RECOMMENDATIONS OF CONSULTATIVE WORKSHOP
ON
STRATEGIES FOR FORMULATION OF FOREST GENETIC RESOURCES MANAGEMENT NETWORK (FGRMN)

9th and 10th March 2011

Editors

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INSTITUTE OF FOREST GENETICS AND TREE BREEDING
(INDIAN COUNCIL OF FORESTRY RESEARCH AND EDUCATION)
COIMBATORE- 641 002

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Detailed programme
09.03.10

Inauguration
(10:00 – 11:00 hrs)

Welcome address : Dr. K. Palanisamy, Organizing Secretary

Introductory note : Dr. N. Krishna Kumar, Director, IFGTB

Presidential Address : Dr. Vijayan Nair, Director, Sugarcane Breeding Institute, Coimbatore

Release of Abstract of FGRMN Workshop, FGRMN brochure in three languages and IFGTB germplasm brochure

Inaugural address : Shri Sundarraju, PCCF & Chief Wildlife Warden, Tamil Nadu Forest Department

Vote of thanks : Shri T. P. Ragunath, Group Co-ordinator Research, IFGTB

Rapporteurs : Dr. John Prasad Jacob, Scientist-E
Shri. A .Mayavel, Research Officer

Session I: Status and Management of Forest Genetic Resources in India – Experiences of stakeholders
(11:15AM – 01:00 PM)

Session: I. 1

Chairman : Shri. Trivedi Babu, Additional PCCF, KFD,Trivandrum

Co – Chairman : Dr. Ansari, Scientist – F & Head of Genetics Division, TFRI, Jabalpur

Rapporteurs : Dr. K. R. Sasidharan, Scientist-D
Dr. Kannan C.S. Warrier, Scientist-D

1. Forest Genetic Resources Management Network - An overview- Dr. N. Krishna Kumar ,Director, IFGTB, Coimbatore

2. Plant Genetic Resources in Relation to Agriculture - Role of NBPGR - Dr.Z. Abraham,Principal Scientist, NBPGR, Thrissur

3. Conservation Status of Seri-Genetic Resources in India - Dr. C. K. Kamble, Director, Central Sericultural Germplasm Resources Center, Hosur, Tamil Nadu

4. Forest Genetic Resources Management in Tamil Nadu-Status Report - Srinivas R. Reddy, CF, Genetics, TNFD, Tamil Nadu

5. Sandal Genetic Garden in Forest Extension and Research Centres in Tamil Nadu – Shri Irulandi, CCF, Extension, TNFD, Tamil Nadu

6. Forest Genetic Resources of Kerala - Dr. Shivaraju, CCF (Research),KFD,Kerala

7. Forest Genetic Resources of Andaman- Shri R.S.C. Jayaraj, IFGTB, Coimbatore

8. Status and Management of Forest Genetic Resources in Gujarat – Shri M. M. Sharma, CCF, Gujarat Forest Department, Gujarat

9. The Role of TBGRI in Conservation of Forest Genetic Resources of Western Ghats – Dr. A.G. Pandurangan, Scientist –F, TBGRI, Palode, Trivandrum

10. Forest Genetics Resources Management Network in Maharashtra - Shri G. Saiprakash, CF, Maharashtra Forest Department, Maharashtra

11. Forest Genetic Resources of TAFCORN, Tamil Nadu- Shri.P. Subramanian, CCF/JMD,TAFCORN, Tamil Nadu

12. Conservation of Forest Genetic Resources – Initiatives taken by AP Forest Development Corporation Limited- Dr. T. Appi Reddy, General Manager, APFDC Andhra Pradesh

13. FGR of Medicinal plants and Ayurveda Industry in Kerala- Dr. Nagesh Prabhu, MD, Oushadhi, Kerala

Session: I. 2 (02:15 – 03:40 hrs)

Chairman : Dr. Z. Abraham, Principal Scientist, NBPGR, Thrissur, Kerala

Co – Chairman : Dr. P.K. Singh, Registrar, PPV & FR, New Delhi

Rapporteurs : Dr. V. Mohan, Scientist-E
: Dr. Rekha Warrier, Scientist-D

14. Forest Genetic Resource Management Network at TFRI: Aspects and Prospects - Dr. S.A. Ansari, Scientist –F, TFRI,Jabalpur, M.P.

15. Status Report of Forest Genetic Resource Conservation in IWST, Bangalore – Dr. Syam Viswanath, Scientist – E, IWST,Bangalore

16. *Ex-situ* conservation of Tree species at Rain Forest Research Institute, Jorhat, Assam – Dr. N. Ravi, Scientist, RFRI, Jorhat, Assam

17. Assessment, Management, Conservation and Improvement of Forest Genetics Resources North Western India- Dr U.K. Tomar, Scientist – E, AFRI, Jodhpur

18. Forest Genetic Resource Management at KFRI- Dr. Seethalakshmi, Scientist, KFRI, Peechi, Kerala

19. Endemic and threatened plants of the Kalakkad- Mundanthurai tiger reserve in India model developed for conservation and management initiatives - Dr M.B. Viswanathan, Professor, Department of Plant Science, Bharathidasan University, Tiruchirappalli.

20. FGR Conservation Activities at College of Forestry, KAU, Vellanikkara – Dr. Sudhakara, Professor, KAU, Thrissur

21. Conservation of Forest Genetic Resources of Konkan Region: DBSKKV Perspectives – Dr. S.S. Narkhede, Professor, College of Forestry, DBSKKV, Dapoli, Ratnagiri , Maharashtra

22. Conservation of Forest Genetic Resources at Acharya NG Ranga Agricultural University, Hyderabad - Dr. Prabhavathi Kona , Asst Professor**,** ANGRAU, Hyderabad

23. Role of Navsari Agricultural University in Conservation and Management of Forest Genetic Resources; Contemporary Efforts and Future Perspective – Dr. Harsha Hegde, Asst.Professor, Navsari Agricultural University, Gujarat

24. Conservation and Management of Cashew Germplasm – Dr. M. Gangadhara Nayak, Principal Scientist, Directorate of Cashew Research (DCR), Puttur, Karnataka

25. Genetic Resources of Rubber and Management - Dr. C.P. Reghu, Deputy Director, Rubber Research Institute of India, Kottayam, Kerala

26. Importance of FGRMN in the Management of Genetic resources of Root AND Tuber Crops - Dr. M.Unnikrishnan, Principal Scientist, CTCRI, Thiruvananthapuram

Session: I: 3 (04:00 – 05:00 PM)

Chairman : Shri P. Subramanian, CCF/JMD, TAFCORN, Tamil Nadu

Co – Chairman : Dr. K.Kathiresan, Professor, Annamalai University

Rapporteurs : Dr. Nagarajan, Scientist-E
: Dr. Vijayaraghavan, Scientist-C

27. Forest Genetic Resources of Tropical Dry Evergreen forests of India - Dr. N. Parthasarathy, Professor, Pondicherry University

28. Mangrove Forests: Genetic Resource Conservation – Dr. K. Kathiresan, Professor, Annamalai University

29. Conservation of Mangroves in Bay Islands- Dr. Manju Nair, Associate Professor, J.N.R.M, Port Blair, Andaman

30. Role of NGO in Forest Genetic Resource Management Network. in Andaman & Nicobar Islands- Shri Suresh Nair, NGO, Port Blair, Andamans

31. Status of Forest Genetic Resources at Tamil Nadu Agricultural University -an over view- Dr.K.T. Parthiban, Professor of Forestry, FC&IR, TNAU, Mettupalayam, Coimbatore

32. Conservation of Forest Genetic Resources of Fast growing tree species For pulpwood by Mysore Paper Mills Ltd., Bhadravathi, Karnataka - B. E. Manjunath, Senior Manager, Mysore Paper Mills, Karnataka

10.03.2011

Session II: Policies and Legislations concerned to FGRs

(09:30 – 10:45 AM)

Chairman : Dr. S.N. Jadhav, Additional PCCF / Member Secretary, A.P. State Biodiversity Board, Hyderabad

Co-Chairman : Dr. T.V. Ananthanarayanan, Principal Scientist & Head of Plant Genetic Resources, IIHR, Bangalore.

Rapporteurs : Dr. Maheshwar Hegde, Scientist-D
: Shri. D. Raja Suguna Sekar, Scientist-C

33. Tree Germplasm, Tree Breeding and Forestry in the context of PPV& FR Act - Dr. S. Nagarajan, Ex- Chairman of PPVFRA, New Delhi

Session III: Tools and techniques for conservation of Forest Genetic Resources – *in situ* and *ex situ* conservation strategies

(11:00AM – 01:00 PM)

Chairman : Dr. C. K. Kamble, Director, Central Sericultural Germplasm Resources Centre, Hosur, Tamil Nadu

Co – Chairman : Dr. T. V. Mohandas, Executive Director, KFDC, Mangalore

Rapporteurs : Dr. Modhumita Dasgupta, Scientist-E
: Dr. A. Nicodemus, Scientist-E

34. Collection, Characterization, Conservation and Documentation of Genetic Resources of Tree-Borne Oilseeds – Dr. Z. Abraham, Principal Scientist, NBPGR, Thrissur

35. Management of Forest Seed Centre and Multiplication Centre – Dr. R.C. Pandalai, Scientist, KFRI, Thrissur

36. Forest Genetic Resources research at NBPGR Regional Station, Hyderabad: Status and Strategies for Management – Dr. N. Sivaraj, Senior Scientist, NBPGR, Hyderabad, Andhra Pradesh

37. Towards Novel Approaches in Plant Genetic Resource Conservation – Perspectives in Horticultural Crops - Dr. T. V. Ananthanarayanan, Principal Scientist, Head of Plant Genetic Resources, IIHR, Bangalore

38. Approach paper for Characterization of Genetic Stock and Elite Germplasm for Setting up of National Bureau of Tree Genetic Resources - Dr. K. Gurumurthi, Ex- Director, IFGTB

39. Forestry Research and Development Program and Clonal Multiplication in TNPL – Dr. P. Chezhian, Assistant Manager, Tamil Nadu Newsprint and Papers Limited, Karur , Tamil Nadu

40. Diversity, distribution mapping and *ex situ* conservation of Rare, Endangered and Threatened (RET) medicinal species of the Western Ghats- Dr. P. S. Udayan, Department of Botany, Sree Krishna College, Thrissur, Kerala

41. Forest Genetic Resources Conservation in SACON, Anaikatty, Coimbatore- Dr. P. Balasubramanian, Scientist, SACON, Anaikatty, Coimbatore.

