

RAIN FOREST RESEARCH INSTITUTE JORHAT

The Rain Forest Research Institute (RFRI), Jorhat, Assam, a constituent Institute of Indian Council of Forestry Research and Education (ICFRE), Dehradun (An autonomous Council) under Ministry of Environment and Forests, Govt. of India mandated to cater the forestry research related needs of North-Eastern India has been pursuing research in the areas of shifting cultivation, ecology and biodiversity, propagation, cultivation and performance trial of important forest species, integrated management of pests and diseases, bio-prospecting of bio-resources, genetic improvement and biotechnology.

An abstract of projects run by the Institute is as follows:

	No. of project completed in 2008-09	No. of ongoing projects in 2008-09	No. of new projects initiated in 2008-09
Plan Projects	11	10	07
Externally Aided Projects	01	08	01
Total	12	18	08

PROJECTS COMPLETED DURING THE YEAR 2008-2009

PLAN PROJECTS

Project 1: Evaluation of different existing land use systems for development of viable economic models in North-East India [RFRI/SC/06/2003-08]

Findings: The benefit cost ratio of Land Use Systems (LUSs) identified at different jhum areas in Assam, Nagaland and Meghalaya revealed that in Assam *Trichosanthes dioica* with B: C (3.75) followed by *Anona comosus* (3.23) were potential LUSs among other in the list, whereas in Meghalaya *Citrus* sp. (6.09) followed by *A. comosus* were practiced as well accepted LUSs because of its prospective characteristics. The data collected from various LUSs in Nagaland revealed that the *Areca catechu* (11.4) followed by *Musa paradisiaca* (10.78) were established as highly sustainable LUSs among other in the list.

Project 2: Management of *Bambusa nutans* for enhancing the productivity of marketable culm through silvicultural practices [RFRI/TI/13/2005-08]

Findings: Trial on thinning and soil mounding revealed that proper thinning and soil mounding of the clumps helps to enhance the productivity. Treatment combination of 20% thinning 30 cm soil mounding resulted in highest collar diameter and plant height. Application of fertilizer (DAP) was also found to be helpful in increasing the production with respect to plant height and collar diameter.



Project 3: Development of nursery for production of quality planting stock of bamboos in North-East [RFRI/SM/06/2005-08]

Findings: In nursery, the sand, soil, FYM and vermicasting (cultured) was found to be the best media for production of bamboo planting stock in polybags. The bamboo seedlings raised in polybags were evaluated for field performance. Seedling raised in soil and vermicasting (wild) seedlings gave best performance in the field.

Project 4: Standardization of nursery technique of *Bambusa pallida* [RFRI/SM/07/2007-08]

Findings: Soil, sand and FYM (1:1:1) was found suitable media for propagation of *B. pallida* through culm cuttings. Culm cuttings treated with IBA 300ppm gave maximum production of new shoots with 20-25% survival. Further proliferation of plantlets gave 75-85% survival. A total of 1200 seedling production was made through macro proliferation technique.

Project 5: The potential bamboo species with reference to carbon sequestration in Assam & Mizoram [RFRI/EE/07/2005-08]

Findings: Carbon sequestration potential of two bamboo species (i.e *Bambusa tulda* from Hudamuagaon, Bhakatgaon and Bosepathar Borgurigaon of Jorhat district, Assam and Lawipu Ram & Tural Aizawl, Mizoram and *Dendrocalamus hamiltonii* from New Sonowal, Jorhat district of Assam and Lawipu Ram & Zembouk Dai of Aizawl, Mizoram) each of 1st, 2nd & 3rd years age groups was studied through biomass estimation. Above ground biomass of *D. hamiltonii* was 50% in most of the samples. In *D. hamiltonii* dry biomass ranged from 46 to 54% in 1st year, 50 to 56% in 2nd year and 48 to 57% in 3rd years culms. Whereas in *B. tulda* it ranged from 43.5 to 56.3% in 1st year, 49.5 to 56% 2nd year and 53.7 to 68.7 % in 3rd years culms.

Project 6: Diversity and dynamics of Arbuscular Mycorrhizal fungi and their influence on biomass production of some medicinal and aromatic plants of Assam [RFRI/FP/10/2005-08]

Findings: Diversity studies of Arbuscular Mycorrhizal fungi associated with medicinal and aromatic plants were completed in fifteen districts of Assam. These districts are Dibrugarh, Sivasagar, Jorhat (including Majuli Sub-Division), Golaghat, Karbi Anglong, Nagaon, Marigaon, Kamrup (Rural), Kamrup Metro, Nalbari, Barpeta, Sonitpur, North Lakhimpur, Dhemaji and Baska. Mycorrhizal spores were isolated from the collected samples and their quantification was done. Root infection percentage was also calculated and it was found that AM fungi infect the plants with varying degree.

Project 7: Studies on structural formation of vegetation for the conservation of biodiversity in Gibbon Wildlife Sanctuary Assam [RFRI/SC/08/2005-2008]

Findings: A total of 225 plant species were enumerated from the forest (91 species of tree, 18 species of shrub, 74 species of herb and 36 species of climber). The canopy height of most of the trees (about 50%) in the study area ranged between 20-35m. The feeding height of gibbons in this study was found to be between 25 to 30 m. Identified 3 vegetation communities and other associate species. Most preferred food plants by Hoolock Gibbons were found to be 45 in number. Their phenological observations were recorded. Quantitatively all these trees are quite abundant in the study area except degraded sites.

