CONTINUED PROJECTS DURING THE YEAR 2015-16 (ICFRE)

Sl.No.	Title of the project/Duration	Name of PI	Current Status
1.	AICP programme for Genetic Improvement of *Melia (*Under AICP on Melia*)* Components: Survey of natural forest and manmade plantations to select CPTs and plus trees Establishment of Multi-locational evaluation trials for testing selected genotypes under different agro-climatic conditions for stability, adaptability and productivity Standardize DNA based tools for application of Biotechnological interventions and enforce marker assisted selection to improve the productivity Project Code: RFRI/2012-13/B&G-3	Dr. N. Ravi Scientist-C	Survey work was carried out in, Manipur and Nagaland, Meghalaya, Sikkim and in Cooch Bihar to identify best performing genotypes through selection and field evaluation. 91 trees were selected from these regions. Fruits were collected to study their physical attributes. The fruits collected from the identified promising trees (91 trees) were soaked in water and pulp was removed. The extracted seed were sown in the nursery beds. Seeds of 42 accessions were also procured from FRI, Dehradun and sown in nursery for arising stock to establish multi-locational trial. 98 seedlots produced the seedlings, of which 40 were from FRI and rest of the 58 from the selections in North East India. The germination attributes and initial growth data was recorded. Five trials were established using these progenies of 98 selected trees. Two trials were established ,one each at RFRI, Jorhat and Tizit, Nagaland, with the progenies raised from the seeds provided by FRI under AICP programme. Three trials were established at RFRI with the progenies from the selected trees of North East region. An experimental trial was established in a low lying area to study the tolerance of the species in water stagnated condition and its performance. Observations were recorded on phenology of flowering i.e. intiation of flowering, fruiting and fruit setting. DNA extraction method was standardized to understand the genetic diversity existing among the progenies using RAPD technique. DNA samples were extracted from 53 progenies selected from North East region and the methodology was standardized for optimization of PCR reactions. The work on screening of primers is in progress.

2.	*In vitro* propagation of *Vanda coerulea* Project Code: RFRI/2013-14/B&G-11	Shri Satyam Bordoloi Scientist -C	*In vitro* seed culture was initiated in *Vanda coerulea* using green pod culture technique. Different culture media were assessed for optimising the best medium that supports high germination rate and for better seedling growth. Accordingly a medium for seed germination and another medium for seedling growth have been optimized. Proper spontaneous rooting in all the seedlings was observed in the growth medium itself. Preliminary hardening of the rooted seedlings was carried out in plastic magenta box containing vermiculite under agro shade net. For secondary hardening brick chips, sand, FYM, Coconut husk, Charcoal etc are being assessed in different proportions. Mortality due to fungal problem has been observed at this stage. Fungicides are being administered to manage this problem and to optimize the conditions. Leaf and root explants from *in vitro* seedlings as well as *ex vitro* plants in orchidarium were used to induce callus for somatic embryogenesis i.e. formation of Protocorm Like Bodies (PLB). Calluses were initiated from both root and leaves from ex vitro explants. Formation of PLB and their subsequent germination have been observed in few calluses. Experiments for further growth and germinations PLBs are under progress. Special attention is given to optimize a media for somatic embryogenesis that does not contain Ammonium Nitrate as marketing of the same has been banned by the government.
3.	Raising of planting materials of selected cane species and establish plantation in fringe villages of Assam and Mizoram to sustain rural livelihood. Project Code: RFRI/2013-14/E&B-3	Shri H.R. Borah Scientist -B	Survey was carried out in different areas of Karbi-Anglong district and discussed with the people about the availability of seed and seedlings of Canes. As per project objective, 3 different fringe villages were selected in the district in proximity of cane resources to have collection of planting materials of Cane and other important NTFPs viz. Jongpha village, Akhaiphutia, Lakhan Terang Gaon, Chowkiholla and Kaheswari, Kailamati. Identified cane harvester as well as collector in selected villages to have collection of planting materials (seeds /seedlings) to raise nursery. At Jongpha, Akhoiphutia, a village level nursery of size (10m x 20 m) with bamboo frame and agro-net top was made to raise ca 10,000 planting materials of Cane and other non-timber forest species. The nursery is considered as a central nursery in where seedlings collected from different localities of the district are raised and maintained. In the nursery raised 2500 seedlings of *Calamus gracilis* and 500 seedlings

