Chapter 1

INTRODUCTION

Indian Council of Forestry Research and Education (ICFRE), an apex body in the national forestry research system, has been undertaking the holistic development of forestry research through need based planning, promoting, conducting and coordinating research, education and extension covering all aspects of forestry. The Council deals with the solution based forestry research in tune with the emerging issues in the sector, including global concerns such as climate change, conservation of biological diversity, combating desertification and sustainable management and development of resources. Topical research by the Council enhances public confidence in the ability of forest managers and researchers to successfully handle challenges related to natural resource management.

Objectives of ICFRE

- To undertake, aid, promote and coordinate forestry education, research and their applications.
- To develop and maintain a national library and information centre for forestry and allied sciences.
- To act as a clearing-house for research and general information related to forests and wildlife.
- To develop forestry extension programmes and propagate the same through mass media, audio-visual aids and extension machinery.
- To provide consultancy services in the field of forestry research, education and allied sciences.
- To undertake other jobs considered necessary to attain these objectives.

Institutes and Centres under the Council

ICFRE has eight Regional Research Institutes and four Advanced Research Centres located in different bio-geographical regions of the country to cater to the forestry research needs of the nation. The Regional Research Institutes are located at Dehradun, Coimbatore, Bangaluru, Jabalpur, Jorhat, Jodhpur, Shimla and Ranchi. The Research Centres are at Allahabad, Chhindwara, Hyderabad and Aizawl.

Research Institutes under the Council are:

- Forest Research Institute (FRI), Dehradun
- Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore
- Institute of Wood Science and Technology (IWST), Bangaluru
- Tropical Forest Research Institute (TFRI), Jabalpur
- Rain Forest Research Institute (RFRI), Jorhat
- Arid Forest Research Institute (AFRI), Jodhpur
- Himalayan Forest Research Institute (HFRI), Shimla
- Institute of Forest Productivity (IFP), Ranchi

Advanced Research Centres under the Council are:

- Centre for Social Forestry and Eco-Rehabilitation (CSFER), Allahabad
- Centre for Forestry Research and Human Resource Development (CFRHRD), Chhindwara
- Forest Research Centre (FRC), Hyderabad
- Advanced Research Centre for Bamboo and Rattans (ARCBR), Aizawl

Salient Achievements/Highlights of Research of ICFRE and its Institutes

ICFRE, Headquarter, Dehradun

- **Participation of ICFRE delegation in the 28th SBSTA/SBI meeting of UNFCCC (United Nations Framework Convention on Climate Change) held in Bonn, Germany from 2nd to 13th June 2008:** The ICFRE delegation, comprising Shri Jagdish Kishwan, DG, ICFRE, Dr. Renu Singh, Head, Biodiversity and Climate Change Division, Mr. V.R.S. Rawat, Scientist-D, Biodiversity and Climate Change Division, and Dr. A. Ramachandran, Director, Centre for Climate Change and Adaptation Research, Anna University Chennai, Tamil Nadu participated in the meeting along with the Government of India Delegation.
- **Participation of DG, ICFRE in Accra Climate Change Talks from 21st to 27th August 2008 at Accra, Ghana:** Shri Jagdish Kishwan, DG, ICFRE attended the Accra Climate Change meeting from 21st to 27th August 2008 and made a presentation on Reducing Emissions from Deforestation and Degradation in Developing (REDD) Countries at Accra, Ghana.
- **Participation of ICFRE delegation in the Fourteenth Conference of the Parties to the UNFCCC and Fourth Meeting of the parties to the Kyoto Protocol held in Poznan, Poland from 1st to 12th December 2008:** The ICFRE delegation, comprising Shri Jagdish Kishwan, DG, ICFRE, Dr. Renu Singh, Head, Biodiversity and Climate Change Division, Mr. V.R.S. Rawat, Scientist- D, Biodiversity and Climate Change Division, and Dr. A. Ramachandran, Director, Centre for Climate Change and Adaptation Research, Anna University Chennai, Tamil Nadu participated in the conference along with the Government of India Delegation.
- **Participation of ICFRE in International Technical Workshop in Brazil:** Dr. Renu Singh, Head, BCC Division, ICFRE attended the international technical workshop on " land area change assessment: the experience of the existing operational system" in Sao Paulo, Brazil from 4th to 6th February 2009.
- **Visit of Shri Jagdish Kishwan, DG, ICFRE to Suriname:** Mr. Jagdish Kishwan, DG, ICFRE was invited by the Ministry of Physical Planning, Land and Forest Management of the Republic of Suriname to participate in the Symposium "REDD Negotiations: the Case of High Forest Cover Low Deforestation Countries" in Paramaribo, Suriname on 13th March 2009 and to make a presentation before the senior officers and negotiators of Suriname.
- **Participation of ICFRE in expert meeting of UNFCCC in Germany:** Mr. V.R.S. Rawat, Scientist-D, ICFRE attended the Expert meeting on methodological issues relating to reference emission levels and reference levels in Bonn, Germany on 23rd and 24th March 2009.
- During X RPC, 89 new projects were discussed by RPC members out of which 81 projects were approved for ICFRE funding amounting to Rs. 810.3 Lakhs.
- Five thousand (5,000) copies of an illustrated Hindi Book "*Bans Ropan evam Upyogita*" were published for the benefit of forest personnel, farmers and field functionaries and distributed free of cost.
- Overall Rs. 502.71 lakhs as Grant-in-aid released to the 14 universities in the year 2008-09.