Session IV: Methodology for prioritization of species and species prioritization

(02:15 PM – 03:30 PM)

Chairman : Dr. N. Krishna Kumar, Director, IFGTB

Co – Chairman : Dr. N. Parthasarathy, Professor, Pondicherry University

Rapporteurs : Dr. Buvaneswaran, Scientist-D
: Dr. N. Senthil Kumar, Scientist-C

42. Methodology for prioritization of species and species prioritization – Smt. R. Anandalakshmi, Scientist – D, IFGTB,Coimbatore

Session V: Plenary session - Implementation of Forest Genetic Resources, Role and Strategies

(03:45 – 05:15PM)

Dr. S. Nagarajan, Ex- Chairman of PPVFRA, New Delhi (Chairman-Plenary Session)
Dr. N. Krishna Kumar, Director, IFGTB, Coimbatore
Dr. T.V.Ananthanarayanan, Principal Scientist & Head of Division, IIHR, Bangalore
Dr. C. K. Kamble, Director, Central Sericultural Germplasm Resources Centre, Hosur
Shri Shivaraju, CCF (Research), Kerala Forest Department, Trivandrum
Dr. Z. Abraham, Principal scientist and Station incharge, NBPGR, Thrissur
Dr. Parthasarathy, Professor and Head, Pondicherry University, Pondicherry
Dr. Pandurangan, Scientist F & Head of Division, TBGRI, Trivandrum
Shri P. Subramanian, CCF &JMD, TAFCORN, Tamil Nadu
Shri P.Durairasu, Dean FC&RI, Mettupalayam, Coimbatore
Dr. K. Gurumurthi, Ex-Director, IFGTB, Coimbatore
Dr. K. Palanisamy, Scientist F & Head of Division, IFGTB, Coimbatore
Smt R. Anandalakshmi, Scientist D, IFGTB, Coimbatore

Rapporteurs: Dr. C. Kunhikannan, Scientist-E
Dr. N.V. Mathish, Scientist-D

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The sustainable management of Forest Genetic Resources (FGR) is a primary global concern today, more as we observe the year of 2011 as the International year of Forests. FGR represent the genetic variation in trees of potential or present benefit to humans. The richness of the forest resources is indicated by the wide genetic variability stored in it. Owing to several threats- anthropogenic, biotic and abiotic stress, valuable FGR are being eroded at an accelerated rate. In a country like India with vast natural resources and diversity, the extent of effort required for FGR conservation is enormous in view of sustaining the productive values of forests, for maintaining the health and vitality of forest ecosystems and, for maintaining their protective and environmental roles. To reduce the direct pressure on forests, to maintain the quality of forests and at the same time to reap substantial benefits, it becomes indispensable to strike a balance between conservation and sustainable use of FGR.

In this scenario, the ministry of Environment and Forests, has identified the Indian Council of Forestry Research and Education (ICFRE) as the nodal centre for establishing the FGRMN with its two regional stations, one in the south at the Institute of Forest Genetics Tree Breeding, Coimbatore and the other in the north at Forest Research Institute, Dehradun. The FGRMN will act as a nodal agency at national level for collection, characterization, conservation, documentation and exchange of information on FGR. IFGTB considered it appropriate to hold this important workshop to identify stakeholders/ partners maintaining and managing FGRs such as State Forest departments, State Agricultural Universities, research institutes/ organisations, forest based industries and other involved, as part of the network and to establish the FGRMN with their views.

The Consultative Workshop on Strategies for Formulation of Forest Genetic Resources Management Network was held at Coimbatore, in the Institute of Forest Genetics and Tree Breeding, on 9th and 10th March, 2011, with the following objectives,

- To build and strengthen the FGR network at regional/national level involving all stakeholders.
- To develop a network would benefit the stakeholders for long term conservation of FGR, exchange of information, data building, documentation, coordinate

research and development and capacity building, thereby making FGR conservation a successful national effort and endeavour.

- To identify roles and responsibilities of networking partners and to chalk out a clear road map for FGR management
- To examine possibilities for a National Bureau of Forest Genetic Resources in the country.

The workshop was attended by the senior forest officers from Forest Departments and Forest Development Corporations of different states like Haryana, Gujarat, Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu, Kerala, Lakshadweep. Professors from various Agricultural Universities of Tamil Nadu, Kerala, Gujarat, Maharashtra, Andhra Pradesh and traditional universities including Bharathiar University, Bharathidasan University, Annamalai University and Pondicherry University represented the academic sector. Scientists from Central Sericultural Germplasm Resource Centre, Hossur, SACON, Coimbatore, TBGRI, Trivandrum, BSI, Coimbatore, ZSI, Kolkatta, TFRI Jabalpur, RFRI, Jorhat, AFRI, Jodhpur, IWST, Bangalore, KFRI, Thrissur, Rubber Board, Kottayam, IIHR, Bangalore, NBPGR, Thrissur and Hyderabad, ICAR Institutes like Central Agricultural Research Institute, Port Blair- Andamans, Directorate of Cashew Research, Karnataka, Sugarcane Breeding Institute, Coimbatore and CTCRI, Trivandrum participated in the workshop. The Registrar, PPVFRA, New Delhi and former chairman – PPVFRA actively contributed to the workshop. Representatives from industries like Tamil Nadu Newsprint and Papers Ltd., Tamil Nadu, JK Paper Mills, Orissa, Hindustan News Print Ltd., Kerala, ITC, Coimbatore, West Coast Paper Mills, Karnataka, Mysore Paper Mills, Karnataka and NGOs from Andamans who are working on Forest Genetic Resource Management attended the workshop. A total of 118 participants (77 from different states and 41 from IFGTB) attended the workshop.

Inaugural Session on 9-3-2011

In the inaugural session Dr. K. Palanisamy, Organizing Secretary, welcomed the gathering. In the introductory remarks Dr.N. Krishna Kumar, Director, IFGTB stressed on the modalities to be followed in the conservation of genetic resources. He also highlighted the importance of food and wood securities. He said that the agricultural crops are protected and conserved and no concerted efforts are in place to protect the forest genetic resources. He added that in the era of climate change, the importance of tree breeders and geneticists in identifying and conserving tree genetic resources which are wild and those which are domesticated is very vital. There is a need to identify stake holders in forest genetic resource conservation and establish "National Bureau of Forest Genetic Resources " as well identify sources for grants for carrying out research towards forest genetic resources conservation and management. He pointed out that ICFRE has

identified FRI, Dehradun and IFGTB, Coimbatore as nodal centres for Forest genetic Resource Management Network based on the directions from MoEF. Dr. Krishna Kumar also reiterated the need for preparation of an action plan involving policy makers, end users, scientists and those involved in forest genetic resource management. He mentioned that IFGTB has been handling nearly 10 species under FGR research. This consultative workshop while identifying new species, needs to assess the strengths of network partners in management of species identified. The species should be identified based on the strengths of institutions and has to be taken up. All the activities should lead finally to the establishment of a "Bureau of Forest Genetic Resources."

Dr. N. Vijayan Nair, Director, Sugarcane Breeding, Institute, Coimbatore, gave the Presidential address. He expressed his concern and said that lot of biodiversity could have been conserved 50 years ago. It is apt that FGRMN is launched during the International Year of Forestry following the International Year of Biodiversity. Forestry is essential for sustenance of life and generation of various products. It also generates employment, carbon sequestration, and helps in modulation of climate. India is rich in biodiversity though it represents 2% of land mass, 7% of world biodiversity is existing in India because of wide geographic and agro climatic variations responsible for this variability and adapted species. Forestry is the first causality in any development programme. Therefore a balanced approach is required for developmental activities. As the custodians of this heritage we are also responsible to pass it on to future. Threats to forests are pests, fire and anthropogenic activities. Recently the climatic change also has its impact in all areas. Tropical forests are the most vulnerable and approximately 16,000 species would disappear due to climate change. Hence role of climate change need to be considered. About 50 km length of coastline of Orissa vanished due to sea inundations, and exotic biodiversity in the area has disappeared. Present initiative of FGRMN is apt and primary focus should be on forest diversity, unlike agro biodiversity where it is easy and many institutes are working on them. Canvas for FGRMN is broader but there are problems in terms of accessibility. It should be achieved in a mission mode or network mode involving many stake holders.

He mentioned that NBPGR which set up in 1976 was successful in making 2.5 lakhs accessions in 4 years period through a mission mode approach when compared to the long term contributions since the inception of the organization. In this operation they have surveyed the entire country involving 120 partners. He stressed the use of Remote Sensing and GIS for mapping the distribution of the species and similar approaches should be followed in forestry. Out of the 700 conserved species only 150 are used in agriculture sector, of which 8 are food crops which includes rice, wheat, maize and potato which are used more. In Forest Genetic Resources, the number of species is more because many species are used by tribals who are now shifting their traditional lifestyles. Growth in forest cover is due to plantations cover and not natural forest. There is a narrow

variability in plantations and it needs attention. *Ex situ* conservation in agriculture is easy. For example 3000 accessions of sugarcane is maintained in 4 ha. However it is difficult in forestry. Cryopreservation could be adopted in forestry. Protocols need to be developed for management, a proper data management system for data storage, retrieval and management needed besides capacity building. He emphasized the need for sensitization of communities involved in FGR conservation and to clearly define the functional roles of partners.

Shri. R.Sundararaju, Prinicipal Chief Conservator of Forests and Chief Wild Life Warden, Tamil Nadu Forest Department (TNFD) inaugurated the Workshop with the release of the following publications: 1) Abstracts of papers to be presented in the workshop 2) Brochures on FGRMN printed in English, Tamil and Malayalam and 3) Brochure on Genetic resources of forestry species assembled by IFGTB. In his inaugural address he said that among 45,000 species of plant kingdom, 19,000 are angiosperms and that the lower species also need attention. During any development activity, lower plant forms are first affected for which anthropogenic pressure is the main reason. Medicinal plants are reducing in forest areas due to gradual removal resulting in genetic erosion. He added that attempts have been made in adhoc manner for conservation but holistic approach is required. For example Gene pool garden set up by TNFD at Naduganni maintains 1200 species. He stressed that IFGTB should develop network with Heads of all Forest Departments and coordinate the activities, and FGRMN can go forward only if Forest Departments are actively involved. The Clonal Seed Orchards (CSO), Seedling Seed Orchards(SSO), Vegetative Multiplication Garden(VMG), Seed Production Areas(SPA) etc. maintained by the partners should be brought under the network. For RET species, cryogenic protocols can be adopted. He mentioned that the Tamil Nadu Forest Department has envisaged Forest Genetic Resources Management Program way back in 1989, but however this endeavour would support the idea of TNFD.

Shri. T. P. Ragunath, IFS, Group Coordinator Research, proposed the Vote of thanks.

Session 1.1: Status and management of Forest Genetic Resources in India- Experiences of stakeholders

This session was chaired by Shri. Trivedi Babu, Additional PCCF, Kerala Forest Department and co chaired by Dr. S.A. Ansari, Scientist-F & Head, Genetics & Plant Propagation Division, TFRI, Jabalpur. A total of 13 papers were presented in the session. The Forest Genetic Resources maintained by various forest departments like Tamil Nadu, Kerala, Andaman and Nicobar Islands, Gujarat, Maharashtra, Andhra Pradesh Forest Development Corporation and TAFCORN, Tamil Nadu were presented. The FGRMN network by IFGTB and the Plant Genetic Resources in NBPGR were also presented.

