Continued ICFRE funded research projects, 2010-11 RFRI

Sl. No.	Projects	Name of PI	Thrust Area	Current Status
1	Macro and micro propagation of selected germplasm (clones) of *Dipterocarpus retusus* Bl. Syn *D. macrocarpus* **(3 years, April, 2007 + one year extension till 31.03.2011)** **Total Duration=4 Yr.**	Dr. (Mrs.) Papori Sharma, R.O	Genetic Improvement (Vegetative propagation)	**Macropropagation** • 18 genotypes were established through rooting of shoot cuttings out of total 23 genotypes. • Plants are ready for establishment of a colnal hedge garden. **Micropropagation** • Prominent gobular, heart shaped embryo has been observed from leaf and petiole callus. • Histology of cell culture identified distinct dicotyledonous embryo. Both the findings of **micro** and **macro propagation are** a pioneer research for the species. Project was extended for 1 yr due to change in objective as approved by 11th RAG and 11th RPC till 31.03.2011.
2.	Improvement of agar/ agarwood production in *Aquilaria malaccensis* Sub-Project IV: Evaluation of insecticidal properties of some plant extract against *Hertia*	Dr (Mrs) Nizara D Barthakur	Forest protection (Insect pest, disease and control.)	• Population dynamics studies reveals the highest population of *H.Vitessoides* occurs during the month of May-June.The population trends will be correlated with abiotic factors (temperature, relative humidity, rain.) • Five botanicals with three conc.(2.5, % 5% and 10 %) of benzene, hexane, petroleum ether , acetone , methanol and water extract were prepared and tested against larvae of *H. vitessoides* with three replications. • Among the five botanicals *A. Indica* showed highest antifeedant (95%) in

	vitessoides Moore (Lep: Pyralidae), a major pest of *Aquilaria malaccensis* Lamk. **(3 years, April 2007+ one year extension till 31.03.2011)** **Total Duration=4 Year**			Hexane extract followed by (90 %) Benzene extract of *A. calamus* and Hexane extract (80.2 %) of *M. azedirach.* Further investigation was required so one year extension was approved by last 11th RPC
3	Development of an efficient technique for *in vitro* clonal propagation of superior clones of *B. tulda* **(3 years, April, 2007 + six months extension till 30.09.210)**	Satyam Bordoloi, RO	Genetic Improvement (Vegetative Propagation)	**Surface Sterilization:** Sterilization technique has been standardized using $HgCl_2$ as surface sterilizing agent. In addition to normal sterilization protocols, use of antibiotics was found suitable to reduce endogenous contamination. **Shoot multiplication:** Modified MS media with cytokinins and amino acid as a source of reduced nitrogen have been found suitable for shoot multiplication.The multiple shoots thus produced were individually separated and was separately inoculated in media for getting enough multiple shoots. **Root induction:** Root induction was found to be very low, about 10%. **Hardening of rooted plants:** Successfully hardened the plants in Green house.

4	Clonal propagation of superior *Dendrocalamus hamiltoni*i Nees germplasm through *in vitro* techniques **(3 years, April-2009)**	Sri Satyam Bordoloi, RO	Genetic improvement (Vegetative Propagation)	**Surface Sterilization:** Sterilization technique has been standardized using $HgCl_2$ as surface sterilizing agent. In addition to normal sterilization protocols, use of antibiotics was found suitable to reduce endogenous contamination. **Shoot multiplication:** Modified MS media with cytokinins and amino acid as a source of reducednitrogen have been found suitable for shoot multiplication. The multiple shoots thus produced were individually separated and was separately inoculated in media for getting enough multiple shoots. Low percentage of bud breaking was observed in single nodded explants. However explants with two nodes resulted in higher bud breaking
5	Genetic Evaluation of Bamboo germplasm in the RFRI Germplasm bank **(2 years, April, 2009)**	Dr. Tara Chand, Scientist-B	Genetic improvement (Conservation of Forest Genetic Resources)	• Standardization of DNA extraction using CTAB Buffer with modification • DNA extraction completed for 70 accessions • Purity of DNA was tested using spectrophotometer • With available primers PCR protocol was optimized for *B. balcoa* (OPA- 4)
6	Rehabilitation of degraded Jhum land through potential bamboo species with reference to carbon sequestration and	Dr. Indrani P. Bora, R.O	Ecosystem conservation & management (Climate change)	• Experimental plot in was prepared in the selected site of Johnar Sinar village and Jilangsu village of Karbi Anglong District of Assam. • Selected bamboo sp. (*Bambusa balcooa, Bambusa nutans, and Oxytenanthera parviflora)* were planted following standard design in two different spacing trial(7m x 7m and 5m x5m).

