ANNUAL REPORT
1983-'84

Kerala Forest Research Institute

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April 1983 March 1984

Kerala Forest Research Institute

PEECHI, TRICHUR - 680 653, KERALA

INTRODUCTION

Additional equipment and other requisite facilities for research investigations were provided to the different laboratories. Research activities were intensified. Field studies were continued and several experimental plots were established in forest areas. More projects relevant to forest management were identified. Final reports on eight projects, three from Entomology, two from Soil Science, two from Economics and one from Pathology (Non-fungal) Divisions were brought out. Final Reports on seven other projects are under preparation. An information bulletin on 'Nursery diseases on Eucalypts in Kerala and their control' was published both in English and Malayalam. 14 scientific papers were published in scientific journals. A number of our scientists participated in seminars/workshops/symposia and also in International Seminar.

GOVERNING BODY

The Governing Body constituted in Order M. S. No. 11/81/Plg. dated 24-3-1981 by the Government of Kerala continued during the year. The Governing Body consists of the following members:

Ex-officio :

1.	Minister for Forests (Kerala)	...	Chairman
2.	Chairman, State Committee on Science & Technology (Kerala)	...	Vice-Chairman
3.	Inspector General of Forests, Government of India	...	Member
4.	Commissioner for Economic Development & Special Secretary to Government of Kerala, Planning & Economic Affairs Dept.	...	,,
5.	The Secretary to Govt. of Kerala, Finance Department	...	,,
6.	Chief Conservator of Forests, Kerala	...	,,
7.	Vice-Chancellor, Kerala Agricultural University	...	,,
8.	Director, Kerala Forest Research Institute	...	,,

Scientists :

9.	Shri K. K. Nair, Managing Director, Kerala Wood Industries Ltd., Calicut	...	,,
10.	Shri Hari Singh, Rtd. Inspector General of Forests, Bangalore.	...	,,
11.	Prof. Y. M. L Sharma, International Forestry Consultant, Bangalore.	...	,,
12.	Shri J. C. Varmah, Ex. President, Forest Research Institute & Colleges, Dehra Dun.	...	,,

Representative of forest-based industry :

13.	Shri A. K. Kaderkutty, Managing Director, Western India Plywoods Ltd., Baliapattom.	...	,,

The Governing Body met twice during the year.

EXECUTIVE COMMITTEE

The Executive Committee consists of the following members

1	Chairman, State Committee on Science & Technology (Kerala)	Chairman
2.	Commissioner for Economic Development & Special Secretary to Govt. of Kerala, Planning & Economic Affairs Department	Member
3.	Chief Conservator of Forests, Kerala	"
4.	Shri K. K. Nair, Managing Director, Kerala Wood Industries Ltd., Calicut	"
5.	Shri A. K. Kaderkutty, Managing Director, Western India Plywoods Ltd., Ballapattom	"
6	Director, Kerala Forest Research Institute	"

The Executive Committee met four times during the year

CAMPUS DEVELOPMENT

The Institute campus is located at Peechi in 28.174 ha. of forest land leased out by the Kerala Forest Department for a period of 99 years Construction of 10 Nos. of Type I quarters entrusted to the Kerala State Construction Corporation (KSCC) is almost completed. The internal fittings/ for the water supply and sanitary arrangements, sewage disposal, etc. are to be carried out. The electrical wiring work is nearing completion. There is thus 61 completed quarters. Construction of another 10 Nos. of Type II quarters has been awarded to the KSCC in February 1984. The Corporation is making preliminary arrangements for starting the construction work.

WATER SUPPLY TO THE INSTITUTE CAMPUS

The work of permanent water supply system to the Campus entrusted to the Public Health Engineering Department is nearing completion. Only the work of purification plant, electrical work in the control room, booster pump house, etc. have yet to be completed. However, the Institute is partially making use of this system. Water from the well is pumped to the temporary water tanks erected on the hilltop and supplied to the quarters, labcratcry, etc. through the distribution lines already laid. It is expected that this work will be got completed by December 1984 or by early January 1985.

ESTABLISHMENT OF SUB-CENTRES

The Institute has a Sub-Centre at Nilambur in 43.358 ha. of forest land leased out by the Kerala Forest Department for 99 years. An office-cum-laboratory building, staff quarters and a rest house have already been got constructed there. The construction of a Type I twin quarters has been taken up during the year and the work is in progress. Necessary experimental plots are being developed on a phased manner at this Sub-centre.

It is proposed to set up a field station at Parambikulam for wildlife studies. A suitable site has been located at Parambikulam for this station and the Forest Department has been approached for allotment of this site.

TEAK MUSEUM AND STUDY CENTRE

The construction of teak museum and study centre at Nilambur has been entrusted to the Kerala State Construction Corporation after executing necessary agreement in this regard.

As per the agreement executed with the Corporation, teak wood required for the building is to be supplied by the Institute. The Government of Kerala was approached to make available 45 cum. of teak wood required for the museum construction free of cost and the Government of Kerala have been pleased to sanction the same.

STAFF

The staff position as on 31-3-1984 is shown in Appendix I.

The offer of appointment for the post of Statistician has been issued to Dr. K. Jayaraman and he is expected to join the Institute shortly. The post of Plant Physiologist and Geneticist could not be filled up so far. Although appointment order for the post of Geneticist was issued to a person, who is working in Canada, he expressed his inability to join the post. The vacancies have been notified again in the newspapers.

Dr. V. S. Vijayan, who was Scientist-in-Charge, Wildlife Division, and Dr. S. K. Ghosh, the Scientist-in-Charge, Plant Pathology (NF) Division, resigned. The vacancies are being notified in the newspapers.

Shri. M. Muhammed Usman, Additional Secretary to the Government of Kerala, continued as Registrar of the Institute.

FINANCE

The budget for 1983-84 approved by the Governing Body was for Rs. 65 lakhs. For the research projects financed by the external agencies, the provision made in the Budget Estimates for 1983-84 was Rs. 3 lakhs. The Government released Rs. 59.96 lakhs during the period under report. The year started with a cash balance of Rs. 5.04 lakhs. The expenditure incurred was Rs. 60.84 lakhs. The cash balance at the close of the year was Rs. 4.16 lakhs.

M/s. Rajan Associates, Trichur, audited the accounts of the Institute for the year. The audited statement of accounts is in Appendix II.

LIBRARY

Acquisition of Documents

The details of books and other documents acquired in the library during the year are as furnished below :

Item		No. acquired during the year	Total acquisition
Books		558	8,938
Photocopies of articles		159	1,020
Reprints		807	3,644
Journals		12	244
Back volumes		320	1,260
	Total	1,856	15,106

Documentation Work

1 Author, title and subject indexes were prepared for 3,000 reprints.
2 All books purchased during the period under report were classified and catalogued and more than 2,000 cards in the card catalogue were interfiled.
3 As a current awareness service, the library news-release was issued every fortnight
4 In connection with the National Seminar on Eucalypts an annotated bibliography on Eucalypts in India was compiled.

BOTANY (PHYSIOLOGY)

Physiol. 01/1979 : Studies on the physiology of vegetative propagation of timber species by rooting stem cuttings.

The project was initiated with the objective of studying the rooting behaviour of stem cuttings of some economically important timber species and the effect of different growth regulators on induction of roots.

Regular trials on rooting stem cuttings of *Tectona grandis* L. f., *Gmelina arborea* Roxb. and *Melia dubia* Cav. (Syn. *M. composita*) were continued. Auxins like IAA, IBA, NAA and other chemicals like coumarin and boric acid were used at different concentrations Cuttings of *G. arborea* responded well to treatment giving root induction varying from 40-60%. Another interesting feature noticed with this species was that the cuttings taken from trees at the time of flowering sprouted in the nursery beds and flowered the same year. In the case of teak although more than 80% of the cuttings sprouted the percentage of rooting obtained was very poor (less than 20% depending on season and treatment). In the case of *M. dubia* also a similar trend was noticed.

Methods to increase the percentage of rooting in the case of *T. grandis* by ringing of bark before taking cuttings, using young cuttings with terminal bud and leaves in tact, and keeping cuttings in the trench covered with polythene did not show any improvement in getting a higher percentage of rooting response. Cuttings from the coppice shoots also did not show any advantage over the branch cuttings. As the age of mother plant is also known to have an influence on the rooting tree species, teak cuttings for treatment were collected from trees in plantations of different age groups. These are under observation and the experiment is being repeated every month.

Physiol. 02/1979 : Investigations on the possibility of vegetative propagation of bamboos and reeds by stem cuttings.

The report for this project has been written up and is being processed for publication.

In brief, the results indicate that it is possible to propagate the following species of bamboo and reed vegetatively using stem cuttings. The percentage of success depends on various factors like growth regulating substance used, method of treatment, season, nature of material and method of planting.

1 *Bambusa arundinacea* (Retz) Wild.
2 *Bambusa balcooa* Roxb.
3 *Bambusa vulgaris* Nees. Schead

4 *Dendrocalamus strictus* Nees.

5 *Oxytenanthera bourdelloni* Gamble

6 *Ochlandra scriptoria* C. E. C. Fisher

Of the three types, culm cuttings, branch and nodal material used for propagation, double noded culm cuttings were found to be the best. Suitable months for maximum sprouting varied from species to species. However, in general, summer months from February to May were the best. In the case of reeds the monthly variation in rooting was very striking. *Ochlandra travancorica* and *O. scriptoria* failed to root during the months of July to January whereas during February to June the rooting response varied from 10-50 per cent.

Physiol. 03/1979 : Studies on the physiology of induction of flowers in teak and eucalypts.

The objectives of the study are (a) to induce flowering before the stage of natural flowering and (b) to study the effect of certain growth regulators and physical treatments like, girdling, etc. on growth and development of young seedlings.

Seedlings of *Eucalyptus tereticornis* and *E. grandis* were polypotted and after 10 months they were subject to various treatments like bark ringing, spraying with GA_3, growth retardant like CCC and 'Alar' to induce flowering. The treated plants are being observed regularly.

Other activities

1 A suitable area was selected at Vazhachal for a field trial on vegetative propagation of reeds through culm cuttings in collaboration with the Silvicultural Research Wing of the Forest Department. About 1,200 cuttings of *Ochlandra travancorica* were suitably treated and available ones used to plant in area of about 2 hectares.

2 Trials were conducted to ascertain whether treatment with growth hormones would help in enhancing rooting percentage of the stumps of *E. tereticornis* for the project Silvi. 04/81.

3 Culm cuttings of about 10 species of bamboos collected from different localities of Kerala were treated with growth regulators for inducing rooting and rooted ones planted in the Bambooteaux at Nilambur for the Project Silvi. 07/81.

BOTANY (TAXONOMY)

Bot. 01/1979 : Studies on the medicinal plants of Kerala forests.

The objectives of the Project are (a) listing of medicinal plants, (b) habitat studies of some selected medicinal plants, (c) collection and display of samples of raw materials and (d) organization of a live collection of medicinal plants.

Information on properties, uses, distribution, description and local names of 569 species of medicinal plants were collected. Medicinal plants from Manantoddy and Munnar were collected and added to the live collection maintained in the Institute. Data on soil types and climatic actors are being incorporated. The report is under preparation.

Bot. 02/1979 : Establishment of an orchidarium in the Institute

The objectives of this project are collection, identification and cultivation of orchids of Kerala forests in the Institute campus.

It has been enumerated that 171 species of orchids belonging to 61 genera are so far recorded from Kerala State. These include *Pomatocalpa marmoratum* (Reich f.) J. J. Sm., *Dendrobium mabelae* Gamme, *Smithsonia maculata* (Dalz.) Saldanha and *Gastrochilus klabelliformis* (Blatt & McCann) Saldanha, which are new records from Kerala. Specimens of about 80 species have been deposited in the KFRI herbarium. A live collection of about 70 species are being maintained in the Peechi campus. This include 13 species known to be of medicinal value. The remaining, about 90 species, are yet to be collected. The great height of the trees on which they occur, pose problems for their collection.

Bot. 03/1980 : Distribution of important forest tree species in Kerala (Central Circle)

The objectives of this study are (a) collection of data on the distribution of important forest tree species of Central Circle, (b) to resolve nomenclatural problems and (c) preparation of distribution maps.

The specimens collected from field trips are being accessioned into the herbarium. Specimens of about 300 species available at the University College Herbarium, Trivandrum, were consulted and indexed. A draft report of the Project is being prepared based on available literature, field observations and specimens available at different herbaria.

Bot. 04/1982 : Establishment of a herbarium in the Institute.

The objective of this project is to build up a herbarium of flowering plants of the Kerala State. Collections made from various forest divisions were incorporated in the herbarium. There are about 3,200 specimens now available in the herbarium mostly of Angiosperms.

Bot. 05/1982 : Morphological, anatomical and physical properties of *Calamus* spp. of Kerala forests.

