CHAPTER V

RAIN FOREST RESEARCH INSTITUTE JORHAT

The Rain Forest Research Institute (RFRI) was established at Jorhat, Assam in the year 1988. The main objectives of the Institute are Conservation of Biodiversity resources of North-East States, Eco-restoration of degraded forests and management of shifting cultivation practice, development of technology for sustainable utilization of forest resource – Bamboo and rattan, genetic improvement and propagation of important tree species of North-East Region, afforestation and silviculture management, management of pests and disease in forestry and technology transfer to user groups.

PROJECTS COMPLETED DURING THE YEAR 2004-2005

Project 1: Management of seed and soil borne diseases of *Gmelina arborea* and *Dipterocarpus retusus* in nursery [RFRI/FP-05/2000-2004]

Findings: Major nursery diseases of *G. arborea* have been identified. Control strategies have been evolved to minimize the losses to seed and seedlings of *G. arborea* by fungal pathogens.

Work on seed and seedling diseases of *Dipterocarpus retusus* is a pioneering one and have been reported and described for the first time. User-friendly protocol has been developed for the management of seed and seedling pathogens of *D. retusus*.

Project 2: Development of VAM as biofertilizer for some economically important forest plant species of Assam and Arunachal Pradesh [RFRI/FP-07/2000-2004]

Findings: Diversity and dynamics of VAM fungi in a cafeteria plantation of 20 fuelwood species have been assessed. The range of percent root colonization significantly varied from *L. nitida* (10.67%) to *A. lebbek* (29.17%) and *S. saman* (29.33%). The study of seasonal variation of VAM spore population associated with twenty species revealed that the spore population started increasing from February and reached the maximum in the month of June.

PROJECTS CONTINUED DURING THE YEAR 2004-2005

Project 1: Evaluation of different existing land use systems for development of viable economic models in North-East India [RFRI/SC-06/2003-2008]

Status: Survey, selection and collection of productivity data of different land use systems in Nagaland is in progress. Cost benefit ratio of settled and jhum cultivation, Kadam and Teak plantation in Nagaland. Soil nutrient status of Pineapple, Teak and Bamboo plantations of Silonjan, Karbi Anglong were evaluated.

Settled Cultivation

Pineapple Cultivation

Project 2: Growth, Biomass and energy production potential of selected energy plantation species [RFRI/ SC-7/2003-2006]

Status: Field trials were set in the Naharoni Field Station and frequent field visits were made for collection of growth data of different fuel wood species. Sample trees were harvested and biomass estimation was completed. The calorific value of different fuel wood species was also determined. Three promising species were identified based upon their growth parameters and high energy value.

Mallotus albus (Promising Fuel wood species)

Project 3: Ecological studies on Dipterocarp forest of Gibbon Wildlife Sanctuary of Assam [RFRI/EE-04/2003-2006]

Status: Ecological assessment of Dipterocarp forest with reference to distribution, abundance rarity and profile sketch of evergreen forest is being carried out in Gibbon Wildlife Sanctuary. Enumeration of tree species was carried out in natural, plantation and disturbed sites of the area. Preliminary data showed that thick canopy cover and biotic interference are responsible for poor regeneration of Dipterocarp.

Project 4: Genetic improvement of *Pinus kesiya* (Khasi pine) [RFRI/TI-08/ 2002-2005]

Status: Evaluation and monitoring of established Seed Production Areas is in progress. Thirty three plus trees were selected in the state of Meghalaya. Seed from plus trees were collected and progenies of the same were raised to establish Seedling Seed Orchard. Seed and cone parameters of different plus trees were estimated. A new record of presence of cone clusters in Khasi pine was also recorded.

Plus Tree Khasi pine

Cone Clusters

Project 5: Stability test of various progenies and clones for different characters in *Gmelina arborea* [RFRI/TI-10/2003-2006]

Status: Evaluation and monitoring of National and regional progeny trials is in progress. Collection of seed from seed orchards and supply to different institutes for gap filling has been completed. The growth data of progeny trials has also been recorded.