	livelihood development. **(5 Years, 2009)**			• Survival percentage and progressive growth data of bamboo seedlings were recorded. • Composite soil samples were collected from each site at regular intervals and analysis will be carried out for organic carbon and NPK following standard method. **Methodological development:** During the course of estimation of Organic carbon in plant material the methodology of Snyder and Trofymow (1984) is trying to modified for make it more simple and suitable. **Extension:** Meetings/demonstration will be conducted to generate awareness about utilization of full potential of bamboo in terms of environmental security and to galvanize the rural economy
7	Ecological assessment of medicinal plants in Nambor Reserve Forest and their socio-economic impact on fringe villagers. **(3 years, April, 2008)**	Alok Yadav, Scientist-B	Ecosystem conservation & management (Biodiversity)	• Collected literature through reputed journals and different libraries • Soil sample from different agro-climatic zone of Assam under progress (Till now samples have been collected from Satra, Melang, Kamrup, Naogaon, Silchar) • Physical properties of samples were analyzed.
8	Assessment of phytodiversity dynamics for conservation in	Dr Ranjeet Kumar Scientist	Ecosystem Conservation and	• Collection of phytosociological data was done from four sites. • Collected soil samples from different sites and analysis of soil samples is

	Jeypore Reserve Forest **(3 years, April 2009)**	'C'	Management (Biodiversity)	going on in laboratory. • A sample plot was established in study area. • Identification of plant specimen is going on with the help of BSI, Shillong.
9	Investigations on Ecology of Mimosa invasion in Kaziranga National Park, Assam **(3 years, April 2009)**	Coordinator Sri N. K Vasu, Director RFRI	Forest Protection (Weeds and Invasive species)	• Classification of course resolution satellite images (LISS 3) was completed. • Questionnaire based appraisal survey for presence/absence of Mimosa in each range was also carried out. • GPS based reconnaissance survey of the study area was carried out for collection of geo-coordinates of Mimosa invaded patches. • A'Potential invasion map' was prepared based on GPS information and the preliminary classified map. • Vector layers like drainage, roads, camp locations, compartments and grids were integrated with Potential invasion map in GIS environment and base map was prepared. • Higher resolution satellite images (LISS 4, PAN) was procured from National Remote Sensing Centre, Hyderabad.Classification is in progress. • Phyto-sociological study has been carried out • Total 35 species were collected for preparation of herbarium. All the species were identified up to genus level; • Data recording on phenological events of Mimosa was completed and phenograms were prepared.

				• Seed germination trials under different physical factor in progress (Water soaked seed and seed burial experiment in different month intervals etc.), Seed germination trials for viability and vigour studies laid out in nursery. Biomass studies under different shade % under progress. Field trials for seedling emergence from soil seed bank laid out and maintained.
10	A study on the biodiversity of plant resources of patch vegetation around rural homestead in Jorhat district, Assam and its role in socio-economy of the villagers. **(3 years, April 2008)**	Dr Dandeswar Dutta, R.O	Ecosystem conservation & Management (Biodiversity)	• Socio-economic and ecological survey at the selected sites completed. • Documentation, identification and valuation of the of different species available in the sites are recorded. • A total of about 230 plant species identified which includes timber, medicinal, fodder, wild edible, silkworm feeder and minor forset prducts. • Awareness programs of the project are being done at two places**.** • Two papers are presented at National seminars held at NN saikia College, Titabar , Jorhat and Namrup College, Namrup
11	Studies on phyto-proteins from selected plant/s of Northeast region for the production of Protein Concentrates with greater food value **(3 years, April 2009)**	Dr. Vikas Rana, Scientist-C	Non-wood Forest Products (Chemistry of NWFPs, Value Addition and Utilization)	• As the expected output of the project is to explore new plant/s for the production of LPC and evaluation of their food values, eight different plant species, viz. *Sambucus javanica* (Caprifoliaceae), *Antidesma bunius* (Euphorbiaceae), *Alocasia macrorhiza* (Araceae), *Cissus adnata* (Vitaceae), *Cissus repens* (Vitaceae), *Enhydra fluctuans* (Asteraceae), *Mimosa invasia* (Fabaceae), *Diplazium esculantum* (Athyriaceae) from Assam has been selected for Nitrogen estimation. • N/protein content in leaves was determined by using kjeldhal method. The nitrogen content has been determined in the range of 1.73-3.62 in these plants leaf.