The objectives of the study are to prepare a key for the identification of *Calamus* species based on morphological, anatomical characteristics and to study the basic density variation along the stem.

Specimens of *Calamus* were collected from various forest Divisions. Out of eight species collected, five were identified : *Calamus thwaitesii* Becc. Var *canarana* Becc., *C. pseudotenius* Becc., *C. hookerianus* Becc., *C. gambleii* Becc. and *C. travancoricus* Bedd. Specimens of *C. caesius* Bl., a cultivated Malaysian species introduced in Kerala by the Forest Research Institute & Colleges, Dehra Dun, were also collected from a single plant (possibly male because it has not yielded any fruits) growing in the Forest Rest House compound at Malayatoor.

Measurement of internodal length and diameter and determination of basic density of all specimens (all the above species) collected were completed. Anatomical studies were completed for *C. thwaitesii* and *C. travancoricus* and are in progress for the other species.

Seeds collected from three species - *C. hookerianus*, *C. thwaitesii* and *C. travancoricus*- were sown in nursery beds. The seeds from the first two species germinated while the seeds of *C. travancoricus* did not germinate. Stratification in moist saw dust for about 2 weeks was found to hasten the germination in both the species. The seedlings were transferred to polybags and would be field planted in the next rainy season. Suckers and/or seedlings (naturally occuring) were collected when seeds were not available and used for establishing a small live collection of different species.

Bot. 06/1983 : Preservation of *Dalbergia* L. f. in Kerala by establishment of a germplasm bank.

The objectives of this project sponsored by the Department of Environment, Government of India are (a) collection of live materials of all species of *Dalbergia* occurring in Kerala, (b) identification of various species under the genus, (c) raising a live collection of the genus in the institute, (d) preparation of a taxonomic account with dichotomous keys and illustrated descriptions and (e) preparation of a distribution map.

A checklist of the species of *Dalbergia* available in the State was prepared from literature, which was subsequently supplemented by the scrutiny of herbarium records. Specimens in various herbaria were consulted so as to gather information on their localities of occurrence, and flowering and fruiting periods to facilitate collection work. Based on this, survey was conducted in the various forest divisions. Both herbarium materials and seeds of *D. latifolia* *D. lanceolaria*, *D. sissoides* and *D. volubilis* were collected. Seedlings of *D. torta* were collected and are being grown. Herbarium specimens of *D. rubiginosa*, stem sample of *D. sissoides*, and *D. multiflora* and both stem samples and herbarium materials of *D. volubilis* were collected. Steps are being taken to germinate the seeds collected for raising seedlings to maintain a live collection Herbarium specimens are also being prepared from the collected materials of different species for taxonomic studies.

Extension work

Medicinal plants were supplied to Amala Hospital, Trichur; to the Conservator of Forests, Calicut, and to the Pharmaceutical Corporation, Kerala.

Other activities

1 Several medicinal plant species were planted in the high altitude experimental garden for medicinal plants at Devicolam.

2 As a part of the afforestation programme 125 mahagony saplings were planted in the Institute campus at Peechi. Seedlings of *Pterocarpus marsupium*, *P. Santalinus* and *P. indicus* were raised for experimental purposes at Peechi.

3 The Division projected the institute's work in the Exhibition in connection with the Silver Jubilee Celebrations of Sree Rama Polytechnic at Triprayar during December 1983 and won the first prize for 'Best display'.

ECOLOGY

Ecol. 01/1979 : Preparation of a soil-cum-vegetation map of the forests of Trichur Forest Division.

The objectives of this study are (a) mapping of various soil types with emphasis on topography, drainage, structure, texture, depth and land use pattern (b) mapping the present stage of natural as well as transformed vegetation types and (c) standardisation of nomenclature of the forest types.

Field work pertaining to this project is over. Sixteen soil profiles and fortyfour soil pits (total 232 soil samples) in natural forests and forty five soil pits in plantations (total 135 soil samples) were taken. Vegetational data from forty four moist deciduous and three semi evergreen forests were gathered.

Analysis of soil and vegetational data are in progress.

Ecol. 02/1979 : A field key to the identification of indigenous arborescent species of Kerala based on eco-taxonomic features.

The project aims at the preparation of a key to facilitate easy identification of arborescent species in the field.

The work under this project has been completed and the final report is being written.

Ecol. 03/1979 : Ecotaxonomic study of the seedlings of commercially important species of Kerala and preparation of a key for their identification.

The objectives of this study are to prepare an identification key of seedlings of different species of commercial importance, because such identification of species at seedling stage is of paramount importance during natural regeneration operations.

The work under this project has been completed and the report is being written.

Ecol. 04/1980 : Phenological studies in the representative evergreen forests of Kerala.

The objectives of the study are (a) to determine the frequency and the peak season for flowering, fruiting and defoliation of principal arborescent species, (b) to correlate this data with local climate and (c) to quantify the total production of flowers, fruits and leaf litter. The data thus generated would be useful for understanding the autecology of the species and in the management of evergreen forests.

Field work pertaining to this project is over. Litter collection for over three years was made, oven dried as per the standard procedure and stored. Analyses of data have been taken up.

Ecol. 05/1982 : Species relation studies in the moist deciduous forests of Trichur Division.

The main objective of the study under this project is to work out the relative proportion of the diffrent species with in a community in the area as observed in natural condition.

Field work pertaining to this project is almost completed. Data from 276 vegetational plots were collected and analysis of data is in progress.

Ecol. 06/1983 : Impact of selection felling in a forest ecosystem in Kerala.

This project has been sponsored by the Department of Environment, Government of India. The study area is in Nemmara Division, where an area of 55 ha. at Pothumala felling series in Nelliampathy range is proposed to be worked under selection system.

An area of 11 ha out of this 55 ha. has been demarcated and sanction obtained from the Forest Department for long term monitoring and to serve as a bench mark. Simultaneously an area of 4 ha. to be felled were also demarcated and the trees within this area were noted. Areas where felling had taken place earlier were also surveyed. The number of trees and names of species to be extracted from this coupe were also gathered from the marking register maintained at the Divisional Forest Office.

Other activities

The Division is associated with project Wild 03/1980 - Long term environmental and ecological impacts of multipurpose river valley project - A comprehensive study in Western Ghats - Wildlife studies.

ECONOMICS

Econ. 02/1982 : A socio-economic study of farm forestry in Kerala.

The main objective of the study is to identify the socio-economic factors that influence the cultivation of tree crops in the homesteads and house compounds in Kerala. The following works were undertaken.

1. Three villages falling in three different agro-climatic regions in Trichur District were selected.
2. Maps on agriculture land use highlighting the distribution of area between wet-land and dry-land were prepared.
3. With the help of the M. Phil students from Centre for Development Studies a preliminary household survey was undertaken. Based on the experience gained during the survey, the questionnaire for detailed survey was modified.

The detailed survey and analysis of data are being carried out.

Econ. 03/1982 : Rural institutions for development of appropriate forestry enterprises : A case study of collection processing and marketing of reeds in Kerala.

This study is intended to supply illustrative materials for preparation of a conceptual framework and guidelines for development of appropriate forestry enterprises by FAO.

The following aspects of the traditional reed industry focussing attention on the institutions involved were studied.

1. Background of the reed-based industries in Kerala giving details of the various activities, their origin etc.
2. Formation of Institutions such as the Kerala State bamboo Corporation and Co-operative Societies.
3. Technological aspects of reed industry.

4 Economic aspects.
5. Organisation aspects of institutions
6. Institutional aspects.
7. Social aspects of the workers involved in reed industry.
8. Appropriateness of technology and institutions.
9 Conditions necessary for success of institutions transferability and adaptability and recommendations.

The final report (KFRI Research Report 18) was submitted to the Food and Agriculture Organisation in October 1983.

Econ. 04/1982 : Studies on intensive multiple use forest management in the tropics : Tropical rain forests and teak plantations in Kerala.

This study was undertaken on the request of the FAO to enable them to get a comparative picture of forest management in representative countries in the three important tropical forest regions. The main aspects dealt with in the study are as follows

1. A background of Kerala highlighting forests and forestry in the State.
2. A detailed description of forests in the study area. namely Quilon District.
3. History of forest management.
4. General description of forest management especially the planning and implementation of various forestry activities, the legal framework etc.
5. Management of evergreen forests for different objectives.
6. Management of moist deciduous forests and teak plantations.
7. Critical evaluation of management highlighting constraints in multiple use management.
8. Conclusions and recommendations.

The draft report was submitted to the FAO. After incorporating the suggestions from FAO and the Institute's Editorial Committee, the final report (KFRI Research Report 22) was submitted to the FAO in March 1984.

ENTOMOLOGY

Final reports on the following research projects were published.

Entom. 04/1979 : Preliminary investigations on the biology and control of beetles damaging stored reed (KFRI Res. Report 19 : 35 pp.)

Entom. 07/1979 : A survey of beetles damaging commercially important stored timber in Kerala (KFRI Res. Report 10 : 92 pp.)

Entom. 08/1979 : Seasonal incidence, host range and control of teak sapling borer, *Sahyadrassus malabaricus* (KFRI Res. Report 16 : 36 pp.)

Entom. 02/1977 : Studies on the seasonal incidence of teak defoliators and the effect of defoliation on volume increment of teak.

Experimental work on this project has been completed. Analysis of data is in progress. Final report will be prepared as soon as this is completed.

Entom. 05/1977 : Biology and control of insect pests of fast-growing hardwood species.

Experimental work on this project has been completed. Final report will be prepared as soon as the work on the analysis of data is completed.

Entom. 09/1983 : Seasonal incidence and possible control of important insect pests of *Ailanthus triphysa* in Kerala.

This project aims to study the seasonal incidence of major insect pests of *Ailanthus triphysa* to identify and evaluate the role of parasites and predators and to explore the feasibility of developin g suitable control methods.

Six plots of 100 plants each were marked out in a 2-year old *Ailanthus* plantation at Pothuchadi in Peechi Range for regular observations. Two important insect pests noticed during the study are *Eligma narcissus* and *Atteva fabriciella*. The incidence of these two pests was high during the period, August - December 1983. Caterpillars of *Eligma* feed on all leaves of *Ailanthus*, whereas the larvae of *Atteva* prefer tender leaves near the growing portion. The attack by these two pests was not severe during the period under report. In the natural population, many larvae and pupae of these pests were found killed due to parasites, fungi or bacteria. Dipteran parasites (sent for identification) from *Eligma* larvae, nematode parasite (sent for identification) from *Atteva* and a fungus, *Paecilomyces farinosus* (identified by CMI) causing mortality of both *Eligma* and *Atteva*, and a bacterium (sent for identification) specifically infecting and killing *E. narcissus* are some of the natural control agents. The fungus and bacterium were isolated and cultured in laboratory. These two appear to be effective as potential biological control agents.

Further observations on the incidence of these pests and their control aspects are being continued.

Entom. 10/1983 : Studies on the natural enemies of the teak pests, *Hyblaea puera* and *Pyrausta machaeralis*.

The objective of this project is to gather information on various species of natural enemies associated with teak pests, *Hyblaea puera* and *Pyrausta machaeralis* in Kerala.

Fortnightly observations were made in three sites at Nilambur, viz. Nedungayam, Aravallikkavu and Kariem-Muriem. Defoliation level of the plantation was visually scored to correlate it with the incidence of pest attack. A maximum of 100 individuals of the avilable developmental stage of the two pests were collected and parasites emerging from them were recorded. Predatory insects were also collected.

The following natural enemies were found on *Hyblaea*. (1) *Palexorista solennis* (Walker) Family : Tachinidae): Recorded from late larval stages of the host, at all the three sites during June to October. The percentage of parasitism varied from 2-38. (2) Ichneumonid wasp (unidentified) : Recorded from Aravallikkavu infesting middle larval stages. Three to 31% of host larvae were found infested in July and August. (3) Braconid wasp (unidentified) : Recorded from Aravallikkavu. It was found to infest 21% of the larvae in September. (4) Chalcidoid wasp (unidentified) : Recorded from Kariem-Murieum and Aravallikkavu; they were found to infest first or second instar larvae of *Hyblaea* and the percentage of parasitism ranged from 10 to 56. (5) *Parena* Sp. (Carabidae : Coleoptero) : The beetle larvae were occasionally observed feeding on *Hyblaea* larvae. (6) Pentatomid bug (unidentified) : Nymphs and adults of this bug were found to predate on larvae. (7) *Birds* : Five species of birds, viz. House crow, Jungle crow, Common mynah, Black drongo and White headed babbler have been found to feed on *Hyblea* larvae.

The following natural enemies were found on *Pyrausta machaeralis* (1) *Ichneumonid* Sp : In one infested sample studied, 15.5% parasitism was found. (2) *Apanteles* Sp Recorded from one host larvae.

The study is continuing.

Entom. 11/1983 : A study of insect pest incidence in natural forest.

