Continued ICFRE Funded Research Projects (2010-11)-IWST

Pro. File S. No.	Name of Project	PI	Thrust Area	Current Status
1	Anatomical approach to evaluate treat ability of timbers **(April, 2008, 2008-2011)**	Mrs. D. Venmalar	Wood products (value addition & Utilization)	Wood samples of five species (*Acacia aurculiformis, Acacia mangium, Hevea brasiliensis, Gmelina arborea* and *Grevillea robusta*) were treated with 5% silver nitrate followed by 2% hydrazine hydrochloride and exposed to bright sunlight. Observed penetration of preservative to carry out qualitative analysis of absorption. Photomicrographs of the same were taken under stereo microscope. Specific gravity of wood samples determined and quantitative analysis of absorption was carried out. Sections were cut to see the impregnation of chemicals under microscope. Sections of the samples of all the five species were taken to find out the stains. Five species (*Acacia aurculiformis, Acacia mangium, Hevea brasiliensis, Gmelina arborea* and *Grevillea robusta*) out of nine species were completed and remaining three species (*Eucalyptus eurogranidis, Eucalyptus tereticiornis* and *Populus deltoids*) will be completed during 2010-11.
2	Biodiveristy of wood inhabiting fungi in the rainforests of Makutta, Western Ghats (April, 2009, 2009-2012)	Dr. Muthukumar A.	Ecosystem Conservation & Management (Biodiversity)	The surveillance of the study area Makutta were undergone during the first two quarter of last year for preliminary identification of site/transects to carry out sampling work. The surveillance was performed based on the observation and existence of fungal fruiting bodies; which later were confirmed. Accordingly transects were identified and finalized. Line transect method was followed for the actual sampling work to be carried out in the study area. A total number of 5 transects were identified. Regular visit to transects for documenting the macrofungi were carried out during all the quarter. Documentation was categorized based on the prevalence of fungi during monsoon, pre and post monsoon. The documentation is being carried out through photographs and collections if necessary. Substrates of the fungi were also recorded.

3	Characterization of marine lignicolous fungi in traditional wooden craft (April, 2008, 2008-2012)	Dr. M. Balaji	Forest Protection (Insects, pests, diseases and control)	Survey was conducted in fishing villages at Bhimunipatnam and Visakhapatnam for fungal infested traditional craft. Fungal infested timber collected from catamarans and mixed culture of fungi carried out. Different fungi were maintained as pure cultures and some isolates identified. Timber test coupons treated with CCA to different loadings. CCA treated coupons along with controls were exposed to individual fungi. A total of 13 isolates identified.
4	Development of agroforestry models in *Givotia rottleriformis* Griff and *Gmelina arborea* Roxb as tree species in semi arid tropics of Andhra Pradesh. – **FRC (April, 2009, 2009-2014)**	Mr. Honnuri	Forest Productivity (Social Forestry, Agro-forestry /Farm Forestry)	• A willing farmer to implement the agroforestry model as per our design in his farm is selected. • MOU has been signed with the farmer. • Collected both the seeds & cuttings of *Givotia rottleriformis* but former have failed to germinate & later have failed to induct the roots & dried off. • Seedlings of *Gmelina arborea* are made available for planting operation. • Ploughed & cleaned the farmers' field. • Collected the seeds of *Wrightia tinctoria* & sown them in the nursery bed and transplanting the seedlings to the poly bags is under process
5	Development of Commercial Timber Information System (CTIS). (April, 2009, 2009-2012)	V.Soundrarajan	Forest Management (Information and Communication Technology)	Software and books have purchased for the project requirement. Project Assistant has recruited and joined on March 2010. Information has been collected from the library, through the literature survey for Web database design. Model design of web site was prepared. Bangalore Timber market survey has been contacted and during the survey collected the information about the timber market price, availability of the species in the market and how they are getting the timber form the various source. Chennai's timber market survey has been contacted and during the survey collected the information about the timber market price, availability of the species in the market. In Chennai market, at present Beech wood, Sapplei Log, Ash wood, Dak wood, Cherry wood , Tali log, Melina log, Teak, Badak, Venteak, Rubber

