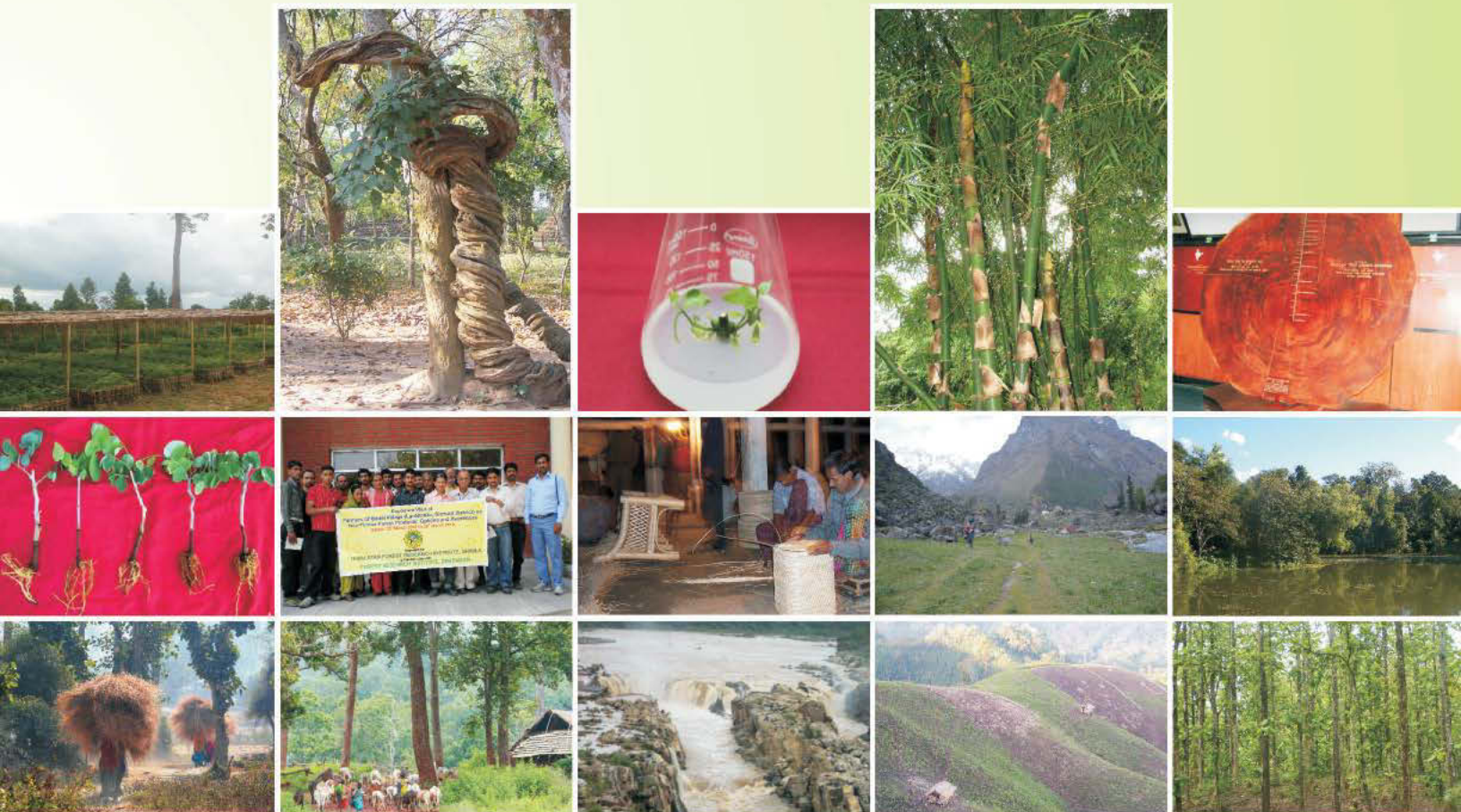


Indian Council of Forestry Research and Education

ICFRE: Vision 2040



**Directorate of Research
(Research Planning Division)**

Indian Council of Forestry Research and Education

(An organisation of Ministry of Environment and Forest, Govt. of India)


P.O. New Forest Dehradun - 248 006

Indian Council of Forestry Research and Education



ICFRE: VISION 2040

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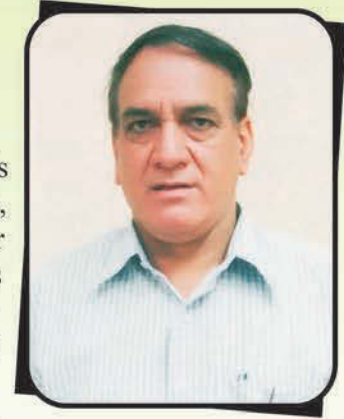
Director General

Indian Council of Forestry Research and Education

Dehradun

Foreword

Competing uses of land for agriculture, forestry pastures, human settlements and industries exerted tremendous pressure on the country's finite land resources, and thus adversely impacting forest resources and biodiversity. The forestry sector in India needs to gear up to deal with these emerging demands and challenges through inter-sectoral linkages and convergence. The use of modern technologies and concepts in natural resource management and compatible changes in governance is also needed.



ICFRE has significantly revised its research focus recently to enable its direct linkages to the society and community for their livelihood issues, specifically rural tribal poor and marginal section of the society, apart from looking after contemporary issues of forest management and other stake holders. The linkage with Panchayati Raj institutions is another major shift in ICFRE research planning system to cater to rural poor and tribals residing in fringe forest areas. For this purpose, ICFRE is taking up special project of Rs 5 crores for developing models for livelihood of tribals on the forest land vested in them under FRA 2006. To make the research inputs relevant to contemporary issues of society and stakeholders, the Research Policy Committee (RPC) 2012 took a hard look on the research proposals of various institutes of ICFRE, deliberated earlier in the Research Advisory Groups (RAGs) of the institutes.

For the purpose four Thrust Area of research i.e. Managing Forests and Forest Products for Livelihood Support and Economic Growth; Biodiversity Conservation and Ecological Security; Forests and Climate Change; and Forest Genetic Resource Management and Tree Improvement were finalized. Apart from these four thrust areas, two thrust areas, one for education and one for extension were also formulated. One National Project Director (NPD) for each Thrust Area has been designated, apart from Chief Project Coordinator and 35 National Subject Matter Coordinators (NSMCs) to give necessary thrust to the changed priorities and to revamp the research information system. Further to harness and collate innovative and out of box ideas and inputs for improving research system 'Think Tank', 'Ginger Group' and 'Knowledge Pool' of eminent foresters and scientists have been established in ICFRE, whose inputs are suitably incorporated in the research programs.

All India coordinated and networked projects have been launched recently on tree improvement, Climate Change, Biodiversity Conservation, Technology development for the farmers, tribals and for enhanced productivity per unit farmland utilized. Reassessment of Champion and Seth classification of Forest Types of India has been taken up recently to analyze the current forest status and to make it more useful from scientific management perspective, both nationally and internationally. In addition a network project involving eighteen Agriculture Universities for assessment of NTFPs focusing on rural and tribal livelihood is also initiated.

I believe that the Vision document will give a new direction to the Forestry research system of ICFRE for next 25 years. The Programs identified would be tuned and improved regularly with my support team. I congratulate Sh. Sandeep Tripathi, DDG (Research) and Dr. Vimal Kothiyal, Scientist G/ADG (Research Planning) and all other officials / scientists of ICFRE Institutes / Centers involved in this task for their excellent work in shaping this document.

(Dr. V. K. Bahuguna)
Director General

Preface

Historically, the management of forest started with the objective of sustained yield of outputs through scientifically based knowledge application. However, ever increasing pressure of growing population put these plans out of gear. Tree planting activities in the country were undertaken through a large number of projects and programs, yet the pace of degradation, denudation and ecological imbalance continued. Development of improved varieties of fast grown species and farmers taking up plantation activities, has led the demand for timber shift from forest resource to trees grown outside forest (TOF). Importance of scientific research inputs into scientific management of the forests was recognized and an independent Council was created to conduct forestry research, develop scientific and technical manpower and provide extension support.

Indian Council of Forestry Research and Education (ICFRE) developed National Forestry Research Plan (NFRP) in 2000 with a functional relation with the National Forestry Action Plan (NFAP) and Five Yearly Plans of the country. The NFRP was drawn for 20 years with a built in mechanism for periodical reviews after every five year.

The rapid pace of globalization, coupled with economic integration and consequent pressure on the natural resources forced ICFRE to have a relook on NFRP and provide mid-term correction to its plan. To cater to new emerging forestry agenda and to meet the aspiration of the society, a mid-term correction was felt necessary.

A committee was formulated at ICFRE level under the Chairmanship of Dr. N. Krishna Kumar, Director, IFGTB to prepare a vision plan of ICFRE. The first draft prepared by the committee was deliberated with Director General, ICFRE and other officials at ICFRE headquarter. It was decided to revise it and prepare a more comprehensive draft. Directorate of Research, ICFRE took up the task of preparing a comprehensive 'Vision Document' under the guidance of Dr. Bahuguna, DG, ICFRE for next twenty five years. The draft was then circulated to all DDGs, ADGs, Directors, Group Coordinators and National Project Directors (NPDs) for comments and suggestions, which were duly incorporated in the final document.

While keeping intact the basic essence of the NFRP for stakeholder's consultation, approval of project proposal by Research Advisory Group (RAG) and Research Policy Committee (RPC), the thrust areas and themes have been revisited. New emerging issues and frontier areas of research have been duly addressed. People centric approach is the highlight of the Vision Document.

I acknowledge the contributions made by all the members of the above committee, all the Directors / officials and scientists of ICFRE Institutes / Centers in improving the vision document, particularly Dr. Krishna Kumar, Director, IFGTB and his team in providing an excellent base document to work upon. I acknowledge the contribution of Dr. Vimal Kothiyal, Scientist G/ADG (RP) who has made significant effort in drafting and shaping this vision document.

I believe that this document containing the changing frontiers of research system in ICFRE will give a new direction to the Forestry research in the country and will guide the scientists and policy makers in formulating the future programs.

(Sandeep Tripathi)

Deputy Director General (Research), ICFRE

Executive summary

The present era of globalization and the rapid economic integration with a fast changing world, is influencing all spheres of life including putting pressure on the natural resources. In this present scenario, the role of forests has become very crucial for maintaining the hydrological cycle; sustaining the food and water security; conservation of biodiversity; mitigating the effects of climate change and providing livelihood support to millions of poor people living in India. Research in the forestry sector, thus, needs greater inputs for technological advancement to sustain the existing resources. The erstwhile FRI and colleges, brought under the umbrella of Indian Council of Forestry Research & Education (ICFRE) has been leading the forestry research in the nation over more than a century. During this journey, ICFRE and its institutes have laid the foundation of scientific research in forestry, which is recognized and appreciated globally. With increasing pressure on India's forests and ever-growing expectations from the society, responsibility of ICFRE has increased manifold.

This document outlines the research needs for the future to meet the challenges of the forestry sector in augmenting the demand of forest resources of the country and to ensure sustainable flow of goods and services for posterity. To address these issues, ICFRE has identified six strategic areas viz.,

- a. Managing Forests and Forest Products for livelihood support
- b. Biodiversity Conservation and Ecological security
- c. Forests and Climate Change
- d. Forest Genetic Resources and Tree Improvement
- e. Forestry Education
- f. Forestry Research Extension

The above six strategic forest research areas have been duly elaborated, along with their justification, associated objectives and indicative actions. Priority list of research programs under the first four areas has also been identified. Emphasis is on networking and all India coordinated programs. Education and Extension are recognized as key elements for a successful research program.