It is generally assumed, that pest outbreaks do not occur in tropical forests because of natural biological equilibrium. This project envisages a study of pest incidence in natural forests to test the above assumption and to throw light on factors which control the development of pest problem.

Two representative sites of moist deciduous forest were selected, one near Vazhani dam and the other across Peechi dam. Since no suitable evergreen forest could be located in Trichur Division, Two evergreen plots were selected at Sholayar. Twenty species of trees were selected from each forest type for study. Monthly observations were made and the insect defoliation intensity scored visually. Wherever possible, insects causing damage were collected and reared for identification.

All tree species in both forest types suffered leaf damage, but in most the damage was negligible. Over 5% leaf loss was noticed only in *Grewia tiliaefolia*, *Haldina cordifolia*, *Tectona grandis* and *Odina wodier* in the moist deciduous forest and none in the evergreen forest. *Mesua nagassarium*, in the evergreen forest was found damaged by trunk boring beetles.

The study is continuing.

Entom. 12/1983 : Search for resistance to the insect pest, *Hyblaea puera* in teak.

The objective of this study is to locate natural resistance, if any, to the teak defoliator *Hyblaea puera*.

Observations made in the seed orchards at Arippa, Palappilly and Nilambur, which together represent 30 clones of plus trees collected by the Genetics Division of KFRI, did not indicate any appreciable degree of resistance in any of the clones.

In plantations, on the other hand, some trees were found to escape defoliation in the midst of other susceptible trees. Fortysix such potentially resistant trees were marked altogether from plantations at Kulathupuzha, Ranni, Nilambur, Parambikulam, Neriyamangalam and Wynad. Early flushing is suspected to be the reason for the observed escape from defoliation. Field observations will be continued in the 1984 defoliation season to establish their resistance potentiality.

Laboratory rearing techniques were standardised for maintaining cultures of *Hyblaea puera* in order to develop resistance screening thaoniques. Initial success has been obtained in continuous laboratory rearing.

GENETICS

Genet. 01/1979 : Genetic improvement of teak in Kerala

Improving the genetic quality of seeds used for raising plantation in the State will have a marked influence on enhancing the quality and quantity of timber output. This project aims

at enhancing the supply of quality seeds by establishment of seed orchards. The final report on the project has been processed for publication.

Genet. 02/1979: Improvement of eucalypts by selection and interspecific hybridisation.

The project was initiated with the objective of genetic improvement of eucalypts through selection and hybridisation.

Eucalyptus grandis plantations at Peermadu, Pamba and Vallakkadavu areas were surveyed and 20 plus trees selected. Data on height, girth, etc. were collected. Seeds from some of these trees have been collected. From the remaining trees also seeds will be collected soon. These will be used for establishing a progeny trial. It was not possible to proceed with collection of seeds due to difficulty in climbing the trees. It is planned to collect the seeds when the trees are felled for the purpose of pulp wood shortly.

E. tereticornis plantations under heavy disease pressure were surveyed and trees free from infection of *Corticium* and *Cylindrocladium* have been selectsd. Seeds will be collected from these trees and progeny raised and tested for their resistance. Selection of more plus trees and establishing of progeny test will be continued. Seedlings of *E. grandis* provenances showing resistance to *Corticium* and *Cylindrocladium* have been raised in plots for attempting controlled crosses between the provenances.

Genet. 03/1979 : Genetic improvement of match wood species, *Bombax ceiba* and *Ailanthus triphysa*.

The objective of the project is to increase wood yield and improve quality of match wood from these species.

The seeds of *Bombax ceiba*, and *B. insigne* collected from trees of different areas were sown in nursery and seedlings raised. Comparative study on seedling characteristics is in progress. Arrangements have been made for their field planting.

The seeds of *Ailanthus* collected from the plus trees were sown in nursery beds and later transplanted in polybags. Comparative study of the progeny is in progress. Areas for field planting and lay out designs have been prepared.

Genet. 04/1979 : Provenance trials and floral biological studies in *Gmelina arborea*

This project aims at detailed study of the floral biology of the species and selection of the ideal provenance for Kerala conditions.

Studies were made on phenology and variations in leaf and floral characters as expressed in the different provenances raised at Nilambur. Further studies are in progress.

Genet. 05/1982 : Management practices for teak seed orchards.

The project envisages to evolve a package of practices for the management of teak seed orchards in Kerala.

The Institute has already set up seed orchards at Nilambur, Palappilly and Arippa. Operations like weeding, pruning, protection, etc., were carried out. Manuring, irrigation, etc. were also carried out. Soil samples were collected from the orchards and were analysed. Based on the results of soil analysis, further management strategies will be planned.

Other activities

1. **Plus tree month :**

In order to mobilise selection of plus trees of the different commercially important trees in Kerala, a plus tree month was organised in April, 1983. During this month the forest department staff were given literature on plus tree selection and requested to select candidate plus trees and report to the Genetics Division. A number of reports have been received covering different species. Checking of these trees and approval, when found suitable, is in progress.

2. **Progeny trials of** *Bambusa arundinaceae*

Seeds have been collected from individual clumps separately (15 clumps) and progeny raised in polybags. Measurements on height and number of culms are taken. The plants will be planted out as trial in June, 1984.

3. For the project on breeding for resistance to *Hyblea puera* assistance was given to Entomology Division. Located about 50 trees free from attack of *H. puera* in various parts of Kerala. Observations were made on their continued performance. Studies were also made on the resistance/susceptibility of plus trees included in the seed orchards to *H. puera*.

Necessary assistance was given to the Forest Department of Kerala in the selection and maintenance of teak seed stands in various parts of Kerala.

PLANT PATHOLOGY (FUNGAL DISEASES)

Pathol. (F) 01/1979: Survey of representative plantations in the State for leaf, stem and root diseases of forest trees and assessment of level of infection.

The project has been taken up with the objective of preparing a checklist of pathogens responsible for causing various diseases in plantations of eucalypt, teak, balsa, rosewood, *Gmelina arborea*, *Bombax ceiba* and *Ailanthus triphysa*, and to assess the level of infection of major diseases.

During the reporting period, third and final observations on the occurrence of various diseases and their level of infection was completed in all the plantations. A few new diseases were recorded from all the tree species under study. Taxonomical characters of 63 isolates and 26 herbarium specimens were studied and referred to Commonwealth Mycological Institute, U. K. (CMI), for authentic identification. Authentic identification of a total of 58 fungal isolates, 2 bacterial isolates and 21 herbarium specimens were received from CMI.

Field studies

i) Field observations on the incidence of *Corticium salmonicolor* on *E. grandis* were recorded in experimental plots at Periya and Noolpuzha and data analysed.

ii) Analysis of field survey observations was initiated.

Lab studies

i) Taxonomical characters of 35 fungal isolates and 2 herbarium specimens were studied and referred to the Commonwealth Mycological Institute, U. K. (CMI), for authentic identific-

ation. Confirmed identification of 25 isolates and 2 herbarium specimens were received from CMI.

ii) a. Pathogenicity of *Colletotrichum gloeosporoides* on *Ailanthus triphysa, Dalbergia latifolia, Gmelina arborea, Tectona grandis; Myrothecium roridum* on *Bombax ceiba; Cytospora* on *E. tereticornis; Phomopsis* Sp. on *T. grandis, Fusarium moniliforme* and *Calonectria rigidiscula* on *Ochroma pyrimidale; Phialophora richardsii* on *Tectona grandis* was confirmed.

b Pathogenicity of *Rhizoctonia solani* on seedlings of *A. triphysa*, *B. ceiba, B. insigne; Sclerotium rolfsii* on seedlings of *Swietenia macrophylla, B. ceiba* and *B. insigne; Coniella granati* on *Eucalyptus* Spp. and an unidentified bacterium on *T. grandis* was confirmed.

c Pathogenicity of *Cryphonectria gyrosa* and *C. cubensis* was tested on 30 different eucalypt types (species and provenances) but it needs to be repeated.

iii) Studies on 47 different provenances of *Eucalyptus* :

a. Height measurements were taken.

b. Toxin bio-assay technique for testing the relative susceptibility of various eucalypts to *C. salmonicolor* was standardized. Twenty three different provenances were tested against two isolates of *C. salmonicolor* (one each from *E. grandis* and *E. tereticornis*) and data analysed statistically.

iv) Thirty different diseased materials were processed for histopathology and slides prepared and observations recorded.

v) All the stock cultures were subcultured.

Pathol. (F) 02/1979 : Epidemiology of *Cylindrocladium* associated with leaf blight and its control using soil fumigants and systemic fungicides.

The important objectives of the study are to identify (1) the prevalent species of *Cylindrociadlum* in Kerala and its distribution, (2) the host-pathogen relationship, mode of infection, survival capability and genetic variability in the pathogen, (3) the diurnal and seasonal variations in the incidence of conidia and its relation to disease severity and climate and (4) to identify appropriate chemical control methods.

Laboratory studies

1. Screening of 45 different eucalypts (species and provenances) against *C. ilicicola* was completed.
2. Studies on *in vitro* germination of conidia of *C. quinqueseptatum* and factors affecting (temperature and pH) were completed.
3. Studies on *in vivo* germination and infection by conidia of *C. quinqueseptatum* using light microscopy was completed. For light microscopy fixing, clearing and staining of infected leaf tissue was standardized using pyridine - lactophenol cotton blue. Preliminary trials were done on the fixing of the material for SEM. Specimens for SEM were prepared and sent to Madurai Kamaraj University and photographs received.

4. Studies to ascertain genetic variability in isolates of *C. quinqueseptatum* :

   a. From over 25 isolates of *C. quinqueseptatum*, 10 isolates were selected on the basis of cultural and morphological characters.

   b To further distinguish the strains an intensive growth study involving 10 growth media was initiated and observations on microsclerotial production, sporulation, colony characters, linear growth, etc. recorded.

   c. The effect of 11 carbon sources, 13 nitrogen sources on the growth of five selected strains of *C. quinqueseptatum* completed.

   d. Relative susceptibility/resistance of 15 eucalypts, selected as differentials to recognize strains, was tested agsinst five isolates of *C. quinqueseptatum* employing detached leaf culture technique standardized earlier.

5. An experiment to study the survival capacity of microsclerotia of *C. quinqueseptatum* under different soil conditions was initated and isolations made.

Field studies

1. Third and final trial for controlling nursery diseases and standardizing nursery practices was completed and seedlings outplanted in 1 ha. area at Chandanathode.
2. Height measurements were taken at Vattappoil *E. grandis* plantation.
3. Aerobiological studies at Mullaringad in *E. tereticornis* plantation were completed.

Pathol. (F) 03/1982 : Diseases of *Albizia flacataria* in Kerala and their possible control measures.

The project has been taken up with the objective of preparing a checklist of prevalent diseases of *Albizia* in nurseries and plantations, assessing the level of infection of serious diseases and to suggest control measures for diseases of major concern.

Field studies

1. Observations on disease incidence in *Albizia* plantations at Punalur, Arippa, Kattilappara, Vamanapuram, Keezhayam, Kulathirumed and Perintholy continued. Observations at Kattilappara and Keezhayam are being recorded in specially selected plots every three months to monitor the spread of die-back disease.

2. a. To confirm the pathogenicity of *Botryodiplodia theobromae* during dry period (February), stem and roots of *A. falcataria* were inoculated at Kattilappara plantation where the disease already exists.

   b. Inoculations with *B. theobromae* were also made on 1-year-old *A. falcataria* plants.

   c. Pathogenicity of *Phomopsis mandax* was tested on 1-year-old *A. falcataria* plants and results recorded.

Laboratory studies

1. Pathogenicity of *Robillarda sessilis* was tested.
2. Thirteen fungicides were screened against *Rhizoctonia solani* causing web blight disease of *Albizia* in nurseries employing soil and poison bait methods.

Other activities

1. Extension work Sixteen disease problems in various host species were referred to this Division by the Kerala Forest Department, and two by UPASI. Wherever possible the affected nurseries/plantations were visited and diseased specimens collected. On the basis of isolations and other studies in the laboratory, recommendations for the remedial measures were sent.

PLANT PATHOLOGY (NON-FUNGAL DISEASES)

Pathol. (NF) 02/1979 : Studies on the little leaf disease of eucalypts.

The objectives of the study are (1) to find out the nature of causal agent of the disease and its mode of transmission, and (2) to develop a method of detection of diseased trees in the field.

The disease could not be transmitted through different methods of grafting or by dodder. Though *Cuscuta* spp. survived on healthy eucalypts, it failed to establish properly on diseased eucalypts. Attempts to root stem cuttings from diseased plants also failed.