Project 6: Reclamation of highly eroded site at Cherrapunjee, Meghalaya [RFRI/SM-04/ 2003-2006]

Status: Experimental area was replanted during May, 2004 with *Alnus nepalensis* and *Exbucklendia populania*. The growth and survival data were taken. The survival percentage of *Exbucklendia populania* and *Alnus nepalensis* was found to be 98.09 % and 96.87 %, respectively. After six months of plantation it was observed that in case of *Alnus nepalensis* the treatment combination $P_2W_1M_0F_1$ shows better growth while for *Exbucklendia populania* $P_1W_1M_1F_1$ gives the highest growth.

Replanted seedlings

Project 7: Studies on distribution dynamics of Bamboo and Canes and their *ex-situ* conservation [RFRI/EE-03 / 2004-2007]

Status: *Ex-situ* conservation of 3 Bamboo species was completed. Identification of different Bamboo species based on morphology is in progress. Recording of growth data and maintenance of propagules / new culms is in progress.

Project 8: Germplasm collection, conservation and mass multiplication of selected medicinal plants of North-East India [RFRI/EE-05/2003-2006]

Status: Collection and *ex-situ* conservation of five different selected species (*Bacopa monnieri*, *Andrographis paniculata*, *Plumbago zeylanica, Plumbago indica* and *Asparagus racemosa)* of medicinal plants have been completed at RFRI campus. Identification of plant species and maintenance of collection is in progress.

Project 9: Germplasm evaluation of selected Bamboo species for various end uses [RFRI/ SM-03/2003-2006]

Status: Clonal trial in split plot design was established. Growth data of six month seedlings and 11 months old trials at Naharani Research Station has been collected. 15 Plus clumps of *Dendrocalamus hamiltonii* were tried for rooting. Improved planting stock of *Bambusa balcooa*, *B. nutans*, *B. tulda* and *Dendrocalamus hamiltonii* has been maintained. About 3200 ramets and the periodic management works are being carried out at regular intervals.

Project 10: Capacity building of village level committee for efficient forest resource management through JFM [RFRI /CFE-01/ 2002-2006]

Status: Resource survey of area was conducted in order to identify the local problems and based on the problem ranking through PRA, micro - plan modules have been developed. Scientific remedial measures were suggested so as to overcome certain problems. Layout design has been prepared for Agroforestry models on the basis of species preference of local communities. Bamboo treatment technique was demonstrated in 6 villages of the Island to generate technical awareness among farmers and to encourage them to use treated Bamboo for greater longevity.

Project 11: Studies on yield and quality traits of fragrant products from selected humid-tropical aromatic plants [RFRI/ CFE-02/2002-2005]

Status: Information regarding harvesting, post-harvesting, extraction and storage practices being adopted by farmers, NGOs and entrepreneurs were collected. Leaf samples from the plants under different maturity stages were analyzed for oil content. Organoleptic characteristics, moisture content and fresh to dry weight ratio of different leaf samples were evaluated. Effect of drying mode of Patchouli leaves on the recovery of oil was studied and appropriate drying method was suggested. TLC fingerprinting for Patchouli leaves was carried out to evolve phyto-chemical parameters for authentication of the leaf raw material even in dried and powdered form.

Extraction of Patchouli oil

Testing Effect of containers on shelf oil life

Patchouli leaves

NEW PROJECTS INITIATED DURING THE YEAR 2004-2005

Project 1: Genetic improvement and clonal propagation of *Dipterocarpus retusus* [RFRI/TI-11/2004-2007]

Status: In view of early flowering and fruit setting in some progenies, the study of floral behaviour and fruit setting of different progenies was undertaken to explore the possibility of getting abundant seed to conserve this threatened species. Significant variation was observed in different progenies for flowering and fruit setting. The period of flowering ranged from June to January with flowering mean duration of 105 days. In all the progenies, fruiting was recorded from 1.63 to 14.28 per cent. In the first flush of flowering in some progenies, less than 0.08 per cent fruit setting was observed.

In progenies performance evaluation, significant variation was observed among all the progenies for different traits. Clonal propagation trials are in progress to develop a suitable protocol of the species.

