 252/96 - Weather data acquisition from selected Wildlife Sanctuaries in Kerala
Investigators : Jose kallarackal, C.K. Somen.

Kerala Forest Department (Wildlife)

- KFRI 265/96 - Ecological and social importance of the Sacred Groves in Kerala
Investigators : U.M.Chandrashekhara, S. Sankar.

(UNESCO, New Delhi)

Medicinal Plants & Tissue Culture

- KFRI 253/96 - Micro propagation of Important, Rare and Endangered Tree Species of Western Ghats
Investigator : E.M. Muraleedharan.

Kerala Forest Department (Wildlife Department)

- KFRI 254/96 - Development and dissemination of Low Cost micropropagation techniques for *Kaempferia galanga* (Kacholan)
Investigator : E.M. Muraleedharan,
U.M. Chandrashekhara

(Science Technology & Environment Committee, Kerala)

- KFRI 256/96 - Assessment of field performance of micropropagated teak and eucalypts
Investigators : E.M. Muraleedharan, R.C. Pandalai

(Indian Council of Forestry Research & Education)

- KFRI 261/96 - Micropropagation of three valuable timber species in Bay islands
Investigators : E.M. Muraleedharan,
A.B.T.Mandal-CARI

Department of Biotechnology

Socio-Economics

- KFRI 181/93 - Teak plantation in Nilambur : An Economic Review
Investigator : Mammen Chundamannil

- KFRI 189/93 - Economics of forest plantations in Kerala
Investigator : Mammen Chundamannil

- KFRI 201/93 - Timber price trends in Kerala
Investigator : C.N. Krishnankutty

- KFRI 249/96 - Study of private sector involvement in Forestry Research in India
Investigators : K.S.S. Nair, Mammen Chundamannil and K.C. Chacko

Action Research Programmes

- KFRI 192/93 - Greening of Ayyampilly Hills - Participatory Action Research Programme
Investigator : S. Sankar
- KFRI 197/93 - Eco restoration of a degraded watershed in Mukundapuram Taluk of Thrissur District
Investigator : S. Sankar

5.3 NEW RESEARCH PROJECTS

During the year under report, the following 31 research projects were initiated.

- KFRI 269/97 - Modelling the growth of teak and real-time monitoring of tree health in STM teak plantations
Investigators : K.S.S. Nair, K. Jayaraman
K.C. Chacko and P. Vijayakumaran Nair
(Sterling Tree Magnum (India) Ltd., Madras)
- KFRI 270/97 - Assessment of pest problems in intensively managed STEM teak plantations
Investigators : K.S.S. Nair, R.V. Varma
V.V. Sudheendrakumar and T.V. Sajeew
(Sterling Tree Magnum (India) Ltd., Madras)
- KFRI 271/97 - Ecophysiology of host - parasite relationship in teak
Investigators : Jose Kallarackal, K.C. Chacko
(Dept. of Science and Technology, GOI)
- KFRI 275/97 - Biological control of Damping-off in Forest Nurseries in Kerala
Investigator : C. Mohanan
(Indian Council of Forestry Research & Education)
- KFRI 278/97 - Germplasm collection and growth studies of selected bamboo species suitable for the region (Western Ghats)
Investigators : R.C. Pandalai, M.S. Muktesh Kumar and K.V. Bhat
(Indian Council of Forestry Research & Education)
- KFRI 279/97 - Development of Technology for collection, processing and testing seeds of five important tree species of Kerala
Investigators : K.C. Chacko, C. Mohanan
(Indian Council of Forestry Research & Education)

- KFRI 280/97 - Establishment of a semi-permanent Field Clonal Propagation Unit for *Eucalyptus*
Investigators : J.K. Sharma, M. Balasundaran
and E.J. Maria Florence
(Indian Council of Forestry Research & Education)
- KFRI 281/97 - Improving and maintaining productivity of eucalypt plantations in India and Australia
Investigators : K.V. Sankaran, M. Balagopalan,
S. Sankar, Jose Kallarackal,
C.K. Soman, J.K. Sharma, K.C. Chacko,
R.C. Pandalai, M. Balasundaran
and C.N. Krishnankutty
(Australian Centre for International Agricultural Research (ACIAR), Australia)
- KFRI 282/97 - Testing and developing Criteria and Indicators for Sustainable Management of Tropical Plantation Forests in India
Investigator : S. Sankar
(Centre for International Forestry Research (CIFOR), Indonesia)
- KFRI 287/97 - Maintenance of the permanent plots to demonstrate the effect of protecting teak plantations from the teak defoliator
Investigators : T.V. Sajeev, R.V. Varma
V.V. Sudheendrakumar, K. Mohanandas
(Kerala Forest Department)
- KFRI 288/97 - Termite control in clonally propagated root trainer raised planting stock
Investigator : R.V. Varma
(Kerala Forest Department)
- KFRI 289/97 - Maintenance of seed stands and species trial plots of rattans
Investigator : C. Renuka
(Kerala Forest Department)
- KFRI 290/97 - Studies on clonal propagation of plus trees of teak (*Tectona grandis L.f*) for identifying superior trees for plantation programme
Investigator : T. Surendran
(Kerala Forest Department)
- KFRI 291/97 - Maintenance and growth observations in multilocational provenance trial plots of Eucalypts
Investigators : M. Balasundaran, E.J.M. Florence
and J.K. Sharma
(Kerala Forest Department)