When thin cross sections of root, stem and leaf were stained with fluorochromes such as aniline blue, golden green, fluorescence in the phloem region of diseased sections were observed. Characteristic blue colouration in the phloem was also observed in diseased tissue only, when stained with Dienes' stain, which is specific for mycoplasmas. These staining reactions could be successfully used for the routine diagnosis of little leaf disease caused by mycoplasma-like organisms (MLOS)

In general anatomical studies, phloem necrosis and excessive formation of phloem were observed in diseased tissues only thereby giving an indirect evidence for the phloem borne nature of the causal agent. Electron microscopy revealed the presence of MLO in sieve tube elements in low concentration. No virus, bacteria or fungi could be observed. Tetracycline therapy using tree injection method gave temporary remission of the disease for 60 - 90 days.

Based on these studies it is concluded that a mycoplasma like organism is involved in causing little leaf disease of eucalypts.

Pathol. (NF) 03/1980 : Studies on the spike disease of sandal.

This study aims at the isolation, characterisation and identification of the causal agent and at evolving possible control measures for the spike disease of sandal.

Histopathological studies using fluorescent stain, aniline blue showed more number of fluorescent spots in diseased phloem tissue than in healthy phloem. Hoechst 33258, a DNA binding fluorochrome could also be successfully used to differentiate the diseased tissue from healthy tissue.

Tree infusion method developed in this division could successfully be used for infusing tetracycline antibiotics into diseased trees. All the tetracyclines gave disease remission for 4 months, after which the disease re-appeared. Chemicals like Digitonin and Guanidino dodecane acetate also gave disease remission for 4 months. Higher dose of tetracycline hydrochloride gave prolonged

remission for 7-8 months. Higher dose upto 8 g/tree did not give any phytotoxic symptoms, where as 12g of tetracycline HCl/tree caused phytotoxicity Combinations of different tetracyclines failed to induce any prolonged remission. Repeated infusions of tetracyclines also failed to produce any long lasting remission.

Monitoring the spread of spike disease at Marayoor Range indicated that a tree takes 17-20 months to get killed after it gets infected.

Pathol. (NF) 04/1982 : Root nodulation potentialities of *Leucaena leucocephala* (Subabul) in Kerala.

The project has been taken up with the objective of acquiring and isolating suitable rhizobial strains and to investigate their effectiveness on the grorth of *Leucaena leucocephala*.

Nursery trials had been carried out in Nilambur and Peechi by raising seedlings from seeds pelletted with six *Rhisobium* isolates collected from Kerala soils and seven isolates obtained from other national/international type culture collection centres. The results confirmed that seedlings raised from *Rhizobium* pelleted seeds gave more biomass (based on the oven dry weight of the seedlings). The number of nodules were also more in seedlings raised from inoculated seeds than in control seedlings. Local strains were found equally efficient compared to the best exotic isolates reported suitable for Kerala soils.

Other activities

The Division is also associated with the project. Wood 05/80: 'Natural durability of commercial timbers of Kerala with reference to decay'.

SILVICULTURE

Silvi. 01/1977 : Silviculture and management of fastgrowing indigenous hardwood species with multiple end uses.

The important objectives of this project are (a) to study natural variability and to locate good seed stands of *Gmelina arborea, Anthocephalus chinensis* and *Melta dubia* (Syn. *M, composita*), (b) to study seed viability and standardise nursery practices, and (c) to provide technical guidance to raise plantations.

The data collected with regard to *Gmelina arborea* provenance trials had been compiled and the final draft report is under preparation.

Silvi. 02/1977 : Study of afforestation techniques in the grasslands of Kerala.

The main objectives of the project are (a) to carry out field trials to identify commercially valuable species for afforestation and (b) to standardise economic methods for raising plantations.

Draft of the final report has been prepared and is being processed for publication.

Silvi. 04/1981 : Studies on stump as planting material for *Eucalyptus tereticornis* plantations.

The objective of the project is standardisation of the practice for raising plantations of *E. tereticornis* with stumps as planting material.

The plots laid out in previous year were maintained and relevant observations taken.

A plot was laid out during June 1983 incorporating the following treatment parameters that were found advantageous in previous year for stump planting.

1. Three lengths of stump
   15 cm shoot 5 cm root
   10 " 2.5 "
   10 " 5 "

2. Storage in pits for 11 days
   " sheds for 4 days
   " sheds for 11 days

Regular observations were taken.

Silvi. 05/1981 : Studies on the effect of slash burning on planting site for teak.

The objective of the study is to find out whether slash burning is necessary at all on planting site and if necessary, to evolve a practice of slash burning which is acceptable with respect to most of the positive effects with special reference to (a) rate of growth, (b) soil properties and (c) weed growth.

The tapioca planted was not seen interfering with growth of teak. The growth of teak showed that the treatment 'No burning with taungya' gave maximum height. This was followed by 'Reduced slash burning with taungya' and 'Full slash burning with taungya'. 'Full slash burning without taungya' gave the least value. Weed growth was almost same in all the treatment plots.

Silvi. 06/1981 : Estimation of quantity of eucalypts seeds for sowing in nurseries.

This project is intended to evolve a suitable method to determine the germinability of seeds and prefix the quantity of seeds of *E. tereticornis* and *E. grandis* to be sown in a standard bed.

Observations were taken. It was found necessary to repeat the trial. This is proposed to be done in August-September 1984.

Silvi. 07/1981 - Establishment of a Bambooteaux in the Institute.

Collection, identification and establishment of Indian species of bamboo are the main objectives of this project.

The following species were added to the collection in the bambooteaux during the year.

1. *Bambusa arundinacea*
2. *Dendrocalamus strictus*
3. *Bambusa vulgaris*
4. *Dendrocalamus longispathus*
5. *Ochlandra travancorica*
6. *Ochlandra scriptoria*
7. *Thyrsostachys oliverii*
8. 'Arayambu' (from Sholayar)
9. *Bamboosa polymorpha*

Other activities

In Nilambur Sub-centre the following plots were laid out with the objective of having small sample plots of different species within the campus.

Sl. No.	Species	Espacement	Plot size
1.	*Dalbergia latifolia*	2m x 2m	0.108 ha.
2.	*Hopea parviflora*	2m x 2m	0.11 ,,
3.	*Luecaena leucocephala* *Luecaena diversifolia* *Eucalyptus citriodora*	2m x 2m	0.11 ,,
4.	*Chukrasia tabularis*	2m x 2m	0.11 ,,
5.	*Pinus caribaea* and *Pinus oocarpa*	2m x 2m	0.02 ,,
6.	*Acacia mearnsii*	2m x 2m	0.01 ,,
7.	*Liquidambar formosona* *Acacia nilotica*	2m x 2m	0.02 ,,
8.	*Tectona grandis*	2m x 2m	0.01 ,,
9.	*Koelreuteria apiculata*	2m x 2m	0.02 ,,
10.	*Leucaena luecocephala*	2m x 2m	0.17 ,,

Location, sketches and plot charts of all the above sample plots and 17 other plots laid out in previous years in the subcentre were prepared and kept in file together with details such as date of planting, espacement, size of the plot, type of propagule used for planting, preparation of the planting site, manurial application etc.

Study of the effect of lime, farm yard manure and Mussorie Phos on growth of *L. leucocephala* (Silvi/Soils/1981 trial)

The crop was harvested during June 1983. Above ground fresh weight and dry weight were taken.

In treatment where Farm Yard Manure was applied the average above ground air dry weight was 14.45 tonne whereas in control it was 4.26 tonne.

Study of the comparative performance of different eucalypt species (also provenances)

Twelve species of eucalypts with a total of 37 provenances were planted during September 1983.

Evolving a relationship between stump girth and size of the teak trees.

Measurement such as height, girth at various heights (i. e. base, 25 cm, 75 cm, 100 cm, 125cm, 137 cm) from the ground level of plants of 4 age groups (in 4 localities) were taken. This work was carried out as per the request from the Forest Department.

Study of seasonal growth pattern of *Ailanthus triphysa*.

Height measurements of plants under irrigated and non-irrigated conditions were commenced from November 1982 The measurements were taken on 5th day of every month.

SOIL SCIENCE

Soils. 04/1979 : Influence of site factors in Bombax plantations.

Generally Bombax trees seem to get stunted in plantations and this investigation has the objective to establish whether site factors cause stunting. Surface soil samples (163) were obtained from plantations having stunted and nonstunted Bombax. At each sampling locale, height and girth measurements of five dominant trees were taken. Particle-size, pH, organic carbon, exchange acidity and exchangeable bases analyses were done on all samples. The project has been completed and the report published in September 1983.

Conclusion : Though the monsoonal climate in Kerala is congenial to Bombax, this study reveals that plantations in central and northern regions do not gain as much height as those in southern region. Stunted and nonstunted stands occur contiguously on subsites with similar physiographic features and above 750 m elevation, height growth is slow. Teak mixing with Bombax does not seem to have any effect on Bombax height while Ailanthus mixing may have an influence. Bombax comes up well in the sandy loam soils of southern but not central region, while stunted plantations of northern region have more silt-clay. The inconsistent trends of mean differences for soil parameters in stunted and nonstunted plantations suggest no clear-cut relationships between tree height and various soil parameters. The feasibility of planting Bombax in central and northern regions where it does not attain sufficient height needs further evaluations.

Soils 06/1981 : Organic matter dynamics in teak and eucalypt plantations.

Besides being a storehouse for several essential elements, organic matter has pronounced influence on the physical, chemical and biological properties of soil. This study aims at evaluating change in the distribution of organic matter in teak and eucalypt plantations due to plantation activities. Study areas were selected in Thora and Karulai for teak, Kadasseri and Tirunelli for eucalypts and Kollathirumed for teak, albizia and eucalypts intermixed. Soil sampling was done at 200 m intervals in a transect of 2.8 km originating from natural forest and running through plantations. At every sampling site, samples from 0-20, 20-40 and 40-60 cm were obtained from a central pit and 15 surface samples were taken within a radius of 10 m from the pit. Organic carbon (OC) analysis was done on all the 1,350 samples. The project has been completed and the report published in December 1983.

Conclusion : At Thora, OC values in teak plantations remain close to that of natural forest and plantation activities have not caused and drastic change in OC content of soils. A decline in OC levels occurs in teak plantations of Karulai sequence and this is attributable to plantations operations in the early stages of second rotation. Eucalypt plantations at Kadasseri have relatively lower contents of OC than that of natural forest and the trend at Tirunelli is opposite. At Tirunelli, well-established root systems of seedling trees and the addition of branches, twigs and leaves after coppicing promote accumulation of OC. Compared to natural forest, higher levels of OC occurs in teak, eucalypt and albizia plantations of Kollathirumed.

Soils 07/1981 : Effect of Mussoorie Phos on the growth of eucalypt seedlings.

Mussoorie Phos (MP), an indigenous rock phosphate, is a recommended fertilise for acidic soils and it has phosphorus and calcium as major and magnesium, ironl sulphur, potassium, zinc, molybdenum and copper as minor constituents. Consonant with the current stress on increasing productivity in forest plantations, this project was initiated to study the effect of MP on the growth of *Eucalyptus tereticornis* seedlings.

An experiment with 0, 25, 50, 75 and 100g MP/Kg of soil was done in sextuplicates on strongly to medium acidic surface soils from four eucalypt plantations. One-month-old eucalypt seedling was grown on 1Kg soil contained in plastic pot for 19 weeks and there was good response to MP inputs as evidenced by the shoot and root dry matter yield. An indepth experiment was conducted in quintuplicates on a medium acidic surface soil conducted in concrete pots of 35 cm height and 25 cm diameter with 0, 50, 100, 150 and 200 g MP/pot at 10, 20 and 30 cm depths. Three-month-old eucalypt seedling was planted in each pot at 20 cm and shoot as well as root were harvested after 19 weeks. A pilot field trial in quintuplicates was run on a medium acidic soil at Arippa with 0, 100 and 200 g MP/seedling and after 20 months height and girth at 30 cm of saplings were measured. The project has been completed and the report is under preparation.

Soils. 08/1982 : Foliar analysis in eucalypts to assess soil test methods for introgen, phosphorus and potassium.

Foliar analysis is a sensitive and practical method for studying mineral nutrition of trees. This investigation aims at evaluating foliar content of NPK in relation to soil test levels. The result would be useful in suggesting fertiliser requirements for eucalypt plantations.

Study sites were chosen in Kondazhi for *Eucalyptus tereticornis* and Muthanga for *E. grandis*. Four plots of 10 x 10 m were marked in both plantations and three soil pits were exposed in each plot and samples taken from 0-20, 20-40 and 40-60 cm layers. Leaf samples were collected three times during 1983-84. Soil and leaf analyses are in progress.

Soils. 09/1982 : Physical properties of soils in relation to eucalypt growth.

As plantation activities are intensified to meet raw materials shortage, the need for inputs like ameliorants and amendments arises.Soil physical properties in combination with chemical and biological properties determine the necessity for these inputs. This study aims to bring out the relationship between soil physical properties and eucalypt growth.

Study sites were selected in Kondazhi for *Eucalyptus tereticornis* and Muthanga for *E. grandis*. Four plots of 10 x 10 m were marked in both plantations and three soil pits were exposed in each plot and samples taken from 0-20, 20-40 and 40-60cm layers. Bulk density, particle density and moisture holding capacity analyses are in progress.

