



**Indian Council of
Forestry Research
and Education**

NATIONAL FORESTRY RESEARCH PLAN

**(NFRP)
2020 - 2030**



**Directorate of Research
Indian Council of Forestry Research and
Education, Dehradun**



**Indian Council of Forestry Research
and Education**

**NATIONAL FORESTRY
RESEARCH PLAN
(NFRP)
2020 - 2030**

**Directorate of Research
Indian Council of Forestry Research and
Education, Dehradun**

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December 2019

Directorate of Research

Indian Council of Forestry Research and Education, Dehradun

मंत्री
पर्यावरण, वन एवं जलवायु परिवर्तन,
सूचना एवं प्रसारण और
भारी उद्योग एवं लोक उद्यम
भारत सरकार



MINISTRY
ENVIRONMENT, FOREST AND CLIMATE CHANGE,
INFORMATION & BROADCASTING AND
HEAVY INDUSTRIES & PUBLIC ENTERPRISES
GOVERNMENT OF INDIA

प्रकाश जावडेकर
Prakash Javadekar



MESSAGE

Importance of forests has been abundantly reflected in our ancient scriptures and it is a cultural practice in India to protect and conserve our natural resources. Forests are important life support systems that provide various services for our survival and existence. Societal needs for development in the recent decades has put pressure on our forests and it is imperative to have conservation and development together.

Scientific interventions through forestry research are key to enhancing forest productivity, extent and health for meeting the aspirations of the people. Indian Council of Forestry Research and Education (ICFRE) Dehradun is spearheading forestry research in the country through its various scientific studies.

In the past ICFRE has released improved varieties of various tree species; developed eco-restoration models of mined areas; developed standards for improving durability of wood; addressed forest health issues and developed wood composites which shall certainly help increase forest productivity and bridge the gap between demand and supply. With the contemporary developments taking place in the international arena, India has expressed its commitment to enhance carbon sink by 2.5 to 3.0 billion tonnes of CO₂ equivalent by 2030 through enhanced forest and tree cover. With these developments, forestry research needs to be realigned in accordance with national requirements and international commitments.

I am happy that the Council has taken initiative in bringing out second version 'National Forestry Research Plan' for a period of 10 years starting from 2020. The council had brought out first 'National Forestry Research Plan' in 2000. The plan is aligned to regional, national and international requirements and includes lessons from the past experiences and recommendations of various forestry conferences and seminars.

I hope this initiative will further help in addressing the critical forestry research issues in the country. I congratulate DG, ICFRE and other scientists for bringing out this important document.

Date 04.12.2019


(Prakash Javadekar)

।। प्लास्टिक नहीं, कपड़ा सही।।

Babul Supriyo

Union Minister of State

Ministry of Environment, Forest & Climate Change
Government of India



सत्यमेव जयते



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केन्द्रीय राज्य मंत्री

पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
भारत सरकार

Message

I am happy that Indian Council of Forestry Research and Education (ICFRE), Dehradun has undertaken an excellent initiative to prepare the second version of 'National Forestry Research Plan (NFRP)' to align forestry research in the council as per the contemporary needs. This plan prioritizes research issues taking into account the vision, mission and objectives of the Council and lays out the research priorities for a period of 10 years starting from 2020.

ICFRE is undertaking a wide variety of studies ranging from Policy matters, improving the Quality Planting Material to sustainable harvesting of Non-Timber Forest Products. The council has been extending their research outcomes from lab to land for the benefit of various stakeholders. Many Agro-forestry models tailored for bio-climate zones have been developed which are benefitting farmers across the country. In the recent past ICFRE has taken up an initiative to improve Bamboo sector in the country through forestry research. ICFRE is also implementing an innovative initiative called 'PRAKRITI' which is a Scientist-Student connect program to enhance environmental awareness among school students.

I am sure that the NFRP will help in addressing research issues of forests holistically in a collaborative manner. This document will not only guide the council and its institutes but will also help other forestry research organization align their research plans on the lines of this document.

I congratulate the Council for preparing this comprehensive document.

(Babul Supriyo)

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MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE



MESSAGE

Enhancing forest cover, providing water and food security, improving forest productivity, maintaining biological diversity, sustaining ecosystem services, addressing issues of land degradation and climate change are some of the major challenges of forestry sector.

Indian Council of Forestry Research and Education (ICFRE), Dehradun has been in the fore-front for providing scientific solutions to many critical issues. To name a few, ICFRE is involved in preparing detailed project report for treatment of catchment areas of major river basins. Its involvement in treatment of many degraded sites, and environment impact assessment of development/mining projects are few to mention. Research in areas of improving productivity of forest and plantation, developing technologies on various contemporary problems of the sector are the key to its success.

Research Planning is very important and necessary and having futuristic vision provides necessary guidance. I am happy, that ICFRE has come out with its second, 'National Forestry Research Plan' for the next 10 years starting from 2020. This is a follow-up of its first 'National Forestry Research Plan' that is completing its 20 Years Period.

I sincerely hope that this document will provide necessary guidance in planning and targeting future research in ICFRE.

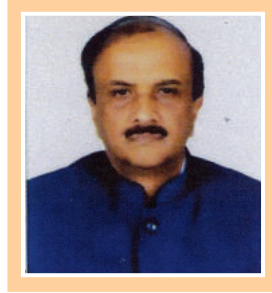

(C.K. Mishra)



सिद्धांत दास
SIDDHANTA DAS



वन महानिदेशक एवं विशेष सचिव
भारत सरकार
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
DIRECTOR GENERAL OF FOREST & SPL. SECY.
GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE



MESSAGE

I am happy to learn that Indian Council of Forestry Research and Education (ICFRE), Dehradun follows a systematic approach in planning forestry research programmes which involves series of consultations at different levels. This Second, 'National Forestry Research Plan' for next 10 years starting from 2020 is the outcome of such consultation process. A lot of efforts have gone into preparation of this research plan. It encompasses the requirements of the forestry sector at regional, national and international levels. Integrating different policies related to forestry and requirements of Government is the key to this Plan. The topics for future research have been carefully planned.

I congratulate ICFRE on accomplishing this wonderful exercise and bringing out this valuable document for forestry research.


(Siddhanta Das)

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(पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय भारत सरकार की एक स्वायत्त परिषद्)
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INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION
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PREFACE

From a humble beginning about 160 years ago, the scientific forestry in India has passed through the phases of baseline research (1864-1947) predominantly dominated by documentation; consolidation (1947-1986) focusing mainly on wood, pulp, NTFPs, forest classification, plantation techniques and strengthening of repositories. The formation of ICFRE marked the beginning (1987-2016) of research on contemporary issues like enhancing forest cover, forest productivity, wood production, protection, mitigating, conservation and impact of climate. This contemporary phase also saw the formation ICFREs 20 years National Forestry Research Plan 2000 (NFRP 2000) to streamline the forestry research in the country.

The phase of 2017 onwards is dominated by strengthening of forestry research by addressing issues of national and international importance through collaboration and applying holistic approach to provide scientific solutions. Many major new initiatives have been taken during this period. Forest are now considered important source of water. For the rejuvenation of river Ganga through forestry interventions a Detailed Project Report (DPR) was prepared by Forest Research Institute, Dehradun. Successes of this effort lead to preparation of DPR rejuvenation of 13 major rivers (Beas, Chenab, Jhelum, Ravi Sutlej, Godavari, Mahanadi, Narmada, Krishna, Yamuna, Luni, Brahmaputra and Cauvery) through forestry interventions. Status report on Bamboo (2017) Covering the research and technology developed in the country was published. Forest Sector Report 2019 was completed for MoEF&CC. XIX commonwealth Forestry Conference was successfully conducted at FRI in April 2017. Scientist-student connect program 'PRAKRITI' was launched to create awareness among the school students for environment, forests and nature brings the research at the door steps of students and teachers. Green skill Development Programme (GSDP) in the field of environment and forest to enable youth of the country to get gainful employment was implemented. National REDD+ Strategy 2018 was prepared by ICFRE and released by MoEF&CC. In addition, many structural reforms were carried out for smooth functioning of ICFRE. Outreach to other organizations was enhanced by signing MOUs with national and international organizations.

The challenges of forestry sector today are many. Human and cattle population is increasing, putting additional pressure for food and water security. Diversion of forest land for development purpose is further affecting carrying capacity of forest. Climate change, land degradation and increase in intensity of extreme events are affecting health of forest. Maintenance of ecological balance, conserving biodiversity, improving and increasing forest.

cover, enhancing productivity and meeting aspirations of public is requiring paradigm shift in research strategy.

This second National Forestry Research Plan (NFRP) has been prepared to address these issues. Learnings from the past, recommendations of various conferences, seminars and consultations has led to formation of this NFRP. A two year period in the preparation of this document has inputs from various levels. The final draft was also circulated to State Forest Departments for comments, which have been duly incorporated. It is worthwhile to acknowledge contribution of the internal committee of Dr H.S. Ginwal, Dr Manisha Thapliyal and Dr Vimal Kothiyal for the preparation of initial draft. Consultation with DDGs, ADGs, Directors and scientists of ICFRE institutes in improving the initial draft is also acknowledged. Shri V.R.S. Rawat, Dr R.S. Rawat and Dr Shilpa Gautam are acknowledged for checking the final draft.

Dr Vimal Kothiyal, Scientist- G and assistant Director General (Research Planning) has whole heartedly contributed to drafting and preparation of this document. Putting all the piecemeal information together in the form of sequential draft has been a painstaking process. My inputs to this document have been duly incorporated by him. He is specially acknowledged for this.

I hope this document will guide the research in future to achieve greater heights in forestry research.



(Dr. Suresh Gairola)
Director General

Indian Council of Forestry Research & Education



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LIST OF ABBREVIATIONS USED

S. No.	Abbreviation	Full expansion
1.	AICRP	All India Coordinated Research Project
2.	ADG	Assistant Director General
3.	APCCF	Additional Principal Chief Conservator of Forests
4.	BOG	Board of Governors
5.	BSI	Botanical Survey of India
6.	CBD	Convention on Biological Diversity
7.	CCF	Chief Conservator of Forests
8.	CF	Conservator of Forests
9.	CIFOR	Centre for International Forestry Research
10.	CSIR	Council of Scientific and Industrial Research
11.	CSO	Clonal Seed Orchard
12.	DCF	Deputy Conservator of Forests
13.	DDG	Deputy Director General
14.	DG	Director General
15.	FAO	Food and Agriculture Organisation
16.	FSI	Forest Survey of India
17.	GoI	Government of India
18.	ICRAF	International Council for Research in Agroforestry
19.	ICAR	Indian Council of Agriculture Research
20.	ICFRE	Indian Council of Forestry Research and Education
21.	INBAR	International Bamboo and Rattan Organisation
22.	IPR	Intellectual Property Rights
23.	ICFRE	Indian Council of Forestry Research and Education
24.	IUCN	International Union for Conservation of Nature
25.	IUFRO	International Union of Forest Research Organisation
26.	IWST	Institute of Wood Science and Technology
27.	JFM	Joint Forest Management
28.	LDN	Land Degradation Neutrality
29.	MoEF	Ministry of Environment and Forests
30.	MoEF&CC	Ministry of Environment, Forest and Climate Change
31.	NAPCC	National Action Plan on Climate Change
32.	NDC	Nationally Determined Contribution
33.	NFAP	National Forestry Action Plan
34.	NGO	Non Governmental Organization
35.	NMPB	National Medicinal Plant Board
36.	NWFP	Non Wood Forest Produce
37.	NTFP	Non Timber Forest Produce
38.	PAG	Project Advisory Group
39.	PCCF	Principal Chief Conservator of Forests
40.	PRI	Panchayati Raj Institution
41.	RAG	Research Advisory Group
42.	RPC	Research Policy Committee
43.	SDG	Sustainable Development Goals
44.	SSO	Seedling Seed Orchard

45	TOF	Trees outside Forest
46	UNCCD	United Nations Convention to Combat Desertification
47	UNFCC	United Nation Framework Convention on Climate Change
48	UNFF	United Nation Forum on Forest
49	UT	Union Territory
50	VMG	Vegetative Multiplication Garden
55.	VOC	Volatile Organic Carbon
56.	WII	Wildlife Institute of India

Executive Summary



Executive Summary

Scientific forestry in India began with Sir Dietrich Brandis, who took over as Inspector General of Forests in 1864 to head the newly created Indian Forest Department. In 1906, scientific aspects of forestry were enhanced with the creation of the Imperial Forest Research Institute at Dehradun. In 1986, Indian Council of Forestry Research and Education (ICFRE) was constituted by the then MoEF and was granted autonomy in June 1991. Presently, it has nine institutes and five research centers under its umbrella. ICFRE was established for spearheading a holistic forestry research through planning, promoting, conducting and coordinating research on all aspects of forestry.

In an effort to streamline the research process into stakeholders' requirements, National Forestry Research Plan (NFRP) was launched in May 2000, keeping in view the national requirement and linkages with the Five Year Plans and National Forestry Action Plan (NFAP) of the then Ministry of Environment and Forests. The NFRP was drawn for a period of 20 years with a built in mechanism for periodical reviews at every five year interval.

Forestry research priorities in the country have changed over the years and so have the expectations from ICFRE. ICFRE has been in existence for almost 30 years and has established research infrastructure across the country through its institutes. It is now required to play a predominant role in addressing the national and international forestry research issues and provide policy guidelines to the Government. At this juncture it is worthwhile to assess the impact of research planning methodologies given in NFRP and take necessary steps for course correction wherever required. During the Directors' conference held at IWST Bengaluru on 18th July 2017, it was felt that NFRP needs to be revised. Similar views have been echoed during different discussions and Research Policy Committee meetings. Some course corrections have been done during the last two decades. Before proposing any change, it was thought appropriate to analyze each step of the process.

The premises of National Forestry Research Plan 2000 were reviewed before embarking on framing new research plan and methodologies. While developing this research plan, National Forest Policy 1988 was reviewed. The draft of National Forest Policy 2018 was also consulted and in addition national and international commitments which the country has agreed to were also kept in mind. The documents of national and international bodies like NMPB, FAO, INBAR, CIFOR, IUFRO, ICRAF and other organizations were also referred during the preparation. 'Aims and Objectives of National Forestry Research Plan 2020-30' in Chapter I summarizes objectives of NFRP 2000 and that of NFRP 2020-30.

The formulation of this document has gone through many phases. First a draft was prepared which was discussed among the committee members formed by Director General, ICFRE for preparation of the new methodology and research plan for next 10 years for ICFRE. The same was then circulated to ICFRE institutes for comments and was discussed in the Directors' Conference held at Arid Forest Research Institute, Jodhpur on 24th November 2017. The suggestions made in this conference and comments received from the Institutes were duly incorporated in different sections of the document. The revised draft was further discussed at

ICFRE on a number of occasions in the monthly meetings and necessary corrections were incorporated in the document.

ICFRE, immediately after its formation, recognized the importance of research planning. Two important guidelines / documents were drafted and put in place in the year 1998 and 2000 to have a uniform research planning process:

1. Methodologies for Setting Research Priorities of ICFRE (ICFRE, 1998)
2. National Forestry Research Plan 2000
 - a. Volume 1: Status of Forestry Research
 - b. Volume 2: Research Priorities and Plans

The guidelines in these documents were followed for planning, prioritization and implementing research projects. In Chapter II of this document a brief review of these guidelines is presented. The process followed for prioritization of research proposals is also discussed.

The research planning process followed in ICFRE and its institutes is based on NFRP 2000 and has completed more than 19 years. Chapter III deals with the analysis of the complete process and the learning and experience gained during the last 19 years. The need for change felt under each step is highlighted. Some modifications which have already been done in the past few years are also included here.

To improve and strengthen the research planning process at ICFRE and its institutes some changes have been suggested with full details and justification. Chapter IV covers all the changes proposed for the new research methodologies of ICFRE. Thrust areas and themes (section 4.5) form the important part of this Chapter. Data generation, data compilation, international commitments, international partnership, public/private partnership, synergy with research organizations/ universities outside ICFRE and environmental issues have also been re-focused in this chapter. Broad frame-work for research issues of emergent and immediate nature has also been given.

Chapter V forms the most important part of this document and details the priority areas of research that ICFRE should focus on in the next ten years. For arriving at the priority areas, recommendations of the national conferences, silviculture conferences, regional research conferences, seminars and workshops conducted by ICFRE institutes over a period of 10 years were consulted. Recommendations of Regional Research Conferences, National Conference and monthly seminars conducted in 2017-2019 for different regions of the country also formed the basis of arriving at the important priority areas of research. These also include NDC commitments, SDG goals, climate change and resilience, carbon sequestration, desertification, land degradation, eco-restoration, biodiversity conservation, water conservation, forest productivity, ecosystem services, trees outside forest, agroforestry, bamboo, fodder, fuel, soil health, forest fire, NTFP including medicinal plants, long term ecological studies, policy research, wood technologies, market research, genetics and tree improvement, weeds and invasive species, insect-pest management, bio-prospecting, value addition and livelihood generation.

Chapter VI of this document is the heart of NFRP 2020-2030 and will ultimately determine the success of ICFRE in dealing with national goals and international commitments through scientific interventions in forestry research. A brief description of the national goals and international commitments is given and the areas where ICFRE needs to intervene are highlighted. Matrix tables 6 and 7 at the end of this Chapter provide the linkages between national goals/ international commitments and ICFRE thrust areas, themes (Section 4.5) and prioritized research issues (Chapter V). This could serve as a barometer of success of research planning and execution at ICFRE.

At the end of this document various formats for concept note development, project format, and All India Coordinated Research Projects (AICRPs) guidelines are annexed. It also gives the framework for organizing periodical seminars to have stakeholder's consultation for addressing their aspirations and use it as a forum for reaching wider audience to popularize the work ICFRE is carrying out in the research, extension and education.

Salient features of NFRP 2020-2030:

The uniqueness of NFRP 2020-2030 lies in the following salient features:

1. The learning's from review of the NFRP 2000 are taken into consideration while formulating this NFRP.
2. Recommendations of conferences (silviculture, regional, national and international) and seminars conducted during the last one decade, forms the basis of prioritizing research issues.
3. Directions received from the MoEF&CC from time to time.
4. Recommendations of National Forest Commission.
5. Internal discussion and consultations (including with retired scientists).
6. Consultation with State Forest Departments.
7. Linkages of ICFRE priorities with national goals and objectives.
8. Strengthening of Research Advisory Group (RAG) of Institutes and Research Policy Committee (RPC) of ICFRE with subject experts.
9. Giving emphasis on All India Coordinated Research Projects (AICRPs) and formulating guidelines for it.
10. Revising criteria for evaluation of projects.
11. Improvising stakeholders consultations by conducting national/ regional conferences and monthly seminars.
12. Giving emphasis on data generation, data compilation, reference collections and partnership with other organizations.
13. Revising formats of project and concept note submission.

CHAPTER I
Aims and
Objectives of
National
Forestry
Research Plan



Aims and Objectives of National Forestry Research Plan

Scientific forestry in India was initiated about 160 years ago, through a memorandum from the Governor General in 1855. It gained momentum with Sir Dietrich Brandis, who took over as Inspector General of Forest in 1864, and under whose guidance state forest departments were created in various British ruled provinces and the methodical development of forestry was initiated. In 1906, scientific aspects of forestry were enhanced with the creation of the Imperial Forest Research Institute at Dehradun which spearheaded the forestry research not only in India but globally with particular reference to south-east Asia for over 90 years till ICFRE was established. After 1945, the Forest Research Institute, Dehradun had as many as twenty four research disciplines. Later, regional research centers were also established at Coimbatore, Bangalore, Jabalpur and Burnihat. FRI and its regional stations were placed directly under the control of Central Government in 1986 when the regional centers were upgraded to full fledged research institutes and along with FRI were transferred to ICFRE under the then Ministry of Environment and Forests. In 1991, ICFRE was established as an autonomous body under the then MoEF with a mandate to develop holistic forestry research in the country.

ICFRE, immediately after its formation, recognized the importance of research planning. Need was felt to develop a systematic research strategy to provide sustained research in the field forestry. Old research practices were reviewed to develop a new research plan. At the national level India launched the National Forest Action Plan (NFAP) in the year 1999. NFAP was in tune with the then National Forest Policy, and was focused towards addressing all critical issues confronting the forestry sector of the country. ICFRE on its part as a research organization prepared a methodology for setting research priorities and a 'National Forestry Research Plan' (NFRP) having functional relation with NFAP and Five Year Plans of the country was prepared in the year 2000.

National Forestry Research Plan 2000 (NFRP 2000):

The objective of National Forestry Research Plan 2000 (NFRP 2000) of Indian Council of Forestry Research and Education (ICFRE), Dehradun was to enhance the research capacities and prioritize the research portfolio of the Country with transparent, participatory and bottom up approach. The plan also developed a process of setting up research priorities in forestry research so that scarce fund grant available can be gainfully utilized for selecting a balance of region specific, national and international research portfolios. The aim was to bring uniformity in research planning process to promote innovations and excellence in research. The purpose was also to achieve consonance among complex and diverse research needs and optimum utilization of resources. India was among the first countries to have launched a National Forestry Action Plan (NFAP) and was in tune with the then National Forest Policy. NFRP 2000 fulfilled one of the objectives of the World Bank funded Forest Research, Education and Extension (FREE)

project designed to enhance the research capabilities and prioritize the research portfolio of India. The NFRP 2000 was drawn for a period of 20 years and was linked with NFAP.

National Forest Policy 1988:

The Forest policy of 1988 was a marked shift from the forest policies of 1894 & 1952 that had stressed on the production & revenue generation. The principal aim of National Forest Policy, 1988 was to ensure environmental stability and maintenance of ecological balance including atmospheric equilibrium which are vital for sustenance of all life forms, human, animals and plants. The 1988 policy recognized that derivation of direct economic benefits must be subordinated to this principal aim. This policy has been instrumental in strengthening ecological security, sustainable forest management, and participatory forest management.

Policy prescriptions of 1988 has led to increase in forest and tree cover and reduction in the diversion of forest land for other land uses despite compelling demands of development. However, the low quality and low productivity of our natural forests, impacts of climate change, human-wildlife conflict, intensifying water crisis, increasing air and water pollution and deteriorating environment are the issues of serious concern even today. The increased concerns for biodiversity conservation and the need to enhance forest ecosystem services, through new technological advancements and the continuously declining investments in the sector present new challenges for forest management in the country.

The Draft New National Forest Policy:

The policy mainly focuses on safeguarding the ecological and livelihood security of people, of the present and future generations through sustainable management of forests for the flow of ecosystem services. For eco-security, the country should have a minimum of one-third of the total land area under forest and tree cover. In the hills and mountainous regions it aims to maintain two-third of the area under forest and tree cover to prevent soil erosion and land degradation along with ensuring the stability of the fragile eco-systems.

The guiding principles of the policy are environmental stability and conservation of biodiversity; reversal of degradation of forest; improvement in livelihoods on sustainable basis; contribute towards Nationally Determined Contributions (NDCs) to the UNFCCC; preventing denudation and soil erosion in the catchments; health of forest vegetation & forest soils; augmenting water supplies; safeguarding forest land; substantially increase in the forest/ tree cover; protected areas and other wildlife rich areas management; conserving and sustainably managing mountain forests; green accounting, valuation of ecosystem services and addressing to climate change concerns; increasing tree cover outside forests; integration of climate change mitigation and adaptation measures in forest management through the mechanism of REDD⁺ and expanding green spaces in urban and semi-urban areas.

The main thrust of policy is on reducing threats to forests, forest fire prevention, enhance quality and productivity of natural forests, increasing the productivity of forest plantations, protecting & enriching the catchments, biodiversity conservation, management of NTFP,

promoting agro-forestry and farm forestry, promoting urban greens, production forestry, economic valuation, forest management for water recycling, forest certification, climate change concerns and REDD+ strategies in forest management, develop a national forest ecosystems management information system, facilitate forest industry interface, research and education, extension and awareness, management of North-Eastern forests, training and skill development. The draft new policy also outlines measures to facilitate contemporary research and education in forestry and wild life. It also calls for strengthening collaboration with regional and international institutions of repute for multidisciplinary research to meet the policy goals.

India is party to several international environmental conventions on climate change, desertification, conservation of biodiversity, marine ecosystem, protection of forests, wildlife and environment and stands committed to the goals set in there. These goals and objectives have been incorporated in the National Forest Policy.

Revision of National Forestry Research Plan 2000:

The necessity for revision of NFRP 2000 emerged from the following:

1. NFRP 2000 is now almost 19 years old. It had built in mechanism for periodical review after every five years. Many changes have been made during the course of its implementation. These changes require updating and also tuning to newer requirements. Priorities of research problems and themes have also changed and need to be set for next decade.
2. NFRP 2000 was more or less driven by National Forest Policy 1988. The same is to be tuned to the expectations of the New Forest Policy.
3. NDC commitments of the country, sustainable development goals (SDGs), Aichi goals and targets, global environmental concerns, climate change preparedness, productivity enhancement, recouping of ecosystem services lost, biodiversity, soil and water conservation are some of the important dimensions that needs to be addressed for the country.
4. Research issues for next one decade are to be planned.

National Forestry Research Plan 2020-2030 (NFRP 2020-2030):

The basic aim of NFRP 2000 to have the process of setting research priorities, to bring uniformity in research planning process and to tune the research efforts in consonance with the National Forest Policy has been achieved. The thrust is now on focusing research and technological efforts in providing scientific solution to the forestry issues concerning the country. The inputs for NFRP 2020-2030 were therefore sourced from the following:

1. Learnings from NFRP 2000.
2. Recommendations of seminars and conferences conducted in the last ten years.
3. Regional and National conferences held during the last three years (2016-19).

4. Monthly seminars conducted at all the ICFRE institutes in last two years (2017-19).
5. Directions received from MoEF&CC from time to time.
6. Draft New Forest Policy.
7. Recommendation of National Forest Commission.
8. Recommendations of National and International bodies dealing with forestry.
9. Regional, national and international commitments.
10. Aims of international organization like FAO, INBAR, CIFOR and ICRAF etc.,
11. Internal discussions and consultations.
12. Inputs from State Forest Departments.

The main aims and objectives of the revised NFRP 2020-2030 are to provide scientific and technological solutions to national forestry research requirements and international commitments of the country by prioritizing research in different thrust areas, themes and subject areas. Chapter VI provides the detailed matrix for the same. Briefly the following will be addressed through this NFRP:

- **Needs as per National Commitments:** Fulfilling the objectives of National Forest Policy, National Action Plan on Climate Change, Biodiversity Act and Rules, National Biodiversity Targets, NDC, National Agroforestry Policy, Green Highways (Plantation and maintenance) Policy 2015, National REDD⁺ Strategy, Forest Conservation Act, Forest Right Act, National Bamboo Mission, Skill development etc.
- **Needs as per International Commitment:** UNFCCC, UNCCD achieving Land degradation Neutrality by 2030, CBD, Aichi Nagoya Biodiversity Targets, UNFF, SDGs (15 aims to “protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss”) and Bonn Challenge on landscape restoration etc.