- KFRI 292/97 - **Pollination Ecology of teak in Kerala**
 Investigators : K. Mohanadas, George Mathew
 and E.P. Indira
 (Kerala Forest Department)
- KFRI 295/97 - **Raising planting stock of Eucalyptus clones
 for the Kerala Forest Department**
 Investigators : J.K. Sharma, M. Balasundaran
 and E.J.M. Florence
 (Kerala Forest Department)
- KFRI 296/97 - **Fungal pathogens as a potential threat to tropical
 acacias - Phase 2**
 Investigators : J.K. Sharma and E.J.M. Florence
 (Centre for International Forestry Research (CIFOR)
 Indonesia)
- KFRI 272/97 - **Survey and estimation of Bamboo Resources of Kerala**
 Investigators : A.R.R. Menon, P.V.K. Nair
 and K. Jayaraman
 (Kerala Forest Department)
- KFRI 273/97 - **Lichen (Macrolichen) Flora of Kerala part of Western
 Ghats**
 Investigator : M.S. Muktesh Kumar
 (Indian Council of Forestry Research & Education)
- KFRI 274/97 - **Conservation and genetic Improvement of Reed Bamboo
 (*Ochlandra* sp.)**
 Investigator : K.K. Seethalakshmi
 (Indian Council of Forestry Research & Education)
- KFRI 276/97 - **Studies on the Biodiversity of New Amarambalam Reserved
 Forests of Nilgiri Biosphere Reserve**
 Investigators : K.S.S. Nair, K.K. Ramachandran
 K.K.N. Nair, K. Yeshodharan
 George Mathew, K. Mohanadas
 E.A. Jayson and P.V.K. Nair
 (Ministry of Environment & Forests, GOI)
- KFRI 267/97 - **Elephant population in Periyar and adjacent areas -
 a demographic study**
 Investigator : P.S. Easa
 (Asian Elephant Conservation Centre)
- KFRI 285/97 - **Forest Atlas of Kerala**
 Investigators : A.R.R. Menon and P.V.K. Nair
 (Kerala Forest Department)
- KFRI 294/97 - **Conservation of Invertebrates through Captive
 breeding**
 Investigator : George Mathew
 (Ministry of Environment & Forests, GOI)

- KFRI 266/97 - Development of appropriate tools for harvesting reed bamboos
Investigators : K.V. Bhat, R.C. Pandalai
(Kerala Forest Department)
- KFRI 268/97 - Investigations into heartwood formation in intensively managed teak plantations in STM teak plantations
Investigators : K.S.S. Nair, K.M. Bhat
Jose Kallarackal and K.C. Chacko
(Sterling Tree Magnum (India) Ltd., Madras)
- KFRI 286/97 - Introducing mechanical slivering technique in traditional reed industry - A techno-economic study
Investigators : R. Gnanaharan, Mammen Chundamannil
and A.K. Kurian (Kerala State Bamboo Corpn.)
(Kerala Forest Department)
- KFRI 277/97 - Carrying capacity based developmental planning for Greater Kochi Region (KFRI Component of a collaborative project)
Investigator : S. Sankar
(Ministry of Environment & Forests, GOI, through NEERI)
- KFRI 283/97 - Integrated management of the alien invasive weed *Mikania micrantha* in the Western Ghats
Investigator : K.V. Sankaran, E.J.M. Florence
and P.K. Muraleedharan
(Dept. of International Development, U.K.
(formerly ODA))
- KFRI 284/97 - Employment, landuse and intercultural ecoscope: Forest-plantation transformation in the Kerala Highranges
Investigator : S. Sankar
(Indo Dutch Programme for Alternate Development - Indian Council for Social Sciences Research, New Delhi)
- KFRI 293/97 - Revisionary studies on four genera of Indian Bamboos
Investigator ; M.S. Muktesh Kumar
(Dept. of Science & Technology, GOI)

6. OTHER ACTIVITIES

6.1 CONSULTANCY SERVICES

The following consultancy projects were completed taken up during the period.

Completed:

- KFRI Cons 12/96 - **Establishment of Interpretation Centre in Periyar Tiger Reserve**
 Investigators : P.S. Easa, George Mathew,
 N. Sasidharan.
- KFRI Cons 17/97 - **Preparation of a preliminary report on medicinal plant cultivation at Pariyaram**
 Coordinator : N. Sasidharan
 Associates : Thomas P. Thomas, K.R. Mukundan
 (The Pharmaceutical Corporation (I.M.) Kerala Ltd.
 (OUSHADHI))
- KFRI Cons 18/97 - **Data sheet on teak (*Tectona grandis*) for the CABI electronic compendium project**
 Project Leader : K.C. Chacko
 Associate : N. Sasidharan
 Resource Persons: K.S.S. Nair, S.Sankar,
 M. Balasundaran, R.V. Varma,
 George Mathew and Subhash Kuriakose
 (CAB International, Wallingford, U.K.)
- KFRI Cons 19/97 - **Wildlife Census Kerala - 1997**
 Investigators : P.S. Easa, K. Jayaraman
 (Kerala Forest Department (Wildlife))
- KFRI Cons 20/97 - **Mahout Training Programme**
 Coordinator : P.S. Easa
 (In association with Elephant Welfare Association
 & Elephant Owners Association)
 (Kerala Forest Department (Wildlife Wing))
- KFRI Cons 22/97 - **Data sheets on *Ailanthus triphyssa*, *Albisia odoratissima*, *Bombax malbaricum*, *Cassia fistula*, *Dalbergia latifolia* and *Xylia xylocarpa* for the CBI Electronic Compendium**
 Project Leader : K.S.S. Nair
 Coordinators : K.C. Chacko, E.P. Indira
 R.C. Pandalai, N. Sasidharan
 K. Balasubramanyan, K.K.N. Nair
- Contributors : M. Balagopalan, K.V. Bhat
 T.K. Dhamodaran, George Mathew
 K.F. George, K.H. Hussain
 E.J.M. Florence, K. Mohanadas
 C. Mohanan, M.S. Mukteshkumar
 K.V. Sankaran, K. Sankara Pillai
 N. Sarojam, V.V. Sudheendrakumar
 Subhash Kuriakose, Thomas P Thomas
 M.P. Sujatha, R.V. Varma

Ongoing:

- KFRI Cons 13/96 - Establishment of Interpretation Centre at Parambikulam and Wayanad Wildlife Sanctuaries
Investigators : P.S.Easa, V.V.Sudheendrakumar.
(Kerala Forest Department (Wildlife Wing))
- KFRI Cons 15/97 - Survey of pests and disease problems in intensively managed teak plantations of Sterling Tree Magnum
Coordinator : R.V. Varma
Investigators: All scientists in Pathology and Entomology

