CHAPTER II

INSTITUTE OF FOREST GENETICS AND TREE BREEDING COIMBATORE

The Institute of Forest Genetics and Tree Breeding (IFGTB) is a national Institute formed in April 1988 under the Indian Council of Forestry Research and Education (ICFRE), an autonomous Council under the Ministry of Environment and Forests, Government of India.

Realizing the fact that Forest Genetics, Tree Breeding and propagation technologies are among the broad spectrum of methods available to enhance the productivity of the impoverished forests and land resources and to foster rural development while at the same time protecting the environment for sustainable future, the Institute is entrusted with the responsibility to undertake research to develop application oriented technology keeping in view the end use requirements by mobilizing and upgrading the existing genetic resources through appropriate breeding and propagation techniques. The Institute conducts National level research on the subjects of Genetics and Tree Breeding of important forest species. In addition, it also attends to the local problems of the States of Tamil Nadu, Kerala and the Union Territories of Andaman and Nicobar Islands, Lakshadeweep and Pondicherry.

PROJECTS COMPLETED DURING THE YEAR 2001-2002

Project 1: Assessing growth and physiological variations like photosynthesis in fast growing tree species for improving yield [IFGTB/PBT/RP4/37/ICFRE/1992-2001]. *For technical report contact, Principal Investigator - Dr. K. Gurumurthi.*

Findings : A total of 106 superior clones of *Casuarina equisetifolia* and 33 clones of *Eucalyptus tereticornis* and *E. camaldulensis* were selected using multi trait index selection method. Superiority and genetic divergence of these materials were investigated. Physiological and morphological studies have been carried out to characterize the clones and to determine the interclonal variation. Morphological descriptors were developed for selected clones of Casuarina. Variations in photosynthesis under stressed conditions were studied in *Eucalyptus*. Studies revealed that photosynthesis can be effectively used as a physiological criteria for rapid screening of salt tolerant clones. Studies on water

Clonal trial of Teak in farmers field

use efficiency were also undertaken. Studies on various wood quality were carried out and characterized the clones for pulp and solid wood products. 5 clones were found promising for paper manufacturing. Ninety-nine clones of *Casuarina equisetifolia* were screened for salinity tolerance at Tiruchirapalli, Tamil Nadu and identified clones tolerant to salinity. *Casuarina frankia* compatibility was also studied.

Project 2: Micropropagation and tissue culture studies on selected tree species procedure for hardening, weaning and out planting [IFGTB/PBT/ RP5/37/ICFRE/1992-2001]. *For technical report contact, Principal Investigator- Dr. K. Gurumurthi.*

Findings : Cost-effective micropropagation protocols were developed for mass propagation of *Dendrocalamus strictus, Bambusa arundinacea, B. arundinacea* var. *gigantean, D. membranaceous, B. nutans* and *Oxytenanthera stocksii*. Developed the strategy for the selection of good quality seeds of bamboos based on the seedling characters like vigour and growth habit. Quality seeds obtained from phenotypically superior clumps of *B. arundinacea* were used as explant source for large-scale multiplication. Field demonstration trials established for the micropropagated plants of *D. strictus* and *B. arundinacea*. Macroproliferation techniques were used to increase the quality planting stock. *In vitro* propagation methods were standardised for mature tissues of *Azadirachta indica*. Difficult to root clones of *E. tereticornis* and *E. camaldulensis* were rejuvenated and 100% rooting achieved. Fast-growing *Acacia* hybrids (*A. mangium* X *A. auriculiformis*) obtained from West coast paper mills, Dandeli were established in culture for clonal propagation through axillary bud multiplication. Methods were developed for the micropropagation of tropical hybrid *Eucalyptus urophylla X E. grandis* that is currently being used in important reforestation programs all over the world. Superior clones of *Eucalyptus pellita* were established in culture. Seventeen-years-old phenotypically superior tree of *Eucalyptus tereticornis* (SMD-7) were micropropagated and a demonstration field trial was established at Panampally Research Station.

Project 3: Standardization of germination methods in *Tectona grandis* and evaluation of vigour for seeds of different sources [IFGTB/ST/RP20/47/ICFRE]. *For technical report contact, Principal Investigator - Mr. B. Gurudev Singh.*

Findings : The effect of time of seed collection on germination was studied. The other factors, which influence the germination, are medium and light. About 16 different types of pre-treatments were imposed on teak drupes to work out the optimum pre-treatment requirement for increasing the germination percentage. Alternate soaking and drying of seeds gave fairly consistent results. The size of seed increase in volume due to imbibition of water and the hard shell of the fruits were broken by the imbibition pressure of the seeds. The pathway of the water movement into the fruits during alternate wetting and drying was studied. Variations in drupe physical characters were studied for 30 different seed sources of various states. Teak fruits collected from wet area and dry area teak sources were studied to find out the better seed source. The effect of grading drupes into small (below 12 mm), medium (12-14 mm) and big (above 14 mm) on germination were studied and found that medium and big drupes gave better germination results. The study on the effect of density of drupes (with and without mesocarp) on seed fillingness and germination revealed that heavier drupes contain more number of seeds and also give better germination results.

Seed dormancy and ageing studies in teak drupes were initiated. The bio-chemical changes were compared.

PROJECTS CONTINUED DURING THE YEAR 2001-2002

Project 1 : Evolving clonal propagation technology for teak to improve productivity [IFGTB/GTB/RP 4/47/ICFRE 2000-2005]. *Principal Investigator - Dr. K. Palanisamy.*

Status: Clonal propagation technology for mature teak tree and quality seedlings has been standardized. There was no seasonal impact on rooting in teak and it can be mass multiplied throughout the year. A total of 60 superior trees were selected in the plantations in different parts of Kerala (Nilambur, Konni, Trichur and Olavakodu) and 8 trees were clonally multiplied. Clonal trials with plantlets raised from mature trees and quality seedlings were established in 3 different locations of Tamil Nadu and Kerala. To study the growth performance of coppice shoot cuttings of mature tree a comparative trial has been raised with coppice shoot plants of mature trees (63 years old tree), seedlings and seedling cuttings.

Project 2: Genetic variability and selection in natural population of *Artocarpus* species [IFGTB/GTB/ RP 5/ 47/ ICFRE {IFGTB/ GTB/RP 1/ 11/ 61(6)}/ 2000-2005]. *Principal Investigator - Dr. Maheshwar Hegde.*

Status : Reconnaissance survey was undertaken in Kerala and Tamil Nadu. Wood samples of *Artocarpus hirsuta*, *A. integrifolia* and *A. lakoocha* have been collected from two populations of evergreen forests of Gudalur (Tamil Nadu and Kerala border region) and Yellapur of North Kanara district of Karnataka and wood density has been determined. The variation on wood density was minimum between trees. Seeds of three species namely, *A. integrifolia, A. hirsuta*, and *A.*

lakoocha have been collected from Yellapur and seed characters like seed weight, seed size and area have been recorded in single tree collections. Considerable tree to tree variations were observed for these seed characters. Some wildlings were also collected from Yellapur (Karnataka) and maintained in the shade house and growth performance recorded. A comparative species trial of *Artocarpus* species and vegetative multiplication garden of *A. integrifolia* was established at Panampalli (Kerala). The plantations of A. *hirsuta* existing at Pallode, Kerala were surveyed and sample plots were laid out. Two plantations were selected and enumerated for conversion to Seed Production Area. Totally twelve hectares of SPA was established after culling the inferior trees.