While doing so it will be ensured that a holistic approach to the issues of national importance is applied by pooling resources from diverse fields and providing complete package of knowledge and output driven solutions. The research plan of ICFRE will be tuned to contemporary issues by improving the quality of research. Policy inputs for achieving national and international commitments will be provided as and when required by the Government.

CHAPTER II
**National
Forestry
Research Plan
(NFRP) 2000**
A Review



National Forestry Research Plan 2000 – A Review

2.1 Introduction

Forestry sector has witnessed radical changes and challenges at regional, national and global levels. On the one hand, the demand for forest produce is steeply rising, while on the other, the forest landscape is shrinking. Forests are facing pressure from diversion and fragmentation of the land for developmental projects, including roads and highways, versus the ecological needs for maintaining tree cover and forest vegetation, enhancing carbon sink to mitigate climate change, maintain hydrological cycle vis-à-vis conservation of water resource, combat desertification and overcome disasters of drought, floods, cyclones, etc.

To provide solutions to challenges, science led and technology driven forestry research was envisaged and Indian Council of Forestry Research and Education (ICFRE) at Dehradun came into existence. The ICFRE, an apex organization in the country is spearheading the forestry research, education and extension activities to provide ecological security and meet the demand side requirement of the country. Nine institutes and five research centers of the council are engaged in providing solutions to the research needs of the country. An effective forestry intervention and innovative continuum plays a crucial role in addressing a number of supply side obstructions and in harnessing numerous demand side opportunities of technology delivery and enhance capacity of all stakeholders.

ICFRE, just after its formation, recognized the importance of research planning and having its linkage with the requirements of country and the states. At the national level India launched the National Forestry Action Plan (NFAP) in the year 1999. NFAP was in tune with the then National Forest Policy, and was focused towards addressing all critical issues confronting the forestry sector of the country. ICFRE on its part as a research organization prepared a 'National Forestry Research Plan' having functional relation with NFAP and Five Year Plans of the country. Two important guidelines/ documents as an outcome were put in place to have a uniform research planning process. The guidelines in these documents were followed for planning, prioritization and implementing research projects. A brief review of these guidelines is presented here. The documents that are being followed for research planning at ICFRE are:

1. National Forestry Research Plan 2000
 - a. Volume 1: Status of Forestry Research
 - b. Volume 2: Research Priorities and Plans
2. Methodologies for Setting Research Priorities for ICFRE (ICFRE 1998)

National Forestry Research Plan (NFRP) 2000

NFRP was framed by following a bottom up approach as research priorities were first decided at state level, followed by institute level and finally at national level with the

equitable participation of all the stakeholders. Methodologies of setting up research priorities for ICFRE (ICFRE 1998) was followed for prioritization of the research problem, research themes and research projects.

ICFRE had prepared NFRP by conducting a national level workshop in which methodology and formats of state forestry research plan and research plan of ICFRE institutes were finalized. The national level workshop was followed by a series of state level workshops in then 26 states and union territory of Andaman & Nicobar for drafting their State Forestry Research Plans and institute level workshops in all the institutes of ICFRE for drafting Institute Forestry Research Plans. On the basis of state priorities, and institute priorities, national level priorities were decided. These priorities cover three aspects viz., research problem, research themes and research projects.

NFRP was published in two volumes followed by annexure. Volume I contained information about the status of research in India (it highlights the status of forests in India) and its contribution (in economic development, social development, cultural development and environmental amelioration, forest management, forestry and development opportunities, research directions (international and national research needs), development of forestry research in India, and vision and strategy (mission, research vision, research strategy, thrust areas and emerging thrust areas).

Volume II of NFRP contained the information about research priorities (state level priorities, regional priorities institute wise and national level priorities) and operational plans (research plan of State Forest Departments, research projects of the national organizations, research projects of industries, NGOs and others, forest research by universities, and research projects of ICFRE institutes) and implementation strategy for NFRP.

2.2 Methodologies for setting research priorities for ICFRE:

This document provides the guidelines for setting up research priorities and the methodologies to be followed for it. It defines the purpose of research prioritization; reviews the setup of then ICFRE; gives historical perspectives of the research planning through silvicultural and forestry conferences; research planning system operational at ICFRE institutes till 1997; methodology for setting the research priorities; new frame work for setting up institute level 'Research Advisory Group' (RAG) and ICFRE level 'Research Policy Committee' (RPC); scoring criterias; formats for preparation/ submission of projects; and some questionnaire for setting up research priorities.

The methodologies mainly deal with the prioritization process of research projects. Bottom to top approach is followed in the project formulation and approvals. The process adopted for prioritizing research themes and thrust areas are also detailed. The key elements of the methodologies are:

2.2.1 Research Advisory Group (RAG) constitution

2.2.2 Scoring criteria of project (index score)

2.2.3 Project format for submission

2.2.4 Research Policy Committee (RPC) constitution

2.2.5 Research Themes and Thrust areas

2.2.1 Research Advisory Group (RAG):

The RAG is an institute based research project evaluation committee, constituted as a technical committee with subject matter expertise to evaluate projects. The tenure of the committee is for two years and is approved by Director General (DG) ICFRE. Each institute has a separate RAG. The role of the committee is to examine and vet the research proposals put up for discussion; suggest modifications in the proposals if required; prioritize the research proposals and recommend suitable projects for final approval to RPC. In addition, the committee also helps to provide directions in forestry research within the overall frame work of research priorities set by ICFRE. The composition of the committee has undergone revision in 2007, 2011 as detailed below. The latest revision in 2018 will be discussed in Chapter IV.

S.No.	Composition of RAG as per Notification No. 58-21/XLIV/2011-ICFRE dt 24-8-2011 (modification of earlier composition 58-21/XXXVI/2007-ICFRE dt 31-5-2007)	
01	Director of the institute	Chairman
02	PCCFs of all concerned states/UTs or representatives	Members
03	ADG (Research Planning)/ DG's representative ICFRE	Member
04	Three scientists of the institutes at each level of Senior (Scientist G or F)	Members
	Middle (Scientist E or D)	
	Junior (Scientist C or B)	
5.	Two foresters (each one at the level of CF and DCF of the ICFRE Institute)	Members
6.	Representative of the universities imparting education in forestry and allied subjects at the level of dean or head of the department	Member
7.	Two representatives of funding organizations	Members
8.	Representative of prominent NGO in the field of forestry	Member
9.	Representative of forest based industries	Member
10.	Eminent forester outside ICFRE	Member
11.	Eminent scientist outside ICFRE	Member
12.	Representative of progressive farmers	Member
13.	Representative of ICAR	Member
14.	Heads of state forest research organizations of the concerned states	Members
15.	Representative of sister organization	Member
16.	Representative of JFM/local government/grass root level organization	Member
17.	Group Coordinator (Research)	Member Secretary

2.2.2 Scoring criteria of project (index score) used in RAGs:

The conceptualisation and project prioritization process being followed in the Council was in accordance with the National Forestry Research Plan (NFRP 2000) and the operational guidelines adopted by the Council in 2002. The project ideas were generally based on the

issues raised by the stakeholders during formal and informal interactions. The project prioritization process is based on 'Weighted Criteria Method' put in place by ICFRE for prioritization of all new projects (Ref: Methodology for Setting Research Priorities for ICFRE (54 ICFRE BL-3, 98-99)).

2.2.2.1 Procedure adopted for selection of the criteria and awarding scaled weight:

Selection of criteria and scaled weight is as per NFRP. During process of the formulation of NFRP, the respondents were given a set of criteria (more than 20) and were asked to select criterias they feel important and give marks (weight) from 1 to 10 (10 being the highest) based on the importance of the criteria in a given format. Respondents were also asked to add new criteria, if required and award marks to them from 1 to 10. The first four criteria given in the table below i.e., User needs (state research problem); scientific advancement; scientific leadership to ICFRE; and importance of research themes (priority of research area)) were compulsory criteria. Ten best score criteria as given in the table below were selected including compulsory ones and scores were calculated.

Given below is an example of scoring on weight criteria in respect of project titled 'Pr-I':

S.No.	Criteria	Scaled Weight	Score by one RAG member (Maximum= 10)
1	User needs (state research problem)	11	10
2	Scientific advancement	13	6
3	Scientific leadership to ICFRE	12	7
4	Importance of research themes (priority of research area)	9	9
5	Economic benefit (increase in productivity)	15	8
6	Improvement of environment quality	10	4
7	Chances of developing a patent	10	6
8	Poverty alleviation (creation of employment opportunity)	8	5
9	Historical trend (institute or researcher's expertise)	7	6
10	Consumption of Resources (high consumption low score)	5	6

The scores given by the RAG member against the above ten criteria are then calculated into Index Score for the project as follows (i.e. scores by the RAG member for the ten criteria are multiplied with the scaled weight for these criteria, and summed up):

Index score of the Project 'Pr -I' by one member of RAG	=11x10+13x6+12x7+9x9+15x8+10x4+10x6+8x5+7x6+5x6 =110+78+84+81+120+40+60+40+42+30 = 685
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Index scores by all RAG members (5 members, M-1 to M-5, in this example) for project 'Pr-I' are then summed up and averaged to arrive at 'Average Index Score'.

Average Index Score	[M-1(685)+M-2(610)+M-3(650) + M -4(582) + M -5(705)] / 5 = 646.4
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Thus, every new project is accorded an average index score, which is used for prioritizing the research projects, i.e. higher the average index score, higher the project priority.

2.3 Priority of research problems and research themes:

Setting research priorities is essential to focus research on needs and utilize scarce resources optimally. The availability of limited resources viz. finance, human resource, research infrastructure and the diverse and competing research needs in terms of discipline and local, national and international necessity, bring setting priorities at central stage of research planning. To achieve this, following methodologies were adopted by NFRP 2000:

A. Prioritization of research problems

The prioritization of research problems is based on the proforma circulated to stakeholders / respondents (states). The respondents were asked to write ten important research problems which they feel are important for their state and were asked to score them from 1 to 10. They were also provided with a suggested list of research problems for help and also encouraged to write their own research problems. The respondents were also asked to characterize them from 1 to 3 (problem to be carried out by state research wing alone; problem to be addressed jointly by state and ICFRE institute; and problem to be addressed by ICFRE institutes).

- a. Problems were grouped into three (to be carried out by states; to be carried out jointly by states and ICFRE; to be carried out by ICFRE) and respondents were requested to score them on a scale of 1 to 3.
- b. The research problems were then prioritized based on the scores awarded by the respondents.

Each state was also given a fixed weight between 100 to 10 depending on forest cover and other factors.

B. Prioritization of research themes:

Similar exercise for prioritization of research themes, as was done for research problems, was carried out by scoring from 1 to 10. Suggestive list was provided to the stakeholders / respondents and were also asked to write their own theme. Themes were also categorized as short term, medium term and long term by scoring from 1 to 3.

2.3.1 Objective of scoring of projects, prioritization of research problems and themes:

The exercise was carried out to bring objectivity in:

- choice of research problems;
- provide justification for selection of projects/themes in competing and diverse research needs;
- help in selection of important and/or emerging research themes; using scarce resources optimally;
- distributing research works rationally among the institutes/ divisions/ disciplines;
- selecting meaningful research projects;
- minimizing frequent changes of direction; and maintaining continuity in the desired direction of research

2.4 Project format for submitting the research proposals:

To bring uniformity the methodologies also designed a format to be followed for formulation of projects, which was developed based on the research prioritization process as detailed

above in sections 2.2.2, 2.2.2.1 and 2.3.

2.5 Research Policy Committee (RPC):

Research Policy Committee (RPC) is the apex body at ICFRE level to recommend the research projects for final approval to Director General, ICFRE. The role of the committee is to:

- provide policy directions to research;
- bring in innovation in research and decide investment in high quality forestry research;
- promote effective coordination of the research work among different institutes of ICFRE and optimize resource utilization;
- ensure balance among different international, national, regional and state research requirements;
- consider current and emerging research issues;
- explore and establish synergetic alliance with other agencies engaged in forestry research;
- examine the project proposals recommended by RAGs of institutes for final approval

The tenure of the committee is for a period of two years and is approved by DG, ICFRE. The composition of the committee as per notification of 2007 is as under. Latest revision of 2018 is discussed in Chapter IV.

The research projects therefore are scrutinized at two levels. The Research Advisory

S.No.	Composition of RPC as per notification No.58-21/XXXVI-2007/ICFRE dated 30 May 2007	
1.	Director General, ICFRE	Chairman
2.	DDGs (Education, Extension, Administration)	Members
3.	Director (International Cooperation)	Member
4.	All Directors of ICFRE Institutes	Members
5.	Two scientists of the council each at level of scientist 'F' or above and scientists 'E' or below	Members
6.	One forester of the ICFRE	Member
7.	ADG (RP), ICFRE	Member
8.	DDG (Research)	Member Secretary
9.	Representative of sister organizations (WII, FSI and BSI)	Members
10.	Representative of forest based industries	Member
11.	Representative of prominent NGO in the field of forestry	Member
12.	Two eminent foresters outside ICFRE	Members
13.	Two eminent scientists outside ICFRE	Members
14.	Representative of ICAR	Member
15.	Representative of Planning Commission	Member
16.	Representative of MoEF&CC	Member
17.	Representative of university imparting forestry education at the level of dean or head of the department	Member
18.	Representative of progressive farmer	Member
19.	Representative of local government / JFM	Member

Group (RAG) at the institute level does the first level of evaluation and recommends the projects to ICFRE. At the ICFRE level the projects of all the institutes are then evaluated by the Research Policy Committee (RPC) which are then finally approved by Director General ICFRE for implementation.

CHAPTER III
Analysis and
Shortcomings
in National
Forestry
Research Plan
2000
(NFRP 2000)



Analysis and Shortcomings in NFRP 2000

3.1 Analysis of the system of NFRP 2000 and shortcomings observed during the course of its implementation

The National Forestry Research Plan (NFRP) launched in May 2000 had a time horizon of 20 years. The importance of the NFRP was to enhance the research capabilities and prioritize the research activities of ICFRE and bring uniformity in the research planning process. The plan had mechanism for periodical review after every five years to make plan more responsive to the changing needs. Forestry research priorities of the country have changed over the years and so have the expectations from ICFRE. ICFRE is now in existence for more than 30 years and has established research infrastructure across the country through its institutes'. It is now required to play a predominant role in national and international forestry research arena and provide policy guidelines to the Government. It is worthwhile to assess the impact of research methodologies given in NFRP and take necessary steps for course correction. During the Directors' conference held at IWST Bengaluru on 18th July 2017, it was felt that NFRP 2000 needs to be revised. Similar views have also been echoed during different discussions and Research Policy meets. Some minor course corrections have been done during the last one and a half decades. Before proposing any changes, it will be appropriate to analyze each step of the process. This chapter therefore provides the analysis of research planning process including NFRP 2000.

3.2 Composition of Research Advisory Group (RAG):

The main functions assigned to the RAG as per the notification 58-21/XLIV/2011- ICFRE dated 24 August 2011 were:

- RAG will provide directions in forestry research of the institutes within overall framework of research priorities set up by ICFRE
- RAG will examine, vet and recommend forestry research proposals and programmes of the institute for considerations of Research Policy Committee (RPC) of the ICFRE
- RAG will formulate and review five years research plan on rolling basis of the institute
- RAG will also carry out any other function related with forestry assigned by the institute from time to time.

The RAG is, therefore, considered a technical body which examines the research proposals for their fitness to qualify for recommending them to RPC and prioritize them by giving scores. It has been felt that the composition and the activity of the RAG is too generalized, and often takes the shape of routine general meetings. Broad composition of the RAGs is as under:

1. Internal members (7 members: Chairman (Director), Group Coordinator (Research), three scientists at different levels, two forest officers- CF and DCF level)
2. External members (PCCFs of jurisdictional states (3-7), forester outside ICFRE -1, scientist outside ICFRE -1, representative of ICAR -1, representative of sister organization -1, Head's

of SFRI of jurisdictional states -1 each, representatives of funding organizations -2, forest based industries -1, NGO-1, progressive farmer -1, representative of JFM / local government/ grass root level organization -1

3. DG ICFRE nominee-1

Out of the 23-33 RAG members (depending upon the jurisdiction states) 21-30% members are internal members and remaining are representatives of various organizations. This left very limited scope for including subject matter/ area experts from among the composition in which the institute is dealing. Since RAGs are meant to technically evaluate the research proposals, a need is felt to modify the composition to the extent that sufficient numbers of subject matter experts are included in the composition, so that it is more science and practice oriented. This is essentially required to make it more effective and objective in evaluation and review of the projects. Minor modification in the composition without much increase in the total number will serve the purpose. The same has been taken care in the revision notified in 2018.

3.3 Scoring criteria of project (index score) used in RAGs:

Evaluation of project proposals as per Methodology for Setting Research Priorities for ICFRE (ICFRE 1998) by RAG members is based on the scaled weights of important criteria developed as described in chapter II. It has been felt that these criteria, in general do not help in evaluating the quality of the project. The process of scoring of the project by individual RAG members is also cumbersome and at times leads to erroneous evaluation which influences the proper ranking of the project. Some of the high quality projects get low Index scores because these projects do not get marking in all the criteria. The index scores of different institutes are seldom comparable and results in faulty ranking, which is difficult to follow. The essence of recommending quality projects having high scientific value is therefore, often lost. Thus, this sometimes results in average quality projects being recommended. The prioritization of project by this method has become meaningless. A need is felt for subject-wise expert committee for scrutinizing the projects. There are ten criteria for vetting a scientific project. Most of the criteria do not deal with the vetting of the concept and objectives and technical programme being drawn to realize the concept. Thus, there is need to incorporate criteria that may assess the project proposal with regard to evaluation of the concept and feasibility of its accomplishment, standing of the concept vis-à-vis scientific advancement/ comparison with published literature in the field, identification of technical programme with each of the objectives, etc.

To overcome the above difficulties, ICFRE recently evolved a method of technical criteria based on comprehensive literature review, identified knowledge gap, clarity of objectives, robust methodology followed for achieving the objectives, statistical analysis proposed and forward and backward linkages. A minimum threshold limit has been proposed for the project to qualify. This methodology has to some extent helped in eliminating the average quality projects, but needs some more refinement. A tendency is developing to at least give minimum qualifying marks so that the project gets through without improving it. The technical criteria method developed is given here.

3.4 Evaluation criteria for research projects (Developed in 2015-16):

The quality of research projects, especially in respect of literature review, statistical design, methodology, and linkages to the previous or future research programme of the council has to be evaluated. A new set of technical criteria for assessment of the new projects from 2015-16 on robustness of statistical design and methodology and appropriateness of literature review and problem analysis at the level of Research Advisory Group (RAG) meetings of the institutes have been introduced. These criteria's are:

S.No.	Technical Criteria for Project Assessment	Max. Score	Score by RAG Member
I	Comprehensiveness of literature review – whether gaps in knowledge on the issue have been clearly brought out	20	
II	Objectives – clarity towards meeting knowledge gaps and measurability	20	
III	Methodology – appropriateness in meeting the objectives	20	
IV	Statistical design and analysis tools – whether robust enough to support project methodology and to help in meeting project objectives	20	
V	Forward-backward linkages – how strongly the proposed project is based on the ongoing institutional programme and how the outputs are proposed to be	20	
	Total:	100	

Only the projects scoring 80 or more on the above technical parameters (based on average of scores by the RAG members present) are to be recommended by the institute RAGs to the RPC. (The criteria of 70% score followed till 2016-17 has been raised to 80% score).

3.5 Evaluation of the projects by experts before RAG meeting:

A procedure was adopted by ICFRE Institutes to obtain the comments of two experts and present them in the RAG. The procedure worked well for some time, but resulted in dilution due to late formulation of the projects, poor response from experts and in some cases late receipt of the comments. This procedure, however, has definite advantages and needs to be reintroduced in the system. In addition to this, the formulation of concept note before the project formulation and its approval by a committee at the institute level needs to be formalized.

3.6 Priority of research problems and research themes:

For prioritization of research problems and research themes a detailed exercise was carried out while preparing NFRP 2000 as has been briefly discussed in chapter II. Problems and themes were identified; stakeholder consultation workshops in each state were held; problems and themes were scaled and prioritized.

The intent of such exhaustive exercise was good; but since developing research agenda is a dynamic process, continuity and evolution in such a process is essentially required. Mammoth exercise of such a scale as done during development of NFRP 2000 is also not possible time and again. A simple mechanism is desirable where problems and themes can be identified on a regular basis. To make the system dynamic, ICFRE and its institutes started stakeholder consultations with states under their jurisdiction on an annual basis. This had limitation owing to the fact that only regional level problems were identified, which is resulting in development of too many standalone region- specific projects, overlooking those of national issues. ICFRE in this manner is also not getting platform to present to stakeholders, its efforts in solving the national issues. Extension of the findings and appreciation of the stakeholders due to poor visibility is limited.

ICFRE recently in the year 2017-18 has started the process of 'Regional Research Conferences' wherein government, all states of the region, along with other research organizations, universities, industries, farmers, NGOs and other organizations are represented. Research problems of the stakeholders are identified so that they can be included in the research plan of ICFRE and other organizations. ICFRE Institutes also get opportunities to share their efforts with the stakeholders at a much larger platform. Regional, national and global issues are assumed to be firmed up. This will also help ICFRE to move towards formulating and implementing All India Coordinated projects (AICRPs) and will be able to firm up ties with other organizations of the region. This process seems to be more effective without doing an extensive exercise.

3.7 Conceptualization of research projects and their approval through RAGs and RPC:

The research conceptualization and execution methodology as adopted by ICFRE at present is project based following bottom up approach as detailed in NFRP 2000. The projects are thus conceived as per the scientific understanding, interest and expertise of the researchers. Also the projects are influenced by the regional mandates and emergent local research problems of the institutes under the ICFRE umbrella. The fragmented outcome and short-term vision has resulted in insufficient pursuance of long-term research and taking up issues of national importance in coordinated manner. The steps followed for formulation of projects as per NFRP 2000 are:

- Preparation of concept note by researchers (in some cases)
- Approval of concept note by Directors of the institutes
- Preparation of project by researchers (most of the time)
- Feedback from the experts before RAGs, wherever possible
- Discussions on the project proposals in the RAGs
- Scoring of the projects by RAG members and recommendation to RPC
- Approval by RPC and implementation of the project on receipt of financial grant from ICFRE
- Completion of projects and submission of project completion report (PCR)

Shortcomings in the process:

- As bottom up approach is followed, small stand alone projects of regional importance are getting formulated. Sometimes, they can be simply called experiments

- Issues of national importance and having ramification of larger scale are getting neglected/ relegated
- Technical quality and superiority of the project proposals is seldom discussed and evaluated in the RAGs. This required for the change in RAGs composition to include more subject matter experts and give sufficient time to RAG members before RAG to evaluate the projects. The composition has been changed as per 2018 notification.
- Budgeting in the projects is grossly ill estimated (most of the time over estimated). This requires to be evaluated by internal committee at institute level (before and after RAGs)
- Mega projects of national importance are seldom formulated and implemented. A balance of standalone projects, institution based multi-disciplinary projects and national level All India Coordinated Research Projects (AICRPs) needs to be conceptualized.
- The independent (blind manuscript) review of the concept note/ project proposal by at least two independent subject experts/referees needs to be made compulsory. The project concept should be brought forward in the process only after getting unanimous positive opinion by both the referees

3.8 Steps taken by ICFRE to overcome shortcomings:

ICFRE has been making efforts for the past few years to change the pattern of formulation of the projects. The first such attempt was made in 2012 to formulate AICRPs which could not succeed due to lack of proper guidelines to handle such AICRPs. In the subsequent years from 2013-2017 such efforts could not be pursued due to insufficient ICFRE plan funding. In 2017, the exhaustive guidelines for AICRPs have been developed and circulated among the institutes. The same will be discussed in next chapter.

3.9 Format for project formulation as per NFRP 2000:

The format for submitting project proposals is tuned to methodology developed for NFRP 2000 and does not have provision for incorporating the changing requirements and the changes that have taken place since 2000. Many of the problems and themes identified in NFRP 2000 are no more relevant as many changes have taken place since then. Commensurate changes have not been done in the project format. Thrust areas and themes have since been revised thrice, the latest being in 2012 (Table 1 and 2 gives the two major revisions). Budget heads under research projects have been reduced considerably to do away with the multiplicity. The project format, however, remained the same. A new format for submission of project proposal needs to be designed, which is more flexible and suitable to the changing requirement and also fits into requirement of majority of funding agencies. The first section of the format to be dedicated to the general requirement of ICFRE, and remaining second section of format has to be designed in tune with requirements of most of the funding agencies. ICFRE in August 2017 has proposed a new format for All India Coordinated Research Projects. Format on the similar lines is required for small projects that has flexibility and fits into requirement of most of the funding agencies. This will help in reducing the redoing work that is required when the project is proposed/ recommended for external funding (funding from other sources). A format for concept note for small projects and All India Coordinated Research Projects (AICRPs) needs to be developed.

