ANNUAL REPORT

1986-'87

kerala forest research institute

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April 1986 March 1987

Kerala Forest Research Institute
Peechi, Trichur 680 653, Kerala

TABLE OF CONTENTS

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1. INTRODUCTION

The year 1986-87 represents a further milestone in the development of the Institute towards fulfilling the objective of providing scientific support to forestry in the State. While research projects initiated during the previous years were continued, a thorough review of the research priorities was undertaken during the year. After deatailed discussion the long-term and short term priorities in research were identified and efforts were made to reorient research through formation of multidisciplinary working groups.

2. GOVERNING BODY

The Government reconstituted the Governing Body as per G. O (Ms) No.29/86/Plg. dated 26.3.1986 on completion of the 5 year tenure of the previous Governing Body. The composition of the reconstituted Governing Body is given in Appendix I.

Meetings of the Governing Body were held on 14.5.86 and 27.1.87. During the first meeting, the Governing Body nominated the members of the Executive Committee as required under rule 8 of the Memorandum of Association. Composition of the Executive Committee is given in Appendix II During the year, meetings of the Executive Committee was held 6 times.

3. REVIEW PANEL

A panel appointed to review the performance of the Institute during 1980-85 submitted its report. While recommending the future directions of research in respect of the major disciplines, the Panel expressed appreciation of the work done by the Institute. Recommendations of the Review Panel were scrutinised and the manpower and infrastructure requirements for implementing the recommendations of the review panel have been estimated.

4. INFRASTRUCTURE

4.1 Library :

Table below gives the acquisition of books, journals and other items in the library

		As on 1-4-1986	As on 1-4-1987
1	Books	9847	10364
2.	Reprints	4763	5024
3.	Photocopies	1283	1340
4.	Journals (Current subscriptions)	236	245
5	Backvolumes	1640	2200

Although budget constraints prohibited increased acquisition of books, the Institute was able to obtain books under the book presentation scheme of the British Council. The British Council presented 164 books to the library costing £ 3501 71

4.2 Computer facilities :

The Computer facilities were enhanced by upgrading the Work Horse to Work Horse level 2 with three terminals

4.3 Teak Research Centre :

An amount of Rs 17 lakhs was expended on the Teak Research Centre building. A major part of the civil works was completed. However, flooring, woodworks, electrification, etc. are yet to be taken up. Availability of funds was a major problem in the smooth progress of work.

4.4 Other civil works :

4.4.1 Water supply at Nilambur Sub-Centre : Very little progress has been achieved with regard to commissioning the water supply system at the Nilambur Sub-centre. While the work on constructing pump house, ground level storage tank and laying pipe lines have been completed, testing has not yet been done by the contractor.

4.4.2 Fencing of Nilambur Sub Centre : Although the work was reported to have been completed by January 1986, serious irregularities were noticed in the foundation work. Accordingly, the contractor was directed to redo the work. This is in progress. Disciplinary action was initiated against the staff responsible for the defective execution of the work.

5. MAN-POWER DEVELOPMENT

Considerable effort was made to improve the technical expertise of the staff in the Institute by deputing them for training, seminars and conferences. The following persons were deputed for training during the year 1986 - 87.

1. Dr. K. Jayaraman was deputed to the School of Forest Resource Management, University of Georgia, U.S.A. to undergo a one year post doctoral programme in stand modelling and simulation techniques. Funding for this was obtained from the Ford Foundation.
2. Mr. Mathew P. Koshy and Mr. T. Surendran were deputed to the Department of Forestry & Wood Science, University College of North Wales, Bangor, United Kingdom for M. Sc. in Environmental Forestry under the Colombo Plan Programme.
3. Mr. Nandakumar U. Narath was deputed to the State Forest Service College, Coimbatore for the two year diploma course in forestry.

6. RE-ORGANISATION OF RESEARCH

6.1 Merger of Divisions :

In order to improve the overall efficiency and promote more inter-disciplinary work the following reorganisations were effected during the year.

(i) The divisions of Economics and Statistics were merged to form the Division of Management.

(ii) The divisions of Pathology (fungal diseases) and Pathology (non-fungal diseases) were merged to form the Division of Pathology.

6.2 Formation of Working Groups :

Further, to focus attention to critical areas of forestry, it was decided to form Working Groups by drawing scientists from different disciplines. The following Working Groups were formed during the year.

1. Teak
2. Eucalypts and other fast growing species
3. Indigenous species
4. Bamboos, reeds and canes
5. Natural forest management
6. Wildlife management
7. Wood utilisation
8. Forest resource management.

These Working Groups met several times, and helped in the formulation of multidisciplinary projects.

7. PROGRESS OF RESEARCH

Table below gives a summary account of the progress in respect of research projects during 1986 - 87

Table 2

Progress of reseerch

1.	Number of ongoing research projects as on 1-4 1986	... 53
2.	New projects taken up during 1986-87	.. 0
3.	Number of projects in which fieldwork was completed and report published during the year	. 10
4	Number of ongoing projects (as on 31-3-1987)	
	(i) Field work was completed and report under preparation	... 19
	(ii) Field work in progress	... 24

7.1. Details of projects on which reports have been published

Summaries of the findings of the projects completed and published are given below.

7.1.1 Studies on the medicinal plants of Kerala by Nambiar, VPK Sasidharan, N, Renuka, C and Balagopalan M. Final report of research project Bot. 01/79. K F R I Research report No 42.

Medicinal properties have been reported for 529 plants that are found in the forests of Kerala. The medicinal plants described are arranged in alphabetical sequence of the botanical name under respective plant families. The families are arranged according to the system of classification of flowering plants by Bentham and Hooker. The current botanical name is followed by important synonyms, if any. Local name(s) and Samskrit name(s) are also provided. The distribution of the plants in Kerala is given by forest types according to the classification by Champion and Seth. A brief description is provided to facilitate identification in the natural habitat. The medicinal properties and uses compiled from literature and the information obtained from tribals and ayurvedic practitioners are given under separate heads. A glossary of medical terms used in the text is also provided.

7.1.2 Preservation of Dalbergia L.f. in Kerala by establishment of a germ plasm bank by Nair, KKN. Final report of the research project Bot. 06/83. K F R I Research Report No. 43

During the study, a total of 18 species and one variety of the genus was recorded from Kerala. They are *Dalbergia acacilfolia* Dalz., *D. beddomei* Thoth., *D. benthamii* Prain, *D. congesta* Grah. ex Wt. et Arn., *D. horrida* (Dennst.) Mabberley, *D. horrida* var *glabrescens* (Prain) Thoth. et. KKN Nair, *D. lanceolaria* L. f., *D. latifolia* Roxb., *D. malabarica* Prain, *D. melanoxylon* Guill. et Perr., *D. paniculata* Roxb., *D. pseudo-sissoo* Miq., *D. rubiginosa* Roxb., *D. sissoides* Grah. ex Wt., et Arn., *D. sissoo* Roxb., *D. spinosa* Roxb., *D. travancorica* Thoth. and *D. vobibilis* Roxb. out of them *D. acacilfolia* and *D. pseudo-sissoo* were new records to the State and *D. benthamii* new to the Indian subcontinent. Live collection of 13 species with 15 to 30 plants for each species was established at Nilambur. Dichotomous keys, up-to-date nomenclature, exhaustive taxonomic descriptions and detailed illustrations were prepared. Distribution maps authenticated by voucher specimens were also prepared for each species. In addition, the report also contains a brief account of the taxonomy of the genus, analysis of the vegetative and floral characters with the help of illustrations and information on the cytology, palynology and phenology of different species.

7.1.3 Morphological, anatomical and physical properties of Calamus species of Kerala forests by Renuka C, Bhat K M and Nambiar, VPK. Final report of research project Bot. 05/82. K F R I Research Report No. 46.

During the present study, 10 species of *Calamus* viz. *C. dransfieldii*, *C. gamblei*, *C. hookerianus*, *C. metzianus*, *C. pseudotenuis*, *C. rotang*, *C. thwaitesii*, *C. travancoricus*, *C. vattayila* and *Calamus* sp. were collected. Of these, *C. dransfieldii*, and *C. vattayila* are new species and *C. metzianus* is a new record to Kerala. The present study proves that stem diameter, leaf sheath, nature of spines on the petiole and rachis, leaflet arrangement and, shape and size of leaflet are important diagnostic features. The key prepared based on these vegetative characters can be of help in the field identification of these canes with remarkable accuracy.

Both stem diameter and specific gravity decrease sharply from the lowest internode to 15% of the stem height and then move slowly towards the top of the stem. Based on physical properties, canes of Kerala are classified into three groups.