			of *Calamus khasianus* and 500 seedlings of *C. latifolius*. Developed 1.0 ha plantation of *Calamus gracilis, C. khasianus* and *C. latifolius,* Collected seeds of *Calamus khasianus* from Forest Training School, Aizawl and raised seedlings in ARCBR nursery, Aizawl Prepared sites (0.50 h) at ARCBR campus to carry out plantation Practical training was given to community people (50 no) for collection and processing of cane seed/seedling and ensured their involvement in nursery development activities.
4.	Studies on the economically important diseases of medicinal and aromatic plants of Assam to develop management practices through organic approach. Project Code: RFRI/2014-15/FP-6	Dr. Shailesh Pandey Scientist-C	Disease surveys were conducted in Medicinal and Aromatic Plant (MAP) Gardens of Assam Forest Department and some private MAPs nurseries. Our disease survey provides some useful data on certain diseases of concern in the state of Assam. Some of the economically important diseases observed during disease survey are Leaf blight of *Cymbopogon winteranius* (Java Citronella), Foot rot or quick wilt of *Piper nigrum* (Black peeper), Leaf spot of *Cinnamomum zeylanicum* (Dalchini), Leaf spot of *Acorus calamus* (Sweet Flag), Rust of *Acorus calamus* (Sweet Flag), Leaf Necrosis of *Curculigo orchoides* (Black Musali), Wilt of *Pogostemon cablin* (Patchouli), Viral disease of *Sida rhombifolia*, Target leaf spot of *Piper longum* (Pippali), Root rot and branch drying of *Aquilaria malaccensis* (Agar), Leaf spot of *Calamus tenuis*, Leaf spot of *Aloe vera* (Aloe), Leaf spot of *Curcuma aromatic* (a wild Turmeric), Leaf blotch of *Curcuma longa* (Turmeric), Anthracnose *of Capsicum chinense* (Bhut jolokia). Disease assessments were made by observing numerous representative plants to determine the general health and presence or absence of disease symptoms and signs The pathogens were isolated, identified and the association of the pathogens with their respective host was confirmed by inoculation experiments. Aqueous extracts of locally available plant species were tested against target pathogens to see the detrimental effect. *Trichoderma* spp were found effective against target pathogens in laboratory and glass house conditions. Present study provides an incentive to take the necessary monitoring, preventative and control measures of economically important diseases of MAPs.

5.	Study on seed source variation for germination and seedling growth and establishment of seedling seed orchard of *Michelia champaca*. Project Code: RFRI/2013-14/B&G-9	Md. Ibrahim Scientist-C	The aims of the project are to identify seed sources of *M. champaca* in different regions of Northeast India, variation studies in identified seed sources for seedling and germination attributes and establishment of Seedling Seed Orchard. Survey was conducted in different regions of Assam, Tripura, Arunachal Pradesh and Mizoram for identification of seed source (both plantation and natural). Phenotypically superior plants were selected from different regions and seeds from the selected trees were collected and were raised in the nursery. Investigated proper sowing method/medium for better germination and it was found that sowing of seed in sand with regular watering gives good result of germination. Data on germination percentage of different sources were obtained. For assessment of storability of seed under low temperature, seeds were refrigerated at 4^0 C and were subjected to viability test using tetrazolium test as well as germination test under nursery condition are in progress. Regular growth data of seedlings were recorded. Observation on Incidence of pest and disease under field condition was also made and found Common Jay (*Graphium dosan*) and Tailed Jay (*G. agamemnon*) as major defoliators. These insect also feed on terminal growing point causing stunted growth of plant. A Seedling Seed Orchard consisting of families of 17 plus trees was established at RFRI. In addition to above wood samples from different sources were obtained and wood density analysis is under progress. Also observation was made on disease and pest infestation in the various fields/ nursery during the tour to different places.
6.	Studies on the diversity of soil borne entomopathogenic fungi in different land use system of North East India and their utility for the management of major defoliators of *Gmelina arborea* Roxb. and *Aquilaria malaccensis* Lamk. Project Code: RFRI/2013-14/FP-4	Shri R.Raja Rishi Scientist -C	The soil samples collected from various localities in Assam ,Nagaland and Megalaya States were subjected to insect bait method to trap the entompathogenic fungi by using the insect *Galleria mellonella*. Total 13 fungi were isolated from the infected insects and identified. The soil borne fungi *Fusarium oxysporum*, *Fusarium* sp. (2 Nos.)*Mucor* sp., *Aspergillus ochraceus*, *A. flavus*, *Trichoderma* sp., *Trichophyton* sp., , *Beauveria bassiana*, *Rhizopus* sp., *Verticillium lecanii*, *Pacilomyces* sp. and *Metarhizium anisopliae* were isolated from the cadavers of *G. mellonella* .