				• Leaf protein concentrate has been prepared from *Diplazium esculantum* and *Alocasia macrorhiza*. • Prepared LPC has been examined for their nutritive value (Mositure, Ash, Crude Fiber, Crude Protein, Ether extract, N free extract).
12	Carbon sink and fertility status relation of soil under different land use system of some States of NE India **(3 years, April 2009)**	Dr. P K Das, Scientist - B	Ecosystem Conservation & Management (Climate Change)	• 225 nos. out of 300 soil sample collected from forest, tea, coffee, cardamom, rubber plantation and jhum land areas. • Soil sample collected from the plantation areas under different land uses of Assam (12 districts), Sikkim (2 districts), Meghalaya (2 districts), Nagaland (2 districts) and Tripura (1 district). • Soil samples processed and stored for lab analysis. • Analyzed 225 nos. of soil samples for pH, org. C, bulk density, av. P, av. K and texture (sand, silt & clay %). ➢ Survey & soil sample collection - 80% (225 nos.) ➢ Procurement of instrument, chemical & glassware etc.- 90% ➢ Lab analysis of soil sample - 80% (225 nos.)
13	Utilization of Vesicular Arbuscular Mycorrhizal diversity for the quality stock production of some useful forest plant/s species of Nongkhyllem Reserve	Dr. Vipin Parkash Scientist-C	Forest Protection (Mycorrhizae, rhizobia and other useful microbes)	• Umtasor range consisted of five compartments (i.e. Umsaw, Khakuoi, Benpoint, Khirdemkulai, Satroh- Khadnio and all these compartments were visited for sample collection. At Nongpoh range, only three compartment i.e. 1A (LC), Tower point and Morok was surveyed for the collection. • Data of physical analysis as well as qualitative and quantitative analysis of endomycorrhiza were collected and documented. • Ethnobotanical data of collected plant specimen were also collected from the

	Forest, Nongpoh, Meghalaya, India **(3 years, April 2009)**			local people of Nongpoh • A total 110 samples of rhizospheric soil from different plant species of two ranges namely Umtasor and Nongpoh under Nongkhyllem Reserve Forest were collected. • The two dominant & efficient strains (*Glomus* sp. and *Gigaspora* sp.) which were prevalent in the forest soil were isolated and are processed for inoculum production and mass multiplication trials in lab. • The seeds of two selected plant species from this reserve forest are being collected and are under further inoculation experiment with VAM fungi
14	Diversity of mycorrhizal associations with *Dipterocarpus* and *Shorea* species in Assam **(3 years, April 2009)**	Dr Ashwani Tapwal, Scientist – C	Forest Protection (Mycorrhizae, rhizobia and other useful microbes)	• Seven field visit were carried out for survey and sample collection from the following sites: ➢ Jeypore, Digboi and Margerita ➢ Amsoi, Dhupdhara and Kulsi • Composite samples of rhizosphere soil, Composite samples of ectomycorrhizal roots and ECM fruit bodies were collected from the site visited. • The geo-coordinate (altitude and latitude) of sample sites were recorded. • Rhizosphere samples were analysed for AM associations. With in all samples *Glomus* was reported to be dominant species. The anatomy of AM roots was worked out for their associations. • Anatomy of ECM roots and ECM fruit bodies were worked out for their association and identification. • *Russula, Lactarius* and *Amanita* sp. were recorded most dominant