Project 8: Development of Patchouli based viable agroforestry models for North-Eastern region of India [RFRI/CFE/04/2005-08]

Findings: Organized farmer visits to the on-farm trials for demonstration of the Patchouli agroforestry practices. Training was imparted through lectures and practical sessions during field visits. The local entrepreneurs were also invited in the program to facilitate liaisoning with the farmers. The farmers were assured 30 % higher price by these entrepreneurs for the raw material (dry leaves) to be supplied to their industries with a purchase guarantee. Under the technical guidance of RFRI, the farmers have already started growing Patchouli in their tree gardens. Primary observations reveal that the practice will be highly beneficial on sustainable basis.

Project 9: Comparative studies on natural resistance of bamboos to biodegradation in Assam [RFRI/FP/08/2005-08]

Findings: Evaluation trial of eleven bamboo species was conducted for their natural resistance against the biodegrading agents under the natural conditions of Assam. Test yards were laid at three sites viz, at Jorhat, Nagaon and Burnihat and were observed for the period of 18 months. The final results revealed that *Bambusa pallida* and *Melocanna baccifera* as the most and least resistant bamboo species respectively based on biomass loss during the period.

Project 10: Investigations on the formation of Agar wood in *Aquilaria malaccensis* Lamk. [RFRI/FP/11/2006-07]

Findings: Symptoms of infected Agar trees have been identified. *Zeuzera conferta* (Walker), a stem borer larva along with the fungi viz., *Fusarium* spp., *Penicillium* spp., *Mucor*, *Rhizopus* spp., *Aspergillus* spp. and *Cladosporium* spp. were found to be associated with Agar wood formation in Agar tree. Artificial inoculation with dominant fungi isolated from diseased wood was found to be the best method for Agar wood inducement in Agar tree as compared to other artificial methods.



Infection in Agar (*Aquilaria malaccensis*) TS



Infection in Agar
(*Aquilaria malaccensis*) LS

Project 11: Appraisal of tree-crop association pattern in selected Jhum areas of North-East region for efficient land use under agroforestry [RFRI/SC/12/2008-09]

Findings: Keeping in view the objective to explore information on intercropping pattern and their socio-economic impacts, required for formulation of comprehensive agroforestry project

with an aim of efficient utilization of land, studies were carried out in specific areas of Meghalaya (selected Jhum practicing villages of West Garo Hills and East Garo Hills districts) and Mizoram (Aizawl district). Information on marketing channel and market data of raw and value added products were collected. New LUSs have also been observed in practice with some newly introduced crops under different programs of Govt. and Non-Govt. agencies.

EXTERNALLY AIDED PROJECT

Project 1: Establishment of a network to facilitate collection, processing and dissemination of statistics pertaining to tropical timber and other forestry parameters in India [RFRI/EP/16/2006-08]

Findings: Project concluded on 31st December 2008. Required information was submitted to the Directorate of Extension, Division of Statistics, ICFRE Dehradun. The revised format received from ICFRE was communicated to all State Forest Departments of North-East states for submission of forestry statistics information.

PROJECTS ONGOING DURING THE YEAR 2008–2009

PLANPROJECTS

Project 1: Investigation on propagation and cultivation of selected Rattan species [RFRI/EE/10/2006-09]

Status: An area of 0.25 ha of *Calamus flagellum* and 2.0 ha of *Calamus tenuis* were planted and growth data recorded.

Project 2: Improvement of Degraded Shifting Cultivation lands through introduction of *Thysanolaena maxima* (Broom Grass) along with *Cajanas cajan* as N₂ fixing plant [RFRI/SC/09/2006-09]

Status: The experimental plots situated at Deohari Rongpi Village (Silonjan) and Raising Rongpi village (Kohora) Karbi Anglong, Assam were maintained. Growth (Plant height, basal diameter, No. of culms/tussock, No. of panicles and length of panicles) and yield data of *Thysanolaena maxima* (Broom Grass) were recorded. No significant difference in growth was observed between 2m and 2.5m spacing trial and least growth was recorded in 1m spacing. The yield obtained from selected individuals planted with *Cajanas cajan* in a spacing of 2m was recorded maximum. Soil samples collected at different stages of growth showed high NPK content in planting stage in comparison to harvesting stage. Significantly high value was recorded in plots where *Thysanolaena maxima* were planted along with *Cajanas cajan*.

Project 3: Improvement of Agar/Agar wood production in *Aquilaria malaccensis* [RFRI/BG/20/2007-10]

Sub-project-I: *In-vitro* induction of essential oil components of *Aquilaria malaccensis* [RFRI/BG-20-I]

Status: Friable callus developed under *in-vitro* condition were transferred to liquid medium for suspension culture. Various elicitor molecules are being used in order to induce essential oil components in the medium.

Sub-project II: Survey and Selection of Desirable Genotypes of *Aquilaria malaccensis* and Establishment of their Field Gene Bank [RFRI/BG/20-II]

Status: Air layering was done in agar trees (*Aquilaria malaccensis*) of approximately 10-14 years old plantation at Nahorani Experimental Station, Nahorani, Golaghat district. The maximum number of roots recorded with treatment of IBA after 45 days.



Air layering in Agar
(*Aquilaria malaccensis*)



Rooting in air layered branches of Agar
(*Aquilaria malaccensis*)

Sub-project III: Clonal multiplication of *Aquilaria malaccensis* through *in-vitro* culture including hardening and out planting [RFRI/BG/20-III]

Status: Optimum shoots regeneration media has been standardized. Five fold multiplications achieved from regenerated shoots of auxillary bud explants.