Project 3: Variability studies with special emphasis on physiology, biometry and biochemistry in selected tree species for tree improvement [IFGTB/PBT/RP7/37/2000DBT IFGTB/PBT/RP3/7/61/ (24)/ 2000-2005]. *Principal Investigator - Mr. Kannan Chandra Sekhara Warrier.*

Status : An experiment was set up in clone bank of IFGTB to study the difference between seed raised and clonally propagated materials. Seeds and cuttings were collected from nine female clones selected were placed in root trainers filled with sand and composted coir pith respectively. Root trainers with seeds were placed in the shade house where the cuttings were placed in polytent for rooting. Later the seedlings and cuttings from the respective female clones were transplanted to polybags. The experiment was set up in a Completely Randomized Design with 10 replications. Height growth of seedlings was found superior to that of clones in all the nine set. Data on total height and collar diameter were recorded. The results after 21 months revealed that seedlings were superior compared to the cuttings when biomass index was concerned. Physiological parameters were also recorded from the experiment.

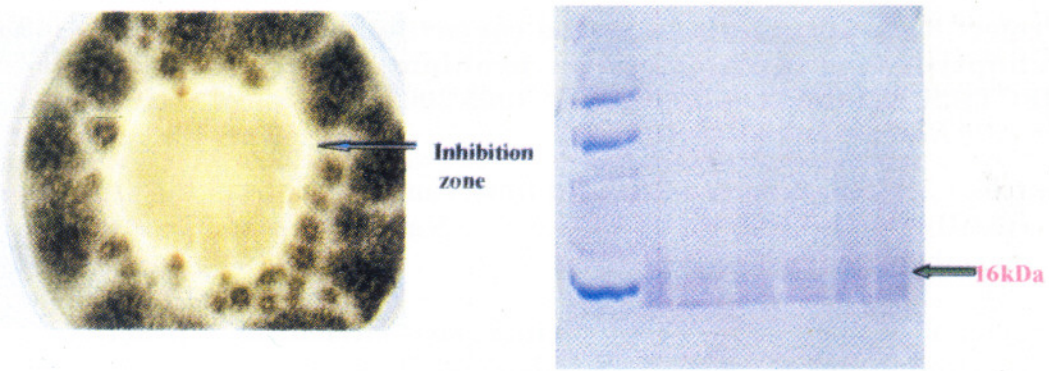
A field experiment was established at Anbil Dharmalingam Agricultural College and Research Institute (Tamil Nadu Agricultural University), Tiruchirappalli to screen salt tolerant clones of *C. equisetifolia*.

Data on biometric traits (like total height, collar diameter and diameter at breast height) and physiological traits are being recorded on a regular basis. Various biochemical and physiological studies will be carried out in the coming years.

Project 4: Genetic transformation of eucalyptus and casuarina to enhance salinity tolerance [IFGTB/PBT/RP8/37/2000/ICFRE [IFGTB /PBT/RP2/ 7/61/ (19)/2000-2005]. *Principal Investigator - Mathish N.V.*

Status : A stress-induced protein was found to be over expressed in a highly salt tolerant casuarina clone when subject to salt stress. This finding is a step aforward in understanding salt stress mechanisms in Casuarina. Transformation vectors were obtained from Centre for Application of Moleculr Biology to International Agriculture, Australia.

Project 5: Identification and cloning of gene(s) encoding protein(s) toxic to *Trichosporium vesiculosum* Butler [IFGTB/PBT/RP10 /37/2000/ICFRE [IFGTB /PBT/ RP7/7/61/(42)/2000-2005]. *Principal Investigator - Dr. Modhumita Ghosh.*



Inhibition of *Macrophomina phaseolina* by protein exudates of *Streptococcus* sp.

Status: A 16 kDa antifungal protein was identified and isolated from the bacterial exudates of *Streptococcus* sp. The protein inhibited the hyphal elongation of the root rot pathogen *Macrophomina phaseolina*. The crude protein extract of *Andrographis paniculata* was found to inhibit the growth of bacterial pathogens including *Salmonella typhii*, *Corynebacterium diphtheriae*, *Bacillus* spp. *Alcaligens* spp. and *Pseudomonas aeruginosa*. An approximately 40 kDa antifungal protein was purified from the leaves of *Andrographis paniculata*. The protein inhibited the spore germination and hyphal extension of *Trichosporium vesiculosum*, *Macrophomina phaseolina* and *Aspergillus flavus*. The purified protein caused increased compartmentalization and vacuolation in the treated hypha. No lysis of the hyphal tips were observed.

Project 6: Standardization of seed handling procedures for commercially important forest medicinal plant [IFGTB/ ST/ RP 17/ 37/ ICFRE/1997-2003]. *Principal Investigator - Mr. V. Sivakumar.*

Status: The extraction procedure of seeds to improve the germination percentage was standardized for *Feronia elephantum*. The effect of different pretreatment on germination was studied for *Aegle marmelos*, *Emblica officinalis* and *Strychnos nux-vomica* to increase the germination percentage. Seed storage trial studies were carried out for the seeds of *Feronia elephantum*, *Aegle marmelos* and *Syzygium cumini* to increase the storability. Germination trials were carried for few important seeds collected from Parambikulam, Kerala State.

Storage trial of *Strychnos nuxvomica* seeds

Project 7 : Standardization of seed handling techniques for tropical recalcitrant seeds [IFGTB/ST/RP18/37/ICFRE/1999-2002]. *Principal Investigator - Mr. V. Sivakumar.*

Status : Studied the storability of *Madhuca longifolia* seeds at different temperature and moisture content levels. Studied the desiccation tolerance and storability of seeds of *Vateria indica* at different moisture contents.

Project 8: Screening of *Casuarina equisetifolia* and *C. junghuhniana* genoptyes for plantation in problem soils of Tamil Nadu [IFGTB/SILVI/RP 12/37/ ICFRE/ 1995/2002]. *Principal Investigator - Dr. Lalit Narayan.*

Status : 51 CPTs have been selected from Tamil Nadu, from the districts of Tiruvallur, Chingelpet, Thanjavur, Nagapattinam, Pudukottai, Ramanathapuram and Salem.

Project 9: Impact assessment of intensive silvicultural practices on Seed production of Seed Orchards/Seed Production Areas in South India with reference to teak [IFGTB/SILVI/RP 11/37/ICFRE] [IFGTB/SILVI/RP 6/8/61 (45/1999-2003)]. *Principal Investigator - Dr. Lalit Narayan.*

Status : The trial plots of *Eucalyptus tereticornis* and *E. camaldulensis* at Panampally, *Acacia nilotica* and *Tectona grandis* at Forest Campus, Coimbatore and the *Eucalyptus camaldulensis* and *E. tereticornis* at Pudukottai on which the treatments of intensive silvicultural practices have been imposed upon are being monitored for the effect of the treatments on its growth performance and flowers and seed production.

Project 10 : Afforestation and productivity studies in the problem soils of Tamil Nadu [IFGTB/SILVI/RP 14/37/ICFRE] [IFGTB/ SILVI/ RP4/8/61(29)/1999-2003]. *Principal Investigator - Mr. Siddappa.*

Acacia auriculiformis trials in the mine dumps

Status : Under the afforestation, the problem soils of ACC Madukkarai and magnesite mine spoils of Burn Standard Co., Salem have been reclaimed by planting of efficient trees such as *Acacia auriculiformis*, *Casuarina equisetifolia*, *Azadirachta indica* and *Gmelina arborea* with suitable bio-manure and bio-fertilizer amendments. 100% survival rate has been observed.

Casuarina equisetifolia trials in the mine dumps

Project 11 : Standardization of containerized nursery practices for selected forest tree species [IFGTB/SILVI/RP 5/8/61(35)/1999-2003]. *Principal Investigator - Dr. Lalit Narayan.*

Status : The potting media standardized by Forest Development Corporation of Maharashtra, Andhra Pradesh Forest Development Corporation and Institute of Forest Genetics & Tree Breeding along with amendments are being used in the present nursery trial. The trial is in progress.

