PROJECTS COMPLETED DURING THE YEAR 2006-2007 (Externally Aided)

back

Project 1: (Phase-I) Evaluation of breeding efficiency and genetic gain in seedling seed orchards of Eucalyptus and Casuarina in South India (Funding Agency: International Foundation for Science, Sweden) [IFGTB/EF-RP4/2002-2005]

(Phase-II) Estimation of effective population size in progeny of first generation seedling seed orchards of Eucalyptus and Casuarina

Findings: Five seedling seed orchards of Eucalyptus and four orchards of Casuarina established according to breeding programmes in South India were investigated for breeding efficiency and genetic gain before resorting to large-scale seed supply. In Eucalyptus, two unpedigreed seedling seed orchards each of Eucalyptus camaldulensis and E. tereticornis and a provenance - progeny trial of E. tereticornis established in different locations in South India were studied for tree growth and seed orchard functions at age four.

Two provenance trials each of Casuarina equisetifolia and Casuarina junghuhniana were converted to seedling seed orchards after early evaluation and thinning to remove inferior provenances and trees within provenances were included in the study. One of the provenance trials of C. equisetifolia located at Sadivayal in Tamil Nadu was established to maintain pedigree information, as provenance progeny trial.

Two genetic gain trials were established for each genus in different locations to test the performance of seeds collected from the seedling seed orchards. A commercially planted Eucalyptus clone was also used as a control in one site. The trials were evaluated for first year growth. Survival of this seedlot was also low in both test sites.

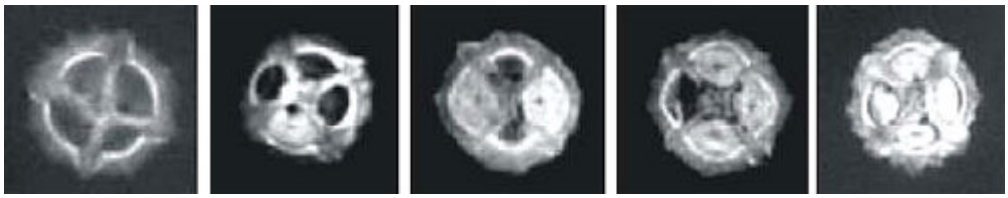
Project 2: Estimation of gene diversity and drift pattern in natural stands and plantations of forest tree species in South India (Funding Agency: SIDA, Sweden) [IFGTB/EF-RP-6/2003-2006]

Findings: Studies aimed at monitoring variation in fertility among trees and clones for different forest species viz. teak, sandal, neem and tamarind situated in Southern India were observed for fertility variations. Fertility variation was generally higher in a natural stand compared to the Seed Production Areas (SPA) in teak even though majority of the trees were fertile in two adjacent years. In teak SPAs there was a positive year to year correlation in fertility parameters like proportion of fertile trees, flowers and fruits produced per tree. The female fertility variation and the fruit set percentage in two successive years were negatively correlated implying that there is a tendency for alternate bearing in the trees in a population.

Selection for tree DBH was observed to reduce the fertility variation as DBH was positively correlated to reproductive output in teak. Fertility variation was found to be low in ten years old Sandal plantations compared to those of Neem and Tamarind.

Project 3: Evaluation of reproductive success in seed orchards of teak in India (Funding Agency: International Foundation for Science, Sweden) [IFGTB/EF-RP-8/2003-2006]

Findings: Fertility variation was studied in two 30 years old Clonal Seed Orchards (CSO) of teak in four consecutive years (2003-2006). CSO I is located in Topslip (Tamil Nadu State) with 15 clones and CSO II in Walayar (Kerala State) with 20 clones. Thirteen clones are common to both the orchards. Flowering was low in all years in both the orchards. Clones differed significantly in reproductive output, a few contributing a major share of flowers and fruits while some did not flower in all four years. Broad sense heritability was moderate for flower and fruit production per tree. A strong positive correlation was found between flower and fruit production assessed in successive years. Diameter showed positive correlation with reproductive traits but clear bole height and height to clear bole ratio were negatively correlated with flowering and fruiting. Fertility variation and group coancestry were higher in poor flowering years than good years as indicated by sibling coefficient values. Between the two orchards CSO II showed about 3 times more fertility variation and group coancestry than CSO I in poor flowering years.



Insects visiting teak inflorescence were studied in two clonal seed orchards of teak. Bees, flies and wasps were among the most frequently observed insects in teak Pollen load and a visitation rate of each species differed significantly. Honeybees were found to be the key pollinators of teak. Nectarivorous birds like sunbirds were also found to effect pollination in one of the orchards. Fruit dimensions and weight correlated positively with seed filling. But germination and seed filling were not strongly correlated. Germination of Walayar orchard seeds was poor compared to Nilambur SPA which showed significant germination. These findings indicate that reproductive success in teak seed orchards is limited by several factors. Genetic and silvicultural interventions are essential to promote flowering and fruiting in teak orchards.