Sub-project IV: Evaluation of insectidal properties of some plant extracts against *Heortia vitessoides* Moore (Lep. Pyralidae), a major pest of *Aquilaria malaccensis* Lamk. [RFRI/ BG/ 20-IV]

Status: Population dynamics studies of the defoliator *Heortia vitessoides* was carried out at three different districts of upper Assam (Golaghat, Jorhat and Sivasagar district). The extracts from five botanicals (*Azadirachta indica*, *Acorus calamus*, *Melia azedirach*, *Adhatoda vesica*, *Clerodendron viscosum*) were bioassayed against the *H. vitessoides* in laboratory and the maximum 97% antifeedant activity was shown by the extracts of *Azadirachta indica*, followed by 94% in case of *Acorus calamus*.

Project 4: Documentation of baseline information and restoration of selected stress sites under shifting cultivation through agroforestry in North-East India [RFRI/SC/11/2007-10]

Sub-project I : Documentation of baseline information on shifting cultivation in North-East India.

Sub-project II : Restoration of Jhum land through intercropping Rhizobium inoculated legume trees with agricultural crops in Assam.

Status:

Sub-project I : The analysis of data revealed that area under shifting cultivation has reduced from 73410 sq km in the year 1975 to 5476 sq km in 2001-2003 in North-East region. Major transformations observed in shifting cultivation is changes in land use pattern like establishment of cashewnut, arecanut, bamboo, orange, gamari, teak, tea plantations on fallow lands. Analysis of field data collected on shifting cultivation practices from eleven sites shows that shifting cultivation practices varies mainly with altitudinal gradient and social, cultural and economic status of Jhumia tribes.

Sub-project II : Experimental field trials were laid out in shifting cultivation land at Bey Killing and Phumen Ingti villages, Karbi Anglong, Assam through participatory approach. Control and Rhizobium inoculated seedlings of *Albizia lucida* and *Indigofera zollingeriana* planted at 10m x 10m spacing with 3 replications in RBD design were intercropped with hill paddy, maize and mixed crops. Composite soil samples were collected randomly at the time of sowing of crops and after harvesting.

Project 5: Establishment of GIS laboratory for systematic creation, management and up-gradation of GIS based forest database of North-East India [RFRI/EE/13/2007-10]

Status: Geometric corrections of 135 nos. of SOI Topographic Sheets (1:50,000 scale) done. Edge matching of the geo-referenced SOI topographic sheets done using proper projection parameters. Digitization of vector layers of reserve forest boundaries from the SOI topographic sheets completed for Assam. Geometric correction of geological zone map, agro ecological zone map and physiographic map of Assam done. Digitization of vector layer of geological zones, agro ecological zones and physiographic zones for Assam has been completed. Hyper linking of the created vector layers and geo-referenced SOI Topographic sheets done with the respective states. Forest cover data of North-East India (digital format) has been procured from Forest Survey of India, Dehradun. Bringing all this spatial and non spatial information in an integrated common GIS platform was done successfully.

Project 6: Genetic improvement of *Acacia mangium* for growth characteristics, pulp and timber quality [RFRI/BG-15/2007-10]

Status: Seeds collected from selected plus trees have been sown in nursery to raise the stock for assessment. A progeny-cum-demo trial of *Acacia mangium* has been laid out to study parent's offspring relation. Similarly a vegetative multiplication garden has been established to get explants for standardization of vegetative propagation technique for the species. In a rooting trial 10% success has been achieved.

Project 7: Development of an efficient technique for *in-vitro* clonal propagation of superior or clone of *Bambusa tulda* [RFRI/BG-17/2007-10]

Status: Multiple shoots developed in the shoot multiplication medium are transferred to various rooting medium for inducing roots *in-vitro*. For inducing roots, treatments with various root inducing hormones, polyamines, carbohydrates are being used.

Project 8: Macro and micro propagation of selected germplasm (clones) of *Dipterocarpus retusus* Bl. Syn *D. macrocarpus* [RFRI/BG/21/2007-10]

Status: Eighteen (18) selected genotypes of *Dipterocarpus retusus* have been established in the green house condition through rooting of shoot cuttings. Axillary bud and shoot tip regeneration was achieved *in-vitro*. Basal and optimal regeneration media has been standardized.

Project 9: Assessment of rattan diversity and conservation strategy with reference to Assam [RFRI/EE/12/2007-10]

Status: Survey was carried out at Dihing Patkai Wild Life Sanctuary (DPWLS), Kaziranga National Park (KNP) and Dibru-Saikhowa Biosphere Reserve (DSBR) and identified 6, 5 and 4 species respectively.

Calamus tenuis, *C. floribundus* and *C. flagellum* were found to be common species in all three study sites and *C. latifolius* was common in KNP and DPWLS only. *C. erectus* and *C. guruba*

are found in KNP and *C. leptospadix* in DPWLS. The species *Calamus tenuis* in Kaziranga National Park and *C. flagellum* in Dihing Patkai Wild Life Sanctuary were found to occur in clustered form. In Kaziranga National Park 940-1195 individuals of *C. tenuis* per hectare were recorded while in Dihing Patkai Wild Life Sanctuary, the total individuals were 490-600 per hectare.

Project 10: Study of Reproductive Biology and Seed Production in Clonal Seed Orchard of *Gmelina arborea* [RFRI/BG-22/2007-10]

Status: Periodical observations were made on the recurring seasonal vegetative and reproductive events. The number of flowers per inflorescence and inflorescence per branch was counted from randomly selected branches. Maximum of 23 number of flower buds per inflorescence were recorded in the clone.