7.1.4 A study of insect pest incidence in natural forests by Nair, KSS, Mathew, G., Mohanadas, K. and Menon, ARR. Final report of research project Entom 11/83. K F R I Research Report No. 44.

Insect damage to trees within natural forests was studied. The observations were limited to 20 tree species in moist deciduous forest (at Peechi and Vazhani) and 18, in evergreen forest (at Sholayar).

In general, very few [illegible] of [illegible] in the 38 tree species studied [illegible] occurred, but for some [illegible] 21% [illegible] types of damage was also [illegible].

Although [illegible] forests, at present, [illegible] that [illegible] of tree species, [illegible] pest [illegible]. Structural diversity [illegible] qualitatively different from the naturally [illegible] forest [illegible] dimension [illegible] experimental studies are required to examine the [illegible] plantations in reducing pest incidence although this is often taken for granted.

Based on susceptibility to pest damage under natural conditions the tree species studied were rated for degree of susceptibility. *Grewia tiliaefolia* and *Lannea coromandelica* among the moist deciduous species and *Anacolosa densiflora* among the evergreen species were comparatively more susceptible and are at high risk of insect damage if raised in plantations. *Dillenia pentagyna* which has recently been shown to possess long-fibred timber, falls under the low-risk group. The present study is of help only to suggest high risk species for elimination; there is no guarantee that species that are under low risk in natural forest are safe from pest damage in plantations. Only field trials can show the real picture, and this study has provided broad indications for field trials.

Out of about 90 species of insects collected in this study, about 60% are new records on the respective host trees in India, showing that a large part of the insect fauna of Kerala forests, particularly the evergreen, remain unrecorded.

7.1.5. *Soils in teak plantations of different site quality* by Alexander, T. G., Sankar, S. Balagopalan, M. and Thomas, T. P. Final report of research project Soil 10/84. KFRI Research Report No. 45.

The study was restricted to six plantation transects of Arienkav, Mannarappara, Pothupara, Nellikkutha and Begur areas. Analysis of variance of one-way classification of age/Sq. group showed significant differences in soil properties among groups. Increase of gravel and exchange acidity and decrease of sand, silt, pH and exchangeable bases resulted in lower site quality along a transect and generally across transects. Bulk density, clay, water-holding capacity and organic carbon trends were inconsistent. In a multiple linear regression analysis, soil variables accounted for 31% of the variation in top height and age 63%. Partial regression coefficients pointed to the prominent effects of gravel, sand, pH and exchange acidity. Thus,

variation in site quality along and across the six transects was explainable in terms of soil parameters. Field attempts to enhance site quality, with due weightage to clayed, sand, pH, exchange acidity, exchangeable bases and other relevant soil parameters are implicated.

7.1.6 *Genetic improvement of teak in Kerala* by Venkatesh CS, Koshy, MP, Chacko, KC and Indira EP. Final report of research project Genet. 01(79) - KFRI Research Report No. 13.

The objective of this project was to improve the genetic quality of teak seeds for raising plantations in Kerala. The methods practised for fulfilling the above requirement were the selection of puls trees and establishment of seed orchards.

Teak plantations in Kerala were surveyed and 50 plus trees were selected. Bud grafts of plus trees were prepared and out planted in the orchard site with an 8 m quincunial espacement. Three pilot seed orchards were established, one at Nilambur, another at Palappilly and the third one at Arippa, having 15, 20 and 25 clones respectively. Palappilly and Arippa seed orchards started flowering.

7.1.7 *Diseases of Albizia falcataria in Kerala and their possible control measures* by Sharma, JK and Sankaran, KV. KFRI research report No. 47.

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

Of the three disease [illegible], Botryodiplodia [illegible] (*B. [illegible]e. [illegible]nae)* Phomopsis shoot die-back *(P. [illegible])*, and [illegible] *(Pseudomonas solanacearum)* recorded in plantations [illegible] was the most serious disease prevalent in all the *Ailanthus* [illegible] areas of the state. Large-scale die-back of trees due to [illegible] of [illegible] was recorded in patches in Kattiluppara - 1980 and [illegible] - 1979 (Thenmala For. Div.), Keezhayam - 1979 (Punalur For. Div.) and [illegible] - 1979 (Vazhachal For. Div.) plantations. The incidence of die-back varied from nil (Vamanapuram - 1980) to 66% (Kattiluppara - 1980) in 1983. It gradually declined to 13 to 25% over the next three years. While the severity remained low throughout in these plantations. Intensive observations on progress and spread of die-back in a plot with moderately severe infection indicated that the high incidence occurred during the dry-warm period but during or just after the monsoon it declined as some of the affected trees recouped partially or completely. Thus the overall incidence gradually declined from 94.3% in June 1983 to 69.82% in May 1985. However the percentage of mortality of the affected trees increased from 8.8% to 30.3% during the same period.

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

7.1.8 *Root nodulation potentialities of Leucaena leucocephala* by Balasundaran, M. and Mohamed Ali, M. KFRI research report No. 48.

In Kerala, nodulation and growth of *Leucaena leucocephala* was found to be poor in soils with low pH (<5.5) and in degraded areas, especially in high ranges. However, the plants nodulated well in places where other leguminous crops like *Mimosa pudica* and *Sesbania grandiflora* nodulated. *Rhizobium* was isolated from nodules of leucaena growing in six localities of Kerala, seven isolates specific for leucaena were obtained from national/international type culture collection centres. Evaluation of all the 13 strains showed that generally, seedlings of leucaena raised from *Rhizobium* pelleted seeds produced more nodules and gave increased seedling biomass. *Rhizobium* isolates originating from Nilambur, Nandiyode (Palghat) and Trivandrum were equally good to the best exotic isolates viz. RCR 3878, RCR 3817 and TAL 582.

Lower pH (5.7) not only reduced the fresh weight of nodules and seedling biomass but also affected root growth and seedling establishment. In soils with pH regulated at 3.2, none of the seedlings survived. At pH 3.7 the survival percentage was 80% but the seedlings were very much stunted and unhealthy. At pH 4.1 and 5.1, though the survival was normal there was yellowing and stunting of seedlings. Nodulation was negligible especially at 4.1. As the soil pH increased, improvement was noticed not only in the fresh weight of nodules and seedling biomass but also in the efficiency of nodules

in increasing the biomass. The *Rhizobium* strain RCR 3817 was found suitable for soils with pH 5.7 and above; below 5.7 TAL 582 was suitable for seed inoculation. The isolate collected from Nilambur was as good as the above varieties at different pH levels though not superior.

7.1.9 *Effect of age and location on pulpwood quality of Eucalyptus grandis* by Bhat, K. M., Bhat, K. V. and Dhamodaran, T. K. KFRI research report No. [illegible]

Trees attained the minimum wood density requirement of pulp industry at the age of 3 years and there was no significant increase in density with increase in age from 3 to 7 or 9 years. On the other hand, 5-year-old trees had lower density wood. This indicates that there is no significant loss in pulp yield per unit volume of wood if 3-year-old trees are pulped as against 7- or 9-year-old trees.

Fibre length and heartwood percentage increased and bark content decreased with age. Within each age group, height and DBH had no marked effects on wood density, fibre length and heartwood percentage. However, bark content was negatively correlated with tree growth. These results suggest that faster growth will not adversely affect the wood quality.

There was no appreciable wood property difference among the three locations (Vandiperiyar, Munnar and Wynad) in the State, although heartwood percentage and fibre length in more rapidly grown trees in Vandiperiyar were slightly greater than trees grown in Munnar and Wynad.

Wood density and fibre length variations were significant within the trees but not between the trees. Along the stem, density decreased from stump to BH level and then gradually increased towards the top while the inverted trend was noticed in fibre length. Also, fibre length increased considerably from pith to bark in all the age groups.

7.1.10 *Vegetative propagation of some important tree species by rooting cuttings* by Surendran, T. and Seethalakshmi, K. K. KFRI research report No. 50.

Branch cuttings of *Tectona grandis* L. f., *Gmelina arborea* Roxb., *Haldina cordifolia* (Roxb.) Ridsal., *Hopea parviflora* Bedd., *Melia duba* Cav., and *Swietenia macrophylla* (L.) Jacq. were tried for root induction. The study was extended to *Casuarina equisetifolia* R. & G. Forst., *Acacia mangium* Willd. and *Leucaena leucocephala* de wit which are grown under afforestation and social forestry programmes in the State. Treatments with five growth regulating substances (GRS) viz. Indole acetic acid (IAA), Indole butyric acid (IBSA), Naphthyl acetic acid (NAA), Coumarin (Cou) and Boric acid (BA) at two concentrations each (10 and 100 ppm) were given separately to find out the

most effective treatment [illegible] of rooting the treatments [illegible] The results showed that [illegible] with regulating substances [illegible] Of the ten species [illegible] *arborea*, *L. leucocephala* *C. equisetifolia* [illegible] was observed [illegible] cuttings [illegible] could be induced [illegible] Of the five species, [illegible] root. Percentage of [illegible] and *A. mangium* treated with GRS [illegible] treated cuttings developed [illegible] and season for various tree species are tabulated below.