				wood, Silver wood, Neem wood, Kongu, Venkai, Mansa kadambai are available. It is imported from Germany, Ivory Cost, Burma, Togo, Ghana, Ivory Coast, Costa Rica, El Salvador, Panama, South Africa and some species from India and information collected from Regional Plants Quarantine Station and Choolai, Greams Road, Koyambedu areas private timber depot, Chennai.
6	Development of micro propagation protocols for production of superior germplasm of *Dalbergia latifolia* Roxb. and *Pterocarpus santalinus* L **– FRC** (April, 2009, 2009-2013)	Dr. G.R.S. Reddy	Genetic improvement (Vegetative propagation)	Tissue culture Lab was established to achieve high rate of multiple shoot initiation and subsequent growth, studies were conducted on the various growth hormones (auxins and cytokinins), nutrient media, additives and period of collection of plant material. Attempts were made towards somatic embryogenesis as well as *In vitro* seed germination in case of red sander.
7	Ecological, economic and socio-cultural evaluation of a traditional ficus based agroforestry system in Mandya District, Karnataka (April, 2008, 2008- 2011)	Dr. S. Syam Viswanath	Forest Productivity (Social forestry/ agro forestry/ farm forestry)	Ficus trees are keystone species, which provide numerous direct benefits to farmers like fodder, firewood, timber for furniture, roofing and agricultural implements and shade during agricultural operations. Ficus trees in agroforestry system also perform various crucial ecosystem services such as soil and water conservation and supporting local biodiversity by providing nesting sites for migratory and native bird species. But the value of ficus trees in agroforestry systems has not been properly documented through systematic studies. In this context the present study evaluates a unique ficus tree based, traditional agroforestry system in rain fed agriculture in Mandya district of Karnataka state in South India and compares and contrasts it with modern systems with irrigated crops and fast growing exotic tree species. The study was initiated with preliminary field visits to different taluks of Mandya district to garner information on social, economic, political and cultural aspects of ficus tree planting and management. Secondary data was collected on demography, agricultural practices, land use history, cropping pattern, prices of agricultural produce in Mandya from census reports, district gazetteer, markets etc. PRAs were conducted in villages sampled at 1% intensity from seven taluks of Mandya to gather information on tree planting at village level. PRA exercise was followed by detailed semi-structured

				questionnaire based survey in which selected sample of farmers (around 13 per village so as to obtain a final sample size of around 200 farmers) categorized on the basis of density of ficus trees in their farms and farmers without any ficus trees but other trees, and farmers with no trees were interviewed from each village.140 farmer surveys and 11 village surveys have been completed from six taluks of Mandya till March 2010. Under ecological experiments envisaged under objective 2 of the project, litter traps were set up (30 traps) under ficus trees in field in March 2009, leaf litter is being collected and analysed for nutrients at monthly intervals from litter traps. Litter decomposition experiments were setup in surface and subsurface treatments in March 2009. Litter bags were retrieved monthly from decomposition experiments and analyzed for N, P and K to assess the nutrient release pattern from litter. Soil samples were collected in March 2009 and March 2010 for analysis. Microclimatic parameters were recorded monthly in fields since March 2009. Crop yield were estimated for rice and ragi to assess influence of trees on yield in two seasons (Dec 2008 and Dec 2009). Data entry and analysis are being done currently for financial and economic cost- benefit analysis of ficus agroforestry system and for assessing factors influencing adoption of ficus agroforestry in Mandya.
8	Effect of moisture content and diameter on the treatability of canes by vacuum impregnation method (April, 2009, 2009-2011)	Sh. D. Venmalar	Wood products (Value addition & utilization	Procured *Calamus thwaitesii* cane from Sakleskpur, karnataka. Removed the outer sheath and converted into 1m length specimens. Prophylactic treatment was given with 2% Boric acid. Determined moisture content by oven dry method and specific gravity of the specimens by measuring mass and volume. Installed and assembled storage tank 5000litres capacity to the vacuum pressure plant. Pipes were connected between storage tank to the treatment cylinders. 60 specimens were treated in green condition and 60 specimens were allowed to dry and treated in dried condition. Green and dried cane specimens were treated with 6% CCB (Copper Chrome Boric) and 6% Boric acid preservatives. 30 specimens in each preservative by vacuum pressure impregnation method following 3 different treatment schedules. Qualitative analysis of the treated cane specimens were determined by spot test.