Forest Genetic Resources Management Network – An overview – Dr. N. Krishna Kumar, Director, IFGTB, Coimbatore

Dr. Krishna Kumar in his orientation talk on FGRMN, explained the objectives, goals and need for the network. He clarified the difference between the biodiversity and Forest Genetic Resource (FGR). FGR are resources managed, harvested and benefits are incurred through exploiting the variability, whereas biodiversity is the variety and variability among the living organisms. He briefly explained the FGR activities of the country as a member of Asia Pacific Region and the role of APFORGEN. He stated that APFORGEN has listed 52 species for ICFRE for taking up under FGR, while FAO identified about 48 species. He highlighted the various centres established in the country for conservation of genetic resources like NBPGR. He also explained the biodiversity richness of India, *in situ* and *ex situ* conservation measures, the legal frame works and various tools and techniques deployed for germplasm conservation. He also mentioned that indigenous and exotic species are parts of FGR. He explained the mandate of the FGRMN of IFGTB and its objectives. He pointed out the role of Forest Departments, being the custodians of the FGR and suggested that the Departments should be taken into cognizance while establishing the network. He showed the proposed network of the FGRMN, involving the Forest Departments, Research Institutes, Academic and Agricultural Universities, Industries and other partners. Expectations from the stakeholders were put forth. The points to ponder over and to decide during the Workshop were projected.

Shri Jose T. Mathew wanted to know, whether the FGR will cover the tree species alone or shrubs and herbs are also considered under it, to which it was replied that there are other agencies, which are looking into the lower categories and that the FRGMN will focus mostly on trees and can have a link with those agencies. He also asked at what level the FGR will be preserved, at species level or at variety level and it was clarified that, it will be stored at all levels, including the population level. There were queries on whether to include wildlife as part of FGR and it was replied that, under the FRGMN, only plants especially trees are considered at present. There was suggestion to include the inhabitants of forest areas also in to the network. Dr. Z. Abraham suggested including soil parameters and its documentation as one of the important activity under the network. Dr. K. Gurumurti opined that FRGMN is a tough subject to deal with and suggested to develop an action plan and to improve upon later.

Plant genetic resources in relation to agriculture –Role of NBPGR- Dr. Z. Abraham, Principal Scientist, NBPGR, Thrissur.

Dr. Abraham presented the overview of activities of NBPGR, including the location of regional stations. He mentioned that collection of over 2.6 lakhs accessions are available in the NBPGR. He stressed the need for making passport data, i.e. documentation of scientific information on various aspects of the plants. He highlighted the importance of *in situ* observations and *in situ* characterization and recording of characters that are highly heritable. Necessity for recording indigenous knowledge associated with germplasm was explained. The salient features of the exploration and database developed by the NBPGR, Hyderabad Centre was discussed. He underscored the need for national accessioning of the materials to claim any right over the genetic resources. Providing identity to accessions with a unique number (IC/ EC) was suggested. Various aspects involved in national containment procedure, for both the declared or undeclared transgenic materials were explained and stated that for transgenic materials the quarantine is being handled by NBPGR. Need for developing descriptors, conservation of PGR, long term and short term storage was highlighted. Utilization of DNA finger printing for identifying clones employed was pointed out. The 'Genomic Resources'- a novel approach for PGR conservation was discussed. He suggested network approach for integrated management and conservation of PGR. He stated that the immediate initiative required for Forest Genetic Resources are to start *in situ* characterization in plantations and natural forests.

Dr. K. Gurumurti stated that the administrative network for FGR has to come from the states and the apex body can be ICFRE. He also mentioned that the State Forest Departments are to be the real stakeholders in Forest Genetic Resources. He pointed out that the scenario in agriculture is totally different compared to forestry. He suggested to rename the bureau as the National Bureau of Tree Genetic Resources instead of the Forest Genetic Resources, to make it more effective. However it was suggested by many participants that Bureau/Network of Forest Genetic Resources would be more appropriate instead of Tree Genetic Resources. Dr. Abraham pointed out that complexities are there, whether it is agriculture system or forestry system, but the problems like that of seed are common for both. He stressed for putting more efforts in research to solve such problems. Dr. K. Gurumurti asked which agency is certifying the transgenic, and how it is being detected, to which Dr. Abraham replied that NBPGR is the certifying agency and it has kits for detecting the transgenic materials. Dr. Abraham added that, when a material contains terminator gene, it is not released by IBPGR.

Conservation status of seri-genetic resources in India – Dr. C.K. Kamble, Director, Central Sericultural Germplam Resource Centre, Hosur.

Dr. Kamble stated that Central Sericultural Germplam Resource Centre (CSGRC) is the only Institute doing research on Seri-genetic resources in India. He highlighted seri-biodiversity in India and also explained about various kinds of silks. He mentioned that 57 species of wild silk worms were recorded from the forest areas, but they have not been commercialized. He touched upon the silk production scenario in India, conservation centres of mulberry, non mulberry silk worms and their host plants. He mentioned that about 5402 accessions of mulberry are available in the world and the need for the *ex situ* and *in situ* conservation strategies for mulberry genetic resources. He also presented the mapping of *Morus* diversity using GIS tools, detecting of salt tolerant mulberry germplasm in the Andaman Islands, *ex situ* field gene banks established, characterization and evaluation of germpalsm, promising germplam available with the Centre, utilization of mulberry genetic resources for other purposes excluding silk worm rearing and mulberry as a suitable species for agroforestry. He suggested to declare the genera like *Morus* and *Terminalia* as national tree genetic resource, considering their importance in silk industry.

Forest genetic resource management in Tamil Nadu: Status report – Shri Srinivas R. Reddy, CF, Genetics Division, TNFD, Coimbatore.

The ongoing research activities in Tamil Nadu Forest Department in different agroclimatic zones of Tamil Nadu and thrust areas of research were presented. Discussed about tree improvement, genetic combing, seedling and clonal seed orchards of various species, sandal clone bank, bambusetum, RET medicinal plants maintained, permanent preservation plots and research on shola species. He pointed out that there is an increased scope for networking with Tamil Nadu Forest Department as far as conservation of FGR is concerned.

Dr. Abraham asked, whether the clones mentioned are from one source or from many and their identity is maintained or not. The speaker replied that, the clones are from many sources and their identity is also maintained.

Sandal genetic garden in forest extension and research centres in Tamil Nadu – Shri Irulandi, CCF, Extension, TNFD

Shri Irulandi said that the sandal germplasm from Andhra Pradesh, Karnataka, Kerala and Tamil Nadu were collected and assembled. He showed the sandal clonal plots established in the Forestry Extension Centres at Salem, Seshanchavadi, Tiruchirapalli,

Tiruvannamalai and Dindigul. He suggested for selection of superior sandal trees and establishment of seed stands of sandal.

Dr. Abraham opined that genetic resource conservation is not meant for protection of superior trees alone, though it is one aspect. Identification of other associated characters for future use is equally important and such aspects are also to be taken care of.

Forest genetic resources of Kerala – Dr.B. Shivaraju, CCF (Research), KFD

The overview of Kerala forests, the forest cover and biodiversity wealth of the State, endemic species and RET species were presented by Dr.Shivaraju. He narrated the conservation initiatives- network of Protected Areas (PAs), and mentioned that 22 PAs are available in the state. He explained the role of Kerala Forest Seed Centre established in collaboration with KFRI, at Peechi. He highlighted the gene pool conservation activities for Mango and Garcinia, the seed orchards of Teak, Eucalypts and Casuarinas established, and the introduction of new species like Red Sanders, *Dendrocalamus longispathulatus*, *Jatropha curcas*, low elevation Pines and Tropical Pines and establishment of permanent preservation plots in various parts of the State.

Dr. Abraham pointed out that NBPGR is finding it difficult to maintain the germplasm of fruit trees. He observed that, since the germplasm of mango assembled are close to wild, they may perform well and suggested to characterize and start cryopreservation of pollen grains, embryos etc. which will be of immense utility potential. He informed that NBPGR has done cryopreservation of mango pollen.

Forest genetic resources of Andamans – Shri R.S.C. Jayaraj, Head, Forestry Land Use and Climate Change Division, IFGTB, Coimbatore.

Shri Jayaraj highlighted the FAO template proposed for report on FGR. He stated that Andaman falls under Indomalayan realm- Sundaland hotspot. The current status of FGR, forest types, cover, landscape ecology and density in Andaman was discussed. He mentioned that about 80 per cent of the Andaman forests are intact without fragmentation, and about 406 medicinal plants, 76 fruit trees, bamboos and canes are available in Andaman. He emphasized the need for protected area management, e*x situ* conservation, enumeration of biodiversity, elimination of introduced species and FGR stands and plots. He also gave a brief account of the genetic improvement programmes, collaborative research with various institutions, and also touched upon the contribution of FGR to food security with focus on wild mango, wild jamun etc.

Dr. Jai Shankar from Andaman informed that many species of mangoes were identified by ICAR Institute.

Status and management of forest genetic resources in Gujarat- Shri M.M. Sharma, CCF, Gujarat Forest Department.

Shri M.M. Sharma informed that Gujarat has lesser forest area, below the national average. He presented the activities of the department with regard to *ex situ* conservation of FGR, botanical gardens, Ayurvedic gardens established and the medicinal plants available. He opined that wildlife should also be brought under the purview of FGR. The works of the Gujarat State Biotechnology Centre was also explained.

The role of TBGRI in conservation of forest genetic resources of the Western Ghats – Dr. A. G. Pandurangan, Scientist-F, Tropical Botanical Garden and Research Institute (TBGRI), Palode, Kerala.

Dr. Pandurangan highlighted the vision and mission of TBGRI. The garden system developed by TBGRI obtained national and international recognitions especially the *Ficus* garden and their bonsai collections. He mentioned about a Palmetum maintained by TBGRI having palm assemblage from whole South East Asia, a medicinal garden as well as orchard of under-utilized fruit plants and wild relatives of fruit plants raised. Plants like *Garcinia imberti*, at the verge of extinction is conserved as *ex situ*. An Orchidarium having several species, including TBGRI hybrids established and some of them have been registered. Gymnosperm collections are also available with their institute. TBGRI also developed a RET species park recently. The institute has been concentrating on species recovery research, restoration work and promotion of medicinal plant cultivation.

Forest Genetic Resource Management Network in Maharashtra- Shri G. Saiprakash, CF, Maharashtra Forest Department.

Shri G. Saiprakash explained the organizational set up, research centres and milestones of research in Maharashtra Forest Department. The research aspects include establishment of Teak seed orchards, seed stands, CPT selection and preservation plots. The forest Department has research collaboration with TFRI, Jabalpur and Agricultural Universities. He stressed for capacity building at lower cadres, continuity of service in research, and posting of staff with research aptitude to give a face-lift to forestry research.

The Chairman underscored the need for capacity building and continuity of personnel engaged in research.

Forest genetic resources of TAFCORN, Tamil Nadu- Shri G. Subramanian, CCF/JMD, TAFCORN, Tamil Nadu

The maintenance of clonal seed orchards and clone bank for Eucalyptus and Cashew was presented. He explained the various initiatives of TAFCORN in providing management of valuable germplasm.

Conservation of forest genetic resources- Initiatives taken up AP Forest Development Corporation Ltd. – Dr. T. Appi Reddy, General Manager, APFDC.

APFDC deals with a variety of species like *Eucalyptus*, Cashew, Bamboos, Coffee, Teak and Amla. Established clonal plantations of Eucalyptus in large scale and also involved in establishment of coffee plantations, botanical gardens and NTFP species. They also proposed a bioconservation zone recently.

