Continued ICFRE Funded Research Projects-IFGTB 2010-11

Project S.No.	Name of Project	PI	Thrust Area	Current Status
1	Allelic diversity of Cinnamoyl CoA reductase enzyme gene in *Casuarina equisetifolia* **(April-08, 2008-2011)**	Dr. A. Shanthi Scientist-B	Genetic Improvement (Biotechnology)	The twenty five shortlisted *Casuarina equisetifolia* clones were studied for its proximate characters (Holocellulose, Lignin, Ash content, Moisture content, NaOH solubility, Hot water Solubility, Alcohol Banzene extractives). CCR enzyme activity was studied for all the selected clones. Twenty two set of CCR primers were designed and synthesized. The cloning and sequencing of CCR gene confirmation is in progress. This project is being requested for one year extension without any extra budget.
2	Assessment of population structure using SSR and Molecular characterization using RAPD in casuarina species **(April-07, 2007-10, Ext. upto March, 2011)**	Dr. D. Thagamani Scientist-C	Genetic Improvement (Biotechnology)	Four SSR primers were developed from ISSR PCR analysis. The five populations of *Casuarina equisetifolia* were assessed for the structure using SSRs. DNA profiling of one hundred and fifty clones were studied using ten RAPD primers. The data were analysed using RAPDistance and NTSYS softwares. The dendrogram and distance matrix were made using the software. The project will be completed by March 2011.
3	Assessment on carbon pool potential of important tree species at different sites, ages, and management regimes. **(Jul-06, 2006-11)**	Dr. C. Buvaneswaran, Scientist-D	Ecosystem Conservation and Management(Climate Change)	The present study aims to assess carbon pools in plantations of Teak, Eucalyptus, Casuarinas and Acacias in different site conditions. For this study, a reconnaissance survey carried out in all the districts of Tamil Nadu for selection of plantations for carbon sequestration studies. With regard to Casuarina plantations, a total of 200 trees were felled from 69 casuarina plantations in Tamil Nadu under different soil types and under irrigated and rain-fed conditions. Estimated dry matter production on per tree basis and in turn worked out carbon stock in biomass components. In these 69 plantations of Casuarina, soil samples were collected and were analyzed for organic carbon and various other properties. Carbon analysis in plant samples collected from casuarina plantations was done by adopting Ash content method using muffle furnace. Biomass and volume table prepared for casuarina plantations in Tamil Nadu. Similarly, 243 Eucalyptus trees were sampled from 81 plantations in Tamil Nadu for biomass estimation In all these 82 eucalyptus plantations, soil samples were collected and analyzed for carbon content and estimated soil carbon stock in these plantations. With reference to Acacia mangium,

				biomass studies conducted in 7 plantations and in turn carbon stock estimation in biomass components was worked out. Soil samples were collected from these plantations were collected and analyzed for carbon content and estimated soil carbon stock in these plantations. With regard to teakcarbon pool assessment has been carried out in 19 plantations. IN another 11 plantations the study will be carried out. The project ends by March 2011.
4	Association analysis of adventitious rooting Traits using STS markers in *Eucalyptus tereticornis* and DNA profiling of *Eucalyptus* clones **(April-07, 2007-10 Ext. upto March, 2011)**	R. Yasodha, Scientist E	Genetic Improvement (Biotechnology)	The project related laboratory activities were completed. Data analysis is in progress. The project will be completed by March 2011. Financial and physical targets achieved as per the annual action plan.
5	Bio-informatics approach to data mine wood forming genes of Eucalyptus. **(2008, 2008-11)**	R. Vivekananda n, Scientist-E	Genetic Improvement (Biotechnology)	Wood forming gene sequences downloaded from Public domain for forty genes. Bioinformatics analysis: Conserved regions and primers obtained for downloaded forty genes sequences. Database tables created. Transferred downloaded sequences and results obtained in to Excel sheets for forty genes. Uploaded genes in to MySQL database for the twenty five genes in to the database.
6	Characterization of Eucalyptus clones for Physiological and Nutritional parameters. **(Jan-08, 2008-11)**	Shri. S. Saravanan, Scientist-C	Genetic Improvement (Tree Improvement)	Established Eucalyptus clonal trials at four locations (Coimbatore, Pudukottai, Sivagangai and Tirunelveli) with the short listed clones from IFGTB and clones of ITC, TNPL and TAFCORN for comparison purpose for assessing the water use and nutrient use efficiency of various clones. Morphological parameters like leaf area, leaf length and width, specific leaf area and leaf area index have been worked out for the short listed 30 clones. Physiological parameters like CO_2 assimilation, net photosynthetic rate, stomatal conductance, transpiration rate, etc. were recorded from the four trial plots. Regarding the growth parameters of the Eucalyptus clones, the height range varies from 0.6 m (TF-271) to 1.9 m (C-14) at Bharathiar University and TF 274 recorded minimum height growth of 0.5 m and C-9 recorded maximum height growth of 1.38 m at Sivagangai. At Pudukottai, seed origin recorded minimum height growth (0.4 m) and C-124 recorded maximum height growth (2.0 m). At