				ectomycorrhizal associations. • Pure cultures of ECM fungi were isolated and are being maintained in pure form. • Mass inoculum (spawn) of *Russula* species was raised on wheat gains in polypropylene bags. • Mass inoculum of AM fungi is raised with living host (wheat) in earthen pots. • Digging and sieving of soil for nursery trials is under progress.
15	Impact of climate change on litter microbial dynamics in *Dipterocarp* forest. **(3 years, April 2008)**	Rajesh Kumar. Scientist - B	Ecosystem, Conservation and Management. (Climate change)	**Long Term** **1. Development of prediction module for the impact of climatic change on litter microbial dynamics:** The occurrence of various fungi in different seasons and variation in population dynamics with respect to different climatic parameters (rainfall & temperature) were studied. It was observed that change in rainfall pattern and temperature exerts significant variation in the population dynamics of decomposer mycoflora. Occurrence of varied fungal forms in different seasons such as, maximum occurrence of *Aspergillus sp., Trichiderma sp., Fusarium sp. Penicillium sp.,* etc. in rainy season*, Alternaria sp, Cladosporium sp.,* in winter season; *Mucor sp., Rhizopus sp.* etc. in spring were indicating a characteristic pattern of occurrence of decomposer fungi of *Dipterocarpus* leaf litter across the seasons of the year. Some species were observed to be limiting their occurrence to certain seasons only. *Sporotrichum sp.*, *Verticillium sp.*, *Paecelomyces sp.* etc. were isolated only in the rainy season. Maximum fungal cfu was observed in the rainy season followed by spring and minimum in winter season. Higher rainfall

				and temperature seemed to be promoting the growth condition with higher number of fungal colonies ($p<0.01$). The thermophilic fungi (*Aspergillus sp., Chetonium sp., Rhizomucor sp.*) were isolated in the rainy and early winter season from deep layers of heaped decomposed leaf litter. From the data obtained from this study, it can clearly be seen that the decomposer mycoflora of *Dipterocarpus* leaf litter is grately influenced by the climatic factors. Scanty rainfall results in depletion of decomposition rate and microbial population dynamics. Due to considerably scanty rainfall in Manipur (Year 2009), depletion in the rate of decomposition and microbial population was observed in that study site. From the correlation analysis ($p<0.01$) it is possible to predict that change in rainfall pattern and temperature exert a great influence in the microbial population dynamics and the rate of decomposition. **2. <u>To inventories litter microbes in *Dipterocarp* forest:</u>** 18 fungal genera and 35 species were isolated under varied climatic parameters from the decomposed leaf litter of *Dipterocarpus* species in the *Dipterocarpus.* **<u>Short Term</u>** **<u>To assess the impact of abiotic environmental factors/climate change on population dynamics of litter microorganisms:</u>** The decomposer mycoflora showed remarkable seasonal variation in their occurrence. The population dynamics of the decomposer mycoflora was observed to be influenced by the climatic factors such as rainfall and temperature. Maximum fungal cfu was observed in the rainy season (1.5×10^{5})

				followed by spring (5.6 x 10^3) and minimum (3.5 x 10^3) in winter season. **2. <u>To assess the rate of litter decomposition, humus formation and mineralization (C, N content) with respect to climate change in abiotic environmental factors:</u>** Higher rate of decomposition was observed in the rainy seasons followed by spring and minimum in dry and cold winter. Higher rainfall and temperature seemed to be promoting the growth condition with higher number of fungal colonies along with higher rate of leaf litter decomposition ($p<0.01$). Range of N content was 2.87- 4.21% (*D. tuberculatus*); 2.31- 3.98 % (*D. macrocarpus*). Organic carbon content of litter of both the specie varied from 4.3-4.1 in different seasons. Due to considerably scanty rainfall in Manipur (Year 2009), depletion in the rate of decomposition and microbial population was observed in that study site. **3. <u>To identify potential bio-indicator species of microorganisms of climate change:</u>** Few species of micro fungi limits their occurrence to a specific season or climatic condition. The three thermophilic fungi isolated, occurred only in rainy season. Occurrence of *Aspergillus sp., Trichiderma sp., Rhizomucor sp., Fusarium sp., Penicillium sp.,* etc. was maximum when rainfall and temperature was higher. *Alternaria sp, Cladosporium sp.,* were isolated maximum in dry winter season; *Mucor sp., Rhizopus sp.* etc. prevails in spring. In draught condition in Manipur (2009) maximum *Aspergillus sp.* were isolated. These organisms may serve as indicator species as they occured only in a specific climatic condition. Prolonged study is required to clearly understand the role of these individual