Project 12 : Productivity and nutrient dynamics in agroforestry systems [IFGTB/FPAF/RP 27/47/ICFRE/1999-2003]. *Principal Investigator -Dr M. George.*

Status : The growth performance of teak and casuarina in agroforestry models in two on -farm trials was monitored. Nutrient uptake and nutrient return via different pathways is also being monitored.

Project 13: Investigations on wood properties of teak in relation to variation in site factors and growth parameters [IFGTB/FPAF/RP 28/47/ICFRE/1998-2001]. *Principal Investigator - Mr. C. Buvaneswaran.*

Status : The growth data of teak plantations in different regions of Tamil Nadu were collected and the wood samples from these plantations were also analyzed. Heart wood/sap wood ratio was also worked out for sample trees.

Project 14 : Management of *Casuarina equisetifolia* in agroforestry system [IFGTB/FPAF/RP 29/47/ICFRE/1999-2003]. *Principal Investigator- Dr. Syam Viswanath.*

Status : Different root and canopy management treatments were imposed and the performance of different agricultural crops as intercrops is being monitored in wide row intercropping system with casuarina in two on-farm trials.

Project 15 : Productivity of *Acacia mangium* plantations in Kerala [IFGTB/FPAF/3/3/61(40)/2000-2005]. *Principal Investigator - Mr. C. Buvaneswaran.*

Status : Details on agroclimatic zones and land uses of Kerala were collected and inventory of plantations is being prepared. Strategies to study the productivity of plantations/homesteads/small blocks in farm fields/farm forestry etc. are being evolved.

Project 16 : Selection of pest resistant trees from wild population, provenances and exotic trials and progeny tests [IFGTB/FP/RP31/47/ICFRE/1994-2004]. *Principal Investigator - Mr. K.R. Sasidharan.*

Status : Field assessment on the incidence of the bark caterpillar *Inderbela quadrinotata* in the International Provenance Trials of *Casuarina equisetifolia* at Neyveli was continued. The incidence and intensity of attack of the pest on individual provenances in the trials were assessed and recorded. The provenance Kilfi from Kenya continued to remain unattacked by the pest.

Project 17 : Development of package of practices for management of nursery pests/diseases [IFGTB/FP/RP 33/47/ICFRE/2000-2003]. *Principal Investigator - Dr. A. Balu.*

Status: *Pest :* Investigation on the pest and disease problem continued in modern nurseries maintained by the SFD and the Institute as well other nurseries in and around Coimbatore. Severe incidence of an unidentified scale insect was recorded on *Pongamia pinnata* and minor incidence of *Papilio demoleus* on wood apple in Coimbatore circle.

Disease: Very severe attack of leaf rust in *Terminalia chebula* clones during February was observed. Severe incidence of leaf blight on *Artocarpus hirsutum* and *A. lakoocha* recorded in January to March and seedling wilt on *Acacia mangium* caused by *Fusarium*. Root rot was the other disease problem noticed in *Dalbergia latifolia* seedlings. Application of biocontrol agent *Trichoderma viridi* was found effective in controlling *Alternaria* disease. Foliar spraying and drenching of neem seedlings with Indofil M-45 @ 0.01% a.i. at weekly intervals was effective in control of seedling blight besides mechanical removal of affected parts of the plants.

Project 18 : Identification, isolation, evaluation and mass production of native fungi for the management of teak and casuarina stem borers [IFGTB/FP/RP 34/47/ICFRE/2000-2005]. *Principal Investigator - Dr. A. Balu.*

Status : Teak and casuarina plantation at various locations of Tamil Nadu and Kerala were surveyed. Soil samples were collected from these plantations as well as from other natural forest areas periodically to trap the naturally occurring isolates of entomopathogenic fungi. Two new strains of *Beaveria bassiana* and a species of *Fusarium* isolated from soils collected from Nilambur and Konni, were subcultured for the pathogenicity on the targeted pests. The spore load retaining capacity of teak and casuarina stems were tested with the already identified strain of the fungus *B. bassiana* and it was observed that the retaining capacity of teak was more than the casuarina.

Application of fungus (*B. bassiana*) and neem oil as a mixture in control of bark feeder *I. quadrinotata* was also attempted to test the synergistic effect. A field level evaluation with *B. bassiana* for the control of the teak borer *Sahyadrassus malabaricus* at Mundoomuzhi teak plantation in Kerala was carried out. Two different methods of application of fungus; spot application and

injection were adapted and both the methods were found effective to the level of cent percent control of the pest. Soil samples collected from various forest areas were subjected to insect baiting by using *Galleria mellonella* larvae.

Project 19 : Testing of promising plant derived chemicals against key pests (Component : Bioactive compounds from *Acacia nilotica* (Babul) against the major defoliators of forestry tree species) [IFGTB/FP/RP35/47/ICFRE/2000-2005]. *Principal Investigator - Dr. S. Murugesan.*

Status : Artificial diet for the mass culture of the test insect *H. puera* was standardized and the individuals were reared for a number of generations successfully. Crude aqueous and organic extracts of *A. nilotica* leaves, flowers, pods and twigs in different concentrations were tested for toxic effects on the teak defoliators, *H. puera* and *E. machaeralis*. Organic extract of flowers, pods and twigs even at lower concentrations were found effective against both the pests to the level of resulting 10-100% larval mortality. Water extract did not express any toxic effect on *H. puera* as compared to low effect recorded on *E. machaeralis*. Bioassay study with crude extract of twigs and seed of *A. nilotica* against the *H. puera* resulted in more than 60% larval mortality with all the concentration tested. Percent yield of end product of different tissues of *A. nilotica* was estimated by using the Speed Vac Rotary evaporator. Microbial bioassay studies with methanol and ethyl acetate extracts of Acacia leaves showed antimicrobial activity of zone of inhibition of to *Pestalotiopsis* as compared to *Phomopsis, Trichosporium* and *Ganoderma.*

Project 20 : Integrated disease management of *Casuarina equisetifolia* in nursery and field with reference to blister bark and root rot diseases [IFGTB/FP/RP36/47/ICFRE/2000-2005]. *Principal Investigator - Dr. V. Mohan.*

Status : Required seedlings of *C. equisetifolia* were raised and inoculated with various biofertilizers, biocontrol agent and fungicide. The inoculated seedlings were maintained in the nursery for a period of 5-6 months and transplanted in the site selected at Panampally. The proposed trial included 9 treatments including a control, replicated 4 times in a RBD design.

Project 21 : Studies on mycorrhizal fungi (biofertilizers) and their application in nursery and field [IFGTB/FP/RP37/47/ICFRE/2000-2005]. *Principal Investigator - Dr. V. Mohan.*

Status : Estimation of VAM spore population and percent colonization in *C. equisetifolia* plantation was continued. Similarly the status of nodule population was also observed. VAM isolates of *Glomus geosporum, G. clariodeum, G. fasciculatum, G. mosseae* and *Acaulospora* spp. were multiplied and maintained. Nutrient status of soil samples were also analysed. A strain of phosphobacterim was isolated from the rhizosphere soil samples collected from Panampally. Further, data collection on growth parameters of inoculated seedlings at the biofertilizer trial of *E. camaldulensis* at the Quartz Sand Mine Spoils at Madukkarai, Coimbatore continued to show better growth. Studies on the effect of different mycorrhizal fungi and phosphobacterim on growth of *C. equisetifolia* in glass house has been initiated.