				Quantitative analysis of 10 specimens for their preservative content was determined by chemical assay method as per BIS 2753.
9	Ethnobotanical studies of north Eastern Ghats in Andhra Pradesh (April, 2007, 2007-2011)	Dr. N. Rama Rao	Ecosystem Conservation & Management (Tribals & traditional knowledge system)	Field tours to Patapatnam, Seethampeta, Bhadragiri, Saluru, Narsipatnam and Paderu agency areas were conducted. Recorded ethnobotanical data on 180 plant species from the tribes of Savaras, Khonds, Jatapus, Kondadoras, Nukadoras, Bagathas and Porjas. Recorded the observations on the effect of tribal culture on vegetation. A rare, endangered and threatened gymnosperm, namely, *Cycas spherica* was collected for the first time from eastern ghats in Srikakulam district. Important medicinal plants, namely, *Drynaria quercifolia, Stemona tuberosa* and *Trichosanthes tricuspidata* were collected and their uses recorded first time. A total of 143 plant species were collected, made into herbarium and identified. Collected ethnobotanical data was scrutinized and screened with available literature.
10	Evaluation of strength properties of the wood and wood products in use by using ultrasonic method. (April, 2009, 2009-2011)	N.C.M. Rajan	Wood Products (Value Addition and Utilization)	3 Field visit were carried out in and around Bangalore for finding suitable Timber Yards and Saw Mills (6 survey each). After detailed survey made the used wood and wood products have been purchased for 50 Nos from which test samples prepared as per **IS 1708 – 1986** for finding **specific gravity** (30 Nos) and **static bending** (Modulus of elasticity and Modulus of rupture) – 30 Nos. During the detailed survey conducted(6 survey), the In-situ structures were identified for 10Nos to study the strength properties(MOE and MOR)
11	Fatty oil composition and utilization of lesser known Tree Borne Oil Seeds (TBOs) *Givotia rottleriformis* Griff., *Madhuca insignis* (Radlk.) H.J.L am., *Shorea tumbuggaia* Roxb., *Poeciloneuron indicum* Bedd., *Hopea parviflora* Bedd.,	Dr. S. Mohan	NWFPs (Chemistry of NWFPs, value addition and utilization)	Surveyed the forest areas namely Agumbe, Kerekatte, Belthangady, Balenje, Kapu, Gundya, Devarayanadurga, Penikunda, Thimbaktu, Tirupathi, Cudappah, Seshachalam and Papavinasam.Identified and collected seeds of *Poeciloneuron indicum, Mesua ferrea, Shorea thumbuggaia, Hopea parviflora, Givotia rottleriformis, Balanites roxburghii* and *Madhuca insignis*. Further collection of seeds from more areas is being taken up.

	Mesua ferrea Linn. and *Balanites roxburghii* G. Planch. (April, 2009, 2009-2012)			Extracted the fatty oils from these seeds. Physico-Chemical properties of oils determined
12	*Garcinia indica* Choisy: Pharmacological evaluation of the extract/active principle for anti diabetic property. (April, 2009, 2009-2012)	B.S. Chandra shekar	NWFPs (Chemistry of NWFPs, value addition and utilization)	The rind of the fruits collected from Subramanya and Puttur are shade dried and stored for extraction process. The rind is subjected to sequential extraction and from the methanol extract further subjected to separation by column chromatography which yielded two distinct fractions with Benzene :: alcohol (80:20 and 60:40.
13	Genetic improvement of *Melia azadirach* and *Melia dubia* through plus tree selection assessment of genetic variation and progeny trial establishment (Phase -1) **FRC** April, 2007**,** 2007-2011	Dr.G.R. S. Reddy	Genetic improvement (Tree Improvement)	Plus trees of *M. dubia* and *M azedarach* have been selected from Karnataka, Andhra Pradesh and Tamil Nadu and seeds were collected from the selected plus trees. Quantification of the oil content in the seeds of plus trees of *M. dubia* and *M. azedarach* were completed and further these studies has been initiated as per review of external expert. Seedlings were raised in the nursery and progeny trial was established by planting the progeny of *M. dubia* and *M azedarach* at Forest Research Centre, Hyderabad. Growth performance of *M dubia* and *M azedarach* in progeny has been recorded. After analyzing. growth performance data, *Melia dubia* showing fast growth as compared to *M. azedarach.* Protocol was standardized to extract DNA from leaf samples of *M. dubia.* Site preparation for establishment of progeny trial of *M azedarach* and *M dubia* at Karnataka is taken up by acquiring land form Karnataka state forest department as per the suggestion of ADG (M & E) has been done.
14	Incidence and diversity of marine borers in mangrove habitats of northern Andhra Pradesh (April, 2008, 2008-2011)	M.V. Rao	Ecosystem Conservation & management (Biodiversity)	Surveyed the mangrove habitats of Bhavanapadu in Srikakulam district; Bangarammapalem in Visakhapatnam district; Coringa, Bhairavapalem, Matlathippa, Masanithippa, Balusuthippa, Molletimoga and Kandikuppa in East Godavari district and Sorlagondi, Yelichetladibba and Nachugunta in Krishna district during pre-monsoon, monsoon and post monsoon seasons for two years. Assessed