- Process of accreditation on the pattern of AICTE has been initiated and the Forestry Courses are being accredited. The Forestry Syllabii of Kerala Agricultural University, Trissur (Kerala) has been accredited in the year 2008-09 and several universities have offered for accreditation of their forestry courses which are in process.
- ICFRE in collaboration with State Forest Departments (SFD's) has established 22 VVKs in different states.

INSTITUTES

FRI, Dehradun

- DNA fingerprinting of *Fusarium solani* by specific primers.
- Molecular characterization of resistant germplasm of *Dalbergia sissoo* using 60 primers.
- Artificial culturing of *Cordyceps sinensis* on Jhingora and Mandua grains and analysis of bioactive principles.
- Identification of potential antagonistic species of Trichoderma for the control of medicinal plants.
- DNA sequencing of various pathotypes of *Cylindrocladium quinqueseptatum*.
- Establishment of variability in Drechlera isolates in causing blight in poplars.
- Hill Bamboosetum established at Khirshu, Pauri Garhwal.
- Germplasm Bank of *Dendrocalamus strictus* maintained at Pavilion Ground of FRI, New Forest Campus, Dehradun.
- Establishment of Bamboo Clonal Nursery at FRI, Dehradun.
- Establishment of five Van Vigyan Kendras by Forest Research Institute in the states/UT of Punjab, Haryana, Uttarakhand, UT Chandigarh and NCT Delhi.
- Establishment of one Demo Village by FRI at Shyampur in Dehradun.

IFGTB, Coimbatore

- Standardized suitable culture medium for mass production of different isolates of Ectomycorrhizal fungi (*Laccaria fraterna* and *Pisolithus albus*) under *in-vitro.*
- Serious pest problems in nursery and plantations of fast growing indigenous tree species such as *Ailanthus excelsa, Melia dubia, Gmelina arborea, Thespesia populnea, Bombax* spp. and *Dalbergia sissoo* in Tamil Nadu and Kerala were identified.
- Eucalyptus clones categorized based on the susceptibility for key pests and disease problems.
- Some of the secondary individual compounds identified from tissues of *Aegle marmelos* viz. fruit, unripe fruits and seeds were tested for their bioactivity on teak pest, *Hyblaea puera*. It was observed that a few individual phenol/phenolics expressed their biopesticidal properties.
- Assessment of biopesticidal effect of *A. marmelos* plant extracts and testing the bioactivity in comparison with traditional insecticides, neem derivatives, and development of suitable biopesticidal formulation & phytomedicine are in progress.
- The seed decoater experiment on *Jatropha curcas* seeds proved that removal of seed coat from the kernel upto the level of 80% is essential in order to improve the oil recovery from seeds and to obtain quality oil with desirable physical and chemical characteristics. A prototype 'Seed Decoater' was fabricated to break the whole seed so that shell or seed coat is removed to release the kernel.