				Tirunelveli, T-4 recorded minimum (0.35 m) and C-115 recorded maximum (1.40 m) height. The average net photosynthetic rate (Pn - μ $molm^{-2}s^{-1}$) is 10.77 and the lowest has been recorded in clone C-186 at Coimbatore and highest in clone C-103 at Tirunelveli with the Pn value of 4.52 and 17.83 respectively. With reference to the stomatal conductance (gs), the average of stomatal conductance ($molm^{-2}s^{-1}$) is 0.18 and the minimum and the maximum values were recorded in 0.004 in clone TF-224 at Tirunelveli and 0.209 in clone TF-4 at Coimbatore respectively. The transpiration rate (E) was also measured in all the four locations and averaged to 2.79 $mmolm^{-2}s^{-1}$. The lowest transpiration rate was observed in clone C-63 (0.26) and highest in clone C-14 (6.07) at Tirunelveli. The ratio of net photosynthetic rate to transpiration is termed as Instantaneous water use efficiency (μ mol $mmol^{-1}$). Higher the value, better the efficiency of plant to divert water for photosynthesis than transpiration. After the analysis of data collected from four locations (3 months data), clone C-63 (45.31) registered more instantaneous WUE at Tirunelveli and clone C-196 (1.38) registered low instantaneous WUE at Coimbatore. Further observations on growth and physiological parameters, productivity studies are in progress at regular intervals.
7	Developing Cloning Techniques for Raising High Yielding Clonal Plantations of *Casuarina equisetifolia* L. **(April-08, 2008-11)**	Kannan C.S. Warrier, Scientist D	Genetic Improvement (Vegetative Propagation)	Evolved a suiable cloning technique for raising high yielding clonal plantations of *Casuarina equisetifolia*. All the objectives have been achieved. The project shall be concluded in March 2011. The completion report shall be submitted within the stipulated time.
8	Development of advanced generation seed orchard of *A. mangium* based on biomass and wood density. **(Aug-09, 2009-14)**	Dr. Maheshwar Hegde, Scientist C	Genetic Improvement (Tree Improvement)	SSOs in Nilambur has been evaluated for growth as well as wood density. CPTs are being selected in plantations. Purchase order has been placed for purchase of instruments namely increment borers, pilodyn, and Hypsometers.SSOs in Nilambur (Kerala) was visited and measurements were taken. trees using increment borer. 80 Families in SSO at Karunya have been evaluated for wood density and growth. Outstanding families have been delineated for seed collection.Single tree seed collection from selected CPTs (125nos) was done from the

				SSO Nilambur (66 nos), Provenance stand Nilambur (6), SSO Karunya (31), anampally(4), and plantations in Palode (22).Bulk collection was also done from these locations. The collected seeds have been processed and kept ready for raising nursery in the coming season
9	Development of Agro forestry systems with economically important medicinal plans under industrial tree species of Casuarina and Eucalyptus. **(April-09, 2009-12)**	Dr. K. Panneer Selvam Scientist-B	Forest Productivity (Social Forestry, Agro-forestry /Farm Forestry)	Maintenance under progress. Some species of medicinal plants has been harvested. Physiochemical analysis is pending. Seeds have been collected from Casuarina and Eucalyptus
10	Development of macro and micro propagation technique for *Melia dubia* Cav. For planting stock production. **(April-09, 2009-11)**	Dr. Rekha .R. Warrier, Scientist C	Genetic Improvement (Vegetative Propagation)	Explants both mature and juvenile were testd for shoot induction. Juvenile shoots, mainly from seedlings showed better response. Explants from coppice shoots showed high levels of contamination. Multiple shoots were induced in basal medium with minimal growth regulators. The microshoots are being tested for ex vitro rooting. Heavy contamination was observed in subculturing which is attributed to the presence of endophytes. Rooting was observed in in- vitro grown shoots. However, the plantlets failed to survive. About 60 per cent rooting obtained in cuttings from coppice shoots.
11	Development of methods for functional analysis of genes involved in salt tolerance in Eucalyptus. **(April-09, 2009-14)**	Dr. N. V. Mathish, Scientist D	Genetic Improvement (Biotechnology)	GFP expression was obtained in hairy root cultures of Eucalyptus tissue cultured shoots. Cocultivation duration at 22°C and pH of 5.3 have been identified as suitable temperature for generation of composite plant. Hardening of composite plants was achieved. HKT1 gene from *E. camaldulensis* and *E.tereticornis* were amplified and partially sequenced.
12	Development of site specific regeneration augmentation plan for potential degraded areas in western ghat. (or development of eco-restoration model for potential regeneration areas in Western ghats) **(April-09, 2009-14)**	Dr.C.Kunhikannan, Scientist D	Forest Productivity (Forest Soils and Land Reclamation)	Four sites for establishment of field trials have been selected in Buffer zone of Silentvalley and Attappady forests. Species inventory was made for all the selected sites. Five each pioneer species for Siruvani, Panthanthodu Thathyangalam and. Pudur area were selected. Vegetation parameters were recorded by laying out quadrats of different sizes for trees, shrubs and herbs from four locations. Soil samples collected from experimental sites and physical and chemical parameters were analyzed and recorded. **Seeds of pioneer species and some of the canopy species were collected and prepared the planting stock for planting in coming season.** **Experimental trials were established in Siruvani, Thathengalam, Panthanthodu**