FGR of medicinal plants and Ayurveda industry in Kerala- Dr. Nagesh Prabhu, Managing Director, Oushadhi, Kerala

Dr. Nagesh Prabhu presented an overview of the medicinal plant wealth of Kerala. There are 80 species of plants in the RET category. He informed that root is the main part used in the case of medicinal plants and therefore destructive harvest is inevitable and suggested to find out alternatives. He stressed for giving importance for conservation of medicinal tree species. He highlighted the role played by Kerala State Medicinal Plant Board, in conservation of important medicinal plants of the State. He suggested for cultivation of medicinal plants as plantation crop, solutions for unsustainable harvesting of medicinal plants, and to convince the decision makers on importance of medicinal plants and its conservation.

Dr. Abraham suggested that the industries which are using medicinal plants as raw materials must be able to meet at least 25 per cent of their requirement through cultivation in farmlands. Dr. Pandurangan stated that when the medicinal plants are supplied to the industries even free of cost, they are not interested to take or grow it and most of them are depending on the materials collected clandestinely from the wild. He also suggested that, a portion of the profit earned by the industries should be invested for the conservation of the species or management of the area, where the plant materials originated.

The co-chairman concluded the session by stating that conserving of the total variability in the forest areas is important in the context of FGR conservation.

Session: I. 2: Status and Management of Forest Genetic Resources in India- Experiences of Stakeholders

This session was chaired by Dr. Z. Abraham, Principal Scientist, NBPGR, Thrissur and co-chaired by Dr. P.K. Singh, Registrar, PPV & FR Authority, New Delhi. A total of 13 papers were presented in the session. The Session began with the welcome note by Dr. P. K. Singh, Co-Chairman and the presentations were made by various Research Institutes and Agricultural Universities dealing with Forest Genetic Resources.

Forest Genetic Resource Management Network at TFRI: Aspects and prospects – Dr. S.A. Ansari, Scientist-F, Tropical Forest Research Institute (TFRI), Jabalpur.

Dr. Ansari presented the genetic diversity of forest species of Central India- Fragmentary and rudimentary, eluding development of strategy for conservation and sustainable utilization. He presented that the total sum of variability within the species as distributed among different populations and individuals within populations. He also highlighted the FGRM set up of his Institution at TFRI, Jabalpur. He mentioned about the species distribution/ location with all field details, total sum genetic diversity by molecular markers, relationship between genetic diversity and economically/ environmentally important traits and identification of populations, provenances or landraces, etc and categorization of superior/ rare/ endangered germplasm of species. He also discussed the different methods of genetic improvement, conservation and sustainable utilization.

Status report of forest genetic resource conservation in IWST Bangalore - Dr. Syam Viswanath, Scientist-E, Institute of Wood Science and Technology (IWST), Bangalore

Dr. Syam Viswanath presented about forest genetic resource conservation in IWST and it has revolved mainly 3 species such as Teak, Sandal and Bamboo. Besides, this research is being carried out on other important plant species such as *Embelia ribes* (Myrsinaceae), *Kingiodendron pinnatum* (Caesapiniaceae), *Pterocarpus santalinus* (Fabaceae), *Nepenthus khasiana* (Nepenthaceae), Wild Orchids (Ground and terrestrial). He informed that the IWST has established germplasm bank cum clonal seed orchards (CSO) of elite material of S*antalum album* and Bamboo. He also informed that the permanent preservation plots as a tool to monitor changes in structure, diversity and regeneration patterns of tropical wet evergreen forests: case study from Western Ghats, India. He has made suggestions for FGR conservation such as species wise directory of germplasm banks/CSO/SSO etc. across the country, genotyping resources in such germplasm banks using appropriate marker technology, unrestricted /Free access and exchange of FGR for registered members of the network programme, on-line access to

mapped FGRs in each repository/ germplasm bank, initiate an on-line newsletter on FGR for members of network, earmark funds for maintaining repositories/germplasm banks maintained across the country among network members, periodical assessment and review of programmes initiated under FGR conservation network through regional co-ordinators.

***Ex-situ* conservation of tree species at Rain Forest Research Institute, Jorhat, Assam – Dr. N. Ravi, Scientist, Rain Forest Research Institute (RFRI), Jorhat, Assam**

Dr. Ravi presented the genetic diversity of forest species of such as *Gmelina arborea, Dipterocarpus retusus* and Bamboo in RFRI, Jorhat. He highlighted that the RFRI has established germplasm bank of *Gmelina arborea* and Bamboo. He also explained about the future conservation programme about Agar (*Aquilaria malaccensis* syn. *agallocha*).

Assessment and conservation of forest genetic resources of North Western India for improvement and management – Dr. U.K. Tomar, Scientist-E, Arid Forest Research Institute (AFRI), Jodhpur

Dr. Tomar highlighted about the status of forest cover of Rajasthan and Gujarat states of his Institution's jurisdiction. He presented the contribution of AFRI on FGRM such as establishment of provenance trials, CPTs selections, progeny trials, Seed Production Areas, Seed Orchards, Germplasm Banks and clonal trials of different tree species such as *Acacia nilotica, Tecomella undulata, Azadirachta indica, Dalbergia sissoo, Tectona grandis* and *Eucalyptus camaldulensis.* He also presented the constraints and future strategies of FGRM particularly long term network programs are essential to use expertise of scientists and forest officials as well as different technologies for management and conservation of FGRs. A close interactive association of forest officers and scientists with clear work responsibilities is also needed to make such programs successful and meaningful.

Forest genetic resources conservation in Kerala Forest Research Institute – Dr. E.P. Indira, Programme Co-ordinator, Forest Genetics and Biotechnology, Kerala Forest Research Institute (KFRI), Peechi, Kerala

Dr. Indira presented the details about the forest genetic resources developed by KFRI such as provenances, clones and seed orchards of Teak, Eucalypts and Acacia, species collection of Bambusetum, Palmetum, Arboretum, medicinal plants, xerophytes, succulents, hydrophytes, fungal collections and endangered species. She highlighted that 25 natural teak populations from 10 states selected and evaluated for tree form, wood characters and other properties and also established a germplasm bank of teak.

Endemic and threatened plants of the Kalakkad- Mundanthurai Tiger Reserve (KMTR) in India model developed for conservation and management initiatives - Dr M.B. Viswanathan, Professor, Department of Plant Science, Bharathidasan University, Tiruchirappalli.

Dr. Viswanathan presented the status of endemic and threatened plants, forest type wise strengths of plants and habit-wise strength of threatened plants of the KMTR, Tamil Nadu. He suggested conservation management priorities which include habitat management, genome resource banking and limiting factor for management studies. He also suggested remedial measures towards conservation which includes establishment of orchidarium, botanic garden, regulation of tourist inflow, stopping of grazing in the buffer zone and establishment of fire protection squads in each range to extinguish annual fires.

FGR conservation activities at College of Forestry, Kerala Agricultural University (KAU), Vellanikkara – Dr. Sudhakara, Professor, KAU, Thrissur

Dr. Sudhakara highlighted the details of various FGR conservation activities carried out by College of Forestry, KAU, Thrissur. He presented about the Bioresource park which includes Garden for medicinal plants, orchids and ferns as an exclusive germplasm collection for different groups of plants. The KAU has also established an instructional farm of about 20 ha comprising of tree crop nursery, arboretum, wood lots, agroforestry experiments and provenance trials of different species. Arboretum has a rich and specialized collection of 60 tree species and i*n-situ* conservation for butterflies.

Conservation of forest genetic resources of Konkan region: DBSKKV perspectives – Dr. S.S. Narkhede, College of Forestry, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra

Dr. Narkhede presented the status of Forest Genetic Resources of Konkan - Western Ghats particularly the Maharashtran coast belt, harbours a significant diversity of forest genetic resources and this region has endowed with number of natural forests like wet evergreen, semi-evergreen, moist and dry deciduous and mangrove forests. He highlighted the role of Dr. Balasaheb Sawant Konkan Krishi Vidhyapeeth in conservation of FGR. Presently, an area of about 60 ha covering Natural and artificial forests in the main campus has been demarked for the conservation of local biodiversity and named as Biodiversity park and it has the collection of commercially important and RET species. He also presented that his organization has established germplasm banks of species like exotic Acacia hybrid, Teak, Pongamia, Garcinia, Undi, Bamboo and RET species like *Saraca asoka, Nothapodytes nimmoniana, Salacia chinensis, Antiaris taxicaria* and medicinal Plant Garden.

Conservation of forest genetic resources - Dr.K. Prabhavathi, Scientist , A N G R Agricultural University AICRP on Agroforestry, Rajendranagar, Hyderabad

Dr. Prabhavathi presented the status of the total geographic area and the dominant tree species in Andhra Pradesh, like *Azadirachta indica, Acacia nilotica, Leucaena leucocephala, Tamarindus indica, Ailanthus excelsa, Dalbergia sissoo, Albizia lebbeck, Pongamia pinnata, Eucalyptus* spp. etc. She also highlighted the agro forestry systems prevailing in this region. She informed that as per the statistics of ITC, Bhadrachalam, 1,00,000 ha of area in A.P is under Eucalyptus block plantations.

Role of Navsari Agricultural University in conservation and management of forest genetic resources: Contemporary efforts and future perspectives – Dr. Harsha Hegde, Assistant Professor, Navsari Agricultural University, Navsari, Gujarat.

Dr. Hegde presented the status of Forest Genetic Resources of Navasari Agricultural University, Gujarat, especially the clonal trials of Eucalypts, Casuarinas, *Salix alba*, Pongamia and species maintained in arboretum.

Conservation and management of cashew germplasm - Dr. M. Gangadhara Nayak, Prinicipal Scientist, Directorate of Cashew Research, Puttur, Karnataka

Dr. Nayak presented the importance of Cashew tree and highlighted the variability recorded for some of the characters like biochemical constituents, kernel variations and dwarf types developed in cashew. He also presented the cashew germplasm collected from different states, maintenance of the assemblage, its characterization and information about recommended varieties of cashew.

Genetic resources and management of rubber – Dr. C.P. Reghu, Deputy Director, Rubber Research Institute of India, Rubber Board, Kottayam, Kerala

Dr. Reghu presented the Status report on Genetic Resources of *Hevea* in India**.** He highlighted the background about the importance of Rubber, major rubber producing countries and suitability for rubber cultivation. He highlighted that expansion of rubber cultivation from traditional to non-traditional regions and the conservation and management of the *Hevea g*ermplasm collection in India. He also presented the future programme like screening and characterization of qualitative and quantitative timber traits for the improvement of strength and durability of rubber wood through laboratory and field studies.

Importance of FGRMN in the management of genetic resources of root and tuber crops– Dr. M. Unnikrishnan, Principal Scientist, Central Tuber Crops Research Institute (CTCRI), Thiruvananthapuram, Kerala

Dr. Unnikrishnan presented the CTCRI's contribution on conservation and management of genetic resources of root and tuber crops explored from Western Ghats, Eastern Ghats, Bastar, North Eastern Region, Jharkhand, Interior plains of Karnataka, Tamil Nadu, Kerala, Andaman & Nicobar Islands and Lakshadweep. He also explained the conservation methods for the management of these root and tuber crops.