Calamus flagellum in Dihing Patkai Wild Life Sanctuary

Pollen production was estimated. Diameter of fresh pollen grains was measured. Pollen fertility was assessed by staining them in 2% acetocarmine. The mode of pollination (wind and insect) was studied. Maximum activity of the active foragers like bumble bees (*Bombux haemorrhoidalis*) and *Apis dorsata* (Asian honey bee) and *Apis sarana* var. *indica* (Indian honey bee) was observed during the full light between 11.30 am and 2.00 pm. During the foraging activity, a large number of pollen grains were transferred to the body parts of the bees.



Flowering and fruit initiation in *Gmelina arborea*



Bumble bee (*Bombux haemorrhoidalis*) foraging nectar from Gamari flower

EXTERNALLY AIDED PROJECTS

Project 1: Validation, testing and locational trial of micro/macropropagated planting stock of selected bamboo species in North-East India [RFRI/EP/08/2004-07 extended up to 2009]

Status: Technical guidance to FIAs in Plantation management, observation recording at eight locational trials of North East states was given. Replacement of dead seedlings at locational trial sites has been done. Monitoring of growth and performance of plantations and tabulation of recorded data has been done by RFRI and TERI collaboratively.

Project 2: Sustained capacity enhancement of economically backward scheduled tribes of North-East region through composite R&D technologies [RFRI/EP/11/2006-09]

Status: Ginger and Turmeric rhizomes (2 quintals each) were planted in 2 ha mixed plantation area in participation with the villagers of the adopted village. Fertilizer dosages were applied

in the plantation area. Fish fingerlings were released in the fish pond that produced about 150 kgs fish and sold in the local market. Honey was also extracted by the villagers and sold in the local market. The amount received from sale of fish and honey was deposited in the bank account of the society formed by the villagers. Three-fourth of the earnings was distributed among the villagers and remaining one fourth was kept for purchase of fish fingerlings and feed for fish.

Project 3: Biological control of *Mimosa invisa*, a destructive alien weed threatening Kaziranga National Park (Grassland) [RFRI/EP/12/2006-09]

Status: Survey was conducted for association of bio-agent in the Mimosa infested areas. One insect larva was found to feed upon young leaves and twigs. Few fungal samples were also collected and further laboratory studies were done using pot planted Mimosa plants. However, fungal species failed to produce any disease on the Mimosa plants when applied artificially.

Project 4: Genetic improvement and conservation of genetic resources of some economically more important bamboo species of North-Eastern India [RFRI/EP/13/2006-09]

Status: Survey continued for selection of CPCs of bamboo, collection of clonal materials from selected CPCs. These clones have been multiplied and conserved in gene bank at RFRI, Jorhat. Yearly observations on survival, growth and performance of species-cum-clonal trial plantations established at all six sites in different North-East states have been recorded. The performance trial is better in Tripura (Teliamura) as compared to that in Nagaland (Jalukie), Assam (Kamrup and Hailakandi) and Mizoram (Aizawl and Virengte). Among species, *Bambusa balcooa* has been found to be performing better in terms of survival and growth attributes. Staggering plantation trial of *Melocana baccifera* has been established on permanent plot in RFRI campus. A new block has also been prepared and plantation of seed collected in year, 2008 has been established. Bamboo nursery has been regularly monitored for incidence of disease and pests. No such incidence has been observed in Muli trial and clonal trial sites.

Project 5: Biodiversity studies of orthoptera in Kaziranga National Park, Assam [RFRI/EP/14/2006-09]

Status: A total of 36 species of Orthoptera belonging to 30 genera and 4 families were recorded in different habitats viz., forest lands, savannahs and grass lands of Kaziranga National Park, Assam. The number of species found to be the highest (19 no.) in case of Acrididae family, followed by Tettigoniidae (9 species) and Mantidae (5 species); and the grasslands harbours greater number of Orthoptera species followed by savannahs and forestlands in Kaziranga National Park, Assam.

Project 6: Mapping and Quantitative Assessment of Geographic Distribution and Population Status of Plant Resources of Eastern Himalayan Region (Upper Assam unit) [RFRI/EP/15/2006-09]

Status: Survey and sampling of 87 belt transects of 80 sampling grid (6.5 kmX6.5 km of size approximately) of upper Assam have been completed so far. Information on tree, shrub and herb species of sampled area has been documented. Collection of specimens for preparation of herbarium has been done. About 60 herbarium were prepared. Photographs of all the species available have been taken. Data feeding for 53 belt-transect is completed so far. Data feeding is in progress for rest of the transects and will be completed soon. Periodic updating of the database is in progress. Creation of a GIS based dynamic data-base for upper Assam is under process.

Project 7: On-farm innovation in macro proliferation technique and promotion for commercial plantations of edible bamboo species [RFRI/EP/18/2008-10]

Status: The site was selected after extensive survey of nearby area of Edible Bamboo Shoot Processing Unit at Rongbonhat, Karbi Anglon district, Assam. Being potential species for edible bamboo shoot production, *Bambusa balcooa*, was selected for study. The Kisan nursery was established after imparting systematic training on raising planting stock using macroproliferation technique. Bamboo was planted at four different spacings i.e. 3m x 3m, 3m x 4m, 4m x 4m & 5m x 5m in RBD design with three replications. Weeding operation done in every three months interval. Survival percentage, growth parameter and number of culms produced per clump were recorded after every six months. The SHGs were motivated to participate in the activity through capacity building approach.

Project 8: Sustainable development of quality bamboo resource for employment generation and socio-economic development in North-East India [RFRI/EP/19/2008-11]

Sub-project I: Development of suitable agroforestry models for promoting bamboo cultivation outside forests in North-East region

Status: Conducted field survey in the four North-Eastern states namely Arunachal Pradesh, Assam, Nagaland and Tripura as proposed in the project and finalized 3 sites of 1 ha each in each of the states. Participatory appraisals have been conducted in the villages where the selected sites are located. Based on the appraisals, designs of agroforestry field trials for different locations have been prepared.