Project 22 : Conservation* of some endangered and endemic plants of Tamil Nadu, Kerala and Andamans (*including cryopreservation** including medicinal plants) [IFGTB/BIO/RP 38/47/ICFRE/1999-2004].** *Principal Investigator - Dr. C. Kunhikannan.*

Status : An informative list of 25 rare, endangered endemic plants of Tamil Nadu and Kerala has been prepared from various sources like red data book, published literature and herbaria collections. Field studies were initiated on 2 endangered and endemic tree species of Tamil Nadu and Kerala, *Vateria macrocarpa* and *Dipterocarpus bourdillonii*. One population each of *Vateria macrocarpa* and *Dipterocarpus bourdillonii* was located in Muthikulam and Anamuly forest areas. Studies on their ecology and phenology were initiated and their samples were collected for herbarium accessions. About 150 species of medicinal plants were collected from Kolli Hills, Valparai, Anaikatty, Anamalais, Mettupalayam, etc. for Germplasm establishment in the botanical garden of the Institute.

Project 23 : Developing a suitable database on biodiversity [IFGTB/BIO/RP 39/47/ICFRE/ 1999-2004]. *Principal Investigator - Dr. C. Kunhikannan.*

Status : A detailed format for database has been prepared and information for 20 endangered plant taxa of Tamil Nadu and Kerala has been collected from various books, journals, herbarias, etc. in the prepared format. This work will be done in collaboration with the computer division of the institute.

Project 24 : Socio-economic studies of some important forestry medicinal plants in the tribal belt of Tamil Nadu [IFGTB/ E & S/ RP 42/ 47/ ICFRE/ 1997-2000]. *Principle Investigator - Mr .D. Rajasugunasekar.*

Status : Database with specific emphasis on commercial exploitation completed for 355 species under 20 heads for commercial and common medicinal plants in Tamil Nadu. Socio-economic surveys conducted for the private lands in Salem and Dharmapuri districts pertaining to *G. superba, Coleus forskohlii* and *Mappia foetida.*

Project 25 : Phyto-sociological and socio-economic impact of Joint Forest Management in Tamil Nadu [IFGTB/E&S/RP 45/47/ICFRE/2000-2003]. *Principle Investigator - Mr. D. Rajasugunasekar.*

Status : Data on socio-economic status of household, role of village forest committee, different training programmes and extension activities has been collected.

Project 26 : Development of database on tree improvement [IFGTB/COMP/ RP1/4/61(5)/2001-2004]. *Principal Investigator- R. Vivekanandan.*

Status: Data format designed and send to different forest departments in respect of Plus trees, Seed Production Areas, Clonal Seed orchards, Seedling Seed Orchards, Provenance Trails, Progeny trials. Information collected from different sources. Database is being designed and framed using Visual Basic.

Project 27 : Modeling the growth of eucalyptus in Tamil Nadu [IFGTB/COMP/ RP4/ 4/61(28)/2001-2004]. *Principal Investigator - Mr. Raman Nautiyal.*

Status : The work done is limited to secondary data obtained from different sources, mostly from controlled experiments, which will give an idea of functions required to be fitted but cannot be used for modeling purpose.

NEW PROJECTS INITIATED DURING THE YEAR 2001-2002

Project 1 : Study of market dynamics relating to important Non-Wood Forest Produce in Tamil Nadu (IFGTB/E&S/RP 43/47/ICFRE/2001-2004). *Principal Investigator - Mr. S. Saravanan.*

Status : Collected preliminary details from Sathyamangalam LAMP society. Preliminary questionnaire designed.

Project 2 : Study of market trend of different commercially important timber species, bamboo and rubber wood in Tamil Nadu and Kerala (IFGTB/E&S/ RP 46/ 47/ICFRE/ 2001-2005). *Principal investigator - Mr. S. Saravanan.*

Status : Collected preliminary details and few secondary data. Preliminary questionnaire designed.

Project 3: To study and develop a model of urban forestry in Coimbatore [IFGTB/E&S/RP 44/47/ICFRE/2001-2002]. *Principal Investigator - Mr. S. Saravanan.*

Status : Literature collection completed. Preliminary visit undertaken to various places in the Coimbatore city for experimental site selection. Model questionnaire was prepared.

EXTERNALLY AIDED PROJECTS

PROJECTS COMPLETED DURING THE YEAR 2001-2002

Project 1 : Genetic improvement of forest trees [FREEP/1995-2002]. *For technical report contact, Principal Investigator - Dr. Mohan Varghese.*

Findings: The breeding populations of *Eucalyptus camaldulensis* and *Casuarina equisetifolia* at Sathyavedu, Panampally and Sadivayal were evaluated to identify the superior provenances and families. The trials were thinned to remove the inferior trees and to convert the progeny trials into Seedling Seed Orchards. Eucalypts provenances of Emu Creek, Mt.Carbine, Laura River and Kennedy River were found to be superior in all the three locations. Most queensland origin seedlots were found to be superior.

Casuarina equisetifolia Thailand, Papua New Guinea and Solomon Island seedlots were found to be the fast growing. Seedlots from Kenya showed superior stem form, provenances from Northern Territory (Australia), Solomon Islands and Kenya were found to have higher density wood compared to Thailand, Malaysian and Indian seed lots. Hence, it is possible to select provenances suitable for different end uses such as biomass, poles and pulp wood

production. Provenances of *C. junghuhniana* from East Timor (Indonesia) were found to be as adaptable and fast growing as *C. equisetifolia* in South India. They also show good coppicing ability and have the potential to produce a coppice crop. Outstanding trees of known origin of eucalypts and casuarina in different trials were clonally multiplied and multi-location clonal trials of eucalypts established in Sathyavedu (Andhra Pradesh), Kulathupuzha (Kerala) and Sadivayal (Tamil Nadu) to identify the best clones for each site.

Project 2 : Reproductive biology of tropical trees (FREEP /1995-2001). *For technical report contact, Principal Investigator - Sh. B. Nagarajan.*

Findings : Studies were conducted on factors that influence fruit and seed setting in teak. Seed set in teak is found to be influenced by abnormalities related to endosperm formation. Controlled self-pollination in teak reveal a very low pre emergent reproductive success value of 0.0004 indicating high levels of self pollen rejection. Successful controlled pollination experiments were conducted in multi-locations in breeding populations of teak, tamarind and *Casuarina equisetifolia*. Mostly clones showed varying rates of reproductive success. Fruit set upto about 60% was recorded in controlled self-pollinating in *Casuarina equisetifolia*. Successful controlled pollination was done between *C. equisetifolia* and *C. junguhuhniana*. Hybridisation studies were conducted in selected families of *Eucalyptus camaldulensis* and *E. tereticornis* in Panampally and Karunya Nagar. High fruit set up to 70% was recorded in interfamily controlled pollination. A full-sib trial consisting hybrids of *E. tereticornis* x *E. grandis, E. tereticornis* x *E. torelliana* and *E. camaldulensis* x *E. grandis* has been established. Open pollination studies on seed output and reproductive success were conducted in *Casuarina equisetifolia*. Local land races of South Arcot and Orissa showed the highest rates of reproductive success. Among the recently introduced resources Beechai land race showed the highest rate of reproduction. Egypt and Kenya land races recorded low levels of reproduction.

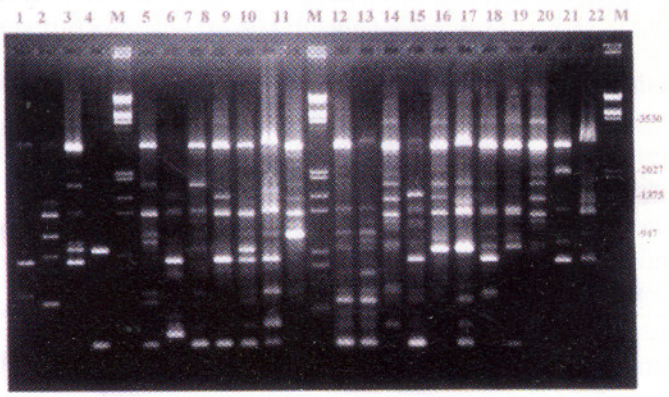
Project 3 : Evaluation of genetic variability of teak in peninsular India (FREEP/1997-2001). *For technical report contact, Principal Investigator - Shri. A. Nicodemus.*

Findings : Teak populations from different regions of Peninsular India (States of Gujarat, Madhya Pradesh, Maharashtra, Orissa, Andhra Pradesh, Karnataka, Kerala and Tamil Nadu) were surveyed for evaluating growth, morphological, phenological and genetic variability. Twenty populations were studied through field surveys of which 10 were screened with DNA (Randomly Amplified Polymorphic DNA) markers. The wood density was found to be stable among the different populations studied. However, there was a moderate negative relationship between wood density and latitude of the population. Populations from lower latitudes tend to have denser wood compared to those from higher latitudes. Seeds from moist populations (e.g. Kerala) showed high levels of seed filling, germination and vigour. They also showed better early growth compared to dry populations in field tests.