				damage caused to vegetation by the attack of marine wood borers. Collected marine borer infested plant roots and stems and destruction caused to them was assessed. Enumerated the incidence of different wood boring groups in infested plant materials. Extracted various species of sphaeromatids, pholadadids and teredinids from live and dead plant material collected. Preserved the animals and prepared voucher specimens. Identified and documented various wood borer species collected. So far, a total of 38 species of marine wood borers were found to occur in the mangrove habitats
15	Investigations on fungal diseases and insect pests in forest nurseries of selected forestry species and their management (April, 2009, 2009-2012)	H.C. Nagaveni	Forestry Protection (Insects, Pests, Diseases & Control)	Processed and appointed 2 Project assistants Procured Autoclave and Balance. Survey was carried out by visiting 10 nurseries in Bangalore and Western Ghat area and selected two nursery in Bangalore and three in Western Ghat area. Periodical assessment was done for the infection and infestation of seedlings of selected species. 5 pathogens were isolated from diseased plants. Identification is being done. About 35% Gall infestation and 100% defoliater infestation was observed along with Scale insect in *Pongamia pinnata* seedlings. Though infestation was observed in other species, incidence was around only 15-20% in Hebbal and other nurseries. 100% Infestation of leaves by *Meconellicoccus hirsutus* was observed in Sulikere nursery for *Emblica officinalis* seedlings.
16	Performance of coatings on modified wood surfaces (April, 2008, 2008-2012)	Dr. K.K. Pandey	Wood Products (Value addition & Utilization)	Work on standardization of reaction conditions of acetylation and benzoylation was carried out. Stands for natural weathering were designed and got fabricated. Chemically modified wood specimens of Rubber wood and Radiata pine were prepared for application of coatings and weathering exposure. The modified wood panels (benzoylated and acetylated) with average weight gains of 10-20% were prepared and were coated with a transparent and opaque polyurethane exterior paint. The coated and uncoated panels have been exposed to outdoor weathering and samples are being periodically examined for weathering deteriorations. Initial results show that modified wood performed very well as compared unmodified specimens.
17	Production of clean producer gas from woody biomass (April, 2009, 2009-2011)	R.Ezhu malai	Wood Products (Value addition & Utilization)	Chemicals, Gas analyzer and Gasifier were procured. Wood wastes and bamboo wastes were collected from Advanced Wood Working Training Centre saw mills of Bangalore. Physical properties of these Collected wood wastes were measured such as Calorific value, Proximate and elemental