				and Pudur area with five selected pioneer species each.
13	Studies on macro propagation of bamboo species. **(May-09, 2009-12)**	K.S. Venkatarama nan Research Officer	Genetic Improvement (Vegetative Propagation)	The project has been transferred to IFGTB, Coimbatore vide ICFRE letter No.5-3/IWST/09-10/ADG (M&E)/ICFRE/Plan/Projects/197 dated 16/6/10 and was requested for budget allotment vide IFGTB letter No.PBT/KSV/NFRP-Bamboo/IFGTB/2010 dated 13/07/2010 to DDG (Admin) ICFRE and revised Action Plan was submitted on 3.8.2010 as per direction of ADG (M&E)/ICFRE and budget Rs.5.03 lakhs was released on 29.10.2011 under this project. The Progress of the Project as follows from August-2010 as follows Raising of *Bambusa bambos* through seeds was carried out and transplanted 250 seedling in the poly bags for planting in the mother bed for collection of single node leafy cuttings. Procured 50 nos of *Bambusa balcooa plants* and macro proliferated for planting in the mother bed. Grounding of 100 plants of *Bambusa bambos* and 100 plants of *Bambusa balcooa* was carried out in the mother bed at model nursery for collection of leafy type cuttings. Macro proliferation of *B.bambos* was carried out from already raised plants through seeds for further multiplication for collection of cuttings. Infrastructure repairs like replacing of cooling pad and serving the misting system in the green house in progress. Collection of different types of cuttings for rooting in progress.
14	Enhancing rootability and planting stock production of selected high yielding clones of Eucalyptus through Micro & Mini cutting technique. **(April-09, 2009-12)**	V.K.W. Bachpai , Scientist B	Genetic Improvement (Vegetative Propagation)	Rooting trials of the productive clones were conducted using conventional two noded cutting method and the 30 clones were categorized as good, moderate and poor rooters. Rooting percentage was enhanced for 15 clones using the new junenile shoot technique (Mini cutting technique). Mini stools are established for the Micro cutting technique (by Tissue Culture route)
15	Evaluation and characterization of clones of *Casuarina* with reference to	Kannan C.S. Warrier, Scientist D Dr A. Balu,	Genetic Improvement (Tree Improvement)	75% of the work has been completed. The project is progressing as per schedule. Short-listed 95 clones of *C. equisetifolia*

	yield, tree form, biomass, pulping characteristics and key nursery pests. **(April-07, 2007-12)**	Scientist E		for field testing and prepared the planting stock. Considerable variation was observed with reference to the rooting percentage. Established three field trials in Tamil Nadu (1) at Mayiladumparai, Karur district (2) in a sodic site at Pugalur and (3) in a casuarina belt at Sirugramam, Cuddalore district during March, September and December 2008 respectively. Assessed the survival and casualty replacement was carried out in all the field trials. Biometric / qualitative observations are being recorded from these trials at regular intervals. The top 10 ranking genotypes are Clone 01, Clone 12, Clone 11, Clone 31, Seed lot 01, Seed lot 02, Clone 83, Clone 21, Clone 49 and Clone 29. Broad sense heritability values for height, dbh and d^2h estimated from the trial at Mayiladumparai at 2 years were 0.77, 0.79 and 0.73 respectively. At Sirugramam, the better performers were CE 2003/5,CE 9, S 88, CE 268, S 90, CE 224, TN 111, CE 219, S89, CH 3001, CE 332, CE 73, CE 2002/1, TNCS 1 and TCR 060101. A total of 220 casuarina clones were maintained a nursery trial. The trial was screened for natural incidence of the targeted pests, *Icerya purchasi* and *Eumeta crameri.* Observations on the incidence and intensity of attack of these pests on the clones recorded at 15 days intervals revealed variations among the clones for tolerance. 215 clones have so far been infested by *I. purchasi* and 132 clones by *E. crameri*. Population dynamics of these pests on the clones during different seasons were studied. Incidence and infestation of other non targeted pests like Myllocerus beetle, a species of mealy bug and a species of scale insect during different seasons on different clones were also recorded. Mass multiplication of the targeted pests using their original hosts as well other alternative hosts like potato, pumpkin, *Acacia nilotica* were continued. Biology of the pests on casuarina was also studied and completed. Clones free from attack of these pests short listed and controlled condition studies in respect of determination of true and pseudo resistance with *E. crameri* was completed for 60 of the 88 short listed clones. Analysis of biochemical parameters such as Phenol and Tannin has so far been completed for 10 short listed clones. Different levels of tolerance for *Eumeta crameri* could be observed.