A Bamboo nursery of 10000 plantlet capacity has been established at Sotai village, Jorhat. Propagules of different bamboo species viz, *Bambusa balcooa*, *B. nutans*, *B. tulda* and *Dendrocalamus hamiltonii* collected from the Bamboo Germplasm Bank of RFRI have been used for multiplication and production of required planting stock.

The first phase of Farmers' Training on Bamboo Propagation, Cultivation and Management was organised from 12-14 May 2008 for the participating farmers from different sites selected under the project.

Sub-project II: Development of Clump Management practices for economically important bamboo species for enhanced production of quality culms and edible shoots

Status: Collected soil samples from three experimental sites from Agchia (Palasbari), Kamrup, Madhapur, (Titabor), Jorhat and Sotai to determine the initial nutrient content. Thirty clumps of 3 species in three sites finalized on the basis of uniform clump diameter in the farmers field to lay out experimental trial.

NEW PROJECTS INITIATED DURING THE YEAR 2008–2009

PLAN PROJECTS

Project 1: A study on the biodiversity of the plant resources of the patch vegetations around rural homestead in Jorhat district, Assam and its role in socio-economy of the villagers [RFRI/EE/15/2008-11]

Status: Study sites were selected and data on socio-economic status and their dependency on homestead forest of the villagers of Pokamua, Lahing, Boloma, Selenghat, Kakojan and Tamulisiga were collected. Phyto-sociological studies were done in patch vegetation at the above sites. Analysis of collected data of vegetation as frequency, density, dominance is in process. Composite soil samples were collected from above sites for analysis.



Project 2: Ecological assessment of medicinal plants in Nambor Reserve Forest and their socio-economic impact on fringe villagers [RFRI/EE/14/2008-11]

Status: Literature on medicinal flora of Nambor Reserved Forest was consulted & collected. Data collection format for Phyto-sociological studies were developed and tested in the field. Sampling for the enumeration of medicinal plants is under process. Socio-economic survey of one village namely Tegaani has been completed. Market survey for availability of medicinal plants & their source was done at Shillong, Karbi Anglong.

Project 3: Development of commercially viable dye products from selected plants of North-East Region [RFRI/BIK/02/2008-11]

Status: Survey was carried out in the nearby areas of Jorhat district and Nambor Reserve Forest for collection of *Baccaurea sapida*, *Aporusa dioica* and *Biscofia javanica*. Plants were identified with the help of BSI, Shillong and herbarium was maintained. The plant material was extracted and material to liquor ratio and time for isolation of dye has been optimized with the help of analytical facilities in Chemistry Division of FRI, Dehradun.

Project 4: Exploration and documentation of indigenous knowledge of Phyto-resources among Mishing tribe of Assam [RFRI/BIK/03/2008-10]

Status: Field visits were made to Mishing villages (viz. Bahfola, Lalitimukh, Neul gaon, Kumolia, Hatisal and Jopong. Sonari, Sundarpur, Bojalkota, Bheloguri in Jorhat District and Agoratoli, Dhaboati, Mohkhuti, Dhanbari Bamungaon, Palas bari, Dhansirimukh, Moriahola, Nikorighat, Amtenga, Alisinga, Ouguri, Nahorkhana Mishing gaon, Nikori under Golaghat District of Assam). Information on plant applications for Pneumonia-6, Worm problem-2, Ring worm-2, Stomach pain-4, Post natal pain-7, Nail infection-1, Urinary problem-8, Stop bleeding-1, Skin diseases-2, Fever-3, Dysentery-6, Nasal bleeding-2, Blood pressure-1, Easy delivery-1, Jaudice-2, Stomach pain-2, Cattle stomach pain-1, Blood dysentery-3, Cattle eye infection-1, Indigestion and lever trouble-1, Intestinal ulcer-1, Cuts-1, Cattle larval infection-1, Snake bite-1, Headache-1 was collected.

Project 5: Impact of climate change on litter microbial dynamics in Dipterocarp forest [RFRI/FP/13/2008-11]

Status: The leaf and litter samples were collected from two sites viz. Deomali (Arunachal Pradesh) and Moreh Town (Manipur) during winter season. Experimental site was selected at Deomali, Arunachal Pradesh to study the decomposition rate of leaf litter under natural conditions. Five fungal genera viz., Aspergillus, Fusarium, Curvularia, Mucor, and Alternaria, were observed to be noticeably dominant over others. Three genera viz. Aspergillus,, Fusarium, and Rhizopus were found to be thermo tolerant under laboratory tests.

Project 6: Seed production potential, seed and seedling quality of planting stock in seedling seed orchards of *Dipterocarpus retusus* (Syn *D. macrocarpus*) [RFRI/G/23/2007-10]

Status: Seedling seed orchard of *Dipterocarpus retusus* (Holong) at Deovan, Naharoni and Joypur has been assessed for seed production potential. Data on flowering and fruiting parameters collected. Seed were collected from Deovan. Seeds sown in nursery for assessment of germination behavior and quality of planting stock of different progenies of plus trees.

Project 7: Appraisal of tree-crop association pattern in selected Jhum areas of North-East region for efficient land use under agroforestry [RFRI/SC/12/2008-09]

Status: Different existing land use systems have been identified out of which most of them are traditional with transforming trends. New LUS have also been in practice with some newly introduced crops under different programs of Govt. and Non-govt. agencies. Site survey was also conducted to identify the suitable sites for field research trials.