Flower and Fruit Drop

Project 2: Development of an eco-friendly strategy for the management of *Calopepla leyana* Latr., a serious pest of *Gmelina arborea* (Roxb.) [RFRI/FE-11/2004-2007]

Status: *Beauveria bassiana* and *Metarrhizium anisopliae* are identified as natural enemies of *Calopepla leayana* from different insect groups. Entomopathogenic fungi was found effective against both larval and adult stages of *C. leayana*. Bakery waste/desolate bread was identified as one of the suitable substrate for the mass production of *B. bassiana*.

Pathogenic effect of *Beauveria bassiana* on *Calopepla leayana*

Project 3: Development of Patchouli based viable agroforestry models for North-East region of India [RFRI/CFE-04/2004-2007]

Status: 4000 plantlets of Patchouli were raised through vegetative multiplication in root trainers. Alley cropping trials with leguminous crops was laid. Laying of *on-station* and *on-farm* agroforestry trials is under progress.

PROJECTS COMPLETED DURING THE YEAR 2004-2005

(Externally Aided)

Nil.

PROJECTS CONTINUED DURING THE YEAR 2004-2005

(Externally Aided)

Project 1: Assessment of biological diversity of various ecosystems and to establish methods for conservation in the Kaziranga

National Park of Assam [RFRI/EP-05/2003-2006]

Status: Quantitative structure, population dynamics of forest communities and grassland productivity has been analysed in the Kaziranga National Park. Three communities were identified in woodland species. Richness was found higher in semi- evergreen forest area of the park.

Grassland enumeration and biomass study has indicated the distinct characters of tall and short grass community.

Data collected reveals the presence of endangered species, rare orchids and rattan species for the first time in Kaziranga National Park, Assam.

A rare ground orchid (*Zeuxine affinis*) in Kaziranga National Park

Savannah Forest (Kaziranga National Park)

Calamus nambereinsis an endemic and endangered rattan from (Kaziranga National Park)

Project 2: Contribution of N_2 fixing plants on improvement of abandoned fallow in shifting cultivation [RFRI/EP-04/2003-2006]

Status: Better enhancement of chemical properties of soil due to addition of *Crotolaria pallida* was recorded. Available NPK was higher after the application of *Crotolaria pallida* followed by *Sesbania bispinosa* and *Cajanus cajan* respectively. Economic analysis is under progress.

Project 3: Indigenous knowledge of Angami tribe in sustainable management of biodiversity in Nagaland, India [RFRI/EP-03/2003-2006]

Status: Documentation of resource use pattern such as medicinal, fodder, wild edible plant, dye and gum etc. has been completed. The important medicinal plants used by this tribe has been listed. Angami tribe use different indigenous techniques for preservation of dry food and also crop in field.

Drying technique of foodstuff

Project 4: Conservation of productive land and promising flora of Majuli Island in Bramhaputra river [RFRI/EP-05/2003-2006]

Status: Problem ranking of the area has been done through PRA exercises. Micro-plan has been prepared to conserve productive soil and promising flora to enhance productivity and resource conservation through PRA methodology.

Resource survey of the area has been under taken and 150 medicinal/promising plants were inventorized.

Project 5: Control of soil and riverbank erosion in Majuli through Bamboo based vegetative embankment [RFRI/EP-07/2004-2007]

Status: The project site has been demarcated and treatment area has also been stratified into four zones as per the technical programme. 12 Kissan Nurseries were established and Village Level Committees (VLCs) in all the five villages were formed. More species suitable for the vegetative embankment were identified. For establishment of Bamboo based soil erosion, control riverbank protection structures, various designs like Water Current Deflector, Bank Wall, etc. have been prepared and finalized to be established at the site based on the erosion pattern.

Project 6: Validation, testing and locational trial of micro/macro-propagated planting stock Bamboo species in North-Eastern India [RFRI/EP-08/2005-2008]

Status: With the consultation of TERI lay out and package of practices for Bamboo locational trails in all the seven North-Eastern states has been prepared.

Project 7: Financial assistance for improvement of infrastructural facilities in Botanical Garden/Centres of *ex-situ* conservation at Rain Forest Research Institute Jorhat, Assam [RFRI/EP-09/2003-2006]

Status: Construction of shade cum poly house, orchidarium and installation of irrigation facilities has been taken up. Twenty species of rare Orchids of North-East region have been collected.