(Sterling Tree Magnum (India) Ltd.)
- KFRI Cons 16/97 - Status and distribution of Masheer in selected streams and reservoirs in Kerala
Investigator : P.S. Easa
(Indo-German Reservoir Fisheries Development Project, Kerala)
- KFRI Cons 21/97 - Production and supply of propagules of ten bamboo species
Coordinator : R.C. Pandalai
(Kerala Forest Department and Tamil Nadu Forest Department)
- KFRI Cons 23/98- Publishing a comprehensive volume on Silent Valley National Park
Collaboratory Editor : P.S. Easa
(Kerala Forest Department (Wildlife Wing))

6.2 Training

International

Mrs EJ Maria Florence (Pathology) attended six months' training in biological control of sapstain at Molecular Life Science Dept. of University of Abertay, Dundee, Scotland, U.K. under Colombo Plan from January to July 1997.

Dr M Balagopalan (Soil Science) attended an advanced research training in soil and plant analyses using sophisticated instruments and soil - stand management studies in eucalypt plantations in the CSIRO Forestry and Forest Products, Webley, W. Australia during 23 July - 17 October 1997 as part of the collaborative project between KFRI and CSIRO Forestry and Forest Products, W., Australia under the ACIAR Funded Project entitled 'Improving and maintaining productivity of eucalypt plantations in India and Australia'.

Mr TV Sajeew (Entomology) underwent a short-term training in spraying technology in Imperial College, UK for 15 days during 16-21 March 1998.

National

Mr. Thomas P. Thomas (Soil Science) attended a Training Course on Environmental Impact Analysis of Water Resources Projects during Aug. 18-23, 1997 at CWRDM, Kunnamangalam.

6.3 Exhibitions/Extensions

The Institute organised exhibitions at Citex 97 at Cochin, Mathrubhumi Farmer's Fair at Palakkad, Khadi Fest at Kozhikode and Rajakkad Development Society at Kozhikode. The Agroforestry and Publicity Division organized these programmes. The Institute was awarded the First Prize among the Department Pavilions.

6.4 Seminars/Symposia/Workshops/Meetings attended

International

Dr. KV Sankaran (Pathology) participated in a Workshop entitled 'Site management and productivity in Tropical Plantations - Impact on soils and options for management over successive rotations', convened by CIFOR in Pietermeritzburg, South Africa during Feb. 16-20, 1998. He presented a paper entitled 'Improving sustainable productivity of eucalypt plantations in Kerala, India'.

Dr KK Seethalakshmi (Physiology) participated in the IUFRO-Symposium on Innovations in Forest tree seed and Nursery technology at Ravishankar Shukla University, Raipur from 22-25 November 1997 and presented a paper on "Seed handling practices for bamboos".

Dr JK Sharma (RME) participated in International Conference on Integrated Plant Disease Management for sustainable agriculture during

10-15 November 1997 and presented a paper 'Tree improvement of eucalypts for higher productivity and disease resistance to *Cylindrocladium* leaf blight and pink disease in Kerala" by JK Sharma, M. Balasundaran and EJM Florence.

Dr KK Ramachandran participated in the "Second International Symposium on Asian Tropical Forest Management" at Samarinda - Indonesia, from 9th to 10th December 1997. Presented a paper entitled "Conservation perspective in Rainforest Management: A case study from Kerala, India. The symposium was organised jointly by the Tropical Rainforest Research Centre (PUSREHUT) Mulavaram University in co-operation with Japan International Co-operation Agency (JICA).

Dr S Sankar (Soil Science) participated in the Fifth International Project Advisory Panel of CIFOR in Rome, Italy during March 1998 and presented a paper entitled "Criteria and indicators for the sustainable management of teak plantations in Kerala".

National

Dr RC Pandalai (Silviculture) attended a seminar on "Environment, People and Development" held at Agali, Attappady by Attappady Hills Area Development Society and submitted a paper in Malayalam on "Afforestation in Attappady - Problems and Prospects" on 6 May 1997.

Dr N Sasidharan (Non-Wood Forest Produce) participated in the National Congress on Medicinal Plants, organised by the Pharmaceutical Corporation of India, Kerala, on 12.06.1997. Presented a paper on "Biodiversity and Sustainable Extraction of Medicinal Plants at Wayanad".

Dr Jose Kallarackal (Physiology) participated in National Seminar of Water and Nutrient Management in Spices held at Madikkeri, Coorg, Karnataka from 5-6, October 1997. He presented a paper on "Tree water consumption - an ecophysiological analysis (J Kallarackal and CK Somen).

Shri UN Nandakumar, Shri KC Chacko (Silviculture) and Dr ARR Menon (Ecology) attended a Workshop on "Preparing Guidelines for Site Specific Plans" for forest officials organised by Kerala Forest Department at Trivandrum on 1 November 1997.

Mr Thomas P Thomas (Soil Science) attended a Training Course on Environmental Impact Analysis of Water Resources Projects during Aug. 18-23, 1997 at CWRDM, Kunnangalam.

Dr M Balasundaran (Pathology) attended the International Seminar on Sandal and its Products at Institute of Wood Science and Technology, Bangalore during December 18-20, 1997 and Dr C Mohanan participated in the IUFRO Symposium on Innovations in Forest Tree Seed Science and Nursery Technology held at Pt. Ravishankar Shukla University, Raipur, M.P. during November 22-25, 1997 and presented papers.

Dr KK Seethalakshmi (Physiology) participated in the seminar on Molecular techniques for improvement at CMS College, Kottayam from 29-31 December 1997 she presented a paper "Molecular techniques for bamboo systematics" by KK Seethalakshmi and Preethi Madhavan.