Thrust areas and themes identified by ICFRE for categorization of the projects at various points of time after NFRP 2000 are given in Table 1 and 2:

Table 1: Thrust areas and themes adopted in 2010 (order number 5-9/M&E/ Thrust Area/ICFRE / 176 dated 17th May 2010)

S.No.	Thrust Area	Themes
1	Ecosystem Conservation and Management	<ol style="list-style-type: none"> 1. Climate Change 2. Ecology and Management 3. Biodiversity 4. Forest Botany 5. Tribal's and Traditional Knowledge Systems
2	Forest Productivity	<ol style="list-style-type: none"> 1. Silviculture 2. Social Forestry, Agro-forestry/ Farm Forestry 3. Forest Soils and Land Reclamation 4. Watershed Management
3	Genetic Improvement	<ol style="list-style-type: none"> 1. Conservation of Forest Genetic Resources 2. Tree Improvement 3. Vegetative Propagation 4. Biotechnology
4	Forest Management	<ol style="list-style-type: none"> 1. Sustainable Forest Management (SFM) 2. Forest Economics 3. Forest Biometrics 4. Participatory Forest Management 5. Policy and Legal Issues 6. Information and Communication Technology (ICT)
5	Wood Products	<ol style="list-style-type: none"> 1. Wood and other lignocellulosic Composites 2. Wood Processing 3. Value Addition and Utilization 4. Wood Chemistry 5. Pulp and Paper
6	Non-wood Forest Products (NWFPs)	<ol style="list-style-type: none"> 1. Resource Development of NWFPs 2. Sustainable Harvesting and Management 3. Chemistry of NWFPs, Value Addition and Utilization 4. Bio-fuels and Bio-energy
7	Forest Protection	<ol style="list-style-type: none"> 1. Insect Pest, Disease and Control 2. Mycorrhizae, rhizobia and other useful microbes 3. Weeds and Invasive species 4. Forest Fire and grazing

Table 2: Thrust areas and themes adopted through office order number 7-10/2012 ADG(PF)/ Thrust Areas - dated 20th January 2012)

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 	<ol style="list-style-type: none"> 1. Silviculture 2. Social forestry, Agro-forestry, Farm forestry 3. Sustainable Forest Management (SFM) 4. Forest Economics 5. Forest Biometrics and Yield Modelling 6. Participatory Forest Management 7. Wood Science and Technology 8. Chemistry of Forest Products 9. Wood Based Industries 10. NTFPs Resource Development 11. Bio-prospecting and Bio-piracy 12. Seed Science and Technology 13. Forest Certification 14. Forest Hydrology 15. Food Security 16. Bio-fuels and Bio-energy 17. Integrated Pests and Disease Management 18. Application of Microbes in Forestry 19. Weeds and Invasive Species 20. Forest Fire and Grazing 21. Bio-informatics and Geo-informatics 22. Policy and Legal Issues 23. Biodiversity Conservation 24. Forest Botany 25. Ethnic and Traditional Knowledge Systems 26. Forest Soils and Land Reclamation 27. Wetland and Marine Ecology 28. Watershed Management 29. Climate Change and Forests 30. Forest Ecology 31. Conservation of Forest Genetic Resources 32. Tree Improvement 33. Vegetative Propagation 34. Biotechnology 35. Environment Management
B. Forestry Education	
<p>Forestry Education and Policy Research to Meet Emerging Challenges</p>	<ol style="list-style-type: none"> 1. Improving Formal Forestry Education 2. Accreditation of Universities 3. Networking Forestry Education with Research and Extension 4. Capacity Building of Scientific and Management Cadre

C. Extension

Forestry Extension for Taking Research to People	<ol style="list-style-type: none">1 Collection, Compilation and Publication of forestry reports / journals2 Dissemination of developed technologies3 Evolving and coordinating comprehensive extension strategies in Forestry Research4 Consultancy services
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3.10 Composition of Research Policy Committee (RPC):

The main functions assigned to the RPC as per the notification 58-21/XXXVI/2007- ICFRE dated 30 May 2007 are:

- RPC being the apex advisory body at the council level, will provide policy directions to research, bring in innovation in research and decide investment in high quality forestry research. It will also provide research leadership so as to make ICFRE a model research organization with international leadership in forestry research
- RPC will finalize a five year research plan of the ICFRE and its institutes and also review the same on rolling basis
- RPC will approve the Annual Research Plan, research projects and programmes of the ICFRE and its institutes on the basis of the recommendations of RAGs of the respective institutes
- RPC will provide the effective coordination of the research work among different institutes of ICFRE and optimize resource utilization
- RPC will ensure balance among different international, national, regional and states research requirements
- RPC will consider current and emerging research issues, and, by keeping these in view, will prioritize research projects and programmes for each institute
- RPC will explore and establish synergetic alliance with agencies engaged in forestry research
- RPC will also carry out any other function related to forestry research assigned by the council from time to time

The five year rolling plan should be approved by the RAG and RPC at the beginning of the financial year in order to give appropriate direction to the research programmes which eventually would coincide with 11th five year plan.

The RPC is, therefore, not only a technical body but also a policy body which finally approves the research proposals. Broad composition of the present RPC is as under:

1. Internal members (19 members: Chairman (Director General, ICFRE), DDGs -4, Director (I/C), All Directors of institutes – 9, ADG(RP) -1, two scientist of the council, one forester of the council,
2. External members (13-15 members; Representative of sister organizations (WII, FSI, BSI), forest based industries -1, NGO -1, two forest officers outside ICFRE, two scientist outside ICFRE, representative of ICAR -1, representative of planning commission -1, representative of MoEF&CC -1, university -1, progressive farmer -1, local government / JFM-1)
3. In addition the Group Coordinator Research of each institute is also invited although they are not members of the RPC.

The composition of RPC is heavily loaded in favor of internal members. Subject matters experts are to be adjusted within this composition. All subjects, therefore, cannot be covered in the composition. Some changes in RPC composition for inclusion of subject matter experts are highly desirable to have scientific and technical inputs on the research proposals. The revision of RPC notified in 2018 has taken care of these aspects.

CHAPTER IV
**Changes in the
Research
Methodology**



Changes in the Research Methodology

Analysis of the NFRP 2000 in the previous chapter, changes that have been carried out subsequently from time to time and changing requirements of the future necessitates complimentary changes to be incorporated in the research planning process of the Council. This chapter deals with changes proposed in each step of the process. Changes in the composition of RAG and RPC have been carried out during the process of preparation of this revised methodology (NFRP 2020-2030) and are included here.

4.1 Composition of Research Advisory Group (RAGs) of Institutes:

RAG is a body which technically evaluates the research projects for their fitness to carry out high quality research within the overall mandate of the institute and ICFRE. This body although has sufficient representation from various quarters, but needed to be strengthened by inclusion of more subject matter experts. Without increasing the number of members and by only internal re-adjustment a new composition of RAG along with function were approved by Board of Governors (BOG) of ICFRE in January 2018 and is reproduced below. The nomination of the members of RAG will be approved by DG, ICFRE on recommendation of respective Director of the Institute.

S. No.	Constitution of RAG as per Notification No. 58-21/55//2017-ICFRE dated 6 February 2018	Role
1	2	3
01	Director of the Institute	Chairman
02	Head of the research wing of the forest departments of concerned states or their representatives	Members
03	ADG (Research Planning)/ DG ICFRE's representative	Member
04	Two senior scientists of the institute	Members
05	One senior forest officer of the institute	Member
06	One representative of the universities imparting education in forestry and allied subjects at the level of Dean or Head of the Department	Member
07	One representatives from a funding organization	Member
08	Two representatives of forest based industries	Members
9	One eminent forester outside ICFRE	Member
10	One eminent scientist outside ICFRE	Member
11	One representative of ICAR / CSIR/ NMPB	Member
12	One representative of sister organizations	Member
13	One representative of progressive farmer / prominent NGO / JFM / Local Government / Grass root level organization	Member
14	Six subject matter experts from outside ICFRE institutes covering the subject areas of the institutes	Members
15	Group Coordinator (Research)	Member Secretary

4.1.1 Functions of Research Advisory Group:

- i) RAG will provide directions in forestry research of the institutes within overall framework of research priorities set up by ICFRE.
- ii) RAG will technically evaluate project proposals for their high quality within the overall mandate of the institute and will recommend only those projects for RPC which are found suitable to be funded from ICFRE plan funds. Project proposals rejected by RAG will not be brought for consideration of RPC.
- iii) RAG will critically examine the monitoring parameters and deliverables that can be achieved during and at the end of the project to ensure effective monitoring and evaluation.
- iv) RAG may recommend the proposed standalone projects to be included in the AICRPs.
- v) RAG may propose the projects to be taken up under funding from other sources.
- vi) RAG will approve the modifications proposed by institutes in the ongoing projects.
- vii) RAG will carry out any other function related with forestry research assigned by the institute from time to time.

4.2 Composition of Research Policy Committee (RPC)

The Research Policy Committee (RPC) is the apex body at ICFRE level to recommend the research projects for final approval to DG ICFRE. The role of the committee is to provide policy directions to research; bring innovation in research and decide investment in high quality forestry research; promote effective coordination of the research work among different institutes of ICFRE and optimize resource utilization; ensure balance among different international, national, regional and state level research requirements; consider current and emerging research issues; explore and establish synergetic alliance with other agencies engaged in forestry research; examine the project proposals recommended by RAGs of institutes for final approval. In the meeting of Board of Governors (BOG) of ICFRE held in January 2018, the new composition of RPC was approved, to bring in more subject area experts without altering the total number of members. New approved composition of RPC along with functions is given below:

S.No.	Composition of RPC as per Notification No. 58-21/55/2017-ICFRE dated 6 February 2018	Role
1	2	3
01	Director General, ICFRE	Chairman
02	DDGs (Education, Extension, Administration)	Members
03	Director (International Cooperation)	Member
04	All Directors of ICFRE institutes	Members
05	One senior scientist of the Council (ICFRE)	Member
06	One forester of the ICFRE	Member
07	ADG (RP), ICFRE	Member
08	ADG(M&E), ICFRE	Member
09	DDG (Research), ICFRE	Member Secretary
10	One representative from WII/ FSI/ BSI and others	Member

11	Two representatives of forest based industries	Members
12	One eminent forester outside ICFRE	Member
13	One eminent scientist outside ICFRE	Member
14	One representative of ICAR / CSIR/ NMPB	Member
15	One representative of NITI Aayog	Member
16	One representative of MoEF&CC	Member
17	One representative of universities imparting forestry education at the level of Dean or Head of the Department	Member
18	One representative of progressive farmer / prominent NGO/Local Government / JFM	Member
19	Six subject matter experts	Members

4.2.1 Functions of the Research Policy Committee:

- i) RPC being the apex advisory body at the council level will provide policy directions to research to bring in innovation in research and decide investment in high quality forestry research. It will also provide research leadership so as to make ICFRE a model research organization with International leadership in forestry research.
- ii) RPC will approve the Annual Research Plan of ICFRE and its institutes on the basis of recommendations of RAGs of the respective institutes.
- iii) RPC will approve All India Coordinated Research Projects (AICRPs) recommended by Project Expert Group involved in formulation of AICRPs. AICRPs will be directly approved by RPC without being routed through RAG channels.
- iv) RPC may propose new subject areas for AICRPs and for institute based projects.
- v) RPC will provide effective coordination of the research work among different institutes of ICFRE and optimize resource utilization.
- vi) RPC will ensure balance among different International, National, regional and states research requirements.
- vii) RPC will consider current and emerging research issues, and keeping these in view, will prioritize research projects and programmes of each institute.
- viii) RPC will help to explore and establish synergetic alliance with agencies engaged in forestry research.
- ix) RPC will also carry out any other function related with forestry research assigned by the Council from time to time.

Further to the above, the Board of Governors has authorized that:

- DG ICFRE shall nominate the members, and review the composition and functions of RAGs and RPCs after every 4 years.
- The tenure of nominated members shall be 2 years. However, position falling vacant due to retirement/ transfer/ repatriation/ resignation or otherwise, can be filled up for the remaining tenure.

4.3 Evaluation of projects by experts before RAG of the Institutes:

It is now an established standard practice in ICFRE that the RAGs of the Institutes is held, between 15th September to 15th November of every year. The procedure adopted by ICFRE Institutes as discussed in section 3.5 of chapter III to obtain comments of two experts before RAG is to be re-introduced with some modifications. The independent/ blind review of the concept note/ project proposal by at least two independent subject expert/ referees needs to be made mandatory. The constitution of committee for evaluation of project concept note is given in Table 5. In addition to this, experts are to evaluate the projects on the parameters as given in Table 3 below:

Table 3: Proforma for evaluation of projects by experts before RAG:

S.No	Points for evaluation by experts	Remarks of the expert
1	Does the project have scientific/ Academic relevance	
2	Is there any innovation in the approach	
3	Can the project generate: New Knowledge New Methodology New Technology	
4	Is there a clear hypothesis that drives this work	
5	Is the research plan clearly presented and realistic	
6	Are the research objectives clearly presented	
7	Are the methodologies and statistical methods mentioned appropriate	
8	Is the status of knowledge clearly brought out	
9	Any other organization carrying out such work	
10	Category of r esearch proposed (applied / basic / extension/ any other)	
11	Do the researchers have the necessary expertise to carry out this project	
12	Is the proposed budget appropriate / over estimated/ under estimated	
13	Are the proposed equipment required (can the services be hired)	
14	Is the manpower requested justified	
16	Possibility of funding from any other source other than ICFRE	
16	Final recommendation	

The project proposals by scientists / officers of ICFRE Institutes are to be normally made ready by 31st July of every year. Experts are to evaluate and score the projects based on the technical criteria as given in this section and that given in section 4.4 of this chapter. The scores awarded and comments of the experts are to be communicated to the concerned scientists before RAG and are also to be placed in the RAG. The RAG will assess whether the scientist concerned has modified the project in line with the comments, and if so whether the project after modification is now suitable for approval. RAG members will give their own marking on the modified project as proposed in section 4.4. If no improvement / modifications are made in the project as per the expert's comments, the project will be deemed to be rejected by RAG.

4.4 Evaluation criteria for research projects by RAGs of the Institutes:

Scoring criteria of project (index score) of NFRP 2000 is proposed to be scrapped as it failed to produce the desired output. New set of evaluation criteria introduced in 2015-16 is proposed to be continued with minor modification as given in Table 4 below. The quality of research projects, especially in respect of literature review, statistical design, methodology adopted, and linkages to the previous or future research programme of the council has to be evaluated. A set of technical criteria for assessment of the new projects from 2015-16 on robustness of statistical design and methodology and appropriateness of literature review and problem analysis at the level of Research Advisory Group (RAG) meetings of the institutes has been introduced. These criteria are given in Table 4.

Table 4: Evaluation of projects by RAGs of the Institutes

S. No.	Technical Criteria for Project Assessment ↓	Max. Score	Grading of Technical Criteria (Based on the criteria covered in the project proposal), RAGs are to tick mark in the appropriate box				Score by RAG Member
			Not covered (0-5)	Marginally covered (6-10)	Moderately covered (11-15)	Fully covered (16-20)	
I	Comprehensiveness of literature review – whether gaps in knowledge on the issue have been clearly brought out	20					
II	Objectives – clarity towards meeting knowledge gaps and measurability	20					
III	Methodology – appropriateness in meeting the objectives	20					
IV	Statistical design and analysis tools – whether robust enough to support project methodology and to help in meeting project objectives	20					

V	Forward-backward linkages – how strongly the proposed project is based on the ongoing institutional programme and how the outputs are proposed to be integrated into the same for future programme / adoption of research by stakeholders / technology development	20					
VI	Total (Overall grading):	100					
VII	Remarks if any by RAG members for Improvement of the project						
<p>Note: The projects scoring 80 or more on the above technical parameters (based on average of scores by the RAG members present) are to be recommended by the institute RAGs to the RPC. The minimum criteria can be changed and fixed before the conduction of each year RPC.</p>							

4.5 Thrust areas and themes:

Thrust areas and themes have significance to the extent that they help in categorizing the projects and identify gaps in the research efforts of the institutes. It also helps grouping the subject areas together and will help in projecting research efforts of various ICFRE institutes on particular theme of national importance. The work done in a particular thrust area / theme will further consolidate ICFRE data base of research activities under a particular theme for the benefit of stakeholders and user agencies. The thrust areas and themes also have significance from the point of database retrieval. Thrust areas and themes were changed thrice after the NFRP 2000. No further changes are proposed and the latest revision adopted vide office order number 7-10/2012-ADG(PF)/ Thrust Areas - dated 20th January 2012 is to be continued and the same is reproduced as below. The focus of research programmes should however shift from state level to national level and more of multidisciplinary projects are to be taken up. The thrust areas and themes lose relevance in multidisciplinary projects as they cater to multiple issues.

Thrust Areas	Themes
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 	<ol style="list-style-type: none"> 1. Silviculture 2. Social Forestry, Agroforestry, Farm forestry 3. Sustainable Forest Management (SFM) 4. Forest Economics 5. Forest Biometrics and Yield Modelling 6. Participatory Forest Management 7. Wood Science and Technology 8. Chemistry of Forest Products 9. Wood Based Industries 10. NTFP Resource Development 11. Bio-prospecting and Bio-piracy 12. Seed Science and Technology 13. Forest Certification 14. Forest Hydrology 15. Food Security 16. Bio-fuels and Bio-energy 17. Integrated Pests and Disease Management 18. Application of Microbes in Forestry 19. Weeds and Invasive Species 20. Forest Fire and Grazing 21. Bio-informatics and Geo-informatics 22. Policy and Legal Issues 23. Biodiversity Conservation 24. Forest Botany 25. Ethnic and Traditional Knowledge Systems 26. Forest Soils and Land Reclamation 27. Wetland and Marine Ecology 28. Watershed Management 29. Climate Change and Forests 30. Forest Ecology 31. Conservation of Forest Genetic Resources 32. Tree Improvement 33. Vegetative Propagation 34. Biotechnology 35. Environment Management
B: Forestry Education	
<p>Forestry Education and Policy Research to Meet Emerging Challenges</p>	<ol style="list-style-type: none"> 1. Improving Formal Forestry Education 2. Accreditation of Universities 3. Networking Forestry Education with Research and Extension 4. Capacity Building of Scientific and Management Cadre

C. Extension

Forestry Extension for Taking Research to People	1	Collection, Compilation and Publication of forestry reports / journals
	2	Dissemination of developed technologies
	3	Evolving and coordinating comprehensive extension strategies in Forestry Research
	4	Consultancy services

4.6 Format for concept note of projects:

This is the new addition in the proposed research planning process. In order to have uniformity in the project concept notes, a format has been designed (Annexure – I). The concept note for the project will be developed before the project proposal preparation. The same will be evaluated by a committee of scientists/ officers at the institutes' level to be formed by the Director of the Institute on the lines of Project Advisory Group (PAG) of the AICRPs. The composition of the committee of institute for evaluating the project concept note is given in Table 5.

Table 5: Committee of Institute for evaluating the project concept note:

S. No.	Committee members	Role
1	Director of the Institute	Chairman
2	Two senior most scientists of the institute	Members
3	Head of the division or discipline in charge	Member
4	Two experts nominated by Director (the comments can also be obtained through email)	Members
5	Group Coordinator (Research)	Member Secretary

4.7 Revised new project proposal format for institute based projects:

The project format adopted earlier was tuned to the requirements of NFRP 2000. The revision of NFRP has necessitated the change in the format. The new format (Annexure - II) is in line with the requirement of ICFRE and most of the funding agencies. The format is divided into two sections. Section I of the format fulfills the general requirement of ICFRE, whereas section II is as per the requirement of most of the funding agencies. It has also been designed to be in tune with the requirement of AICRPs (Annexure III(i-iii): Guidelines for the AICRPs).

4.8 Guidelines for All India Coordinated Research Projects (AICRPs):

The guidelines for AICRPs (Annexure – III(i-iii)) have been formulated in August 2017 and circulated to institutes. It contains guidelines for preparation of AICRPs, procedure for evaluation & monitoring, format of the projects, format of the utilization certificate and draft of MoU. No change has been suggested in these guidelines for AICRPs.

The concept note of All India Coordinated Research Projects will be evaluated by the Project Advisory Group (PAG) as per the approved guidelines for AICRPs.

4.9 Stakeholder's consultations and identification of problems to be taken up by ICFRE:

While formulating NFRP 2000 massive exercise was carried out for identifying problems/ themes and prioritizing them. Such massive exercise is not frequently possible and has become redundant in the long term as the priorities keep on changing during the course of time. During the implementation of the NFRP 2000, it was experienced that such prioritization of research problems/ themes is seldom followed in practice. A process is, therefore, required wherein the priorities are decided for three to five years and are continuously upgraded with the new issues. The process should also identify priorities of national, international and regional importance.

ICFRE institutes also followed the practice of stakeholders' consultative meetings where meetings were held with the representatives of forest departments and other user agencies, NGOs, civil society of the jurisdiction states to identify their research needs. Such interactions resulted in only very specific problems to be identified as the participation of the stakeholders and scientists was limited. In such meetings, institutes hardly get the chance to present their findings and enhance their extension capacity to a larger audience.

ICFRE and its institutes over a period of time has conducted number of conferences, seminars and workshops and the recommendations of these meetings have thrown up new challenges and ideas and many of them are in tune with the national priorities. However, these recommendations did not receive the level of attention that was required in the overall planning process. While prioritizing the research issues the recommendations of these meetings have been actively considered while setting priorities for the future.

ICFRE had also started the process of organizing one day 'Regional Research Conference' since 2017 wherein participation of all ICFRE institutes, Government, PCCFs (HoFF) of regional states along with officials of research wing is ensured. Other stakeholders of the region like research organizations, universities, industries, NGOs, farmers, and other institutions dealing with forestry sector are also invited. States and other stakeholders are given the opportunities to identify the issues which are expected from ICFRE to address and linkage that can be developed among research organization and stakeholders. ICFRE and other institutes also get the opportunity of the platform to showcase their research efforts for the region. Two to four regional research conferences on an annual basis are proposed to be held across different regions of the institutes of the council. This exercise needs to be continued. In addition to this, theme based monthly seminars are being conducted by each institute, in which the participation of the concerned stakeholders is encouraged. A national level conference is also proposed once in a year. Framework for organizing periodical seminar/ conference is given in Annexure - IV. Variation in the procedure and number of conferences can be made from time to time depending on the requirement.

4.10 Tackling the research issues of regional and emergent nature:

The research projects taken up by ICFRE institutes follow the due process of approval by RAGs and RPC which meet once in a year. At times it happens that some forestry issues

although of small dimension and limited time period crop up or are referred by State and Central Govt., / various agencies which require immediate attention. Studies on such issues cannot be delayed for want of RAGs and RPC approval. The nature of such studies may be of small time period (3 to 6 months) or may incur small expenditure (say Rs one lakh or so). At present the only route available is through RAGs and RPC if the study is to be taken up from ICFRE funding. Directors of the institutes do not have powers to make such expenditure and take up such research issue unless funded by external agencies. To overcome these shortcomings the following guidelines are to be followed:

Directors of the institutes will be empowered through separate notification to approve such studies provided:

- a. The duration of study is less than six months and is completed between periods of two RAGs/ RPC or if an urgency comes 1-2 months before RAG/RPC
- b. The estimated cost of the study is not more than the cost mentioned in the notification (to begin within say Rs 1.00 lakhs)
- c. Director of the institutes will be able to approve not more than 5 such studies in a financial year and are to be completed within the financial year
- d. Studies more than 5 and expenditure of more than that stipulated in the notification will require sanction of Director General, ICFRE (subject to a maximum of nine months and estimated cost no more than Rs 2.50 lakhs). Director General, ICFRE will approve not more than two such studies in a calendar year for an institute.
- e. No limit is applicable to studies referred by court orders
- f. A fund of Rs 5.00 lakhs on annual basis is to be placed at the disposal of Directors of the Institutes. However such unspent balance towards the end of the financial year will be adjusted towards other research grants due to the institute in the financial year.
- g. The duration, number, guidelines and cost of such studies can be modified through proper notification. Director General, ICFRE will be the competent authority to approve such notifications from time to time.
- h. These guidelines will not be applicable to studies funded by other agencies other than ICFRE. The process recommended by the funding agencies will be followed for studies funded by other agencies.

4.11 Data compilation:

Forest Research Institute, Dehradun and its erstwhile centers since its inception have generated voluminous data on various subjects through its research activities and programmes. There was a well laid procedure for compilation of this data in the form of Indian Forest Records, Forest Bulletins and Leaflets. These were published by Government press and by orders of Government at various point of time. On reviewing the National Forest Library Information Centers records and that of other forest libraries it was found that about 470 Indian Forest Records were published between 1908 and 1988.

Similarly many Forest Bulletins and leaflets were also published. These documents were published under the well laid down procedure in different subject related series.

The Indian Forester was the principal medium for dissemination of research findings in the field of forestry and in 1892 the "Appendix Series" to the Indian forester was started which comprised of monographs on important subjects. This was circulated to all the members of Forest Department.

In 1905 the 'Appendix Series' was succeeded by Forest Bulletins of which nine volumes were published and were in high demand. Sir Eardley Wilmot, Inspector General of Forests to the GoI while addressing forest officials at the Imperial Forest Research Institute (IFRI) announced the publication of Indian Forest Records (circular No. 3/290-4 dated 13 February 1907), which comprised the results of investigation and research undertaken at IFRI. The GoI decided to publish:

- a. Indian Forest Records
- b. Indian Forest Memoirs

The forest Memoirs were kept technical comprising complete technical information on a particular subject. Indian Forest Records were published as the results of local investigation, together with short notes on preliminary research. Both publications were kept strictly professional, emphasizing upon information important for scientific management of forest. Indian Forest Records were published from 1908 to 1988 by GoI. Till 1983 these were published continuously and last record was published in 1988. These were widely circulated.

The initial series of Indian Forest Records were mainly of Mycology, Entomology, Botany, Silviculture, Economy and Chemistry. These were later expanded into various series like Utilisation, Wood Technology, Wood Anatomy, Composite Wood & Preservation, Minor Forest Products, Timber Mechanics, Timber Engineering, Wood Seasoning, Wood Preservation, Composite Wood, Statistics, Forest Pathology, Logging, Forest Logging, Forest Management and Mensuration, and Forest Influence etc. Similar was the situation for Forest Bulletins and Leaflets.

These publications compiled various scientific and technical information generated over a period of time in well designed formats. Such publications are store house of valuable information and have been used extensively. The best advantage of these publications is that comprehensive compiled information is available at one place from many research studies. The number of research publications (research papers) in research journals over the years has increased but they lack comprehensiveness when it comes to detailed scientific and technical information on a subject area.

The probable reasons for discontinuance of publication of Indian Forest Records due to re-organization of the forestry research in the country. ICFRE was established in 31st December 1986 and granted autonomy in 1991. There was a shift towards implementation of World Bank funded FREE project, UNDP/FAO sponsored project on

Poplars, IDRC funded project on Eco- rehabilitation of Himalayas and USDA funded pine project.

It is with this background that re-introduction of these publications is proposed by laying down proper procedure. Now since ICFRE has grown into nine institutes and five centers and the erstwhile IFRI is now part of it. These institutes have domain area of expertise. It is therefore proposed to divide the work of publication of different series (subject area) among these institutes by assigning unique series numbers. Institute concerned will prepare the draft/ material for the series and will forward it to domain institute for publication. Alternatively a suitable mechanism can be developed for such publications, including pricing and distribution mechanism. The level of exposure of the published material to public domain can also be decided. A separate notification/procedure in this regard is to be formulated. In the era of information Technology/ Digital India, it is suggested that publication may be made additionally in the form of electronic copy (with ISBN/ISSN) for wider circulation.

4.12 Data Generation and collection of reference material:

The other important long term aspect of research is data generation on important subject areas. If we look back in the history of forestry research, we find that lot of emphasis was laid on data generation and collection of specimens. To name a few, the herbarium collection, insects collection, fungarium, enrichment of bambusetum, authentic wood samples collection and maintenance/ enrichment of museums of ICFRE institutes is a reference material for many contemporary studies. Similarly data on sample plots, volume tables, yield table, strength properties, peeling & slicing characteristics, pulping properties and many more are reference data for many new studies. These activities need to be continued for posterity, as source of reference material and for education.

The contemporary research is more focused towards applied aspects, the data generation and reference material collection activities have taken a beating. These activities in the long run produce voluminous information for the future contemporary research and needs to be continued. A mechanism is to be evolved to collect such information as this does not form a part of contemporary research and scientists are seldom interested in such work and hardly any effort are made to maintain the old treasure. ICFRE over the years has evolved and now has a dedicated cadre of Technical Officers who can be assigned the task of data generation, reference material collection and its maintenance. Procedure can be put in place to lay guidelines for such works. Work on different aspects can be divided among the institutes. A dedicated line of funding for such work can be thought of.