Best treatments for rooting stem cuttings of various tree species

Tree species	GRS	Concentration	Month of treatment	Maximum % rooting obtained
T. grandis	IBA	100	May	40
G. arborea	NAA	100	April	60
L. leucocephala	BA	10	September	80
C. equisetifolia	IBA	10	November	70
A. mangium	IAA	1000	June	43

7.2 Details of projects completed and reports under preparation

7.2.1. *Botany Division*

(i) Bot. 02/79. Establishment of an orchidarium in the Institute.

Principal Investigator : N. Sasidharan
Associates : VPK. Nambiar
C. Renuka

Date of commencement : February 1979
Date of completion : January 1984

Collection of orchids and establishment of orchidarium were completed and the final report is under preparation. Fifty-nine species of Kerala orchids have been collected and a live collection is being maintained.

7.2.2 *Ecology Division*

(i) Ecol 01/1979. Preparation of a soil-cum-vegetation map of the forests of Trichur Division

Principal Investigator : K. Balasubramanyan
Associates : ARR Menon
Thomas P. Thomas

Date of commencement : January 1980
Date of completion : December 1983

Most of the analysis of soils and vegetation was completed last year. Soil analysis has been completed. Synthesis of vegetation and soil data has yet to be completed.

(ii) Ecol. 04/80 Phenological studies in representative evergreen forests of Kerala.

Principal Investigator : K. Balasubramanyan

Date of commencement : April 1980
Date of completion : May 1984

No progress has been made in respect of this project during the year 1986-87

(iii) Ecol. 06/83 Impact of selection felling in a forest ecosystem in Kerala.

Principal Investigator : K. Balasubramanyan

Date of commencement : July 1983
Date of completion : June 1986

The report is under preparation.

7.2.3. *Entomology Division*

(i) Entom 05/77. Biology and control of insect pests of fast growing hardwood species.

Principal investigator : KSS. Nair
Associate : George Mathew

Date of commencement : March 1977
Date of completion : February 1982

Part of the final report has been written up during the year and the processing of data is continuing.

(ii) Entom 12/83. Search for natural resistance to the insect *Hyblaea puera* in teak

Principal Investigator : KSS. Nair
Associates : Mathew P. Koshy
KV Sudheendrakumar
K. Mohanadas
RV. Varma
George Mathew

Date of commencement : April 1984

Date of completion : December 1986

The project was initiated in April 1984 to investigate natural resistance of teak, if any, to the teak defoliator. The experimental part of the project has been completed and the final report is under preparation.

Based on earlier field observations 12 clones were selected for further testing and graftings raised in a statistically planned design within a field cage. Susceptibility of these clones to *Hyblaea* was tested by releasing field collected larvae in July 1986. The results did not indicate absolute resistance in any of the clones.

7.2.4 Genetics Division

(i) Genet 04/79 Provenance and floral biological studies in *Gmelina arborea*

Principal investigator : Dr. C S. Venkatesh / Dr. S. Kedharnath

Date of commencement : January 1979
Date of completion : January 1985

Floral biological studies have been completed. The studies show that *G. arborea* is an entomophilous cross pollinating species and there is no absolute self incompatibility. Isolated trees also are found fruit bearing. The report is under preparation.

7.2.5 Management Division

(i) Econ 02/82 A socio-economic study of forestry with special reference to Kerala

Principal investigator : CTS. Nair
Associates : C N. Krishnankutty
Mammen Chundamannil
A R. Rajan.

Date of commencement : April 1982
Date of completion : September 1984

Not much progress has been made in preparing the final report of this project.

(ii) Econ 06/85. Techno-economic study of the saw milling industry in Kerala.

Principal investigator : P K. Muraleedharan
Associate : K M. Bhat

Date of commencement : April 1985
Date of completion : April 1986

7.2.6 *Pathology Division*

(i) Epidemiology and control of diseases in *Eucalyptus* caused by *Cylindrocladium* spp in Kerala.

Principal Investigator : JK Sharma
Associates : C. Mohanan
Date of commencement : January 1979
Date of completion : January 1983

Except for a few experiments where different models have to be attempted for interpretation, statistical analysis of the data was completed. Literature concerning *Cylindrocladium* spp. and chemical control was gathered, writing up of the project report was commenced and a draft on the chapter on "Relative susceptibility of eucalypt provenances to three *Cylindrocladium* spp" prepared.

(ii) Pathol NF 05/84 Control of teak mistletoe through trunk injection of chemicals

Principal investigator : S K. Ghosh
Associates : M. Balasundaran
M I. Mohamed Ali
Date of commencement : January 1984
Date of completion : December 1986

Field work was completed during the year. The most effective dose was identified. Differences in tolerance of trees with the same girth were noticed.

7.2.7 *Silviculture Division*

(i) Silvi 01/77. Silviculture and management of fast growing indigenous hardwood species with multiple end uses

Principal investigator : C S. Venkatesh
Associate : K K. Chacko
Date of commencement : January 1977
Date of completion : January 1982

Although fieldwork has been completed the report has not been published yet. Conclusions from the project were reported earlier.

(ii) Silvi 02/77 Study of the afforestation techniques of the grasslands of Kerala

Principal investigator : VPK. Nambiar
Associates : K C Chacko
N. Sasidharan
Thomas P. Thomas

Date of commencement : [illegible]
Date of completion : [illegible] 195[illegible]

[illegible] from the study were reported [illegible]. Not [illegible] published [illegible] the report.

7.2.8 Soil Science Division

(i) [illegible] 03/82 [illegible] *[illegible]* to assess soil test methods for nitrogen, phosphorous and potassium

Principal investigator : S. Sankar
Associate : [illegible] Alexander

Date of commencement : April 1982
Date of completion : March 1985

Field work was completed in March 1985. However the report has not been finalised and published.

7.2.9 Wildlife Biology

(i) Wild 04/83 Ecology and behaviour of Malabar Giant Squirrel, *Ratufa indica*

Investigator : K. K. Ramachandran

Date of commencement : January 1983
Date of completion : April 1985

The report is being finalised.

(ii) Wild 05/85. Habitat utilisation by large mammals in Parambikulam Wildlife sanctuary

Principal investigator : P. Vijayakumaran Nair

Date of commencement : April 1983
Date of completion : September 1985

Availability of fodder, shelter, abundance of animals, fodder consumption and damage dome to by animals in the area were studied. The report is under preparation.

7.3 Ongoing Projects :

Progress achieved in respect of the ongoing Projects during the year 1986-87 is as follows :

7.3.1 Botany Division

(i) Botany 04/82. *Establishment of a herbarium in the Institute.*

Principal investigator : Sasidharan N
Date of commencement : October 1982

Although collection and maintenance of herbarium was commenced as soon as the Institute was established, the establishment of herbarium unit was projected in 1982. This is an ongoing programme. During the year 1986-87, 425 new specimens were added to the herbarium. In view of the fact that this is a continuous programme, this could not be taken up as a research project, and should be continued as part of the regular activities of the division.

(ii) Bot. 01/85. *A study of the tree legumes of the Western Ghats of Kerala*

Principal Investigator : N. Gopalakrishnan Nair

Date of commencement : October 1985

Date of completion : September 1988

Field trips were conducted to Southern Kerala, Tirunelveli and Kanyakumari districts of Tamil Nadu. Forest areas in Papanasam, Sivasailam and Ashambu Hills were visited for locating tree legumes. Reservoir catchments of Pechippara, Perinchani, Chittar and Ghadana were also visited. Seven endemic legumes were relocated during the trips. Specimens were collected and flowering materials preserved for morphological studies. Seedlings of two species *(Ormosia travancorica* and *Cynometra bourdillonii)* were raised during the period.

(iii) Bot 08/85. *Distribution of important forest tree species in Kerala (Southern Circle)*

Principal Investigator : N. Gopalakrishnan Nair

Date of commencement : October 1985

Date of completion : September 1988

Extensive exploration trips were conducted centred around Neyyar, Karamana and Vamanapuram river basins. Trekkings were undertaken from Aryanad to Agastyar hills through Kottur and Peppara dam and from Ponmudi to Chemunji hills. About 600 specimens were collected including endemic trees like *Gluta travancorica* and *Garcinia travancorica*. A new species of *Calamus* was collected from Chemunji Hills. Seedlings of 27 species were collected and raised in the Institute.