For successful implementation of these strategies, the document also address key elements like fund-raising protocols for research and development; forging strategic partnerships with other institutions / organizations both National and International and capacity building considering that forestry is an interdisciplinary subject.

This Vision Document for the next 25 years would be the guiding force for initiating strategic actions in the area of forestry research in the country through ICFRE.



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India's wide range of agro-climatic regions, vast extent of land and forest including rich variety of biodiversity ranks it amongst one of the most naturally endowed nations of the world. However, its huge and still expanding human and animal populations and its rapid industrialization tax these resources. Competing uses of land are exerting enormous pressure on the country's finite land resources and thus adversely impacting forest resources and biodiversity. The limits of agriculture technologies have already been attained and the issue of raising agriculture productivity for food security and prevent alarming depletion of natural resources is still a critical issue to be dealt with.

About half of the recorded forest area of the country is degraded and is therefore, unable to play an important role towards sustainability and meeting the needs of the people, industry and other sectors. Approximately 50 m ha of degraded wasteland lie outside the national forests in addition to 30 m ha within recorded area. In spite of this huge expanse, country is a net importer of forest products.

Over the years, there has been immense change in the aims and objectives of managing forestry and forestry research. Significant changes are taking place in forestry sector, and as the economy of country is growing, the demand of different forest products including timber/industrial wood and non-timber forest products is increasing at a very fast rate. Forestry research, education and extension therefore have to diversify to face new challenges and address emerging issues in the forestry sector. The research requirements in the field of forestry need to be updated in accordance with the emerging research needs and requirements of stakeholders. Integration of forestry efforts with State Forest Departments, Universities, Panchayati Raj Institutions, civil societies, rural and urban development authorities, other research organization and global bodies and regional countries is necessary. Impact of population growth, migration, urbanization, and consequent livelihood issues particularly rural poor and tribals in forest fringe areas, forest productivity, climate change and emergence of new national/international forestry agendas are necessitating transformation of forestry research.

The total forest cover of the country is 69.20 m ha that is 21.05% of the geographical area, while the tree cover of 9.08 m ha which accounts for 2.76% of the geographical area. In total, the forest and tree cover is 78.29 m ha accounting for 23.81% of the geographical area (FSI, 2011). The forests are concentrated mainly in the North-eastern States, the Himalayas and Shiwalik ranges, the Central highlands, Andaman and Nicobar Islands, strips along the Western Ghats, the Eastern Ghats and other hilly areas and in Coastal Mangroves.

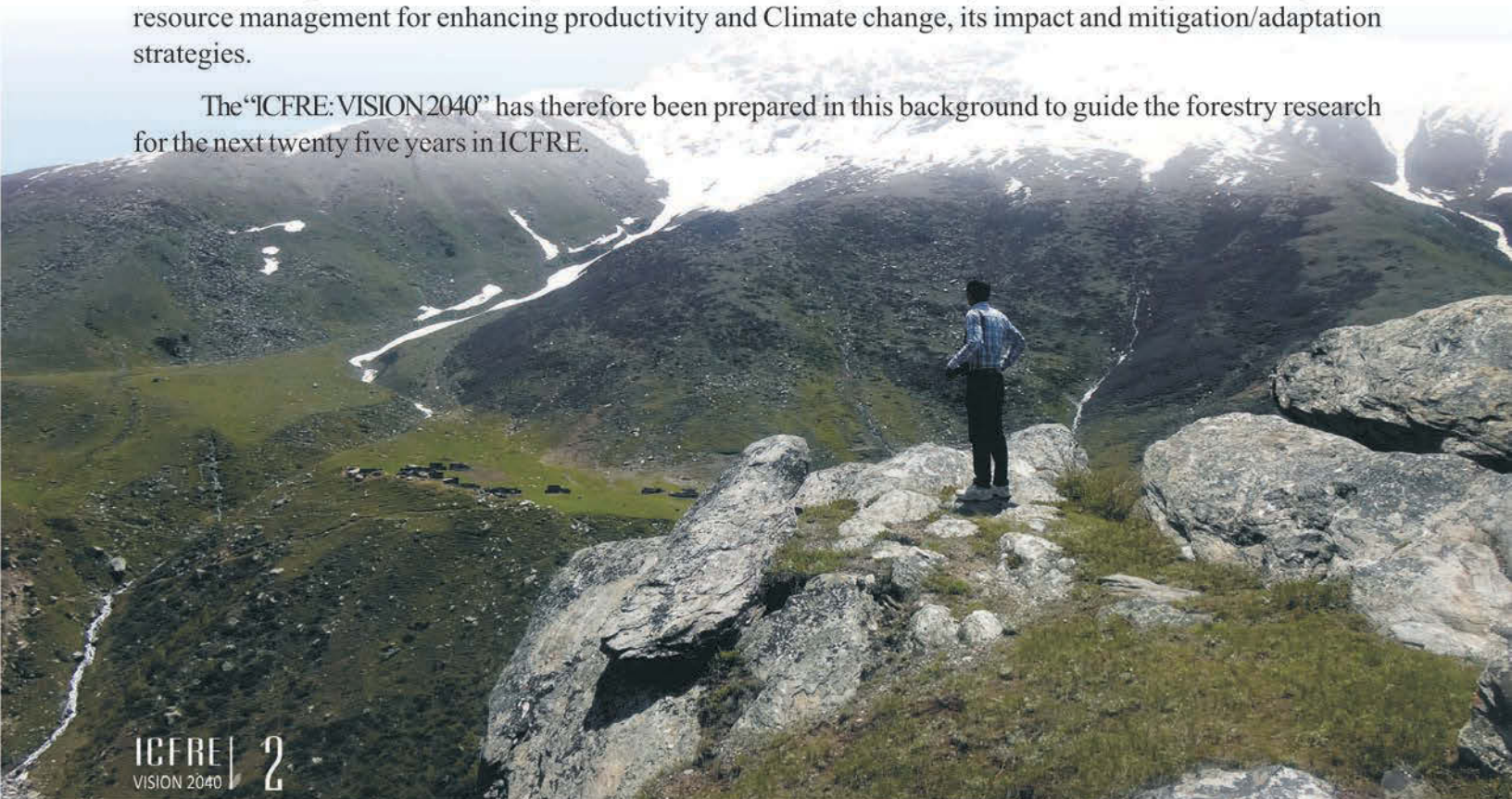


The growing stock of Indian forests is estimated at 4,498.73 m³ and of the Trees outside forests (TOF) is 1,548.42 m³. The estimated removal of wood from forests annually is 3.157 m³ and from TOF is 42.77 m³. The TOF, therefore, provides almost 80% wood requirement of the country (FSI, 2011). The Mean Annual Increment (MAI) of the planted forests range from 10 to 60 m³ /ha/yr, especially those of poplar and eucalypts; however, the MAI of natural forests is just 0.7 m³/ha/yr as against the world average of about 2.1 m³/ha/yr. This low productivity is mainly due to fire, grazing, over-exploitation and non-recycling of biomass in forest soil. It is estimated that 1.6 m ha is affected by fire annually and 25.5 m ha are affected by grazing. In total, nearly 44% of Indian forests are affected by biotic and abiotic stresses, adversely affecting the productivity (Asia pacific forestry sector outlook study-II, MoEF, Govt. of India).

The forestry sector in India has to deal with emerging demands and challenges. Increasing inter-sectoral linkages have to be understood and established. The use of modern technologies and concepts in management of natural resource and compatible changes in governance and documentation systems, with accountability and transparency is the need of the hour.

While embarking upon creation of 'ICFRE: VISION 2040', the important areas of significance in next 25 years are attempted to be addressed. The plan for the future is therefore, based on issues of livelihood support and economic growth, biodiversity conservation and ecological security for the future generation, genetic resource management for enhancing productivity and Climate change, its impact and mitigation/adaptation strategies.

The "ICFRE: VISION 2040" has therefore been prepared in this background to guide the forestry research for the next twenty five years in ICFRE.

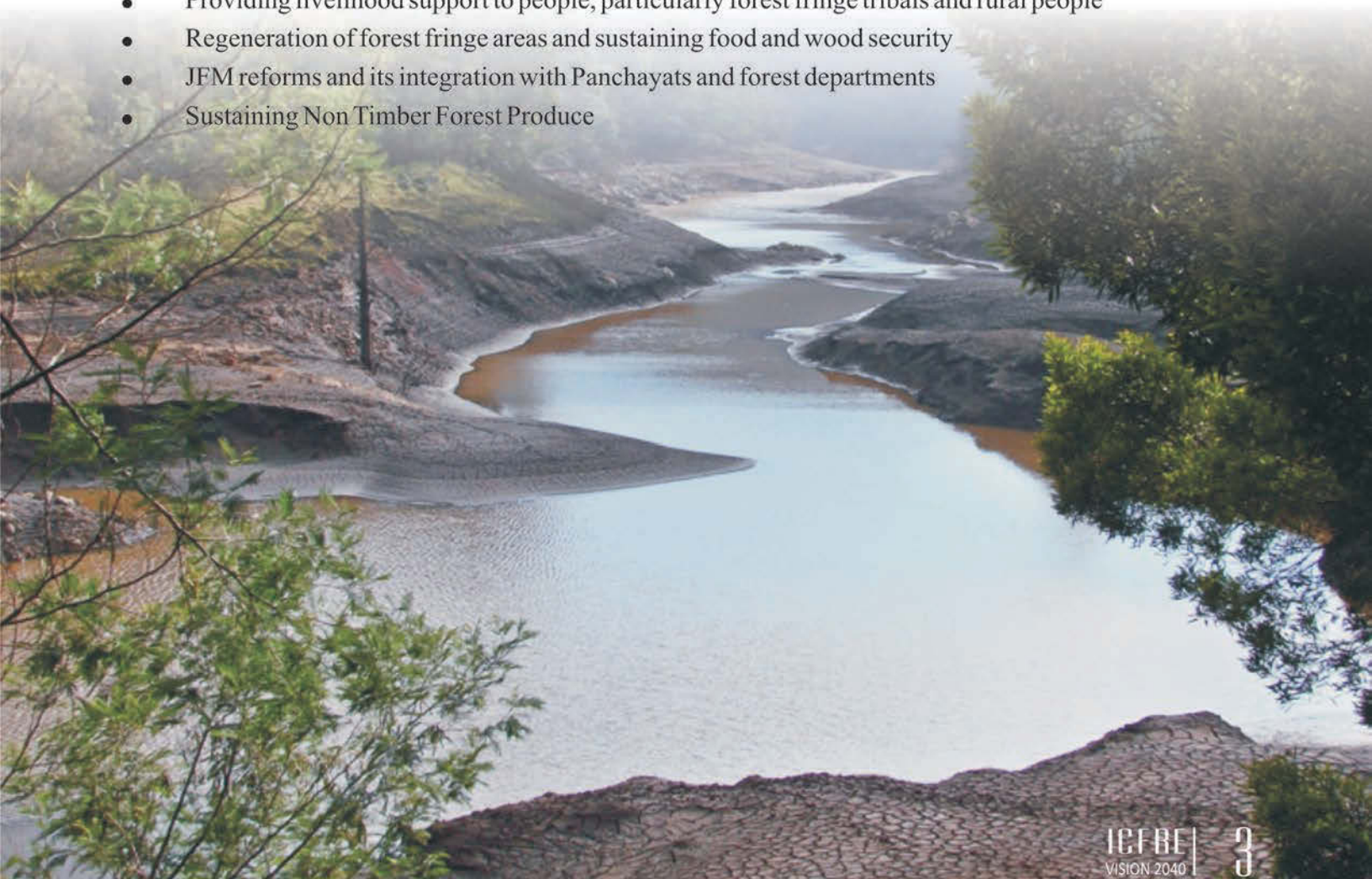


The Challenge 2

With 17% of the world's human population, and 18% livestock population over only 2.4% of world's total geographical area, India's forests are facing severe biotic and abiotic pressures. The dependency on forest resources is enormous, extending from un-ending demand of forestry resource, food and water security, and environmental services, maintaining biodiversity and averting adverse effects of climate change. These compelling situations are posing challenges and the opportunities as well for the forestry sector.