Session 1: 3: Status and Management of Forest Genetic Resources in India: Experiences of Stake Holders

This session was chaired by Shri P. Subramanian JMD, TAFCORN, Tamil Nadu and co chaired by Dr. K. Kathiresan, Professor, Annamalai University. A total of 6 papers were presented in the session. The session highlighted the genetic resources maintained by the Universities and Paper Industries.

Forest genetic resources of tropical dry ever green forests of India- Dr. N. Parthsarathy, Professor, Pondicherry University, Puducherry

Dr. Parthsarathy stated that the forest type is getting endangered. Resources from these forests are maintained in botanical gardens. This unique vegetation type is highly productive under very harsh conditions. Economical value of taxa such as *Diospyros ebenum* and *Sanseveria roxburghiana* need to be comprehended. The potential of *S. roxburghiana* being used as fiber resource is yet to be exploited in a larger scale.

Mangrove forests: Genetic resources conservation- Dr. K. Kathiresan, Professor, Center for Marine Biology, Parangipettai, Annamalai University

Dr. Kathiresan presented about the Mangrove Forest Genetic Resources and the conservation efforts at the Porto Nouvo campus at Annamalai University. Mangroves are unique tropical oceanic rain forests wherein India has almost 81 % of world's mangrove in terms of taxonomic diversity. In a recent effort on RET listing 11 species have been classified as globally threatened of which two taxa namely *Sonneratia griffithii* (restricted to Andamans) and *Heritiera fomes* are present in India.

Dr. K. Gurumurthi, former Director IFGTB, asked that why the genetic variability is very narrow in mangroves and how to improve it. Dr. Kathiresan agreed on the lower levels of genetic variability among mangroves and this could vary on the geographical location where the sampling is made.

Conservation of mangroves in Bay Islands - Dr. Manju Nair, JNRM College, Port Blair, Andamans

Dr. Manju Nair spoke on the geomorphological feautures unique to Andaman group of Islands and the geographical changes that have occurred in the post Tsunami. She cited the 2005 Forest Survey of India report and indicated that there was a reduction in forest cover in the Andaman group of Islands. She also showed the inundation and submergence of land in the North and South of Andamans respectively. She sought help in coming up with issues related to restoration of Mangroves in the region.

Role of NGO in Forest Genetic Resource Management Network in Andaman & Nicobar Islands- Shri Suresh Nair, NGO, Portblair, Andamans

Shri Suresh highlighted the ecotourism potential and related economy and socio structuring of work force towards adventure, sport and ecotourism within the region.

Status of forest genetic resources at Tamil Nadu Agricultural University - An over view- Dr. K.T. Parthiban, Professor of Forestry, Forest College and Research Institute (FC&RI), TNAU, Mettupalayam

Dr. Parthiban presented the genetic resources of Teak, Casuarina, Eucalyptus, medicinal plants, Simarouba and Jatropha accessions with the FC&RI, Mettupalayam. He also highlighted an array of hybrids within the species of Casuarina and Jatropha. Dr. K. Gurumurthi asked despite the FCRI's strength on materials and human resources strength of TNAU why attempts are not being made to characterize the existing FGRs using molecular characterization tools. Dr. K.T. Parthiban replied Centre for Plant & Molecular Breeding at TNAU is largely involved in agri-horti crops and it would desirable if IFGTB and FCRI could reach a MOU on comprehending this aspect.

Conservation of forest genetic resources of fast growing tree species for pulpwood by Mysore Paper Mills Ltd., Bhadravathi, Karnataka- Shri. B.E. Manjunath, Senior Manager, MPM, Shimoga

Shri. Manjunath, Senior Manager, MPM Shimoga explained the FGRs available in the organization with reference to taxa of industrial importance namely Eucalyptus, Phyllodinous Acacias and Tropical Pines. He also highlighted the screening of hybrids of phyllodinous Acacias and its deployment in Industrial forestry programme that are being attempted in Shimoga. The phyllodinous Acacia hybrids have been found to be heterotic than either parents and are also known to perform better in locations with 800-1000 mm rainfall. He also informed that the available FGR can be accessed for research purposes.

Dr. K. Kathiresan, co- chair of the session concluded the session with thanks to all the speakers.

Session II: Policies and Legislations concerned to FGRs

This session was chaired by Dr. S.N. Jadhav, Additional PCCF / Member Secretary, A.P. State Biodiversity Board, Hyderabad and co chaired by Dr. T.V. Ananthanarayanan, Principal Scientist & Head, IIHR, Bangalore.

Dr. S. Nagarajan delivered a lecture on "Tree Germplasm, Tree Breeding and Forestry in the context of PPV and FR Act". He emphasized that**,** since forest genetic resources are property and wealth of the nation like any other resources such as water or mineral resources, there should be a separate Institute on "Forest Genetic Resources Bureau" and the regional institutes, State Agricultural Universities and private institutions can have access to germplasm and their usages. He opined that Exploration, Collection, Conservation, Evaluation, Documentation and Exchange of FGR will be the functions of the Bureau. He also stressed that "Forest Genetic Resources Bureau" should be a committed Institute, with committed and qualified people and it should have a committed funding and should have regional centres in different parts of the country. Initially, to begin with it can be started as a Division at Institute of Forest Genetics and Tree Breeding. Later, in subsequent years, it can be developed into a full fledged independent Institute, and tree breeding should be separated from FGR conservation. He stated that the forest genetic resources include very large number of trees, shrubs, lianas, algae, fungi, pteridophytes, lichens, microbes and medicinal plants. Initially it may not be possible to cover all the species. To begin with, few tree species of importance may be taken and later other species including medicinal plants can also be covered. He further told that the Institute going to be established should be called as "Forest Tree Genetic Resources Bureau". Later, as Institute grows separate Divisions/ Institutes –like "Forest Medicinal Plant Resources" or "Forest Animal Genetic Resources" may be bifurcated. The farmers, forest dwellers who helped in conservation should also be taken care by the FGRMN. The varieties for forest trees should also be registered within one year of release as in the case of agricultural crop varieties. Already existing varieties, provenances, clones etc. of forestry Species should be brought to "Common Knowledge" through publications to avoid bio- piracy.

He expressed his hope that a National Gene Bank may be established at IFGTB in future. He gave a detailed overview of PPVFR Act 2001, mechanism, its genesis and development, significance of IPR, India and TRIPS, variety in PPVFR and its significance, farmers rights and protection, registration procedure of varieties under PPVFR, DUS testing, DUS descriptor development etc. He also discussed about the significance and impact of Seed Act.

Scientist from KFRI asked why the seed act is pending for a long time. Dr. Nagarajan replied that it is being discussed since 2004 and modifications are being done and is being examined in different dimensions. He hoped that it will be passed parliament soon. Dr. K. Gurumurthi, former Director IFGTB asked whether the bureau should be named "National Bureau of Tree genetic Resources" or "National Bureau Forest genetic Resources", Dr. Nagarajan opined that "National Bureau of Forest Tree Genetic Resources" may be the right way to name the Institute. If only "tree genetic resources" mentioned all horticulture tree may also interfere. He further explained that there is an absolute necessity and scope for more than one bureau in forestry like National Bureau of Forest Tree Genetic Resources, National Bureau of Forest Medicinal Plants Genetic Resources and National Bureau of Forest Wildlife Genetic Resources. He opined that policy makers should be convinced of this.

Dr. Gurmurthi asked further that, since the forest is a state subject and by making Forest Genetic Resources Bureau a central institute there may arise some confusions in future. Dr. Nagarajan replied that Forest Genetic Resources are wealth of India, like mineral, water etc., and regionalism should not be at the cost of federalism and it should not interfere in smooth administration. The acronym needs to be very clear to the extent that to which ministry it belongs to. The procurement, exchange of germplasm in future will be less complicated if it is a central institute. There are lots of advantages being a central rather than regional institute in administration. The listing of forestry as in concurrent list does not make any problem in declaring FGR as national resources. Although agriculture is a state subject the NBPGR was made as a central institute.

The co-chairman wanted to know the meaning of community in PPVFR as often it is difficult to define it. Dr. Nagarajan replied that even if 50 farmers form a Co-operative society from a block or village duly signed or endorsed by the Panchayat President and District Agriculture Officer- then it is considered as a community. The co-chairman wanted to know differences between "common knowledge" and "public domain". Dr. Nagarajan replied that "public domain" means it is in public utility for more than a decade, whereas, common knowledge is that already known to everyone.

The chairman Dr. S.N. Jadav added that every village is having a Biodiversity Management Committee and without their knowledge no material can go out of the village as per the Biodiversity Act and that benefit sharing mechanism also exists.

Dr. S. Nagarajan concluded his speech by stressing that whatever policy decisions we take we should keep at the back of our mind - societal responsibilities, social accounting, social auditing, social equality and the necessity for transparency in public dealing.

Session III: Tools and techniques for conservation of Forest Genetic Resources – *in situ* and *ex situ* conservation strategies

This session was chaired by Dr. C.K. Kamble, Director, Central Sericulture Germplasm Resources Centre, Hosur, Tamil Nadu and co chaired by Dr. T.V. Mohandas, Executive Director, Karnataka Forest Development Corporation, Mangalore. A total of 8 papers were presented on the Genetic Resources of various Research Institutes

Collection, characterization, conservation and documentation of genetic resources of Tree Borne Oilseeds (TBO) - Z. Abraham, Prinicipal Scientist, NBPGR, Thrissur

Dr. Abraham presented the conservation efforts made in major TBO species like *Garcinia cambogia, G. indica, Madhuca longifolia, Jatropha curcas* and *Pongamia pinnata.* He also detailed on the cryopreservation of species like *Jatropha curcas* and *Pongamia pinnata*. He discussed about the variability in Malabar Tamarind, Kokum, Mahua and Pungam.

Management of forest seed centre and multiplication centre – Dr. R.C. Pandalai, Scientist, Kerala Forest Research Institute (KFRI), Peechi

Dr. Pandalai explained the details on the forest seed facility at KFRI and highlighted the need for state of art facility for seed storage and also insisted on the use of scientific parameters during seed collection.

Forest genetic resources research at NBPGR regional station, Hyderabad: Status and strategies for management – Dr. N. Sivaraj, Senior Scientist, NBPGR, Hyderabad

Dr. Sivaraj presented the major programs of NBPGR, its activities at various levels and the availability of the genetic resources of target species which were prioritized for the state of Andhra Pradesh. He also described the development of minimal descriptors in *Jatropha* and its implications. He explained the variation existing in Canavalias and *Mucuna pruriens*. Training programs were also conducted on PGR management and database development. He also pointed out that National Gene Bank located at NBPGR can hold 1 million accessions and that currently 3.75 lakh accessions are available which includes 9145 accessions of FGR. He also presented the strategies for FGR management.