INTERDISCIPLINARY PROJECTS

The Division is associated with the following projects of Botany (Taxonomy), Ecology and Silviculture Divisions.

Bot. 01/1979 (Feb. 1979-Jan. 1984)

Study of soil requirements for selected medicinal plants. Soil properties of medicinal plants garden at Peechi.

Ecol. 01/1979 (Jan. 1980-Dec. 1983)

Study of soils in natural forests and plantations for preparation of soil-cum-vegetation map of Trichur Forest Division.

Silvi. 02/1977 (Jan. 1977-Dec. 1982)

Soil properties of experimental plots at Chandanathod.

Silvi. 05/1981 (Oct. 1981-Sept. 1985)

Soil properties of experimental plots at Mundakkadav. Soil properties before slash burning, after burning and after final taungya cropping.

Extension

The Division attended to the following queries :

i) Soil suitability in 1 hectare KSEB treatment yard of Kaprikkad for *Caryota urens* and *Santalum album* from Range Officer, Kodanad.

ii) Soil studies in Attappadi Reserve Forests.. from conservator of Forests, Kozhikode.

iii) Help in locating undisturbed soil profiles for geophysical studies.. from Physical Research Laboratory, Ahmedabad.

STATISTICS

Stat. 02/1977 : A data bank for forestry sector in Kerala.

The objectives of this project are to collect, compile and store the data pertaining to forestry and allied activities in Kerala. Eventhough the data in respect of plantations of various species have been collected from the forest offices, a comprehensive list could not be finalised. This will be done only after conducting a thorough field check.

Stat. 05/1979 : Analysis of factors influencing timber prices in Kerala.

This study is an attempt to analyse the trend (temporal and spatial) in timber prices at the stage of auction in the timber depots of the Government of Kerala and to identify the factors influencing the prices.

From the analysis of price data collected from various Government timber depots for the period from 1975-76 to 81-82, trend in prices was examined. To examine whether the trend observed during the period 1975-76 to 81-82 had existed prior to 1975-76, data on timber prices was compiled from various forest working plans and analysed From the discussions held with timber traders at Trichur and Calicut, the factors that could possibly influence the timber prices were identified. To see whether the reported factors are the same in other regions in the State the timber traders at Quilon, Cochin, Perumbavur, Alwaye, Palghat and Baliapattom were interviewed. Also discussions were held with some of the forest officers. Since the import of timber from

Karnataka to the Northern region of Kerala was reported to be an important factor affecting spatial variation in prices, data on timber import from Karnataka to Kerala was collected from the forest check-post at Iritty and the data was compiled. It is learned that the timber-demand-supply situation in Tamil Nadu is the major factor that affects tibmer prices in Kerala. To understand the supply situation in Tamil Nadu, out-turn of timber for the period 1972-73 onwards was compiled from the administration reports of the Tamil Nadu Forest Department. The information so far collected was analysed.

The project is completed and the final report is under preparation.

Other activities

The division was also associated with Project Econ. 02/1982 - socio economic study of farm forestry in Kerala.

The division attended to the statistical analysis of data pertaining to the research projects undertaken in other divisions as indicated below.

1. Pathol. (F) 01/1979 - Survey of representative plantations in Kerala, for leaf, stem and root diseases of forest trees and assessment of level of infection.
2. Pathol (F) 02/1979 - Epidemiology of *Cylindrocladium* associated with *Eucalyptus* leaf blight and its control using soil fumigants and fungicides.
3. Silvi. 04/1981 - Studies on stump as planting material for *E. tereticornis* plantations.
4. Silvi. 06/1981 - Estimation of quantity of eucalypt seeds for sowing in nurseries.
5. Soils. 07/1981 - Effect of Mussorie Phos on the growth of eucalypt seedlings.
6. Physiol. 02/1979 - Investigations on the possibility of vegetative propagation of bamboos and reeds by stem cutting.
7. Wood. 06/1982 - Wood and bark properties of branches of selected tree species in Kerala.

WILDLIFE BIOLOGY

Wild. 02/1977 : An ecological study in Periyar Tiger Reserve with special reference to wildlife.

Preparation of management plans of wildlife sanctuaries requires a thorough knowledge on the population status of different species etc. This project was formulated to undertake such studies in the Periyar Tiger Reserve in Kerala.

The final report is being processed for publication.

Wild. 03/1980 : Long term environmental and ecological impact of multipurpose river valley projects - A comprehensive study in Western Ghats - Wildlife studies.

This project is taken up as a component of the major project to study the long term environmental impact of multipurpose river valley projects and aims at identifying the direct and indirect effect of river valley schemes on wildlife. The study aims at identifying the structure of mammalian and avian community in disturbed and undisturbed ecosystems and to assess the behavioural changes, if any, consequent to habitat alterations.

The density of larger mammals in the study area has been reduced due to biotic disturbances that existed even before the construction of the dam.

A preliminary analysis shows that the elephants in the area do not represent a healthy population. The number of males and young ones seem to be much lower than that in other populations. The bonnet macaques in the outskirts of the area indulge in a great deal of crop raiding. The population characteristics of these animals are under analysis.

The wild dogs seem to have been seriously affected. The low herbivore density seems to have forced them to lifting domestic cattle and goats.

The habitat use pattern of these animals in relation to resource availability is under analysis.

The data collected from Idukki area will be compared with that of other River Valley areas like the Silent Valley and Thekkady.

The midterm report of this project sponsored by the Department of Environment, Government of India, was sent during this period.

Wild. 04/1983 : Ecology and behaviour of Malabar Giant Squirrel *Ratafa indica* maxima (Schreber)

The objective of the project is to study the feeding habits, home range, movement and activity patterns and intra and inter specific association of the animal. The study will be mostly based on visual observation. Method of repeated plotting of the animal range will be employed for study of home ranges. The study will provide valuable information for maintaining optimum habitat condition for the animal.

Study area and the animals were selected for the project. Regular observations were maintained on individually recognizable individuals. One baby squirrel was marked by the freeze banding technique to facilitate easy observation.

Wild. 05/1983 : Habitat utilization by large mammals in teak plantation and natural forests.

The objectives of the project are (1) to study the food and shelter availability in teak plantation vis-a-vis natural forests and (2) to quantify damage done by wild animals to plantation. The study will indicate the desirability of teak plantation in wildlife sanctuary.

Study plots were selected and data collected periodically for this project on the habitat utilization by large mammals in teak plantation at the Parambikulam wildlife sanctuary. The data collection is continuing.

Wild. 06/1984 : Movement pattern of Asiatic Elephant *Elephas maximus* in Parambikulam wildlife sanctuary.

The objectives of the project is to study the movement pattern of selected groups of elephants in the sanctuary. The result will be useful for management of the sanctuary. At present demarcation of the border of the sanctuary is based on physical features and administrative convenience. The results will be useful to evolve a more rational demarcation of the sanctuary area.

The project work was initiated recently and the extensive literature survey on the subject is being carried out.

Project : Aspects of reproductive and lactional physiology of Asian Elephant, *Elephas maximus* (L).

The experiments on lactation and reproduction of elephants on the samples already collected earlier were continued.

WOOD SCIENCE

Wood 02/1979 : Effect of age and location on pulpwood quality of *Eucalyptus grandis*

The objectives are (a) to study the variability of two important pulpwood quality parameters, viz. wood density and fibre length in relation to age and location and (b) to elucidate the relationships between these parameters and tree growth parameters like height and diameter.

The original title of the project, 'Structural variability in the woods of *Eucalyptus grandis* and *E. tereticornis* in relation to age and locality was modified with the modification of the scope of the project.

Twentyfive trees were sampled in two age groups (3 and 7 years) for wood property measurement. The experiment is in progress.

Wood 05/1980 : Natural durability of commercial timbers of Kerala with reference to decay.

The objectives are to assess the resistance of commercial timbers of Kerala against decay caused by wood-rotting fungi and rate these timbers into different durability classes.

Samples of *Vitex altissima* were exposed to one brown rot and three white rot fungi. Test blocks of *V. altissima* lost about 3 to 7% of the original weight while the reference blocks of *Bombax ceiba* lost 60%.

Wood samples of *Dysoxylum malabaricum* lost about 24 to 33% of the original weight when exposed to *Polyporus palustris*. Samples from *Hopea glabra* and *Vateria indica* have been exposed to various brown rot and white rot fungi and are undergoing decay.

Wood 06/1982 : Wood and bark properties of branches of selected tree species in Kerala.

The objectives of this study are (a) to determine the physical properties such as basic density, moisture content and bark percentage of branches and to compare with those of stems, (b) to measure basic density and moisture content of bark and (c) to investigate the anatomical properties, viz., percentages of heartwood (if distinct) and different tissues (fibres, vessels, rays and parenchyma) and fibre dimensions.

Samples have been collected from stem and branches of 16 more trees adding up to 50 trees from 10 commercially important species. Laboratory work and data analysis are in progress.

Wood 07/1982 : Establishment of Xylarium

The objectives are (a) identification and collection of wood samples and timber species of Kerala, (b) collection of voucher herbarium specimens and (c) preparation and collection of authentic slides of wood samples.

Four species were available from selection felling areas. Work on identification and authentic slide preparation is in progress.

Extension

Technical information on the extractives of wood was given to Velton Prefab Elements Ltd.

Wood samples were identified for Kerala Wood Industries Ltd. and Forest Industries (Travancore) Ltd.

Fibre length of *Leucaena leucocephala* was determined for the Kerala Forest Department.

Information on the preservative treatment of rubber wood was given to 29 different parties.

Technical information on diffetent timber species was given to ASCU Hickson Ltd. and Mahaveer Wood and Furniture Industries.

Information on the classification of Kerala timbers on the basis of durability was given to the Kerala Forest Department.

Veneer band dryer of Kerala Wood Industries Ltd. was inspected during erection and at the time of commissioning.

NATIONAL SEMINAR ON EUCALYPTS

An important event of the year was the organisation of a National Seminar on Eucalypts in collaboration with the Kerala Forest Department. The Seminar was held on January 30 and 31, 1984 at the KFRI Peechi. Since eucalypt is one of the genera being planted extensively in different states in the country, it was thought appropriate to review the experience gained hitherto. The objectives of the seminar were:

(1) to make an assessment of the performance of thev arious species of eucalypts in different parts of the country.

(2) to examine its future role taking into account the economic, social and environmental aspects,

and

(3) to identify gaps in information so as to facilitate research.

About 110 delegates and 40 observers attended the Seminar and about 78 papers covering different aspects of eucalypt plantation were presented during the seminar.

The inaugural function was presided by Shri KP Nooruddin, Minister for Forests, and Chairman, Governing Body of the Institute. Dr. T. N. Khoshoo, Secretary, Department of Environment, in his inaugural address identified some of the important environmental and economic problems confronted by planners and policy makers and why a scientific approach based on research is necessary to tackle the problems. Shri C. L. Bhatia, Inspector General of Forests, Government of India, gave a succin account of the forestry problems and why a new approach is necessary. Ten members of the Governing Body of the KFRI, Sri Hari Singh, Sri C. L. Bhatia, Sri YML Sharma, Sri K K. Nair, Sri JC Varmah, Sri Hassankutty,Sri Madhava Menon and Dr. S. Vasudev participated in the Seminar.

Some of the important recommendations of the seminar are as follows :

1. Realizing the importance of maintaining the ecosystem, ecologically sensitive forest areas should not be planted with eucalypts and an all out effort shout be made to regenerate such areas with indigenous species.

2 As there is further need for study with regard to the effect of the different species of eucalypts on wood qualities, organic matter, nutrient status, suface water run-off, ground water and water conservation under varying edaphic and climatic conditions and use of fertilizer and pesticides, research on these aspects be intensified.

3 With a view to evolve suitable genetic strains of eucalypts to suit various agro-climatic regions, intensive genetic research be undertaken on a priority basis.

4. As eucalypts are being planted as a short rotation crop to be utilised as small timber, firewood and pulpwood and is being managed under coppice system detailed investigations regarding the extent of its coppicing power and the number of coppice rotations along with the yields should be carried out.

5. As eucalypts are being planted on a large scale by farmers along the field boundaries and sometimes as an inter crop with various agricultural crops like sugarcane, wheat and others, detailed investigations be carried out on the interaction of eucalypts with various agricultural crops.

6. In future, before introducing eucalypts in tribal areas, a careful impact study on the welfare of tribal population should be undertaken.

A post-seminar tour was organised to the Pamba-Peermade eucalypt plantations and to the Periyar Tiger Reserve.

Recognition to the Institute

The Kerala Agricultural University has accorded recognition to the Institute as a Centre for Post-graduate Research for collaborative work between the University and the Institute The other Universities in Kerala, viz. Calicut and Cochin Universities have been moved for according similar recognition to the Institute and their decision is awaited.