7.3.2. *Physiology Division*

(i) Physiol. 03/79. *Studies on the physiology of flowering in teak and eucalypt.*

Principal Investigator : CS. Venkatesh

Associate : KK. Seethalakshmi

Date of commencement : June 1979
Date of completion : May 1984

Work was confined to test only. For induction of early flowering the grafts of *T. Grandis* were treated during January June 1986 with Chloro ethyl trimethyl ammonium chloride (500 and 1000 ppm) 2 3 5 triodo benzoic acid (TIBA 100 and 500 ppm) 2-Chloroethyl phosphoric acid (1000 and 3000 ppm) Potassium nitrate (KNO_3 1 and 2%) and Gibberallin (10 and 50 ppm) The treatments were given by foliar application and repeated at monthly intervals till June 1986 Observations on height, number of branches and leaves and other morphological changes, if any were recorded There was no indication of phase change during the flowering season (July-Sept 1986). The same treatments were given from January 1987 onwards at monthly intervals. Observations on growth and other morphological changes are continued.

7.3.3 Ecology

(i) Ecol 07/86. *Vegetation analysis and mapping of Parambikulam Wildlife Sanctuary.*

Principal Investigator : ARR. Menon

Date of commencement : April 1986
Date of completion : March 1988

The formulation of the research project and the preliminary gathering of information were done during the first half of 1986. Collection of geological information and the preparation of a rough map of the area were also done during this period. Systematic field trips were started from June 1986. Vegetation data from 49 localities (39 moist - deciduous and 10 semi-evergreen) were collected during the field trips from June 1986 to February 1987. The vegetation data mainly from moist deciduous areas were collected for detailed analysis. Some of the evergreen and semi-evergreen areas along with plantations have been explored

7.3.4 Entomology

(i) Entom 13/84. *Biology and ecology of the teak trunk borer Cossus cadambae Moore and its possible control.*

Principal Investigator : George Mathew

Date of commencement : October 1984
Date of completion : September 1987

Light trap studies in a teak plantation at Palappilly showed that moth emergence was highest during the month of May and August

December. Small numbers continued to emerge at other months resulting in continuous overlapping generations. Pupation occurred in the soil usually following rains.

In the sampling conducted in selected teak plantations in various forest divisions, infestation was recorded in the following plantations :

Aruvapalam, 1931; Udumbannor 1935 (Konni division); Karikulam, 1959 (Ranni Division); Kaprikad 1928, 1932, 1949, 1956, 1951; Arattukadavu 1926, 1928, 1930, Karakadu 1952 (Malayattoor Division)

Machad 1947, Manalithara 1947, (Trichur Division);

Palappilly 1935, 1937, Vellikulangara 1965 (Chalakkudy Division) Pothundy and Meenchady 1946, Pothundy 1949 (Nemmara Division)

Moths were not attracted to some mixtures of pheromone compounds of the European goat moth tested in the field.

7.3.5 *Genetics*

(i) Genet 03/1979. *Genetic improvement of important matchwood species. Ailanthus triphysa* and *Bombax ceiba*

Principal investigator : C.S. Venkatesh
Date of commencement : January 1979
Date of completion : January 1987.

Apart from maintaining the progeny trials established in 1984 at Edacode, and recording data on survival and height growth not much work was done during the year.

(ii) Genet 02/79. *Improvement of Eucalyptus by selection and inter-specific hybridisation*

Principal investigator : C.S. Venkatesh
Date of commencement : January 1979
Date of completion : January 1987

No progress has been made with regard to this project during the year 1986.87. This has been largely due to the absence of any proper guidance, since the leaving of the prinicpal investigator.

7.3.6 Pathology

(i) Pathol 04/86 *Sapstain fungi of some commercially important timbers and their chemical control*

Principal investigator : Maria Florence

Date of commencement : January 1986
Date of completion : December 1988

From 180 sapstained wood samples of various timber species 210 micro organisms, mostly fungal were isolated. Twentyfive fungal isolates were identified based on their morphological and cultural characters. *Botryodiplodia theobromae* was the major fungus associated with the sapstains of all timbers, followed by *Fusarium*, *Aeremonium Aspergillus*, *Penecillium*, *Syncephalastrum* and *Mucor*. Pathogenecity of *B. theobromae* and *Acremonium* was confined on rubberwood. Antagonistic ability of streptomyces sp., an actinomycete was tested against *Trichoderma*, *Acremonium*, fusarium and Seytalidium. All the isolates were subcultured at quarterly interval.

(ii) Pathol NF 06/86 *Evaluation of microbial pathogens for biocontrol of insect pests of Ailanthus and teak*

Principal investigator : M. I. Mohamed Ali

Date of commencement : October 1985
Date of completion : March 1988

From *Hyblaea puera*, *Cossus cadambe* and *Eligma narcissus* respectively 5, 3 and 2 microorganisms were isolated and their pathogenecity confirmed. An attempt was made to ascertain the minimum lethal dosage for *Bacillus firmus* affecting *Eligma narcissus*, but the results were not promising. The experiment has to be repeated as soon as larvae were available. Cross effectivity of *B. firmus* to *Atteva fabriciella* was found to be negative. Synergistic action of *B. firmus* with different insecticides were tested by mixing them with the bacterial suspension. The larvae were allowed to feed on leaves treated with different combinations. The experiment is being continued. A nuclear polyhedral virus (NPV) was isolated from dead insects of *Hyblaea puera* using ultra centrifuge. Cross infectivity of NPV tested on *Eutectona machaeralis* gave negative results.

7.3.7 Soil Science

(i) Soil 11/84 *Physical and chemical properties of soils in Albizia falcataria plantations*

Principal investigator : M. Balagopalan

Date of commencement : April 1984
Date of completion : December 1987

Determination of particle density of soil samples and compilation of data were done during the year.

(ii) Soils 12/84 *Nutrient partitioning in an evergreen ecosystems*

Principal investigator : S. Sankar
Date of commencement : July 1984
Date of completion : December 1987

Very little progress has been made during the year.

(iii) Soils 13/84 *Effect of varying soil moisture and bulk density on root growth of teak, eucalypt and albizia seedlings.*

Investigator : Thomas P. Thomas
Date of commencement : July 1983
Date of completion : December 1987

Teak, eucalypt and albizia seedlings were transplanted in soils contained in concrete pots and adjusted to bulk densities of 1.1, 1.4 and 1.6 g/cm^3. Dry matter yield of root and shoot were assayed. Pot experiment has been completed.

(iv) Soils 14/84. *Ex-situ decomposition of leaf litters of teak, eucalypt and albizia.*

Principal investigator : M.V. Mary
Date of commencement : July 1984

Isolation of microorganisms from decomposing litters, determination of weight loss of litter and estimation of Co_2 from the decomposition processes were continued during the year.

7.3.8 Silviculture

(i) Silvi 07/81 *Establishment of a bambooteaux in the Institute*

Principal investigator : E. Muhammed
Associates : K.C. Chacko
: T. Surendran
: N. Gopalakrishnan Nair

There was no addition to the collection. The specimens that have been collected earlier were maintained.

In view of the fact that a major project on bamboos covering all aspects has been taken up with IDRC support, including collection of germ plasm of bamboos, it is desirable that this project is terminated.

(ii) Silvi 08/84 *Polyurethane foam sheet for raising forest tree seedlings*

Principal Investigator : K. C. Chacko
Associate : R. C. Pandalai

Date of commencement : July 1984
Date of completion : December 1980

During the year trials were conducted with *Anthocephalus chinensis* and *Haldina cordifolia*

(ii) Silvi 09/85 *Nursery techniques for raising tall seedlings of evergreen species*

Principal Investigator : K. Shanmuganathan
Associates : R.C. Pandalai
U.N. Nandakumar

Date of commencement : July 1986
Date of completion : June 1987

Heights of *Hopea parviflora* and *Mimusops elengi* planted in the deep sunken beds were recorded periodically to study the effectiveness of sunken beds in producing tall seedlings in short periods.

7.3.9 Management

(i) Stat 02/77. *A data bank for the forestry sector in Kerala.*

Principal investigator : K. Easwaran Kutty
Associate : P. Rugmini

Date of commencement : January 1977
Date of completion : Continuous

This is an ongoing project. As part of the project a study of the factors influencing yield variation in eucalypts plantations in Kerala has been taken up. Data collection has been completed. The data collected were compiled and analysis is in progress.