16	Evaluation of improved germplasm of *Eucalyptus camaldulensis* and *E. tereticornis* for productivity, wood traits, tolerance to insect pests and diseases and management for higher seed production. **(April-07, 2007-10, Ext. upto March, 2011)**	Dr. A. Balu, Scientist-E Shri. D. Rajasugnasekar, Scientist-C Smt. R. Anandhalakshmi, Scientist-C	Genetic Improvement (Tree Improvement)	(1) Clonal trials of eucalyptus at three locations (Karunya, Sathyavedu and Kulathupuzha) were evaluated for growth traits and 30 clones prioritized for productivity based on volume table analysis. (2) Analysis of wood traits (the fibre length, fibre width, lumen width, wall thickness, fibre length/fibre width ratio, and specific gravity for 59 clones) and pulping characters (Kappa number, Pulp yield, Strength properties such as Tear Factor, Breaking length and Burst factor bark, soft wood and hart wood ratio for 67 clones) for the prioritized clones has been completed. (3) Pests and diseases incidences on 110 clones of eucalyptus at three different locations during different period were studied, documented and the variations among clones for the attack of key pest and diseases were assessed in the field and lab. Based on the observations on pests and diseases infestations collected from the field and controlled conditions studies the clones were categorized for the insect and diseases resistance/tolerance and susceptible natures. (4) Experiments to enhance seed production in seed orchards were carried out by adopting silvicultural practices combined with applications of (1) Watering (2) Watering + FYM and (3) Watering + FYM + Paclobutrazol and (4) Control as treatments at Karunya Clonal Seed Orchard (CSO). The flower and fruit productions after the treatment were estimated tree wise. Seed collections were made and the Germination tests to test seed quality are under progress.
17	Genetic Improvement of *Casuarina* species through Second Generation Orchards. **(April-08, 2008-14)**	Dr. A. Nicodemus , Scientist D	Genetic Improvement (Tree Improvement)	Two hundred outstanding trees were identified from eight first generation orchards of *Casuarina equisetifolia* and seeds collected individually. Seedlings raised retaining family identity. Six progeny /clonal tests cum second generation SSOs were planted at 5 locations in Tamil Nadu, Puducherry and Andhra Pradesh. Periodic assessment for survival and early growth was carried out. Trials and orchards are intensively maintained for high survival and good growth. Seed collection from first generation orchards is continued for further establishment of orchards.
18	Identification of Biochemical marker linked to sex determination in	Dr. A. Shanthi Scientist-B	Genetic Improvement (Biotechnology)	Twelve isozymes were studied in *Casuarina equisetifolia* male, female and monoceious clones. Five isozymes were indicated consistant stable expression

	Casuarina equisetifolia. **(April-08, 2008-11)**			towards gender discrimination. Biochemical studies for hormonal expression through HPLC studies in flowering and non flowering stages for male, female, monoceious sample screening is in progress. This project will be completed by March 2011.
19	Identification of Biochemical marker of salinity tolerance in *Casuarina equisetifolia*. **(April-09, 2009-12)**	Smt. R. Anandalakshmi, Scientist-D	Genetic Improvement (Biotechnology)	Rooting of clonal cuttings for 25 completed and hardened. Imposed salinity ranging from 0 to 450 mM in 25 clones and in another experiment imposed gradually increasing concentration of sodium chloride treatment in step by step manner . Clones in one time saline induction experiment subjected showed survival upto 250mM NaCl. Completed studies on morphological, physiological and biochemical estimations on control and salinity induced clones of results are in progress.
20	Identification of secondary xylem specific cellulose synthase genes from *Eucalyptus tereticornis*. **(April-08, 2008-11)**	Dr. Modhumita Dasgupta, Scientist D	Genetic Improvement (Biotechnology)	The project aims at isolating developing secondary xylem specific cellulose synthase (*CesA*) genes from E. tereticornis. All six classes of *CesAs* were identified from the genomic DNA and cDNA pools derived from different tissues. Expression profiling of the truncated genes showed the up-regulation of three *CesAs* in the developing xylem. The 3'RACE targeting the poly A end has been conducted for all the three *CesAs* and sequencing of the amplicons is in progress.
21	Impact of continuous moisture on growth, flowering, seed production and wood characteristics of canal Teak plantation in Tamil Nadu. **(April-09, 2009-12)**	Dr. K. Palanisamy, Scientist-F	Genetic Improvement (Tree Improvement)	In canal teak plantations the percentage of flowering varies from 40 to 84% and fruit setting varies from 4 to 5%. The plantation at Nadupadugai (33 years) showed outstanding growth performance with good flowering. This plantation may be converted into seed production areas to meet the demand of planting material for canal areas. Generally flowering and fruit setting in canal teak was late compared to other natural teak growing areas. A total of 28 superior teak trees were selected in different locations of Thanjavur, Tiruvarur and being multiplied clonally. Seeds were collected from selected trees in canal teak plantations and seed characteristics like seed weight, seed size and germination percentage has been studied. Wood samples were collected from canal teak and wood properties are being studied . The canal teak plantations were surveyed and recorded the damages and hollowness in different parts of the tree. Samples were collected for further studies in laboratory. Soil samples were also collected from the study sites and further analysis is in progress. The teak logs kept in the Teak Depot at Thanjavur was