Distinguished visitors :

A number of distinguished persons have visited the Institute during the year. The most prominent among them were -

1.	Dr. Peter Ashton Director Arnold Arboretum Harward University, U. S. A.	visited on 23-9-1983
2.	Mr. William R. Bentley Program Officer Ford Foundation, New Delhi	,, 23-9-1983
3.	Dr M. H. Ivory University of Oxford Dept. of Agriculture and Forestry Science Commonwealth Forestry Institute, Oxford, U. K.	,, 1-12-1983

4.	Shri S. Gopalan I. A. S. Agricultural Production Commissioner Govt. of Kerala	"	29 12-1983
5	Shri. W. Finlayson Director Commonwealth Forestry Institute Oxford, U. K	"	23-3-1984
6.	Shri H. L. Wright Commonwealth Forestry Institute Oxford, U. K.	"	23-3-1984

PARTICIPATION IN SEMINAR, WORKSHOP, CONGRESS AND SPECIAL LECTURES DELIVERED

Dr. S. Kedharnath, Shri. M. Balasundaram and Shri Mathew P. Koshy attended the National Symposium on Advances in Tree Sciences held at Forest Research Institute & College, Dehra Dun on 11-12 April 1983. Dr. Kedharnath gave a talk on 'Forest Tree Breeding in India'. He also chaired the session on Social Forestry. Sri Balasundaram presented a paper entitled 'Towards' the control of mistletoe on teak through tree injection using weedicides' by S. K. Ghosh, M. Balasundaran and M. I. Mohamed Ali.

Shri K. Sankara Pillai attended a Workshop on Information Services - A network for Kerala, held at the Centre for Water Resources Development & Management, Calicut on 27-28 April 1983.

Prof. V. P. K. Nambiar attended a Symposium organised by the Kerala Forest Protective Staff Association, Trichur on 29 April 1983.

Shri N. Gopalakrishnan Nair gave a lecture on Environmental Management at the Summer School held at the Govt. Engineering College, Trichur on 14 May 1983

Dr. P. Vijayakumaran Nair and Shri K. K. Ramachandran attended the 12th. Annual Conference of the Ethological Society of India held at Bangalore on 27-29 May 1983. Dr. Nair presented a paper entitled 'Development of behaviour and social interaction in captive elephants' and Shri Ramachandran presented a paper entitled 'Eco-ethological studies on elephants of Periyar Wildlife Sanctuary'.

Dr. K. Balasubramanyan and Dr. A. R. R. Menon attended a Workshop on Scientific Methods and Collection and Documentation of Hydrometeorological Data for Surface Water Studies held at the Centre for Water Resources Development & Management, Calicut on 28-29 May 1983.

Dr. C. T. S. Nair presented a paper entitled 'Ecological aspects of forest management' at the Seminar sponsored by the National Conservation Society, Calicut on 1 June 1983.

Dr K. M. Bhat participated in IUFRO All Division 5 Conference held at Madison, USA from 27 June to 5 July 1983 and presented a paper entitled 'Wood properties of one-year-old *Eucalyptus tereticornis* Sm ' by K M. Bhat and K V. Bhat

Dr. C. T. S Nair participated in the National Seminar on Strategies for Environmental Awareness held at Trivandrum on 1 July 1983 and presented a paper entitled 'Man and forest : Co-existence or mutal annihilation'.

Shri E. A Jayson gave a talk entitled 'Wildlife farming' on All India Radio, Trichur on 11 July 1983.

Dr. R. V. Varma participated in a seminar on Pesticides and Environment held at Tamil Nadu Agricultural University, Coimbatore on 4-5 August 1983.

Dr. C. T. S Nair attended a symposium organised by the KFRI Employees Union at Trichur on 7 August 1983 and presented a paper entitled 'Forestry in changing society'.

Shri Mammen Chundamannil participated in the Workshop on "Environmental challenges facing the future of Indian Forests held at Thekkady on 26-29 August 1983 and presented a paper entitled 'Environmental challenges facing the future of Indian forests'.

Dr. K. M. Bhat gave a lecture on "The importance of forest resources in the economic development of different natural regions' at Sree Kerala Varma College on 26 September 1983.

Dr. C. Renuka attended a Seminar on 'Medicinal Plants of Kerala Forests' held at the Kerala Agricultural University, Mannuthy on 1 October 1983.

Shri. P. S. Easa participated in a Seminar on Importance of Research in Wildlife Management held at Calicut on 6 October 1983.

Shri K. K. Ramachandran and Shri E. A. Jayson attended a Seminar on Education in Wildlife Conservation in School Curriculum and its Importance and Wildlife Farming held at Thekkady on 7 October 1983.

Dr. S. K Ghosh attended the 10th International Plant Protection Congress at Brighton, UK on 20-25 November 1983 and he put up a poster exhibit on 'Possible control of teak mistletoe through trunk injection of weedicides by S. K. Ghosh, M. Balasundaram and M. I. Mohamed Ali.

Dr. P. Vijayakumaran Nair participated in a Seminar on conservation in Developing Countries - Problems and Prospects conducted by the Bombay Natural History Society on 6-10 December 1983.

Dr. K. M. Bhat attended the 71st Annual Session of the Indian Science Congress held at Ranchi on 2-8 January 1984 and presented a paper entitled 'Effect of agroforestry practices on wood quality' in a satellite seminar organised by the Indian Society of Tree Sciences.

Dr. C. T. S. Nair and Shri P. K. Muraleedharan presented a paper entitled 'forestry development perspective for 7th Plan' in the Seminar on Development Prospective of Kerala during 7th Five Year Plan (1985-90) held at the University Centre, Trichur on 10 January 1984.

Dr. S. Kedharnath, Shri M. Balasundaran and Smt. E. P. Indira attended a Seminar on the Role of Genetic Engineering in relation to India's Economic Development held at Kerala Varma

College on 18 January 1984. Dr. Kedharnath chaired the session. Shri Balasundran presented a paper entitled 'The role of genetic engineering in India's agricultural development and Smt. Indira presented a paper entitled 'The social problems in genetic engineering'.

The following papers were presented by the Institute Scientists at the National Seminar on Eucalypts held at the Kerala Forest Research Institute, Peechi on 30-31 January 1984.

Balagopalan, M and Jose, A. I. Distribution of organic carbon and different forms of nitrogen in a natural forest and adjacent eucalypt plantation at Arippa, Kerala.

Bhat K. M. Can eucalypts meet the wood quality requirements of the industries from plantation growth?

Chacko K. C and Muhammed, E. Polyurethane foam nursery technique for raising healthy seedlings of Eucalyptus.

Gnanaharan, R. Eucalyptus for non-pulp uses-research needs.

Krishnankutty, C. N., and Mammen Chundamannil. Eucalypt plantation in the forest of Kerala: are the goals being fulfilled.

Maria Florence, E J. Sharma, J. K. and Mohanan. C. Occurrence of Cryphonectria canker disease of Eucalyptus in Kerala.

Mohan, C. and Sharma, J. K. Epidemiology of Cylindrocladium causing a disease complex Eucalyptus.

Mohammad Ali, M. I., M. Balasundaram and S. K. Ghosh. Histopathological detection of little leaf disease of eucalypts in Kerala.

Nair, K. S. S. George Mathew, Varma, R. V. and Sudheendrakumar, V. V. Insect pests of of eucalypts in India - present problems and trends for future.

Nair, K. S. S., Varma, R V., Karunakaran C K, Muhammad E. and Chand Basha Control of termites in eucalypt plantations - large scale field trials.

Sankar, S. What is wrong with eucalypts?

Sharm, J. K. Potential threat to exotic eucalypts in Kerala by native pathogens - how to meet the challenge?

Sharma, J. K., Maria Florence. E. J. Sankaran. K. V., and Mohanan. C, Toxin bioassay, a rapid method for assessing relative susceptibility of eucalypts against pink disease.

Sharma. J. K. and Mohanan, C. Management of seedling diseases of eucalypts in nursery by container sowing method and its economic implications:

Sudheendra Kumar, V. V., and Chacko, K. C. Effect of site preparation on incidence of termites in Eucalyptus plantations.

Varma, R. V, and Nair, K. S. S. Evaluation of insecticides and treatment methods againt subterranean termites attacking eucalypt plantations.

Dr. S. K. Ghosh presented a paper entitled 'Control of angiospermic parasite (s) on forest trees by infusion of weedicides' by S. K. Ghosh. M. Balasundaram and M. I. Mohamed Ali in the 30th Annual Meeting of India Phytopathological Society held at Hissar, Haryana on 16-18 February 1984.

Dr R. Gnanaharan gave a talk on 'The importance of wood seasoning and wood preservation' at the 'Industry Workshop on Wood Seasoning and Furniture Finishing' organised by the Small Industries Service Institute, Calicut on 18 February 1984.

Dr. K. S. S. Nair, Dr. R. V. Varma and Dr. George Mathew attended the 3rd Oriental Entomology Symposium held at Trivandrum on 21-24 February 1984. Dr. Nair presented a paper

'Bagworks (*Lepidoptera*, Psychidae) of Kerala'—their potential aspects of tree crops of Kerala' Dr. Varma presented a paper, 'Response of the subterranean termite *Odontotermes guptai* to eucalypt root extract'.Dr Mathew presented a paper'Insect borers of commercially important stored timber of Kerala'

Dr. J. K. Sharma and Dr. K. V. Sankaran attended the 11th Annual Meeting of Mycological Society of India held at Trivandrum on 23 February 1984.They also participated in the symposium on fungal resources and their utilization, held at the Kerala Agricultural University Vallayani on 23-24 February 1984.

Shri M I. Mohammed Ali presented a paper on 'Studies on spike disease of sandal in Kerala' in the, National Seminar on Mycoplasma Infection in Animals, Plants and Men, held at CS Azad University, Mathura on 27-29 February 1984.

PAPERS PUBLISHED IN JOURNALS, BOOKS ..

1. Bhat, K. M., Bhat, K. V. and Rugmini, P. 1983. Variation in wood and bark properties of cashew. Journal of Indian Academy of Wood Science 14 (1) : 12-17
2. Bhat, K. V. and Bhat, K. M. 1983. Anatomical changes associated with interlocked grain in *Anacardium occidentale* L. IAWA Bulletin n. s. 4 (2/3) : 179-182.
3. Chacko, K. C. 1983. Polyurethane foam sheet as a substratum for germination tests. Indian Journal of Forestry 6 (4) : 325.
4. Ghosh, S. K., Mohamed Ali, M. I , Balasundaram, M. and Mathew, G. 1983. *Redarator bimaculatus*, a possible vector for sandal spike in Kerala. Int. J. Trop. Plant Dis. 1 (1) : 197-198.
5. Gnanaharan, R. 1982. A simplified boron diffusion treatment for rubber wood – International Journal of Wood Preservation 2 (4) : 169-172.
6. Gnanaharan, R. 1984. Evaluation of an alkylammonium compound as a fungicide to control sapstain and mould during diffusion storage. International Research Group on Wood Preservation Document No. IRG/WP/3282. 4p.
7. Gnanaharan, R. and Mathew, G. 1983. Rasapariraksha nalkia rubberthadi (Chemically treated rubber wood). Rubber No. 215 November 1983.
8. Gnanaharan, R., Mathew, G. and Dhamodaran, T. K 1983. Protection of rubber wood against the insect borer *Sinoxylon anale* Les. (Coleoptera : Bostrychidae). Journal of Indian Academy of Wood Science 14 (1) : 9-11.
9. Kedharnath, S. 1983 Genetics and Forest-tree Breeding. In 'Genetical Research in India' Published by Publications & Information Dn. of I. C. A. R. New Delhi. Chief Editor P. L. Jaiswal.
10. Sasidharan, N. and Nambiar, V. P. K. 1983. *Hedyotis' pinifolia* Wall. ex. G. Don (Rubiaceae), a new record for South India. Indian Journal of Forestry 6 (3) : 284
11. Seethalakshmi, K. K., Venkatesh, C. S. and Surendran, T. 1983 Vegetative propagation of bamboos using growth promoting substance - 1. *Bambusa balcooa* Roxb. Indian Journal of Forestry 6 (2) : 98-103.
11. Sharma, J. K., Mohanan, C. and Maria Florence, E. J. 1983. A little leaf disease of *Eucalyptus* in Kerala, India. European Journal of Forest Pathology 13 : 385-388.
13. Sharma, J. K., Mohanan, C and Maria Florence, E.J.1 984 Nursery diseases of *Eucalyptus* in Kerala. European journal of Forest Pathology 14 : 77-89.
14. Surendran, T., Venkatesh, C. S. and Seethalakshmi, K K. 1983 Vegetative propagation of the thorny bamboo, *Bambuse arundinaceae* (Ret.) Wild. using some growth regulators. Journal of Tree Science 2 (1&2) : 10-15.
15. Varma, R.V.1983. Hormonal mechanisms of soldier differantietion in *Postelectrotermes nayari*. *In* Odhiambo, T, R. (Ed.) Current themes in tropical science. Vol. 3, Chapter 29, Pergamon Press.