Dr N Sasidharan (Non-Wood Forest Produce) participated in the seminar on medicinal plants and their conservation on 12 December 1997, at Wayanad, organised by MS Swaminathan Research Foundation Community Agro-biodiversity centre and Development Agency for Rural Areas, Wayanad. Gave a talk on the importance of conserving medicinal plants in Non Forest Areas.

Dr RC Pandalai (Silviculture) attended a meeting on "Application of coir pith compost on different agricultural/horticultural crops on 7 January 1998 at Coir Board, Cochin.

Dr Jose Kallarackal (Physiology) gave a invited special talk entitled "Eucalypt water consumption - facts and figures at the Indian Science Congress held in January, 1998 at Osmania University, Hyderabad.

Dr Jose Kallarackal (Physiology) participated in the National Seminar on Oppurtunities and Challenges for Oil Palm Development held on 19-21, January in Vijayawada. He presented a paper entitled "Ecophysiological arameters determining tree performance of oil palm in peninsular India" by J. Kallarackal and P. Jeyakumar.

Dr KK Seethalakshmi (Physiology) and Dr. PK Muraleedharan (Economics) attended the International Seminar on Medicinal plants for survival at National Centre for Advanced Studies, Bangalore from 16-19, February 1998.

6.5 Resource Persons for Workshops/Meetings

Shri KC Chacko, Dr RC Pandalai and UN Nandakumar (Silviculture) acted as Resource Persons for the Workshop of forest officers of Social Forestry Circle, Ernakulam on 'Degraded Forests' organised jointly by the Kerala Forest Department and KFRI, Peechi at KFRI, Peechi on 23 September 1997 and took classes on (1) Identification of degraded forests, (2) Causes of forest degradation, (3) Species selection for compensatory afforestation, and (4) Strategies in afforestation of degraded areas. Sri KC Chacko delivered a lecture on General Silviculture on 19 May 1998 for the III Semester Master of Environment Management students from the School of Environmental Studies, Mahatma Gandhi University, Kottayam.

Shri KC Chacko delivered a lecture on "General Silviculture and Silvicultural System" to M.Sc. (Final Year) Environmental Science Students of M.G. University, Kottayam on 26 June 1997.

Dr. RC Pandalai participated in discussions on "Species selection, planting techniques soil conservation measures to be adopted for compensatory afforestation programmes" with the CF, ACF, ROs and Forests of SF & P, Cochin on 3 January 1998 at Mangalavanam, Kochi.

Dr M Balasundaran Dr C Mohan, Dr KV Sankaran and Dr JK Sharma (Pathology) organized theory and practical classes in Forest Pathology for 1996-1998 batch of ACF Trainees from the State Forest Services College (SFRC), Coimbatore.

6.6 Visitors

Shri Sukh Dev Kang, Governor of Kerala visited the Sub Centre, Nilambur.

Shri P.R. Kurup, Hon'ble Minister for Forests.

Prof. Jaffry Saeyer, Director General, Centre for International Forestry Research, Bogor, Indonesia.

Shri J.N. Sirsikar (Rtd. DFO), 10/16, Sachin Society, Mithagar Road, Mulund (East), Mumbai.

Members of the "Citizen Forum" comprising Shri K.K. Nair, Rtd. CCF, Shri K.V. Sankaran Nair, Rtd. CF., Prof. Vijaya Madhavan, Prof. Unnikrishnan Nambisan, Shri Thiruvath Raman.

Ms. Catherine Mackenzie, Technical Cooperation Officer, DFID Forestry Programme, Battaramulla, Shri Lanka.

Dr. Maudgal, Senior Advisor, Cleaner Technology, MOEF, GOI.

Shri S. Balaji IPS, Dean, Forest College & Research Institute, Tamil Nadu Agricultural University.

Dr. S.T. Murphy and Dr. Harry Evans, International Institute of Biological Control, U.K. and Dr. C. Conroy, Natural Resources Institute, Chatham, U.K.

Dr. H.F. Evans, Principal Entomologist, Forestry Commission, U.K.

Shri M.F. Ahamed, Inspector General of Forests, Govt. of India.

Dr. B.N. Gupta, Director General, ICFRE.

Dr. Tony O'Connell, Scientist, CSIRO, Australia.

Dr. Tim Grove, Scientist, CSIRO, Australia.

7. PUBLICATIONS

7.3 Research Reports

Flora of Kerala Forest Research Institute Campuses Peechi, Nilambur and Velupadam in Trichur and Malappuram Districts, Kerala State. KFRI Research Report No. 124. (Nair, K.K.N., K. Yeshodharan and K.K. Unni 1997.)

Socio-economic and Ecological aspects of Developing Bamboo Resources in Homesteads of Kerala. KFRI Research Report No. 125. (Chandrasekara, U.M., S. Sankar and R. Gnanaharan 1997.)

Quantification of soil and water loss from teak (*Tectona grandis*) and eucalypt (*Eucalyptus tereticornis*) plantations. KFRI Research Report No. 126. (Thomas P. Thomas, S. Sankar and M.P. Sujatha 1997).

Evaluation of newer termiticides including plant products for forest plantation establishment. KFRI Research Report No. 127. (Varma, R.V., K.S.S. Nair 1997).

Studies on the flora of Shendurni Wildlife Sanctuary with emphasis on endemic species. KFRI Research Report No. 128. (Sasidharan, N 1997).