EXTERNALLY AIDED PROJECT

Project 1: Assessment of Land Use pattern on Jhum land and Investigation of Production Related Parameters [RFRI/EP/20/2009-11]

Status: The project was initiated in January 2009. Site survey was conducted for identification of parameters to prepare data cataloguing sheets. Planning for execution of future course of action has been prepared during the workshop in consultation with the Coordinating Agency and DST officials.

EDUCATION AND TRAINING

Trainings

Conducted

1. Farmers' Training on Bamboo Cultivation for Sivasagar Forest Development Agency on 19th September 2008 at RFRI, Jorhat (Assam).
2. Propagation, Cultivation Technology and Value addition of Bamboo for Eco-development Committees of Kaziranga National Park and adjoining areas on 9th November 2008 at RFRI, Jorhat.
3. Bamboo Cultivation under NBM for Farmers and JFMC member of Sivasagar FDA, Sivasagar (Assam) at RFRI, Jorhat on 27th March 2009.
4. Organized the visit of school students of different districts of Assam under Assam Chief Minister's Gyanjyoti Scheme on 24th and 25th October 2008.
5. On-site awareness programme under Technology Transfer Programme on Capacity building of SHGs for sustainable livelihood through forestry activities from 5th to 9th February 2009 at Gibbon Wild Life Sanctuary, Jorhat, Assam.
6. Technology transfer programme for sustainable livelihood of Jhumias through plantation of cash crop (Broom grass) at Deohari Rongpi Village, Silonijan and Raising Rongpi Village, Kohora (Karbi Anglong), Assam on 16th February and 3rd March 2009.
7. One week (16th to 21st February 2009) training on Capacity Building/Extension of Forestry for JFMC Members/Stakeholders under Van Vigyan Kendra Hathipara, Gandhigram, Agartala, Tripura to JFMC members, farmers and field staff.
8. Participatory Rural Appraisal for Preparation of Micro plan for Demo Village, Melang Grant organized at Melang Grant village from 6th to 9th February 2009.



Attended

1. Training on 'Mainstreaming Biodiversity in Impact Assessment' held at WII, Dehradun from 18th to 22nd August 2008.
2. Workshop on 'Recent Advances in Microbial Biotechnology and Molecular Biology' from 6th to 10th October 2008 at NERIST, Nirjuli, Arunachal Pradesh.
3. Training on Recent Advances in Agroforestry w. e. f. 24th November to 5th December 2008 held at National Research Centre for Agroforestry, Jhansi, UP.
4. National Seminar on Bio-resources of North-East India: Industrial potential and Intellectual property Rights Issues on 2nd and 3rd January 2009 at Nowgong College, Nagaon (Assam).
5. National Workshop on Extension Strategies in Forestry Research and presented detailed account of VVK and Demo Village of RFRI on 15th and 16th January 2009 at ICFRE, Dehradun.
6. National Seminar on Exploitation, Utilization and Strategies Action Plan for Sustainable Management of Plant Resources on 27th and 28th February 2009 at Gauhati University, Guwahati (Assam) and presented paper.
7. National Seminar on Bio-piracy: Imminent threat to the conservation of Biodiversity and Bioprospecting of flora and vegetation of NER, held at DKD College, Dergaon, Golaghat (Assam).
8. Training on Bioreactor operation and scale up studies of plant cell culture (1st to 13th December 2008) at Institute of Himalayan Bioresources, Palampur (HP).
9. Training on Biotechnological tools & techniques for plant biodiversity and conservation study from 19th to 31st January 2009 at North-East Institute of Science & Technology (NEIST), Jorhat.
10. Advanced training on non-timber forest produce at Dr. Y. S. Parmar University of Horticulture & Forestry at Solan, during 16th February to 8th March 2009.
11. Meeting on Climate Change adaptations at Assam Secretariat, Guwahati, Assam on 4th March 2008 with German Development Bank.

VAN VIGYAN KENDRA PROGRAMME

RFRI, Jorhat established five Van Vigyan Kendras in the states of Assam, Arunachal Pradesh, Tripura, Mizoram and Nagaland.

Five two-day trainings each in Assam (Jalukbari, Makum, Silchar, Tezpur), Nagaland (Dimapur, Mokakchaung, Peren, Wokha and Kohima), Mizoram (Forest Training School, Aizawl) and two one week trainings at Arunachal Pradesh (Itanagar and Zero), Tripura (Hathipara Research Station, Agartala) were imparted to frontline officials of State Forest Departments, JFMC members, NGOs, farmers during 2008-09.

Trainees were trained in wide range of subjects of stakeholders need like agroforestry practices; bamboo propagation, cultivation, preservation and value addition; nursery practices of rattans; NTFPs marketing; medicinal plants cultivation; Panchakarma uses of medicinal



Vermicompost unit at Hathipara, under VVK Tripura

plants; plantation technology; pest and disease management; vermicomposting; and biofertilizers.

Modern nurseries were created in all the five VVKs for training and demonstration purposes. The VVKs were supplied with literature in different subjects. Audio-visual CDs were prepared for distribution to the VVKs. These were also equipped with extension equipment such as LCD projector, camera, PA system, exhibition display system, furniture, almirah, computer, bouchery machines for bamboo preservation.

RFRI Demo Village – The Meleng Grant

Selection of Demo Village: The Meleng Grant village adjacent to the Gibbon Wild Life Sanctuary in Jorhat District was selected as the RFRI Demo Village. This single village comprises of three hamlets viz. Bhogpur, Madhupur and Govindpur with a total of 220 households.