				analysis. Pre heat the Wood chips, bamboo chips and saw dust for biomass gasification was done
18	Seed infestation by insects among the emergent rainforest canopies at Makutta, western ghats (April, 2007, 2007-2010)	Y.B. Srinivasa	Ecosystem Conservation & Management (Biodiversity)	A one hectare sample plot has been laid out and the species-abundance data on the emergent canopies has been drawn. Interception traps have been designed and 30 nos fabricated. Interception traps were set up in the one-hectare sample plot. Insect emergences and extent of seed predation have been recorded. Field and lab germination studies for *Dipterocarpus indicus* have been carried out. Sampling work during the pre-monsoon period yielded seed fall from very few species – *Knema attenuata* and *Dipterocarpus indicus*. Data on seedling establishment of the 2007 and 2008 has also been recorded. Germination and regeneration data from 60 one square meter sample plots have been noted during 2007 and 2008. No seeding was recorded during the January to March 2009 and very poor seeding during Jan to March 2010. Only a few seeds of an unidentified species were collected in summer of 2010. No insect emergence was recorded from the seeds.
19	Standardization of flower induction schedule in *Tectona grandis* CSO and its impact on fruit set (April, 2009, 2009-2012)	Dr. Ashutosh Srivastava	Genetic Improvement (Tree improvement)	After extensive surveys in Karnataka and Andhra Pradesh one CSO each was selected (Janganamatti, Dharwad, Karnataka and Achutapuram, Rajamundry, Andhra Pradesh). Low and non flowering clones were selected from these orchards and flower induction treatments and flower inducing cultural operations were administered. Among 36 treatments, the preliminary observations at Janganamatti CSO, Dharwad, CCC @ 500 ppm foliar, PBZ @ 3g/tree foliar, SA @ 200 ppm, ALAR @ 250 ppm foliar and vernalization for three months have shown encouraging results in terms of number of flowering panicles and fruit set. Whereas, in Achuthapuram CSO, Rajamundry the flower bud initiation has started and observation on fruit set has to be taken.
20	Studies on age related durability of Plantation-grown timbers (April, 2005, 2005-2012)	H.C. Nagaveni	Wood Products (Value Addition & Utilization)	Procurement of timber and conversion of 5, 10, 15 and 20 year old plantation of selected species from high and low rainfall areas is completed. Prepared test samples from all the 8 selected timbers for decay and termite test as per IS standards. Treatment of all test samples is completed. Maintenance of wood decay fungi in virulent condition is being done by repeated sub-culturing wood decay fungi viz. *Trametes versicolor, T. hirsutus* (white rot fungi) and *Tyromyces palustris* and *Polyporus meliae* (Brown rot fungi) and

				conducted durability test against decay fungi as per IS 4873- 1968 for *Acacia auriculiformis, A. mangium, Grevillea robusta, Eucalyptus terreticornis, Melia dubia*, and *Ailanthus excelsa* from low rain fall area. Conducted the durability test against termites as per IS 4833-1968 for all selected 8 species by exposing the test samples in Nallal test yard. Observation for their performance is being taken periodically.
21	Studies on chemical modification of wood and its Thermoplasticization (April, 2009, 2009-2012)	Dr. K.K. Pandey	Wood Product (Value Addition & Utilization)	Chemical modification of wood (Rubberwood, Silver oak) using octanoyl and lauoryl chloride has been carried out. Reaction parameters being optimized. Basic experiments on chemical modification of wood using alkylene epoxides viz., propylene oxode and butylene oxide carried out. Esterified/etherified wood was characterized using FTIR and NMR spectroscopy.
22	Studies on Co-polymerization Kinetics Using Filler Supported Catalyst System. (April, 2009, 2009-2012)	Dr. Ajay Karmarkar	Wood Products (Wood and other Lignocellulosic Composites)	Glass reactor and valves procured. Experimental setup has been laid. Experiments on filler activation completed. Preliminary experiments on ethylene polymerization completed.
23	Studies on genetic fidelity of the micropropagated Plants of bamboo-*Bambusa bambos* and *Dendrocalamus stocksi*i (2007, 2007-2010)	Dr. Syam Viswanath	Genetic Improvement (Biotechnology)	The present study was designed to evaluate the genetic stability of tissue culture raised plantlets, which are subjected to genetic and epigenetic variations due to exposure to high multiplication rate, chemicals and number of passage. Testing of true to type character and virus free testing of tissue culture raised plants is mandatory for commercial production. The present studies were carried out to standardize the method of testing of genetic stability of *D. stocksii* & *B. bambos* using DNA marker studies. Initially, micropropagation studies were carried out for first year using axillary mode of regeneration. *In vitro* establishment of axillary shoot cultures of *D. stocksii* & *B. bambos* was done in MS + additives (add) +BAP 2.0 mg/l + NAA 0.25 mg/l & MS + additives +TDZ 0.25 mg/l + NAA 0.25 mg/l respectively in liquid medium. Various experiments carried out for multiple shoot induction using varying cytokinins concentration, explant size, for which *D. stocksii*