- Evaluation of parasitoids for biological control of the Teak Defoliator.** KFRI Research Report No. 129. (Sudheendrakumar, V.V 1997).
- Vegetation mapping analysis of Eravikulam National Park using remote sensing techniques.** KFRI Research Report No. 130. (Menon, A.R.R. 1998).
- Distribution of mammals and birds in Chinnar Wildlife Sanctuary.** KFRI Research Report No. 131. (Vijayakumaran Nair, P, K.K. Ramachandran and E.A. Jayson 1997).
- Effects of Faster Growth on Timber Quality of Teak.** KFRI Research Report No. 132. (Bhat, K.M. and E.P. Indira 1998).
- Biodiversity in Tropical Moist Forests : A study of sustainable use of non-wood forest products in the Western Ghats, Kerala.** KFRI Research Report No. 133. (Muraleedharan, P.K., N. Sasidharan and K.K. Seethalakshmi 1998).
- Status, Food and feeding of larger mammals in Idukki Wildlife Sanctuary.** KFRI Research Report No. 134. (Easa, P.S 1998).
- Insect Biodiversity in disturbed and Undisturbed Forests in the Kerala part of Western Ghats.** KFRI Research Report No. 135. (George Mathew, P. Rugmini and V.V. Sudheendrakumar 1998).
- Water Relations and Rooting Depth Selected Eucalypt Species.** KFRI Research Report No. 136. (Jose Kallarackal and C.K. Somen 1998).
- Cambial Activity and Juvenile Wood Formation in Teak.** KFRI Research Report No. 137. (Bhat, K.M 1998).
- Soil nutrient management for teak plantations of Kerala.** KFRI Research Report No. 138. (Balagopalan, M., P. Rugmini, S. Chand Basha 1998).
- Studies on the Epiphytic Flora in the Tropical Forest Ecosystem of Western Ghats with Special Reference to Nilgiri Biosphere Reserve.** KFRI Research Report No. 139. (Muktesh Kumar, M.S 1998).
- Studies on Man-Wildlife conflict in Peppara Wildlife Sanctuary and Adjacent Areas.** KFRI Research Report No. 140. (Jayson, E.A 1998).
- Structural Dynamics of Teak Stands in Kerala.** KFRI Research Report No. 141. (Jayaraman, K 1998).
- Evaluation of methods for estimating the abundance of herbivores in the Forests of Kerala.** KFRI Research Report No. 142. (Jayaraman, K., P.S. Easa and E.A. Jayson 1998).

7.2 Scientific Papers

Agroforestry

Sankar, S. and Christopher G 1997. Role of Social Work in environmental conservation. In-Social Work education-emerging concerns. Eds. Joseph G and George PO. Rajagiri College of Social Sciences, Kalamasserry, Kerala. pp. 141-155.

Botany

Kishore Kumar, K. and Kumar, M. 1997. *Sinarundinaria microphylla* (Munro) Chao and Renv. (Poaceae): A new record of Bamboo for Peninsular India. Rheedea 7(1):11-14.

Kumar, M and Stephen Sequiera 1997. New records of macrolichens from Silent Valley, Kerala. J. Eco. Tax Bot. 21(1):67-73.

Kumar, M and Stephen Sequiera 1997. Lichen Flora of Western Ghats: An appraisal. J. Eco. Tax. Bot. 21(1):27-39.

Kumar, M and Stephen Sequiera 1997. Diversity & Systematic Distribution of Epiphytes in the Western Ghats. Proc. Impact Assessment of Working of Forests of Western Ghats. March 3-5, Madikeri, Karnataka Forest Department.

Nair, K.K.N. 1997. A contribution to the bibliography on the angiosperm flora of Kerala State, India. J. Eco. Tax. Bot. 21(2):441-462.

Renuka, C and Vijayakumaran, T.T. 1997. Rattans of Andaman and Nicobar Islands. A state of the art report. In: Infran, A. Khan (Ed.) Frontiers in Plant Sciences. Nawab Shah Alam Khan Centre of Post Graduate Studies and Research, Hyderabad. pp.85-88.

Renuka, C., Sasidharan, N. and Anto, P.V. 1997. A new species of Calamus (Arecaceae) from Silent Valley, Kerala, India. Rheedea 7(2): 69-71.

Yeshodharan, K. and H.C. Dube 1997. Some lignicolous Aphyllophorales from Gujarat and Kerala forest trees. Indian J. For. 20(4): 369-372.

Ecology

Gutler, A.M., Mohanan, N., Balasubramanyan, K. and Wijesundara, D.S.A., 1997. Composition of the forests at the Tropical Botanical Garden and Research Institute, Palode and comparisons with some forests of adjacent areas, Kallar and Ponmudi (Trivandrum District, Kerala, India. J. of South Asian Nat. History, Vol. 2: No.2: 165-182.

Varghese, A.O., A.R.R. Menon, P.K. Suresh Babu, M.A. Suraj and M. Pradeepkumar 1997. Remote sensing data utilization in bamboo stock mapping. *Journal of Non-Timber Forest Products*, 3(3/4).

Economics

P.K. Muraleedharan, B. Jayasankar and P. Rugmini, 1996. Some economic aspects of cane harvesting in Kerala *Journal of Non-timber Forest Products* 3(3/4):93-99 (published in December 1997).

Entomology

Nair, K.S.S, Sudheendrakumar, V.V, Mohandas, K, Varma, R.V, George Mathew, Mathew P. Koshy and Kedharnath, S. 1997. Search for teak trees resistant to the teak defoliator, *Hyblaea puera* Cramer (Lepidoptera, Hyblaeidae) In: Ecology and evolution of plant feeding insects in natural and man-made environment (ed. A. Raman) PP 185-198. International Scientific Publications, New Delhi.

Ravindra, R.J, Varma, R.V, Ali, M.I. and Sudheendrakumar, V.V. 1997. Tests for cross-infectivity of the Nuclear Polyderosis Virus of the teak defoliator, *Hybaea puera* to some Lepidopterous insects. *Pest Management in Horti. Ecosystems*. 3(2) 109-111.

Genetics

Indira, E.P. 1997. Improvement of Bamboo for higher productivity. *Proc. National Seminar on Bamboos, 1996. Bangalore*. 141-144.

Valsala, K. and Muralidharan, E.M. 1998. Plant regeneration from *in vitro* cultures of rattan (*Calamus*). In: A.D. Damodaran (Ed.) *Proc. 10th Kerala Science Congress, Kozhikode*. Pp. 161-163.

Non-Wood Forest Products

Sasidharan, N., Rajesh, K.P. and Augustine Jomy. 1997. Orchis of Highways Recollected. *J. Bombay Nat. Hist. Soc.* 94:473-476.