Training for Capacity Building: Training on Participatory Rural Appraisal (PRA) and Microplanning was organized during 05th to 09th February 2009. Other trainings on different aspects viz. Bamboo Nursery, Vermicomposting have already been conducted during the current financial year.

Participatory Implementation: A local TTMC (Technology Transfer Monitoring Committee viz. Trinayan Unnayanmukhi Committee) has been constituted by the villagers. The committee visits the sites as per schedule and maintains the records of feed backs and advice besides recording the field data. It has also been agreed by the individuals and groups to contribute 5% of the income to the Committee's Account. The committee has already opened their Bank Accounts with State Bank of India and Union Bank.

Two Patchouli Nurseries of about 3 lakhs plantlet production capacity has already been established. Two Bamboo Treatment Tanks have been installed and brought under operation. The bamboo culms will be treated with the techniques developed by RFRI. Treated bamboos will be fetching income to the farmers by selling it with at least 10 % more income. Twenty two number of Vermicompost Units have been constructed.

LINKAGE AND COLLABORATION

The linkage were established with State Forest Departments of all North-Eastern states, Central/State Universities, other research organizations, NMBA, MoEF, NBM, NABARD, DBT, NEC and NGOs working in the field of forestry and forestry research. Multi-locational trials of three bamboo species and clonal trials of six bamboo species are being conducted in association with SFDs. Bamboo based agroforestry demonstration plots have been established in Assam, Arunachal Pradesh, Nagaland and Tripura states.

CONSULTANCIES

- Consultancy awarded by Principal Chief Conservator of Forests, Department of Forests, Ecology, Environment & Wild Life, Government of Nagaland, Kohima for preparation of project proposals for funding under Central Sector Scheme for Conservation, Development and Sustainable Management of Medicinal Plants Scheme of National Medicinal Plants Board, GoI, New Delhi.
- Successfully completed the consultancy on first concurrent monitoring and evaluation of the projects of North-East States except Tripura and internal monitoring and evaluation of the projects under Golaghat Forest Development Agency (FDA) sponsored by National Afforestation and Eco-development Board (NAEB), Ministry of Environment & Forests (Govt. of India).



Newsletter/ Technical Bulletins/ Manuals/ Reports/ Chapter in Books

- RFRI (2009), RFRI Newsletter (VVK Issue). Vol. 1 (No. 1), January to March 2009: 8p
- Bamboo Cultivation: An Opportunity for Livelihood Needs, RFRI Publication.
- Rattan Nursery & Plantation: Techniques & Practices, RFRI Publication.
- *Mimosa invisa*- Alien Invasive Species, Pamphlet, Rain Forest Research Institute, Jorhat, Assam: 6pp (English & Assamese version).

Brochures

1. Vermicompost Production Technology and its Role in Increasing Soil Productivity, RFRI/BR-18/2009.
2. Self Employment through Scientific Patchouli Cultivation, RFRI/BR-19/2009.
3. Compost- Methods of Preparation and its Importance, RFRI/BR-20/2009.
4. Bamboo nursery by Scientific Method: A Way of Self Employment, RFRI/BR-21/2009.
5. Bamboo Preservative Techniques, RFRI/BR-22/2009.
6. The Bamboo Flowers: Its Problems and Remedies, RFRI/BR-23/2009.
7. Hollong Nursery Techniques: Theory and Practices, RFRI/BR-24/2009.
8. *Michelia champaca* Linn. (Titachapa).
9. *Gmelina arborea* (Gamari).
10. *Anthocephalus sinensis* Linn. (Kadam).
11. Bamboo Nursery Techniques: Theory and Practices.
12. Rattan Nursery Techniques: Theory and Practices.
13. *Acacia mangium* - A Prospect Tree Species for North-East.
14. *Aquilaria malaccensis* Lamk. (Sachi).
15. Mimosa- An Alien Invasive Species.
16. Sarpagandha (*Rauwolfia serpentina*).

Book/Training Manual

1. Bamboo in North-East India: A Management Guide, Vol. II.
2. *Dipterocarpus retusus* Syn. *D. macrocarpus*.

CONFERENCE/MEETINGS/WORKSHOPS/SYMPOSIA/EXHIBITIONS**Attended**

The representatives from The Rain Forest Research Institute (RFRI), Jorhat, Assam attended the Workshops/Seminars/Conferences/Symposia as given below during the period under report:

1. National Seminar on Exploitation, utilization and strategies action plan for sustainable management of plant resources on 27th and 28th February 2009 at Guwahati University, Guwahati (Assam).



2. National Seminar on Bio-piracy: Imminent threat to the conservation of Biodiversity and Bioprospecting of flora and vegetation of NER, held at DKD College, Dergaon, Golaghat (Assam).
3. National Seminar on Exploration, Utilization and Strategy Action Plan for Sustainable Management of Plant Resources, organized by Department of Botany, Guwahati University, Assam on 27th to 28th February 2009 Abstracts of Papers: 93p.
4. Symposium on Forest Insect – Pest and disease management in Himalaya organized by Himalayan Forest research Institute, Panthghati, Shimla, H.P. held on 10th and 11th January 2008, pp20 (Abstract).

Organized

RFRI, Jorhat, organized a “National Conference on All India Co-ordinated Project on Bamboo” at Indian Institute of Entrepreneurship, Guwahati, Assam on 23rd May 2008.