				in MS + add +TDZ 0.25 mg/l + NAA 0.25 mg/l produced maximum shoot number with 2.0-3.0 mm dia nodal size and in case of B. bambos MS + add +BAP 2.0 mg/l + NAA 0.25 mg/l produced maximum shoots with 2.5 mm nodal dia. Further, the initiated plants were multiplied on MS medium with BAP 1.0 mg/l in liquid and solid medium. The above raised cultures were rooted in *in vitro* conditions in MS + add + NAA 1.0 mg/l for D. stocksii and NAA 2.0 mg/l for B. bambos, and these plants were further acclimatized in mist chamber conditions. In the second phase, the above shoots were used for induction of callus in MS + add + 2,4 D 1.0 mg/l for *D. stocksii* and 2,4,5 T for *B. bambos*. The callus regenerated was utilized for somatic embryogenesis in the second year. Various experiments carried out for induction of somatic embryo and the best results were observed in MS + HF medium followed by MS/2 + add + BAP 2.0 mg/l + NAA 1.0 mg/l for somatic embryo maturation and germination in both the species. Somatic embryo plantlets were produced every six monthly interval for genetic stability studies. In third year, DNA marker studies were undertaken for which DNA extraction procedure was standardized using Doyel and Doyel CTAB method. Further the DNA was quantified using NanoDrop UV spectrophotometer. UPA & UBC primers series were screened for RAPD & ISSR marker studies. Experiments such as DNA, primer, dNTP's, $MgCl_2$ concentration and PCR cycles were standardized for optimum amplification of DNA. The amplified DNA was run on 2% agarose with ethidium bromide for separation of DNA bands. Monomorphic banding obtained showed no genetic variations from 12^{th} month regeneration and 24^{th} month regeneration. Further studies are being carried out to reconfirmation of 24^{th} month. Further, the tissue culture raised plants at nursery were tested for any morphological variations such as internodal length, tiller number and shoot height and variegated leaves. All the parameters documented were showed no morphological variations from axillary and somatic embryo mode of regeneration.

24	Studies on scale up of protocols for *in vitro* propagation, hardening, production of cloned Plants and establishment of field trials of Sandalwood (*Santalum album* L) (2008-2011)	Dr. Geera Joshi	Genetic Improvement (Vegetative Propagation)	New shoot initiation cultures has been established from selected clones and multiplied in about 800 culture bottles. Plants were produced through axillary shoot proliferation, adventitious shoot induction and somatic embryogenesis *in vitro*. *Ex vitro* rooting was carried out from the *in vitro* shoots. During hardening of tissue culture raised plant high mortality was recorded, recovery was less than 15%. Experiments for hardening are in progress.
25	Studies on seed variability, propagation and ex-situ conservation of *Canarium strictum* Roxb. and *Hydnocarpus pentandra* (Buch. – Ham.) Oken - threatened medicinal trees (April, 2008, 2008-2011)	Dr. Geeta Joshi	Forest productivity (Silviculture)	• Survey was conducted in and around Agumbe and Ponnampet for identification of populations of *Canarium strictum* and *Hydnocarpus pentendra* and Karwar and adjoining area for survey of Hydnocarpus population. Both the species are sparsely distributed and very few trees were fruiting. Maturation of fruit is staggered; fruits collection was initiated for *Canarium strictum* and *H. pentendra* in July from Agumbe and in August from Ponnampet. Studies on variability in fruits and seeds and on germination behaviour has been carried out. Experiment on standardization of germination media and pretreatment for germination were carried out. Visited Ponnampet, surveyed the population of *Canarium strictum* and *Hydnocarpus pentandra* in Ponnampet and adjoining areas, identified the tree populations for both the species. In case of *Canarium strictum* 12 trees were marked and fruiting status of each tree was recorded. Seeds fallen below the trees were collected and sown in nursery to study germination behaviour. Plots were laid and seedlings were identified and marked to study natural regeneration Seeds of *Canarium strictum* has been stored. As the seeds of *Hydnocarpus pentendra* were found to loose viability with drying so experiment has been laid on desiccation sensitivity .Experiment has been laid for standardization of potting media and container size and type. Stored seeds of *Canarium strictum* were tested for viability.
26	Studies on the insect pest disease problems of sandal under cultivation and their management(April, 2008, 2008-2011)	Raja Muthukrishnan	Forest Protection (Insect pests, Diseases & Control)	All the 6 objectives are being monitored and under progress. The damage potential of new and old insect pests on sandal and its host plants in the different models have been studied and documented. New pests and parasites have been to experts for identification