Ex –situ conservation of Orchids of North-East

Shade cum poly house constructed under MoEF funded project for development of botanical garden at RFRI

RESEARCH ACHIEVEMENTS

Name of State	No. of Projects completed in 2004-2005	No. of on-going Projects in 2004-2005	No. of Projects initiated in 2004-2005
Assam	2	17	3
Meghalaya	-	6	1
Manipur	-	4	-
Tripura	-	5	-
Nagaland	-	4	-
Mizoram	-	3	-
Arunachal Pradesh	-	3	-

TECHNOLOGY ASSESSED AND TRANSFERRED

One site training programme on Compositing and Vermi-composing was organized at Majuli from 1st and 2nd April, 2004 for Kissan Nursery holders.

Three training programme on different aspects of Bamboos were organized at RFRI for the Foresters and Forest Guards of Assam and Arunachal Pradesh.

EDUCATION AND TRAINING

Dr. A. N. Singh, Scientist-C and Dr. K. Panneer Selvam, Scientist-B of this Institute participated in the training-cum-workshop on *"Advanced Environmental Management Systems, Auditor Training Course (IEMA Approved)"* from 23rd to 27th November, 2004 at ICFRE, Dehradun.

LINKAGES AND COLLABORATION

The linkage and collaboration were established with SFDs of Noth-East States and other research organizations like G.B. Pant, NMBA, MoEF, DBT, DST, NEC and NGOs working in the field of forestry and forestry research.

PUBLICATION

Abstracts

1. Kaushik, P.K. and Tripathi, Y.C. (2004). Microplan Modules for Community Based Management of Biological Embankment Programme, *IInd International Conference on Scour and Erosion (ICSE–2)*, from 14th to 17th November, 2004, Singapore.

2. Kaushik, P.K.; Pandey, B.K. and Tripathi, Y.C. (2004). Medicinal Plant Based Agroforestry for Tackling Raw Material Crisis in Herbal Drug Industries, *2nd Global Summit on Medicinal and Aromatic Plants*, organized by Century Foundation in New Delhi from 25th to 29th October, 2004.

3. Kaushik, P.K.; Pandey, B.K. and Tripathi, Y.C. (2004). Participatory Approach to Watershed Management in India, *National Conference on Resource Conserving Technologies for Social Upliftment*, organized by Indian Association of Soil and Water Conservations at Central Soil and Water Conservation Research and Training Institute, Dehradun from 7th to 9th December, 2004.

4. Pandey, B.K.; Kaushik, P.K. and Tripathi, Y.C. (2004). Medicinal Flora of Majuli Island – An Ethnobotanical Appraisal, *2nd Global Summit on Medicinal and Aromatic Plants*, organized by Century Foundation in New Delhi from 25th to 29th October, 2004.

5. Pandey, B.K.; Tripathi, Y.C. and Kaushik, P.K. (2004). Soil Stabilization and River Bank Protection through Bamboo Based Biological Embankment Around Majuli Island, VIIth *World Bamboo Congress 2004*, from 27th February to 4th March, 2004, New Delhi.

6. Singh, J. and Bora, I.P. (2004). Scared Groves of Meghalaya – status, floristic composition and conservation strategies National Workshop on Strategy for conservation of scared groves, ogranized by I.F.G.T.B., Coimbatore from 27th and 28th May, 2004.

7. Singh, Ombir and George, M. (2005). Conservation of genetic resources of non-mulberry host trees in Northeast India. *In Workshop on Strategies for non-mulberry Germplasm maintenance* from 10th and 11th March, 2005. Organized by Central Muga Eri Research and Training Institute, Central Silk

Board, Ministry of Textiles, Govt. of India, Lahdoigargh, Jorhat, Assam, pp. 37-44.

8. Singh, Ombir and Mahanta, N. Genetic Improvement of Khasi pine (*Pinus kesiya*) in North-east India. Abstract accepted in 2004 in IUFRO Conference on *Forest Genetics and Tree Breeding in the Age of Genomics* at South Carolina, USA.

9. Tripathi, Y.C. and Pandey, B.K. (2004). Socio economic and Environmental Impact of Biological Embankment at the Eroding Bank of Majuli Island in Brahmaputra River, *IInd International Conference on Scour and Erosion (ICSE–2)*, from 14th to 17th November, 2004, Singapore.