Hon'able Chief Minister of Assam Sri Tarun Gogoi in inaugural session of National Conference on All India Co-ordinated Project on Bamboo at IIE, Guwahati, Assam

Exhibition/Fairs/Kissan Mela

1. Participated in the Exhibition at DCB College, Jorhat (Assam) in commemoration of its Golden Jubilee Celebration on 9th and 10th January 2009.
2. Participated in the Exhibition on the occasion of 7th Kaziranga Elephant Festival at Kohora, Kaziranga, Golaghat (Assam) from 9th to 12th February 2009.
3. Participated in the Science Exhibition on the occasion of 16th National Children Science Congress-2008, State Level, Jorhat (Assam) from 23rd to 26th October 2008.
4. Participated in the Regional Agricultural Fair 2008 to be held at Saramsha Exhibition Center, Ranipool, Gangtok, Sikkim from 1st to 3rd December 2008.



RFRI participation in 7th Kaziranga Elephant Festival, Kohora



RFRI participation in Regional Agriculture Fair in Gangtok, Sikkim

DISTINGUISHED VISITOR

Thailand Embassy dignitaries visited RFRI, Campus on 7th January 2009.

MISCELLANEOUS

Sri Mridul Saikia, TA Grade-IV of this Institute who represented ICFRE in the XVII All India Forest Sports Meet held at Chandigarh, Punjab bagged the BRONZE MEDAL in Weight Lifting 77 kg category competition.



Sri Mridul Saikia
with Bronze Medal

ADVANCED RESEARCH CENTRE FOR BAMBOO AND RATTANS, AIZAWL

Advanced Research Centre for Bamboo and Rattan (ARCBR), Aizawl (Mizoram) is one among the network of eight Institutes and four centres under aegis of the Indian Council of Forestry Research and Education, Dehradun, an autonomous body under Ministry of Environment and Forest, Govt. of India. The Centre is first of its kind in India for socio-economic upliftment of North-Eastern people that revolve around Bamboos and Rattans. The Centre is aimed to cater the bamboo and rattan related research needs of all the eight North-Eastern states viz., Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim. In addition, the Centre is entrusted to support various research activities of RFRI in Mizoram, Tripura and Barak Valley of Assam states. The Centre is mandated to conduct advance research on Bamboo & Rattan with regard to management and sustainable utilization, standardization of nursery technology including cultivation practices, macro and micro propagation, diversity enrichment, genetic improvement and conservation of promising genetic resources, certification, technology development for value addition, edible shoot processing, product development including bamboo composites, Bamboo based tools/machines for bamboo working, extension of bamboo based knowledge and technologies to stakeholders. The Centre is presently in establishment stage and is equipping and aligning itself to fulfill the mandate.

PROJECT ONGOING DURING THE YEAR 2008-2009

PLANPROJECT

Appraisal of tree-crop association pattern in selected Jhum areas of North-East Region for efficient land use under agroforestry (RFRI/SC/12/2008-09) of RFRI in Mizoram.

EXTERNALLY AIDED PROJECT

Project 1: Validation, testing and locational trial of micro/macro propagated planting stock of selected bamboo species in North-East India [RFRI/EP/08/2004-09].

Project 2: Genetic improvement and conservation of genetic resources of some economically more important bamboo species of North-Eastern India [RFRI/EP/13/2006-09].

LINKAGES AND COLLABORATION

1. Technical Meeting with Forest Officers/Officials of Aizawl Forest Division at Aizawl (Mizoram) on 17th May 2008 related to management of Bamboo Species-cum-Clonal Trial.

2. Technical Meeting with Forest Officers/Officials of Kolasib Forest Division at Kharjawl (Mizoram) on 6th June 2008 related to management of Bamboo Species cum Clonal Trial.
3. Visited Model Nursery of Mamit Forest Division, Mizoram on 30th January 2009 and extended technical advice to the forest official regarding management of nursery, proper upkeep of the bamboo planting stock, installation of essential nursery components and measures to overcome the mortality problems in nursery stocks.
4. Extended technical advice to the Nodal Officer-VVK, E & F Deptt., Mizoram in designing the training programmes, finalizing topics and preparing the course material.

PUBLICATIONS

Brochures

1. Bamboo Cultivation: Choice of Species, ARCBR/BR/01
2. Propagating Bamboo, ARCBR/BR/02
3. Bamboo Plantation Management (for better productivity), ARCBR/BR/03
4. Propagating Rattans, ARCBR/BR/04

CONFERENCES/MEETINGS/WORKSHOPS/SYMPOSIA/EXHIBITIONS

Attended

The representatives from Advanced Research Centre for Bamboo and Rattan (ARCBR), Aizawl (Mizoram) attended the Workshops/Seminars/Conferences/Symposia as given below during the period under report:

1. Fifth Meeting of Scientific Advisory Committee – Consortium on Micropropagation Research and Technology Development (SAC-CMRTD) held on 11th April 2008 at DBT, New Delhi.
2. First Meeting of the Working Group of National Bamboo Mission on R&D held on 14th and 15th October 2008 at Krishi Bhawan, New Dehli.
3. Tenth Central Monitoring Committee Meeting of MoEF held on 14th January 2009 at Agartala (Tripura).

Organized

1. Two days Farmers Awareness Programme organized on 20th and 21st November 2008.
2. Awareness Campaigns conducted in remote areas of southern Mizoram including Phawngpui, Cheural, Rawlbuk, Lungpher, Siachangkawn, Kawlchaw, New Lataw, Saisih, Khawmawi, Hmunnuam and Bualpui villages from 27th January to 2nd February 2009.



Awareness Campaign at Kawlchaw village

Training programme on "Cultivation and sustainable use of Bamboo and Rattans" organized at Sangau-II village in Saiha District on 29th January 2009 and at Phura village under Mara Autonomous District Council of Mizoram on 31st January 2009.