Data on timber prices from selected depots have been collected and updated. A paper on long term price trend of timber in Kerala has been prepared and sent for publication.

(ii) Stat 06/84 *Statistical techniques in forestry research and forestry.*

Principal investigator : K. Jayaraman
Associates : C.N. Krishnankutty
: P. Rugmini

Date of commencement : July 1984
Date of completion : 1988

Review of the existing techniques in forestry research and forestry was completed. The techniques broadly fall under experimental designs and sample surveys and their corresponding inferential aspects. The interdisciplinary areas relevant to forestry with a significant bearing on statistical techniques were identified. Attempts to develop new techniques centred round the topics like, stand models for mixed forests, bound count method for estimation of animal abundance and multivariate ranking procedures using selection indices.

(iii) Econ 05/84 History of forest management in Kerala

Principal investigator : C.T.S. Nair
Associate : Mammen Chundamannil
Date of commencement : October 1984
Date of completion : March 1987

During the year, analysis of the statistics from the administration reports of the Forest Department for the post 1957 period was continued. Changes in the pattern of investment between resource augmenting and resource depleting activities were analysed.

7.3.10 Wildlife

(i) Wild 06/84 *Movement pattern of Asiatic elephant Elephas maximus in Parambikulam Wildlife Sanctuary.*

Principal Investigator : P.S. Easa
Date of commencement : July 1984
Date of completion : January 1987

Monitoring the movement pattern of elephents was continued. Locations of sightings of herds were plotted on an area map. The food and water availability and disturbance in different areas were recorded.

The home ranges of two herds were computed with the help of a computer programme. The average distances covered by the herd in different seasons were calculated. Attempts are being made to find out the influence of rainfall on the seasonal shift in home range. Most of the field work has been completed.

7.3.11 Wood Science

(i) Wood 07/82 *Establishment of xylarium*

Principal Investigator : K.M. Bhat

Date of commencement : April 1982
Date of completion : March 1987

This is an ongoing project. Wood specimens of 11 species were added to the collection and the total collection available is about 100 species. Slides of about 50 species were prepared and the work is in progress.

(ii) Wood 07/84 *Comparison of wilt-diseased and non-diseased (over-aged) coconut stem with respect to their utilisation potential.*

Principal investigator : R. Gnanaharan

Date of commencement : July 1984
Date of completion : June 1986

Estimation of calorific value using Bomb calorimeter was standardised and coconut wood of different age groups were tested.

One drum-type portable kiln ('Tongakiln') was got made and 11 hatches of charcoal were made. Analysis of charcoal obtained from different group coconut wood is being carried out.

Coconut wood was tested in static bending and compression parallel to evaluate its potential for different end uses.

Treatability of coconut wood with preservative chemicals under pressure was ascertained.

7.3.12 General

(i) Gen. 03/1985. *Long term environmental and ecological studies of Pooyamkutty hydroelectric project.*

Investigators : K. Balasubramanyan
S. Sankar
P. Vijayakumaran Nair
K.K. Narayanan Nair
Mammen Chundamannil

Date of commencement : November 1984
Date of completion : October 1988

This is a multidisciplinary work involving the divisions of ecology, soil science, wildlife, botany and management. Progress in respect of each component is summarised below.

(i) *Botanical studies:* Extensive field surveys covering most of the project area in the different seasons were undertaken and more than 350 specimens were collected and herbarium sheets were prepared. More than 200 species were also recorded from the area. Analysis of the world distribution pattern of each of the floristic element recorded from the area is also being conducted to identify endemics in the study area.

(ii) *Management:* During the year some of the tribal families were visited and data were collected on socio-economic aspects, particularly about dependence on reed collection, pattern of cultivation in the areas, etc.

(ii) *Wildlife studies :* A grid system has been followed to record the abundance of important mammals. Abundance is being estimated by indirect means.

(iv) *Soil studies :* Soil samples have been collected from localities with different land use. Also soil erosion and sediment load is being monitored.

(v) *Ecological studies:* Detailed reconnaissance was done and major characteristics of vegetation have been studied. Sample profiles have been laid out and complete enumeration has been done of trees above 10 cm DBH.

8. PUBLICATIONS

8.1 Research Reports

Alexander TG, Sankar S, Balagopalan M. and Thomas P. Thomas 1987. Soils in teak plantations of different site quality. KFRI Research Report 45. 17 p. Report of the Soils 10/84 Project.

CS. Venkatesh, MP. Koshy, KC. Chacko and EP. Indira. Genetic Improvement of Teak in Kerala (Genet 01/79) July 1986 (KFRI Research Report No.13)

Vegetative propagation of some important tree species by rooting stem cuttings. (Report of Physiol 01/79)

K.S.S. Nair, George Mathew, K. Mohanadas and A.R.R. Menon (1986). A study of insect pest incidence in natural forests. KFRI Research Report 44, 28 pp.

Sharma JK. and KV. Sankaran 1987. Diseases of *Albizia falcataria* in Kerala and their possible control measures. KFRI Research Report No. 47, 50p.

Balasundaran, M. and MI. Mohamed Ali 1987. Root nodulation potentialities of *Leucaena leucocephala* in Kerala. KFRI Research Report No. 48.

A study of insect pest incidence in natural forest.(KFRI Research Report No.44).

Nair, K.K.N. 1986. Preservation of *Dalbergia* L. F. in Kerala by establishment of a germplasm bank. KFRI Research Report No. 43.

Nambiar, P. V. K., Sasidharan, N., Renuka, C. and Balagopalan, M. 1986. Studies on the medicinal plants of Kerala Forests. KFRI Research Report No. 42.

Renuka, C., Bhat, KM. and Nambiar, V. P. K. 1987. Morphological, anatomical and physical properties of *Calamus* species of Kerala forests. KFRI Research Report No. 46.

8.2 Papers published in journals and proceedings

8.2.1 Papers published in journals

Indira EP. and MP. Koshy 1986. A report of monohybrid ratio for albino expression in *Bambusa arundinacea* (Retz.) wild. Current Science 55 (19): 993-994.

Mathew, G., Koshy, MP. and Mohanadas, K. (1986). Preliminary studies on insect pollinators of teak in Kerala, India. Indian Forester 113(1):61-64.

Nair, K.S.S. and Sudheendrakumar, VV. (1986). Population dynamics of teak defoliator *Hyblaea puera* (Lepidoptera: Hyblaeidae). Current Sci. 55(23): 1207-1208.

Mohamed Ali, MI. and EJ. Maria Florence 1987. Leaf blight of teak mistletoe, *Dendrophthoe falcata* in Kerala, India. Trans. Brit. Mycol. Soc. 88:275-277.

Mohanan, C. and JK. Sharma 1986. *Bipolaris spicifera* and *Exserohilum rostratum* causing leaf spots of *Eucalyptus tereticornis* - new records from India. Curr. Sci. 55:991-992.

Mohanan, C. and JK. Sharma 1987. *Phomopsis eucalypti* and *Bartalina terricola* - new pathogen record on eucalypts from India- Trans. Brit. Mycol. Soc. 88:125-126.

Sankaran, KV. and JK. Sharma 1986. *Hydnum subvinosum*, a rare parasite on *Leucaena leucocephala* in India. Trans. Brit. Mycol. Soc. 87:401-405.

Sankaran, KV. M. Balasundaran and JK. Sharma 1986. Seedling diseases of *Azadirachta indica* in Kerala, India. Eur. J. For Path 16:324-328.

Muktesh Kumar and Sasidharan, N. 1986. On the occurrence of *Dendrobium lawianum* [illegible] Kerala. Curr. Sci. 55:187-188.

Muktesh Kumar and Sasidharan, N. 1986. Endemic orchids of South India. [illegible] Hat. 8:[illegible]5-2[illegible]

Muktesh Kumar and Sasidharan, N. 1986. Orchids of Kerala and their conservation. Proc. National Seminar on the Biology, Conservation and Culture of Orchids. pp. 363-376.

Nair, KKN. 1986. An amended description of *Dalbergia beddomii* Thoth. (Fabaceae) rediscovered from Silent Valley, Kerala, India. J. Econ. and Tax. Bot. 8:2[illegible]

Nair, KKN. 1986. Two unrecorded species of *Dalbergia* L.f. (Fabaceae) in Kerala. J. Econ. and Tax. Bot. 7:730-734.

Nair, KKN. 1986. Additions to Gamble's Flora of the Presidency of Madras (1915-1935) from the State of Kerala, Tamil Nadu, Karnataka and Andhra Pradesh upto 1982. Ind. J. Forestry. 8:250-261.

Renuka, C. 1986. Distribution of canes in Kerala and the need for their conservation. J. Indian Bot. Soc. 65 (suppliment).