RAPD markers revealed high levels of genetic variability among different populations of teak in peninsular India. Nearly 70% of the diversity is due to variation existing within the populations. Therefore, breeding and conservation strategies should aim at capturing both within and across population variation to realize maximum gains.

Project 4 : Biotechnology of trees [IFGTB/PBT/RP 6/37/FREEP/1994-2001]. *For technical report contact, Principal Investigator - Mr. R. Yasodha.*

Findings : Laboratory facilities for core biotechnology areas have been developed viz. infrastructure like tissue culture laboratory and molecular biology laboratory. Developed complete micro-propagation package for large-scale production of genetically enhanced planting stock of teak. Somatic embryogenesis system was developed for *Eucalyptus tereticornis* for transformation studies. Optimised DNA isolation protocols for eucalyptus and casuarina. RAPD markers were used to fingerprint and to assess the genetic divergence of the clones of *Casuarina equisetifolia*. Methods were also optimised for ISSR, FISSR, AFLP markers. An antifungal protein of molecular weight 20 kilo Dalton (kD) was identified from *Plumbago capensis* against the blister bark pathogen of casuarina, *Trichosporium vesiculosum*.



RAPD analysis of twenty two ITC clones of Eucalptus with OPB 04

Project 5 : Nutrient cycling in teak plantations of Tamil Nadu (IFGTB/FPAF/RP 26/47/FREEP/1995-2001). *For technical report contact, Principal Investigator- Dr. M. George.*

Findings : The biomass productivity and nutrient cycling in teak plantations in Tamil Nadu was investigated. Productivity models for different agroclimatic zones were developed and prediction equations established. Nutrient cycling at different ages was estimated and correlation between productivity and soil nutrients was established.

Project 6 : Selection of pest and disease resistant phenotypes of teak, eucalyptus and casuarina [FREEP/1997-2001]. *For technical report contact, Principal Investigator - Dr. A. Balu.*

Findings : *Pest Resistance-Teak :* Feeding experiments under controlled condition with *Hyblaea puera* on representative clones selected out of the most susceptible and moderately susceptible and all the clones under resistant or unattacked categories subjected to the feeding test exhibited variations in quantum of food intake by *H. puera*.

Biochemical parameters such as Primary (protein, carbohydrates and lipids) and Secondary (phenols, flavanoids and anthocyanidins) metabolites of representative clones of the three categories (Most susceptible, Moderately susceptible and Unattacked/resistant) were analysed. About 9 phenolic and 10 flavanoid fractions were detected and identified with the clones subjected to the test. Anatomical studies on selected teak clone leaves showed significant variations in the leaf surface cuticular structure between the susceptible and resistant clones.

Eucalyptus : Defoliation of few families in the Pudukottai trial, by *Myllocerus* sp. was encountered during the year.

Two families available in the trial at Pondicherry suffered from minor bark feeding of termite, though the attack was not serious.

Casuarina : Similarly in the case of casuarina, out of 50 families available in the progeny trial cum seedling seed orchard of *C. equisetifolia* established at Panampally, four families, nos.18,20,24 and 55 had attack of the bark caterpillar, *Indarbela quadrinotata*. The intensity of attack of the bark caterpillar, I. *quadrinotata* was low in general, in the International provenance Trial having 35 seed sources, established at Pondicherry. The seed source from QL, Australia and Kenya continued to remain unattacked, while that from N.T. Australia showed consistency in having low level of infestation. Certain provenances from China and Tamil Nadu exhibited highest level of susceptibility to the attack of the caterpillar.

Disease Resistance - Casuarina : The individuals of 50 families in the progeny trial cum SSO at Panampally screened for the incidence of the blister bark and root-rot diseases revealed that 35 families were affected by the blister bark and 15 families by the root-rot diseases. Though all the families were affected by either of these diseases, the intensity of the attack varied among the families. In the case of root-rot disease, the family No. 18 was much affected.

Screening of the individuals of the provenances at the International Provenance trial at Pondicherry exhibited that out of 35 provenances, 17 provenances were affected by the blister bark disease.

Six progenies (from Progeny cum SSO, Panampally) and 10 provenances (from International Provenance Trial, Pondicherry) representing different levels of susceptibility and unattacked by the blister bark disease and subjected to the bioassay study under controlled condition revealed that all the progenies and provenances tested were susceptible to the culture filtrate (100%) of the pathogen. However, the time taken to express the symptoms varied among the progenies and provenances. The progenies grouped under severely affected category expressed wilting symptoms at 20 hours, while the progenies of moderate category expressed the symptom at 36-72 hours.

The provenances grouped under severely affected category expressed wilting symptom of foliage, branches and roots in lesser than 20 hrs, while it was observed to be 20-36 hrs and 36-72 hrs, respectively with the provenances grouped under moderate and less affected categories. Where as the provenances belong to the unattacked category did not express any prominent symptom till 4th day. Mild symptom of wilting was observed from unattacked provenances only with the maximum concentration (100%) of the culture filtrate of the pathogen after 4th day. However, the same experiment with lesser concentration (25%) of the culture filtrate did not have any effect on unattacked provenances. Whereas the susceptible provenances expressed the wilting symptom with lesser concentration also. Examination of root sections of the control and treated plants showed that the root tissues were intact in control whereas in the treated roots the cortical cells and other structures were badly damaged.

Project 7 : Comparative growth studies of teak in farm lands and waste lands of different agro climatic zones of Tamil Nadu [Main Project III, sub-project II/1997-2001]. *For technical report contact, Principal Investigator - Mr. Saravanan.* **(FREEP Sub-project)**

Findings : *Economic aspect :* The large farmers mostly adopt teak as an agro forestry tree. Majority of the farmers planted teak under irrigated condition in central zone. In western and south zone the irrigated and rainfed teak were equally distributed among the sample farmers. Teak farmers had larger share of non-farm income in their average income per annum. More than 80% of the teak farmers had not cultivated intercrop in the teak. Coconut is the major intercrop. Majority of the farmers had obtained their seedlings from the private source. The farmers were very reluctant to accept the idea of thinning especially mechanical thinning. In central zone majority of the farmers expressed that they could afford to wait only up to 20 years to realize the benefits. In western and southern zone the farmers were ready to wait up to 40 years. Higher income to be received in the long run was the important reason for shifting to teak. Local dailies and peer group were the major sources of knowledge for the teak farmers regarding teak cultivation.

Sociological aspect - Teak being a long term crop, adoption of teak farming involves risk taking, especially for those who have planted in large area. While mass media of communication disseminate the knowledge, it is the personal contacts which enable the families finally decide and act. The impact on the gender role-structure is only marginal. Women are likely to lose the small independent income and their role in financial management. Other broad social changes like withdrawal of children for providing them education have proceeded and have brought about the shift to teak farming. The long-term direct and indirect impact of teak farming on the inter personal relationships are yet to manifest.