Dr. Gurudev Singh, suggested that the list of species prioritized may be considered to avoid duplications. Dr. Sivaraj explained that only species with relevance

to agro-biodiversity are prioritized. Dr. Abraham added that field gene banks were established for medicinal and aromatic plants. Dr. Krishna Kumar, Director, IFGTB enquired regarding the tree species prioritized by NBPGR and the speaker enumerated that species like *Pterocarpus santalinus* were included under the prioritized list. Dr. S.N. Jadav, Addl. PCCF, Andhra Pradesh suggested that CAMP workshop need to be organized in every region to prioritize the species for FGR conservation.

Towards novel approaches in plant genetic resource conservation –Perspectives in horticultural crops - Dr. T. V. Ananthanarayanan, Prinicipal Scientist, Indian Institute of Horticultural Research (IIHR), Bangalore

Dr. Ananthanarayanan highlighted the approaches for genetic resource conservation in horticulture species emphasizing on the conservation of trait specific germplasm. He also enumerated the different techniques used in *in vitro* conservation, including pollen storage and DNA bank. He explained the methods on molecular characterization of germplasm using markers like ISSR, AFLP and SSR. He mentioned that IIHR has established field gene bank for 100 species.

Dr. Krishna Kumar suggested that the strategies employed for conservation of horticulture species can provide leads for similar efforts in forest tree species and critical areas for conservation can be identified.

Approach paper for characterization of genetic stock and elite germplasm for setting up of National Bureau of Tree Genetic Resources - Dr. K. Gurumurthi

Dr. K. Gurumurthi, Former Director of IFGTB presented an approach paper on characterization of genetic stock and elite germplasm for setting up of National Bureau of Tree Genetic Resources. He emphasized the need to determine the extent of variation that is required to be maintained for long term conservation and utilization needs considering the perennial nature of forest trees. He highlighted the usefulness and effectiveness of various biotechnological tools in characterizing germplasm and their subsequent documentation and conservation. Dr. Gurumurthi reiterated the need for ICFRE/IFGTB and forest departments to be equal partners in the FGR conservation programs.

Forestry reseach and development program and clonal multiplication in TNPL - Dr. P. Chezhian, Tamil Nadu Newsprint and Papers Limited, Karur , Tamil Nadu

Dr. Chezhian presented the programs implemented at TNPL with reference to FGR. He discussed about the germplasm of different pulp wood species maintained and promoted by TNPL. He shared the industrie's facilities for clonal multiplication.

Diversity, distribution mapping and *ex situ* conservation of Rare, Endangered and Threatened (RET) medicinal species of the Western Ghats- Dr. P. S. Udayan, Department of Botany, Sree Krishna College, Thrissur , Kerala

Dr. Udayan presented the paper on distribution of RET species in Western Ghats and highlighted that about 22% of plant species are presently facing extinction. He also suggested that for prioritization of medicinal plants, their use in ayurvedic formulations should also be considered.

Forest genetic resources conservation in SACON- Dr. P. Balasubramanian, SACON, Anaikatty, Coimbatore

Dr. Balasubramanian presented the availability of tree genetic resources at SACON and suggested that ecologically important tree species may be considered during prioritization for FGR conservation.

Session IV: Methodology for prioritization of species and species prioritization

This session was chaired by Dr. N. Krishna Kumar, Director, IFGTB and co chaired by Dr. N. Parthasarathy, Professor, Pondicherry University.

Smt. R. Anandalakshmi, Scientist-D, IFGTB, Coimbatore presented the methodology for prioritization of species for conservation of forest genetic resources. She briefed on species prioritization criteria adopted by FORGENMAP (2002). The three main criteria in this approach was i) Socio-economic, ii) level of variation within species and iii) level of threat or risk of the species. Each criteria was scored between 0 to 5 based on the importance of the respective species. She also informed that these criteria varies with approaches of different countries. For example, Malaysia weighs importance only to two criteria *viz.*, i) economical importance and ii) threat level of the species (endemic or rare). In Philippines, three criteria are used such as i) Economic use, ii) Current IUCN status of the plant and iii) report from individual studies on biodiversity value of the species. In the presentation, the list of species prioritized by FAO-APFORGEN as well as by IUFRO were discussed. She informed the forum that ICFRE and IFGTB has also shortlisted species for conservation as Genetic Resources after having several in-house discussions and brainstorming sessions. Finally, 105 species have been shortlisted for evaluation by the participants of this workshop. Dr. N. Parthasarathy, Professor, Pondicherry University enquired that whether new species can be added to this list of 105 species. He was informed that the new species of regional and national importance if any missed out can be added to this list. Dr. Tomar informed that the species *Tecomella undulata* is a very important species only for western region of the

country and in that case how this species will be prioritized. It is decided that there can be lists of species both for regional importance as well as national importance. To a query for prioritizing of exotic species, Dr. N. Krishna Kumar clarified that genetic resources includes exotic species as well. Dr. A. G. Pandurangan enquired that whether social and utility values and threat levels of a species will go hand in hand. Replying to his query, Dr. N. Krishna Kumar informed the forum that this is mainly to make sure that not to miss any species wherein genetics and improvement works have already been carried out. Dr. S. N. Jadhav, Additional PCCF, Andhra Pradesh Biodiversity Board insisted that this list can be considered only as indicative list and prioritization of a species need to be done only after studying each species at regional level. Smt. R. Anandalakshmi replied that the exercise on species in this forum would enable to provide the list of species to be dealt under FGRM Network in a phased manner in order to save time, fund and efforts at the juncture of initiating the network activities.

The participants were given the list of 105 species for their evaluation on three criteria by scoring 0 to 5. They were also asked to inform on other information about these species mainly on availability of seed orchards, research trials, CPTs and other details pertaining to conservation of Genetic resources so that consolidating their scores and availability of germplasm assets and research capabilities, the species and stakeholders would be identified. Filled data sheets have been collected from all the participants for further analysis and short listing.

Session V: Plenary Session- Implementation of Forest Genetic Resources, Role and Strategies

This session was chaired by Dr. S. Nagarajan, Ex- Chairman, PPVFRA, New Delhi with the following panel members

Dr. N. Krishna Kumar, Director, IFGTB, Coimbatore
Dr. T.V. Ananthanarayanan, Principal Scientist & Head of Division, IIHR, Bangalore
Dr. C. K. Kamble, Director, Central Sericultural Germplasm Resources Centre ,Hosur
Dr.B. Shivaraju, CCF (Research), Kerala Forest Department, Trivandrum
Dr. Z. Abraham, Principal scientist and Station incharge, NBPGR, Thrissur
Dr. Parthasarathy, Professor and Head, Pondicherry University, Pondicherry
Dr. Pandurangan, Scientist F & Head of Division, TBGRI, Trivandrum
Shri P. Subramanian, CCF & JMD, TAFCORN, Tamil Nadu
Shri P.Durairasu, Dean FC&RI, Mettupalayam, Coimbatore
Dr. K. Gurumurthi, Ex-Director, IFGTB, Coimbatore
Dr. K. Palanisamy, Scientist F & Head of Division, IFGTB, Coimbatore
Smt R. Anandalakshmi, Scientist D, IFGTB, Coimbatore

Dr. N. Krishna Kumar, Director, IFGTB, welcomed the chairman and the members to the dais. He presented the draft recommendations of the four sessions held in the two days workshop, and requested the members to give their views on the session's recommendations so that the future course of action of FGRMN and the species to be prioritized could be crystallized.

Recommendations and comments of Session I-1

Status and Management of Forest Genetic Resources in India – Experiences of stakeholders

Dr. N. Krishna Kumar, Director, IFGTB presented the draft recommendations of Session I-1

1. Co-operation and support of State Forest Departments should be ensured for effective functioning of the Network.

2. FGR of both indigenous and exotic species, including their landraces are recommended for conservation and preservation.

3. The network would be handling enormous number of species of forest origin, which must be equitably allocated to respective network institutions for comprehensive database development, genetic improvement and sustainable utilization.

4. Nodal centres are to be identified for various species for development and maintenance of database containing all relevant information, including GPS coordinates, soil parameters and variability range of economic traits for stakeholders.

5. Taxonomical research has to be promoted in nodal centres and network institutions / organizations to deal with inventorisation, characterization and documentation of FGRs.

6. Capacity building for frontline officials, especially field staff and researchers is very essential for effectively managing FGR.

7. The concept of Preservation Plots needs revival both in natural forests and plantations.

8. Forest dwelling communities / adjoining rural communities and self help groups need to be involved as stakeholders and their support and co-operation in this venture to be ensured.

9. Industries dependent on forests for raw materials (e.g. medicinal plants) should meet at least 25 per cent of their requirements through cultivation outside forests.

10. Conservation and sustainable utilization of FGR of NTFP which provide livelihood support for rural people and host plant resources of economically important insects like silkworm, lac insect etc. need to be ensured.

Dr. Nagarajan emphasized that in agricultural crops, there is no differentiation of indigenous and exotic species. Many of the crops under cultivation have exotic origin and over the years these have been domesticated in India and have therefore become Indian. Delineating them as exotic and indigenous would invite confusion as many of the species have originated from different parts of the world and have now been naturalized in India. Considering these aspects any crop grown in India automatically becomes an Indian crop. He felt that the native tribes should be included and clear communication should be made to convince that we are here for conservation. Sharing his experience in PPVFRA, he stated that initially few species could be taken up for conservation. He opined that tree species for wood should be taken up as a priority and other species like lac could be taken up in the second phase.

Dr. K. Gurumurthi supported Dr. Nagarajan's views, and emphasized that tree species should be given priority. Furthermore, those species at different levels of improvement should be given priority. He felt that inclusion of RET species may lead to dilution of effort.

Shri P. Subramanian expressed that networking on a MoU basis may have to be done for implementation of FGRMN. Dr. Palanisamy, suggested that a Division for Forest Genetic Resource may have to be created in the Forest Departments and other partners for smooth functioning of FGRMN.

Dr.B.Shivaraju said that species other than woody species should also be taken up. Shri Duraiarasu, wanted a clarification as to whether it is Forest Genetic Resource or Plant Genetic Resource. The Director clarified that FGRMN would initially cater to tree species to start with.

Dr. Abraham emphasized that Marayur Sandal and Nilambur teak need to be conserved. He sought clarification on the term land races. Dr. Nagarajan clarified that land races are local varieties of domesticated species developed by natural processes by adaptation to the natural environment in which it thrives. Dr. Pandurangan emphasized that heterogeneity is very important and areas with maximum heterogeneity need to be identified. Dr. Nagarajan informed that a statistician needs to be involved to chose the minimum genetic width to capture the genetic variability. If FGRMN involves 100 species, and as heterogeneity is to be considered, the resources required in terms of finance, space and human resources would be enormous and so a focused programme

involving a few species must be considered. He suggested that FGRMN starts with a focused list of species some of which may have future importance. The list of species may be revisited later. He emphasized the need for a crash course on plant genetic resources from field men to the in-charge. He suggested that IARI may be contacted for such a crash course programme.

Dr. N. Krishna Kumar enquired if we can start with few selected species, for which Dr. Nagarajan replied that for FGRMN the core species need to be finalized.

Recommendations and comments of Session I-2

Status and Management of Forest Genetic Resources in India – Experiences of stakeholders

Dr. N. Krishna Kumar, Director, IFGTB presented the draft recommendations of Session I-2.