Appendix I

STAFF AS ON 31-3-1984

Dr. S. Kedharnath. FNA, FASc – Director

Administration

1.	Shri M. Muhammed Usman	Registrar
2	,, P. Viswanathan	Dy. Registrar (Admn)
3.	,, P. K Balan	Dy. Registrar (Fin)
4.	,, P. Achuthankutty	PA to Director
5.	,, M. K. Aravindakshan	Office Assistant
6.	,, M. S. Sukumaran	,,
7.	, T. G. Ananthanarayanan	,,
8.	,, V. K. Mohanan	,,
9.	Smt. K. M. Suseela	,,
10.	Shri. E. V. Eshac	,,
11.	,, K. K. Thomas	,,
12.	,, P. V. Sankaranunni	,,
13.	Smt. M. Kamalamma	Stenographer
14.	Shri. T. J Alfred Headjisjis	,, (left on 23-3-84)
15.	Kum. V. Dhanalakshmi	Receptionist
16.	Smt. Mary Kuruvila	Typist
17.	Sri. P. M. Venugoplan	Driver
18.	,, T. Chandran	,,
19.	,, V. D. Johny	Attender
20.	,, M. C. Reghunathan	,,
21.	,, C. Radhakrishnan	,,
22.	,, V. S. Neelakantan	,,
23.	,, K. R. Sevaraman	,,
24.	,, B. P. Sreedharan	

Engineering

25.	Shri. K. R. Mukundan	Engineer
26.	Kum V. K. Leela	Office Assistant
27.	Shri P. R. Jose	Sergeant
28.	,, K. S. Gopalan	Overseer
29.	,, U. Y. John	,,
30.	,, P. P. Sunny	Skilled Maintenance Asst.
31.	Smt. T. V. Chandrika	Typist
32.	Shri. P. I. Madhavan	Driver
33.	,, K. Girijavallabhan	,,

34.	Sri.	K. Dorairaj	,,
35.	,,	S. Shahul Hameed	,,
36.	,,	P. Mohandas	Driver
37.	,,	K. Chandran	Attender
38.	,,	M. K. Krishnankutty	Watcher
39.	,,	P. M Vasu	,,
40.	,,	V. N. Balakrishnan	,,
41.	,,	K. C. Subramanian	,,
42.	,,	A. C. Antony	,,
43.	,,	C. K Vincent	Cleaner
44.	,,	V. A. Sudhakaran	Pump Operator/Plumber
45.	,,	D. Skariah	,,
46.	Smt.	V. M. Amminy	Part time Sweeper
47.	,,	K. D. Chinnamma	,,

Library

48.	Shri.	K. Ravindran	Librarian
49.	,,	K. Sankara Pillai	Asst. Librarian
50.	,,	Subash Kuriakose	Artist Photographer
51.	Smt.	N. Sarojam	Library Assistant
52.	Shri.	K. H. Hussain	,,
53.	Smt.	K. N. Rajamma	Office Assistant
54.	Shri.	V. Asokan	Typist
55.	,	C. A. Jose	Binder
56.	,,	K. R. George	Attender
57.	,,	A. V Velayudhan	,,

Botany (Physiology)

58.	Dr.	K K. Seethalakshmi	Scientist Grade E
59.	Shri.	T. Surendran	,,
60.	,,	C. K. Soman	Field Assistant
61.	,,	C. V. Jose	Stenographer
62.	,,	K. V. Sidharthan	Attender

Botany (Taxonomy)

63.	Prof.	V. P. K. Nambiar	Scientist (left 28-2-84)
64.	Shri.	N. Gopalakrishnan Nair	Scientist Grade D
65.	Dr.	K. K. Narayanan Nair	,,
66.	Shri	N. Sasidharan	Scientist Grade E
67.	Dr.	C. Renuka	,,
68.	Shri.	M. S. Muktesh Kumar	,,
69.	,,	K. K. Unni	Field Assistant
70.	,,	T. Prabhakaran	Gardner
71.	,,	M. A. Sankarankutty	Attender

Ecology			
72.	Dr.	K. Balasubramanyan	Scientist Grade C
73.	Shri.	K. Swaroopanandan	Scientist Grade E
74.	Dr.	A. R. Ramachandra Menon	,,
75.	Shri.	P. K. Chandrasekhara Pillai	Field Assistant
76	,,	P. V. Subramanian	Attender
Economics			
77.	Dr.	C. T. S. Nair	Forest Economist
78.	Shri.	P. K. Muraleedharan	Scientist Grade E
79.	,,	Mammen Chundamannil	,,
Entomology			
80	Dr.	K. S. S Nair	Scientist Grade C
81.	Dr.	R. Venugopal Varma	Scientist Grade D
82.	Dr.	George Mathew	,,
83.	Shri.	V. V. Sudheendrakumar	Scientist Grade E (Nilambur)
84.	,,	K. Mohandas	,,
85.	,,	P. Padmanabhan	Field Assistant
86.	Smt.	K. Annapoorni	Stenographer
87.	Shri.	P. S. Raman	Attender
Genetics			
88.	Shri.	Mathew P. Koshy	Scientist Grade E
89.	Smt.	E. P. Indira	,,
90.	Shri.	K. K. Ramesh	Field Assistant
91.	,,	K. K. Ahammed	Attender
Pathology (Fungal Disease)			
92.	Dr	J. K. Sharma	Scientist Grade C
93.	Shri.	C. Mohanan	Scientist Grade E
94.	Smt.	E. J. Maria Florence	,,
95.	Dr.	K. V. Sankaran	,,
96.	Shri.	K. Yesodharan	Field Assistant
97.	,,	E. P. Somasekharan Nair	Attender
Pathology (Non Fungal Disease)			
98.	Dr.	S. K. Ghosh	Scientist Grade C (left on 23-3-84)
99.	Shri.	M. Balasundaran	Scientist Grade E
100.	,,	M. I. Mohammed Ali	,,
101.	,,	M. B. Dasan	Attender

Silviculture

102.	Shri. E. Muhammed	Silviculturist
103.	,, K. C. Chacko	Junior Silviculturist
104.	,, R. Chandrasekharan Pandalai	Scientist Grade E (Nilambur)
105.	,, Nandakumar U. Narath	Scientist Grade E
106.	,, M. Cherukunhan Nair	Attender (Nilambur)
107.	,, A. S. Sreenivasan	Attender
108.	,, P. Avunni	Watcher (Nilambur)

Soil Science

109.	Dr. T. G. Alexander	Scientist Grade C
110.	Dr. S. Sankar	Scientist Grade D
111.	Shri. M. Balagopalan	Scientist Grade E
112.	,, Thomas P. Thomas	,,
113.	Kum. M. V. Mary	,,
114.	Shri. E. T. Kuttykrishnan	Attender

Statistics

115.	Smt. P. Rugmini	Scientist Grade E
116.	Shri. C. N. Krishnankutty	,,
117.	,, A. R. Rajan	Field Assistant
118.	,, A. Ramakrishnan	Stenographer
119.	,, E. D. James Tidode	Typist
120.	,, K. S. Karunakaran	Attender

Wildlife Biology

121.	Dr. P. Vijayakumaran Nair	Scientist Grade D
122.	Dr. (Mrs.) Rekha Sharma	Scientist
123.	Shri. P. S. Easa	Scientist Grade E
124.	,, K. K. Ramachandran	,,
125.	,, E. A. Jayson	,,
126.	,, M. C. Mohandas	Attender

Wood Science

127.	Dr. R. Gnanaharan	Scientist Grade C
128.	Dr. Nazma	Scientist Grade D (left on 29-6-83)
129.	Dr. K. Mahabala Bhat	Scientist Grade D
130.	Dr. K. Vishnu Bhat	Scientist Grade E
131.	Shri. T. K. Dhamodaran	,,
132.	Shri. P. A. Sankarankutty	Attender

General Project

133.	Shri. James Mathew	Field Assistant
134.	Shri. K. Vijayan	Driver
135.	,, K. Mohanan	Motor Boat Driver

Telephone : 22058
25/558, Pazhayanadakavu
Trichur - 680 001

R. RAJAN Associates
Chartered Accountants

AUDITORS REPORT

We have audited the accounts of the KERALA FOREST RESEARCH INSTITUTE SOCIETY, Peechi, Trichur District, for the year ended 31st March 1984 with the books of accounts and other records maintained by the Institute and subject to facts contained in notes regarding.

1. Valuation of Current Assets, Loans and Advances.
2. Provision for income tax.
3. Excess service charges written back during the year.
4. Non capitalisation of IIIrd Phase quarters.

5 Providing same depreciation rates as in previous year, we report that :-

a) We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purpose of our audit.

b) The Balance Sheet and the Income and Expenditure account dealt with by this report are in agreement with the books of account and

c) In our opinion and to the best of our information and according to the explanations given to us the accounts give a true and fair view :

i) In the case of the Balance Sheet of the State of Affairs of the Institute as at 31st March 1984 and

ii) In the case of the Income and expenditure account of the excess of the expenditure over income for the year ended on that date.

For R. Rajan Associates

Sd/

C. K. Vasudevan
Partner
Chartered Accountants

Place : Trichur
Date : 12-9-'84

(Seal)

THE KERALA FOREST RESEARCH INSTITUTE SOCIETY PEECHI, TRICHUR DISTRICT

BALANCE SHEET AS AT 31ST MARCH 1984

	As per schedule	Current Year Rs. Ps.	Previous Year Rs. Ps.
LIABILITIES			
General Fund	A	17084625.50	15045230.98
Reserves and Surplus	B	109703.68	109703.68
Current Liabilities and Provisions	C	1482995.16	894665.68
		18677324.34	16049600.34
ASSETS			
Fixed Assets	D	6152841.12	6075017.33
Capital work in progress	E	7947547.74	7329421.57
Current Assets, Loans and Advances	F	4576935.48	2645161.44
		18677324.34	16049600.34

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31-3-'84

	Current Year Rs. Ps.	Previous Year Rs. Ps.
INCOME		
Interest on Savings Bank a/c. and F. D.	115495.90	97885.23
Service charges from Research Projects	—	102894.00
Miscellaneous income - as per sch. G.	65366.22	49955.52
Provision for contribution to Employees Provident Fund written back	—	26640.00
Excess of expenditure over income	3956176.77	3194399.26
	4137038.89	3471774.01

	Rs. Ps.	Rs. Ps.
EXPENDITURE		
Salary and allowances	2080280.38	1723905 13
Contribution to Employees Provident Fund	125679.00	102947.00
Leave Travel Concession	6361.35	3002.00
Group Gratuity Assurance	24864.16	26476.81
Travelling expenses (including Rs. 14933.90 to Governing Body members)	107322.95	132712.46
Medical Reimbursement	41991 56	38761.97
Leave Salary & Pension contribution	26829.83	17660.00
Postage	11741.85	11622.45
Telephone charges	33899.40	27335.45
Bank Charges	2159.00	14.85
Rent	11767.70	22940.96
Printing & Stationery	38259.71	53683.95
Subscription to journals and periodicals	94192.39	97651.10
Repairs and Maintenance of vehicles	234161.74	220848.11
Potting shed	-	11266.00
Repair and maintenance of building and equipments	263027.25	50183.81
Consumables including stores and chemicals	291302.13	284030.19
Advertisement charges	17883.25	13252.00
Staff welfare expenses (Uniform)	2841.41	4829.40
Garden development expenses	17168.59	11773.63
Audit fees : For audit	6000.00	6000.00
Professional charges - (Legal charges)	20325.00	13000.00
Electricity charges	43430.26	20661.25
Panchayath and Municipal Property Taxes	20677.40	13259.16
Lease rent of land	2.00	2.00
Miscellaneous expenses	22928.50	20702 93
Depreciation on fixed assets	528042.41	538368.73
Campus Development	2503.70	1175.00
Seminar and symposia	61395.97	3707.67
	4137038.89	3471774.01

KERALA FOREST RESEARCH INSTITUTE, PEECHI

	Current Year Rs Ps.	Previous Year Rs. Ps.
SCHEDULE - A		
General Fund		
Balance as per last Balance Sheet	15045230.98	13814630.24
Add : Grant received from Govt. of Kerala	5995571.29	4425000.00
	21040802·27	18239630.24
Less : Excess of expenditure over income	3956176.77	3194399.26
	17084625.50	15045230.98
SCHEDULE - B		
Capital Reserve		
Surplus in grants received over the expenditure incurred, in respect of projects sponsored and financed by the following external agencies :-		
Federation of Indian Panel & Plywood Industries	3183.51	3183.51
Food and Agriculture Organisation	106520.17	106520.17
	109703.68	109703.68
SCHEDULE - C		
Current Liabilities & Provisions		
A. Current Liabilities		
Grant for research work in progress	1247084.10	658444.10
Security deposit from customers	2318.00	5399.00
Other Liabilites	233593.06	238022.58
	1482995.16	894665.68
SCHEDULE - E		
Capital work in Progress		
Peechi Building III Phase	7934433.61	7316307.44
Teak Museum	13114 13	13114.13
	7947547 74	7329421.57