Besides globalization and rapid economic integration in this fast changing world is also putting enormous pressure on the natural resources. Consequently the role of forests too has become very crucial. Agriculture alone will be unable to support the future demand of livelihood sustainability and forestry seems to be the most suitable option for the multifunctional role to address the following major challenges:

- Sustained environmental goods and services from forests
- Recharge groundwater tables and maintain the hydrological cycle
- Conservation of biodiversity
- Mitigating the effects of climate change
- Providing livelihood support to people, particularly forest fringe tribals and rural people
- Regeneration of forest fringe areas and sustaining food and wood security
- JFM reforms and its integration with Panchayats and forest departments
- Sustaining Non Timber Forest Produce





- Addressal of low forest productivity
- Restoration of degraded areas, avert forest degradation, soil erosion and restoration of crop lands
- Bioremediation of mining areas
- Creating forest inventory
- Management of forest invasive species
- Reducing risks of forest fire
- Convergence between forestry activities and non-forestry land use
- Adopt holistic approach to land management that combines technologies and policies to integrate ecological, socio-economic, and political principles
- Protection forestry in combating, disaster management and pollution abatement

Through a wide range of stakeholders consultations, four key set of issues have been identified as challenges and incorporated for its addressal in the Vision for 25 years of ICFRE

- ▶ Food security and livelihood support
- ▶ Biodiversity conservation and ecological security
- ▶ Forest genetic resource management for improving productivity
- ▶ Climate change, its impact and mitigation/adaptation strategies



Scientific forestry in India began with Sir Dietrich Brandis, who took over as Inspector General of Forests in 1864, and under whose guidance State Forest Departments were created in various British ruled provinces and the methodical development of forestry and management was initiated. In 1906, scientific aspects of forestry were enhanced with the creation of the Imperial Forest Research Institute at Dehradun. After 1945, the Forest Research Institute, Dehradun had as many as twenty-four research disciplines. Later, regional research centres were also established at Coimbatore, Bangalore, Jabalpur and Burnihat to handle forestry research in different agro-climatic zones (Ranganathan, 1974). FRI and its regional stations were placed directly under the control of Central Government (Ministry of Agriculture/Ministry of Environment and Forests). In 1986 the regional centres were upgraded to full fledged research institutes and along with FRI were transferred to the Indian Council of Forestry Research and Education (ICFRE) under the Ministry of Environment and Forests (MOEF, 2008). In 1988, ICFRE was established as an autonomous body of MOEF with a mandate to develop holistic forestry research in the country through its eight institutes and four research centres. State Forest Department are complimenting the work of forestry research by conducting applied aspects of the forestry research.

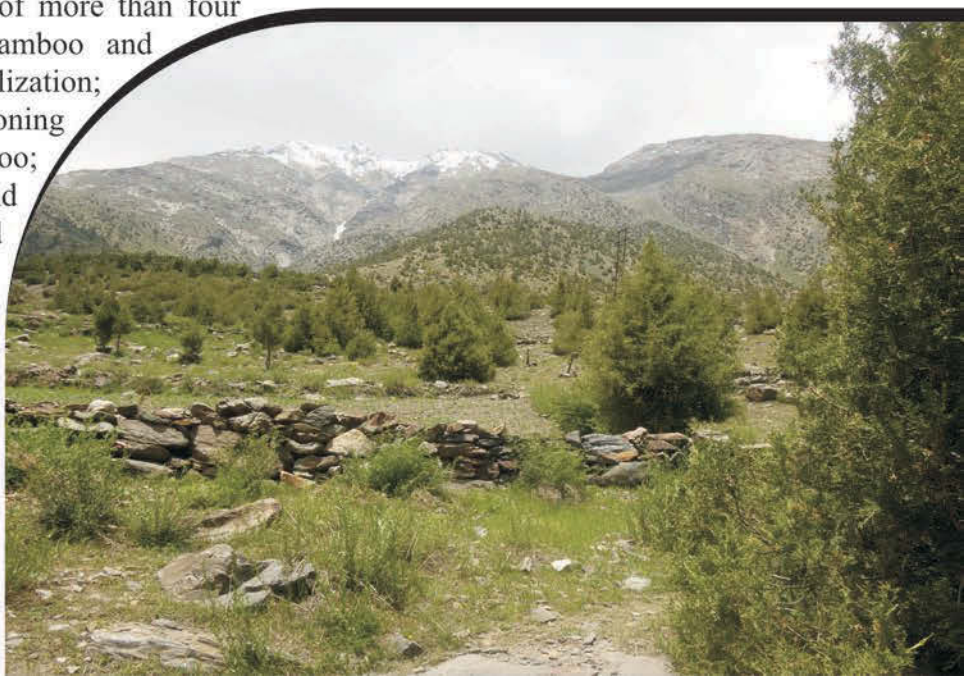
3.1 Indian Council of Forestry Research and Education, Dehradun

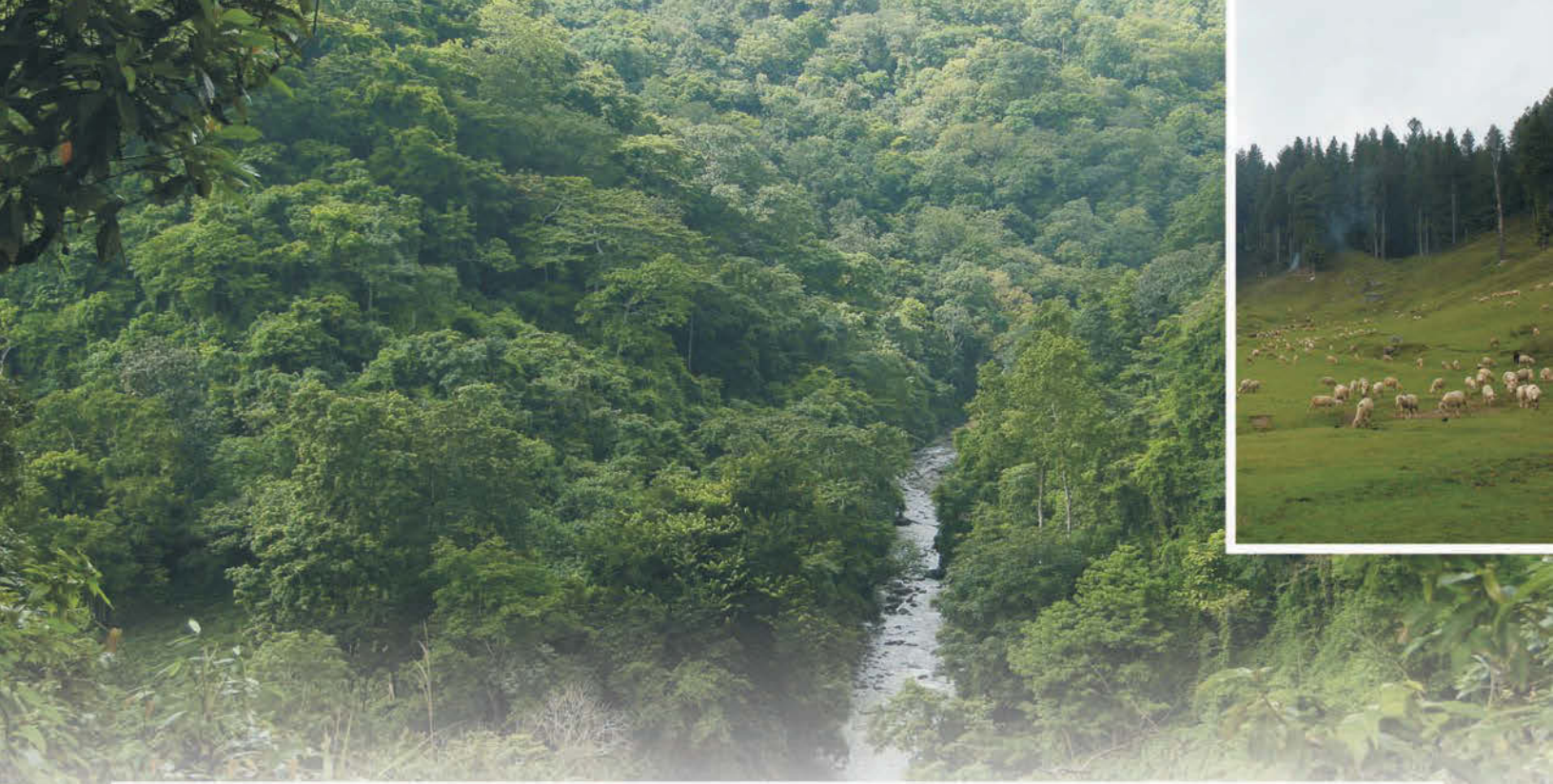
Indian Council of Forestry Research and Education (ICFRE) was established for developing a holistic forestry research through planning, promoting, conducting and coordinating research, education and extension on all aspect of forestry. Being the premier forestry research organization in the country, 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 handle challenges related to natural resource management. In an effort to streamline the research process into stakeholder's requirements, National Forestry Research Plan (NFRP) was launched in 2000 keeping in view the national requirement and linkages with Five year Plan. Research Advisory Group (RAG) at Institute level prioritizes the projects as per guidelines and themes given in NFRP and are finally approved by Research Policy Committee (RPC) at the National level. RPC ensures the balance among international, national, regional and state research requirements and decide investments in high quality research giving priority for livelihood support. The process is now well established in ICFRE system. However, in order to meet emerging challenges as discussed above and adopt people centric approach, ICFRE during its XIII RPC meeting in 2012 embarked upon to revisit the research system and design them in such a way that the research has direct links with the community and society. While recognizing the importance of integrated research, possibility of improvement in present research system, to face new forestry agenda was discussed upon, along with new challenges of the future. While deliberation at different forums, it was felt, that ICFRE system must have forward and backward linkages of the scientific efforts and move towards convergence for achieving a common goal through interdisciplinary research and teamwork; and therefore, networked, inter-institutional efforts in All India Coordinated Programs mode to maximize the output. Research programs in the council attempts to address the issues related to various stakeholders including SFDs (State Forest Departments), forest based industries, universities, farmers, livelihood of rural poor, tribal and other forest dependent communities apart from meeting the needs of goods and services from forests and trees outside forests (TOF), improve forest productivity and address the impacts of climate change on forests.