				studied and found that the teak logs were showed hollowness due to fungal infection.
22	Improvement of Teak through selection, quality seed production, hybridization and clonal evaluation **(April-07, 2007-12)**	Dr. B. Gurudev Singh, Scientist – F Dr. K. Palanisamy, Scientist – F Dr. B. Nagarajan, Scientist – E Dr. A. Nicodemus, Scientist – D	Genetic Improvement (Tree Improvement)	About 400 trees identified. Seeds were collected from 230 selected trees from Parmbikulam, Topslip, Konni , Tholpatty and Nilambur. Analysed the morphological character using image analyzer and x-radiography has been done to determine seed filling for 70 trees.Germination studies were carried out for 82 trees. 4000 seedlings were transplanted to polybags. Due to rust disease there was heavy casualty in nursery.Flowering and fruiting (number of inflorescences per tree and number of flowers / fruits per inflorescence) was assessed in 475 trees in Walayar CSO and 170 trees in Panampalli CSO. Assessed all clones for flowering and fruiting behavior in three CSOs and one SSO (1500 trees).Seeds from 70 ramets of 15 clones collected processed and stored for further analysis.Pollinator visitation per unit time per tree was assessed in both the CSOs. Trees were selected at Walayar for carrying out the control crosses. A partial diallele crossing design has been developed. The Following crosses were made in teak at Panampully field trial: TNT19xTNT10,TNT20XTNT10 TNT19XTNT20. The selected clones were planted in the Vegetative multiplication garden and being multiplied for establishing clonal trials . The rooting performance of different clones were studied. A clonal trial of teak has been established at Salem (TN) which showed outstanding growth performance. Maintenance work has been carried out in the clonal trial of Teak.
23	IPM for the key pests of *Ailanthus excelsa, Gmelina arborea* and *Dalbergia sissoo* in nurseries and in young plantations. **(April-09, 2009-12)**	Dr. A. Balu, Scientist – E	Forest Protection (Insects pests, diseases and control)	(1) 25 field trips were undertaken to Kodumudi, Bhavanisagar, Melakadu, Vilamundi, Bannari, Arimalam, Thadiyankudisai, Palayar (Sirkali), Sivagangai, Vangal, Amaravathi, Thirumoorthy hills, Salem and Puravipalayam areas in Tamil Nadu. The targeted insects *Tingis beessoni*, *Myllocerus spp*., *I quadrinotata*, *S. malabaricus, Eupterote geminate, M. hirsutus, Eligma narcissus* and *Atteva fabriciella* were collected from the field and reared in the laboratory for further studies. (2) Bio-efficacy of chemical pesticide (Thiodicarb, Monocrotophos, Flubendiamide, Chlorpyriphos, Ekalux, Confidor and Rogor) and botanicals (*Ailanthus excelsa, Lantana camara, Aegle marmelos, Pongamia* oil*, Jatropha* oil, Neemol, and Tobacco + Neem soap extract,