Rajesh, K.P., Augustine Jomy and Sasidharan, N. 1997. Rediscovery of *Taeniophyllum scaberulum* Hook. f., an endemic orchid from Periyar Tiger Reserve, Kerala, India. *Rheedea* 7: 43-46.

Rajesh, K.P., Sasidharan, N. and Madhusoodanan, P.V. 1997. On the occurrence of *Arthropteris palisotii* (Desv.) Alston (Oleandraceae) - a little known climbing fern in India. *J. Econ. Tax. Bot.* 21:723-726.

Sajeev, K.K. and Sasidharan, N. 1997. Ethnobotanical Observations on Tribals of Chinnar Wildlife Sanctuary. *Ancient Science of Life* 16: 284-292.

- Balagopalan, M. and Jose, A.I. 1997. A comparison of the effectiveness of various extractants for organic matter fractionation of red ferrallitic soils of Kerala, India. *Adv. Plant Sci.*, 10: 19-28.
- Balagopalan, M. and Seethalakshmi, K.K. 1997. Physical and chemical properties of red ferrallitic soils as modified by *Glyricidia sepium* leaf litter in Kerala, India. *Adv. Plant Sci.*, 10: 177-180.
- Sujatha, M.P. 1997. Soil nutrient reserve in a degraded tropical moist deciduous forest - case study at Nilambur Kerala. *J. Trop. For.*, 13(1):25-29.
- Sujatha, M.P. and T.P. Thomas. 1997. Soil variability in a tropical moist deciduous forest of Kerala, India. *J. Trop. For. Sci.*, 9(3):340-344.

Statistics

- Rugmini, P., K. Jayaraman and V.K. Bhadrans 1997. Designing experiments in forestry through expert system. In: P.K. Iyengar (Ed.) Proc. IX Kerala Science Congress. Thiruvananthapuram. pp. 195-196.
- Rugmini, P. and K. Jayaraman 1997. Expert system for designing experiments in forestry. *J. Trop. For.*, 13(iii), 119-122.

Wildlife Biology

- Easa, P.S. and Shaji, C.P. 1997. Freshwater fish diversity in Kerala part of Nilgiri Biosphere Reserve. *Curr. Sci.* 73(2):180-182.
- Easa, P.S. 1997. Status, Food and Feeding of larger mammals in Idukki Wildlife Sanctuary. KFRI Research Report No. 134. Kerala Forest Research Institute, Peechi.
- Jayaraman, K., P.S. Easa and E.A. Jayson 1998. Evaluation of methods for estimating the abundance of herbivores in the forests of Kerala. KFRI Report No. 142.
- Jayson, E.A. 1997. Status and distribution of larger mammals in Chimmony Wildlife Sanctuary. *Indian Forester.* 123(10): 939-947.
- Jayson, E.A. 1997. Status and distribution of larger mammals in Chimmony Wildlife Sanctuary. *Indian Forester* 123(10): 939-947.
- Jayson, E.A. 1998. Studies on man/wildlife conflict in Peppara Wildlife Sanctuary and adjacent areas. Research Report No. 140, Kerala Forest Research Institute, Peechi.

Govindarajalu, E. and Sasidharan, N. 1997. Monographia Indicorum Fimbristylum Precursores - Novelties. *J. Econ. Tax. Bot.* 21:373-376.

Pathology

Florence, E.J.M. and Sharma, J.K. 1997. Control of sapstain and mould on rubber wood using sodium azide laboratory evaluation. *J. Trop. For. Products* 2:187/192.

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Physiology

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8. LIBRARY SERVICES

A compendium of all KFRI Publications, with index was published.

Continued updates of the TREE-CD database published by CABI were received during the year.

About 60% of the books held in library have been included in a computerised database.

Monthly Additions to the Library were circulated among the Scientists of the Institute. Information retrieval from Compact Discs. Bibliographic services, Reprographic Services and Art and Photographic Services were rendered to the Scientists. The library facilities were also extended to a large number of users from outside the Institute.

The current holdings in the library are shown below.

Books

Total number of books in the beginning of the year	13,389
Addition during the year	212

Journals

Total number of back volumes in the beginning of the year	6,150
Addition during the year	165
Number of Journals currently subscribed	54

Reprints

Total number of reprints at the beginning of the year	7,469
Number of reprints acquired during the year	250

APPENDIX IV

Financial Statement for 1997-98*

Expenditure

Heads	Approved outlay for 1997-98 Rs.	Actual expenditure for 1997-98 Rs.
A. Non-Plan		
1. Staff salaries and benefits	1,52,00,000	1,54,62,000
2. Office expenses	11,00,000	10,12,000
3. General utilities	10,00,000	6,70,000
	<u>1,73,00,000</u>	<u>1,71,44,000</u>
Total Non-Plan:	1,73,00,000	1,71,44,000
4. Civil works	54,00,000	2,32,000
5. Capital assets (Laboratory equipments and furniture)	11,00,000	3,97,000
6. Library	15,00,000	30,000
7. Research expenses	14,00,000	1,87,000
	<u>94,00,000</u>	<u>8,46,000</u>
Total Plan:	94,00,000	8,46,000
Grand Total	2,67,00,000 =====	1,79,90,000 =====

* to be audited.