3.2 Salient achievements of ICFRE

ICFRE through its network of Institutes has supported forestry research in the country through time bound actions and provided solutions to Forest Departments and other agencies. Some of the salient achievements for which the organization stands recognized are:

- ICFRE laid the foundation for scientific forestry and development of agroforestry models for the livelihood of farmers and Tree growers
- ICFRE has historical contribution for improving the productivity of tree outside forest system by developing and releasing improved clones/ varieties of eucalyptus, poplar, shisham etc., during last 2-3 decades. Variety Releasing Committee (VRC) the apex body, constituted to institutionalize the registration of superior varieties and clones on a uniform basis in forestry sector throughout the country as per “Guidelines for Testing and Releasing of New Tree Varieties and Clones”, released one improved clone each of shisham (*Dalbergia sissoo*) FRI-DS-14 and *Eucalyptus* hybrid FRI-EH-001 developed by FRI, Dehradun for commercial cultivation. Elite clone of *Eucalyptus camaldulensis* (IFGTB-EC1, IFGTB-EC2, IFGTB-EC3, IFGTB-EC4) and *Casurina equistifolia* (IFGTB-CE1, IFGTB-CE2, IFGTB-CE3, IFGTB-CE4) developed by IFGTB were also released
- Reassessment of Champion and Seth Forest Types classification for scientific management of forests
- Establishment of 'Panchayat and Human Dimensions' at ICFRE to develop linkages with rural institutions like Panchayats, Tribal bodies, JFM and others
- Restoration research through silvicultural interventions and precision forestry improvement to support wood based industries and tree growers and livelihood support through decentralized orchards
- Improving productivity of important plantation species of different regions of the country including bamboo through selection, disease control, improving nursery technology and regeneration protocols, and developing technology for sustainable harvest and bioprospecting for new products
- Teak mortality studies, description of a new fungus species of *Nitschkia* and three new records (*Australohydnum dregeanum*, *Hjortstamia friesii* and *Schizopora flavipora*) of wood decay fungi from wood depots of central India
- Development of technology packages for raising quality plantations of *Santalum album*, *Guadua angustifolia* and *Dendrocalamus stocksii*
- Standardization of cost effective protocol for successful artificial regeneration, nursery and planting of high-level conifers and its dissemination to State Forest Department
- Evaluation of strength properties of more than four hundred fifty Indian timbers, bamboo and foreign species for various end utilization; Development preservation and seasoning technique for timber and bamboo; Development composite wood and particleboards from agro-waste and secondary timber. New initiatives include wood modification, biofiber filled polypropylene composites and standardization of





non-destructive techniques

- Development of Molecular Diagnostic kit for the identification of *Gamoderma lucidum* and *Cylindrocladium quinqueseptatum*
- Standardization of technology for artificial induction of agarwood in *Aquilaria malaccensis*
- Restoration of degraded site and its impact on degraded sites. Rehabilitation of stress sites, including mined over burdens. Biofertilizer treatment for plantations in the mine dump areas. Models for economic rehabilitation in the mined out areas developed and demonstration plantation established
- Carried out productivity research aimed at trait improvement to support wood based industries and tree growers
- Conducted RAPD, ISSR and AFLP molecular marker based genetic diversity analysis of teak populations of central and peninsular India
- Productivity enhancement in abandoned jhum lands through agroforestry models
- Establishment of Demo Villages at different locations through the participatory initiatives of the villagers. These setup are now used for showcasing various extension activities of the organisation
- Operationalisation of Van Vigyan Kendras in states to conduct activities like training programs, extension activities such as visits of local entrepreneurs to various industries like Agarbatti and furniture making units, and raising of quality seedlings at VVK nursery
- Study on biosphere reserve and Wildlife sanctuaries in different agro-climate zones and different land uses in western Rajasthan, floristic assessments and prioritization of the plant species in wildlife sanctuaries and recording few new species. Generation of baseline data for some of the wildlife sanctuaries, establishment of sample plots for future climate change studies
- International exposure to 73 scientists and technologists and capacity building of 173 scientists at different National Institutes in all aspects of forestry during the year 2011-12

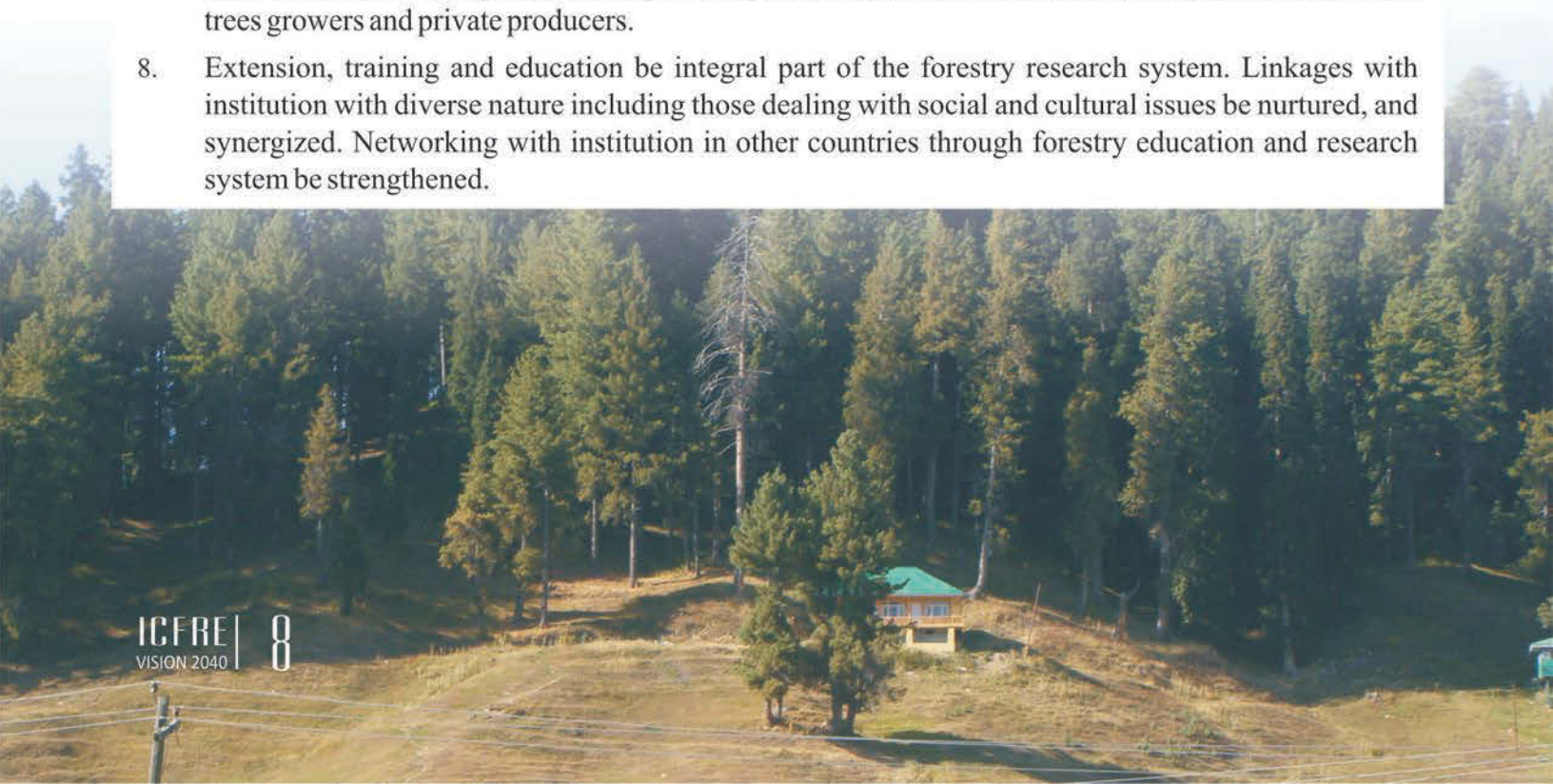
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The Vision



To improve the outcome of the research system in ICFRE, the focus of research has to be re-assessed to meet the aspiration of the society. Based on deliberations and recommendations of various forums, the following initiatives are envisioned to form part of research system:

1. The research programs to be made interdisciplinary in nature to ensure that the output of one scientist becomes input of other. Special attention is on networking with institutes outside ICFRE system. Research planning is to seek linkages with Panchayati Raj Institutions in the country.
2. Forest types over the years have changed due to various anthropogenic and natural factors. Generate baseline information and develop change matrix; and to understand the impact of climate change on forest vegetation to evolve appropriate mitigation strategies for the future.
3. Research in frontier areas of forestry like climate change, nanotechnology, biotechnological intervention, tree improvement through genetic engineering for desired traits.
4. Policies to support and encourage tree cultivation outside forests. In addition, the other forest products like medicinal plants, NTFP, wild fruits, shrub and grass components need to be incorporated into the farming systems including forest fringe villages. Forest to act as safety net for poor people at times of scarcity.
5. Forest Right Act (FRA) 2006 introduced in the country, grants legal recognition to the rights of forest dwelling communities. The research programs to address the issue of evolving suitable sustainable land based forestry models for the beneficiaries of FRA 2006 on a long-term basis
6. Marketing mechanisms has not fully been evolved for forest produce due to government owned forests. With new plantations, protocols by industries/farmers and imports being liberalized, free market infrastructure need to be supported for maximizing economic gains.
7. Integration of policy and legal issues in forestry on legislations and procedure in respect of felling, timber and other forest produce transport and processing besides economic security and incentives for trees growers and private producers.
8. Extension, training and education be integral part of the forestry research system. Linkages with institution with diverse nature including those dealing with social and cultural issues be nurtured, and synergized. Networking with institution in other countries through forestry education and research system be strengthened.



5

The Action Plan

In view of the massive research support required for attaining the stipulated vision of the forestry sector and limited resources at our disposal, the need to optimize the research outputs with the available resources was felt in order to develop synergy between the research input and output detailed deliberations at different levels and forums were undertaken. The inputs of various forums, platforms and initiatives were synergized to embark upon the path of the stipulated vision of ICFRE research system. The priorities of ICFRE were accordingly, revisited and four research thrust areas and thirty-five themes were identified. Two thrust areas, one each for Education and Extension with four themes each were also identified. The focus was to undertake planning on prioritized thrust areas to help in optimum resource allocation, avoiding duplication of efforts and minimized regional and sectoral imbalances in the research endeavors.

Following are the revisited Thrust areas along with the themes for ICFRE, which were finalized after in-house meetings and deliberations. For institutionalizing activities in each Thrust area, National Project Directors (NPDs) were also designated for each thrust area.