				Pure Neem oil and Neemazal) were also tested on the targeted pests of *Ailanthus excelsa* (*Atteva fabricilla, Eligma narcissus*), *Dalbergia sissoo* (*M. discolor, M. viridanus*) and *Gmelina arborea* (*Eupterote geminate, Tingis beessoni*) relevant data on larval mortality and antifeedent effects were collected and effective doses for control of the pests determined. Further work in this aspects is in progress.
24	Progeny testing of selected clones for establishment of clonal and seedling seed orchards in Eucalyptus **(April-08, 2008-14)**	Dr. V. Sivakumar, Scientist D	Genetic Improvement (Tree Improvement)	Clonal trials were assessed. About 25000 seedlings of 60 clones were raised and 2 progeny trials established at Hyderabad and Puthukottai. Seed orchards were established at Salem (2 ha.) and Nellore (4 ha). Produced about 23000 plants for establishment of seed orchard during 2010-11. Seed orchard in Madukarai was established in 2 ha area. Land preparation in Chennai (3ha) completed. Seedlings transported to Nellore for planting 7 ha seed orchard with APFD
25	Quantitative trait loci (QTL) mapping in eucalypts for salinity tolerance and adventitious rooting. **(April-08, 2008-11, Ext. upto 2 yrs, March, 2013)**	R. Yasodha, Scientist E	Genetic Improvement (Biotechnology)	The title of the project is changed as "Quantitative trait loci (QTL) mapping in eucalypts for salinity tolerance" which was approved in RPC 2010. The project activities are in progress as per the modified annual action plan.
26	Screening for blister bark disease resistance in *Casuarina equisetiflolia* clones. **(April-09, 2009-14)**	Dr, A. Karthikeyan, Scientist D	Forest Protection (Insects pests, diseases and control)	The project aims to identify the resistant candidates of Casuarina equisetifolia clones against blister bark diseae. 150 clones of C. equisetifolia were assessed for blister bark disease resistance by artificial inoculation of *Trichosproum vesiculosum* which caused the disease. Out of 150 clones 16 clones were identified as resistance based on their performance in nursery. 100 more clones to be assessed and thereafter the identified resistant candidates will be planted in the field for further evaluation.
27	Screening of high yielding clones and seed sources of Eucalyptus spp. For gall insect pest, *Leptocybe invasa* . **(April-09, 2009-12)**	Dr. A. Balu, Scientist E	Forest Protection (Insects pests, diseases and control)	(1) About 268 Eucalyptus Clones collected from 9 different organizations . (2) A trial at hot spot area at Satyavedu is established . About 179 clones planted at the trial. The rest of 89clones are maintained at VMG for multiplication and adding to the trial in the forthcoming rainy season during October, 2010. (2) Incidence of the gall insect, *Leptocybe invasa* on 302 clones at the trials at Satyavedu and at Panampally was assessed and three rounds of observations

				completed.. (3) Biotic factors such as phenology of the plant, occurrence of natural enemies and abiotic factors like temperature, humidity and rainfall were collected. A species of spider predator and native parasitoid were recorded from Satyavedu. Further observations are in progress
28	Selection, evaluation and identification of efficient bio inoculants for quality seedling production of selected fast growing native tree species. **(April-09, 2009-12)**	Dr. V. Mohan, Scientist-E	Forest Protection (Mycorrhizae, rhizobia and other useful microbes)	The project is aimed to inventorize the beneficial microbes from the rhizosphere of fast growing native tree species and determine the synergistic combination of selected bio-inoculants for quality planting stock production in nursery. The salient findings and current status of the project are as follows: • Project was initiated during April, 2009. • Field visits made and collected roots and rhizosphere soil samples from the selected plantation sites of *Ailanthus excelsa, A. triphysa* (*A= malabaricum), Neolamarckia cadamba* (= *Anthocephalus cadamba*), *Gmelina arborea, Melia dubia* and *Dalbergia latifolia* in Tamil Nadu and Kerala. Estimated the physico-chemical properties such as pH, E.C., macro and micro nutrients from all the soil samples collected from different plantation sites. • Roots and rhizosphere soil samples collected from these plantations were processed and recorded percent root colonization and spore population of Arbuscular Mycorrhizal (AM) fungi. Three types of AM fungi *Acaulospora, Gigaspora* and *Glomus* were recorded. • 216 PGPR isolates from the rhizosphere samples viz., *Ailanthus excelsa* (69 isolates), *A. triphysa* (12 isolates), *Neolamarckia. cadamba* (33 isolates) *Gmelina arborea* (45 isolates), *Melia dubia* (28 isolates) and *Dalbergia latifolia* (29 isolates). • Estimated population density of all the PGPR isolates and stored for further biochemical analysis. • Species level identification of PGPRs of genera such as *Azotobacter, Azospirillum, Bacillus, Pseudomonas and Serratia* have been done. • Screening of efficient PGPR