R e c e i p t s

Sl. No.	Head	Actual receipts 1997-'98
A. Internal Receipts		
1.	House rent for quarters	1,40,000
2.	Hire charges of vehicles	67,000
3.	Rent from Guest House & Rest House	15,000
4.	Photocopying charges	88,000
5.	Sale of books	58,000
6.	Interest on bank accounts	33,000
7.	Gate fee from Teak Museum	80,000
8.	Miscellaneous	2,76,000
	Total (A)	7,57,000
B	Grant from Govt. of Kerala	1,46,00,000
C	Overheads charges from external projects	22,00,000
D	Contribution from Forest Dept.	5,00,000
	Grand Total:	1,80,57,000

APPENDIX - II L

LIST OF STAFF AS ON 31-3-1998

DIRECTOR : Dr. K.S.S. Nair

ADMINISTRATION DIVISION

REGISTRAR : Shri P. Aravindakshan

Administration Unit

1.	Shri K.K. Bhagianadh	Dy. Registrar (Admn)
2.	Shri P. Achuthankutty	PA to Director
3.	Smt. K.N. Rajamma	Superintendent
4.	Shri M.K. Aravindakshan	"
5.	" T.J. Alfred Headisjis	PA to Registrar
6.	Smt. K. Annapoorni	Stenographer
7.	Shri E.V. Eshac	Office Assistant
8.	Smt. Mary Kuruvila	Receptionist
9.	Shri P.R. Jose	Sergeant
10.	" M. Cherukunhan Nair	Typist
11.	" K.S. Karunakaran	Clerical Assistant
12.	" T. Chandran	Driver
13.	" K. Dhorairaj	"
14.	" V.D. Johny	"
15.	" Kurien Mathew	" (on leave)
16.	" K. Chandran	Attender
17.	" P.V. Subramanian,	"
18.	" K.R. Sevaraman	"
19.	" P.A. Sankarankutty	"
20.	" V.N. Balakrishnan	"
21.	" V.K. Mohandas	Bus Cleaner
22.	" A.C. Antony	Watcher
23.	" K. Said Mohammed	"
24.	" K. Nanu	"
25.	" P.K. Thankamani	Field Worker
26.	" A.K. Ammini	"
27.	" K.C. Mary	"
28.	" E.V. Thanka	"
29.	" K.V. Bharathy	"

3Accounts Unit

30.	Smt. V.K. Leela	
31.	Shri K.K. Thomas	Superintendent
32.	" V.K. Mohanan	Office Assistant
33.	Smt. K.M. Suseela	"
34.	" M. Kamalamma	"
35.	Shri K.A. Gopalan	"
36.	" B.P. Sreedharan	Attender

Engineering Unit

37.	Shri K.R. Mukundan	Engineer
38.	" P.P. Sunny	Overseer
39.	" U.Y. John	Overseer
40.	Smt. T.V. Chandrika	Typist
41.	Shri D. Skariah	Pump Operator
42.	" K.C. Subramanian	"
43.	" K.M. Velayudhan	"
44.	" P.B. Sajeeva Rao	"
45.	" M.R. Anilkumar	"
46.	" K.K. Ahammed	Attender

Nilambur Sub Centre

47.	Shri N.C. Induchoodan	Scientist-in-Charge
48.	" T.V. Sajeev	Scientist
49.	" K. Rajendran	Office Assistant
50.	" K.P. Manoj	Typist
51.	" K. Mohanan	Ticket Vendor
52.	" V. Mohammed Ali	Field Worker
53.	Smt. A.V. Thankam	"
54.	Shri P. Mohammed	"
55.	" C.P. Shoukathali	"
56.	" E.T. Narayanan	"
57.	" K. Muhammed	"
58.	" K.K. Mohammed	"
59.	" T.P. Padmanabhan	Cook

Field Research Centre, Palappilly

60.	Shri K.K. Unni	Field Assistant
61.	" E.P. Ulahannan	Field Worker
62.	" C.J. John	Field Worker

RESEARCH DIVISIONS**Research Monitoring and
Evaluation Unit**

63.	Dr. J.K. Sharma	Research Coordinator
64.	Shri A.R. Rajan	Programmer
65.	" M.S. Sukumaran	Superintendent
66.	" V. Asokan	Faircopy Superintendent
67.	" A. Ramakrishnan	Stenographer

Agroforestry

68.	Dr. S. Sankar	Scientist-in-Charge
69.	Dr. U.M. Chandrashekara	Scientist
70.	Shri K.V. Mohammed Kunhi	Senior Scientific Asst.
71.	" V.P. Ravindran	Field Assistant
72.	" T.M. Abdul Vahab	Word Processing Asst.

Botany

73.	Dr. K.K. Narayanan Nair	Scientist-in-Charge
74.	Dr. C. Renuka	Scientist
75.	Dr. M.S. Mukteshkumar	"
76.	Dr. K. Yesodaran	Senior Scientific Asst.
77.	Shri K. Vijayan	Driver
78.	" M.C. Mohandas	Attender

Ecology

79.	Dr. K. Balasubramanian	Scientist-in-Charge
80.	Dr. K. Swarupanandan	Scientist
81.	Dr. A.R. Ramachandra Menon	"
82.	Smt. Grace Andrews	Stenographer
83.	Shri M.A. Sankarankutty	Attender

Economics

84.	Dr. P.K. Muraleedharan	Scientist-in-Charge
85.	Shri Mammen Chundamannil	Scientist
86.	" S. Shahul Hameed	Driver

Entomology

87.	Dr. R.V. Varma	Scientist-in-Charge
88.	Dr. George Mathew	Scientist
89.	Dr. V.V. Sudheendrakumar	"
90.	Shri K. Mohanadas	"
91.	" P. Mohandas	Driver
92.	" K.C. Subramanian	Attender

Genetics

93.	Smt. E.P. Indira	Scientist-in-Charge
94.	Dr. E.M. Muralidharan	Scientist
95.	Shri E.O. James Tidode	Typist
96.	" A.S. Sreenivasan	Attender

Non-wood Forest Products

97.	Dr. N. Sasidharan	Scientist-in-Charge
98.	Shri C.K. Vincent	Gardener
99.	Smt. A.M. Lalitha	Field Worker
100.	" T.G. Chandrika	"
101.	Shri N.I. Thankappan	"

Pathology

102.	Dr. M. Balasundaran	Scientist-in-Charge
103.	Dr. C. Mohanan	Scientist
104.	Dr. K.V. Sankaran	"
105.	Smt. E.J. Maria Florence	"
106.	Shri M.I. Mohammed Ali	" (on leave)
107.	Smt. D. Sumangalamma	Stenographer
108.	Shri A.V. Velayudhan	Attender
109.	Smt. T.S. Chandrika	Field Worker