7.	Studies on soil profile attributes under forests and jhum lands areas of some selected sites of Nagaland state. Project Code: RFRI/2013-14/SFM-1	Dr. Gaurav Mishra Scientist -B	Out of proposed 300 soil samples, two hundred and fifty (250) numbers of soil sample horizon wise were collected. Fifty four (54) soil profiles were studied under Forest, Tea garden and Jhum land areas from different places of Mokokchung, Wokha, Mon, Dimapur and Kohima districts of Nagaland state. All the soil samples were analysed and the content of Soil organic carbon, pH, Electrical Conductivity (Ec), Texture (Sand, Silt and Clay percent), Bulk Density, Available Nitrogen, Available Phosphorus, Available potassium, Cation exchangeable capacity (CEC), Exchangeable calcium, magnesium, sodium and potassium estimated. Forest vegetation growth data collected from the sites where soil profile studied under forest areas and calculated basal area, tree density, frequency, dominance and IVI.
8.	Studies on the traditional knowledge of medicinal plants used by Nepali community in Assam and identification of important species for chemical analysis**.** Project Code: RFRI/2013-14/E&B-2	Sh. H.D. K. Meena Scientist-B	Survey was conducted in 25 Nepali villages in Kamrup, Morigaon, Jorhat, Golaghat, Sivasagar, Dibrugarh, Tinsukia, Sonitpur and Dhemaji districts of Assam for the collection of information on traditional uses of medicinal plants by Nepali community. Commonly used medicinal plants by the villagers were recorded. It has been found that women have fair knowledge on use of traditional medicine particularly those plants available in homestead gardens and in the villages. The medicinal plants are used for fever, cough, blood pressure, jaundice, diabetes, worms in children, injury or cut etc. Medicinal plants along with parts used and mode of usage were also recorded. The mode of use of medicinal plants are almost same in different villages. No professional medicine men were found, there are persons having knowledge of the medicinal plants and give medicines whenever necessary. Most of the villagers are in touch with the traditional medicines. Comparison on use with Assamese community was made. There are some medicinal plants used by both the communities for the same ailments. Present status on use of medicinal plants due to socio-economic change recorded during survey.

9.	Assessment of diversity and carbon sequestration potential of above ground woody biomass of semi evergreen forests in Assam Project Code: RFRI/2013-14/SCD-8	Shri B. Pradhan DCF	Surveys were conducted in Jorhat Forest Division, Dibrugarh Forest Division, Golaghat Forest division and Sibsagar Forest Division, Territorial Forest Division Tezpur, Sonitpur and East and West Forest Divisions of Karbi Anglong district. Ecological sampling was done in different semi-evergreen forests of the region including Hollangapara Gibbon wild life Sanctuary, Jorhat; Nambor RF, Golaghat; Haldhibari under Kohora range in Golaghat. About 106 numbers of random sample points were laid down during field visit and tree dbh at 1.37 m from the ground surface was recorded. During field surveys more than 161 tree species of 53 families were found. Data entry for all the quadrats has been completed and identification of encountered tree species from these semi-evergreen forests has been completed. Digitization of thematic layers like Road, settlement, drainage etc. is done partially from topo sheets available in GIS laboratory. Forest cover data (2013) of Assam and nearby areas in original soft copy format (.img) was procured from Forest Survey of India. This data will be used for generation of maps. Phytodiversity of tree species recorded in different semi evergreen forests will be calculated after completion of field survey and data collection. To achieve objective 3 & 4 local tree volume equations and wood specific gravity of the identified tree species has been collected from pertinent sources. Field survey and sampling will be continuing up to December, 2015. Estimation of tree biomass and carbon stock in above ground wood volume will be initiated after January, 2016 onwards and all the collected data will be compiled for timely completion of the project.
10.	Studies on *Trichoderma* strains inhabiting different forest ecosystem of North East India Project Code: RFRI/2013-14/FP-5	Dr.Shailesh Pandey Scientist- C	A total of 50 *Trichoderma* isolates were recovered from soil and pure cultures were maintained. Studies in previously uninvestigated regions or habitats have led to the isolation of *Trichoderma* spp. showing distinct cultural characteristics. *Trichoderma harzianum* was found to be widely distributed Growth patters were recorded in Potato dextrose agar, Malt extract agar and Czepox dox agar and the isolates were grouped into different clusters based on their morphological characteristics Purified *Trichoderma* isolates were found effective against pathogens of medicinal and aromatic plants A severe disease was observed in Agar trees Efforts are under progress to isolate the pathogen