4.13 International commitments

Government of India is committed to fulfilling the requirements of international commitments. ICFRE being the premier body of forestry research is to support GoI through scientific, technical and policy related inputs. The challenge to sequester 2.5 to 3 billion tonnes additional carbon dioxide by the year 2030 as per NDC requires scientific and

technical inputs with regards to quality planting material, and supporting plantation techniques. ICFRE has contributed significantly in developing Working Plan code 2014. It is also part of negotiation with the international agencies particularly international climate deliberations. Similarly in REDD+ discussion ICFRE has played important role. ICFRE has to enhance its capabilities to play more such roles and work as think tank of GoI.

4.14 Synergy with research organizations/ Universities outside ICFRE

The R&D works should provide solution to the research problems in terms of a complete package, thus addressing most of the aspects through an integrated holistic approach. This requires expertise in the diverse fields which an organization may not possess. Convergence and networking of resources, capabilities and core competencies and where expertise is not available or due to geographical location or other operational difficulties, the integration becomes essential. ICFRE needs to develop synergy and put in place the process so that the participation of other institutions becomes possible. One such example can be of ICAR and ICFRE working together for development of agroforestry using each other's strength.

4.15 Public/ Private Partnership research

Extension has been weak the link in forestry research; as a result absorption of research finding in the field had been dismally low in the past. Many a times technologies need to be scaled up in the user's premises. Also for adopting the technologies the private partners/ parties need to work in the premises of research organization. ICFRE should encourage such partnership and develop process/ protocols for such endeavors. Long term collaborative research in the each other's premises need to be encouraged.

4.16 International Partnership

Research and innovation partnership between countries and their institutions are required for speeding up Science and Technology interventions for growth and inclusive sustainable development. Such collaboration can create common Science & Technology and different insights to tackle the new challenges of forestry research. This also helps in building the brand and reputation of ICFRE for quality research and education. ICFRE being the premier forestry organization in the country may identify areas of research and education and build partnership in research, education and faculty exchange programs with cooperation from Government of India. This could help in improvement of life and livelihood, scientific skill development and generation of new knowledge mutually which will help the partner countries.

4.17 Environmental issues

Over the years forestry research requirements are changing. Environmental degradation is in the main focus and has superseded the core issue of forestry. ICFRE needs to rethink its strategy and re-align its focus to the changing requirements. Some of the issues of environment degradation which have close association with the forestry need to be included in its planning. Pollution in rivers, lakes, water bodies, wetlands, mangroves which have direct bearing on the wild animals, humans, livelihood, health and carrying capacity of forest needs to be included in research plan of ICFRE.

CHAPTER V
**Prioritization
of Research
Issues**



Prioritization of Research Issues

5.1 Introduction

Indian Council of Forestry Research and Education, Dehradun is mandated to conduct holistic research on forestry and provide solutions tuning with the emerging issues in the sector, including global concerns. Concerns are many and ICFRE through this National Forestry Research Plan, prioritizes the research areas which will guide the ICFRE institutes in framing the research plan and programmes that can be taken up in the near future for solutions to the problems.

Deforestation, degradation and fragmentation of forests are one of the sources of CO₂ emissions and climate change related issues. According to India's Second National Communication to UNFCCC, the climate modeling for likely impacts of Climate Change on natural ecosystems and biodiversity in India has shown that 30.6% of forests are projected to be vulnerable by the year 2035 which is likely to increase to 45.9% by the year 2085. There is a need to have a road map to meet various international commitments. Convention of Biological Diversity (CBD) 2011-2020 adopted a strategic plan for biodiversity with 5 goals and 21 Aichi targets. The establishment of National Targets in tune with Aichi biodiversity targets and their integration into updated National Biodiversity strategies and Action Plan (NBSAP) are key to implementation of strategic plan. The 17 Sustainable Development Goals (SDGs) and 169 targets are part of 2030 agenda for sustainable development. Goal 15 dealing with "Life on Land" addresses sustainable use of terrestrial ecosystem, sustainable management of forest, combat desertification, halt and reverse land degradation and halt biodiversity loss. The NDC targets towards sequestering 2.5 to 3.0 billion tonnes carbon dioxide additionally by 2030 is also to be taken up on priority. Government of India under Bonn challenge initiative has committed restoration targets of 13 million ha of degraded lands by 2020 and 21 million ha by 2025, and ICFRE has to play its role towards the same as a research organization by providing scientific and technical inputs. Assessing vulnerability of forest ecosystems, mitigation and adaptability of forest ecosystem & society for climate change, enhancing forest productivity, biodiversity conservation, tree improvement, water use efficiency, soil and water conservation, water treatment, intervention in river catchments, combating desertification, bridging the demand and supply gap of timber, fuel wood and other forest products, generating alternative livelihoods are some of the many challenges in front of the country. The need is for integrating ICFRE research activities with national needs and thereby developing synergy between the efforts of ICFRE and priorities of Government of India. Often the research is done to meet the academic goals, which need to be molded to meet the societal needs yielding direct and indirect benefits, quantified and documented for future references along with meeting the national priorities with International commitments which is the need of the hour.

In a recent study conducted by World Bank: "Climate Change will hit living standards of 600 million Indians" (The Times of India, 29th June, 2018): the climate change and the rise in

temperatures shall have implications for agricultural productivity, health and migration. Further it is said that unchecked climate change will dent India's GDP by 2.8% and depress the living standards of nearly half the population by 2050. As per report the inland regions are at far higher risk of economic losses than coastal areas. Among the states, Chhattisgarh and Madhya Pradesh are projected to witness over 9 percent dip in living standards by the year 2050. [Ref: Mani M, Bandhopadhyaya S, Chonabayasi S, Markandey A, Mosier (2018) South Asia's hotspot: Impact of temperature and precipitation changes on living standards. South Asia Development matters].

Majority of the wood based industries are in the unorganized sector where scale of production is low and unless and until it becomes economically viable they are unable to take up captive plantations. Only a few industries like pulp and paper manufacturers have made their own arrangements for raw material and have developed good rapport with the tree growers and farmers. It is the mechanical wood processing, plywood and panel industries which are facing shortage of raw material. For these industries with limited scale operations, growing trees outside forest alone would not help as real estate prices are high and it is uneconomical to grow trees on expensive lands. With India aiming to achieve NDC target of creating additional carbon sink of 2.5 to 3.00 billion tonnes of CO₂ equivalent by 2030, the use of wood needs encouragement for capturing additional carbon in the harvested wood products. Therefore in addition to increasing forest and tree cover, productivity enhancement and use of wood in products having long life cycles needs encouragement.

MoEF&CC has also assigned some areas of priority on which ICFRE should work. These include eradication of weeds/ invasive alien species; water harvesting- recharging through forests; fodder; tree improvement; prioritization of species for plantation in different eco-climatic zones; improving the quality of forests; bio-pesticides; bio-fertilizers; species recovery and revival of threatened species; improving survival in plantations; utilization of bamboo; habitat improvement of wild animals; improved wood utilization; and enhancing tree cover through agroforestry models. This has been taken care of while formulating this research plan.

Re-orientation of silviculture practices in the management of natural forests as well as the vast extent of degraded land available outside forests to maximize eco-system services especially water and carbon sequestration is required. For sustaining productivity of forest plantations, modern package of practices, application of latest technologies, certification of quality planting material and supporting policy measures are required to be adopted. Urban forestry is needed to improve urban ecosystem and create green lungs/ green infrastructure in different agro-climatic zones in the urban areas.

Expert committee on "Strategy for increasing green cover outside recorded forest areas" primarily setup for Tree outside Forest (TOF) by MoEF&CC in January 2018 under the Chairmanship of Shri Abhijit Ghose, Ex- PCCF (HoFF), Rajasthan has given its recommendations for increasing green cover through agroforestry. Their recommendation has been taken care while formulating this research plan of ICFRE.

To take the inputs on the national and regional priorities on research needs and to firm up in an inclusive manner, forestry research requirement of the country, Regional Research Conferences were held by ICFRE, during 2017-18 and 2018-19 in Northern, Southern, Western, Eastern and North Eastern regions of the country so as to consider the recommendations of these conferences in addition to the national and international conferences held in the past in various institutes of ICFRE, to revise the National Forestry Research Plan of ICFRE. Silvicultural conferences are the regular feature of ICFRE. Inputs from these conferences have been very valuable for drafting this revised NFRP. Prominent areas in which ICFRE needs to focus have thus been identified. Efforts shall be made to attain synergy by collaboration with partners in forestry research from other organizations, Universities, ICAR, CSIR, DST, DBT etc engaged in research on similar topics of mutual interest and domain apart from collaborating with Institutes within ICFRE. Endeavour is to focus, identify, understand and analyze the problem faced by the stakeholders and to provide solution to the problem which is environmentally acceptable and socially viable. The emerging areas which ICFRE needs to focus are categorized into different research areas and are detailed below. These research issues are in line with the thrust areas and themes listed in section 4.5 of Chapter IV.

5.1.1 Forest and climate change

India is a mega-biodiversity country where forests and tree cover account for about 24.39 percent (80.20 million ha) of the geographical area. With nearly 173,000 villages classified as forest fringe villages, there is obviously a large dependence of communities on forest resources. India's national strategy for REDD plus aims at enhancing and improving the forest and tree cover of the country thereby enhancing the quantum of forest ecosystem services that flow to the local communities. The services include fuel wood, timber, fodder, NTFP and also carbon sequestration. Attempt to attend to research under climate change pertaining to modeling, adaptation and mitigation should be aimed. Indicative list of research problems under the thematic area of climate change and forests are:

1. Vulnerability assessment of forest ecosystems, potential hazards and associated risks based on the likely impacts of climate change on forests and biodiversity at national, regional, sub-regional and local levels, using high resolution data.
2. Developing vulnerability indices and generating vulnerability maps/atlas to identify critically vulnerable areas, species, populations and prioritize actions. Assess vulnerability of endemic and endangered taxa of flora and fauna in different forest ecosystems. Studies on tree phenology and migration of forest species (latitudinal and altitudinal migration) under the influence of climate change.
3. Standardization of methodologies for carbon assessments for use by agencies like, Forest Departments. Estimation of carbon sequestration potential of forest ecosystems, important species including bamboo across landscape/ forest types/ agro climatic zones. Assessment of Green house gas emissions and carbon sequestrations in various forest eco-systems and forest products including timber.

4. Promotion of multi crop farming systems to shape a biodiversity rich landscape and food security. Searching out appropriate species crop combinations for enhanced productivity and carbon sequestration under agroforestry/ farm forestry. Selection of tree species based on their adaptive strategies i.e. matching species and site modeling.
5. Impact of climate vulnerability on productivity and quality of medicinal plants.
6. Promotion of composting of biodegradable domestic and industrial wastes by involving local communities/ local bodies of PRI.
7. Research on long-term ecological effects of fast growing short-term rotation trees. Establishment of permanent preservation/observation plots in both protected and other areas along rainfall/ altitudinal gradient for Forest Observational Studies (FOS) network and establishing mechanism for long-term ecological monitoring and impact of climate change.
8. Short term and long term adaptation and mitigation measures of forests, as also relevant ecological research, and development of vegetation and climate change modeling of forests.
9. Monitoring climate change driven effects on carbon regulating services, soil health, nutrient dynamics and bio geochemical cycling in forest ecosystem.
10. Composite seed sources from multiple provenances to be deployed to increase diversity and buffer against future climate change threat.
11. Explore and identify climate resilient species (natural/ plantation) specific to regions and climatic zone. Develop and identify new varieties/species for climate change adaptation through conventional breeding/molecular breeding. Harness genomic tools to improve understanding of genes that are important for salt and drought tolerance/ resistance, flood tolerance, and phenophases response to elevated CO₂ levels/ temperature.
12. Assessment of the role of wetlands in climate change mitigation and role of mangroves in carbon sequestration.
13. Develop strategies to tackle issues like outbreak of unforeseen pests and diseases, erratic precipitation patterns, prolonged drought conditions and increased CO₂ levels.
14. Vegetation dynamics of ecotone regions of the important forest types.
15. Socio-economic adaptation to climate change among forest dependent people/ fringe forest communities for livelihood and poverty alleviation.

5.1.2 Biodiversity conservation

Forest degradation, diversion of forest land for non-forestry purposes, human interference, and invasive species are causing loss to biodiversity. Mangroves ecosystems and wetlands are degrading fast. Grasslands are dwindling and degrading. Poor regeneration of species and loss of rare, endangered and threatened species is a cause of concern. Indicative list of research problems under the thematic area of biodiversity conservation are:

1. Identification and prioritization of rare, endangered and threatened species. Conservation of rare endangered and threatened species of medicinal & aromatic plant. Development of effective mix of in situ, circa situ and ex situ approaches of conservation. Standardization of propagation protocols and packages of practices for in-situ and ex-situ conservation of native and overexploited species. Studies on species distribution, reproductive biology, ecology and taxonomy for developing better protection strategies.
2. Studies on current conservation status and key processes that threatened the long-term persistence of the vulnerable, endangered and significant plant species.
3. Technological innovations for combating desertification and eco-restoration of degraded lands and cold & hot deserts. Treatment of degraded hills through soil, water conservation and application of suitable combinations of trees, shrubs, herbs, climbers and grasses. Sand dune stabilization and control of sand drift and check dust mobilization by suitable combination of vegetation and tree cover.
4. Assess distribution/ persistence of priority species under different environments and their correlation with morphological, physiological and molecular data.
5. Documentation of seed storage behavior and germination requirements of prioritized species.
6. Studies on conservation of mangrove ecosystem. Genetic diversity and differentiation studies of important mangroves species to assess their genetic adaptability to the changing climatic conditions. Phylogenetic studies of mangroves to gain insight into their evolutionary history and document genetic relationships among the mangrove species. Quantitative inventory of floral and faunal diversity and their dynamics study in mangroves. Thrust on livelihood activities based on mangroves like crab farming and aquaculture etc.
7. Establishing methodology and use of advanced taxonomic tools like DNA barcoding to resolve plant taxonomic issues.
8. Focused research on grass land ecosystem and sacred-groves
9. Monitoring biodiversity in major forest types with special emphasis on invasive species.
10. Assessment of urban biodiversity and its inventorisation.
11. Integrated research on soil-water-vegetation-animal linkage.

5.1.3 Forest ecosystem services

Forest ecosystem has an inherent capacity to withstand incremental changes in climate and landscape, leading to a natural carrying capacity of ecosystem. When this capacity exceeds, the ecosystem characteristics get changed in ways that become socially and environmentally unacceptable. This could well lead to loss of biodiversity of rare or endangered species, migration of species, and shifting of habitats. Indicative list of research problems under the thematic area of forest ecosystem services are:

1. Valuation of ecosystem services of different forest types.

2. Valuation of ecosystem goods and services of forests and other ecosystems (grassland, sacred groves, agroforestry systems, Himalayan ecosystem, water conservation, eco-tourism, soil conservation etc).
3. Environmental impact of jhum cultivation and suggested actions to mitigate the effects.
4. Studies on environmental awareness of different strata of the populations.
5. Partnership for validation of ecosystem services and land use mapping for helping the livelihoods of communities and farmers.
6. Valuation of ecosystem goods and services of urban forests and recreational use value of urban green spaces.
7. Undertake demographic studies, filling gaps in available information by collection, compilation, analysis and documentation of data on forest villages, forest fringe villages, population and demography including vital statistics of the excluded and vulnerable population dependent on forests.

5.1.4 Hydrological function of forests

Fresh water sources are facing extensive pressures not only from domestic users, but also from agriculture and industries. Sources are also degenerating due to pollution, diversion, developmental activities and getting very little time for recharging. Forests are the primary source of regulating continuous supply of fresh water. Water holding capacity of the forest is, therefore, required to be increased by suitable interventions in addition to developing practices that optimizes the water use and inculcates practices that conserves water. Indicative list of research problems under the thematic area of hydrological function of forests are:

1. Studies on plant water relationship – stress physiology.
2. Studies on water use efficiency of different tree species and assessing its environmental impacts vis-a-vis water table depletion. Addressing water level depletion in agroforestry and plantation vis a vis their productivity. Screening of species for their excess water utilization.
3. Long-term studies on selected hydrological parameters in identified catchments.
4. Integrating ongoing programmes and actions of various allied sectors with the objective to enhance water yield of the watersheds. Visualization of the moisture stresses that can arise in the watershed due to changing climate or weather pattern and its impact on characteristics of watershed leading to change in its water yield.
5. Developing models on optimization of water harvesting structures for particular watershed area- large v/s small structures.
6. Improving water holding capacity of soil/ forest ecosystem in India especially Himalayas in the context of rising demand, declining snowfall and uncertain rainfall pattern. Developing water conserving strategies in forests & grasslands through staggered

contour trenching in hills and unsubsidized Water Demand Management.

7. Studying reasons for depletion of ground water in degraded regions and studying suitability of different species for water conservation and ground water recharge.
8. Harvesting water by moisture tapping from air may be a future technology
9. Water budgeting and water use efficiency aspects to be incorporated in research programmes, especially for TOF species.
10. Hydrodynamic studies in mangroves to assess and document critical requirement of water for mangrove vegetation, wildlife, fishery and other resources.

5.1.5 Enhancing forest productivity

Productivity of the Indian forests is one among the lowest in the world and is also the focus of draft National Forest Policy 2018. Low quality and productivity of natural forests will put additional pressure on forest resources, increase human-wildlife conflict, increasing water crisis, deteriorating environment, biodiversity loss, decreasing resilience to climate change impacts, livelihood support and ecosystem services that the forest provides. Indicative list of research problems under the thematic area of enhancing forest productivity are:

1. Prioritization of high yielding native tree species of both long and short rotation for plantation activities with appropriate domestication programmes.
2. Improvement in seed storage, nursery and propagation techniques for production of quality planting stock. Establishment of improved seed sources and seed certification system.
3. Identification of superior genotypes based on economic traits, assemblage of germplasm and establishing multi-location trials. Use of marker assisted selection for identification of superior genotypes.
4. Developing varieties specifically suited for different industrial use like pulpwood, plywood and fibre boards, matchwood, pencilwood and biomass based energy generation.
5. Developing protocols for mass production of improved planting stock of important plantation/ agroforestry/ farm forestry species.
6. Development of agroforestry models of important agroforestry species. Searching out appropriate tree crop combination for enhanced productivity and carbon sequestrations under agroforestry and farm forestry.
7. Coordinated research programmes and multi-location trials on important species. Pilot scale projects for problematic sites along with cost benefit analysis. Research on species for adapting to biotic and abiotic stresses and use marker assisted selection for adaptive traits.
8. Improvement of plantation forestry by adopting silvicultural practices and by employing improved quality planting materials as well as use of bio-fertilizers for enhancing forest productivity.

9. Scaling up and commercialization of bio-pesticides and bio-fertilizers technologies.
10. Phyto-remediation of soil for productivity enhancement.
11. Growth modeling of forests for their productivity.
12. National level survey for estimation of forest tree plantations and their productivity.

5.1.6 Conservation of forest genetic resources

Forest Genetic Resources (FGRs) constitute a very important sub-set of biodiversity. FGRs are very essential for the adaptation and the evolutionary processes of forests and trees as well for improving their resilience and productivity. In addition, the FGRs at the levels of species, populations, and individuals form a very vital and irreplaceable resource for the benefit of mankind. Generating understanding and knowledge on FGR of the country through exploration, documentation, characterization, and strengthening in situ and ex situ conservation is important for long term safeguard for the benefit of humanity. Indicative list of research problems under the thematic area of forests genetic resources are:

1. Identification of stakeholders, prioritization of tree species for conservation.
2. Capacity building and establishing networking for operational synergy for Forest Genetic Resource assessment and conservation.
3. Developing appropriate conservation strategy amalgamating in vitro and ex vitro measures that need to be adopted for FGR conservation depending upon the species and conservation status.
4. While giving attention to FGR conservation of tree species, herbaceous vegetation, orchids and non/lower vascular plants such as bryophytes, pteridophytes, ferns, mosses should also be given due consideration as they constitute important part of forest genetic resources.
5. Characterization of genetic resources of forest tree species by DNA based molecular markers preferably co-dominant markers.
6. Reproductive biology of the tree species for their effective in-situ conservation.
7. Biodiversity-based livelihood through involvement of local communities in assessment, documentation and conservation of forest genetic resources.
8. Logistic application of micro-propagation of vulnerable tree species and callus-mediated in vitro regeneration of tree species.
9. Whole genome sequencing (WGS) programmes in few selected keystone indigenous tree species of the country.
10. Establishment of a National Bureau on Forest Genetic Resources.
11. Breeding of trees for increased tolerance to water stress, improved nutrient use efficiency.

5.1.7 Developing bamboo sector

India has the largest area under bamboo in the world, yet it is a net importer of bamboo and rattan products. The bamboo based industry is also under developed and uncompetitive. Low value, poor quality traditional articles are produced for domestic market through obsolete tools and techniques. Research inputs in many areas are required not only to enhance the production, but also to develop technologies and upgrade skills of users. Value addition at every stage in bamboo chain including better quality planting material, tissue culture, scientific and efficient harvesting, e-marketing and zero-waste bamboo processing system are to be addressed. Inputs from Bamboo sector report 2017 prepared by ICFRE and mandates of NBM and INBAR were considered for listing the research issues. Indicative list of research problems under the thematic area developing bamboo sector including rattans are:

1. Developing comprehensive national strategy for research and extension in improvement of bamboo sector comprehensively.
2. Species-wise distribution and density mapping of bamboo resources of the country and mapping of habitat suitable for bamboo species. Mapping the populations of bamboo species and modeling using GIS based platforms. Developing resource inventory in government and private lands and estimation of production potential.
3. Bio-climatic analysis of bamboo growing areas and developing models for matching species and site.
4. Ensuring supply of quality bamboo planting stock, developing varieties and clones of commercially important bamboo species for large scale planting. Developing models for bringing down cost of quality planting bamboo material by promoting mass propagation ventures through incentives like financial support and buy-back arrangements. Criteria development for certification of Quality Planting Material. Technologies for mass multiplication of germplasm, rebuilding of populations post-flowering, sporadic and gregarious flowering and production of viable seeds.
5. Demonstration of farmer-friendly bamboo propagation technologies to train farmers for producing their own low cost bamboo planting stock.
6. Bamboo seed handling and storage techniques to be developed and refined. Certification of bamboo seeds and establishment of bambusetum to be taken up.
7. Productivity enhancement through various models of clump management for higher economic gain. Silvicultural interventions for enhancing productivity of both edible and non-edible bamboos. Documentation of indigenous traditional knowledge (ITK) on production and management of bamboo resources. Develop criteria and indicators for sustainable management of bamboo resources in the country. Development of site specific agroforestry model for bamboo with proper spacing.
8. Promoting cultivation of edible bamboo, popularizing and developing its cultivation and value addition practices. Developing edible bamboo models on large scale.

9. Managing bamboo flowering and natural regeneration for achieving staggering in flowering for selected species. Regeneration (AR and ANR) of flowered area and developing strategies for their utilization. Development of protocols to rehabilitate the unproductive bamboo areas.
10. Developing packages of practices and knowledge on seed, nursery, growth and yield, matching species and site for different bamboo species, climate suitability and ecology, developing bamboo volume table, silvicultural aspects of management, thinning, pathogen and disease control, economic aspects, climate change carbon capture and feasibility of bamboo based carbon trading.
11. Ecological functions of bamboo forests, focused ecological studies on bamboos including hill bamboos, field identification keys based on phenology, fodder value, screening for high quality germplasm.
12. Conserve rattan resources and enhance the rattan production. Promoting rattans in community land, agroforestry, jhum land, outside protected areas etc. by collecting the rattan seeds, raise rattan nursery and for field transplantation.
13. Disease and insect-pests management and establishment of gene pool.
14. Development of technologies for source identification.
15. Introduction of premier bamboo species native to other countries into India, site suitability and standardization of cultivation practices for maximizing the productivity of important species.
16. Diversification of bamboo species for protection against natural calamity and flowering and exploring the possibilities of introducing suitable species for mixing with existing and future plantations.
17. Improving the quality of bamboo products, diversifying the uses and design. Developing bamboo processing industry to meet global standards. Develop international standards for bamboo products and bamboo specific certification schemes. Certification of finished products specially handicrafts.
18. Establishing primary processing centers and estimating capacity of present primary processing centre/ unit and identification of technology gaps for improvement of machinery tools and related technologies.
19. Developing and promoting engineered bamboo products like paneling, bamboo lumber, flooring and even structural bamboos in government sector as well as in private sector to lessen the burden on wood resource.
20. Studies on construction of housing designs using Indian bamboo species for earthquake prone areas in collaboration with premier national level institutions.
21. Establishing grading standards for bamboo to improve uniformity in product quality, optimize uses and ascertain higher returns to growers.

22. Designing equipment for fast and economic harvesting of bamboos.
23. Evolving and refining technologies for enhancement of service life of bamboo (including hill bamboo) and bamboo products. Technologies to be developed for treatment for basket with chemicals of natural origin and thermo-treatment. Develop species specific package of practices for various bamboo species.
24. Promotion of bamboo for water channels and bridges.
25. Developing bamboo as a renewable energy source for reducing fossil fuel consumption.
26. Standardization of marketing of bamboo and bamboo products at national level to promote trade. Developing community based market information system at national, regional and local levels for quick dissemination of market intelligence to all stakeholders to promote bamboo trade. Developing models for establishment of forward and backward market linkages.
27. Develop a uniform unit for measuring bamboo yield data at national level and standardized conversion factors instead of various units.

5.1.8 Non timber forest produce

NTFP is one of India's largest unorganized sectors having a large dependent population. NTFP contributes to about 20% to 40% of the annual income of forest dwellers who are mostly landless communities with a dominant population of tribals. This sector alone is able to create about 10 million workdays annually in the country. Indicative list of research problems under the thematic area of Non Timber Forest Produce are:

1. Document the status of resource inventory, current levels of wild harvest and trade, management of commercially important MAPs including silvicultural practices, participatory and co-management experiences in respect of NTFP management, conservation and sustainable harvest strategies and opportunities under the revised National Working Plan Code.
2. Survey and assessment of valuation of NTFP and medicinal plants on national Level.
3. Development of models of value addition and marketing strategies of NTFP and medicinal plants. Develop market viability studies and market monitoring tools for specific NTFP products. Information about existing markets and marketing network for various products and possible linkage to help farmers. Developing mechanisms for ensuring fair and equitable economic returns to primary collectors/ cultivators.
4. Develop tools to monitor the sustainability of the extraction at species and ecosystem level. Provide insight into the socio-economic dynamics of NTFP extraction both for subsistence and commercial extraction. Study the potentials of domestication of commercially attractive forest products and their integration into silvi-/agro-forestry systems. Promotion of cultivation of commercially important medicinal plants and NTFPs in horticultural and agro-forestry plantations by developing appropriate models to enhance farmers' income.