Physiology

110.	Dr. Jose Kallarackal	Scientist-in-Charge
111.	Dr. K.K. Seethalakshmi	Scientist
112.	Shri T. Surendran	"
113.	" C.K. Somen	Senior Scientific Asst.
114.	" P.I. Madhavan	Driver
115.	" M.B. Dasan	Attender
116.	" M.K. Sivaraman	Field Worker

Silviculture

117.	Shri K.C. Chacko	Silviculturist-in-Charge
118.	Dr. R. Chandrasekhara Pandalai	Silviculturist
119.	Shri U.N. Nandakumar	"
120.	" P.K. Chandrasekhara Pillai	Field Assistant
121.	" T.C. Paul	Driver
122.	" K.R. George	Attender

Soil Science

123.	Dr. M. Balagopalan	Scientist-in-Charge
124.	Shri Thomas P. Thomas	Scientist
125.	Smt. M.P. Sujatha	"
126.	" V.M. Ammini	Typist
127.	" K.K. Ramesh	Field Assistant
128.	" P.M. Vasu	Attender

Statistics

129.	Dr. K. Jayaraman	Scientist-in-Charge
130.	Smt. P. Rugmini	Scientist
131.	Shri C.N. Krishnankutty	"
132.	" K. Girijavallabhan	Driver
133.	" P.S. Raman	Attender

Wildlife

134.	Dr. P.S. Easa	Scientist-in-Charge
135.	Dr. K.K. Ramachandran	Scientist
136.	Dr. P. Vijayakumaran Nair	"
137.	Shri E.A. Jayson	"
138.	" P. Padmanabhan	Senior Scientific Asst.
139.	" E.T. Kuttikrishnan	Attender

Wood Science

140.	Dr. R. Gnanaharan	Scientist-in-Charge
141.	Dr. K. Mahabala Bhat	Scientist
142.	Dr. K.V. Bhat	"
143.	Shri T.K. Dhamodaran	"
144.	" P.K. Thulasidas	Laboratory Asst.
145.	" V.C. Chandran	Driver
146.	" V.S. Neelakantan	Attender

Library

147.	Shri K. Sankara Pillai	Librarian
148.	Smt. N. Sarojam	Asst. Librarian
149.	Shri Subash Kuriakose	Artist Photographer
150.	Shri K.H. Hussain	Library Asst.
151.	" K.F. George	Library Assistant
152.	" P.M. Venugopalan	Typist
153.	" C.A. Jose	Binder
154.	" T. Prabhakaran	Clerical Assistant
155.	" M.C. Reghunathan	Attender
156.	" K.V. Sidharthan	"
157.	Smt. N. Baby	"

Smt. K.T. Pathamma, Field Worker retired on 31.3.1997
 Smt. K.D. Chinnamma, Sweeper retired on 30.6.1997

LIST OF GOVERNING BODY MEMBERS OF KERALA FOREST RESEARCH INSTITUTE

1. Shri P.R. Kurup
Hon'ble Minister for Forests
Government of Kerala .. Chairman
Secretariat
Thiruvananthapuram - 695 001
2. Dr. A.D. Damodaran
Chairman .. Vice-Chairman
State Committee on Science, Technology &
Environment
C.M.D. Buildings
Thycaud
Thiruvananthapuram - 695 014
3. The Secretary to Government
Planning & Economic Affairs Department
Secretariat
Thiruvananthapuram - 695 001
4. The Principal Secretary
Finance Department
Secretariat
Thiruvananthapuram - 695 001
5. Shri K. Mohanachandran, IAS
Principal Secretary to Government of Kerala
Forest & Wildlife Department
Secretariat
Thiruvananthapuram - 695 001
6. Shri T.K. Raghavan Nair
Principal Chief Conservator of Forests (G)
Forest Headquarters
Vazhuthacaud
Thiruvananthapuram - 695 014
7. The Vice-Chancellor
Kerala Agricultural University
Vellanikkara, Thrissur Dist.

8. The Inspector General of Forests
Ministry of Environment & Forests
Paryavaran Bhavan
CGO Complex, Lodi Road
New Delhi - 110 003

9. Prof. P.S. Ramakrishnan
Professor of Ecology
School of Environmental Sciences
Jawaharlal Nehru University
New Delhi - 110 067

10. Dr. P. Pushpangadan
Director
Tropical Botanical Garden & Research Institute
Pacha, Palode
Thiruvananthapuram Dist.

11. Shri K. Subramaniam, IFS
Director
Institute of Forest Genetics & Tree Breeding
R.S. Puram
Coimbatore - 641 002

12. Shri K. Radhakrishnan
Director, NNRMS, RRSSC
Indian Space Research Organisation
Bangalore - 560 094

13. Shri Raji Philip
Managing Director
Hindustan Newsprint Ltd.
Newsprint Nagar, P.O.
Kottayam Dist.
Pin: 686 616

14. Dr. K.S.S. Nair
Director
KFRI, Peechi

LIST OF EXECUTIVE COMMITTEE MEMBERS OF KERALA FOREST RESEARCH INSTITUTE

1. Dr. A.D. Damodaran
Chairman
State Committee on Science, Technology & Environment .. Chairman

C.M.D. Buildings
Thycaud
Thiruvananthapuram - 695 014
2. Shri K. Mohanachandran, IAS
Principal Secretary to Government of Kerala
Forest & Wildlife Department
Secretariat
Thiruvananthapuram - 695 001
3. Shri T.K. Raghavan Nair
Principal Chief Conservator of Forests (G)
Forest Headquarters
Vazhuthacaud
Thiruvananthapuram - 695 014
4. Shri K. Subramaniam, IFS
Director
Institute of Forest Genetics & Tree Breeding
R.S. Puram
Coimbatore - 641 002
5. Dr. P. Pushpangadan
Director
Tropical Botanical Garden & Research Institute
Pacha, Palode
Thiruvananthapuram Dist.
6. Dr. K.S.S. Nair
Director
KFRI, Peechi