				isolates was done by IAA production and phosphate solubilization under *in vitro.* • Molecular identification of Phosphate Solubilizing Bacteria (PSB) from the *A. excelsa* rhizosphere was carried out. • Nucleotide sequence of Phosphate Solubilizing Bacterium (***Bacillus megaterium***) isolated from the rhizosphere of ***Ailanthus excelsa*** plantations, Tamil Nadu was submitted in European Nucleotide Archive (ENA) of European Molecular Biology laboratory (EMBL) and Accession No. is **FR716832.** • Nucleotide sequence of Phosphate Solubilizing Bacterium (*Stenotrophomonas* sp..) isolated from the rhizosphere of ***Melia dubia*** plantations, Tamil Nadu submitted to **EMBL database** and **Accession number obtained as FR821513.** • Nucleotide sequence of Phosphate Solubilizing Bacterium (***Bacillus subtilis***) isolated from the rhizosphere of ***Melia dubia*** plantations, Tamil Nadu submitted to **EMBL database** and **Accession number obtained as FR821514.** • Nucleotide sequence of ***Azospirillum* sp**. isolated from the rhizosphere of ***Ailanthus excelsa*** plantations, Tamil Nadu submitted to **EMBL database** and **Accession number obtained as FR821515.** • Nucleotide sequence of Phosphate Solubilizing Bacterium (***Pseudomonas synxantha***) isolated from the rhizosphere of ***Ailanthus excelsa*** plantations, Tamil Nadu submitted to **EMBL database** and **Accession number obtained as FR799726.** • Nucleotide sequence of Phosphate Solubilizing Bacterium (***Bacillus* sp**.) isolated from the rhizosphere of ***Gmelina arborea*** plantations, Tamil Nadu submitted to **EMBL database** and **Accession number obtained as FR799727.** • Nucleotide sequence of Phosphate Solubilizing Bacterium (***Pseudomonas* sp**.) isolated from the rhizosphere of ***Gmelina arborea*** plantations, Tamil Nadu submitted to **EMBL database** and **Accession number obtained as FR799728.**

				• Nucleotide sequence of Phosphate Solubilizing Bacterium (***Bacillus subtilis***) isolated from the rhizosphere of ***Dalbergia latifolia*** plantations, Tamil Nadu submitted to **NCBI database** and **Accession number obtained as BankIt1429067 Seq1 HQ914787.** • Nucleotide sequence of Phosphate Solubilizing Bacterium (***Acinetobacter* sp**.) isolated from the rhizosphere of ***Neolamarckia cadamba*** plantations, Tamil Nadu submitted to EMBL database and **Accession number obtained as FR775977** • Nucleotide sequence of Phosphate Solubilizing Bacterium (***Pseudomonas* sp**.) isolated from the rhizosphere of ***Neolamarckia cadamba*** plantations, Tamil Nadu submitted to EMBL database and **Accession number obtained as FR775978.** • Submission of Nucleotide Sequence of some more isolates of PGPRs is under progress. • 26 different AM fungi belonging to three genera such as *Acaulospora, Gigaspora* and *Glomus* were recorded. Among them the genus *Glomus* was found dominant, followed by *Acaulospora.* • Seedlings of *Ailanthus excelsa, A. triphysa* and *Neolamarckia cadamba* were raised in nursery and the seedlings were transplanted to poly bags containing sterile soil + sand as potting medium and the PGPR isolates and AM fungi were inoculated into the potting medium as per standardized procedures. The experiment is under progress. • Presented a research paper entitled "Diversity of Beneficial Micro flora in the Rhizosphere of Fast Growing Native Tree Species *Neolamarckia cadamba* in Tamil Nadu" in National Conference on Biodiversity for Sustainable Development during 25-27 August, 2010 at Madurai Kamaraj University, Madurai. The paper has got **Best Paper Award.** • Presented a research paper entitled "Diversity of beneficial microflora in the rhizosphere of fast growing native tree species, *Gmelina arborea* in Tamil Nadu and Kerala" in International Conference on Bioresource Technology-Its

				Applications and Achievements during 7-8 October 2010 at Nirmala College, Coimbatore. The paper has got **Best Paper Award** as First Prize. Other project activities are under progress.
29	Some phytochemical, Toxicological, pharmacological investigations of *Aegle marmelos* for a new product. **(April-08, 2008-2011, 3 years)**	Dr. S. Murugesan, Scientist F	Non-wood Forest Products (NWFPs) (Chemistry of NWFPs, Value Addition and Utilization)	Standardized the successive extraction & fractionation of *A. marmelos* leaves, ripened and unripened and completed preliminary pharmacological studies. Series of pharmacological evaluation of the combined extracts (nine extracts of three tissues) were evaluated for the three parameters namely superoxide dismutase, GT catalase and lipid peroxide. Chemical analysis such as Primary nutrients, phenols, alkaloids, flavonoids, tannins, saponins, enzymes like PO, PPO and micronutrients, metals and other chromatography analysis had been completed. Two doses of 100 and 200 mg extracts were tested in order to select the better extract. Among the three tissues leaves are having more behavioral activity. Ripen and unripen fruits exhibited similar antioxidant activity in super oxide and nitric oxide scavenging activity. All the three crude extracts shown similar reducing power activity. Among the three antioxidant activities studied super oxide scavenging activity was found to be better. All the nine extracts were subjected to *in vitro* & *in vivo* antioxidant activity for three parameters namely superoxide dismutase, GT and catalase. Pharmacological evaluation of combined extracts and dose finalization for the formulation were completed. The toxic effect if any in the tissues and safety of the extracts on experimental organisms were assessed. Based on which totally 11 preformulations (leaf, ripen unripen extracts) were developed.
30	Status and influence of microbial inoculants associated with Eucalyptus clones in established breeding populations. **(April-08, 2008-11)**	Dr, A, Karthikeyan, Scientist D	Forest Protection (Mycorrhizae, rhizobia and other useful microbes)	This project aims to find out the rooting and growth response of Eucalyptus stem cuttings to inoculation of AM fungi and Plant growth promoting rhizobacterias (PGPRs). 30 clones of Eucalyptus were tested and identified clone specific AM fungi and PGPRs. The AM fungi and PGPRs showed good rooting performance and growth improvement in certain clones e.g. C-111, C-14 and C 53 compared to IBA treated cuttings. Rest of the other clones showed moderate growth and root