5. Generate scientific information on key ecological functions like phenology, reproductive biology and to develop sustainable harvesting methods.
6. Develop participatory management models taking into account traditional/ local knowledge.
7. Develop yield enhancing methods and techniques.
8. RIS-GIS mapping of MAPs and NTFPs resources and identification of superior populations for promoting cultivation in non forest areas.
9. Creation of National Knowledge Database with ICFRE/FRI as the Nodal Agency for consolidation of scattered information for better planning and resource management including conservation of NTFP.
10. Threat assessment for developing conservation, assessment and management prioritization plan (CAMP). Creation of sufficient numbers of Medicinal Plant Conservation Areas (MPCAs) and Forest Gene Banks for conservation and manipulation of resources for judicious utilization.
11. Bioprospecting, DNA fingerprinting, chemical profiling, sustainable harvesting protocols for highly traded and conservation-concerned species of NTFP.
12. Setting up Value Addition Points especially by community enterprise for medicinal plants and NTFPs.
13. Development of nursery techniques of high altitude medicinal and aromatic plants and lesser known forestry species along with maintenance of germplasm.
14. Assessment and documentation of local health traditions and community knowledge registers.
15. Developing models and capacity building to encourage farmers to take up the medicinal plants cultivation to avoid destructive collection of medicinal plants from the wild habitat.
16. Develop a regulatory regime for harvesting of plants from natural flora, to save the plants from extinction and also to ensure sustainable supply of plant raw drugs for the industry.
17. Documentation of diversity in areas rich in medicinal plants diversity and traditional knowledge of the inhabiting communities.
18. Evolving mechanism for certification of good sustainable agricultural and collection practices as well as checking adulteration in raw materials and products through stringent quality control measures.
19. Prepare inventory of agar plantations in north-east region. Conduct detailed study to understand the variation in yield of agar-wood in different regions. Studies on role of insects in developing natural infections in agarwood. Promotion of small scale distillation unit. Transfer of new extraction technologies to the end users. Develop agar wood based agroforestry models and develop extension strategy for popularizing agarwood plantations in NE region.

20. Develop complete package of practices for cultivation, harvesting, extraction and marketing of agar. Creating awareness amongst tree growers, industry people, forest departments on harvesting and trade related issues. Studies on host-pathogen compatibility for agar wood formation.
21. Survey and inventorisation of species and extent of distribution/ conservation status of wild fruits, their market potential and livelihood opportunities.
22. Economics based on the existing information of distribution, production and market rates of wild fruits.
23. Studies on long-term storage and enhancing shelf life of wild fruits and their products.
24. Studies on nutritional value of wild fruits for human and livestock health and Certification system for wild fruits products.
25. Develop sustainable non-destructive harvesting and tapping techniques.
26. Developing models of wild fruit trees mixed with trees of forestry importance to mitigate human-wildlife conflict.

5.1.9 Forest health

Forest health is a matter of serious concern under changing climatic conditions. There is an urgent need to assess the impact of pests and diseases in forest resources in quantitative terms and economic significance. Research in support of Insect Pest and Disease Management should be the priority area and needs thorough investigation. Under changing environmental conditions, especially temperature, erratic rainfall, receding glaciers in hills and drought like conditions interfering with the growth and development of tree needs to be studied. Such events also influence the population dynamics and development of insect and pathogens, which negatively impact the sustainability of ecosystem and its services to the society. Indicative list of research problems under the thematic area are:

1. Eco-friendly management of insect-pest and diseases.
2. Research on pests and diseases of forest tree species in nursery.
3. Utilization of ITK practices available and their up-scaling.
4. Biological control of selected key insect pests of important tree species. Compatibility of biological control agents with naturally occurring agents, their establishment and impact assessment studies also to be carried out. Biological studies on insect attacks and eco-friendly control of insects like using pheromones/ kairamones should be undertaken.
5. Timber borers affect the utility of timber and need to be studied.
6. Plant physiology is the backbone of productivity or disease/ pest resistance, work to be carried out on all major discipline of physiology.
7. Exploration of different parasitoids. Screening the efficacies of parasitoids and predators and to standardize their mass multiplication techniques for applied biological control in

plantations and forests.

8. Screening of insect pests for eradication and control of invasive and alien species.
9. Diversity and taxonomic works along with generating information about their host associations should be encouraged for strengthening of database on the subject. Taxonomy aspects of insects and enrichment of insectaries need importance.
10. Impact of climate change and habitat fragmentation on the bio-control agents, especially herpeto-fauna.
11. Pest and disease problems of important mangroves like *Sonneratia apetala*, *Xylocarpus granatum*, *Avicennia marina* etc., and suitable control measures need to be developed.
12. Devising control measures that are easy to apply on tall trees like eucalyptus, poplar to tackle problems of insect pests and diseases in plantations.

5.1.10 Soil health

Soil health, moisture regime, nutrient cycling, microbes are important indicators for a healthy forest, plantation survival and productivity enhancement. Soil mapping, its characterization and classification is important for implementing soil treatment. Indicative list of research problem in the thematic area are:

1. Soil testing and plant response study for fertility management is important as there is no comprehensive classification done to ascertain the nature and behavior of soil for raising most suitable plantation initiatives.
2. Site suitability plan for every category of plantation like timber, fuel wood, seed orchards, Jhum lands, aromatics plants.
3. Soil health care system for optimum soil productivity.
4. Linking study on soil/ site factors to communities and their economic gains/ losses.
5. Assessment of forest soil and nutrient losses through multi location trials.
6. Generation of data backed map of degraded soil/ sites in India for planning best utilization alternatives.
7. Forest soil carbon management initiatives.
8. Assessment of forest soil microbial diversity, health and functions.
9. Documentation of all beneficial microbes used for accelerating the process of rehabilitation of different mined areas.
10. Assessment of forest soil health and identification of suitable species with reference to specific forest types.
11. Demonstration/ sample plots in all forest types for evaluation of short and long term changes in the soil conditions.
12. Soil moisture regime study under different forest covers.

5.1.11 Forest management

Management of forest is essential for maintaining structure and functions of forests and avoiding threats for their existence on a sustainable basis. Flow of Important functions like livelihood support, water conservation, shelter, food, fodder, timber forest products, forest genetics resources, habitat/ landscape and corridor management, biodiversity hotspots, water bodies, wetlands, mangroves, restoration, regeneration, soil stabilization are to be sustained through proper planning and management. Threats to these functions from invasive species, recreational activities, degradation, mining, diversions, floods, forest fire, and many others are to be minimized. Some of the other aspects such as regulating tree density as to delay maturity of the natural forest, thinning and crown thinning for enhancing growth of saplings, regulating slash for natural decomposition, and gap filling in natural forests are also to be addressed. Dependency of cattle and human population on forests is to be minimized by increasing the carrying capacity of forests, domestication of important plants and meeting the requirements of forest produce by developing areas outside forests. Indicative list of research problems under the thematic area are:

1. Monitoring and assessment of area under invasive/ alien species using RS & GIS. Studies on eco-restoration and containment of invasive alien species. Develop technologies for eradication, control, management and utilization of invasive alien species. Study the Impact of invasive species on forest health and ecology.
2. Developing strategy for control of key invasive species like *Prosopis juliflora*, *Lantana camara*, *Parthenium*, *Eupatorium* and others in different parts of the country.
3. Development of bio-control measures for eradication of weeds. Bioprospecting of weeds and invasive species for useful products. Evaluation of fodder from invasive species for their nutritive value and palatability.
4. Develop models for reforesting different refractory areas in different forest types and soils. Developing and documentation of improved & site specific eco-rehabilitation technologies for degraded areas, pasture lands, stress sites, mined lands and wastelands. Eco-restoration of abandoned Jhum areas.
5. Creation of seed production areas, seed orchards, vegetative multiplication gardens of different commercial forestry species in different zones for certified seed source for establishing future plantations.
6. Factors affecting natural regeneration and strategy to improve natural and artificial regeneration of identified species in different climatic zones. Develop assisted natural regeneration (ANR) protocols for different forest species.
7. Identification of drivers of forest degradation and develop strategy to mitigate them.
8. Study the effect of forest fire specially on soil, chemical and physico-chemical properties, runoff and erosion in different forest types and quantification of economic loss thereof in different forest types of India. Developing effective technologies for predicting, preventing & controlling forest fires.

9. Management of tree health in urban areas.
10. Habitat/ landscape and corridor management to be taken up.
11. Measures to address the silvicultural challenges to tackle regeneration issues in sal (*Shorea robusta*), sandalwood (*Santalum album*), oak (*Quercus leucotrichophora*), rosewood (*Dalbergia latifolia*), ebony (*Diospyros ebenum*), white cedar (*Dysoxylum malabaricum*), and red sanders (*Pterocarpus santalinus*). Challenges of large scale dieback of shisham (*Dalbergia sissoo*), spike disease in sandalwood and other emerging pest and disease challenges in forest plantation need to be addressed.
12. Developing knowledge on seed science, nursery techniques, plantation maintenance, tending operations and silviculture systems
13. Development of high yielding varieties / clones of fodder trees species like *Prosopis cineraria*, *Ailanthus excelsa*, *Acacia nilotica*, *Hardwickia binnata* etc., and grasses.
14. Develop agri-silvi-horti-medicinal-pastoral models for different agro-climatic zones for enhancing farmers' income.
15. Regulate the tree density as per the age of the forest to delay maturity of the natural forest.
16. Develop models and techniques for densification of degraded forests, gap filling in natural forests with suitable species. Address thinning and crown thinning for enhancing growth of saplings and better mineralization.
17. Identification of hotspots to address issues like erosion by wind and water, salinization, vegetation degradation, competition for water, forest fire, drought and flash floods.
18. Saline/alkaline and mine overburdens areas to be treated suitably through physical, chemical and biological soil amendments and selected species to rehabilitate these lands.
19. Pilot plantations with all technical inputs by ICFRE to reclaim saline wastelands.
20. Involving all stakeholders dealing with desertification, by building capacities and equipping the local government institutions in rural and urban landscapes by providing incentives support.
21. Study in forest fringe areas for livelihoods, ecological security and resolution of human-animal conflict.
22. Restoring and reclaiming degraded mangrove wetlands with suitable mangrove species. Minimising the impacts of cyclones and floods in coastal areas by developing mangrove shelterbelt using different models.
23. Study ecological impact of forest fire, grazing and collection of non-wood forest product on regeneration and growth.
24. Restoration of community pasture to enhance traditional livelihoods and biodiversity and

for diverting grazing pressure from forestlands while ensuring and enhancing livelihoods.

25. Development of eco-restoration model for region specific mined out areas. Exploring potential of fast growing indigenous multipurpose plant species in restoration of mine spoils. Involvement of local community in the management of mining area. Assessment of use of bio-fertilizers and their impact on mined out areas. Application of microbial biotechnology in management of mined out area.
26. Publication of the state of knowledge on mined area/ mine spoil reclamation.
27. Develop training modules for all stakeholders on rehabilitation & reclamation.
28. Documentation and dissemination of existing approaches and models available for restoration of different minded areas in India to stakeholders.
29. A systematic long-term national forest-monitoring and assessment programme including forest and tree cover, soil assessment, forest health, etc.

5.1.12 Forest policy research

Forest policy research addresses issues related to the setting of goals to meet the needs and aspirations of the stakeholders and establishing strategies and instruments for implementation. In the forestry sector it has not been given due recognition. Forest policies are affected by development of several constraints, such as intrinsic weaknesses of the policy, conflicts with other policies, inadequacies of instruments and institutions resulting in weak enforcement, and lack of awareness resulting from insufficient knowledge and information. These cause gaps between policies and ground reality, resulting in failure to address the underlying causes, adversely affecting sustainable forest management, socio-economic aspirations and leading to continued forest loss and degradation. Indicative list of research problems under this thematic area are:

1. Encourage trees outside forests especially economically important tree species, refining production and marketing avenues to farmers. Removal of legal impediments on tree cultivation by farmers.
2. Enhance timber use in buildings/ houses with the objective of mitigating climate change.
3. Need for operational research to utilize substitute/alternate technologies for cottage industries.
4. Formulation of policies for promotion of bamboo cultivation and utilization. Develop strategy to ease out harvesting and transportation rules and regulations of bamboo and bamboo products in the country.
5. Drafting policy for agarwood trade related issues.
6. Development of wood use policy.
7. Develop road map for wood science and technology and networking of wood science institutes/ institutions.

8. Evolving National Medicinal Plants Policy as well as National NTFP policy. Study on role of NTFP extraction as a suitable and compatible land use option and forest management planning.
9. Suitable legislation for mandatory disclosure of information on trade related aspect of NTFP, source of procurement and quantity of NTFP consumed by the Industry in order to help in organizing the collection of these resources for meeting the market demand through joint efforts of state agencies and the collectors.
10. Develop policies on incentive based programs to promote large scale cultivation of medicinal plant to meet the industrial demand.
11. Facilitating preparation of working plan as per new working plan code (2014) incorporating climate change concerns including REDD⁺.
12. Preparing case of special compensation for forests conserved in the hill states for the opportunities foregone while conserving soil and water and supporting downstream agriculture.
13. Developing water harvesting strategies and legislation for rational ground water use. Appropriate cropping pattern based on water availability in different climatic zones.
14. Study impact of joint forest management and other forms of participatory forest management on socio economy of people dependent on forests and the health of forests and suggesting policy measures to improve upon.
15. Impact of Forest Rights Act on livelihoods and infrastructural improvement and fragmentation and health of forests.
16. Estimation of fuel wood and fodder production (using production approach).
17. Develop state wise minimum support price mechanism and insurance scheme against theft and other natural calamities of identified forest produce.
18. Policy intervention on quality control parameters and sustainable harvesting of wild fruits of forest origin.
19. Ecological impact study of eco-tourism activities and suggest measures to sustain the activity on a long term basis.
20. Develop policy on growing certified reproductive material and developing seedlings in advance by the state forest departments.
21. Develop certification mechanism for forest tree seeds and nursery and develop policy assuring sale and use of certified forest tree seeds and nursery plants for ensuring establishment of high yielding, disease resistant, superior clones.
22. Undertake case studies on economic analysis of agroforestry systems and TOF. Develop policy to provide minimum support price to tree growers thus promoting the species in agroforestry systems. Research on diversification of uses widely grown species like poplar/ Eucalyptus.

23. To assess and document balance of trade of forestry Commodities including timber and resin and suggest improvement measures.
24. Developing policy approach for achieving NDC targets of capturing 2.5 to 3.0 billion tonnes additional CO₂ equivalent by the year 2030.
25. A policy document to critically review implementation of Green India Mission (GIM) and suggest remedial measures to steer the mission so that it catches its objectives. Possibility of apportioning greening targets to states under GIM and financial incentives.
26. Policy brief on effective implementation of national agroforestry policy, forestry intervention in Ganges and major river catchments.

5.1.13 Trees Outside Forest (TOF)

Natural forests are managed in a sustainable manner. In order to meet growing demand of timber and forest produce TOF have gained importance in national economy for sustaining increased demand of forest produce and supplement farmers' income. TOF has significantly buffered the pressure of escalating demands for industrial wood. India has huge potential for increasing TOF area which has been continuously increasing ever since 2005. This requires scientific interventions at various levels and synergy between ICFRE and ICAR.

Expert committee on "Strategy for increasing green cover outside recorded forest areas" primarily setup for Tree outside Forest (TOF) by MoEF&CC in January 2018 under the Chairmanship of Shri Abhijit Ghose, Ex- PCCF (HoFF), Rajasthan has given its recommendations for increasing green cover through agroforestry. Indicative list of research problems under the thematic area of TOF are:

1. Development of advanced tools and techniques for monitoring and assessment of TOF.
2. Certification of forests seed, planting material and nurseries to ensure quality material to farmers and forest department.
3. Trees at the rural-urban interface: study on relationship between green areas and biophysical and socio-economic features.
4. Preparation of volume/biomass/carbon tables and allometric equations for TOF.
5. Improved agroforestry models for maximizing output and enhancing carbon sequestration and other ecosystem services.
6. Policy issues and strategies for promoting TOF and urban forests.
7. Screening of pollution and heat tolerant/absorbent native woody species for urban green spaces/ urban heat islands.
8. Research on multipurpose native tree species having low water requirement for urban and peri-urban areas.
9. Focused research on agroforestry systems and adaptation of line planting in traditional

agroforestry system. Piloting of multi storied crop based/ agroforestry models for different agro climatic zones to sequester additional carbon optimally. Adoption of different agroforestry models to address the shifting cultivation in North eastern India. Development of integrated farming system such as silvi-pasture, horti-pasture and agri-horti models using different plant species should be taken up.

10. Develop agroforestry models based on species like *Prosopis cineraria*, *Tecomella undulata*, *Azadirachta indica*, *Acacia nilotica* and *Albizia lebbeck* for dry areas.
11. Developing models for creation of fuelwood species lots in the fringe forest area in community lands.
12. Developing and promoting planting of suitable species and clones of poplar and willows for hilly areas..

5.1.14 Important species to be studied

ICFRE should prioritize important species for conducting focused research and to develop a package of practices right from plantation technology to its sustainable harvesting and utilization. Some of the species at regional institutes may be taken in mission mode. A non exhaustive list is as below which however can be enriched from time to time:

Sandalwood, Red sanders, Neem, Pongamia, Bamboo, Hill Bamboo, Rattan, Teak, *Cedrella toona*, *Prosopis cineraria*, *Melia composita syn Melia dubia*, *Grewia optiva*, *Dalbergia sissoo*, *Dalbergia latifolia*, *Capparis decidua*, *Taxus baccata*, *Terminalia myriocarpa*, *Eucalyptus sp*, *Populus sp*, *Shorea spp.*, *Bombax*, *Ailanthus*, *Ardu*, *Ephedra foliata*, *Guggal*, *Terminalia spp.*, *Thysanolaena maxima*, *Homalomena aromatica*, *Phoebe goalparensis*, *Parkia roxburghii*, *Paris polyphylla*, *Flemingia*, *Morus leavigata*, *Rauwolfia serpentina*, *Panax ginseng*, *Clinogyne dichotoma*, *Acacia spp.*, *Casuarina*, *Leucaena*, *Gmelina*, *Mahogany*, *Thespesia*, *Kadamba*, *Tamarind*, *Calophyllum*, *Pongamia*, Wild mushrooms and species having medicinal and conservation importance.

5.1.15 Wood utilization and panel products

India has a long history of forest products research, however, the diffusion of the developments into wood processing industry remains far from satisfactory. Now there is a need to enhance the research outputs to the next level with the inbuilt mechanism to achieve better penetration into the industries. The forest products research has gone transformational change globally to the development of new high level biomaterial products, advanced composites, novel packaging, nanotechnology applications, bioenergy, fire proof structures and life-cycle analysis. Indicative list of research problems under the thematic area of wood utilization and panel products are:

1. To develop technology for wood based products and industries to meet international standards and competitiveness in the world market, conforming to the international emission norms of VOC (Volatile organic carbon).
2. Development of national wood use policy.
3. Develop road map for wood science and technology and networking of wood science

institutes/ institutions.

4. Develop and adopt environmentally friendly processes, maintaining the quality of products.
5. Domestication and development of improved varieties indigenous trees instead of relying heavily on exotic species in wood Industries.
6. Some of the processes/ technologies such as wood polymer composite; thermal modification; chemical modification of wood; liquefied wood adhesive; which have been perfected at laboratory scale needs to be up scaled and commercialized.
7. Developing completely biodegradable composites to address the environmental concerns.
8. Develop commercially feasible and reliable non-destructive systems (e.g. Near infrared spectroscopy, acoustics etc) for prior assessment of wood quality parameters.
9. Conduct studies on improved wood utilization techniques like finger joining to use small girth timber
10. Explore use of non-traditional timbers through value addition using thermal & chemical modification techniques etc.
11. Develop cost-effective eco-friendly wood preservatives and efficient & less time consuming seasoning techniques.
12. Research on developing new materials like wood plastic composites.
13. Explore applications of nano-technology in field of forestry and value addition of forest products.
14. Conduct and strengthen research on developing environment friendly techniques and technologies enhancing the life of wood and wood articles.
15. Reducing the energy cost in wood processing by utilizing solar energy and dielectric/ microwave heating

5.1.16 Bioprospecting of forest resource

Forest resource is source of raw material for various products. Identification and isolation of useful components (both gene and chemical prospecting) require long term research. List of some indicative areas are given below:

1. Bio-prospecting studies to screen for novel and useful bio-active compounds.
2. Exploration and screening of new plant polysaccharide source as natural additive to improve fiber-fiber bonding.
3. Preparations of different blends of natural or established gums and their suitability for the improvement of fiber-fiber bonding and recycling of paper.
4. Research on yield enhancement of waste paper.

5. Screening of forest fungi for bio-bleaching (of agro based) for reducing the bleaching chemical demand.
6. Development of products from the residual biomass (hemicelluloses, lignin etc. obtained as by-products) in a variety of bio-products.
7. Explore use of invasive species for handmade papermaking, hemicellulose and lignin extraction, cellulosic modified products and bio-ethanol production.
8. Assessment and validation of superior quality germplasm or clones of potential species (e.g. *Melia*, *Eucalypts*, Bamboo etc.) for paper industry.

5.1.17 Forest based industries

Forest based industries can survive in enabling environments of scientific and technical support, conducive market, friendly market mechanism, support for transfer of technology, flow of information from developer to producer, easy finance and conducive legal policies. There will be different level of requirements of each industry e.g. timber, pulp, pharma etc., and are required to be dealt accordingly. Some the indicative areas of research and policy support under the theme are indicated here:

1. Effective marketing mechanism for transferring research findings from lab to end users.
2. Creation of intermediary marketing organization/ mechanism to transfer technology as a complete and holistic package having inbuilt scaling up mechanism with substantial funding.
3. R&D technology to be developed as a complete package consisting of raw material, machinery, process and training of manpower etc.
4. Analysis of trade of forest products including demand and supply in national and international markets.
5. Screening of suitable species for face veneer of plywood for large scale cultivation so as to reduce dependence on imports of the industries.
6. Research should be carried out for diversification on uses of poplar and other prominent agroforestry/ farm forestry species.
7. Identifying suitable tree species for production of charcoal.

5.1.18 Extension and livelihoods

The success of research lies in its effective transfer to end users. Tools of extension and publicity through media and other effective tools to enhance the livelihoods are the key to success of any research and technology developed. Sadly in forestry sector the absorption and penetration of technology is dismally low, resulting in underutilization of the research results. Farmer's income is to be doubled and living standard of forest dependent communities is to be enhanced. It is imperative that emphasis is given on extension support. ICFRE needs to use forestry extension as tool of image building and

penetrating deep into the user groups. This requires message identification, understanding the audiences, prioritizing channels of reaching them, developing promotional material and investing in up scaling of research interventions. Availability of land (approx 200 ha) with each institute needs to be ensured for field experiments, establishment of CSO, SSO and VMGs of high yielding varieties. A road map for fixed duration need to be implemented. Some of the initiatives that need to be taken are the followings:

1. Training to be used as a strong medium of extension.
2. Enhancing visibility of ICFRE through membership of scientist in important bodies and forums.
3. Developing policy of open access publication for improved citation of ICFRE research achievements.
4. Strengthening of extension wings in the form of Van Vigyan Kendra on the lines of Krishi Vigyan Kendras
5. Creating sufficient infrastructure and resources for extension. Inducting extension specialists in each institute.
6. Participation of senior functionaries in policy making forums and bilateral meetings to increase visibility of Council. Participation of extension wings of institutes and ICFRE in exhibitions, melas and promotional events. Organization of extension fests in national and state capitals on regular basis.
7. Economic upliftment of farmers making use of the opportunity of the rapidly growing market demand for the medicinal & aromatic plant species.
8. Documenting and extending the past success stories to policy makers.
9. Documentation of ethno botanical knowledge of the indigenous people dependent on forests/ mangroves for their numerous day-to-day needs.
10. Restoration of community pasture, to enhance traditional livelihoods and biodiversity and for diverting grazing pressure from forestlands.
11. Integration of scientific and indigenous technical knowledge.
12. Identification and promotion of lesser known trees spp. (having similar properties and uses) in place of traditional plant spp.
13. Promoting large-scale cultivation of economically important wild plants by involvement of the local communities.
14. Training to the artisans and basket makers in improving range and quality of products.
15. Developing synergy between institutions working on various aspects of bamboos.
16. Awareness and capacity building in conservation, development and sustainable

utilization.

17. Collaborate with SFDs to establish nurseries of bamboos including hill bamboos and undertake plantations to strengthen the resource base on forest lands, community lands, promoting integration with agricultural crops.
18. Developing models on Enhancement of livelihoods with value addition (like health food) of wild fruits.
19. Develop the synergy between research organization, NGO's, farmers and other stakeholders to facilitate coordinated/collaborated research programs.
20. To replicate the success story on declaration of mangroves, existing on revenue and private lands, as Reserve Forest in Kerala and Maharashtra in all coastal states.
21. Extension of improved plantation, agro-forestry and their management practices developed by research organization, industries and successful entrepreneurs should be given to farmers and growers.
22. Adoption and extension of techniques developed by ICFRE for lac/ silk cultivation in their potential growing areas/ regions including Northeast.
23. Extension material in hindi and other vernacular languages should be brought out for farmers.
24. To undertake research in lesser known forest species developing edible products and their collection, processing and value addition, offering alternative livelihood options and enhancing income of forest based communities.
25. Capacity building of various stakeholders including Industry, farmers, and State Forest Department staff at all levels to adopt varieties and techniques developed by ICFRE.
26. Hand holding of weaker sections in building their capacity to self sustainability.

The list is not exhaustive and it is expected that with progress in forestry research and evolving solutions to current problems and developing technologies more areas of research shall open up in the times to come.

CHAPTER VI
Achievement
of National
Goals and
meeting
International
Commitments
through
NFRP
2020-2030



Achievement of National Goals and Meeting International Commitments through NFRP 2020 - 2030

6.1 Introduction

The vision of ICFRE is to achieve long-term ecological stability, sustainable development and economic security through conservation and scientific management of forest ecosystems. The mission of the Council further elaborates the manner in which it will be achieved. Mission of ICFRE thus lays emphasis “to generate, advance and disseminate scientific knowledge and technologies for ecological security, improved productivity, livelihood enhancement and sustainable use of forest resources through forestry research and education”. ICFRE has made concerted efforts in furthering the cause of forestry research resulting in significant achievements and development of a strong scientific forestry research base in the country. NFRP 2000 has helped in streamlining the forestry research in the council. It was felt during the implementation that although there are innumerable success stories, the societal impact is comparatively limited. Emphasis has therefore been laid to link the new forestry research plan of ICFRE to national goals and international commitments. This NFRP 2020-2030 provides the roadmap as to how ICFRE will help in achieving national goals and meeting international commitments through generation of scientific knowledge and technological solutions in the field of forestry. Thrust areas and themes of ICFRE are well defined and enlisted in the Chapter IV of the NFRP (section 4.5). Prioritized research issues in Chapter V have been framed for ICFRE. Matrix Table 6 and 7 at the end of this Chapter map the synergy between the three (Thrust areas, themes and prioritized research issues) and give a clear direction on how ICFRE through scientific research will address the national goals and meet the international commitments. The issues to be addressed under each national and international priority are described in brief in the succeeding paragraphs with description on how ICFRE will address them, a linkage is provided in the matrix tables.