10. Tripathi, Y.C.; Kaushik, P.K and Pandey, B.K (2004). Modern Phytomedicines – Paradigm of Ancient-Modern Concordance, *2nd Global Summit on Medicinal and Aromatic Plants*, organized by Century Foundation in New Delhi from 25th to 29th October, 2004.

11. Tripathi, Y.C.; Kaushik, P.K. and Pandey, B.K. (2004). Bamboo Identification – A Morphological Consideration. *VIIth World Bamboo Congress 2004*, from 27th February to 4th March, 2004, New Delhi.

12. Tripathi, Y.C.; Kaushik, P.K. and Pandey, B.K. (2004). Conservation of NTFPs for Efficient Forest Management, *National Conference on Resource Conserving Technologies for Social Upliftment*, organized by Indian Association of Soil and Water Conservations at Central Soil and Water Conservation Research and Training Institute, Dehradun from 7th to 9th December, 2004.

13. Tripathi, Y.C.; Pandey, B.K. and Kaushik, P.K. (2004). Riverbank Erosion – Bioembankment, *VIIth World Bamboo Congress 2004*, from 27th February to 4th March, 2004, New Delhi.

Technical Bulletins

Meena, C.R.; Tripathi, Y.C. and Saikia, D. (2004). Positive response to selection for flowering in *Dipterocarpus retusus-Future prospects*. Submitted to ICFRE, Bulletin, Newsletter, 2004.

CONSULTANCY

R.F.R.I. successfully completed the consultancy on evaluation of Afforestation and Tree Planting activities in Dimapur District of Nagaland, sponsored by National Afforestation and Eco-develpment Board (NAEB), Ministry of Environment and Forests (Govt. of India) under Integrated Afforestation and Eco-development Projects (IAEP) on January, 2005.

CONFERENCES/MEETINGS/ WORKSHOPS/SEMINARS/ SYMPOSIA/EXHIBITIONS

Organised

1. R.F.R.I., Jorhat organized a meeting on Planting stock of Bamboo species on 14th December, 2004. The meeting was sponsored by Department of Biotechnology (DBT), Govt. of India.

2. 6th Research Advisory Group Meeting was held in the premises of RFRI on 15th February, 2005.

3. Vigilance Awareness Week was celebrated at RFRI from 1st to 6th November, 2004. During the celebration essay competition was organized on the topic "Necessity of Vigilance to upgrade research in RFRI" and also a seminar held on topic " Why vigilance is in Research ?"

Attended

1. Dr. Y.C. Tripathi, Scientist-E, attended NMBA sponsored Round Table Meet on Bamboo Location Trial held at G.B. Pant University of Agriculture and Technology Pant Nagar from 15th and 6th January, 2005.

2. Dr. Y.C. Tripathi, Scientist-E, attended Expert Group meeting for evaluation of projects held at DBT, New Delhi on 8th February, 2005.

3. RFRI participated in Scientific Exhibition cum Technology Demonstration in Farmer Festival at Assam Agricultural University, Jorhat from 2nd to 4th March, 2005.

4. RFRI participated in exhibition held during Kaziranga Centenary Celebration from 11th to 17th February, 2005.

5. Dr. M. George and Dr. Ombir Singh participated in *Strategies for nonmulberry germplasm maintenance* from 10th and 11th March, 2005 organised by Central Muga and Eri Research and Training Institute, Lahdoigarh, Jorhat.

6. Dr. Tilak Hazarika, Asstt. Librarian R.A. Gr. II attended the National Seminar organized by the Media Trust, Assam on *Building up of a National Information-cum-Achieve Centre for the North-East India* held at Guwahati from 2nd and 3rd November, 2004 and presented paper on *Role of media in larnessing sustainable management of environment and forests in North-East India.*

7. Dr. Tilak Hazarika, Asstt. Librarian R.A. Gr. II attended the XXI IASLIC National Seminar held at Kolkata from 31st December, 2004 to 3rd January, 2005 and presented a paper on *Information input for rural development in agricultural and forest services : an assessment.*

DISTINGUISHED VISITORS

Shri V.S. Oberio, Advisor, NMBA (TIFAC), visited on 14th December, 2004.