IWST, Bangaluru

- Studies carried out on *Simarouba glauca* showed that the timber is dimensionally stable and found suitable for making artifacts, match sticks, tool handles, light packing cases, light furniture and 'BWR' grade plywood.
- Investigations on tree ring analysis of certain species in Western Ghats to monitor climate change and its relevance to wood quality showed local insect attack in 1966 and 1976 in teak based on observations of growth rings and its abnormalities.
- Studies on wood filled thermoplastic composites show that filler morphology, type of coupling agent and processes additive have large influence on the mechanical performance of wood flour filled polypropylene composites. Formulations for producing wood filled composites were developed. To predict the properties of composites, a micromechanics model based on shear lag theory was developed. A fast and reliable method to measure elastic constants using vibration method was also developed.
- Fatty oil content of the seeds of *Baccaurea courtallensis* Muell. Arg. was found to be 22.5%. Ethyl acetate and Methanol extracts of the fruit rind were found to be highly inhibitive to *Fusarium oxysporum* fungi.
- Natural durability of timber of 6 plantation grown species of 5, 10, 15 and 20 years was tested against decay fungi, termites and beetles. By field studies, a package of practice was developed for timber storage in depots. Laboratory and field trials have shown the effectiveness of phosphine fumigation for wood protection.
- One hundred fifty three herbivorous species and 29 species of flower visiting insects were recorded and details of 11 major pollinators of three major species were studied from Karnataka mangroves. Ninty four species of forest lepidoptera were tested and microsporidian parasites were isolated from 29 species.
- One hundred fifty fungal species were isolated from the seeds of selected endemic plants, 40 species were pathogenic and the rest were saprophytic fungi.
- IWID, a database on Indian wood insects is developed including details of about 1000 timber species and 2500 wood inhabiting insects.
- Three important medicinal plants, namely, *Drynaria quercifolia* (L.) J. E. Sm., *Stemona tuberosa* Lour. and *Trichosanthes tricuspidata* Lour. reported for the first time from the tribal areas of North-Eastern Ghats of Andhra Pradesh.
- The fouling organisms, namely, *Siphonaria* cf. *kurracheensis* (Reeve), a new record to India and *Perna indica* Kuriakose and Nair, a new record to East Coast of India were reported from Visakhapatnam harbour.
- Established germplasm bank of 21 bamboo species at Gottipura, Bangaluru.
- Based on the overall biomass and productivity data of 5 years of *Acacia mangium* hybrid under semi-arid condition, line planting was found better than block plantation.
- Among the seeds collected from SPA, SSO, CSOs and unimproved population of teak, seeds from SPA were better in quality in terms of morphological characters and germinations. Seeds from CSO had more emptiness as compared to those from SPAs and unimproved populations.
- Established two agroforestry trials with four industrially important bamboo species in farmers' field. Produced 50,000 plants of sandal and provided to the farmers, NGOs and plantation companies. Established two agroforestry trials of sandal in Karnataka.
- A systematic study on fuel properties and combustion characteristic of *Lantana camara* and *Eupatorium* spp. was carried out and compared with that of a mature tree (20 years old)

of *E.* hybrid and *C. equisetifolia*. The calorific value and other fuel properties of *Lantana camara* were found as good as that of *E.* hybrid and *C. equisetifolia*.

TFRI, Jabalpur

- Dispersion of Suspended Particulate Matter (SPM) from sponge iron factory may render the area near the factory unfertile.
- Complete host record of Indian Braconid species has been prepared.
- Control measures for Xanthomonas leaf curl and stunting in young teak plants has been developed.
- A calendar on nursery techniques of medicinal plants prepared.
- Five hundred sixty three herbal plants used by the traditional healers to cure the various diseases prevailing among the tribal/local communities documented.

RFRI, Jorhat

- Nursery technique for multiplication of *Bambusa pallida* has been standardized.
- Carbon sequestration potential of *Bambusa tulda* and *Dendrocalamus hamiltonii* has been evaluated.
- *Bambusa pallida* has been found to be most resistant bamboo to biodegradation in natural conditions.
- Keys have been developed for identification of infested agar trees.
- Areca nut + Patchouli and agar + Patchouli agroforestry models have been developed. The models have been extended to the farmers' fields in Jorhat and Nagaon districts of Assam.