Project 4: Full sib production in selected high yielding tamarind clones of Tamil Nadu (Funding Agency: Tamil Nadu Forest Department) [IFGTB/ EF-RP-14/2003-2006]

Findings: Tamil Nadu Forest Department addressed a specific need of control pollinating red and other high yielding tamarind varieties for full sib production. Accordingly full sib families were produced by control pollinating red tamarind clones TNRJ-402, TNRJ-403 and TNRN-401 as pollen parents with other high yielding clones. About six full sib families have been transferred to a field trial in State Forest Research Institute, Kolapakkam. About 40 families have been developed as a trial in Forest Campus, Coimbatore for further experimentation.

Project 5: Characterization of tropical and temperate forest seeds with reference to seed storage behavior (Funding Agency: SIDA, Sweden) [IFGTB/ EF-RP-10/2003-2006]

Findings: Seed storage behaviour of Azadirachta indica, Persea macrantha, Bambusa arundinacea, Artocarpus heterophyllus, Myristica dactyloides, Strychnos

nux-vomica, Vateria indica, Hopea parviflora, Embelia ribes, Garcinea gumigutta, Myristica fragrance, Pithcellobium dulce, Hydnocarpus alpine and Smilax zeylanica was studied. The germination and storage methods were developed for these species. The seeds were characterized for physical and biochemical traits. The relationship between the seed characters and the ecological characters was studied.

Project 6: Evaluation of superior planting stock of Acacia mangium in agroforestry systems at different eco-climatic zones of Kerala and Tamil Nadu [IFGTB/EFRP11/ 2003-2006]

Findings: Experimental plots of 2 ha in Tamil Nadu and 2 acres in Kerala have been laid out with seedlings raised using the seeds collected from identified superior trees of Acacia mangium (Mangium) in Panampalli, Kerala as well as from Theni, Tamil Nadu along with ramets of superior trees of Mangium were procured from Mysore Paper Mills. Growth data was recorded during the first year. Studies on intercropping of fodder sorghum under one-year-old Mangium based agroforestry system revealed that on per plant basis there was no difference in height growth as well as dry matter production of fodder sorghum under open field and under mangium based agroforestry system. However, yield of fodder sorghum was slightly higher under open field than under mangium owing to the difference in the total number of plants under open and mangium plot. Among different agricultural crops intercropped with mangium, blackgram, horsegram, fodder sorghum and beans were found to be compatible and onion was observed to be less compatible. Since the biomass and productivity studies of the tree component and economics of cultivation can be estimated only at half the rotation of Acacia mangium, i.e., 3 years; extension has been sought from the funding agency.

Project 7: Establishment of agroforestry plantations with medicinal plants and trees for conservation, propagation and utilization [IFGTB/EF-RP-16/2003-2006]

Findings: Established about 4 ha of amla based agroforestry models in 10 farmers' fields with medicinal plants (Withania somnifera) and other agricultural crops like red gram, black gram, horse gram, tomato etc. In the amla based agroforestry models, economics of cultivation for various agricultural crops has been worked out and black gram model gives higher economic return to the farmers.

Withania was intercropped under different agroforestry systems and the results showed amla-based agroforestry system registered maximum tuber yield. Effect of different spacing of Withania was assessed and the results showed variation in tuber yield under different spacing. Further, in the established amla based agroforestry plots imposed various treatments viz. organic manures like FYM, vermicompost and mulching treatments and assessed the growth performance.

Also, established 2 ha of pungam and neem based agroforestry plots with quality planting material of identified superior parent trees. The effect of pruning on agricultural crop yield under neem based agroforestry has been carried out in five year old neem plot which showed that 100 per cent pruning increased the annual crop yield by 40% compared to shade.

Project 8: Development of integrated pest management package for forest

nursery insect pests of some economically important tree species (Funding agency: Department of Science and Technology, Government of India) [IFGTB/EF/RP13/2003- 2006]

Findings: Identified and standardized integrated pest management measures to develop management package for forest nursery insect pests of some economically important tree species. First report in India about the incidence of an invasive insect pest Leptocybe invasa Fisher and La Salle (Hymenoptera: Eulophidae) in Eucalyptus plantations and nurseries in southern India was made besides assessing the nature and extent of damage in Eucalyptus clones in plantations.

Project 9: Exploitation of Mycorrhizal systems in the Nilgiri biosphere reserve areas in India [IFGT/EF-RP-15/2004-2007]

Findings: Different ECM and AM fungi collected from different forest ecosystems were identified to genus and species level. Species richness and species dominance of AM fungi in association with the rhizosphere of different host plants was also assessed and recorded. Mass production of different ECM fungi was done for screening experiments in glass house and nursery.

Mass culturing of dominant AM fungi with different host cover crops like Bajra, Maize, Ragi, Sorghum, Wheat and other leguminous plants in a glass house condition revealed that Maize was the most suitable host cover crop.

Screened the efficacy of both ECM and AM fungi on growth enhancement of shola and commercially important plantation species such as Acacia mearnsii, A. melanoxylon, Eucalyptus globulus, E. grandis, E. tereticornis, Cupressus macrocarpa,Casuarina equisetifolia and C. junghuhniana in nursery condition and the experiment revealed that the seedlings inoculated with mycorrhizal fungi had better growth performance over control.