6.2 National Goals

6.2.1. Draft New National Forest Policy:

Draft (2018) of new National Forest Policy, attempts harmony with national interest, international commitments, rights and interests of forest dependent communities, challenges of climate change, biological diversity conservation and sustainable management of forest for sustainable ecosystem services. Main objectives of the draft policy is to maintain environmental stability and conservation of biological diversity through preservation and conservation of natural forests, to rehabilitate degraded forests, to maintain forest health, to increase tree cover outside forests by incentivizing agro-forestry and farm forestry, to integrate climate change mitigation and adaptation measures in forest management through the mechanism of REDD⁺ so that the impacts of climate change are minimized. Important points of the draft policy are:

- Increasing forest productivity through scientific and technological interventions
- Research on structural and functional diversity of the forests to increase the flow of ecosystem services
- Increase quality and productivity of natural forest through planting stock improvement
- Preparation of catchment area treatment plan of the major river systems of India
- Documentation, collection and ex-situ conservation of forest genetic resources
- Development of agroforestry models with native and commercial tree species for promotion of agroforestry in different parts of the country
- Development of scientific method for appropriate valuation of forest and their services.
- Development of forest certification system
- Research to support policy decisions on Climate change concerns and REDD⁺ strategies in forest management
- Support in development of national forest ecosystem management information system
- Promotion of forestry education and adoption of forestry curriculum addressing the contemporary priorities

6.2.2 National Action Plan on Climate Change (NAPCC):

India's National Action Plan on Climate Change (NAPCC) was launched in 2008. It identifies a number of measures that simultaneously advance the country's development and climate change related objectives of adaptation and mitigation. The implementation of the NAPCC is designed to take place through eight National Missions (Green India Mission, Solar Mission, Mission for Enhanced Energy Efficiency, Mission on Sustainable Habitat, Water Mission, Mission for Sustainable Agriculture, Mission for Sustaining the Himalayan Ecosystem and Mission on Strategic Knowledge for Climate Change) which form the core of the NAPCC and incorporate multi-pronged, long-term and integrated strategies for achieving India's key goals in the context of climate change. The National Mission for a Green India (also referred to as Green India Mission or GIM) recognizes that climate change phenomena will seriously affect and alter the distribution, type and quality of natural resources of the country and the associated livelihoods of the people. Broad objective of the mission is to increase the forest and tree cover by 5 million ha, as well as to increase the quality of existing forest and tree cover in another 5 million ha forest/non-forest lands. Key points of research for ICFRE are:

- Research on strategic knowledge for climate change
 - Socio-economic impact of climate change
 - Technologies supporting mitigation and adaptation to climate change
- Dissemination of new knowledge based on research findings
- Research on key substantive domains of climate science in relation to ecosystem responses.
- Research on climate modeling in India at national and regional level
- Database on climate research in the field of forests, soil and biodiversity

6.2.3 Nationally Determined Contribution (NDC) Goal for Forestry Sector:

The Paris Agreement on climate change was adopted on 12 December 2015. India signed the Paris Agreement on 22 April 2016 and ratified on 2 October 2016. Accordingly, India submitted its Nationally Determined Contribution (NDC) for the period 2021-2030 to UNFCCC. The NDC goal for forestry sector is “to create an additional carbon sink of 2.5 to 3 billion tonnes of CO₂ equivalent through additional forest and tree cover by 2030. ICFRE institutes will be concentrating on development and promotion of fast-growing species/ varieties/clones of proven higher biomass production under tree outside forest (agroforestry/ farm forestry/ urban forestry), eco-rehabilitation of mined out areas/ degraded forests. The key requirements of the priority areas are:

- Promotion of agroforestry through, planting stock improvement and improved agroforestry model for additional carbon sink
- Development of forest-based adaptation and mitigation strategies against the climate change in the vulnerable landscapes/ecosystem
- Dissemination of new knowledge and technology related to climate change assessment, adaptation and mitigation
- Research to support policy related to climate change (state/national) to facilitate domestic and additional funds from developed countries to implement mitigation and adaptation action in view of resource required and resource gap

6.2.4 National Biodiversity Targets, 2014:

National Biodiversity Action Plan, 2008 was prepared by India prior to the adoption of the CBD Strategic Plan for Biodiversity 2011-2020 and its 20 Aichi Biological diversity Targets. Accordingly, an addendum to the National Biological diversity Action Plan was prepared by India in 2014 and submitted to CBD. It consists of 12 national biological diversity targets which are related to awareness generation about the values of biodiversity and its conservation, integration of biodiversity values in national and state planning processes, development programmes and poverty alleviation strategies, strategies for reducing rate of degradation and loss of all natural habitats, management of invasive alien species, sustainable management of forests etc., conservation of species-specific ecological areas, maintenance of genetic diversity of cultivated plants, farm livestock, and their wild relatives, valuation of ecosystem services, access to genetic resources and the fair and equitable sharing of benefits arising out of utilization, and documentation and strengthening of traditional knowledge related to biodiversity. Role of ICFRE will be in the following:

- Capacity building and generating awareness on importance of biodiversity and its conservation
- Research on amelioration of degraded land and eco-rehabilitation of overburden dumps, mine-spoils and other fragmented/degraded ecosystems
- Research on management of invasive alien plant species
- Research on management of forest for structural and functional diversity and flow of

ecosystem services

- Documentation, collection and conservation of forest genetic resources
- Preparation of database of traditional knowledge associated with forest resources

6.2.5 Land degradation and neutrality targets:

India is committed to achieving its land degradation neutrality target by 2030. Country is vowed to make five million hectares of degraded land fertile in next 10 years. This target is part of countrys' ongoing effort to restore 13 million hectares of degraded and deforested land by 2020 and an additional eight million hectares raising the targets for restoration to 21 million hectares by 2030. During CoP 14 of UNCCD during 2019 at New Delhi, the Hon'ble Prime Minister of India announced further restoration of 5 million hectares thus raising the total target for restoration of degraded lands to 26 million hectares by 2030. ICFRE institutes will intervene in the following areas:

- Capacity building of stakeholders (mining industries, forest department etc.) on restoration of degraded land.
- Research on restoration of landscape for increased flow of ecosystem services and building resilience to climate change
- Research on economics of land degradation
- Identification of the area vulnerable to land degradation, and mitigative measures
- Research to support policy (central and state govt.) on integrated landscape management for sustainable development, ecosystem services and resilience to climate change
- Development of knowledge base on sustainable land management and restoration

6.2.6 National Agro-forestry Policy, 2014:

The policy emphasizes the environmental contribution of agroforestry by preventing deforestation, and promoting carbon storage, biological diversity conservation through reducing pressure on natural forests, and soil and water conservation. Agroforestry also provides livelihood opportunities to the rural as well as urban communities. Forestry research needs to be focused on productivity through:

- Promotion of agroforestry through, planting stock improvement and improved agroforestry models,
- Extension of the agroforestry models and associated varieties developed by ICFRE through trainings and capacity building and related services
- Improving famers' access to quality planting material
- Research for promoting sustainable agroforestry for renewable biomass-based energy

6.2.7 Green Highway Policy, 2015:

The vision of the Green Highway Policy 2015 is to “develop eco friendly National Highways

with participation of the community, farmers, NGOs, private sector, institutions, government agencies and the forest departments. Documentation of species to be planted along National Highways". The Council can provide support in:

- Development of policy framework for plantation along the national and state highways
- Identification of the suitable species for plantations to reduce air pollution, dust, noise pollution, soil erosion, prevention of glare and moderating the impact of glare and radiation, at the same time facilitating and supporting the native biodiversity
- Improving access to quality planting material

6.2.8 India's National REDD+ Strategy 2018:

The objective of National REDD+ Strategy is to facilitate implementation of REDD+ programme in the country in conformity with relevant decisions of UNFCCC. The strategy focuses on creation of trained human resource capable of carrying out forest related measurements at all levels of REDD+ implementation. The strategy will support empowerment of youth cadres as Community Foresters, which can be engaged effectively in assisted natural regeneration, soil and moisture conservation, harvesting, thinning and hygienic removals, forest nurseries and raising of quality planting stocks, prevention and control of forest fires, pests and diseases and spread of invasive alien plant species through green skill development. Forestry research needs to be focused on:

- Research on identification of drivers of deforestation and degradation and strategy for implementation of REDD+
- Research to support the National and State REDD+ policy
- Capacity building of human resource to undertake forest-based measurements at all levels of implementation of REDD+
- Preparation of policy documents (for centre and states) in accordance to UNFCCC requirements
- Development of Forest Reproductive Material (FRM) Certification Policy-cum-Strategy
- For increasing forest productivity, research in following sectors is recommended:
 - Forest inventory including growth yield assessment of forest products,
 - Increasing forest productivity through forest genetic resource management and tree improvement
 - Ecosystem services
 - Biodiversity conservation,
 - Reclamation of degraded and mined areas for ecological security,
 - Integrated pest management,
 - Invasive alien species management,
 - Forest fires,

- Forest hydrology and
- Carrying capacity of ecosystems

6.2.9 National Bamboo Mission:

The emphasis of revamped National Bamboo Mission (NBM) is on propagation of quality plantation of bamboo of the required species, product development and value addition including primary processing and treatment; micro, small and medium enterprises as well as high value products; markets and skill development, thus ensuring a complete value chain for growth of the bamboo sector to boost bamboo based industry which would also have a ripple effect on rural economy. ICFRE through R&D interventions can help in partially achieving the objectives of the NBM which are:

- To increase the area under bamboo plantation in non forest Government and private land to supplement farm income and contribute towards resilience to climate change as well as availability of quality raw material requirement of industries. The bamboo plantations will be promoted predominantly in farmer's fields, homesteads, community lands, arable wastelands, and along irrigation canals, water bodies etc.
- To improve post-harvest management through establishment of innovative primary processing units near the source of production, primary treatment and seasoning plants, preservation technologies and market infrastructure
- To promote product development keeping in view market demand, by assisting R&D, entrepreneurship & business model at micro, small and medium levels and feed bigger industry
- To rejuvenate the under developed bamboo industry in India
- To promote skill development, capacity building, awareness generation for development of bamboo sector from production to market demand
- To realign efforts so as to reduce dependency on import of bamboo and bamboo products by way of improved productivity and suitability of domestic raw material for industry, so as to enhance income of the primary producers

6.3 International commitments

6.3.1 United Nations Framework Convention on Climate Change (UNFCCC):

The objective of the Convention is to stabilize greenhouse gas concentrations at a level that would prevent dangerous anthropogenic interference with the climate system. It states that such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner. India ratified UNFCCC on 1st November 1993 and ratified its Paris Agreement on 2nd October 2016 which aim "to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and

impacts of climate change; increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production, and making finance flows consistent with a pathway towards low greenhouse gas emissions and climate resilient development”.

UNFCCC agreements on REDD⁺ (reducing emission from deforestation and forest degradation in developing countries (REDD) along with conservation, sustainable management of forests and enhancement of forest carbon stocks) encourages developing country parties to contribute to mitigation actions in the forest sector by undertaking the activities, i.e., (a) Reducing emissions from deforestation; (b) Reducing emissions from forest degradation; (c) Conservation of forest carbon stocks; (d) Sustainable management of forest; and (e) Enhancement of Forest Carbon Stock. REDD⁺ is now widely recognized as financial incentive to the communities for their contribution in reducing greenhouse gas emissions from forests by encouraging aforesaid activities.

6.3.2 Convention on Biological Diversity (CBD):

Main objectives of the CBD are conservation of biological diversity, sustainable use of the components of biological diversity and, fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

India ratified the Convention on 18th February 1994. India also ratified its successive off shoots i.e. Cartagena Protocol on Bio-safety to ensure the safe handling, transport and use of living modified organisms resulting from modern biotechnology that may have adverse effects on biological diversity, and Nagoya Protocol on access and benefit sharing ratified on 9 October 2012. Aichi biodiversity Targets are the outcomes of Nagoya Protocol. This includes 20 targets organized under five goals named under Aichi Biodiversity Targets to address the underlying causes of biodiversity loss, reduce the pressures on biodiversity, safeguard biodiversity at all levels, enhance the benefits provided by biodiversity, and provide for capacity building. Following are five goals of Aichi biodiversity targets:

- Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society
- Reduce the direct pressures on biodiversity and promote sustainable use
- Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity
- Enhance the benefits to all from biodiversity and ecosystem services
- Enhance implementation through participatory planning, knowledge management and capacity building

6.3.3 United Nations Convention to Combat Desertification (UNCCD):

India ratified the convention on 17th December 1996. The objective of this Convention is to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, particularly in Africa, through effective action at all

levels, supported by international cooperation and partnership arrangements, in the framework of an integrated approach which is consistent with Agenda 21, with a view to contributing to the achievement of sustainable development in affected areas. UNCCD 2018–2030 Strategic Framework has following objectives:

- To improve the condition of affected ecosystems, combat desertification/land degradation, promote sustainable land management and contribute to land degradation neutrality
- To improve the living conditions of affected populations
- To mitigate, adapt to, and manage the effects of drought in order to enhance resilience of vulnerable populations and ecosystems
- To generate global environmental benefits through effective implementation of the UNCCD

The Land Degradation Neutrality (LDN) Target setting programmes in synergy with the SDG target 15.3 which states “by 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world”.

6.3.4 United Nation Forum on Forest (UNFF):

The main objective of UNFF is “the management, conservation and sustainable development of all types of forests and to strengthen long-term political commitment to this end”. Under this, United Nations Strategic Plan for Forests provides a global framework for action at all levels to sustainably manage all types of forests and trees outside forests, and to halt deforestation and forest degradation. Following are six global forest goals and 26 associated targets to be achieved by 2030:

- Reverse the loss of forest cover worldwide through sustainable forest management, including protection, restoration, afforestation and reforestation, and increase efforts to prevent forest degradation and contribute to the global effort of addressing climate change
- Enhance forest based economic, social and environmental benefits including by improving the livelihoods of forest dependent people.
- Increase significantly the area of protected forests worldwide and other areas of sustainably managed forests, as well as the proportion of forest products from sustainably managed forests.
- Mobilize significantly increased, new and additional financial resources from all sources for the implementation of sustainable forest management and strengthen scientific and technical cooperation and partnerships
- Promote governance frameworks to implement sustainable forest management, including through the United Nations forest instrument, and enhance the contribution of forests to the 2030 Agenda for Sustainable Development

- Enhance cooperation, coordination, coherence and synergies on forest related issues at all levels, including within the United Nations system and across member organisations of the collaborative partnerships on Forests, as well across sectors and relevant stakeholders.

6.3.5 Bonn Challenge:

The Bonn Challenge is a global effort launched in 2011 by the Government of Germany and IUCN. The main aim of this challenge is to bring 150 million hectares of the world's deforested and degraded land into restoration by 2020 and 350 million hectares by 2030. It is the forest landscape approach (FLR) which aims to restore ecological integrity at the same time as improving human well-being through multifunctional landscapes. Under this challenge, Government of India has pledged to bring 13 million hectares of degraded land under restoration by 2020 and an additional 8 million hectare by 2030.

ICFRE institutes made significant contribution in restoration of mined degraded lands and also developed restoration models for limestone mined out areas, coal mined out areas, rock phosphate mined out areas, masonry stone mined out areas, iron & uranium mined out areas, landslide stabilization and sodic soil restoration, sand dune stabilization; rehabilitation of salt land; reclamation of water logged areas; improvement of common property resources-oran and gauchers and agroforestry research in dry areas.

6.3.6 Sustainable Development Goals:

In September 2015, the General Assembly of United Nations adopted the 2030 Agenda for Sustainable Development that includes 17 Sustainable Development Goals with 169 targets for achieving sustainable development for all. SDGs came into effect on 1st January 2016 and address the global challenges related to poverty, inequality, climate, environmental degradation, prosperity, and peace and justice.

The 17 SDGs and 169 targets are part of the 2030 Agenda for Sustainable Development adopted by 193 Member States at the UN General Assembly Summit in September 2015. These goals are the result of an unprecedented consultative process that brought national governments and millions of citizens from across the globe together to negotiate and adopt the global path to sustainable development for the next 15 years.

ICFRE thrust areas of research on managing forest and forest products for livelihood support and economic growth, biodiversity conservation and ecological security, and forests and climate change are linked for providing necessary inputs to the Government of India for achieving the SDG goal 13 (take urgent action to combat climate change and its impacts) and SDG 15 (protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat, desertification, and halt and reverse land degradation and halt biodiversity loss).

Table 6: Linkages of ICFRE thrust areas, themes and prioritized research issues with National Goals

S.No.	National Commitments	Thrust areas of ICFRE	Themes of ICFRE	Prioritized research issues
1	Draft (2018) National Forest Policy	<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 5. Forestry Education 	<ul style="list-style-type: none"> • Tree Improvement • Vegetative propagation • Biotechnology • Integrated pests and disease Management • Application of microbes in Forestry • Seed science and technology • Weeds and Invasive Species • Forest fire and grazing • Forest soils and land Reclamation • Forest ecology • Environment management • Biodiversity conservation • Forest economics • Conservation of forest genetics resources • Forest hydrology • Watershed management • Wetland and marine ecology • Climate change and forests • Policy and legal Issues • Improving formal forestry education • Networking of forestry education with research and extension • Capacity building of scientific and management cadre 	<ul style="list-style-type: none"> • Enhancing forest productivity • Trees outside forest (TOF) • Forest health • Soil health • Developing bamboo sector • Forest management • Biodiversity conservation • Forest ecosystem services • Forest management • Conservation of forest genetics resources • Hydrological function of forests • Forests and climate change • Forest policy research • Forestry education
2	National Action Plan on Climate Change	<ol style="list-style-type: none"> 1. Forests and Climate Change 2. Forestry Extension for taking research to people 	<ul style="list-style-type: none"> • Climate change and forests • Forest soil and land reclamation • Collection, compilation and publication of forestry reports / journals • Dissemination of developed technologies • Evolving and coordinating comprehensive extension strategies in Forestry Research • Consultancy services 	<ul style="list-style-type: none"> • Forest and climate change • Biodiversity conservation • Hydrological functions of forests • Forest health • Soil health • Extension and livelihood

<p>3</p> <p>Nationally Determined Contributions</p>	<p>1. Managing Forest and Forest Products For Livelihood Support and Economic Growth</p> <p>2. Forests and Climate Change</p> <p>3. Forest Genetic Resource Management and Tree Improvement</p>	<ul style="list-style-type: none"> • Tree Improvement • Vegetative propagation • Biotechnology <p>Social forestry, agroforestry, farm forestry</p> <ul style="list-style-type: none"> • Climate change and forests • Policy and legal Issues 	<ul style="list-style-type: none"> • Enhancing forest productivity • Trees outside forest (TOF) • Developing bamboo sector • Forests and climate change • Forest policy research
<p>4</p> <p>National Biodiversity Targets 2014</p>	<p>1. Managing Forest and Forest Products For Livelihood Support and Economic Growth</p> <p>2. Biodiversity Conservation and Ecological Security</p>	<ul style="list-style-type: none"> • Biodiversity Conservation • Conservation of forest genetic resources • Forest ecology • Weeds and Invasive Species • Ethnic and traditional knowledge systems • NTFP resource development • Forest economics • Participatory forest management • Sustainable forest management (SFM) • Bio-prospecting and Bio-piracy • Forest soils and land reclamation • Environment management 	<ul style="list-style-type: none"> • Biodiversity conservation • Forest ecosystem services • Conservation of Forest Genetic Resources • Non wood forest produce • Soil health • Forest management • Bio-prospecting of forest resource
<p>5</p> <p>Land Degradation Neutrality Targets</p>	<p>1. Managing Forest and Forest Products For Livelihood Support and Economic Growth</p> <p>2. Biodiversity Conservation and Ecological Security</p> <p>3. Forests and Climate Change</p>	<ul style="list-style-type: none"> • Forest soils and land reclamation • Policy and legal issues • Climate change and forests • Biodiversity conservation 	<ul style="list-style-type: none"> • Biodiversity conservation • Soil health • Forest management • Climate change and forest • Forest policy research
<p>6</p> <p>National Agroforestry Policy 2014</p>	<p>1. Managing Forest and Forest Products For Livelihood Support and Economic Growth</p> <p>2. Forest Genetic Resource Management and Tree Improvement</p>	<ul style="list-style-type: none"> • Tree improvement • Vegetative propagation • Biotechnology • Social forestry, agroforestry, farm forestry • Food security • Integrated pests and disease management • Application of microbes in forestry • Seed science and technology • NTFP resource development • Forest certification • Bio-fuels and Bio-energy 	<ul style="list-style-type: none"> • Trees outside forest (TOF) • Enhancing forest productivity • Developing bamboo sector • Non wood forest produce • Forest and climate change • Important tree species to be studied • Extension and livelihood

7	<p>Green Highways Policy 2015</p>	<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"> • Tree improvement • Vegetative propagation • Social forestry, agroforestry, farm forestry • Seed science and technology • Biotechnology • Policy and legal issues • Biodiversity conservation 	<ul style="list-style-type: none"> • Forest policy research • Trees outside forest (TOF) • Developing bamboo sector • Biodiversity conservation • Important tree species to be studied • Forest ecology
8	<p>National REDD+ Strategy 2018</p>	<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"> • Social forestry, agroforestry, farm forestry • Participatory forest management • Forest certification • Forest hydrology • Food security • Integrated pest and disease management • Weeds and invasive species • Forest fire and grazing • Policy and legal issues • Biodiversity conservation • Forest soil and land reclamation • Tree improvement • Vegetative propagation • Biotechnology • Forest ecology 	<ul style="list-style-type: none"> • Biodiversity conservation • Forest ecosystem services • Hydrological functions of forests • Enhancing forest productivity • Developing bamboo sector • Non wood forest produce • Forest management • Forest policy research • Trees outside forest (TOF) • Extension and livelihood
9	<p>National Bamboo Mission: Bamboo and Skill Development</p>	<ol style="list-style-type: none"> 1. Managing Forest and Forest Products For Livelihood Support and Economic Growth 2. Forest Genetic Resource Management and Tree Improvement 	<p>Silviculture</p> <p>Wood science and technology</p> <p>Chemistry of forest products</p> <p>Wood based industries</p> <p>Tree improvement</p> <p>Vegetative propagation</p> <p>Biotechnology</p> <p>Food security</p>	<ul style="list-style-type: none"> • Developing bamboo sector • Forest management • Wood utilization and panel products • Forest based industries • Extension and livelihoods

Table 7: Linkages of International commitments of India with ICFRE thrust areas, themes and prioritized research issues

S. No.	International commitments	Thrust areas of ICFRE	Themes of ICFRE	• Prioritized research issues
1	<p>United Nation Framework Convention on Climate Change (UNFCCC)</p>	<p>1. Managing Forest and Forest Products For Livelihood Support and Economic Growth 2. Biodiversity Conservation and Ecological Security 3. Forests and Climate Change</p>	<ul style="list-style-type: none"> • Silviculture • Social forestry, agroforestry, farm forestry • Sustainable forest management (SFM) • Participatory forest management • Seed science and technology • Forest certification • Food security • NTFP resource development • Integrated pests and disease management • Weeds and invasive species • Biodiversity conservation • Ethnic and traditional knowledge systems • Forest soils and land reclamation • Wetland and marine ecology • Watershed management • Climate change and forests • Forest ecology • Environment management 	<ul style="list-style-type: none"> • Forests and climate change • Biodiversity conservation • Forest ecosystem services • Non wood forest produce • Forest health • Soil health • Forest management • Trees outside forest (TOF)
2	<p>Convention on Biological Diversity (CBD)</p>	<p>1. Biodiversity Conservation and Ecological Security</p>	<ul style="list-style-type: none"> • Forest ecology • Biodiversity conservation • Conservation of forest genetic resources • Biotechnology • Sustainable forest management (SFM) • Participatory forest management • Forest ecology 	<ul style="list-style-type: none"> • Biodiversity conservation • Forest ecosystem services • Forest management • Conservation of forest genetic resources • Forest ecosystem services
3	<p>United Nations Convention to Combat Desertification (UNCCD)</p>	<p>1. Managing Forest and Forest Products For Livelihood Support and Economic Growth 2. Biodiversity Conservation and Ecological Security 3. Forests and Climate Change</p>	<ul style="list-style-type: none"> • Biodiversity conservation • Forest hydrology • Forest soil and land reclamation • Forest ecology • Climate change and forests • Environment management 	<ul style="list-style-type: none"> • Biodiversity conservation • Forest ecosystem services • Forest management • Forest and climate change • Hydrological functions of forests • Soil health

S. No.	International commitments	Thrust areas of ICFRE	Themes of ICFRE	• Prioritized research issues
4	United Nation Forum on Forest (UNFF)	<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 	<ul style="list-style-type: none"> • Silviculture • Social forestry, agroforestry, farm Forestry • Sustainable forest management (SFM) • Forest economics • Forest biometrics and yield modelling • Participatory forest management • NTFP resource development • Bio-prospecting and bio-piracy • Seed science and technology • Forest certification • Food security • Biodiversity conservation • Forest ecology • Environment management • Climate change and forests 	<ul style="list-style-type: none"> • Forests and climate change • Biodiversity conservation • Forest ecosystem services • Forest management • Forest health • Soil health
5	Bonn Challenge	<ol style="list-style-type: none"> 1. Managing Forest and Forest Products For Livelihood Support and Economic Growth 2. Biodiversity Conservation and Ecological Security 	<ul style="list-style-type: none"> • Forest soils and land reclamation • Sustainable forest management (SFM) 	<ul style="list-style-type: none"> • Forest management • Soil health
6	Sustainable Development Goals	<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 	<ul style="list-style-type: none"> • Forest soils and land Reclamation • Sustainable forest management (SFM) • Forest ecology • Environment management • Climate change and forests 	<ul style="list-style-type: none"> • Forests and climate change • Biodiversity conservation • Forest management • Soil health • Forest health

Annexures I-IV



Format for concept note of project (to be followed both for institution based projects and AICRPs)

1. Title: (It should be informative and distinctive; to be able to convey the essential theme of the proposed project)
2. Research Problem (200 words): (A short summary of the research problem. It may address two guiding questions (1 – Why it is crucial to address the problem identified?. 2 – What has already been done to solve the problem both at national and global level?)
\
3. Background (200 words): A concise review of the main research work and current issues in the specific subject area. What is already known about this specific subject? (Brief description).
4. Objectives: They should relate to the more general aims/objectives of the proposed research.
5. Methodology: Outline the proposed methodology for conducting the research (in brief may be 100-120 words)
6. Outputs: Outputs should be directly related to the project objectives. Typically they could be tangible items, like creation of technical facility, benefits to various stakeholders of the sector, new knowledge to be generated, publication of information materials (technical manuals/booklets). Depending on project objectives intangible items might also be mentioned, such as awareness creation, etc.
7. Project Timeframe: Duration of the project, proposed project start date.
8. Principal Investigator/Project Coordinator (and other associates/participating Institutions, if applicable): Provide name(s) and full contact details.