Project 8 : Planting Stock Improvement Programme [1996-2001]. *For technical report contact, Group Co-ordinator/Co-ordinator - Mr. Siddappa.*

Findings : *Seed Production Areas* - The Institute has established about 130 hectares of Seed Production Area of teak, acacia, eucalyptus, padauk, albizia and casuarina in the states of Kerala, Tamil Nadu and Andaman Nicobar Island. These SPAs were maintained during year and seeds were collected.

Seedling Seed Orchard - 45.75 hectare of Seedling Seed Orchard of eucalyptus, casuarina, acacia, teak and gmelina were maintained and observed for the flowering habitat.

Clonal Seed Orchard - Clonal Seed Orchards of casuarina, eucalyputs and teak extending an area of 20.07 hectares in the State of Tamil Nadu and Kerala were maintained and monitored for growth characteristic.

Vegetative Multiplication Garden - In addition to the 13 ha. of Vegetative Multiplication Garden of casuarina, eucalyptus and teak established in the different location of Tamil Nadu and Kerala clone banks of neem. Tamarind and amla was established within the forest campus, Coimbatore, adjoining the Model Nursery facility. Twenty ramets of each nearly 170 identified CPT's of casuarina were supplied to Karnataka Forest Department for laying out a trial at Hosekote.

Model Nursery - Rooted, 19,381 ramets of casuarina and eucalyptus maintained at the Model Nursery, Coimbatore and IFGTB field station, Panampally. Hands on training on the modern nursery techniques was also imparted to the different user groups.

Seed Handling - Seeds of various important species were collected from different localities of Tamil Nadu, Andhra Pradesh, Karnataka and Kerala. Seeds of the

many of above species were supplied to other divisions of the Institute, SFDs and NGOs on request.

Project 9 : Development of neem in various agro-ecological regions of India (Tamil Nadu, Andhra Pradesh and Karnataka) [IFGTB/ ST/RP 19/37/2000; NOVOD funded/1999-2001]. *For technical report contact, Principal Investigator - Mr. B. Gurudev Singh.*

Findings : Seeds were collected from 259 Candidate Plus Trees (CPTs) from 13 provenances in the states of Tamil Nadu (215 CPTs from 9 provenances), Andhra Pradesh (19 CPTs from 1 provenance) and Karnataka (25 CPTs from 3 provenances). The CPTs were identified based on their fruit yield and after comparison with the fruit yield of the check trees of the same diameter class growing around the CPTs. Data on growth parameters, tree architecture, health of CPTs and locality particulars were recorded. The seeds were also studied for various parameters. Bio-chemical analysis of seeds stored at ambient, fridge and deep freeze conditions were carried out for peroxidase, polyphenol oxidase and catalase at 15 days intervals. The images of the fruits and seeds collected were captured in Image Analyzer and database of the CPTs with images of the tree, fruits and seed are being made. 250 gram seeds from each of the above 259 CPTs were sent to TERI for chemical analysis and 100 grams seeds to NBPGR for long term storage. Seed storage trials were carried out by storing the seeds at different temperature and different moisture contents at regular intervals.

The clonal propagation technology for mass multiplying the high yielding neem tree has been standardized. A total of 140 superior trees selected in different locations of Tamil Nadu were multiplied clonally and a clone bank/ vegetative multiplication garden has been established with 60 clones. A clonal seed orchard with 17 clones has been established at sadivayal, Tamil Nadu. The clonal propagules gave flowering and fruiting from second year after planting. Generally neem tree takes 8 to 10 years for fruit setting. Controlled pollination on different clones of neem has also been attempted.

In order to meet the target of 1 lakh seedlings for the year 2001-2002 around 45 kg of bulked seedlots collected various locations in Tamil Nadu, Karnataka and Andhra Pradesh and 80 seed sources were also sown in the mother beds with identity to produce seedlings for the provenance trial. Around 1.35 lac seedlings have been transplanted into polybags and root trainers and order for the supply of 0.9 lac seedlings have been obtained.

Established 10 ha of agro-pasture Model with neem as tree species and fodder sorgum, in 3 villages. 2 ha of Clonal Seed Orchard with 17 clones was established and maintained.

PROJECTS CONTINUED DURING THE YEAR 2001-2002

Project 1: Domestication of Australian trees [IFGTB/GTB/RP7/CSIRO/2000-2003]. *Principal Investigator - Dr. Mohan Varghese.*

Status : The flowering and fruiting status of different accessions in the seed

orchards of *Eucalyptus camaldulensis, E. tereticornis, Casuarina equisetifolia, Acacia auriculiformis* and *A. mangium* have been evaluated. The impact of different combinations of fertilizers on flowering and seed and seed production in the seed orchard of eucalypts has been studied. Seeds have been collected from the orchards for establishing genetic gain trial.

Project 2 : Finger printing of economically important clones of eucalyptus and casuarina [IFGTB/ PBT/RP7/37/2000/DBT (IFGTB/PBT/RP3/7/61/(24)/2000-2003)].
Principal Investigator - Dr. K. Gurumurthi.

Status : Unique fingerprints were obtained for 12 clones of *C. equisetifolia* and eight economically important clones of eucalyptus using RAPD, ISSR and FISSR techniques. A strategy of DNA fingerprint database management using Microsoft Access was developed for use in germplasm inventorization. Genetic uniformity was tested in micropropagated eucalyptus using RAPD and AFLP. A case of mixing of eucalyptus clones during micropropagation was identified. AFLP reaction conditions were standardized for eucalyptus and casuarina. Genetic analysis was carried out for 5 species of casuarina. Studied morphological descriptors for the clones of *C. equisetifolia.*

Project 3 : Seed collection, germination, storage and propagation of rare and endemic medicinal plants of Silent Valley and Kolli Hills [IFGTB/ST/RP 20/37/ 2000; FRLHT funded/2000-2002]. *Principal Investigator - Mr. V. Sivakumar.*

Status : Fruits of *Canarium strictum, Persea macrantha* and *Symplocos racemosa* were collected from Kolli Hills and Silent Valley. The seeds were studied for the morphological characters. Germination trials were carried out for all the above seeds.

Storage trial of the seeds of *Persea macrantha* and *Symplocos racemosa* were carried out by storing the seeds at different temperatures and in different moisture contents.

Project 4 : Ecology, reproductive biology and seed biology studies on red listed medicinal plant species (RLMPS) in Silent Valley Kolli Hills Medicinal Plant Conservation Areas (MPCAs) funded by Foundation for Revitalization of Local Health and Traditions (FRLHT), Bangalore [IFGTB/BIO/RP40/47/FRLHT/ 2000-2003].
Principal Investigator - Mr. C. Kunhikannan.

Status : Ecological assessment of the recommended species was carried out through quadrat analysis for finding out the status of the species in Silentvalley MPCA. A total of 30 permanent plots of size 20 x 20m were laid out throughout MPCA. Data from each quadrat was recorded separately and all individuals of the recommended species were recorded. Regeneration of the species also studied through laying out smaller quadrats inside the bigger plots. The total area sampled was 12000 sq m.

Research Achievements

Name of state	No.of projects Completed in 2001-2002	No.of Ongoing projects in 2001-2002	No.of projects Initiated in 2001-2002
Tamil Nadu	10	27	03
Kerala	06	14	01
Pondicherry	03	-	-
Andaman & Nicobar Island	01	03	-

Technologies Assessed and Transferred

- Seedling seed orchards of eucalypts, casuarina and phyllodinous acacias have been designed, evaluated and transferred to the State forest Departments of Tamil Nadu, Kerala and Tamil Nadu Forest Development Corporation.
- Clonal Propagation Technology for Teak has been transferred to Kerala State Forest Department and Forest Development Corporations under KFDC consultancy programme. The clonal trial of Teak has been demonstrated in Farmlands, Tirunelveli.
- The economic productivity of Agri-silviculture. (Casuarina-maize model), Agri-silvi-horticulture (Casuarina-moringa-maize model) and Silvipasture (*Acacia auriculiformis- Pennisetum purpureum*) were worked out and technology packages developed and transferred from lab to land.