11.	Screening of *Gmelina arborea* Roxb.clone for productivity and stability. Project Code: RFRI/2013-14/B&G-10	Dr. N. Ravi Scientist-C	The aims of the project are to select stable genotypes/clones of *Gmelina arborea* for different growth characters. The clones in the clonal trial to be screened based on their growth performance and incidence of defoliating insect, *C. leayana.* The clones screened for best performance and moderately or less susceptible to the insect attack, need to be propagated through Vegetative Multiplication Garden(VMG) for establishing multilocational trials in different regions to findout the stable clones. Growth parameters viz. Height, collar diameter(CDM), diameter at breast height(DBH), straightness and crown shape were recorded for the clones (70 numbers) in clonal trial at RFRI experimental trial, Naharoni, Jorhat. Based on their performance, they were ranked and 21 clones found to be ranking top among all. Fruits were also collected from the clones and seeds were sown for the germination studies and data were recorded for their germination percentage and other parameters. Two clonal trials were established having 25 clones each in the trial. The trials were established in Manipur with the co-operation of State Forest Department. The trials were established at Luwangsangbam, Imphal East, Imphal under the Research Division of SFD, Manipur and another at Noney, Tamenglong Dt., Manipur under the DFO, Tamenglong Dt. Two VMGs were established with 25 clones each. One at RFRI, Jorhat and another one at Luwangsangbam, Imphal East, Imphal, which is under the Research Division of SFD, Manipur. This VMG was established as per the request of SFD for production of propagules, to meet their requirement. Field tours were carried out to Naharoni and regular observations on the incidence and intensity of attack of the insect pest *Craspedonta leayana* on different clones of *G.arborea* was recorded. The intensity of the attack of the pests *(Craspedonta leayana)* on each clone in Naharoni experimental trial was estimated using the modified Wellendorf severity scale and were classified in to three categories viz.Severely attacked, Moderately attacked and less attacked or with negligible attack. The clones **GA 019,GA 100, GA 109, GA 081, GA 034, GA 002** and **GA 086** are considered as with less attacked or with negligible attack. The clones **GA 003, GA 007, GA 021, GA 022, GA 026, GA 027, GA 037, GA 044, GA 045, GA 071, GA 072** and **GA 114** (12 clones) are considered as Moderately attacked. The biology of the pest, *C. leayana* was studied in the clones **GA 019, GA 100, GA 109, GA 081, GA 034** and **GA 086** in laboratory condition.