1. There is a need to spell out the forest genetic resources that are to be covered in the first phase of the Network.
2. Stakeholders should submit a note in the following format which would contain the following information,
    - Name of the Institution / Organisation
    - Name of the designated Nodal Officer
    - Name and short details of the species with which they are working
    - Level of variability existing within the species with the institution
    - Scientific and other strengths of the Institution to work with the species
    - The requirements of the Institutions for developing the database and linkage with Nodal Centre.
    - Financial requirements from the Network
3. A task force may be constituted to finalise the Network on the basis of notes submitted by the stakeholders on the guidelines provided. The Task force shall decide upon the priority species and fund allocation for each species and each stakeholder in the Network.

4. A subsidiary Network of all botanical gardens, bambusetums, arboreta, palmetums etc. can be made as a part of the main Network to enlist the database of all species and variability conserved in them.

5. A nodal and single window system for allotting “Identification Numbers” to the accessions in the Network need to be developed. These numbers should be unique and only these should be used by the members of the Network.

6. A digital and GPS record of the mother plants needs to be collected during explorations along with minimum passport data and indigenous knowledge if any, associated with it.

7. Due recognition should be given to the stakeholders who are providing germplasm to the Network. A database may be created for the exploration (with GPS records) being taken up by the stakeholders to ascertain the availability of the species in the natural conditions.

8. The database should be comprehensive with access being provided to them in the form of digital library, publications etc.

Dr. Nagarajan suggested that there has to be one commandant either at Dehradun or at Coimbatore. Accession number has to be provided and the international convention needs to be followed in this aspect. Digitalization of the genetic resources would be important and systems manager would play a crucial role. Incorporation of GPS data during collection is mandatory. Dr. K. Gurumurthi suggested that IFGTB should be the nodal agency. Dr. Nagarajan pointed out that as botanical gardens are generally educational resources and they should not be considered under the network and the keyword is "Genetic Resource". Shri Duraiarasu felt that botanical garden reflects the status and conservation of any species and therefore should be considered under FGRMN. Similarly Dr. Pandurangan stated that botanical gardens are repositories of critically endangered species which play a conservatory role and should be considered under FGRMN. Dr. Parthasarathy said that there is a shifting paradigm to germplasm conservation. Dr. Gurumurthi pointed out that while botanical gardens are static, genetic resource networks are dynamic. Dr. Abraham clarified that while botanical gardens have individuals representing a species, the genetic resource networks have many accessions representing diverse germplasm of a particular species. Dr. Gurudev Singh clarified that unlike botanical gardens, Forest Genetic Resource deal with conservation of species with commercial value arising out of its utility. Dr. Nagarajan felt that there is a need for a vision statement for FGRMN. Dr. N. Krishna Kumar informed that a vision statement has already been prepared and read out the vision statement "To promote sustainable utilization of forest genetic resources with focus on socio-economically important species of the South India through exploration, collection, evaluation, characterization,

documentation and conservation". Dr. Nagarajan pointed out that the FGRMN deals with commercially exploited species as given in the vision. Dr. Kunhikannan added that Botanical Gardens already have a network (International Botanical Garden Network). Dr. Shivaraju clarified that the Tropical Botanical Garden and Research Institute would be a part of the network. Dr. Gurumurthi felt that TBGRI is more than a botanical garden and would automatically form a part of the network unlike other botanical gardens.

Recommendations and Comments of Session I-3

Status and Management of Forest Genetic Resources in India – Experiences of stakeholders

Dr. N. Krishna Kumar, Director, IFGTB presented the draft recommendations of Session I-3.

1. Economic value and utility aspects of genetic resources from Tropical Dry Evergreen forests need to be comprehended.
2. Capacity building for mangrove genetic resource conservation to community, students and frontline forest staff.
3. Documentation on globally threatened mangrove taxa in different parts of the country to be prioritized.
4. FGR selections in industrial forestry research and development need to be included in the Network.

Dr. Nagarajan stated that addressing future energy needs is important and therefore, energy plantations would be the need of the hour. For these very reasons tree species mandated for IFGTB would always have relevance. Shri Jayaraj informed that variations in species are being characterized in relation to climate change.

Recommendations and Comments of Session II

Policies and Legislations concerned to FGR

Dr. N. Krishna Kumar, Director, IFGTB presented the draft recommendations of Session II.

1. Forest Genetic Resources Bureau should be a Central Institute. Regional institutes, State Agricultural Universities and private institutions can have access to germplasm and their usages.

2. Exploration, Collection, Conservation, Evaluation, Characterization Documentation and Exchange of FGR are the functions of the Bureau.

3. " Bureau of Forest Genetic Resources " should be a committed Institute, with committed people and it should have a committed funding and regional centers.

4. Initially, to begin with it can be started as a Division at the Institute of Forest Genetics and Tree Breeding. Later, in subsequent years, it can be developed into a full fledged independent Institute, and tree breeding should be separated from FGR conservation.

5. The forest genetic resources include very large number of trees, shrubs, lianas, algae, fungi, pteridophytes, lichens, microbes and medicinal plants. Initially it may not be possible to cover all the species. To begin with, few tree species of importance may be taken and later other species including medicinal plants can also be covered. It should be called " Bureau of Forest Tree Genetic Resources ". Later, as Institute grows separate Divisions/ Institutes –like "Forest Medicinal Plant Resources" or "Forest Animal Genetic Resources" may be bifurcated.

6. The farmers, tribals who helped in conservation should also be taken care of.

7. The varieties for forest trees should also be registered within one year of release as in case of Agricultural crop varieties.

8. Already existing varieties, provenances, clones etc., of forestry species should be brought to "common knowledge" through publications to avoid bio- piracy. A National Gene Bank may be established at IFGTB.

9. Under equitable sharing of benefits, benefits sharing from final product –out of Biological material taken by access should flow back to the area from where the biological material was drawn for conservation of species and development of the area.

10. Identify people who conserve land races and recognize them to know more about land races available with farmers.

Dr. Nagarajan suggested it would be appropriate to start with the division for Forest Genetic Resource which would ultimately grow into a Bureau. Initially a Forest Tree Genetic Resource Bureau could be created in 12^{th} plan and subsequently Bureaus for medicinal plants, microbial resources could be created. He suggested that a central gene bank needs to be created at IFGTB. He also opined that the knowledge of the tribals be documented and copywrited so that it becomes a common knowledge. Dr. Jadav mentioned that benefit sharing is

important. Dr. Gurumurthi suggested that biodiversity and benefit sharing should be separately treated.

Recommendations and Comments of Session III

Tools and techniques for conservation of Forest Genetic Resources – *in situ* and *ex situ* conservation strategies

Dr. N. Krishna Kumar, Director, IFGTB presented the draft recommendations of Session III.

1. CAMP workshops have to be organized for different species or a group of related species to understand the level of diversity, utilization and conservation needs for prioritizing species.

2. Different units of NBPGR have already either prioritized or started accumulating accessions of tree species in their respective regions. Such initiatives have to be compiled by consulting these NBPGR stations for allocation of species to different partners.

3. Sustained interaction between organizations concerned with genetic resources of horticulture trees and forestry institutions to learn from the strategies adopted for tree crops and modify them for forestry tree species. In particular the long-term pollen storage techniques available for horticulture species may be useful for forestry species.

4. The extent of variation required to be maintained for exotic germplasm may be determined after characterizing the germplasm currently available.

5. IFGTB/FGRMN and State Forest Departments should be equal partners in FGR related activities. A National Coordinator in the FGRMN Secretariat and State Coordinators for participating States will be necessary for effective networking.

6. Molecular characterization of assemblages required for conservation and management of FGRs. Advanced molecular tools like SNP genotyping may be considered during characterization.

Dr. Nagarajan informed that CAMP workshop needs to be immediately taken up. The bureau should have a plant protection and quarantine system. He felt that molecular characterization could be taken up in phase two while documentation and publication be taken up immediately.

Recommendations and Comments of Session IV

Methodology for prioritization of species and species prioritization

Dr. N. Krishna Kumar, Director, IFGTB presented the draft recommendations of Session IV

1. Species prioritization need to be done both at country and regional level.
2. Species on which genetics and improvement work has been done should not be missed out.
3. Species other than given in the indicative list need to be explored at regional level for next stage of conservation.
4. Species having conservation value can be added to the prioritized indicative list.
5. Species of indigenous and exotic tree species of economic importance need prioritization to begin with Forest Genetic Resources Management.
6. The potential of each partner in the species prioritized have to be enlisted to strengthen FGRMN.

The list of species prioritized for FGRMN is given below,

S. No.	Prioritized Species	Networking partner for species
Phase I		
1	*Tectona grandis*	IFGTB, IWST, TFRI, AFRI, TNFD, KFD, APFD, KaFD, MFD, KFRI, KAU, FCRI, ASPEE, CTCRI, CARI, DBSKKV
2	*Gmelina arborea*	IFGTB, IWST, TFRI, RFRI, TNFD, KFD, APFD, KaFD, MFD, DBSKKV, ASPEE, TNPL, TBGRI, KFRI
3	*Melia dubia*	IFGTB, TNFD, KFD, APFD, KaFD, MFD TNPL, FCRI
4	*Casuarina equisetifolia*	IFGTB, TNFD, KFD, APFD, APFDC, KaFD, MFD, FCRI, DBSKKV, ASPEE, TNPL, CTCRI, TAFCORN
5	*Eucalyptus camaldulensis*	IFGTB, AFRI, IWST, TNFD, KFD, APFD, APFDC, KaFD, MFD, FCRI, ANGRAU, TNPL, TAFCORN, MPM, WCPM
6	*Ailanthus excelsa*	IFGTB, TNFD, KFD, APFD, KaFD, MFD, ASPEE, FCRI, TBGRI

