Externally Aided Project (EAP)

Completed EAP 2012-13

Project Sl. No.	Name of Project	PI	Thrust Area	Research Findings
1	Improving the accessibility and affordability of improved seeds from breeding programs to benefit large numbers of smallholder tree farms and rural communities in Tamil Nadu and Puducherry, India. (Aus AID, Australia)	Dr. A. Nicodemus	Genetic Improvement and Tree Improvement	This project was aimed at making available of high quality planting stock in the form of orchard-produced seeds to resource-poor farmers through a community-based seed production programme. Efforts were taken to disseminate the benefits of breeding undertaken in IFGTB to the users particularly farmers with the cooperation of State Forest Departments. A study visit to Australia, Vietnam and Thailand was undertaken 3 officials of IFGTB and one from TNFD. Two visits were made by Scientists from CSIRO Plant Industry to review seed production systems and to conduct training workshops for staff of forest department and industries and farmers. Established three community orchards in Puducherry, Marakkanam and Madurai (Total 4 ha) by involving farmers, forest department staff and traditional nursery operators. An action plant seed production and dissemination has been prepared.

2	Conducting Awareness Training Workshops on The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). (MoEF –VI)	Dr. Maheshwar Hegde	Forest Genetic Resource Management	Series of training to CITES implementation agencies like Forest Department, police, Directorate of Revenue Intelligence, Customs and Excise were conducted on all India basis and booklets and brochures on all the CITES listed species were prepared.
3.	Bioproduction of Secondary Metabolites from *Aegle marmelos* (National Medicinal Plants Board, Govt. of India)	Dr. Rekha R Warrier	FGR Management	Phytochemical screening of the leaves and roots of the species was carried out Crude extracts of 3 different tissues of *Aegle marmelos* (leaves, stem bark and roots) were prepared in 5 different solvents *viz*., chloroform, methanol, dichloromethane, petroleum ether & water and subjected to HPTLC. The distribution of alkaloids, flavanoids, terpenoids and coumarins was studied through uv fluorescence, uv absorption and white light transmittance. Eight different media combinations were tested with five growth regulator combinations in five replicates. Shoot and root explants responded well with the initiation period ranging from one to three weeks. 6.0 mg / L 2, 4 D was found to be the optimal growth regulator concentration. WPM medium facilitated better callus induction. Calli produced had a weight ranging from 85-100 mg on fresh weight basis. Variations in salt mixtures are being attempted to

				increase the callus production. Metabolite profile of the roots, stem, leaves, and primary branches of the wild plants was developed. Compact callus aggregates for callus obtained from different explants was optimized for increased growth in suspension cultures. Analysis of secondary metabolites in suspension cultures was carried out. Plant and human pathogens were tested with extracts from calli obtained using different explants to assay the efficacy of the active principles in the calli. Active principles present in the calli showed inhibitory effects on the pathogens.
4	Web- Enabled Database and Analysis of Gene Sequences Implicated in Abiotic Stress Tolerance for Screening Gene Homologues in Salt Tolerant Tree Species. (DBT)	Dr. N.V. Mathish	Applied Genomic Research and Genetic engineering for desirable traits	• A web enabled bioinformatics database "In Silico Gene Bank for Adaptation to Abiotic Stresses" were developed and is hosted at http://igbaas-ifgtb.icfre.gov.in • Salt tolerant (TNIPT-4, TNKBM-407,) and salt susceptible (PYN, TNPV2,) clones contrasting for sodium accumulation during salt stress were screened from 85 clones that were tested. In tolerant clones, roots were shown to be critical in reducing sodium transport to the shoots. A progressive increase in proline content with the increasing NaCl concentration upto 450 mM was observed after which there was a decline. Differential expression

				analyses of sodium transporter genes were initiated using Real-time PCR for quantifying gene expression in the identified salt tolerant and susceptible clones of Casuarina. • The sodium-hydrogen antiporter genes (NHX) from *Casuarina equisetifolia* (330 bp), *Eucalyptus camaldulensis* (494 bp), *E. tereticornis* (614 bp), *Pongamia pinnata* (385 bp), *Acacia nilotica* (348 bp), *Prosopis juliflora* (371 bp), *Kandelia candel* (725 bp), *Bruguiera gymnorhiza*, (355 bp), *B. cylindrica (*445 bp), *B. sexangula* (351 bp), HKT1 gene from *E.tereticornis* (638 bp), *P. juliflora* (220 bp), AKT1 genes from *C. equisetifolia* (236 bp), *E. camaldulensis* (280 bp), *P. juliflora* (300 bp), *B. sexangula* (325 bp), *B. cylindrica* (230 bp), *K. candel* (310 bp), and *A. nilotica* (361 bp), and the Actin genes from *B. cylindrica* (293 bp), *B. gymnorhiza* (265 bp), *B. sexangula* (255 bp), *K. candel* (234 bp), *A.nilotica* (201 bp), *P. pinnata* (213 bp), *E. camaldulensis* (311 bp) and *C. equisetifolia* (204 bp) were sequenced and published with accession Numbers at the GenBank Database of the National Centre for Biotechnology Information (NCBI), National Library of Medicine, National Institute of Health, USA.

5	Identification of superior growth promoting strains of *Frankia* in *Casuarina equisetifolia* and *C. junghuhniana* (DBT)	Dr. A. Karthikeyan	Mycorrhiza and other beneficial microbes	Casuarinas are being cultivated in Pondicherry and Tamilnadu day by day due to its popularization as fuel wood species, nitrogen fixing capacity and potential for adaptation to diversified soil and climatic conditions. *Casuarina equisetifolia* and *Casuarinas junghuhniana* seedlings were raised under nursery level and also vegetatively propagated rooted stem cuttings using inert material (vermiculate) of *C.equisetifolia* and *C.junghuhniana*. The roots of *C.equisetifolia* and *C. junghuhniana* produce root nodules were the bacteria fixes atmospheric N_2 which is essential nutrient for all plant metabolites activities.10 different strains of *Frankia* isolated from different places of *C.equisetifolia* and *C.junghuhniana* plantations. The strains were characterized and identified as *Frankia* through morphological. *Frankia* colonies are differentiated in to 3 different cell types' vise (1) hyphae (2) spores and (3) vesicles. *Frankia* strains cultured in artificial liquid P media and applied in this study. Nitrogenase activity was done using Acetylene reduction Assay (GC) for identified superior strains of *Frankia*. The superior strains identified as Cjcbe1, CeAN1, CePy2, and CeCo2. The Frankia strains were inoculated at the rate of 5ml during the

				root initiation stage of above casuarina spp. as the result in the development of root nodules of *C.equisetifolia* and *C.junghuhniana* after 25 days. The rooted stem cuttings of *C.equisetifolia* and *C.junghuhniana* also showed increase in root shoot biomass and .tissue N_2 content due to the inoculation of *Frankia*. These clones were planted in the field and growth assessments were taken. The inoculation of *Frankia* resulted increased growth than non inoculated trees. Soil nutrients were increased after planted *Frankia* inoculated *C.equisetifolia* and *C. junghuhniana* rooted stem cuttings. A product called N fixer was developed and released for the benefit of Casuarina growers.