12.	Exploration of adhesive materials for incense sticks from the plant species. Project Code: RFRI/2014-15/BIK-5	Dr. S.C. Biswas Scientist-B	Field survey tours were conducted to collect adhesive (binder) plant samples for agarbatti industry. Eighty (80) plant samples were collected so far from different plant species of Jorhat, Golaghat, Goalpara, Borpeta, Nagaon, North Cachar and Sibsagar districts of Assam and Meghalaya, of which, 77 plant samples were evaluated for their efficiency as binding material. Samples(such as bark, leaf, flower, seed etc.) from more than 23 plant species are recorded for adhesive properties; of which ten (10) plant species were identified as suitable so far, either alone or in combinations to be used as adhesive material for agarbatti preparation. Prepared agarbatti sticks were tested for the adhesive quality, durability, burning time, odour and suitability for transportation. Isolation / extraction and determination of physical properties of sticky mucilage from suitable plant samples for binder materials are under process. Standardization of application of adhesive material alone or in combinations by paste method is under process.
13.	Evaluation of forest fruits for the nutritional value and develop value added products for economic enhancement of the local people Project Code: RFRI/2014-15/BIK-6	Dr. S.C. Biswas Scientist-B	Conducted tour to survey and collect fruits from the forests and homesteads of Jorhat, Golaghat, Sivasagar and North Cachar districts of Assam and Shillong of Meghalaya. Collected fruits of Carallia brachiata (kuji thekera), Spondias axillaris (Mitha amora), Garcinia pedunculata (Borthekera), Crataeva magna (Borun) and Artocarpus chaplasha (cham) etc for preparation of value added products Prepared one value added product from Carallia brachiata (kuji thekera), one value added product from Crataeva magna(Borun), one value added product from Artocarpus chaplasha(cham), two value added products from Dillenia indica(Ou tenga) fruit and two value added products are prepared from Flacourtia jangomas. Laboratory works on antioxidant property of Crataeva magna (Borun) and Artocarpus chaplasha (cham) are done for raw as well as the prepared value added product. Shelf life of the prepared value added product are also studied.
14.	Studies on ecological and ethnomycological aspects of wild mushrooms of Meghalaya. Project Code: RFRI/2014-15/FP-6	Shri Rajesh Kumar Scientist-D	Field tours to Shillong, Jawai and Dowki of Meghalaya state were conducted. One hundred fourteen mushroom species were collected. Data about sites such as topography, vegetation, and habitat, specific association of fruit body with surrounding trees, herbs and shrubs were documented at the time of collection. GPS reading of the surveyed areas have been recorded. Market survey has been carried out and information like price,

			local name, medicinal value, and uses were documented. Out of one hundred fourteen species eighty eight mushroom species were identified and documented. Chemical analysis of total fifteen important mushroom species has been completed for their nutrient value.
15.	Investigations into the mortality of *Parkia roxburghii* G. Don in North East India. Project Code: RFRI/2014-15/FP-1	Dr. R.K. Borah, Scientist-E	Survey was carried out in Aizawl, Manipur and Nagaland and found 100 per cent and 30 per cent disease incidence in Tegnopol, Manipur and Zubza, Nagaland respectively. Infected wood samples were collected and isolation of fungi from the diseased samples frequently yielded Fusarium sp. During the tour to Aizawl, Manipur and Nagaland, soil samples were collected. Physico-chemical analysis carried out. Carbon, and Nitrogen was found to be highest in Tegnopol, Manipur and pH of soils was found to be acidic in general. *Parkia* seeds were collected and raised in polybags for seed germination and studied seedling growth. Also Pathogenecity study using the *Fusarium* sp. was carried out.
16.	A preliminary investigation on hypotrophy (dwarfing / stunting) of *Lilium mackliniae* Sealy. Project Code: RFRI/2014-15/SFM-4	Shri A. K. Deka DCF	Information on morphology, pest and disease of the species and ecological parameters of the site is being collected through literature survey and library consultation. Historical meteorological data of eight nearest stations/observatories have been procured and analytical process initiated for interpolation and determination of historical climatic conditions.
17.	A study on distribution and phenological events of *Pinus kesiya* along an altitudinal gradient at regional scale in North East India Himalayas. Project Code: RFRI/2014-15/SFM-3	Shri A. K. Deka DCF	Distribution of the species was analysed from herbarium data that are accessible through the Global Biodiversity Information Facility supplemented byDocumented geographic distribution, and other published literature. A distribution map was generated using these location data in goggle map. A generalised Calender of phenological event was prepared with information from published literature and other reference materials. Pine growing areas are identified through visual interpretation of satellite imageries and potential sites for sampling were identified at various altitudinal range. Survey and sample collection have been carried out in different sites of four different states viz.-Arunachal Pradesh, Meghalaya and Manipur and Nagaland. Dimensions of specimens (length of needle and length and girth of female cone) collected from the marked and tagged trees are being recorded in order to ascertain the phenophase of the trees on the date of observation. Analysis of distribution of the species has been done