				initiation. The AM fungi and PGPRs inoculated Eucalyptus clones also showed nutrient (P) enrichment under nursery conditions. The project is progressing as per the action plan and will be completed in Mar 2011.
31	Studies on efficacy of secondary plant derivatives of *Aegle marmelos* on important insect pests of Teak. **(April-07, 2007-2011, 4 years)**	Dr. S. Murugesan, Scientist F	Forest Protection (Insects pests, diseases and control)	Extraction and identification of bioactive compounds of *A.marmelos* tissues (half fruit, pulp and seeds) were completed and biopesticidal properties have been identified. Bioassay confirmation of 10 groups of 13 individual compounds (identified from 3 tissues of *A. marmelos),* were tested on the target pests at different concentrations (250 to 1000 to 10,000 ppm) both in the laboratory and systematic field trials at Nilambur and Kulathupuzha state forest nurseries. Data analysis and confirmatory test against teak insects recorded 70 % larval mortality against *H. Puera* and lower than 30% in case of *S.litura*. No further insect attack (teak larvae & nematode) was observed after application of aegle extracts and also observed as a growth promoter. Based on the results the selected three formulations of oils were analyzed through HPLC and GC-MS-MS techniques for further confirmation of bioactive compounds.
32	Studies on the impact of *Indarbela quadrinotata* on growth of *Casuarina equisetifolia*, factors influencing the pest infestation and developing eco friendly management practices. **(April-09, 2009-13)**	Dr. K. R. Sasidharan, Scientist - D	Forest Protection (Insects pests, diseases and control)	1) Information on *Casuarina* plantations was collected from four Agro-climatic Zones (ACZ) of Tamil Nadu, namely ACZ I, IV, V and VI. 2) Out of 180 suitable Casuarina plantations, 22 plantations were selected, by adopting a stratified random sampling methodology. Infestation of the Bark Eating Caterpillar assessed; information on Silvicultural practices, biotic and abiotic factors collected. It showed wide variation in the infestation of the Bark Eating Caterpillar among the four Agro-climatic Zones of the State. (3) A 2006 *Casuarina* plantation raised at T.S.Pettai in Cuddalore Forest Division was selected for studying the impact of the Bark Eating Caterpillar infestation on growth parameters of trees; sample plots laid out, insect infestation on trees assessed and growth parameters recorded at six monthly intervals. Data collected up to one year revealed that, though the pest infestation had a negative impact on the growth of the trees, the reduction in growth was not significant. The study is in progress.

				(4) Entomopathogenic fungi (biocontrol agents) were collected from the dead pest larvae; isolated the fungi in the laboratory and pure cultures developed. Initiated evaluation of the entomopathogenic fungi and botanicals in the laboratory and field conditions and it gave promising results. The studies are being continued.
33	Studies on the suitability of *Eucalyptus tereticornis and E. camaldulensis* clones for various agroclimatic zones of Southern India. **(April-08, 2008-13)**	Dr. A. Vijayaraghavan, Scientist-C	Genetic Improvement (Tree Improvement)	• Established VMG in Bharathiar University. 28 clones are planted in the VMG for multiplication • Established totally 12 clonal trials at **Andhra Pradesh** (4 trials) viz., Rajmundhry, Warangal, and Mulug (Hyderabad), Sreevarimettu (Tirupathi), **Puducherry** (1 trial) at Karaikal, three clonal trials in **Karnataka** viz., Gangargatti (Dharwad), Halbhavi(Belgaum) and Badami, in **Tamil Nadu TAFCORN** area (4 l trials) viz., Nachiarpettai (Ariyalur), Tiyagadurgam (Kallakurichi), Amaravathi Pudur (Karaikudi) and Marakkanam. of 1. 2 ha in each location. • Maintenance of the trial and recording the data is in progress. Till date around 9.33 lakhs has been spent