	Current Year Rs. Ps.	Previous Year Rs. Ps.
SCHEDULE - F		
CURRENT ASSETS, LOANS & ADVANCES		
A. Current Assets	1088890.28	902111.39
1. Research work in progress		
2. Stocks as per inventory taken, valued and certified by the Directors.		
a) Stock of stationery	19998.57	5072.94
b) Stores and chemicals	30325.41	35393.54
c) Unused stamps	13.75	978.00
3. a) Cash on hand	3180.92	120901.08
b) With scheduled bank :-	239123.16	122684.47
i) in Savings Bank a/c	23500.00	15000.00
ii) in Fixed Deposit (Being security for obtaining guarantee facility from SBT)	4599.77	4592.27
iii) in Current a/c	109700.00	109700.00
iv) Fixed Deposit with Sub Treasury	322087.85	8217.89
c) With Sub Treasury S. B. a/c	1841419.71	1324651.58
B. Loans and Advances		
Advance receivable in cash or in kind or for value to be received (unsecured considered good)	72328.00	60999.65
Pre-paid expenses	1851871.00	1034763.00
Advance for capital work in progress	106829.90	103687.85
Accrued interest	698686.87	115259.36
Other Advances	5800.00	5800.00
Telephone Deposit	2735515.77	1320509.86
SUMMARY (A & B)		
Current Assets	1841419.71	1324651.58
Loans and Advances	2735515.77	1320509.86
	4576935.48	2645161.44
GRANT FOR RESEARCH WORK IN PROGRESS		
Grant from Forest Department	185444.10	185444.10
Grant from Govt. of India for MRV Project	438800.00	250000.00
Gwalior Rayons - Wood.04	15000.00	15000.00
Advance from H. P. C. - Reeds	8500.00	8000.00
Grant from Govt. of Kerala towards Teak Museum	200000.00	200000.00
Grant from Govt. of India for preservation of Dalbergia - Bot 06	16500.00	—
Grant from Govt. of India for Impact of selection felling in Forest ecosystem - Ecol. 06	228700.00	—
Grant from Food and Agriculture Organisation - Econ. 03 & Econ. 04 (Rural Institution for development of appropriate forestry enterprises and case study on multiple use of forest management in evergreen forests and (Teak plantations)	154140.00	—
	1247084.10	658444.10

	Current Year Rs Ps	Previous Year Rs Ps
ADVANCES FOR CAPITAL WORK IN PROGRESS		
Kerala State Construction Corporation	620371.00	103263.00
Public Health Engineering Department Government of Kerala	1231500.00	931500.00
	1851871.00	1034763.00
PREPAID EXPENSES		
Journal Subscription	70536 24	58400.00
Advance for books and Micro Films	1047.76	1451.15
Insurance of Vehicle	744.00	1148.50
	72328 00	60999 65
RESEARCH WORK IN PROGRESS		
Genetic improvement of teak in Kerala	236796.41	249658.16
Thekkady wildlife project	300796.40	347956.15
Multi Purpose River Valley Project	410053.76	295258.13
Wood. 04 (Gwalior Rayons)	3809 91	3801.91
Control of insects damaging stored reeds - Entom.04 (HPC)	5234.79	5234.79
F. A. O Project - Econ 03	2189.70	202 25
F. A. O. Project - Econ.04	8774.38	—
Preservation of Dalbergia - Bot. 06 Government of India project	3722 17	—
Impact of selection felling in forest ecosystem in Kerala Western Ghats - Ecol.06	117512·76	—
	1088890.28	902111.39
SCHEDULE G		
Miscellaneous Income		
Application fee	206.00	635.00
House Rent recovery from Staff	35347.05	25927.20
Sale proceeds of tender documents	2305.00	1275.00
Cost of service book collected	—	72.20
Rest House rent recovered from third parties	2511.35	2694.75
Sundry	798.12	558.25
Hire charges of vehicles	24198.70	18793.12
	65366.22	49955.52

	Current Year Rs. Ps.	Previous Year Rs. Ps
OTHER LIABILITIES	174008.80	171857.85
Salary payable	7924.40	13057.2
T. A payable	2897.15	2969.37
Medical reimbursement payable	1450.00	450.00
Rent payable	14.00	12.00
Lease rent payable to Govt. of Kerala	512.00	211.00
C. P. F. collected not remitted	50.00	164.00
C. P. F. loan collected not remitted	11696.26	4223.62
Electricity charges payable	2650.00	—
Advertisement charges payable	6000.00	12000.00
Audit fee payable	69.50	99.80
Life Insurance contribution collected from staff	150.00	150.00
Caution Money deposit for Library Membership	3944.00	2691.00
Tax deducted at source	81.70	8.62
Income tax	20556.00	20556.00
Sales tax	—	359.00
Suspense account (cement)	733.00	1738.00
Leave salary and pension contribution payable	—	250.00
Telephone charges payable	466.25	25.00
Legal fees	390.00	—
Co-operative society recoveries pending remittance	233593.06	230822.58
E. M. D. of contractors		

	Current Year Rs. Ps.	Previous Year Rs. Ps.
OTHER ADVANCES		
1. T. A. Advance	3,803 00	14,266.00
2. Work Advance given to Institute scientists for research work	19,270 39	19,938 56
3. Kerala Govt. (National Seminar)	4,950.00	—
4. Tras Electricals, Cochin	—	6.00
5. Leave salary advance to deputationist	24,585.25	37,450.64
6. Leave travel concession advance		1,733.00
7. ASCU HICKSON, Calcutta (Treatment Plant)	—	—
8. INSDOC, Bangalore	1,155.70	1,135.70
9. Telephone deposit (Dept. advance)	4,250.00	4,550.00
10. Deposit with KSEB	11,200 00	6,700.00
11. Deposit with IOC	195.00	195.00
12. DFO, Nilambur	100 00	100.00
13. Chitra Sales Corporation	840.00	840.00
14. DFO, Arunachal Pradesh	22.65	22 65
15. Private Trunk Call Charges	242.00	415.50
16. Central Transport of India, Calcutta	—	6,202.00
17. M/s. C. P. N. Industries, New Delhi	—	1,926.00
18. Dy. Conservator of Forest, Coimbatore	—	15.50
19. Macneil and Magor Ltd., Cochin	400.00	400 00
20. Festival Advance	180.00	3,590 00
21. Rent Advance, Director's Residence	5,000 00	185.80
22. LIC Advance	—	23.21
23. Bharath Pumps & Compressors, Allahabad	536.00	536.00
24. M/s. Sartorius, West Germany	—	13,027.80
25. P. S. Krishna Iyer	175.00	—
26. M/s. Saraswathy Printers, Trichur	—	2,000.00
27. M/s. Weather Measure Corpn., USA	20,953.78	—
28. M/s. E. I. DU DONT DE Nemours and company, USA	5,94,538.10	
29. Director Central Scientific Instruments	140.00	—
30. Motor Cycle Advance - A. Ramakrishnan	4,233.00	—
31. Marriage Advance	1,917.00	—
	6,98,686.87	1,15,259.36

KERALA FOREST RESEARCH INSTITUTE, PEECHI

SCHEDULE - D

Sl. No	Discription of Assets	Rate	Gross Block As at 1-4-83	Additions	Sales	Total	Sl. No	Depreciation Till 31-3-83	For the year	Till 31-3-84	Net Block As at 31-3-83	As at 31-3 84
1.	Building - Office	2.5	2664752.45	—	—	2664752.45	1.	335730.14	58225 56	393955 70	2329022.31	2270796.75
2.	Compound wall and Fencing	7.5	579872.24	—	—	579872.24	2.	98264.04	36120.62	134384.66	481608.20	445487.58
3.	Nilambur Nursery Fencing	10	12990.77	—	—	12990.77	3.	6777.32	621.35	7398 67	6213.45	5592.10
4.	Roads	—	153635.84	150636.00	—	304271.84	4.	—	—	—	153635 84	304271.84
5.	Well	—	26295.73	—	—	26295.73	5.	—	—	—	26295.73	26295.73
6.	Cycles	20	1034.63	—	—	1034.63	6.	804.29	46.07	850.36	230 34	184.27
7.	Bus, Jeeps & Trailers	30	471388 44	—	—	471388.44	7.	376634 04	28426 32	405060.36	94754.40	66328 08
8.	Boat	10	32219.81	—	—	32219 81	8.	10644.05	2157.58	12801.63	21575.76	19418.18
9.	Cars & Motor Cycles	20	96577.26	—	—	96577.26	9.	70865 15	5142.42	76007.57	25712.11	20569 69
10.	Electric Fittings	15	283815.89	19738.09	—	303553 98	10.	100551.68	30450 35	131002.03	183264.21	172551.95
11.	Motor Pumps and Fittings	10	33290.10	—	—	33290 10	11.	13102.52	2018.76	15121 28	20187.58	18168 82
12	Motor Spectro Photo Metre	10	230113.83	—	—	230113.83	12.	80653 32	14946.05	95599.37	149460 51	134514 46
13.	Micro Scopes	15	258225.51	22188 50	—	280414.01	13	135621.44	21718.89	157340.33	122604 07	123073 68
14.	Laboratory Equipments	10	1184363.50	82261.24	—	1266624.74	14.	361065.50	90555 92	451621.42	823298.00	815003.32
15.	Library Books	15	1092422.72	143054.17	—	1235476.89	15.	547897.30	103136.93	651034.23	544525 42	584442.66
16.	Typewriters, Duplicators and Calculators	15	76464.88	38214.70	—	114679.58	16.	44636 04	11556.53	56192.57	31828.84	58487.01
17.	Furniture & Fittings	10	871588 89	32010.90	—	903599.79	17.	302980 75	60061.90	363042.65	568608 14	540557.14
18.	Refrigerators	10	52968.70	—	—	52968.70	18	19239.60	3372.91	22612 51	33729 10	30356.19
19.	Air Conditioners	15	40321.39	27980.12	—	68301.51	19.	15491'12	7921.56	23412 68	24830.27	44888.83
20.	Office Equipments	10	11520.77	—	—	11520.77	20.	4501.96	701.88	5203.84	7018.81	6316.93
21.	Micro Computor	15	67833.98	—	—	67833.98	21.	37735 68	4514 75	42250.43	30098.30	25583.55
22.	Research Binocular Microscope	10	170209.01	—	—	170209.01	22.	47233.43	18446.34	65679.77	122975.58	104529.24
23.	Insectorium	15	115367.88	—	—	115367.88	23.	11238 87	5206.45	16445.32	104129.01	98922.55
24.	Area Meter	5	78920 65	—	—	78920 65	24.	14994 92	6392.57	21387 49	63925 73	57533 16
25.	Wood Seasoning Plant	10	117206.25	7625.00	—	124831.25	25.	11720.63	11311.06	23031.69	105485.62	101799.56
26.	Electronic Balance	10	—	13027.80	—	13027.80	26.	—	1302.78	1302.78	—	11725.12
27.	Potting Shed	10	—	64522.00	—	64522 00	27.	—	3226.10	3226.10	—	61295.90
28.	Utencils	5%	—	4607.68	—	4607.68	28.	—	460.76	460.76	—	4146.92
		10%	—									
			8723401.12	605866.20	—	9329267.32		2648383.79	528042.41	3176426 20	6075017.33	6152841.12

THE KERALA FOREST RESEARCH INSTITUTE SOCIETY
PEECHI. TRICHUR DISTRICT

SCHEDULE - G

Notes attached to and forming part of the Balance Sheet as at 31st March 1984.

1. In the opinion of the Committee members, Current Assets, Loans and advances have the value at which they are stated in the Balance Sheet if realised in the ordinary course of business.

2. No provision for Income tax is made in the accounts as the Institute has granted exemption from income tax for the year 1983-84. Regarding previous years the matter is under correspondence and the members of the committee feel that the Institute will be granted exemption.

3. Excess service charges calculated for research work in progress in the previous years have been written back during the year as the same is not necessary.

4. The construction of IIIrd phase quarters were completed and type I, II & III quarters were let out to employees. But the cost of construction was not capitalised because the value could not be ascertained as the final bill has not been settled with the contractors namely, the Kerala State Construction Corporation. For the above reason depreciation on these quarters have not been calculated and debited to accounts. Estimated amount of depreciation comes to Rs. 1,98,000/-.

5. Depreciation has been calculated at the rates as applied during the previous year.

6. The previous year figures were regrouped/recast wherever necessary to suit current years lay out.

For R. Rajan Associates
Sd/
C. K. Vasudevan
Partner
Chartered Accountants

(Seal)