			from herbarium data. Weather data from meteorological stations/ observatories in the region has been procured and data cleaning for the data sets has been initiated.
18.	Impact of *Mikania micrantha Kunth*. ex H.B.K. on microenvironment of native species in Bherjan-Borjan-Padumoni R.F., Dilli R.F. and Abhayapur R.F. of upper Assam. Project Code: RFRI/2014-15/E&B-8	Dr. Kuntala N. Barua Research Officer, Gr. I	Invasion by aggressive alien species causes serious problem for ecosystem alteration and declining the indigenous species. Mikania micrantha, is a perennial vine of Central and South American origin now poses a serious threat to natural forests sites of studied Bherjan-Borjan-Padumoni R.F (Tinsukia district) Dilli R.F (Dibrugarh/Tinsukia/Sibsagar district) and Abhayapur R.F (Sibsagar district). High level Mikania infestation is observed in mixed deciduous forests and other open canopy sites because of their maximum ramet proliferation from a horizontal root stock and also from seeds. Extensive field survey was conducted in different study location according to intensity of infestation weed through GPS reading. Floristic survey was carried out in winter, pre monsoon and monsoon season. Vegetation composition and plant diversity, soil nutrient and regeneration status of forestry species were assessed in Mikania infested and un infested areas. Maximum species richness was documented in Dilli RF followed by Abhayapur R.F. Regeneration of tree seedling in Dilli RF were recorded as Dipterocarpus retusus > Mesua ferrea > Sapium baccatum > Vatica lanceaefolia and Mesua ferrea > Dipterocarpus retusus > S. baccatum in Abhayapur R.F .Soil sample were analysed for pre monsoon, monsoon and winter season and maximum pH was recorded in 0-15 cm depth of Mikania infested sites of Podumoni segment (4.95). Bulk density, organic carbon & NPK were determined, analysis and compilation of data is in progress. All total 131 butterfly species were sampled in Tropical Moist Semi – evergreen forest of study sites. Among them, 54 species were documented from Mikania infested forest areas, 38 species from un- infested and 39 species from the both forest sites. Micro environmental parameter like light intensity and interception, soil temperature etc were documented seasonally to determine correlation on microenvironment and vegetation component at different canopy level.
19.	Identification of suitable clones of Populus species for Northeast India through genetic evaluation. Project Code: RFRI/2014-15/B&G-7	Md. Ibrahim Scientist-C	The aim of the project is to identify suitable clones of Populus for Northeast through selection and evaluation of *Populus gamblei* along with known clones of *Populus deltoides.* For selection to be effective molecular diversity of different populations will be assesed. Survey was conducted in Lower Subansari and Lower Dibang valley of Arunachal Pradesh for investigation on distribution status of *P. gamblei*, selection of phenotypically superior genotypes and collection of propagating

			material. Survey was also conducted in West Kameng district of A.P and Kohima and its adjoining areas of Nagaland. Survey was also conducted in Anjaw district of Arunachal Pradesh. Identified distribution in Yazali and Yachuli of lower Subansari, Bomdila and its adjoining area of West Kameng and Kohima and its adjoining area of Nagaland. Seedling and propagating materials from identified areas were collected and established in nursery. Standardization work on propagation by branch cutting was carried out. However no satisfactory result could be achieved. For genetic diversity analysis leaf samples were collected from different regions. For effective DNA extraction from silica dried leaves standardization protocol was initiated.
20.	Population genetic structure of Calamus species and influence of infectious diseases in Mizoram and Tripura, North East India. Project Code: RFRI/2014-15/ARCBR-9	Shri Hansraj Scientist-C	The field visit in the different forest Range of Mizoram was conducted to assess the diseases incidence of rattan in nurseries. During the survey the diseased sample were brought from the field to isolate the pathogen (s) in laboratory. Seedlings/wildlings of the selected *Calamus* species were also brought and planted in a site at ARCBR for genetic diversity study. Pathogen(s) from the infected plants were isolated and identified. The pathogens isolated and identified were further multiplied through the hyphal tip method to get the pure culture. Pathogenicity of the major pathogen(s) isolated was also proved by following the Koch's Postulates. Studies on effect of different solid and liquid media, pH level and temperature on the mycelia growth of the isolated pathogens from selected rattan species were also performed. Isolation of Indigenous *Trichoderma* strains from the forest soil was carried out and later evaluated for their biogenic sensitivity against the target pathogens. *In vitro* evaluation of systemic and non systemic fungicide against the target pathogens is in progress.