AFRI, Jodhpur

- Severe infestation of a semilooper, *Achaea janata* (noctuidae) has been noticed on all mehndi (*Lawsonia inermis*) growing areas at Sojat road (Pali).
- Isabgol (*Plantago ovata*) crop was found severely attacked by downy mildew disease (*Peronospora* sp.).
- The major insect pest attacking Isobgol is an aphid species (*Aphis gossypii*).
- Soil treatment (Trichoderma + Vermicompost + Phorate) was found the best amongst other three treatments wherein Mehandi yield was increased from 1.5 to 2.1 kg per metre sq. in treated plots.
- A check list of 20 species of insects, 2 species of mollusk and 5 species of mites of infesting neem in arid areas of Rajasthan has been prepared and compiled. Bioecology of neem weevil, *Myllocerus tenuicornis* has been studied in detail.
- The provenance from Palanpur and Jhansi exhibited the least preference for the larvae of *M. tenuicornis* (0.65 and 0.69 cm sq.) whereas the provenance from Mulag was the most favoured host as the leaf area consumed by larvae was 3.11 cm sq.
- AMF genera like *Glomus, Scutellospora, Sclerocystis* and *Acaulospora* and Seven species of *Glomus* viz., *G. fasciculatum, G. aggregatum, G. mosseae, G. macrocarpum G. intraradices, G. reticulatum,* and *G. constrictum* were isolated and identified.
- The distribution of different VAM species viz., *Glomus aggregatum* (35%); *G. mosseae* (15%); *Glomus fasciculatum* (20%); *G. macrocarpum* (10%); *Glomus* sp. (15%); *Scutellospora* (3%) and *Acaulospora* (2%) were recorded.

- Established performance trial and agri-trial of guggal.
- Established clonal trials and seedling seed orchard of *Jatropha curcas.* Established progeny trial of 30 CPTs of *J. curcas* selected from Rajasthan and Gujarat.
- Developed preliminary seed yield equation for *J. curcas* relating to seed yield with crown diameter.

HFRI, Shimla

- *Arnebia euchroma* (Royle ex Benth.) I.M. Johnston, a critically endangered plant in Himachal Pradesh, has been found in open, drier slopes in Namgia and Hango valley of district Kinnaur, Himachal Pradesh at an elevation ranging from 3700 m to 4200 m above msl. The plant belongs to family Boraginaceae and commonly known as Ratan Jot is used in the treatment of measles, mild constipation, burns, frostbite, dermatitis etc. It inhibits the growth of cancer cells on the chorion membrane.
- The problem of large scale drying of Deodar trees was diagnosed in the Pangna Forest Range of Karsog Forest Division (District Mandi). It was observed that Deodar trees in the two compartments i.e. C-1A (D-19 Shlog) covering area 31.50 hectares and C-1 (D-15 Rakni) covering area 10.49 hectares are drying and dying due to some disease. The symptoms revealed the prevalence of Heterobasidium root rot of Deodar.

IFP, Ranchi

- Traditional medicinal practices commonly used by 22 tribes of Jharkhand were documented under the NMPB funded project. Herbal remedies for common ailments among ethnic communities viz. Arthritis, Diarrhoea, Dysentery, Spermatorrhoea, Bone fracture, Epilepsy, Piles, Asthma, Hyperacidity, Paralysis, Infertility (Male & Female), Otitis, Snake bite and Dog bite, etc. were noted. Herbarium specimens were preserved for plants used by different tribes for treatment of disease symptoms.
- Vegetative propagation techniques were standardized for *Rauvolfia serpentine*, *Gloriosa superb*, *Asparagus racemosus* and *Withania somnifera* in Jharkhand. Growth of four species of medicinal plants was recorded under the shade of trees viz. Teak, Sisham, Khair and Sal.
- Developmental stability of leaves in Neem and Sissoo is demonstrated suggesting that air pollutants and their associated changes in the environment such as increase in temperature and humidity did not induced genotypes to change to their environment. Hence plants have inherent physiological adaptations to overcome evils of environment. Plants do not suffer under optimal water regimes, even under the influence of air pollutants indicating fair resistance to them. However, herbs showed susceptibility to diseases and pests under prolonged exposure to air pollutants.