27	Studies on the natural resistance of imported woods against insects and decay fungi in Indian environment. (April, 2007, 2007-2011)	Dr. R. Sundara raj	Wood Product (Value Addition & Utilization)	Survey conducted in Bangalore Mangalore and Cochin timberyards. 20 different types of imported timbers procured and they were authentically identified. All the 20 species of woods were seasoned, converted to required size and labeled. Field experiments were laid at Trivandrum, Nallal, Visakapatanam, Hydrabad, Jodhpur, Jabalpur and Dehra dun. Up to 24 months observations are taken in all the places except Dehra dun where upto 12 months observation are taken in terrestrial condition. Upto 24 months observations are taken in marine condition. 10 timber species are exposed to fungal cultures. Strength properties of wood exposed for one year are assessed.
28	Studies on the permeability of selected imported timbers marketed in Karnataka (April, 2008, 2008-2011)	Sh. P. Narayan appa	Wood Product (Value Addition & Utilization)	Five selected imported timbers viz., Pyinkado-*Xylia dolabriformis*, Marabau-*Instia bijuga*, Red meranti-*Shorea spp.,* Balau-*Shorea spp.* and Gurjan-*Dipterocarpus spp* were procured and samples were prepared and kept for conditioning over saturated salt solutions. About 350 samples (size: 22mm x22mm x22mm) obtained from pykindo, red meranti and merabau were measured for flow rates. 250 test stakes of all five species (size 19mm x19mm x450 mm) were installed in test yard at Nallal forest area near Hoskote. Periodical observation is underway to evaluate the service life under local conditions.
29	Study on microwave assisted extraction and transesterification of *Pongamia pinnata* (L.) seed oil (April, 2009, 2009-2012)	Sh. Ritesh Kumar. D. Ram	NWFPs (Biofuel and Bioenergy)	The required equipments for different analysis were procured. The experiments on microwave assisted oil extraction of pongamia seeds was carried out. The reaction parameters were optimised for maximum yield. The transesterification by conventional heating using NaOH as catalyst has been carried out. Microwave assisted transterification is under progress.
30	Study on morphology and properties of natural fiber filled polypropylene composites (NFPPC) (April, 2008, 2008-2011)	Dr. Pankaj Kumar Aggarw al	Wood Products (Wood and other lignocellulosic composites)	Bio-fiber- PP composites using bamboo, jute, rubberwod, as bio-fiber and Polypropylene have been prepared. Rheological properties of jte, bamboo and rubber wood with PP composites have been evaluated. Mechanical properties of these composites have been studied. It is observed that jute-Pp composites have the better properties than bamboo and rubber wood composites. Moisture absorption studies are under progress.
31	Synthesis of	Sh. S.H.	NWFP	Collected leaf and bark of *Cleistanthus collinus*

	organometalic complex replacing arsenic component in CCA preservative by organic ligand (Plant extractive) and evaluate as semi bio preservative. (April, 2008, 2008-2011)	Jain	(Chemistry of NWFP, Value Addition & Utilization)	& *Prosopis juliflora.* Processed the plant material and extracted with different polar solvents and quantified. Extracts have been tested for its anti fungal, anti termite and insect activity. Solubility test has been carried out for pure extract. Prepared organo-metallic complex by reacting with Cu++ and Cr+++ ions. Different concentration of plant extract was subjected to *invitro studies* for testing the antifungal activity using poison food technique against wood decay fungi. Prepared complex has been subjected to durability test of non durable timber against termite's, borers and wood rot fungus as per Indian standard IS 401 and IS 4873.
32	Variability studies in *Hardwickia binata* – a multipurpose tree species in Karnataka, Andhra Pradesh and Tamil Nadu (April, 2008, 2008- 2013)	Sh. A.N. Arun Kumar	Genetic Improvement (Tree Improvement)	Survey has been carried out in states of Karnataka, Andhra Pradesh and Tamil Nadu. Core samples have been collected from the populations identified and wood parameters are being recorded. Seed collected from different populations are studied for seed physical parameters and seedlings are raised. However, considerable mortality has been observed.