Thrust Areas (4+2)	Themes (35+8)
A. Research	
<ol style="list-style-type: none"> 1. Managing Forest and Forest Products For Livelihood Support and Economic Growth 2. Biodiversity Conservation and Ecological Security 3. Forests and Climate Change 4. Forest Genetic Resource Management and Tree Improvement 	<ul style="list-style-type: none"> • Silviculture • Social Forestry, Agro-forestry, Farm Forestry • Sustainable Forest Management (SFM) • Forest Economics • Forest Biometrics and Yield Modelling • Participatory Forest Management • Wood Science and Technology • Chemistry of Forest Products • Wood Based Industries • NTFP Resource Development • Bio-prospecting and Bio-piracy • Seed Science and Technology • Forest Certification • Forest Hydrology • Food Security • Bio-fuels and Bio-energy • Integrated Pests and Disease Management • Application of Microbes in Forestry • Weeds and Invasive Species • Forest Fire and Grazing

	<ul style="list-style-type: none"> • Bio-informatics and Geo-informatics • Policy and Legal Issues • Biodiversity Conservation • Forest Botany • Ethnic and Traditional Knowledge Systems • Forest Soils and Land Reclamation • Wetland and Marine Ecology • Watershed Management • Climate Change and Forests • Forest Ecology • Conservation of Forest Genetic Resources • Tree Improvement • Vegetative Propagation • Biotechnology • Environment Management
B. Forestry Education	
Forestry Education and Policy Research to Meet Emerging Challenges	<ul style="list-style-type: none"> • Improving Formal Forestry Education • Accreditation of Universities • Networking Forestry Education with Research and Extension • Capacity Building of Scientific and Management Cadre
C. Extension	
Forestry Extension for Taking Research to People	<ul style="list-style-type: none"> • Collection, Compilation and Publication of forestry reports / journals • Dissemination of developed technologies • Evolving and coordinating comprehensive extension strategies in Forestry Research • Consultancy services



5.1. Thrust Area 1: Managing Forest and Forest Products for Livelihood Support and Economic Growth

The sustainable management of forests and natural resources simultaneously aims to protect and conserve the resources and provide opportunity for economic well being of the people and the country. Integration of environmental issues with developmental strategies is not only important for poverty alleviation, but also for economic growth. For millions of people living in poverty, particularly tribals and rural poor in the forest fringe areas, forest and tree resources act as safety nets in times of scarcity. Despite the importance of these resources for the range of economic, environmental, social and cultural benefits they provide, data on such dimensions are either sketchy or not available. At the same time, extent to which forest contribute to national development to reduce poverty and enhance food security are not well recognized and documented.

Mission: Maximize benefits from the forests for livelihood support of the tribals and rural people residing in forest fringe areas

The diversity of products, goods and services that are available from the forest is tremendous. These include timber / wood-based products, non-timber forest products and services (recreational, watershed, religious-cultural, ecotourism, soil and ground water recharge, increased water flow in rivers and drinking water). The identified areas of envisioned research under the thrust area are as under:

- **Non Timber Forest Produce (NTFP):** NTFPs are the products from various parts of forest species, such as roots, barks, leaves, flowers, fruits, seeds gums and grasses etc., including entire plants of medicinal herbs / shrubs. Optimization of the production of NTFP will benefit socially and economically weaker sections of the communities. The Eleventh Finance Commission has also supported this cause through grant-in-aid for forest maintenance and increasing the production of timber and NTFP. In the 73rd amendment of the constitution, NTFP has been allocated to the Panchyat Raj Institutions (PRIs). Hence to begin with the areas which are to be focused for NTFP include:
 - Development of processing techniques, value-addition and storage facilities
 - Develop a scientific system of collection, quality evaluation, sustainable harvesting, utilization and resource management
 - Standardization of methodologies for NTFP resource assessment in forest areas of the country and compilation of countrywide data and development of online SDSS (Spatial Decision Support System) on NTFP resources including distribution, cultivation and commercial components for making effective management plan
 - Improvement of NTFP yielding species through selection and breeding
 - Research on wild edible plants for food and health-care security
 - Marketing of NTFP





- **Forests for wood, food and water:** Watershed interventions in the forest areas have led to increase in water availability in the adjoining agricultural fields especially in the fringe villages leading to change in cropping pattern, intensity and enabling multi-cropping with increased productivity and yield. Focused attention is therefore required in securing the ecology and hydrology of watershed and catchments.
- **Integrated assessments in forests:** Appropriate strategies and policies to develop the Indian forest system is urgently needed, which first require integrated assessments that take account of the likely impacts of different actions. Future assessments may include all-important aspects of the role of the forest sector in Indian society and assess causes of the degradation of forest resources, livelihood pressures, and cover full range of pertinent issues, such as demand/supply of timber, non-wood forest products, ecosystem services, socioeconomic aspects, poverty and impact of ecotourism.
- **Development of local forest based enterprises:** Enterprises like lac, honey and tussar etc., based on natural resources will give opportunity for strengthening the livelihoods of poor, forest-dependent people and provide an economic incentive to conserve forests through sustainable management.
- **Integration of agricultural landscape with forest:** Most of the demands for wood and wood-based products are met from the Trees Outside Forests (TOF). Incorporation of medicinal plants into the farming systems would further help in productivity & utilization as well as conservation of resources. Integration of tree, shrub and grass components into the agricultural landscape will help in better utilization of the resources in spatial and temporal framework. Extensive agroforestry systems especially in arid, semi arid, hill areas and wastelands are to be developed.
- **Development of appropriate technologies:** Development of appropriate and adoptable technologies by the research endeavors to ensure direct benefit to society would be integrated with strong extension and training support.
- **Demand and supply of Forest Products:** The huge gap in supply and demand of Forest Products is to be bridged to prevent ecological disasters. The fuel wood and fodder from the forests and plantations is extracted much in excess of what they are capable of producing on a sustained basis, which needs to be met sustainably.
- **Market information & infrastructure:** In the past, the timber was produced only from Government owned forests, so a free

market infrastructure could not develop. With development of new plantations. Protocols on the private lands, and imports liberalized, markets have started evolving but market mechanisms need to be strengthened, through research and infrastructure development. A market cell at head quarter and regional level would be established to tap the market potential of NTFP species.

- **Integration of Panchayati Raj Institutions:** Research Planning and prioritization is to seek linkages with other civil society and Panchayati Raj Institution (PRIs) in the country for improving the livelihood status for forest fringe communities.
- **Policy & Legal issues in forestry:** There is a strong need to undertake studies on legislations and procedures in respect of the felling, timber transport and processing, export and import policies besides economic security and incentives for tree growers.
- **Nanotechnology:** In the forest products utilization the manipulation and utilization of materials at the nanoscale, is expected to be a critical driver of economic growth and development. Over the last couple of years, globally, the potential for nanotechnology development in the forest sector has become apparent and realizable. By exploration our perceptive and control of matter at such levels, new avenues in product development can be opened. The envisioned areas are:
 - More efficient method in wood processing
 - Development of pest resistant wood
 - Decrease in UV degradation and moisture resistance
 - Development for new generation fiber based products, pulp, paper, composite wood, production processes and many more
 - Utilization of plant accumulated nano particles in medicinal and other uses
 - Increase efficiency of nutrient and water use
- **Wood science and technology:** Development of appropriate technologies for plantation short rotation species; Development of composites from wood, agro-waste, weeds and lops and tops etc.
- **Extension, training and capacity building:** A technology that does not reach the user signifies the failure of the delivery systems. With available technologies in a number of fields such as wood technology and agroforestry, the extension mechanism and training of stakeholders is the most essential. Besides, capacity building of personnel involved in research and development in forestry at national as well as international level needs to be augmented.

In view of the important role of forestry in livelihood support and economic growth of the people, an ambitious program is being envisaged with emphasis on Agroforestry, Chemistry of Forest products for Value Addition, Utilization of Forest Invasive Species, Wood Science and Technology, Valuation of Forest Ecosystems, Wild Fruits, Sustainable management of Fringe Forests, Microbes in service of mankind, Tree Resource Management for livelihoods and economic growth with particular reference to species like Bamboo, Rattans, *Buchanania lanzan*, *Madhuca latifolia*, Juniperus, Hippophae, besides other target specific programs. Also, regional programs will be developed on specific NTFP like tussar, lac and honey etc., by the concerned institutes. Integration of forestry and agricultural University in ICFRE research system though project on “NTFPs quantification and evaluation” has also been taken up. Apart from these, development of suitable strategies with reference to fodder and fuelwood species so as to reduce the pressure on natural forests will also be given priority to help the Council to come upto the expectation of the

end users and the implementers. Some other areas of interest are:

- Growth and yield / productivity studies in natural and planted forests
- Forest based medicinal plant introduction / cultivation in forest fringe areas
- Insect pests and diseases of forest tree species and their control measures
- Assessment of utilization potential of timber from *Melia composita* syn *Melia dubia* and other plantation species like *Ailanthus excelesa*, *Alnus nepalensis*, *Anthocephalus chinensis*, *Grewia optiva* etc.
- Life Cycle Analysis of Wood products

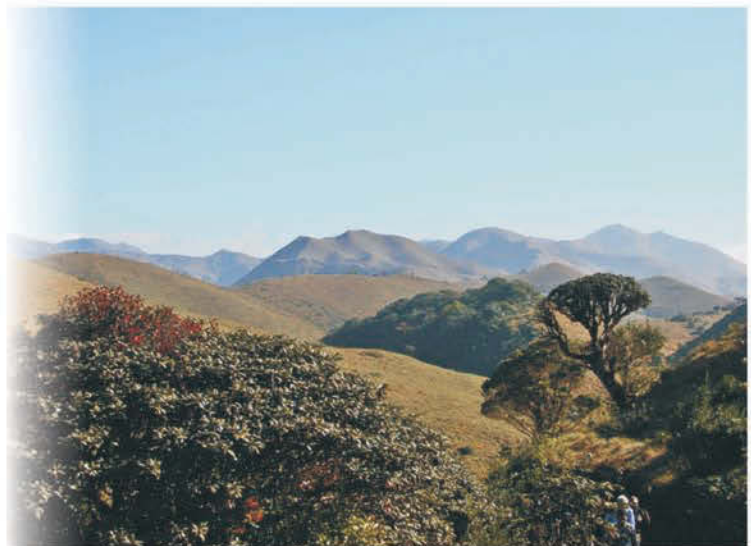
5.2. Thrust Area 2: Biodiversity Conservation and Ecological Security

Biological Diversity implies the variation of life forms within a given ecosystem, biome or on the entire Earth and is a measure of the health of biological systems. Over the past half-century, human activities have caused an unprecedented decline in biological diversity. A wide variety of environmental goods and services are under threat with profound and damaging consequences for ecosystems, economies and livelihoods.

Mission: Assess, conserve and sustain biodiversity for food, water and ecological security

India is one of the 17-mega diversity countries of the world, with only 2.4% of the world's land area and contributing to about 8% of the known global biodiversity. The identified areas of envisioned research are as under :

- **Documentation of biodiversity:** Recurrent documentation of biodiversity at local, regional and national level be conducted along with development of online 'Spatial Decision Support System (SDSS)'. Research to study impacts of development of activities like construction of roads, railways, dams, and mining activities in areas rich in biodiversity. A systematic program to document phytodiversity including angiosperms, gymnosperms, bryophytes, fungi etc., in a phased manner to be taken up.
- **Bioprospecting:** Search for useful organic compounds in microorganisms, plants, and fungi that grow in extreme environments, such as rainforests, deserts, and hot springs and search for useful organic products from various genetic resources for commercial utilization is gaining significance world over. Resources for food, pharmaceuticals, pest control has increased markets and utility in human development while the search for novel compounds is on the increase. Most of the potential bioprospecting, is currently related to the study of microorganisms.
- **Protection of plant species:** Research needs to be undertaken to develop and standardize norms for inclusion and exclusion of plant species in the Schedules of Wildlife (Protection)





Act, 1972. Schedules needs to be reviewed at regular intervals to determine status of species for the purpose of their inclusion in and exclusion from the Schedules to rationalize the traditional use and economic benefits to the local communities

- **Cold desert forestry:** Himalayas occupy an important space in maintaining a balance of ecology of downstream areas. Assessment and long term ecological monitoring including productivity of coniferous forests and their associates along with survey, screening and development of agro-techniques of high altitude important medicinal plants and study of forestry practices and solutions of cold deserts is important for survival of population of hilly terrain.