Renuka, C. and Nambiar, VPK. 1986. Axillary shoot development in the aerial stem of *Calamus*. Principes 29: 160-161.

Renuka, C. and Swarupanandan, K. 1986. Morphology of the flower in *Thottea siliquosa* and the existence of staminodes in Aristolochiaceae. Blumea. 31:313-318.

Sasidharan, N. 1986. On the rediscovery and distribution of five endemic and endangered taxa in Kerala. J. Indian Bot. Soc. 65 (supplement):51.

Ramachandran, KK., Vijayakumaran Nair, P. and Easa, PS. 1987. Management of Periyar Wildlife Sanctuary. Tiger Paper.

Bhat, KM., Bhat, KV. and Dhamodaran, TK. 1986. Thickness and percentage of bark in some timbers grown in Kerala. J. Indian Academy of Wood Science. 17:23-29.

Bhat, KV., Swarupanandan, K. and Surendran, T. 1986. Anatomy of branch abcission in *Lagerstroemia microcarpa* Wight. New Phytol. 103:177-183.

Dhamodaran, TK., [illegible], Gnanaharan, R. and Nair, KSS. 1986. Relation between [illegible] [illegible] 11 [illegible]

Gnanaharan, R. 1986. [illegible] for [illegible] treatment of rubber wood. International Research Group on Wood Preservation Document No. IRG/WP/3367. 6 p.

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

8.2.2 Papers communicated

Varma, R.V., Mathew, G., Mohanadas, K., Gnanaharan, R. and Nair, KSS. 1986. Laboratory evaluation of insecticides for control of the bamboo borers, *Dinoderus minutus* and *D. ocellaris*. Internat. J. Wood Pres. (In Press).

Mathew, G. (1986). Insect borers of commercially important stored timber in the State of Kerala. (India). J. Stored Prod. Res. (In Press).

Mathew, G. Natural enemies of some timber borers in Kerala and their possible role in regulating pest incidence. Proc. National Seminar on Entomophagous Insects, Calicut. Oct. 1985 (In Press).

Nair, KSS. Migration, a mechanism of parasite evasion. Proc. National Seminar on Entomophagous Insects Calicut Oct. 1985 (In Press).

Sudheendrakumar, VV. Studies on the parasites of *Hyblaea puera* in teak plantations at Nilambur. Proc. National Seminar on Entomophagous Insects, Calicut, Oct. 1985 (In Press).

Mathew, G. Cossid pests of plantation crops in India and the prospects of their management. J. Coffee Res. (In Press).

Mathew, G. Some aspects of the biology and ecology of the teak carpenter-worm, *Cossus cadambae* Moore (Lepidoptera, Cossidae). National Symposium on insect physiology, ecology and behaviour. Trivandrum (In Press).

Soman, CK. and Seethalakshmy, KK. Effect of different storage conditions on the viability of seeds of *Bambusa arundinacea* (communicated to Seed Science and Technology).

9.2.3 *Papers published in proceedings*

Remesh, C. and Seethalakshmy, KK. Phenology and propagation of Calamus - their bearing on practical applications. (Accepted by Rattan Information Centre. Proceedings of Colloquium on Rattan propagation 19-22 January 1987 Sabah, Malaysia)

Nair, KSS. 1986. Important insect pest problems of forest plantations in tropical India Proc. 18th IUFRO World Congr. Vol. 1:134-145.

Nair, CTS. 1986. Critical issues in the management of biosphere reserves. *In* Biosphere Reserves Proceedings of the First National Symposium. Uthagamandalam. Sept. 24-26, 1986. Ministry of Environment & Forests. Govt. of India. New Delhi.

9. EXTENSION ACTIVITIES :

Scientists in the Institute actively involved in extension activities, particularly by way of rendering advice to the Forest Department on various matters. Some of the important activities in this regard were as follows:

9.1 Soil Science Division:

The division undertook the following soil studies:

Effect of fire on soil properties - Advisory study for the Fire Training Centre, Kulamavu. Analyses were done on the sample, data processed and statistical analyses carried out. The report is under preparation.

Soils of the Wynad Forest Division. Analyses were done on the samples, data processed and statistical analyses carried out. The report is under preparation.

Soils of the Trivandrum Forest Division. Some of the analyses were completed and this study is in progress.

Soils of the Nilambur Subcentre. Soils sampling as per a grid-map was completed.

9.2 Entomology Division :

Instances of insect damage reported to Forest Department as listed below were investigated and advice on control measures offered successfully.

	Tree species	Problem caused by	Location
1	Casuarina	Sapling borer, *Sahyadrassus malabaricus*	Kunnamkulam (Social Forestry Idukki)
2	Eucalyptus Casuarina Mahogany (mixed plantation	Termites in eucalypts and Casuarinum and shoot borer in Mahogany	Kuyiletton Kattappana (Social Forestry Thodupuzha
3	*Eucalyptus tereticornis*	Termites and other site factors	Manjapetta, Erumeli, (Social Forestry Kottayam)
4.	Cashew	Cashew stem borer *Plocaederus ferrugineus*	Kurisumudi, Kalady (Malayattor Div)
5	Teak nursery	Phytotoxicity due to excess insecticide	Panyangode (Nilambur Div)
6.	*Ailanthus triphysa*	The Ailanthus defoliator, *Eligma narcissus*	Erumeli (Kottayam Div)
7.	Eucalypts and other spp.	Termites	Karuli (Rajasthan)
8.	*Grevillea*	Catterpillars	Nagarampara Idukki (Kottayam Div)
9.	*Ailanthus triphysa*	*Eligma narcissus & Atteva fabriciella*	Thattekkad, Kothamangalam (Trichur Div)
10.	Eucalyptus	Sapling borer, *Sahyadrassus malabaricus*	Elevancherry (Social forestry, Palghat)
11	*Ailanthus triphysa*	*Eligma & Atteva*	Pullarnkandam, (Trichur Div.)

9.3 Pathology Division

[illegible] referred to the Division, were investigated [illegible] communicated to the Forest Department in [illegible] Report [illegible]

[illegible]	[illegible] diagnosed	M[illegible] of year	Locality
1	[illegible] of *E.* [illegible]	May 1986	Kollathirumedu
2	Mortality of *E. camaldulensis* due to [illegible]	June 1986	Khamam Dist. AndhraPradesh
3	Leaf spot by *Cr[illegible]*	June 1986	"
4	Rhizoctonia foliar rot of Mahogany seedlings	June 1986	Thenmala
5	Collar rot of *Ailanthus* seedlings	June 1986	Trivandrum SF
6	Infusion of large shade trees with elemental mercury	July 1986	Mionampara Cardamom estate (Nelliampathy)
7.	Collar rot of *T. grandis* seedlings	July 1986	Vadasherikkara
8.	Leaf blight of *Eupatorium*	August 1986	KFRI
9	Collar rot of *Mimoops elengi* caused by *Cylindrocladium*	August 1986	KFRI
10.	Leaf spot of *Populus deltoides* caused by *Cylindrocladium*	August 1986	KFRI
11	Death of seedlings due to herbicide	Sept. 1986	Kothamangalam
12.	Leaf spots of *Pterocarpus marsupium*	Sept 1986	Erumely
13.	Death of Cashew trees tea mosquito	Sept. 1986	Kalady
14.	Bacterial wilt of *Casuarina*	Sept 1986	Muliar Kasaragod

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
19.	[illegible] extraction	[illegible]	[illegible]
20.	Bacterial rhizome decay in *B. arundinacea*	Dec. 1986	Kaliyar Kothamangalam
21.	Stem canker of *E. camaldulensis*	February 1987	E. Godavary Dist. Andhra Pradesh

9.4 Wildlife Biology Division

The staff of the division participated in the wildlife census conducted at the Silent Valley National Park and Parambikulam Wildlife Sanctuary by the Kerala Forest Department.

9.5 Botany Division

Preliminary work by way of raising seedlings for greening Pattikkad hills was commenced.

9.6 Wood Science Division

A total of 36 timber specimens were identified for various organisations and private users. Technical information on these species was given wherever required.

9.7 Genetics Division

9.8 Other items

9.8.1 Court Assistance to Kerala High Court

The Hon'ble High Court of Kerala requested the Director to appoint a technical Commission to study the soil erosion and siltation of irrigation tank in Akathethara due to forest encroachment. The Director appointed a Commission consisting of scientists in the Soil Science and Botany divisions and himself as chairman. The report was submitted to the High Court. This has been very much appreciated by the Court.