Format for submission of institute based research projects

The proforma for Institution based stand alone projects is divided into two sections. Section I is for general information requirements by ICFRE about the project proposal. Section II deals with actual project format. Efforts have been made to design Section II in such a way that it meets the requirements of most of the funding agencies. In case the project submitted to RPC for ICFRE plan funding is recommended for funding from other funding agencies, the same can be done with minor changes in the existing format.

Section I

(Deals with general ICFRE requirements)

Project Title	
Thrust Area of ICFRE (Forestry)	
Theme of ICFRE (subject / theme)	
Name of Species (wherever applicable)	
Field of Study – key area of study (e.g. bio-prospecting of fungus)	
Name of Principal Investigator	
Name of Co-PIs	
Name of ICFRE institute and division / divisions	
Name of other participating ICFRE institute and division / divisions	
Name of participating organization / institute outside ICFRE (if any)	
Duration of the Project	
Likely date of start	
Budget outlay of ICFRE institutes	
Total budget outlay of the project	
Whether, the project is a follow up of any previous project. If yes, what were the leads / outcomes	

Section II

(Project Format)

1. Title of the project:
2. Introduction (including how the problem originated):
3. Background status - National and International (Backward linkages and status of past work linking it to the present):
4. Objectives of the project (both long term and short term):
5. Current status – national:
6. Current status – international:
7. Gap area (s) identified between international and national review status:
8. How this project will address the identified research gap at the end of project (establish relation between project objectives and identified gap areas):
9. Premise and justification of taking up the project:
10. Novelty of the project/ innovative aspect:
11. Duration of the project:
12. Total budget outlay (Total cost in Rs):
13. Name and designation of Scientific and Technical Personnel associated with the project (institute wise if more than one institutes are involved):
 - a. Project leader
 - b. Co- project Investigators
 - c. Associates
 - d. Supporting staff (existing)
 - e. Additional staff required (RA / SRF / JRF/ SPA / JPA/ PA / FA) (Role of each additional staff required)
14. Collaborating Institutions, if any:
15. Work plan (detailed plan of granulation of research problem into work elements, time lines for each work element):
16. Approaches / detailed methodologies / proposed experimentations of the research work / plan:
17. Time-lines (milestones) – linking objectives to activity, activity to output and output to deliverable from the project (appointment of project staff, purchase of consumable and equipments, literature survey are not to be considered as activities. The activities are to be main plan of research work):

18. Relevance of the project to the work already going on in the organization (ICFRE and other institutes as well):
19. Deliverables from the project:
20. Parameters for monitoring the progress of the project and effectiveness of the project:
21. Suggested plan of action for utilization of expected outputs from the project:
22. Suggestions for reproducibility and / or scaling-up of the research outcomes from the project:
23. Leadership to ICFRE:
24. Expected / foreseen risks of implementation of the project, if any:
25. Budget estimates (Rs in lakhs): (consolidated budget head wise and year wise budget). Separate table for each institute if more than one institute are involved. Consolidated table is to be given at the end.

S. No.	Budget heads	First year	Second year	Third year	Total
1	Fellowship (RA, SRF, JRF, SPA, JPA, FA, PA)				
2	Travel (including TA/ DA, Fuel etc)				
3	Material and supplies – M&S (consumables, glassware and chemicals)				
4	Forest Research Expenses (FRE)				
5	Capital (Equipment)				
	Note: <ol style="list-style-type: none"> 1. Casual daily labor is not to be included in the fellowship. Fellowship will be paid as per norms of ICFRE. 2. Capital will include only equipments and cost of spare parts of permanent nature. Cost of annual maintenance and maintenance of equipment is to be built in FRE. 3. No institutional and overhead charges are to be built in the ICFRE plan project funded by ICFRE. 4. Cost of conducting extension, demonstration, training, contingencies is to be built in subhead FRE. 				

1. Justification of budget (for each subhead and institute along with details of instrument proposed):
2. Action plan for extension of interim and final project outputs:
3. Chances of developing intellectual property (patents, variety, technology, knowhow):
4. Cost benefit analysis of the project:

DECLARATION

This is to certify that

- to the best of my knowledge the research work proposed in the project does not duplicate the work already done by any institute or individual.
- The project has been developed with full consultation among the project leader and the associates.

Signatures

1. Project Leader:

2. Associates:

Signature & comments of the Head of division:

Signature & comments of the Director of the institute

References and patent search:

Guidelines for All India Coordinated Research Projects

August 2017



**Indian Council of Forestry Research and
Education Dehradun**

Guidelines for All India Coordinated Research Projects (AICRPs) of ICFRE

ICFRE has made concerted efforts in furthering the cause of forestry research resulting in significant achievements and development of a strong scientific forestry research base in the country. The research conceptualization and execution methodology as adopted by the ICFRE at present, is project based, mostly following bottom to top approach and thus supporting research proposals conceived as per the scientific understanding, interest and expertise of the researchers. Also, the project proposals are influenced by the regional mandates and emergent local research problems of the institutes under the ICFRE umbrella. This approach has contributed in laying a strong foundation for the forestry research by scientific capacity building and generation of vast knowledge base. But in spite of innumerable success stories, the societal impact is comparatively limited. The fragmented outcome and short-term vision has resulted in lack of pursuance of long-term research objectives, thus, leading to the loss of valuable germplasm, know-how, and technologies etc., generated during the course of various studies. The R&D works should provide solution to the research problems in term of a complete package, thus addressing most of the aspects through an integrated holistic approach. By adopting an incremental course correction, the research problems are required to be addressed. Therefore, a coordinated approach in mission mode on most important priority research areas is required.

All India Coordinated Research Project (AICRP) is defined as a project, where more than one research institutes and disciplines are collectively involved to implement the identified objectives together. The emphasis is on networking of resources, capabilities and core competencies of participating institutions. Such projects are also sometimes referred as Network Projects (projects having shorter duration). However, for the sake of convenience all such projects (inter-institutional and inter-disciplinary) are also to be referred as AICRP here.

GENERAL GUIDELINES:

- 1. Scope & Priority:** The priority of AICRPs would be to develop output driven multidisciplinary programs for addressing priority species or research areas based proposals of national concern, wherein subject matter specialists from multi-disciplines will join hands to achieve targeted outputs. Such programs will be highly output driven flagship ventures of ICFRE. These AICRPs will be given priority over other ICFRE funded projects in terms of funding, manpower and implementation. AICRPs will be long term programs spanning over several years (5 years and more, normally five years). Short duration AICRPs will be supported for a period of about 3 years. These AICRPs will be multidisciplinary, multi-institutional and multi-locational in nature. There shall be a well laid down procedure of entry and exit of the Institutions/ disciplines/ organization as per the envisaged action plan. The institutes involved should commit themselves fully for the phase /component of the programme in which they are involved. Proper material transfer and IPR agreements shall be in place for executing the exit of an institute / organization.
- 2. Funding arrangements:** The AICRP will either be fully /partially funded by ICFRE and /or from other funding agencies. In case of joint /collaborative funding from other agencies, the project proposal will clearly identify the components to be taken up with ICFRE funding and those with funding from other agencies.

3. Participation of other organizations: In case the expertise is not available with ICFRE institutes or due to geographical location or other operational difficulties, other organizations in India can also be included in the AICRPs. Participation of such organizations will be governed by signing of an agreement / MOU. The broad format for the same is provided with these guidelines.

4. Status of standalone, inter and intra institutional Projects: Majority of ICFRE projects at present are stand alone projects. Institutes of ICFRE, therefore, will strive to have more of inter and intra institutional projects and reduce the number of standalone projects. ICFRE institutes, however, shall continue with limited number of small / standalone research projects to cater to emergent regional research needs or incubate new research ideas. The guidelines for these small projects are well established in the council and may require only minor course corrections from time to time, as and when required.

5. Conceptualization of All India Coordinated Research Projects (AICRPs): The problem of national importance proposed to be undertaken as AICRP will be identified by a Project Advisory Group (PAG) to be constituted by DG, ICFRE at ICFRE headquarters, headed by the Deputy Director General (Research) who will invite the concept notes / proposals on identified research problems / topics for AICRPs. Directors at their level can also submit concept notes for AICRPs to DDG(R) thus making it a two way communication. The PAG will short list the concept notes /proposals for developing AICRPs and will identify a subject matter specialist to be designated as National Project Coordinator (NPC) having sufficient experience of handling research projects in the relevant field and the lead institute. The constitution of PAG will be as under:

- | | | |
|--|---|------------------|
| 1. DDG(R) | – | Chairman |
| 2. DDG (Ext) | – | Member |
| 3. Dir (IC) | - | Member |
| 4. Two experts nominated by DG - Members | | |
| 5. ADG (BCC) | - | Member |
| 6. ADG (RP) | - | Member secretary |

(The composition of PAG can be changed according to the requirement as and when arise)

6. Concept Note: The National Project Coordinator (NPC) will prepare a concept note outlining the background, research gaps, significance, objectives, methodology and outcomes/ deliverables. The NPC will present it before the PAG and after the approval, will develop it into a detailed AICRP. The beneficiaries, stakeholders and extension strategy of the project outcome / deliverables should be clearly identified and defined. NPC can seek seed money for formulating the project, if required.

7. Project Formulation: The NPC will identify a Project Investigator (PI) in each participating institute in consultation with the PAG at ICFRE. The Principal Investigators in consultation with the NPC shall identify Co-investigators (Co-PI). This team will develop detailed project proposal including methodology, activities, outputs, expected outcomes, timelines and monitorable indicators. The NPC may convene brainstorming sessions and invite experts

and the investigators of the participating institutes for formulating the project. The detailed project will be assessed and recommended by the body to be called Project Expert Group (PEG) consisting of ICFRE officials and experts, as appointed by DG ICFRE for each proposal independently. AICRPs will not be required to be presented before RAG. The NPC will present the AICRP before Research Policy Committee (RPC). After the approval of RPC, the AICRP will be recommended for funding to ICFRE / or other funding organizations. The team of NPC and PIs, while formulating the project, will ensure that similar work if being carried out elsewhere (by ICFRE or other organizations) or has already been done (by ICFRE or other organizations) is not repeated here. Backward and forward linkages will be well established in the project. The novelty and leadership that the project will provide to ICFRE, has to be well spelt out in the project with clear cut milestones and deliverables during the progress and at the end of the project. Ongoing ICFRE funded projects, if proposed by project formulating team to be subsumed in the AICRP will, be so identified in the research proposal. On approval of RPC, the ongoing ICFRE funded project will become a part of the concerned AICRP and will cease to have independent existence. The NPC will clearly mention all such projects in AICRP proposal. The information of the same will be provided to Research Advisory Group (RAG) next year. All the components of the AICRP will have direct relevance to the deliverables and will not be included in isolation in the project.

8. Roles and Responsibilities of AICRP Team: National Project Coordinator will be the chief executive of the project. Principal Investigators will ensure execution of activities of the proposed project outputs and achievement of objectives allotted to their respective institutes with the assistance of identified Co-PIs and support staff. There shall be several multidisciplinary components with clear activities and deliverables. Co-PIs will be responsible for the execution of components / activities assigned to her / him by the NPC in consultation with the PI of the respective institute as per the project proposal. For the same objective / component being implemented at different institutes, among the PIs / Co-PIs, one PI / Co-PI, as identified by the NPC, will be designated as Component Coordinator (CC). The CC will be only for suggesting common protocol/methodology to NPC to be adopted by all the PIs/ Co-PIs of respective objective/ component for obtaining verifiable and reproducible results. However, the requirement of designating a CC may vary from project to project and in some cases, it may not be required at all. The composition of project team will, therefore, be based on the exact requirement of the project. CC will only be for suggesting methodologies to the NPC and will not in anyway control any part of the project independently, except for component for which she / he is responsible. The Co-PIs of the project will prepare the quarterly progress report of their component and will submit it to PI of their institute. The PIs will submit consolidated quarterly progress reports of their institute to NPC. The NPC will prepare a consolidated half yearly progress report for submission to ICFRE and the same will be presented by her / him before PEG and RPC for monitoring. The NPC will quarterly review the progress of the concerned AICRP with the PIs. However, the NPC will be in regular touch with the PIs. The duties of NPC, PIs, Co-PIs, CC are defined below in the tabular form.

S. No.	Project Executing Team	Composition of Team	Responsibilities of Project Team
1	National Project Coordinator (NPC)	Chief Executive of the project and will lead the project	ICFRE will identify NPC from the lead institute who will also be one of the PI of the project. He will prepare the concept note and develop the project. Other PIs and Co-PIs will be identified by him in consultation with ICFRE. He will be responsible for formation and execution of the project, submission of reports, utilization certificates and review of the progress as provided in guidelines for the AICRP
2	Principal Investigators (PI)	One PI from each participating institutes	PIs will be identified by NPC in consultation with ICFRE. They will develop the project along with NPC. PIs will be responsible for execution of the work assigned to the institutes, preparation of the reports, utilization certificate and will coordinate among the Co-PIs of the institute.
3	Co-Principal Investigator (Co-PI)	Co-PIs can be more than one from an Institute	Co-PIs will be responsible for the execution of the work assigned to the Institute and the component in particular to him. Requirement of the Co-PIs will be as per the mandate of the project.
4	Component Coordinator (CC)	CC will be from the PIs of the project	This arrangement may be required in some of the AICRPs to help NPC in developing uniform protocols for components which are implemented in more than one institute. However, such arrangement will be at the discretion of the NPC.

- 9. The IPR issues and agreement / MoU requirements:** The NPC and PIs will devise a mechanism of information sharing and address IPR issues in order to protect the rights and interest of teaming scientists. Joint management of intellectual property generated from joint research/efforts, from the collaborative project shall be applicable, which shall include its protection, maintenance and the commercialization. Each team scientist shall have the right to publish the results emanating from the project component he or she is handling. However, it will be in the interest of all, that before any such publication(s) of the results of the AICRP, the teaming scientists shall ensure in consultation amongst themselves that no rights are compromised. The publications resulting from the project shall bear the names of all the team scientists handling the component of the project,

unless any team scientist explicitly declines to be named. All publications / IPR emerging out of the project shall duly bear the name of the project. The IPR and technologies /processes developed will be maintained by the institute filling the IPR on behalf of the participating institutes and ICFRE. In case of any dispute, decision of the Project Expert Group will be final and will be abided by all the participants.

10. **Deliverables:** The project proposals are required to include targeted outputs and deliverables over the period of the project. Objectives of the projects must be linked to measurable outputs, outputs to be linked to monitorable activities and further to be linked to final one or two goals i.e. deliverables.
11. **Review Committee:** A Review Committee (RC) of the project comprising of the National Project Coordinator, Principal investigators (PI) of each of the institutes / collaborators shall review the progress of the project atleast once in 3 months. The progress report approved by the Chairman (NPC) of the specific meeting shall be submitted to PEG within 4 weeks of the review meeting. The meetings of the Review Committee shall be facilitated and convened by the Lead institute or as deemed fit by the concerned NPC. As far as feasible the review shall be held through video conferencing.

In the absence of the chairman (NPC) due to unavoidable reasons, the members present (PIs) in the meeting shall elect one of the members to chair the specific meeting. In the event PI is not available, the meeting will be attended by Co-PI.

The major 'Terms of Reference' of the Review Committee (RC) would be:

- To evolve suitable monitorable parameters
- Review the physical progress of the project for achievement of the monitorable parameters on quarterly basis
- Assess and advise the mid-term course change/corrections in the project required to achieve the desired objectives
- Review the utilization of funds/financial progress
- Recommend for additional release of funds, inclusion/exclusion of institutes, deletion of an activity, foreclosure of the project etc.
- Provide half yearly reports to PEG on the progress of the project

12. Roles of Directors and Group Coordinator Research (GCR) of participating institutes:

As is done for the others projects, Directors and GCRs of the institutes will continue monitoring of the components of the project that are being handled by his / her institute in the respective AICRPs and submit an independent six monthly report to ICFRE headquarter.

13. **Monitoring of AICRP by Project Expert Group (PEG):** Headed by the DDG (R), the monitoring of AICRP will be carried out by Project Expert Group (PEG is same for recommending AICRP for approval and will also carry out monitoring) every six months. The ADG (M&E) will act as the convener and will also prepare proceedings of the meeting. The annual progress of the project will also be presented before RPC. The major activities of the PEG would be:

- To assess the monitorable parameters
- Assess the physical progress of the project
- Review the utilization of funds/financial progress
- Submit the recommendations to DG, ICFRE for additional release of funds, inclusion/exclusion of institutes, deletion of an activity, foreclosure of the project etc., if required.
- Provide annual reports to DG ICFRE / DDG(R) on the progress of the project

14. The composition of the Project Expert Group (PEG) will be as under. A minimum of 2/3 members will constitute the quorum (members at b, c and e must be present).

- | | |
|---|-------------|
| a. Deputy Director General (R), ICFRE | – Chairman |
| b. At least two Subject Matter Experts | – Members |
| c. National Projector Coordinator (NPC) | – Presenter |
| d. Assistant Director General (RP) ICFRE | – Member* |
| e. Assistant Director General (M&E) ICFRE | – Convener* |
| f. Principal Investigators (PI) | – Presenter |

*Till the formation and approval of the projects ADG (RP) will be the convener. On the initiation of implementation phase ADG (M&E) will be the convener till the completion of the project. The composition of PEG can be changed according to the requirement as and when arise.

15. Release of funds

After the approval of AICRP by RPC and DG ICFRE, an executive order and financial sanction shall be issued by the ICFRE Hqrs. The institute wise, head wise and year wise release of funds from ICFRE shall be made on the basis of approved project outlay. A separate lump-sum provision will be made for monitoring of AICRPs by Directorate of Research. The budget allotment for AICRPs will be made by ICFRE headquarters to respective Directors on the recommendations of NPC. The Directors will place the funds at the disposal of PIs of AICRPs under intimation to NPC. There shall be no diversion of funds assigned for AICRP at the level of the institutes without permission from ICFRE. Within the institute, the PI will make the budget available to each Co-PI as per the approved budget outlay.

ICFRE will release funds as per the phasing of expenditure provided in approved project document subject to adjustment of expenditure in previous years. The NPC will provide details of head-wise and actual expenditure of previous years in respect of all the participating institutes duly authenticated by the accounts officers of respective institutes in the Form 19(A).

Changes in budget allotment to the participating institutes can be recommended by the NPC based on the physical progress of the works and targets achieved and financial utilization. Due process of standard budget utilization will be followed. NPC and respective institutes will maintain a separate account of expenditure for each AICRP.

- 16. Reporting:** The PIs / Investigators from the institutes shall make periodic progress and financial reports, Utilization Certificates (UCs in Form 19(A)), as outlined in the sanction to NPC under intimation to Director of the Institute. The National Project Coordinators will compile these reports and submit them to ICFRE Hqs.
- 17. Dissemination of project findings:** A workshop will be organized by the National Project Coordinator where all the concerned departments and other stakeholders in that sector would be invited to participate. The project implementing team in joint authorship with ICFRE should suitably publish the outcomes of the study. Apart from the workshop, an endeavor would be made to publish the findings in professional journals/books, News bulletins etc. Results will also be put on the website of ICFRE and other related websites.
- 18. Enclosures with the guidelines**
- Annexure – III (i): AICRP Format (Broad Format is given)
 - Annexure – III (ii): Format for Utilisation Certificate
 - Annexure – III (iii): Broad format for agreement/MoU between partners and/or funding agencies (May have to be modified according to requirement of the project)

List of Abbreviations used

ICFRE	Indian Council of Forestry Research and Education
RAG	Research Advisory Group
RPC	Research Policy Committee
AICRP	All India Coordinated Research Project
PAG	Project Advisory Group
PEG	Project Expert Group
DG	Director General
DDG(R)	Deputy Director General (Research)
ADG(M&E)	Assistant Director General (Monitoring and Evaluation)
ADG(RP)	Assistant Director General (Research Planning)
GCR	Group Coordinator Research
NPC	National Project Coordinator
PI	Principal Investigator
Co-PI	Co Principal Investigator
CC	Component Coordinator
RC	Review Committee
UC	Utilization Certificate
MOU	Memorandum of Understanding

**All India Coordinated Research Project Format
Project Title**

Project Proposal

Prepared by

The Expert Group

for

Indian Council of Forestry Research and Education, Dehradun

1. Preamble
2. Executive summary
3. Title of the project
4. Introduction
5. Background status (Backward linkages and status of past work linking it to the present work proposed. Any meetings held in relation to preparation of project and their recommendation. E.g. brain storming session, stakeholder's consultation, and recommendations of experts groups)

6. Objectives of the project

The broad objectives of this research proposal are as follows. The institutional linkages are shown in Flow Chart I. (say 1 to 13 objectives depending on the project requirement)

Phase I activity (duration: X years) : Objectives say 1 to 13 (If different objectives have different time periods the same can be mentioned here, although the complete project may be of X years)

7. Current status – national
8. Current status -international
9. Premise and justification for undertaking the project
10. Novelty of the project
11. The proposed work plan including methodology (Project components)

Project Duration:

Project outlay:

(Note: The outputs of the projects should flow from the objectives of the project and vice – versa. Activities are to be planned in such a way that they lead to delivery of the outputs and are moniterable as reflected in the milestone chart below)

Output 1

Activity 1.1

Output 2

Activity 2.1

Activity 2.2

Output 3

Activity 3.1

Activity 3.2

Activity 3.3

Output 4

Activity 4.1

Output 5

Activity 5.1

Activity 5.2

Activity 5.3

Activity 5.4
Activity 5.5

Output 6

Activity 6.1
Activity 6.2
Activity 6.3

Output 7

Activity 7.1
Activity 7.2

Output 8

Activity 8.1
Activity 8.2

Output 9

Activity 9.1
Activity 9.2
Activity 9.3

Output 10

Activity 10.1
Activity 10.2
Activity 10.3

Output 11

Activity 11.1
Activity 11.2

Output 12

Activity 12.2

12. Networking of the institutions/laboratories along with their capabilities:

The networking of research institution/ industries that will be created while pursuing this programme is shown in Flow Chart 1.

13. Deliverables

Year 1

Year 2

Year 3

Year 4

Year 5

14. Milestones to be monitored (give six monthly)

Work plan for complete project period. Table here is just indicative for 2 years (milestones)

Output/activities	Year 1				Year 2			
Output 1 (Give name of output)								
Activity 1.1 (Give name of activity)	■	■	■					
Output 2								
Activity 2.1 (Give name of activity)		■	■	■	■	■	■	■
Activity 2.2		■	■	■	■	■	■	■
Output 3								
Activity 3.1		■	■	■				
Activity 3.2		■	■					
Activity 3.3		■	■	■	■	■		
Output 4								
Activity 4.1			■	■	■	■	■	
Output 5								
Activity 5.1		■	■	■	■	■	■	
Activity 5.2		■	■	■	■	■	■	
Activity 5.3			■	■	■	■	■	■
Activity 5.4					■	■	■	■
Activity 5.5					■	■	■	■
Output 6								
Activity 6.1	■	■	■					
Activity 6.2		■	■	■				
Activity 6.3			■	■	■			
Output 7								
Activity 7.1				■	■			
Activity 7.2					■	■		
Output 8								
Activity 8.1				■	■			
Activity 8.2					■			
Output 9								
Activity 9.1					■			
Activity 9.2					■			
Activity 9.3					■			
Output 10								
Activity 10.1	■	■	■	■	■	■	■	■
Activity 10.2	■	■	■	■	■	■		
Activity 10.3			■	■	■			
Output 11								
Activity 11.1					■	■		
Activity 11.2					■	■		
Output 12								
Activity 12.1						■	■	
Activity 12.2							■	■

15. Role of industry partners or stakeholder (if included in the project)
16. IPR (briefly describe the possibility of developing new IPR from this project)
17. Leadership perspective- briefly describe the global positioning of the technology and resultant leadership position and economic benefits to the country
18. Project component Co-ordinators (Examples are given here. The work of the component coordinator would be to suggest uniform methodologies for the project work to be used across the Institutes to National Project Coordinator)

- (a) Component 1:
Name of the Co-ordinator along with institute Name
- (b) Component 2:
Name of the Co-ordinator along with institute Name
- (c) Component 3:
Name of the Co-ordinator along with institute Name
- (d) Component 4:
Name of the Co-ordinator along with institute Name
- (e) Component 5:
Name of the Co-ordinator along with institute Name

Institution Abbreviation Key:

- Institute 1 (Inst 1)
- Institute 2 (Inst 2)
- Institute 3 (Inst 3)
- Institute 4 (Inst 4)
- Institute 4 (Inst 5)

BUDGET INSTITUTION WISE (RS IN LAKHS)

Name of the institute: Inst 1

Head of expenditure	1 st Year	2 nd Year	Total
Recurring			
Salary			
Consumables (M&S)			
Travel			
Field Research Expenses (FRE)			
Contingencies			
Non-recurring			
Equipment & Accessories			
Total			

Names of Equipments

Name of the institute: Inst 2

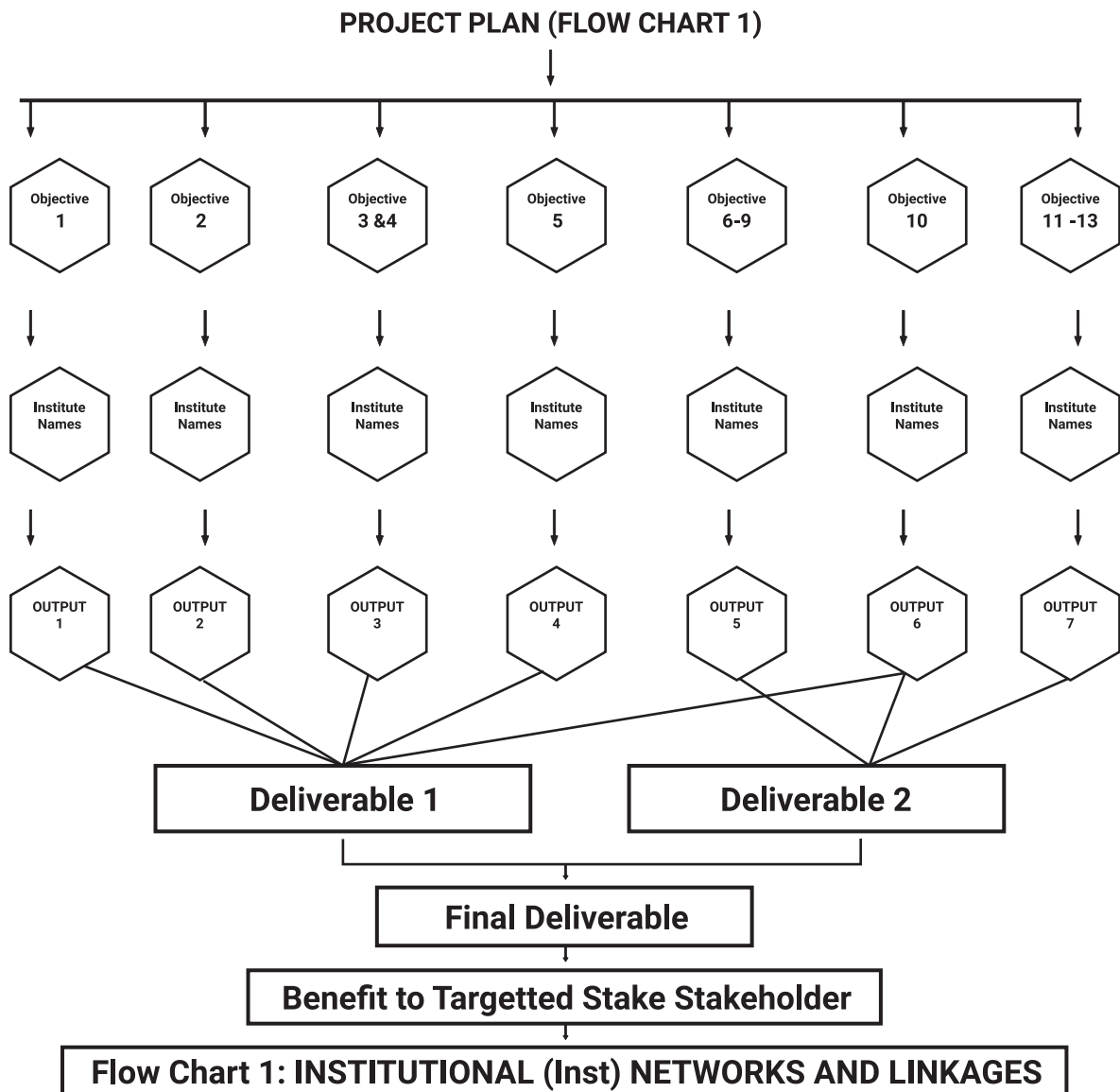
Head of expenditure	1 st Year	2 nd Year	Total
Recurring			
Salary			
Consumables			
Travel			
Field Research Expenses (FRE)			
Contingencies			
Non-recurring			
Equipment & Accessories			
Total			

Names of Equipments

Summary Budget Estimate For All Participants:

Head of expenditure	1 st Year	2 nd Year	Total
Recurring			
Salary			
Consumables			
Travel			
Field Research Expenses (FRE)			
Contingencies			
Non-recurring			
Equipment & Accessories			
Total			

References:



Annexure-III (ii)
(Form 1 to 3)

Form GFR 19-A

Form of Utilization Certificate

S. No.	Letter No. and date	Amount
	Total	

Certified that out of Rs. _____ of grant-in-aid sanctioned during the year _____ in favour of _____ under ICFRE Office Order No. given in the margin and Rs. _____ on account of unspent balance of the previous financial year, a sum of Rs. _____ has been utilized for the purpose of _____ for which it was sanctioned and that the balance of Rs. _____ remaining unutilized at the end of the year has been surrendered to ICFRE/ Government (vide no. _____ dated _____) /will be adjusted towards the grants-in-aid payable during the next year _____.