There are number of important issues to be addressed in the sphere of biodiversity conservation. ICFRE with its rich background in biodiversity research and volumes of database in areas of microbiology, biotechnology, bioprospecting has to join hands with R & D organizations, universities, industries to steer a revolution for conservation and sustainable use of bioproducts. Thematic assessment of biodiversity in various biogeographic zones, monitoring of their status, establishment of representative sample plots, assessment of regeneration pattern and mortality etc., shall be the main theme or research to be included in ICFRE institutes. Some of the issues pertinent to be addressed are:

- Research on sustainable use of biodiversity by latest technological interventions
- Natural regeneration, population dynamics and the impact of anthropogenic threat factors for management gains to be augmented
- Detailed survey and inventorization of Rare Endangered and Threatened (RET) species, reproductive biology, ecology, physiology, genetics including capacity building

- Concerted research through species recovery and restoration on species both of economical and ecologically significance including RET species
- *In situ, ex situ* research with augmented action plan through phytodiversity assessment of ecologically fragile zones including cold deserts
- Intensive research for management gains on Invasive aliens threatening the hot spots
- Monitoring of biodiversity through networking of permanent preservation plots (PPP)
- Forest observational networks for studying and analyzing ecosystem structure and dynamics
- Plant-animal association interactions, restoration research and endemism significance of Indian forests through mapping and monitoring
- Legal gaps, IPR issues, people's participation and policy issues for conservation gains and sustainable use
- Restoration and reclamation of degraded sites
- Silviculture of Indian Trees
- Seed Science and Technology of Indian Tree Species
- Nursery Technique
- Establishment of Forest Phytodiversity Network in India
- Establishment of Conservation Centre for Rare and Endemic Species
- Research on environmental problems and desertification control measures



5.3. Thrust Area 3: Forests and Climate Change

Research on climate change is by nature interdisciplinary and multi-disciplinary in view of the large impacts the climate change has on all aspects of forest ecosystem. There is a need for an integrated approach to study the problem cutting across disciplines of physical, biological and social sciences. Systematic studies on impact of climate change on forest ecosystems, assessment of carbon sequestration potential of various land use systems for climate change mitigation is the main theme under this thrust area along with adaptation, and mitigation needs in the forestry sector.

Mission: Impact of climate change / climate, and its associated adaptation / mitigation strategies for garnering services of forests for climate amelioration

The National Mission for a Green India and the National Mission for Sustaining the Himalayan Ecosystem are two of the eight Missions under the National Action Plan on Climate Change (NAPCC) which

recognize that climate change phenomenon will seriously affect and alter the distribution, type and quality of natural biological resources of the country. The Green India Mission (GIM) envisages supporting long term research to study vegetation response to climate change; silvicultural and management response to achieve the Mission objectives; pilot adaptation projects to develop adaptation options, strategies and practices; benchmarking carbon capture potential of ecosystems and economic evaluation of ecosystem goods and services; measuring degradation within density class ranges, etc. Further, there is urgent need to mainstream climate change aspects such as impacts, vulnerability, adaptations, mitigation and REDD⁺ (Reducing Emission from deforestation and forest degradation) into forest management through community participation.

An all encompassing study in program mode is launched under the aegis of ICFRE titled “**All India Coordinated Climate Change Forestry Research Programme (AICFP-INDIA)**” for undertaking studies to improve our understanding and assessment of the impacts of climate change on forest ecosystem processes and functioning and to make informed decisions on practical adaptation actions and mitigation measures.

ICFRE, the premier for CDMA&R (Clean Development Mechanism Afforestation & Restoration) projects on forestry research and having acquired Designated Operational Entity (DOE) status would facilitate the followings:

- Co-coordinate research projects related to climate change and their impact on forest ecosystems
- Develop methods for estimating dynamic baselines that allow credible assessments of additional emissions reductions
- Quantify net emissions reduction related to implementing different land use, land use change, and forestry management practices
- Definitions of deforestation and forest degradation for consensus among parties for use in a REDD+ context under the UNFCCC (United Nations Framework Convention on Climate Change), and its application for quantitative assessments
- Definition of forested land for estimating emissions reductions/ increases for its consistency across spatial scales (national, provincial or state, and project)
- Evaluating opportunities related to land tenure reform and clarification, which may lead to enhanced forest conservation and reductions in emissions
- Evaluating emissions associated with dynamic ecosystem (e.g. fire and other natural disturbances, and human activities) and mitigation strategy
- Standardizing sampling and estimation procedures/techniques for uncertainty assessment
- Tracking drivers, linking drivers to specific land areas for emissions quantification
- Deforestation and forest degradation detection, and attributing observations to the different drivers
- Relative emission profiles study of systems and settlements that frequently replace forest, including emissions from soil carbon. Broadly, the climate change research is categorized into:

Impact Component

- Dynamics, composition and morphology of forests
- Biochemical interactions
- Phenological studies
- Bio-geochemical interactions
- Dendrochronology studies
- Genetic diversity study and species richness

- Insects diversity / abundance / migration
- Fungal diversity and change
- Bio-chemical indicators
- Forest hydrology and water yield
- Fire frequency and burn severity
- Impact of climate change and CO₂ sequestration in forest canopies
- Impacts of long-term environmental changes to the growth of trees and productivity of forests
- Impact of climate change on plant diversity and reproductive behaviour
- Climate change prediction modeling
 - Development of vegetation models
 - GIS based framework for risk assessment
 - Socio-economic impact assessment



Mitigation

- Integration of low-rainfall species into forestry / agro-forestry systems
- Biomass for bio-energy production and composite wood products
- Quantification of impacts of management practices on soil carbon dynamics
- Development of improved models of sequestration
- Role of forest products in mitigation
- Development of methods for inclusion of wood products in carbon trading
- REDD+ and carbon accounting
- Mainstreaming REDD+ in forest management
- Community and Forest Management



Adaptation

- Selection and breeding new varieties with wider tolerance to climate variability
- Selection and breeding for increased tolerance to water stress, improved nutrient use efficiency
- Resilience and adaptation in forests on pests and diseases
- Interactive effects of increased carbon dioxide and water/ nutrient deficiency
- Adaptational changes towards grazing, and weeds invasion
- Responses to elevated CO₂ studies
- Community and Ecosystem goods and services

5.4. Thrust Area 4: Forest Genetic Resources Management and Tree Improvement

The program aims to improve the productivity of plantation forest through use of quality seeds and seedlings obtained through tree improvement and breeding program for meeting the demands of farmers, industries and forest department. The mission-based program will strengthen the R&D programs for conservation and management

Mission: Sustainable utilization and conservation of forest genetics resource for ecological and economic gains

of forest genetic resources, which are under great pressure from environmental changes and anthropogenic pressure. Besides, capacity building in many frontline areas of research areas will also help in addressing the issues of forest degradation, low productivity, demand for fuel wood & timber, resistance against insects-pests, adaptability against climate change and dynamic industrial requirements.

To augment tree improvement short and long term goals encompassing comprehensive breeding strategy for a whole range of economically and ecologically important tree species of industrial importance, agroforestry, particularly those now being promoted under Trees Outside Forests, and with Green India Mission and the other externally aided and locally supported programs have to be implemented. With this broad perspective, the entire research activity under this thrust area is grouped in the following three major programs:

Program 1 - Tree Improvement and Breeding for improved productivity and adaptability

Program 2 Forest Genetic Resource Evaluation and Conservation

Program 3 Applied Genomic Research and Genetic Engineering for desirable traits

Tree improvement and breeding for improved productivity and adaptability:

Forest geneticists and Tree breeders have to cope up with changing needs of forest industry and with changing climate. Dedicated tree breeding program has to be reoriented towards development and deployment of productive and adaptive populations and varieties across sites. A tree improvement strategy will provide a robust, cost effective means of addressing the problems of the agroforestry and industrial plantation sector in terms of securing seed and seedlings of high and proven genetic quality. National tree breeding strategies would be developed through a consultative process for the priority species focusing on the conservation of existing genetic resources, and the establishment of production and breeding populations. In this direction emphasis need to be given on the following:

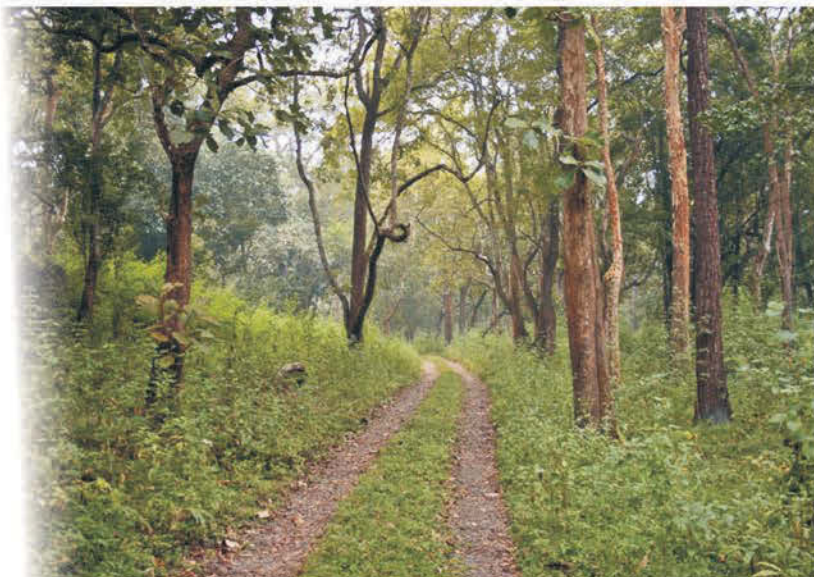
- Investigation on genetic variation, inheritance pattern and reproductive biology etc.
- Development of a comprehensive tree breeding strategy with short-term and long-term goals
- Development of breeding populations/mapping population with regard to wood, pulp & resistance properties
- Selection, development, testing and deployment of clones/ varieties of commercially important tree species for desirable traits
- Vegetative propagation (micro and macro) of the elite germplasm
- Explore possibility of marker-assisted selection (MAS) for breeding and improvement of commercially important tree species as well as those suitable for specific problem sites

Forest Genetic Resource Evaluation and Conservation

There is huge wealth of unexplored potential of genetic resources, which are very vital, more so in view of impending



threats of climate change looming large for extinction of threatened/vulnerable species. Undocumented and uncontrolled movement of germplasm is also a major cause of concern. Forest genetic resource management is surmounted by plethora of issues like forest degradation, habitat destruction, climate change, pest and disease, declining productivity and growing demands. Average yields from plantations, both of seedling and clonal origin have to be increased manifold to increase the productivity of forests. This thrust area on FGR will provide solutions to scale up the productivity of plantation forests through use of quality seeds and vegetative propagules through tree improvement, biotechnological interventions and concerted breeding programs involving multitude of stakeholders.



The forest departments are the major custodians of valuable germplasm. ICFRE through a network approach has to work with the forest departments and other stakeholders for the conservation of germplasm. With this in mind recently, Forest Genetic Resources Management Network (FGRMN) was established under ICFRE, to act as nodal agency at national level for acquisition and management of indigenous and exotic forest genetic resources for their exploration, documentation, conservation and their sustainable utilization.