7	*Eucalyptus tereticornis*	IFGTB, AFRI, IWST, TNFD, KFD, APFD, APFDC, KaFD, MFD, FCRI, TNPL, TAFCORN, MPM, WCPM
8	*Anthocephalus cadamba*	IFGTB, TNFD, KFD, APFD, KaFD, MFD, CTCRI, FCRI, TBGRI, KFRI
9	*Pterocarpus santalinus*	IFGTB, IWST, TNFD, KFD, APFD, APFDC, KaFD, CTCRI, NBPGR (Thrissur), FCRI
10	*Acacia mangium*	IFGTB, TNFD, KFD, APFD, KaFD, MFD, KAU, KFRI, MPM
11	*Acacia auriculiformis*	IFGTB, TNFD, KFD, APFD, KaFD, MFD, KAU, KFRI, MPM
12	*Casuarina junghuhniana*	IFGTB, TNFD, KFD, APFD, APFDC, KaFD, MFD, FCRI, ASPEE, TNPL, TAFCORN
13	*Calophyllum inophyllum*	IFGTB, TNFD, KFD, APFD, KaFD, MFD, DBSKKV, NBPGR (Thrissur), TBGRI
14	*Sapindus emarginatus*	IFGTB, TNFD, KFD, APFD, KaFD, MFD, CTCRI
15	*Azadirachta indica*	IFGTB, IWST, AFRI, TFRI, TNFD, KFD, APFD, KaFD, MFD, CTCRI, ANGRAU, FCRI, MFD
Phase II		
16	*Tamarindus indica*	IFGTB, TNFD, KFD, APFD, KaFD, MFD, CTCRI, CARI, FCRI
17	*Dalbergia latifolia*	IFGTB, TNFD, KFD, APFD, KaFD, MFD, CTCRI, KFRI
18	*Dalbergia sissoo*	IFGTB, AFRI, TNFD, KFD, APFD, KaFD, MFD, CTCRI, FCRI, TNPL
19	*Artocarpus heterophyllus*	IFGTB, TNFD, KFD, APFD, KaFD, MFD, ASPEE, CTCRI, NBPGR (Thrissur), TBGRI
20	*Santalum album*	IFGTB, IWST, TNFD, KFD, APFD, KaFD, KaFDC, MFD, ASPEE, CTCRI, FCRI
21	*Pongamia pinnata*	IFGTB, TFRI, TNFD, KFD, APFD, KaFD, MFD, FCRI, KFRI, DBSKKV, CARI
22	*Aegle marmelos*	IFGTB, TNFD, KFD, APFD, KaFD, MFD, TBGRI, KFRI
23	*Pterocarpus marsupium*	IFGTB, TNFD, KFD, APFD, KaFD, MFD, KFRI
24	*Ailanthus triphysa*	IFGTB, TNFD, KFD, APFD, KaFD, MFD, KFRI, FCRI, CTCRI
25	*Terminalia chebula*	IFGTB, TNFD, KFD, APFD, KaFD, MFD, CSGRC, ASPEE, CTCRI, KFRI

26	*Albizia lebbeck*	IFGTB, TNFD, KFD, APFD, KaFD, MFD, KFRI, FCRI
27	*Leucaena leucocephala*	IFGTB, TNFD, KFD, APFD, KaFD, MFD, FCRI, WCPM, CARI
28	*Thespesia populnea*	IFGTB, TNFD, KFD, APFD, KaFD, MFD
29	*Bombax ceiba*	IFGTB, TNFD, KFD, APFD, KaFD, MFD, CARI
30	*Bamboos* (13 economically important bamboo species identified by NMBA)	IFGTB, IWST, RFRI, TNFD, KFD, APFD, KaFD, MFD, TNPL, KFRI, CARI, FCRI, TBGRI

The other important tree species will be taken up later.

Dr. Nagarajan felt that species prioritization alone is not sufficient. Exploration at the centre of origin is important to capture the diverse genetic variability. Dr. Krishna Kumar, felt that short rotation fast growing tree species can be taken up. Dr. Gurumurthi enquired whether these species prioritized gives national representation, Dr. Krishna Kumar clarified that IFGTB Coimbatore and FRI Dehradun have been designated as the nodal centers for Forest Genetic Resources of South and North India respectively and therefore, these species represent predominantly the South Indian priority. Dr. Nagarajan suggested that different agro climatic zones have zonal offices. Dr. Abraham emphasized that zonal level co-ordination is important. Dr. N. Krishna Kumar informed that there are eight institutes under ICFRE already having collection of Forest Genetic Resources and they would function as zonal networks. Dr. Palanisamy stated that major FGR are available with Forest Departments and they have an important role in the FGRM network.

Dr. Nagarajan concluded the session. He thanked the Director, IFGTB for inviting him for attending this workshop. He felt that the 9% economic growth to be achieved by India should be matched by such conservation efforts so that the Forest Genetic Resources are not lost in the process. He suggested the Director to initiate the charter, mandate, structure and project launching within the next three months. He emphasized that for FGRMN to be successful, the mandate should be clear and focused, and what cannot be handled should not be taken up. It is also important for human resource development, database automation and digitalization. FGRMN should cover issues pertaining to economic interest, social justice and productivity. The network would provide the spadework for National Bureau of Forest Genetic Resource. The important areas would be cryopreservation, synthetic seeds and field gene bank. Indian Forestry should take care of the global climate change issues also. He applauded the efforts so far taken and wished the network a success.

The Recommendations of the "Consultative Workshop on Strategies for formulation of Forest Genetic Resources Management Network" finally discussed and accepted are as follows:

1. Co-operation and support of State Forest Departments should be ensured for effective functioning of the Network.
2. FGR of both indigenous and exotic species, including their landraces are recommended for conservation and preservation.
3. The network would be handling many species of forest origin, which must be allocated to respective network institutions for comprehensive database development, genetic improvement and sustainable utilization.
4. FGRMN starts with a focused list of species which have present and future importance. Species of indigenous and exotic tree species of economic importance need prioritization to begin with Forest Genetic Resources Management. Species prioritization need to be done both at country and regional level. Tree species for wood should be taken up as a priority in FGRMN and other species like lac could be taken up in the second phase. There is a need to spell out the forest genetic resources that are to be covered in the first phase of the Network.
5. Species on which genetics and improvement work has done should not be missed out.
6. Species other than given in the indicative list need to be explored at regional level for next stage of conservation. Species having conservation value can be added to the prioritized indicative list.
7. The potential of each partner in the species prioritized have to be enlisted to strengthen FGRMN.
8. Nodal centres are to be identified for various species for development and maintenance of database containing all relevant information, including GPS coordinates, soil parameters and variability range of economic traits for stakeholders.
9. Taxonomical research has to be promoted in nodal centres and network institutions / organizations to deal with inventorisation, characterization and documentation of FGR.
10. Capacity building for frontline officials, researchers, forest field staff, community and students is very essential for effectively managing FGRs.

11. Forest dwelling communities / adjoining rural communities and self help groups need to be involved as stakeholders and their support and co-operation in this venture to be ensured. The knowledge of farmers and tribals to be documented.

12. Division for Forest Genetic Resource may have to be created in the Forest Departments and other partners for smooth functioning of FGRMN.

13. Stakeholders should submit a note containing the following information,

    - Name of the Institution / Organisation
    - Name of the designated Nodal Officer
    - Name and short details of the species with which they are working
    - Level of variability existing within the species with the institution
    - Scientific and other strengths of the Institution to work with the species
    - The requirements of the Institutions for developing the database and linkage with Nodal Centre.
    - Financial requirements from the Network

14. A task force may be constituted to finalise the Network on the basis of notes submitted by the stakeholders on the guidelines provided. The Task force shall decide upon the priority species fund allocation for each species and each stakeholder in the Network.

15. A subsidiary Network of all botanical gardens, bambusetums, arboreta, palmetums etc. can be made as a part of the main Network to enlist the database of all species and variability conserved in them.

16. A nodal and single window system for allotting "Identification Numbers" to the accessions in the Network need to be developed. These numbers should be unique and only these should be used by the members of the Network.

17. A digital and GPS record of the mother plants needs to be collected during explorations along with minimum passport data and indigenous knowledge if any, associated with it.

18. Due recognition should be given to the stakeholders who are providing germplasm to the Network. A database may be created for the exploration (with GPS records) being taken up by the stakeholders to ascertain the availability of the species in the natural conditions.

19. The database should be comprehensive with access being provided to them in the form of digital library, publications etc.

20. Economic value and utility aspects of genetic resources from Tropical Dry Evergreen forests need to be comprehended.

21. Documentation on globally threatened mangrove taxa in different parts of the country to be attended.

22. FGR selections in industrial forestry R&Ds need to be included in the Network.

23. Bureau of Forest Genetic Resources should be a central institute. Regional institutes, State Agricultural Universities and private institutions may have access to germplasm and their usages.

24. Exploration, Collection, Conservation, Evaluation, Characterization, Documentation and Exchange of FGR are the functions of the Bureau.

25. "Bureau of Forest Genetic Resources " should be a committed Institute, with committed people and it should have a committed funding and regional centers.

26. Initially, to begin with it can be started as a Division for forest Genetic Resources at the Institute of Forest Genetics and Tree Breeding. Later, in subsequent years, it can be developed into a full fledged independent Institute, and tree breeding should be separated from FGR conservation.

27. The forest genetic resources include very large number of trees, shrubs, lianas, algae, Fungi, pteridophytes, lichens, microbes and medicinal plants. Initially it may not be possible to cover all the species. To begin with, few tree species of importance may be taken and later other species including medicinal plants can also be covered. It should be called "Bureau of Forest Tree Genetic Resources ". Later, as Institute grows separate Divisions/ Institutes –like "Forest Medicinal Plant Resources" or "Forest Animal Genetic Resources" may be bifurcated.

28. The varieties for forest trees should also be registered within one year of release as in case of Agricultural crop varieties.

29. Already existing varieties, provenances, clones etc., of Forestry Species should be brought to "Common Knowledge" through publications to avoid bio- piracy. A National Gene Bank may be established at IFGTB.

30. Under equitable sharing of benefits, benefits sharing from final product –out of Biological material taken by access should flow back to the area from where the biological material was drawn for conservation of species and development of the area.

31. Identify people who conserve land races and recognize them to know more about land races available with farmers.

32. CAMP workshops have to be organized for different species or a group of related species to understand the level of diversity, utilization and conservation needs for prioritizing species.

33. Different units of NBPGR have already either prioritized or started accumulating accessions of tree species in their respective regions. Such initiatives have to be compiled by consulting these NBPGR stations for allocation of species to different partners.

34. Sustained interaction between organizations concerned with genetic resources of horticulture trees and forestry institutions to learn from the strategies adopted for tree crops and modify them for forestry tree species. In particular the long-term pollen storage techniques available for horticulture species may be useful for forestry species.

35. The extent of variation required to be maintained for exotic germplasm may be determined after characterizing the germplasm currently available.

36. IFGTB/FGRMN and State Forest Departments should be equal partners in FGR related activities. A National Coordinator in the FGRMN Secretariat and State Coordinators for participating States will be necessary for effective networking.

37. Molecular characterization of assemblages required for conservation and management of FGRs. Advanced molecular tools like SNP genotyping may be considered during characterization.

38. The Bureau of Forest Genetic Resources should have a plant protection and quarantine system. Molecular characterization could be taken up in phase two while documentation and publication be taken up immediately.

39. Different agro climatic zones may have zonal offices, and zonal level co-ordination is important. Major FGR are available with Forest Departments and they have an important role in the FGRM network.

40. An exclusive website for FGRMN should be created for effective information exchange.

Dr. K. Palanisamy, Organizing Secretary of the workshop proposed the vote of thanks.

Photographs of the Workshop Proceedings

Inauguration with release of Abstract of FGRMN Workshop

Participants attending the FGRMN Workshop

Dr. N. Krishna Kumar, Director, IFGTB presenting the FGRMN- overview

Presentation by Shri Srinivas R. Reddy, CF (Research), TNFD

Presentation by Shri G. Saiprakash, CF, Maharashtra Forest Department

Interaction of participants

Presentation by Smt R. Anandalakshmi, Scientist, IFGTB, Coimbatore

Lateral interaction among participants

Presentation by Dr. Syam Viswanath, IWST, Bangalore

Presentation by Dr. Harsha Hegde, Asst. Prof. Navsari Agricultural University, Gujarat

Plenary session discussion

Participants of the FGRMN workshop

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