The High Court of Kerala requested the Director to appoint a technical Commission to study the effect of felling and removal of trees from Karappara Cardamom estate in Nelliampathy hills. A Commission consisting of scientists from the Pathology, and Ecology divisions was appointed. The report has been submitted to the High Court.

The Institute also helped the Department to determine the age of trees in an area located under the Kerala Private Forest (Vesting and Assignment) Act 1971.

9.8.2 Training of I F S Officers

The Institute organised three one week courses for senior I F S Officers on the request of the Ministry of Environment and Forests. Altogether 56 Officers attended the courses.

10. CONFERENCES / SEMINARS / SYMPOSIA ATTENDED

10.1 International

K.S.S. Nair participated in the 18th IUFRO World Congress held at Ljubljana, Yugoslavia in September 7 to 14, 1986. He presented two invited papers entitled (1) Important insect pest problems of forest plantations in

[illegible] by KSE [illegible] by K.S.E. Nair and V.V. Sudheendrakumar [illegible] research laboratory [illegible] grant from the British Council [illegible]

R. [illegible] participated [illegible] Seminar [illegible] 9-12 [illegible] 1986 [illegible]

K.K. Seethalakshmi [illegible] organised by International Development Research Centre from 19 [illegible] 1987 in Sabah, Malaysia and presented [illegible] paper [illegible] propagation of Calamus [illegible]

K. Swarupanandan attended the Regional Training Workshop on "Ecology and conservation of the Tropical Humid Forests of the Indo-Malayan Realm" in Sri Lanka from 17.2.87 to [illegible].

C.T.S. Nair, Director attended the UNESCO Workshop on Rainforest regeneration and management held at Guri, Venezuela from 24-28 November 1986, and presented a paper titled Management of the Tropical Wet Evergreen Forests in India: A Comparative account of the silvicultural practices in Kerala, Andaman islands and Assam.

K. Jayaraman, attended the inaugural seminar on Multipurpose tree species research organised by the Winrock International Institute for Agriculture Developement, at Bangkok from 24th to 27th September 1986.

10.2 Others

K. Shanmuganathan attended a meeting of the Research Programme Committee of the Kerala Forest Department.

T.G. Alexander participated in the State-level Workshop on Agro/Social Forestry Practices held at the Directorate of Extension, Kerala Agricultural University, Mannuthy, 12-13 Aug. 1986.

M. Balagopalan attended the National Seminar on Recent Advances in Soil Research/Special Seminar on Land Evalution for Multipurpose Landuse Utilisation organised by the Indian Society of Soil Science during its 51st Annual Convention, Tamil Nadu Agriculture University, Coimbatore, 23-25 Sept. 1986 and presented a paper "Soil properties in selected teak and eucalypt plantations of Trichur Forest Division".

S. Sankar took part in a Seminar on Impact of Agriculture on Environment at Kerala Agricultural University, Mannuthy, 20-21 Dec. 86

P.V. Varma participated in the state level workshop on Agro-Social Forestry Practices held in the Kerala Agricultural University Mannuthy, during 12-13 August 1986.

C. Mohanan attended a state level Agro-Social Forestry Workshop in the Kerala Agricultural University, Mannuthy, during 12-13 August 1986.

M. Balasundaran and E.J. Maria Florence attended a Workshop on "Beneficial microbes in crop management" at CPCRI, Kasaragod 8-9 Sept. 1986 and they presented the following papers

i Balasundaran, M. and M. Mohamed Ali. Effect of soil pH on root nodulation in *Leucaena leucocephala*.

ii Sankaran, K.V. and E.J. Maria Florence. Status of mycorrhiza research in forest trees in India.

J.K. Sharma and K.V. Sankaran attended the Symposium on Applied Mycology held at Sri. Pushpam College, Poondi, Thanjavur, Tamil Nadu from 26 - 27 December 1987. Dr Sankaran presented a paper entitled "New record of *Collybia leucophaea* from India and its association with decomposing *Albizia* leaf litter".

A.R.R. Menon attended the Indian National Cartographic Association meeting at Centre for Earth Science Studies, Trivandrum, November 24-26, 1986.

A.R.R. Menon attended the All India Symposium on the biology and utility of wild plants at South Gujarath University, Surat March 14-16, 1987.

K. Balasubramanian attended the Workshop on Western Ghats Eco-development Programme at New Delhi 12-13 January 1987.

N. Sasidharan attended the 9th All India Botanical Conference held at Madras during 28-30 December 1986 and presented a paper entitled "On the rediscovery and distribution of five endemic and endangered taxa in Kerala".

K.K.N. Nair attended the Workshop of the Principal Investigators of Department of Environment sponsored Projects, organised by the Department of Environment at New Delhi on 12-13 January 1987.

P.S. Easa attended the Wildlife Conservation and Management Training Programme organised by the National Zoological Park, Washingtom DC for nine weeks.

P. Vijayakumaran gave a lecture on [illegible] computer package" to the participants of workshop on [illegible] at the Madurai Kamaraj University.

KK. Ramachandran attended the [illegible] organised by the Wildlife Institute of India.

TK. Dhamodaran attended the Seminar on [illegible] at the Forest Research Institute, Dehra Dun on 26-27 May 1986 and presented the following papers :

1) Some promising tropical hardwood species for [illegible] wood-wool board (By TK Dhamodaran and R Gnanaharan)

2) Tropical hardwood branches as raw material for [illegible] products (by KM Bhat and TK Dhamodaran)

KM. Bhat attended the seminar-cum-demonstration "Semi-automatic Image Analysis of Microscopic Objects" organised by M/s Leitz at Trivandrum on 28 August 1986.

TK Dhamodaran attended a Short Term Institute on Polymer Technology conducted by the UGC at the Department of Polymer Science and Rubber Technology, Cochin University of Science and Technology from 24 November to 12 December 1986.

CTS. Nair attended the first National Symposium on Biosphere Reserves held at Udhagamandalam, September 24-26, 1986 and presented a paper entitled "Critical issues in the management of biosphere resereves".

11. VISITORS TO THE INSTITUTE

1.	Prof. MGK. Menon Scientific Advisor to Prime Minister and Member, Planning Commission, New Delhi.	1.9.1986
2.	Dr. Manju Sharma Chief (Science) Planning Commission, New Delhi.	1.9.1986
3.	Justice Sivaraman Nair & Justice John Mathew Kerala High Court (Visited KFRI Sub Centre Nilambur)	19.9.1986

		16.10.1986
5.	Mr. Charles Hatch Forestry Advisor, USA	28.10.86
6.	Mr. Karim Oka Project Officer IDRC, New Delhi	31.10.1986
6.	Mrs. Sarala Gopalan Secretary to Govt. of Kerala, Trivandrum	15.12.1986
7.	Prof. A.M. Stewart Professor of Zoology University of Massachussetts, USA	15.12.1986
8.	Mr. William Stewart Asst. Programme Officer Ford Foundation, New Delhi	26.12.1986
9.	Mr. Alan Oswald (Rtd. Conservator of Forests Madhya Pradesh), Australia	26.12.1986
10.	Swami Ranganadananda Sree Ramakrishna Ashram, Hyderabad	12.2.1987
11.	Prof. L. Roche Professor of Forestry University of North Wales Banger, UK	28.2.1987
12.	Hon. Justice S. Mallimath Chief Justice of Kerala (Visited KFRI. Sub Centre Nilambur)	

A team consisting of Mr. RV. Singh, President FRI, Mr. Narayan Singh, DIG of Forests, Mr. R. Srinivasan, Jt Secretary, Govt. of India visited the institute on 7.1.1987 in connection with the reorganisation of Forestry Research in India.

An expert team of FAO/Govt. of India consisting of five members visited the Institute on 31.3.1987 to draw up plans for reorganisation of Forestry Research in India.