The FGRMN envisages the following strategies:

- Identification and formal recognition of priority genetic resources and gene pools in need of conservation
- Development of institutional frame work and mechanism with adequate legal and policy frame work to insure conservation of genetic resources, particularly tested and assessed valuable germplasm
- Species specific in situ Gene Conservation Areas, their selection and management
- Development of management strategies for priority genetic resources in Natural Forests
- Map-based distributional information of intraspecific variability, habitat relationships and relative abundance in Protected Areas
- Integrated approaches for *Ex situ* Conservation and Use of Forest Genetic Diversity
- *Ex situ* Conservation through Selection
- Establishment and Management of *Ex situ* Conservation Stands
- *Ex situ* Conservation through Storage

Applied Genomic Research and genetic engineering for desirable traits

Genomic research is motivated by the need to support genetic improvement programmes and to develop diagnostic tools for the conservation, restoration and management of natural populations threatened by biotic and abiotic factors. Outcomes of genomic research in trees will indeed provide necessary tools to elucidate the past evolutionary success of these species and to understand their future response to environmental changes. These outcomes will also accelerate the deployment of breeding



populations that satisfy major economic needs. This programme will be a supportive programme for Programme 1 and 2. The tools, techniques and processes that are developed under this programme will be directly linked and applicable to the programmes 1 and 2.

For producing high quality wood, it is crucial to raise plantations of the species with elite materials and or genetically modified plants that meet the demands of industry in economical and sustainable manner. For this the path of genomics and genetic engineering provides opportunity for adaptation and productivity.

- Development of Microsatellite markers for important tree species
- Develop understanding the association of genes/gene regions including quality trait linking (QTL) mapping and association mapping in forest trees with quantitative (growth) and qualitative traits (disease- pest resistance, drought and salt tolerance, wood and pulp characters)
- Understand the molecular mechanism determining a trait in different tree species
- Genetic engineering of trees for biotic and abiotic stress tolerance and commercially important traits (altered lignin/ cellulose profiles)
- Allele mining for traits related to biotic and abiotic stress
- Full genome sequencing of the native tree species
- Development of bioinformatics tools and database for the priority species

5.5. Thrust Area 5: Forestry Education and Policy Research to Meet Emerging Challenges

Agriculture Universities of the country has developed courses on forestry education and extension to meet the demand of skilled manpower. Specialization in subjects like forest economics, plantation technology, forest genetics and tree breeding, computer applications in forestry, and biodiversity conservation are some of the subjects initiated in agriculture Universities. Further, to promote quality forestry education, ICFRE is supporting Universities by developing and bringing

Mission: Develop pool of human resource in the field of forestry and provide policy support to the Ministry of Environment and Forests

uniformity in syllabus of forestry courses and providing grant-in aid for infra-structure development and research funds. Over 27 Universities including FRI deemed university are receiving the grant-in aid. This has enabled growth of forestry discipline and overall improvement in the quality of forestry education. Accreditation system on the pattern of NAC (National Accreditation Committee) and ICAR are in place to ensure quality of forestry education. This has enabled excellence, high institutional quality and brought uniformity in the course curriculum/ forestry program. HRD plan of ICFRE is enabling to enhance core competence of researchers.

The Forest Research Institute, Dehradun was conferred the status of deemed University in December 1991. The University imparts education, conducts research, and creates awareness about environment through forestry extension programs. ICFRE also has a National Forest Library and Information Centre (NFLIC) at Dehradun, which is one of the oldest in forestry today, and has a collection of more than 1.75 lakhs books covering wide range of forestry subjects. Such Universities of excellence in forestry should be established in different selected Institute of ICFRE.

ICFRE being the nodal centre for forestry, also support MoEF and state forest department in the governance and management of forestry through forest policy initiatives. The envisaged forestry education and policy research during the next two decades of ICFRE will emphasise on:

Education

- Financial and technical support for networking forestry education with research and extension
- Capacity building of scientific, management cadre and technical staff of the council
- Forging global linkages with institutes of excellence in higher education in forestry
- Integration with Universities imparting forestry education under the aegis of accreditation. Support capacity development of University professionals by the Council
- Develop pool of talented knowledge professional in forestry by way of scholarships for augmenting advanced forestry research and education
- FRI-SAARC Fellowship formalisation and implementation at FRI University
- Upgradation of FRI deemed university as an institute of excellence on the lines of IIM and IIT
- Augmenting access to international level resources (including books and journals through e-consortium and IT enabled education)
- Integration of ICFRE and its Institutes with National Knowledge Network (NKN)
- Forging linkages and tie-ups for better employability of the forestry professionals

Policy Research

- Specific policy research inputs supports to MoEF for enabling forestry policy at national level
- Policy inputs for national policy on forestry in emerging critical areas (CDM, REDD⁺, biodiversity conservation, bioprospecting, participatory forestry, Green India Mission)





5.6. Thrust Area 6: Forestry Extension for Taking Research to People

ICFRE has a mission to generate, preserve and promote knowledge, technologies and solutions for issues related to forests, environment and to facilitate management of these resources on a sustained basis for benefit of human kind through research. With this aim, forestry extension initiatives and programs are being launched from time to time to include villagers and farmers and the forest department to adopt improved forestry practices and technologies. About 25 VVKs are operational to show case the research to the stakeholders. Extension technology in forestry sector needs quantum leap as presently it is in very nascent stage. Agriculture sector unlike forestry has a very well networked extension support in the country. Forestry unlike agriculture does not have enough manpower to exclusively handle forestry extension. Forestry extension groups lack combination, of forest managers and specialists from related forestry disciplines (soil, agronomy, sociology, anthropology, economics, genetics, pathology, entomology, and other allied areas). ICFRE findings are yet to reach the stakeholders in a big way.

Mission: Reach out to larger sections of society through scientific interventions for forestry gains and increase visibility of forestry science

R & D initiatives in lab are not widely adopted by the industry, as it is not going through up scaling process, which requires sufficient funding. There is no effective mechanism for transferring research findings from lab to end users. A mechanism to market technological developments made by research organizations is needed. Creation of intermediary marketing organization/ mechanism to transfer technology as a complete holistic package having inbuilt scaling up mechanism with substantial funding grant is needed.

It is therefore proposed to undertake following envisioned activities:

- Intensification of 'Direct to Consumer' scheme to demonstrate the research outputs to the user groups
- Propagate best success stories of the past (e.g. plywood industries at Yamunagar, poplar planting in north, casurina in south, community based lac cultivation model in Jharkhand etc) for reaching out to user groups
- Linking best practices in forestry research to the livelihood support through extension networking
- Strengthen transfer of scientific knowledge to the artisans / farmers who are at the bottom of the ladder of stakeholders
- Improvement /development of risk assessment methodologies/ modeling in wood and non-wood based products, processes and related aspects
- Initiate Institution / industry based collaborated projects for taking research from the laboratory to the industry till it is commercialized
- Strengthen interactions between the government agencies and wood-based industries, linkages between the research oriented units and wood-based industries be established
- Upgradation of and scaling of the quantum of extension modes and technologies presently available. Creation/ adoption of demo villages/ trials across states and agro-climatic zones
- Increase the number of Van Vigyan Kendras to all blocks in the country and develop sound linkages with Krishi Vigyan Kendras for dissemination of findings through institutionalised knowledge programs and knowledge workers
- Use of information technology for faster and cheaper dissemination to attract wider target groups, particularly the rural women and weaker section of society
- Enlargement of product attributes by diversification in products and innovation catering to environment and linking fusion of traditional richness and modernity
- Establishment of Tree help lines, tree ambulance service, forest and plantation health diagnostic centres at block levels providing advisory, diagnostic and marketing solutions including certification services for timber etc.
- Opening of comprehensive Intellectual Property Rights cell to support researches and forests communities with qualified people
- Legal and policy support for tree cultivation like patents, know-how, registration, trademarks / service marks, trade secrets, geographic indicators, IPRs issues etc., to users to enhance their revenue through tree cultivation



6

The Strategy

With the shift towards sustainable development and participatory mode of forest management, the forestry has been undergoing fundamental changes in recent times. Forestry research thus needs to reorient itself to fit into the national priorities, namely poverty alleviation, literacy and drinking water supply. Forestry research action plan has been proposed for ICFRE Institutes for next 20 years. To fulfill the objectives adequate support in terms of infrastructure, human resource, funding and new initiatives are to be undertaken. The requirement for the future to fulfill the objectives and some of them are elaborated below:

6.1. Creation of Action Groups

To improve the research system, ICFRE initiated discussions and deliberations on contemporary research issues by forming different groups like **Think Tank, Ginger Group and Knowledge Pool. 'Direct to Consumer'**; a new scheme has been launched and is being implemented to take the research forward directly to consumer/end-users. National Subject Matter Coordinators (NSMCs) are designated to prepare specific State of Knowledge Reports (SKRs) on various facts of forestry research. These forum would provide necessary inputs for shaping the forestry research.

6.1.1. Think Tank

A nationwide representation has been made, of scientific force to bring together eminent foresters and scientists from all over the country to infuse new thinking and address the gaps between forestry and research under the Chairmanship of Director General, ICFRE.

6.1.2. Ginger group

A Consultative group of ICFRE scientists to think beyond the traditional concept of stakeholder / demand driven / need driven research concepts has been created to bring 'innovative ideas and out of box thinking' for solving the problems of consumers on the issues relating to emerging challenges of forestry science.

6.1.3. Knowledge Pool

A Consultative group of field foresters at ICFRE has been constituted to bring about innovative ideas for solving the contemporary problems of forest management in the country with special focus towards solving the problem of rural poor, tribals and other marginal sections of the society. The knowledge pool would also strive to improve the communication between scientists, research workers and consumers/ stakeholders of research.

6.1.4. National Subject Matter Coordinators (NSMCs)

Thirty-five numbers of NSMCs have been identified to develop systematic approach paper on various subject matters and would compile a 'State of Knowledge Report' on each assigned theme. They are expected to develop site specific and subject specific research programs and coordinate research, extension and marketing activities in the identified theme.

6.1.5. National Project Directors (NPDs)

To improve upon research planning system of ICFRE, National Project Directors have been designated to steer research in program mode in six identified thrust areas falling under broad areas of



research, education and extension. Role of NPDs is important in integrating research efforts of ICFRE institutes within the ambit of ICFRE research planning system for next 25 years.

6.2. Direct to Consumer Scheme

Research communication is a two way process. The forest officials are vital link between SFDs/industries/farmers and other stakeholders linking research and management practices in the field of forest conservation/ development and forest based livelihood, while the work of ICFRE scientists / professionals is to transfer research results to the field to meet the emerging challenges of climate change, forests and water security and biodiversity conservation etc., by amalgamation of efforts of both. The envisaged step is to enhance the outreach of the research findings so that the extension of research makes immediate impact of research in the field. The 'Direct to consumer scheme', has been launched for immediate transfer of technologies developed by ICFRE to the consumers.

6.3. Capacity Building for the future

ICFRE has geared itself to face new challenges by taking new initiatives and plan will have to play an important role in forestry research in the country and South Asia. Research on more diverse fields to meet the challenges of livelihood, food and environmental security and meet the aspirations of common man and nation as a whole by strengthening present Institutes and establishing new Institutes and upgrading present research centers with educate scientific manpower and infrastructure is envisaged. Council has taken up conscious initiatives to expand its activity in the forestry research, education and extension. New challenges in the forestry research at the national and international level are focal point of discussions. To expand the vistas of forestry research, education and extension interface in a more efficient manner to face these new changes is contemplated.