Education & Training

Trainings Organised

Sl.	Subject	Duration	Target Group
1.	Genetic Improvement and Propagation of Forest Trees	5.11.2001 to 9.11.2001	10 IFS Officers
2.	Reproductive Biology and Controlled Pollination in teak	6.8.2001 to 18.8.2001	Scientists from State Forest Research Institute, Jabalpur

3.	Forest Genetics and Tissue Culture	15.05.2001 to 06.06.2001	Students from undergraduate and post graduate levels from Avinashilingam Deemed University, Coimbatore, Nehru College, Ramakrishna College, Maharaja College of Arts and Science, Coimbatore, and Loyola College, Madras
4.	Isozyme Analysis through Starch gel Electrophoretic Technique	20.2.2002 to 26.2.2002	Researchers from State Forest Research Institute, Kanpur, Uttar Pradesh
5.	Neem seed collection, handling and storage under NOVOD Board	August 200-October,2001	Tribal Folk, Farmers and State Forest Department Staff

Trainings received

Sl.	Name	Training	Place of Training	Duration	National/ International
1.	Ms. R. Yasodha,	DNA based marker technologies & its application in plant biology	TATA Energy Research Institute, New Delhi	20.11.2001 to 30.11.2001	National
2.	Mr. Mathish N.V.	Gene Isolation, Sequencing and Sequence Aanalysis	M. S. Swaminathan Research Foundation, Madras	15th Oct., 2001 to 29th Oct., 2001	National
3.	Mrs. R. Anandalakshmi	Recent Techniques and Participatory Approaches in Quality Seed Production	Department of Seed Science and Technology, Tamil Nadu Agricultural University, Coimbatore	01st Sept., 2001 to 30th Sept., 2001	National
4.	Shri R. Vivekanandan, Shri V. Sivakumar, Mrs. Rekha Warrier, Shri Santhan Bharathwal,	Web Graphics/ Animation, Audio-video, Editing and print/ Publishing		3 months w.e.f. 24th Dec., 2001	National

	Shri Raman Nautiyal, Shri Buvaneswaran, Shri Prasanth Jacob, Shri P. Manickam, Shri S. Sankaranarayanan, Mrs. S. Shanthi, Shri C.K. Jagannath and Shri Amaldass				
5.	Dr. Syam Viswanath	Participatory Planning and Management of Watershed Projects	NIRD, Rajendranagar, Hyderabad	03rd to 15th Sept., 2001	National
6.	Shri K.R. Sasidharan, Shri R. Raja Rishi and Shri B. Sunitha	Methodologies in Host Plant Resistance for Insect Pest Management	Tamil Nadu Agriculture University, Coimbatore	10 days	National
7.	Shri Raman Nautiyal	LAN	ICFRE, management	26th June, Dehra Dun 06th July, 2001	National 2001 to
8.	Shri Raman Nautiyal and Shri P.M. Manickam,	Windows 2000 Server	ICFRE, Dehra Dun	20th Nov., 2001 to 26th Nov., 2001	National
9.	Shri R. Vivekanandan, Shri Raman Nautiyal and Shri C.K Jagannath	Oracle 8i	SSI, Coimbatore 2002	1st Jan., 2002 to 31st March,	National
10.	Shri R. Vivekanandan, Shri Rama Nautiyal and Shri P.M. Manickam,	Linux	ACCEL IT Academy Coimbatore	1st Jan., 2002 course still in progress	National
11.	Shri B. Gurudev Singh	Tree Improvement Training Course (Planting Stock Improvement activities, Seed Technology, Histo-chemistry, DNA markers and Genetic transformation)	The University of Melbourne, Department, of Forestry, Creswick, Australia	12 weeks from the first week of March 2001	International

12.	Shri C. Buvaneswaran	Agroforestry	University of Florida, USA	30th July to 26th Oct 2001	International
13.	Dr. V. Mohan	Biofertilizers	University of Florida State, USA	3 months	International
14.	Shri D. Rajasugunasekar	Forest Ecosystems and Ecology	University of Florida, USA	30th July to 26th October 2001	International
15.	Shri. S. Saravanan	Agroforestry	University of Florida, USA	30th July to 26th October 2001	International

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56. George, M. & S. Viswanath (2001). Final Report of the NABARD Project on "Development of Agroforestry Models for various Agroecological regions" submitted to National Project Director (NABARD project), ICFRE, Dehra Dun.

57. George, M., Viswanath, S. and P. Manivachakam (2000). Development of agroforestry models. II. agri-silvi-horticulture. casuarina-moringa-maize model. FPA 2000(2).

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60. Viswanath, S., M.George and P. Manivachakam. 2001. Development of agroforestry models. III. silvipasture. *Acacia auriculiformis- Pennisetum purpureum*. FPA, 2000(3).

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Consultancies

Consultancy for sub-programme on Participatroy Agro-forestry for poverty alleviation and environmental restoration in Perur Block, Shanti Ashram, Coimbatore.

Introduction of *Muntangia calaber* in the problem soils at the ACC, Madukkarai.

Demonstration of plantations in mine dumps at Burn Standard Salem, under afforestation in problem soils.

Extended, training on establishment of root trainer and clonal nursery to the Kerala Forest Development Corporation.

"Status of Anubhav Plantations" by Economic offences wing of Tamil Nadu Polic completed during the period. Duration - 4 months.

Plants and plant products slated for export were examined and 518 Phytosanitary Certificates were issued to various organisations and individuals. The total revenue earned out of this is Rs.51,800/-.

Guest lectures on "Disease problems and their managemnt in nursery and field" and "Role of Biofertilizers in Forestry Practices" were delivered by the Scientist of the Division to the serving Forest Officers of DCF/ACF rank on different dates at State Forest Service College, Coimbatore.

The pests and disease problems referred by the State Forest Departments, farmers and NGO's were investigated and suitable management practices advocated.

Demonstration cum training on isolation, identification, mass multiplication of inoculum of mycorrhizal fungi & other biofertilizers and their application in nursery and field was conducted.

Conferences, Meetings, Workshops, Symposia, and Exhibitions

Workshop Organised

Sl.	Subject	Duration	Target Group
1.	CTA workshop on Teak	27 November, 2001	Officials from State Forest Departments of Tamil Nadu, Kerala, Karnataka, Maharastra and Scientists from KFRI, Kerala and SFRI, Madhya Pradesh
2.	Annual Workshop cum Peer Review on Casuarina	8th 9th October, 2001	Officials of Regional Forest Research Centre, Andhra Pradesh
3.	CTA Workshop cum Peer Review on Agroforestry	22nd -23rd Nov, 2001	-

4.	CTA Meeting cum Peer Review of Neem [NOVOD sponsored project on Development of Neem in various agro-ecological regions of India (Tamil Nadu, Andhra Pradesh and Karnataka)].	16th October, 2001	-
3.	CTA Workshop on Pathology	October	Scientists
4.	CTA Workshop cum Peer Review on Ecology	30th -31st Oct, 2001	Scientists, AFRI, Scientists, AFRI, Jodhpur
5.	CTA Workshop cum Peer Review on Forest Diseases and on Biofertilizers	October 2001	Scientists

Workshops/Seminars Attended

Sl.	Subject	Duration	Held at
1.	Seminar on Recent Trends in Biotechnology	29th August 2001	RVS College of Arts and Science, Coimbatore
2.	Tropical Ecosystems Structure, Diversity and Function	19th July 2001	Bangalore
3.	Fast growing and High yielding selected cultivars in NTFPs including medicinal plants	16th 18th. January, 2002	Bangalore
4.	National Symposium on Developments in Molecular Genetics	15th 16th February, 2002	PSG college of Technology, Coimbatore
5.	National Workshop on Bioinformatics	29th to 1st Oct., 2001	School of Biotechnology, Dr. G.R. Damodaran College of Sciences, Coimbatore
6.	National Symposium on Emerging Trends in Modern Biology	10th - 12th January, 2002	Department of Plant Biology and Biotechnology, Loyola College, Chennai