				microbes in leaf litter decomposition and the effect of individual climatic parameters on them. The present data also can be simulated in the future studies which is planned to be carried out in the turned over project entitled "CO_2 emission and microbial immobilization in *Dipterocarp* forest soils: effect of abiotic and biotic factors with special reference to climate change".
16	Comparative studies on optimum treatment time and durability test of commercially important bamboo species of North-eastern Region. **(3 years, April 2009)**	Dhruba Gurung, R.O.	Wood products (Value Addition and Utilization)	• One meter long bamboo samples derived from top, mid and bottom of the freshly harvested bamboo (*Bambusa pallida* and *Dendrocalamus hamiltonii*) were treated with 8%, 10% and 12% CCB under 1 and 1.5 kg pressure using Boucherie Apparatus (Jagriti). Optimum treatment time of 1 m long bamboos varied from 20 minutes to 2 hours 30 minutes depending on the volume; moisture content, species and age of the bamboo, even though the bamboo samples selected were from 4-5 years age group. Five mm from all samples, including control, were taken out and kept aside for chemical analysis. • Test yard at Jorhat has been established at RFRI Campus and test yard at Aizawl will be done during the month of July 2010.Test yard at ARCBR, Aizawl, and Mizoram was established during July 2010. • Inspection of the test yards at Jorhat, Assam and Aizawl, Mizoram has been done. At Aizawl Mizoram 66 bamboo samples out of 210 bamboo samples were infected with Black Powdery/sooty Mould; 4 were infected with *S. commune* (Basidiomycetes; schizophyllaceae); 4 were infected with pink coloured fungal fruiting body and one sample was infected with undetermined fungal fruiting body. The fungal bodies were very small, less than 3 mm in size, no insects were observed during November 2010.
17	Studies on the incidence and management of culm rot and bamboo	Dr. R.K. Borah,	Forest Protection (Insect pests,	• **Results from the eight field tours conducted with a view to survey the culm rot and bamboo blight disease status in Assam were summarized**

	blight disease in Assam. **(3 years, April 2009)**	Scientist-E	diseases and control)	**below-** • The highest per cent incidence of blight in case of *Bambusa tulda* and *B. balcooa* was recorded in Golaghat (55.18%) and Goalpara district (41.93%) of Assam, respectively. • However, the highest per cent incidence of culm rot in case of *B. tulda* was recorded in Jorhat (45.22%); and it was found to be highest in Sibsagor (23.20%) district of Assam in case of *B. balcooa*. • Fungal species from the collected disease samples were isolated, identified and pure cultures of the fungal species were maintained for future studies
18	Standardization of Inoculation Technique for Agarwood formation in *Aquilaria malaccensis* Lamk. **(5 years, April 2009)**	Dr. R. K. Borah, Scientist-E	Forest Protection (Mycorrhizae, rhizobia and other useful microbes)	• The agar plantations of Jorhat, Sibsagor, Golaghat, Nagaon, Tezpur and Kamrup (Rural) districts of Assam were visited and infected wood and soil samples as well as meteorological data were collected. • Fungal species of different genera were isolated, identified and pure cultures were maintained. Isolated fungi includes- *Penicilium* sp*., Aspergillus* sp*., Fusarium* sp., *Mucor* sp., *Trichoderma* sp., *Cunninghamella* sp*., Paecilomyces* sp*., Pythium* sp. And *Gliocladium* sp. • Collected soil samples were analyzed for various physico-chemical properties such as- pH, electrical conductivity, organic carbon, N, P, K and rhizosphere soil fungi .
19	Conservation of superior germplasm of commercially significant bamboo and rattan species of Mizoram. **(3 years, April 2009)**	Sh.K. Kar, Dy. C.F	Genetic Improvement (Conservation of Forest Genetics Resource)	• 20 different species of bamboo have collected from different parts of Mizoram. • Selected site for germplasm within the ARCBR campus and planted species in the area and maintained regularly. • Selection of candidate plus clumps carried out and collected propagules and introduced in the germplasm bank.

				Established nursery for mass propagation
20	Assessment of Rattan diversity and conservation strategy in respect of Mizoram, Tripura and Barak Valley of Assam. **(3 years, April 2009)**	Sh.K. Kar, Dy. C.F.	Genetic Improvement (Conservation of Forest Genetic Resources)	• 4 field trips conducted in 3 states covering 12 districts and geo-coordinates, locations recorded • Established nursery to raise planting stock • Inventorized rattan species viz. *Calamus acnthospathus, C. khasianus,C. flagellum, C. gracilis, C. tenuis, C. erectus, C. guruba, C. inermis, C. latifolius, Daemonorops jenkinsianus and Salaaca secunda*