6.3.1. Mandates of ICFRE Institutes

At present ICFRE has nine (Hyderabad has been recently upgraded to institute) institutes and they have regional mandates covering specific states and union territories. The following changes are to be adopted:

- FRI Dehradun will be an Institute of excellence and shall have a pan-India mandate for conducting and coordinating forestry research on all the aspects, while continuing to cater to the research needs of its jurisdiction states

- Other Institutes will have pan India mandate in the area of their excellence and will continue to cater to the research needs of the jurisdiction states in the other areas

6.3.2. Strengthening of scientific manpower in ICFRE

The ICFRE functions through a permanent cadre of scientists and officers on deputation from the forest departments. In ICFRE, the total sanctioned Group 'A' posts are 387, of which 280 are the scientists and rest 117 are filled on deputation, mainly with IFS officers. It is felt important to increase the strength of scientists and practicing foresters for more focused research. The posts of technical and ministerial staff also need to be augmented to strengthen the manpower of the council. Historically, FRI had a total strength of about 3800 personnel, which has now drastically come down to merely one-third.

6.3.3. Infrastructure support for ICFRE and its institutes

ICFRE is functioning for the past twenty five years. After the setting up of the Council, the mandate has increased manifold, whereas the infrastructure facilities have remained stagnant. With the passing of years and new emerging fields of research, it has been felt that there is an urgent need to strengthen and develop infrastructural support for the council and its institutes. An overview of the existing infrastructure and future perspectives has revealed the following issues, which need appraisal, attention and course corrections:

It is a known fact that the present set up of the council and its institutes has evolved from the erstwhile Forest Research Institute and Colleges and its regional centers. Most of the infrastructure either remained the same or built up on the existing ones. Most of the instruments and equipments have become very old and obsolete. There is a urgent need to address the issue of upgradation of old machines and instruments and state of the art technology is to be used for research.

It also envisaged that the existing buildings used for laboratories and other works in some of the Institutes like FRI need renovation and face-lift and regular maintenance. Library facilities and land for field experiments are other issues to be addressed in addition to welfare facilities like hospitals/ dispensaries, schools, community halls etc.

Each Institute of ICFRE would be encouraged to prepare a “Perspective Plan” covering the vision period of ICFRE in tune with the four future five-year plans of the country to enable development of its core competencies and to evolve into a centre of excellence

6.3.4. Human Resource Development (HRD)

Motivated human resource is an important ingredient for the effective implementation of the policy initiatives. To meet the new and emerging challenges as per revised focus of ICFRE research, a new HRD policy has been formulated for creating an in house corpus of trained researches and managers to achieve scientific breakthrough in the face of complex forestry challenges of today and future.

Following research aspects will be given due importance in future policy

- Creation of more research institutes under ICFRE
- Strengthening of recruitment board of the ICFRE
- Development of scientific cadre of ICFRE and strengthening of scientific manpower
- Training and upgradation; Extra incentives and perks
- Participation in national and international workshops / seminars; Membership to national and



international societies / forums / bodies etc

6.3.5. Creation of Corpus Fund and enhancement in annual budget outlay

A corpus fund of Rs. 1,000 crore is needed for infrastructure expansion and maintenance of assets and to start futuristic research on frontline areas. This corpus fund would enable ICFRE to take up research in problems in networking with industries, universities, IITs/IIMs, Civil Societies and others. Such research issues at present remain unattended for want of funds. Activities and salaries of officers and staff have grown over the years where as budget allocation has remained almost constant. This has further reduced the funds available for research activities.

6.4. Proposed Expansion of ICFRE

To expand the vistas of forestry research, education and extension in a more efficient manner following new programs are proposed:

- Establishment of Certification Mechanism for Sustainable Forest Produce
- Upgrading Aizawl Centre as an Institute (Bamboo and Rattans Research Institute)
- Establishment of an Advance Research Centre for Ecology and Biodiversity in Western Ghats of Maharashtra and Eastern Ghat
- Establishment of a Centre for Forestry Research and Technology Demonstration (CFRTD), Agartala, Tripura
- Establishment of Adivasi Van Vikas Kendras (AVVKs) in certain states
- Establishment of Centre for 'Saline and Costal belt Afforestation and Rehabilitation' under AFRI, Jodhpur
- Establishment of Centre for Transfer of Technology at Guwahati
- Initiation of South Asian Network of Forestry Research Institutes
- Creation of separate technical service in the ICFRE for enhanced technical inputs to research, education and extension on the pattern of similarly placed organizations
- Allocation of , separate funds for infrastructure development and strengthening of research base in already established centers of excellence in the different research Institutions (like Cold Desert Afforestation and Pasture Establishment in case of HFRI and Wood Science and Technology in case of IWST)
- Establishment of Forest University at IFGTB



- Establishment of Mangrove Research Station
- Establishment of Species Specific Research Institutes/centres like teak, poplars, eucalypts

6.4.1. Establishment of National Academy of Forestry Sciences (NAFS)

The forestry sector in our country lacks an appropriate forum for exchange of views among different stakeholders such as the villagers, farmers, forest managers, forest scientists, NGOs, planners etc. ICFRE proposes establishment of a 'National Academy of Forestry Sciences' that would provide an opportunity to all these stakeholders to have exchange of views and knowledge.

6.4.2. Establishment of the Institute of Forest Chemical Technology

An institute is proposed to be established at Kolkata/ Guwahati / Ahmedabad. It would serve the purpose of conducting pioneering research focused towards utilization and promotion of NWFPs, Chemistry of forestry produce, Wood and Wood substitutes, waste products from forestry operations and forest-based industries.

6.4.3. Establishment of National Bureau of Forest Genetic Resources

The National Bureau of Forest Genetic Resources will involve all institutes and centers of ICFRE and will work in close collaboration with State Forest Departments, Universities and other R&D organizations to manage, conserve and utilize the forest genetic resources for improvement of quality and quantity forest produce.

6.5. Forging strategic partnership

Forestry being a multidisciplinary science, research agendas can be sufficiently addressed only with the participation of scientific talent and experience from within and outside the Council. Linkages with institution of diverse nature including those dealing with social and cultural issues are to be nurtured, and synergized. Networking with institution in other countries through forestry education and research system will be strengthened. Joint ventures for forestry research programs for effective delivery will be developed. Special consideration for sharing of credits under collaborative arrangements would benefit forestry research.

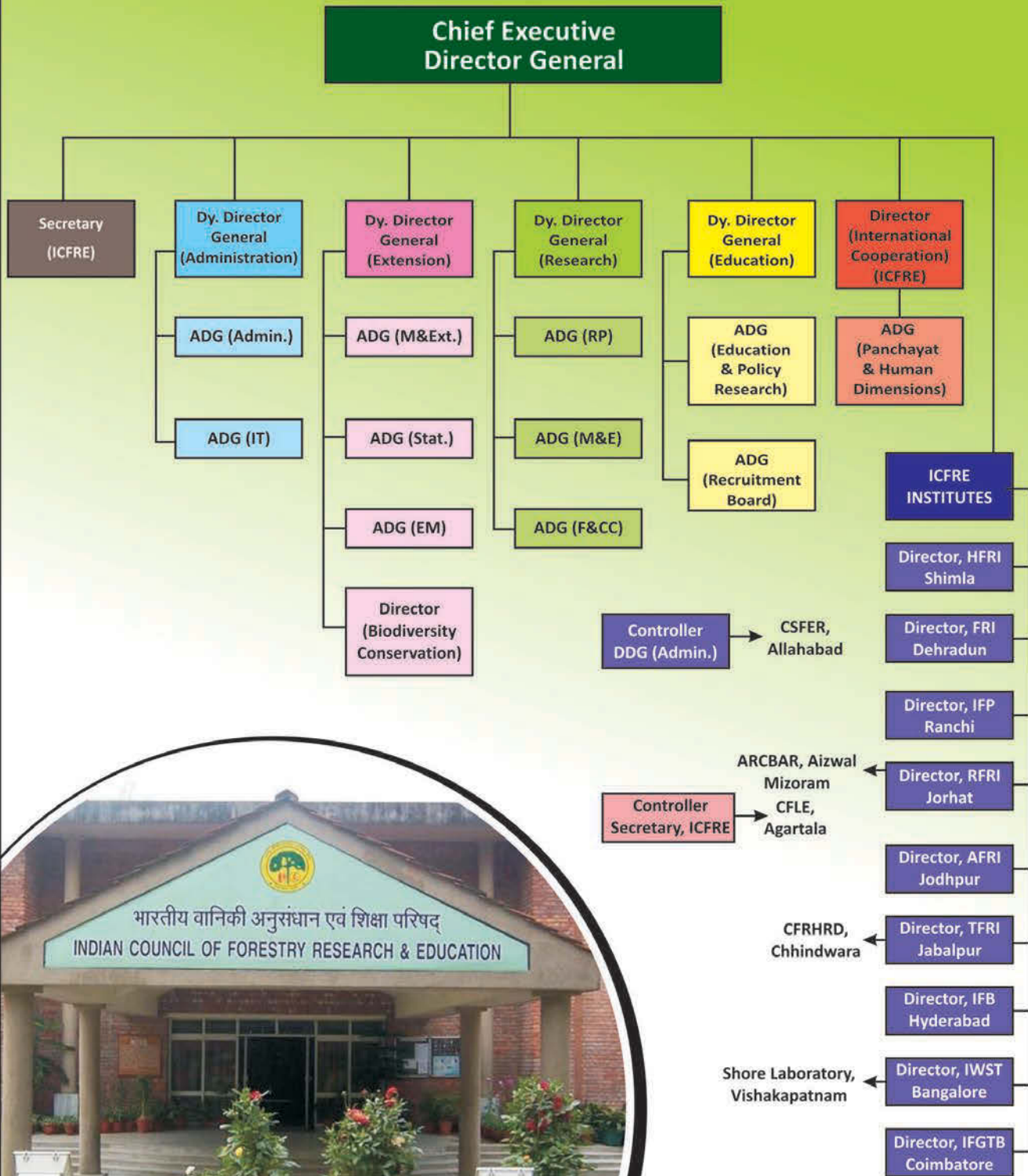
6.6 Meeting Commitment to society

ICFRE, though meaningful, innovative and need based research, will strive to deliver services to the society for urban and rural development. Forestry science through capacity building of a larger force will create a vibrant critical mass for forestry professionals and findings through which forestry sector will stand to support all other sectors of the country.

6.7 Consortium of NGOs

Research findings of ICFRE needs to reach to the stake holders efficiently for better and pin pointed extension of developed technologies a consortium of NGOs may be helpful. This could bridge the gap between the researchers and stakeholders or field functionaries.

ORGANISATIONAL STRUCTURE OF ICFRE



Objectives of ICFRE

- ? To undertake, aid promote and co-ordinate forestry research, education and its application
- ? To extend the research finding from lab to land
- ? To develop and maintain a National Forest Library and information Centre
- ? To provide consultancy services in the field of forestry research, education and training, and in allied sciences

Mission

“To generate, preserve, disseminate and advance knowledge, technologies and solutions for addressing the issues related to forests and promote linkages arising out of interactions between people, forests and environment on a sustained basis through research, education and extension”

**Research Planning Division
(Directorate of Research)**

Indian Council of Forestry Research and Education

(An organisation of Ministry of Environment and Forest, Govt. of India)

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