7.	AGRI INTEX 2001	01st - 8th August, 2001	Tamil Nadu Agricultural University, Coimbatore in CODISSIA Hall, Coimbatore
8.	5th Workshop cum Peer Review Meeting on Seed Technology	11th and 12th December, 2001	Centre for Social Forestry and Eco-rehabilitation, Allahabad
9.	Regional Workshop on Fast Growing and High Yielding Selected Cultivars in NTFPs/MFPs including Medicinal Plants	16th - 18th January,	Institute of Wood Science and Technology, Bangalore
10.	CTA workshop on Nursery	28th - 29th Nov., 2001	Tropical Forestry Research Institute, Jabalpur
11.	National Workshop on Policy and Legal issues in Cultivation and Utilization of Bamboos, Rattans and Forest Trees in Private and Community Lands	7th -9th August, 2001	KFRI, Peechi, Kerala
12.	Fifth Annual Workshop of Casaurina Network	8th -9th October, 2001	RFRC, Rajahmundry, Andhra Pradesh
13.	National Workshop on Joint Forest Management and Watershed Development	21st -22nd January, 2002	IIT, Chennai
14.	CTA Workshop cum Peer Review of Eucalyptus	October 2001	IWST, Bangalore
15.	CTA Workshop cum Peer Review of Forest Ecology	October 2001	AFRI, Jodhpur
16.	Symposium on Frontiers of Fungal Diversity and Disease in South East Asia	February, 2001	Gorakhpur University, Gorakhpur, Uttar Pradesh
17.	FAO Endowment Lecture on Frontieer of Semiochemical Research : Exploitation in Crop Protection Strategies	April, 2001	TNAU, Coimbatore

18.	National Conference on Industrial Pollution and Environmental Degradation	-	PSG College of Technology, Peelamedu, Coimbatore
19.	State Level Seminar on Recent Trends in Biotechnology	-	RVS College of Arts and Science, Sulur, Coimbatore
20.	Recent trends in Eco-Conservation	Feb., 2002	St. John's College, Palayamkottai
21.	3rd Indian Mushroom Conference	March, 2002	TNAU, Coimbatore
22.	Workshop for Designated Inspection Authority and Phytosanitary	April 2001	Regional Plant Quarantine Station, Chennai
23.	National Symposium on `Recent Trend in Restoration of Aquatic Environment and Biodiversity of Insects'	15th - 16th February, 2001	Kongu Nadu Arts and Science College, Coimbatore
24.	Workshop on Intellectual Property Rights Issues in Forestry	19th - 21st December, 2001	IWST, Bangalore
25.	Workshop on Research needs in Nilghiri Biosphere Reserve	8th August, 2001	State Forest Service College, Forest Campus, Coimbatore
26	Seminar on Threatened Plants of Tamil Nadu	29th December, 2001	Tamil Nadu Forest Department, Tirunelveli
27.	International Conference on Tropical Ecosystems Structure, Diversity and Human Welfare	15th -18th July, 2001	-
28.	International Symposium on Recent Advances in Biological Sciences	11th - 12th October, 2001	K.S.R College of Arts and K.S.R. college of Arts and Sciences, Tiruchengode, Tamil Nadu

29.	International Workshop on Environment & Energy	1st - 3rd November, 2001	Vallam, Thanjavur
30.	International Conference on Nature farming and Ecological balance	7th 10th March, 2001	CCS HAU, Hissar
31.	International Conference on Milestone in the Developing of Mycology and Plant Pathology	March, 2002 March, 2002	Madras University

Exhibitions

AGRI INTEX 2001, August 1-7, 2001 at CODISSIA Trade Fair Complex, Coimbatore.

Agri Tech 2001 Nov. 2001 at Cochin,organised by Fair Point, Chennai.

Awards

Dr. M. Varghese, Sh. A. Nicodemus, Sh. B. Nagarjan and Sh. K.Shubramanian were awarded ICFRE award for Silviculture (Tree improvement) for the year 2000.

Dr. V. Mohan was given- ICFRE Cash award for the significant contribution in the field of Forest Protection.

Distinguished Visitors

1. A team of 15 members from Indonesia Forest Seed Project (IFSP) headed by Mr. Suharisno, Director of Forest Tree Seed, Ministry of Forest, Indonesia visited IFGTB.
2. Mr. Petrus Daru Darmojo, Project Manager, IFSP and Mr. Soren Moestrup, Chief Technical Adviser, IFSP in their remarks mentioned "We are all very impressed about the work being done by your institute both from a scientific/technical - and from a collaborative point of view. The art of the game is to do scientific work at a high level, which is relevant for the ultimate target group (the farmers), and at the same time ensure the results of the work being made available to the target group. In order to succeed one need to set up integrated programmes/networks involving the major stakeholders. This is always not easy, but we do think that you and your institute has managed to this very well, - and may be this is one of the explanations why you are so successful in your work."
3. Shri P.V. Jayakrishnan, IAS, Secretary, MoEF visited the Model Nursery.
4. Smt.Rukmani Sudhakaran, I.A.S Under Secretary, MoEF visited the Model Nursery.

5. Dr P.K.R. Nair, World leader and Distinguished Professor of Agroforestry visited IFTGB and delivered a talk on Agroforestry at Champion Hall of SFSC, Forest Campus, Coimbatore. He was taken around the various agroforestry models developed and On-farm field trials being executed by IFGTB in Coimbatore district on 6-7 August, 2001.
6. The Forest Seed Project Leaders from Indonesia were taken around and shown various agroforestry models developed by IFTGB in Coimbatore district on 24th Nov, 2001.

Gass Forest Museum

Collection management, upkeep and maintenances, visitor's service and educational service were undertaken. A total of 23,632 people visited the museum during the year.

Computer Support

Information technology support in achieving Institute's goals and objectives.

Installation and maintenance of LAN/WAN. The computer center has hardware / software resources for diverse computing requirements of IFGTB. Windows 2000 sever based Local Area Network is in operation. Linux based Web, mail and proxy servers are in operation.

Software Support to other Divisions

Support in installation, management and troubleshooting problems related to software. Support in preparing and managing various presentations.

Computer Applications in Research Activities

Support in statistical analysis of research data and Statistical consultancy provided to different divisions, prominent being Silviculture, Forest Productivity and Agroforestry, Forest Protection regarding probit analysis, Plant Biotechnology.

The website of IFGTB constructed and uploaded at our server, www.ifgtb.res.in . The website was updated in March 2002.

Conducted environmental awareness programme to the College students during August, 2001. 40 students from Kongu Nadu Arts and Science College, Coimbatore took active participation and planted saplings in the Botanical Garden in the presence of the Director, IFGTB.

Video Films

The documentary on economic utlization of casuarina and clonal multiplication have been dubbed into four regional languages Viz. Malayalam, Tamil, Kanada, Telugu.

Library and Documentation

IFGTB library is a repository of literature on Forestry Genetics, Bio-technology, Environment and Ecology. The library renders services to the foresters and researchers of the Institute. The library facilitates access to wide range of information and documentation resources to the State Forest Departments, Research Institutes, Universities and Colleges. The total books available in the library are 7457 and 40 foreign and Indian journals were subscribed.

The highlights of the library services are:

- Reference and Bibliographic
- Circulation, Current awareness, New additions to the library-Paper clippings, display of the new arrivals
- Literature Search/Document Supply Service