APPENDIX I

Governing Body

1) Minister for Forests, Kerala ... Chairman
2) Chairman
State Committee on Science
Technology & Environment, Kerala ... Vice-Chairman
3) Secretary to Government of Kerala
Dept. of Planning & Economic Affairs
4) Secretary to Government
Finance Department, Govt. of Kerala
5) Vice-Chancellor
Kerala Agricultural University, Mannuthy
6) Chief Conservator of Forests, Kerala
7) Inspector General of Forests
Govt. of India, or his alternate
President
Forest Research Institute & Colleges, Dehra Dun
8) Director
Kerala Forest Research Institute, Peechi
9) Prof. PS. Ramakrishnan
Head
School of Environmental Sciences
Jawaharlal Nehru University, New Delhi
10) Shri. JC. Varmah
Former President
Forest Research Institute & Colleges
New Forest, Dehra Dun
11) Dr. PM. Ganapathy
Director
Indian Plywood Industries Research institute
Bangalore
(former Director, Kerala Forest Research Institute)
12) Shri KK. Nair
Retd. Chief Conservator of Forests
Komath House, Calicut-673 011
13) Shri AK. Kaderkutty
Managing Director
Western India Plywoods Ltd.
Ballapattom, Cannanore

APPENDIX II

Executive Committee

1) Chairman
State Committee on Science
Technology & Environment, Kerala ... Chairman

2) Secretary to Government of Kerala
Dept. of Planning &
Economic Affairs

3) Chief Conservator of Forests Kerala

4) Dr. P.M. Ganapathy
Director
Indian Plywood Industries Research Institute
Bangalore
(former Director, Kerala Forest Research Institute)

5) Shri K.K. Nair
Retd. Chief Conservator of Forests
Komath House, Calicut - 673 011

6) Director
Kerala Forest Research Institute, Peechi

APPENDIX III

STAFF AS ON 31-3.1987

Dr. C. T S. Nair, Director

Administration

1	Shri M. [illegible]	[illegible]
2	.. CD Jolly	Dy. Registrar [illegible]
3	PK Bh[illegible]	Dy. Registrar [illegible]
4	.. P. Achuthankutty	PA to Director
5	.. MV Narayanan [illegible]	Internal Auditor
6	.. MK. Aravindakshan	Office Assistant
7	.. MS. Sukumaran	
8	.. VK Mohanan	.
9	Smt KM Suseela	
10	Shri. FV. Eshac	..
11	.. KK. Thomas	..
12	.. Thampi J. Kollannal	.
13	Smt. M. Kamalamma	..
14	Shri TJ Alfred Headsjus	
15	Smt. Mary Kuruvila	Stenographer
16	Shri. PM. Venugopalan	Receptionist
17	.. T. Chandran	Typist
18	.. P Mohandas	Driver
19	.. K. Chandran	..
20	.. KR. George	Attender
21	.. PV. Subramanian	..
22	.. PS. Raman	..
23	.. MB. Dasan	..
24	.. PA Sulaiman	..
		Office Asst (joined on 29-9-86)
25	Kum. Grace Andrews	Stenographer (joined on 27-1-87)

Engineering

26	Shri. KR. Mukundan	Engineer
27	Smt. VK. Leela	Office Assistant
28	Shri. PR. Jose	Sergeant
29	.. KS. Gopalan	Overseer
30	.. UY. John	..

31	Shri.	PP. Sunny	Skilled Maintenance Asst
32	Smt.	TV. Chandrika	Typist
33	Shri.	PT. Madhavan	Driver
34		K. Gopavallabhan	..
35		K. Dharmaraj	..
36		VD. Johny	..
37		K. Vijayan	..
38	..	S. Shahul Hameed	..
39	..	BP. Sreedharan	Attender
40	..	K. Said Mohammed	Watcher (joined on 24-7-85)
41	..	PM. Vasu	..
42	Shri.	KC. Subramanian	Watcher (joined on 24-7-85)
43	..	AC. Antony	..
44	..	CK. Vincent	Bus Cleaner
45	..	KC. Subramanian	Pump Operator / Plumber (joined on 22-7-85)
46	..	D. Skariah	Pump Operator
47	..	KM. Velayudhan	..
48	Smt.	VM. Ammini	Full-time Sweeper
49	..	KD. Chinnamma	..
50	Shri.	ET. Devassy	Pump Operator / Plumber (Joined on 8-7-86)
51	Smt.	PK. Thankamani	Part-time Sweeper (Joined on 3-11-86)
52	..	KK. Ammini	..
53	..	KC. Mary	..
54	..	PV. Thanka	..
55	..	RV. Bharathi	..

Library

56	Shri.	K. Ravindran	Librarian
57	..	K. Sankara Pillai	Asst. Librarian
58	..	Subash Kuriakose	Artist/Photographer
59	Smt.	N. Sarojam	Library Asst.
60	Shri.	KH. Hussain	..
61	Smt.	KN. Rajamma	Office Assistant
62	Shri.	V. Asokan	Typist
63	..	CA. Jose	Binder
64	..	VS. Neelakandan	Attender
65	..	KK. Ahamed	..

Botany (Physiology)

66	Dr. KK. Seethalakshmi	Scientist Grade D
67	Shri T. Surendran	"
68	" CK. Soman	Field Asst.
69	" PA. Sasikumarakurty	Attender
70	Smt. D. Sumangala Amma	Stenographer (joined on 19-4-85)
71	Shri. MK. Sivarajan	Garden Worker (joined on 1-8-86)

Botany (Taxonomy)

72	Shri. N. Gopalakrishnan Nair	Scientist Grade D.
73	Dr. KK. Narayanan Nair	"
74	Shri. N. Sasidharan	"
75	Dr. C. Renuka	"
76	Shri. MS. Muktesh Kumar	"
77	" KK. Unni	Field Asst.
78	" T. Prabhakaran	Gardener
79	" VN. Balakrishnan	Attender
80	Smt. AM. Lalitha	Garden Worker (joined on 1-8-86)

Ecology

81	Dr. K. Balasubramanyan	Scientist Grade B
82	Shri. K. Swarupanandan	Scientist Grade D
83	Dr. AR. Ramachandra Menon	"
84	Shri P. K. Chandrasekhara Pillai	Field Asst.
85	KR Sevaraman	Attender

Entomology

86	Dr. KSS. Nair	Scientist Grade B
87	Dr. R. Venugopal Varma	Scientist Grade C
88	Dr. K. George Mathew	Scientist Grade D
89	Shri. VV. Sudheendrakumar	Scientist Grade D
90	" K. Mohanadas	Scientist Grade E
91	" P. Padmanabhan	Field Asst.
92	Smt. K. Annapoorni	Stenographer
93	Shri. ET. Kuttykrishnan	Attender

Genetics

96	Shri. [illegible]	Scientist Grade D
97	Smt. [illegible]	..
98	Shri. RK. Ramesh	Field Asst
99	.. Ms. Sreekumari	Attender

Management

98	Dr. K. [illegible]	Statistician
99	Smt. P. Rajamma	Scientist Grade D
100	Dr. PK. Muraleedharan	Scientist Grade E
101	Shri. Mathew Chandramohan	..
102	.. CN. Krishnankutty	Programmer
103	.. AR. Rajan	Stenographer
104	.. A. Ramakrishnan	Typist
105	.. CO. James Tulode	Attender
106	.. EP. Somasekharan Nair	

Pathology

107	Dr. JK. Sharma	Scientist Grade B
108	Shri. C. Mohanan	Scientist Grade D
109	Smt. EJ. Mary Florence	..
110	Shri. M. Balasundaran	..
111	.. Mt. Mohamed Ali	Scientist Grade E
112	Dr. KV. Sankaran	..
113	Shri. K. Yesodharan	Field Asst.
114	.. MA. Sankaran Kutty	Attender
115	.. MC. Mohandas	..
116	.. TS. Chandrika	Garden worker (joined on 1-8-86)

Silviculture

117	Shri. K. Shanmuganathan	Silviculturist
118	.. KC. Chacko	Junior Silviculturist
119	Dr. R. Chandrasekhara Pandalai	Scientist Grade E
120	Shri. Nandakumar U. Narath	..
121	.. M. Cherukunnan Nair	Attender (Nilambur)

122	Shri PS Kar[illegible]	Attender
123	.. P. Avu[illegible]	Watcher (Seasonal)
124	.. K. Mohana[illegible]	..
125	.. AK. S[illegible]	Cook-cum-Attender
126	.. C. Mohan	Garden Coolie (Joined on 1-6-86)
127	.. P. Mohammed	..
128	.. C.I. John	..
129	Smt. K.I. Pathumma	..
130	.. AV. Thankam	..

Soil Science

131	Dr. TG. Alexander	Scientist Grade B
132	Dr. S. Sankar	Scientist Grade D
133	Shri. M. Balagopalan	..
134	.. Thomas P. Thomas	..
135	.. AV. Velayudhan	Attender

Wildlife Biology

136	Dr. P. Vijayakumaran Nair	Scientist Grade D
137	Shri. KK. Ramachandran	..
138	.. PS. Easa	Scientist Grade E
139	.. EA. Jayson	..
140	.. KV. Sidharthan	Attender

Wood Science

141	Dr. R. Gnanaharan	Scientist Grade B
142	Dr. K Mahabala Bhat	Scientist Grade C
143	Dr. K. Vishnu Bhat	Scientist Grade E
144	Shri. TK. Dhamodaran	..
145	.. PK. Thulasidas	Laboratory Asst.
146	.. MC. Raghunathan	Attender