2. Certified that I have satisfied myself that the conditions on which the grants-in-aid was sanctioned have been duly fulfilled/are being fulfilled and that I have exercised the following checks to see that the money was actually utilized for the purpose for which it was sanctioned.

Kinds of checks exercised:

- 1.
- 2.
- 3.
- 4.
- 5.

Signature	Signature	Signature
Name	Name	Name
Designation	Designation	Designation
with date	with date	with date
(Competent Financial Authority)	(Principal Investigator)	(Head of the Institute)

Utilization Certificate for AICRP Project
For the Financial Year Ending 31ST March 20....
(Please submit in duplicate)

1. Title of the Project " _____ " (Order No– AICRP)
2. Name of the Institution _____
3. Principal Investigator(s) _____
4. ICFRE Office Order No. & Date _____ – AICRP
and ICFRE budget head of the Date: _____
sanctioning project
5. Amount brought forward from the previous financial year (if applicable) quoting ICFRE letter no. and date in which the authority to carry forward the said amount was given
 - i. Amount (Rs.) _____
 - ii. Letter No. & Date _____
6. Amount received during the financial year
 - i. Amount (Rs.): _____ Lakh
 - ii. Letter No. & Date: _____
 - iii. _____ | _____
7. Total amount that was available for expenditure during the above financial year (s.no. 5+6) Rs. _____ Lakh
8. Actual expenditure (including commitments) incurred / committed to be incurred during the above financial year Rs.
9. Balance amount available at the end of the financial year Rs.
10. Unspent balance refunded if any (please give details of cheque no. etc.) Rs.
11. Amount requested to be carried forward to the next financial year (if applicable with justification) Rs.

Utilization Certificate

1. Certified that out of Rs. _____ of grant-in-aid sanctioned and remitted during the financial year _____ in favour of _____ vide ICFRE Office Order No. _____ and Rs. _____ being the unspent balance of the previous financial year carried forward, a sum of Rs. _____ has been utilized for the purpose of the project activities for which it was sanctioned (detailed statement of expenditure enclosed) and that the balance of Rs. _____ remaining unutilized at the end of the year has been surrendered to ICFRE/ Government (vide no. _____ dated _____) /will be adjusted towards the grants-in-aid payable during the next year i.e. 200_ to 200_.

2. Certified that I have satisfied myself that the conditions on which the grants-in-aid was sanctioned have been duly fulfilled/are being fulfilled and that I have exercised the requisite checks to see that the money was actually utilized for the purpose for which it was sanctioned.

Signature
Name
Designation of
Principal (s) Investigator
with date

Signature
Name
Registrar/Accounts Officer
with date

Signature
Name
Head of the Institute
with date

Statement of Expenditure:

Form No. 3

S.No.	Sanctioned Heads	Funds Allocated	Expenditure Incurred			Total Expenditure	Balance as on	Funds committed upto 31 st March	Remarks (if any)
			I Yr.	II Yr.	III Yr.				
i	ii	iii	iv	v	vi	vii	viii	ix	
1.	Salaries (Manpower)								
2.	Equipment(s)								
3.	M& S(Consumables)								
4.	Travel								
5.	Forest Research Expenses (FRE)								
6.	Contingencies								
7.	Others (if any please specify)								
8.	Total								

Signature

Name

Designation of Principal Investigator

Date: _____

Authority

Signature

Name

Designation of Competent Financial

Date: _____

Note:

1. Expenditure under the sanctioned heads, at any point of time, should not exceed funds allocated under that head, without prior approval.
2. The institution/ organization receiving the grant shall submit a Utilization Certificate for the period ending 31st March and 30th September by 31st May and 30th November of the year respectively. Where the second / third year grant is due the institute will also submit a provisional Utilization Certificate by first week of March for facilitating the release of funds for the subsequent years.

Draft of Agreement

AGREEMENT

THIS agreement made and entered into on this ___ day of _____ between _____ having, its registered office at _____ (hereinafter called _____ which expression shall wherever the context so admits include its successors and permitted assigns) and its constituent _____; _____; _____; and _____ participating as institutional partner in the project of the first part.

AND

_____, a society registered under the _____ and established by the Government of _____ (hereinafter called _____ which expression shall wherever the context so admits include its successors and permitted assigns) of the second part.

AND

_____ an autonomous institution _____ (hereinafter called _____ which expression shall wherever the context so admits include its successors and permitted assigns) of the third part.

AND

____ University, ____ established through the ____ University Act, No. ____ having its registered office at ____, ____ (hereinafter called ____ which expression shall wherever the context so admits include its successors and permitted assigns) of the **fourth part**.

AND

____ University, ____ established in ____ having its registered office at ____, ____ (hereinafter called ____ which expression shall wherever the context so admits include its successors and permitted assigns) of the **fifth part**.

AND

____Ltd. a Company incorporated under the companies Act ____having its registered office at _____(hereinafter called ____ which expression shall wherever the context so admits include its successors, receivers and permitted assigns) of the **sixth part**.

AND

____ Ltd. a Company incorporated under the companies Act _____ (hereinafter called ____ which expression shall wherever the context so admits include its successors, receivers and permitted assigns) of the **seventh part**.

AND

____ Ltd. a Company incorporated under the companies Act _____ (hereinafter called ____ which expression shall wherever the context so admits include its successors, receivers and permitted assigns) of the **eighth part**.

WHEREAS ICFRE has launched a scheme of AICRP that seeks to realize the vision of of ICFRE. The scheme envisages to support innovation centered scientific & technological developments as a vehicle to attain for the country a global leadership position at least in some selected niche areas. The scheme in a true 'Team India' spirit envisages synergistic networking of publicly funded institutions, academia as well as private industry.

WHEREAS the ____ head office in _____ is entrusted with the responsibility of implementing the scheme.

AND WHEREAS ____ through wide ranging and wide spread national consultations, followed by stringent and rigorous system of screening, expert evaluation and assessment has identified _____ as one project under AICRP. Thereafter through inputs from experts in the area, a detailed project was evolved at the national level involving above mentioned institutions and industries. The project was then scrutinized and modified wherever necessary by Task Force constituted for the specific purpose by ____.

WHEREAS ____, ____, ____ and ____ are premier research and development institutes in the field of science & technology and other related subjects and have developed, over the years expertise, facilities and capabilities in frontier research areas and have agreed to participate in the programme as participating institutions/laboratories of ICFRE.

AND WHEREAS ____, ____ are premier universities which have developed considerable knowledge base over the years in the frontier research areas including that of biotechnological intervention and have agreed to participate in the programme as "Institutional Partner".

AND WHEREAS ____, _____ are premier Research & Development institutes in the field of science & technology including plant biotechnology and have developed, over the years, expertise, facilities and capabilities in frontier research areas relating to _____, _____ and _____, have agreed to

participate in the programme as 'Institutional Partners'.

AND WHEREAS ____, ____, ____ are premier Indian companies engaged in the R&D, production and marketing of _____ related products and have significant Research and Development base and have agreed to participate in the programme as 'Industrial Partners'.

AND WHEREAS the Research Policy Committee (RPC) of ICFRE has approved of the project under AICRP and financial support to the project. The support will be in the form of grant-in-aid to the institutional partners in the public domain. Now, therefore, in consideration of the premises and mutual covenants hereinafter contained, the partners here to agree as follows:

CL.1 Scope of the agreement

This agreement details (i) the modalities and the terms and conditions of the collaboration, financial arrangements, outputs of the project including intellectual property rights, (ii) responsibilities and obligations of each party (iii) role and functions and powers of the Review and Project Expert Group Committees, pertaining to the project.

CL.2 Modalities of collaboration

The respective responsibilities of ICFRE and the participating institution & industrial partners shall be as follows:

2.1. Responsibilities of an institutional partner:

- i. Undertake the scientific and technological activities of the project as outlined in the project document and conform to the outputs, milestones & targets;
- ii. Maintain a separate account operated by a designated and authorized Accounts Officer of the institute under the control of the principal investigator of the project;
- iii. Submit a statement of accounts and utilization certificate of the funds of the project to ICFRE for the period ending 31st March and 30th September by 30th April and 31st October of the year respectively in the format provided by ICFRE;
- iv. Submit a quarterly Progress Report to Review Committee (as provided in clause 4) and participate in the review / monitoring meetings;
- v. Permit the Project Expert Group (as provided in clause 5), appointed by ICFRE access to the premises where this part of the project activity is being carried out and provide all the information required by the Committee;
- vi. Abide by the decision of the Project Expert Group based on assessment of the progress in the project to modify the objectives, outputs, milestones, targets, funding as also the foreclosure of any activity or subproject.
- vii. Considering that the project is made of interlinked and interdependent activities, each institution shall endeavour, as a special case wherever necessary, to simplify the system for deploying the requisite project fellows and in procuring the requisite consumables and equipment.
- viii. Accord due recognition and credit to the project staff for the work done in/for the project in their performance evaluation / assessments.
- ix. Ensure and warrant that no same collaboration/ similar project has been executed by it with any other party, National or international for the project duration & five years thereafter.

2.2 Responsibilities of industrial partner

- i. Undertake/carry out the activity of the project as outlined in the project document and conform to the outputs, milestones & targets;
- ii. Maintain a separate bank account operated by authorized persons of the company under the control of the principal investigator of the project;
- iii. Submit a statement of accounts and utilization certificate of the funds of the project to ICFRE for the period ending 31st March and 30th September by 30th April and 31st October of the year respectively in the format provided by ICFRE;
- iv. Submit a quarterly Progress Report to the Steering Committee (as provided in Clause 4) and participate in the Steering Committee meetings to review the progress of the project;
- v. Permit the Project Expert Group (as provided in Clause 5), appointed by ICFRE access to the premises where this part of the project activity is being carried out and provide all the information required by the Committee.
- vi. Abide by the decision of the Project Expert Group based on assessment of the progress in the project to modify the objectives, outputs, milestones, targets, funding, as also the foreclosure of any activity or subproject.

2.3 Responsibilities of ICFRE

- i. Provide financial support for the project as outlined in the Annexure-FS;
- ii. Facilitate, coordinate, monitor the activities of the projects for smooth functioning of the project etc;
- iii. Facilitate and ensure the holding of review meetings at least once in 3 months to review the progress of the project;
- iv. Facilitate and ensure the holding of Project Expert Group meetings at least once in 6 months to monitor the project;
- v. Facilitate the securing of IPR protection and its equitable sharing by the partners;
- vi. Take necessary steps to implement the decisions of the Project Expert Group including extension/ curtailing/ modification of outputs, milestones & targets and funding;
- vii. Appraise the progress of the project to High Powered Committee and Governing Body of ICFRE from time to time.

CL. 3 Financial arrangement

- 3.1 The total estimated cost of the project is Rs. _____ lakh. The financial support is in the form of grant-in-aid to the institutional partners in public domain. The detailed year-wise and head-wise breakup of the financial support to individual institutional as well as industry partners component is shown in the Annexure-FS. The first year support to each of the institute shall be released by ICFRE after signing of the agreement.
- 3.2 The participating institutions shall ensure that the funds of the project are utilised only for the project and as per this agreement. Without the approval of ICFRE, re-appropriation of funds from one budget head to other will not be effected by the partners.
- 3.3 The institutional partners shall immediately refund to ICFRE any funds remaining with it

unutilised on foreclosure / termination (as per clause 5) / completion of the project.

- 3.4 ICFRE shall retain the right to transfer the capital assets acquired during the tenure of the project by the research institutions after completion of the project.
- 3.5 The provision of the grant to the institution or support to industry partner does not create any liability explicit/ implicit on ICFRE of the manpower engaged for the project.

CL.4 Review committee

A Review Committee (RC) of the project comprising of the National Project Coordinator / Principal investigators (PI) of each of the institutes / other collaborators shall review the progress of the project at least once in 3 months. The composition of the RC, Chairman designate (NPC) and its functioning are indicated in the Office Order (Enclosure 2). The progress report approved by the Chairman of the specific meeting shall be submitted to the Project Expert Group within 4 weeks of the meeting. The meetings of the Review Committee shall be facilitated and convened by the Nodal Institute ICFRE with Director of the Nodal Institutes as Chairman / or as designated by ICFRE.

CL.5 Monitoring of the project

A Project Expert Group Committee comprising of at least two experts in the area as indicated in the Office Order (Enclosure 2) in their personal capacity shall monitor the project for achieving the defined objectives in the time and costs projected. The terms of reference to the Project Expert Group are:

- (i) To review and examine the progress of the project in conformance with the milestones, targets and objectives set as contained in the MoU.
- (ii) To assess the global developments impacting the domain of the project
- (iii) Based on the foregoing to assess and recommend for:
 - (a) foreclosing or dropping or modification in the components of the project, within the overall approved objectives, budget and timeframe;
 - (b) including additional institutional / industrial partners, in the overall interest of the project; and
 - (c) revising the funding support to any / or all implementing parties.
- (iv) To advise on issues related to publications and securing of IPR individually or severally by the implementing parties.
- (v) Any other matter as referred to by DG, ICFRE.

The Project Expert Group shall meet at least once in six months. The meetings of the Project Expert Group shall be facilitated and convened by the ICFRE.

CL.6 Results of the project

- 6.1 The deliverables from the project are defined and included as enclosure I.
- 6.2 It is the responsibility of the individual parties to protect any intellectual property rights that may result from the project. The question of whether or not IPRs should be secured and the territory where the IPRs are to be secured shall be decided by the Project Expert Group in consultation with the involved partners. ICFRE shall facilitate in fulfilling the procedural formalities for

securing and maintaining the intellectual property right/patents, and bear the expenditure involved in protecting such intellectual property.

- 6.3 The intellectual property, if any, generated in the project shall be owned by partners who have actually contributed to the generation of the intellectual property. Any disputes in regard to the actual contribution of the individual parties shall be resolved by the Project Expert Group failing which the Project Expert Group and the decision of the Project Expert Group shall be binding on all the parties. ICFRE shall facilitate the fair sharing of the IPRs.
- 6.4 No party can license or transfer their IPR from the project to any third party without the written consent from the other parties and ICFRE.
- 6.5 The industrial partners shall be offered the first right to avail/ utilise the IPR on terms and conditions to be settled by the Project Expert Group/ ICFRE which shall be final and binding to all the parties. The industrial partners shall inform to ICFRE in writing about its/their willingness to exploit the intellectual property commercially or for further development within six months time frame. In such an event the IPR shall be licensed to the industrial partners for further development/commercial exploitation on terms decided by the Project Expert Group and ICFRE. In the event the firm not informing to ICFRE its willingness within the stipulated time frame or not willing to exploit the IPR further, ICFRE is free to offer the IPR to other firms.
- 6.6 On acceptance of the offer the industrial partners shall have the exclusive right, till such period as the IP rights, to commercially exploit/conduct further research work on the Intellectual Property in the project so developed. However, in the event that the Industrial partner(s) does not take effective steps to do so as determined by ICFRE within six months of exercising the option, ICFRE shall have the right to license it to any other party(ies) on terms and conditions as it deems fit.
- 6.7 On commercial exploitation of the project output and IPR/ further research work, the industrial partner and/ or its successors/ assignees/ sub-licensees shall pay premia and/or royalty to the institutions for a period of 10 (ten) years or till such period as the IP rights are enjoyed by the industrial firm, whichever is later. The premia and /or royalty and the payment terms shall be decided by the Project Expert Group in consultations with the involved parties and ICFRE.
- 6.8 Any publications in journals, presentation in seminars in respect of the project are prohibited until such publications/presentations are cleared by the Project Expert Group and a written permission is issued by the ICFRE. These publications shall be in the name of research workers, duly acknowledged that the work has been carried out under the AICRP scheme with support from ICFRE.
- 6.9 None of the parties hereto shall file any exclusive claim for seeking intellectual property rights in its own name or in the name of its associates upon the intellectual property generated in the project unless it can be documentarily demonstrated that it has been outside of the project.

CL.7 Duration of the project

The Project duration shall be for ___ years from the date of receipt of first funds from ICFRE. It would be the endeavour of all parties to complete the project within the stipulated period. In case the Project Expert Group feel that it is desirable to undertake further developmental work on the outcome of the project which requires additional financial commitment, the concerned parties shall submit a separate project proposal for consideration under the AICRP.

CL.8 Completion

The project envisaged shall be deemed to have been successfully completed, as assessed by Project Expert Group. In case, during the tenure of the project it is found that the project or any project component is not likely to lead to successful completion, the Project Expert Group may decide to foreclose the project or the project component as warranted. The decision of the Project Expert Group is fully binding on all the participants.

CL.9 Confidentiality

9.1 During the tenure of the agreement and for five years after the successful commercialisation of the project, all the parties undertake on their behalf and on behalf of their employees/representatives/associates involved in the project to maintain a strict confidentiality and refrain from disclosure thereof, of all or any part of the information and data exchanged/generated from the project under this agreement for any purpose other than in accordance with this agreement.

9.2 The parties shall not have any obligation of confidentiality with respect to any information that;

- i. is in the public domain by use and/or publication at the time of its receipt from the disclosing party; or
- ii. was already in its possession prior to receipt from the disclosing party; or
- iii. is properly obtained by the recipient from the third party with a valid right to disclose such information and such third party is not under confidentiality obligation to the disclosing party;
- iv. is required by public authority by law or decree.

Any and all information received by either party from the other upon request shall be promptly returned, however, the parties involved in the project may retain one copy of such information in their confidential files, solely for record purposes.

CL.10 Effective date, tenure & termination of the agreement

10.1 The agreement shall be effective from the date of signing and be valid for a period of two years thereafter.

10.2 The original agreement duly signed by all the partners shall remain in the custody of ICFRE and a copy of the agreement duly authenticated by ICFRE shall be provided to each partner.

10.3 During the tenure of the agreement, parties hereto can terminate their part of the agreement either for breach of any of the terms and conditions of the agreement or otherwise by giving a three months notice in writing.

10.4 In the event of termination of the agreement vide CL 10.3 the rights and obligations of the parties thereto shall be settled by mutual discussions. In case the parties fail to reach on the mutual settlement within a period of 3 months, the matter shall be referred for decision of the Project Expert Group. The decision of the Project Expert Group shall be final and binding on the parties. The financial settlement shall take into consideration not only the expenditure incurred but also the expenditure committed by the parties hereto.

10.5 Clause 6 of this agreement as also the agreement arrived at between the parties hereto for the utilisation of the intellectual property shall survive the termination of the agreement.

CL.11 Force majeure

Neither party shall be held responsible for non-fulfilment of their respective obligations under this

agreement due to the exigency of one or more of the force majeure events such as but not limited to acts of God, War, Flood, Earthquakes, Strikes not confined to the premises of the party, Lockouts beyond the control of the party claiming force majeure, Epidemics, Riots, Civil Commotions etc. provided on the occurrence and cessation of any such event the party affected thereby shall give a notice in writing to the other party within one month of such occurrence or cessation. If the force majeure conditions continue beyond six months, the parties shall jointly decide about the future course of action

CL.12 Amendments to the agreement

No Amendment or modification of this Agreement shall be valid unless the same is made in writing by all the parties or their authorized representatives and specifically stating the same to be an amendment of this Agreement. The modifications / changes shall be effective from the date on which they are made / executed unless otherwise agreed to. However, if any amendment/ modification need to be carried out between the parties and the said amendment/ modification does not in any way affect the rights/obligations of the other parties then such document be signed between those parties to whom amendment/modification applies.

In case recommendations of the Project Expert Group of the project for inclusion of additional industrial/institutional partners (as per the Clause 5.iii.b) are approved by the DG, ICFRE, a separate agreement shall be signed between ICFRE and the new industrial/institutional partner. The said agreement after signing shall be appended to the main agreement and shall be treated as part of the agreement by all the parties.

CL.13 Assignment of the agreement

The rights or/and liabilities arising to any party to this agreement shall not be assigned except with the written consent of the other parties and subject to such terms and conditions as may be agreed upon between the involved parties.

CL.14 Notices & jurisdiction

All notices and other communications required to be served or the party under the terms of this agreement shall be considered to be duly served if the same shall have been delivered by hand or posted by registered mail to the party at its last known address of business. Similarly, any notice to be given to ICFRE shall be considered as duly served if the same shall have been delivered to, left with or posted by registered mail to the ICFRE at its registered address in Dehradun.

The Courts at Dehradun shall have exclusive jurisdiction in all matters concerning this agreement including any matter arising out of the arbitration proceedings or any award made therein.

CL.15 Arbitration

Except as herein before provided any dispute arising out of this agreement or relating to its interpretation, the same shall be referred to the committee comprising of four members of Project Expert Group members. All the five members of committee shall act as the Arbitral Tribunal and the decision of the majority shall be final and binding on all the parties. The venue of the arbitration shall be at such places as may be fixed by such arbitral tribunal and the arbitration proceedings shall take place under the Indian Arbitration and Conciliation Act 1996. Each party shall bear and pay its own cost of the arbitration proceedings unless the arbitrator otherwise decides in the award (or shall be shared equally). The provision of this clause shall not become inoperative notwithstanding this agreement expires or ceases to exist or is terminated or revoked.

Seal of the Parties

In witness whereof the parties hereto have signed this agreement on the day, month and year mentioned hereinbefore.

Parties

For & on behalf of
____ (First Part)

Signature

Name

Designation

SEAL

For & on behalf of
____(Third Part)

Signature

Name

Designation

SEAL

For & on behalf of
____(Fifth Part)

Signature

Name

Designation

SEAL

For & on behalf of
____(Seventh Part)

Signature

Name

Designation

SEAL

Witness (Name and Address)

- 1.
- 2.

Date:

For & on behalf of
____ (Second Part)

Signature

Name

Designation

SEAL

For & on behalf of
____ (Fourth Part)

Signature

Name

Designation

SEAL

For & on behalf of
____(Sixth Part)

Signature

Name

Designation

SEAL

For & on behalf of
____(Eighth Part)

Signature

Name

Designation

SEAL

Project Title

Budget for Monitoring of the project (Shall be placed with DDG (R) at ICFRE Headquarters

(Rs. in Lakh)

Head of expenditure	1 st Year	2 st Year	Total
Recurring			
Salary (Office staff)			
M & S (Consumables)			
Travel			
FRE (Field Research Expenses)			
Contingency			
Total			

Institute Name

(Rs. in Lakh)

Head of expenditure	1 st Year	2 st Year	Total
Recurring			
Salary			
M & S (Consumables)			
Travel			
FRE (Field Research Expenses)			
Contingency			
Non-recurring			
Equipment & Accessories			
Total			

Institute Name

(Rs. in Lakh)

Head of expenditure			
Recurring			
Salary			
M & S (Consumables)			
Travel			
FRE (Field Research Expenses)			
Contingency			
Non-recurring			
Equipment & Accessories			
Total			

Project Title

Objectives

Deliverables

No. _____-AICRP

Dated _____

DIRECTORATE OF RESEARCH

Indian Council of Forestry Research and Education, Dehradun

Office Order

Sub: AICRP on “ _____ ” – approval and grant or loan sanction for _____ (Name of the Institute/organization)

1. The Research Policy Committee (RPC) of ICFRE has approved of the undertaking of the project on “ _____ ” under the AICRP scheme at an estimated total cost of **Rs. _____ lakhs** for a project duration of _____ years.
2. The institutional and industrial partners in the project and their designated Principal Investigators (PI) are as follows:
3. A Review Committee (RC) of the project is constituted comprising of the National Coordinator, Principal Investigators of each of the institutional and industrial partners as in para 2 above. The Review Committee will be chaired by Director of the Nodal Institute or as designated by ICFRE. The meetings of the Review Committee will be facilitated and convened by the Director of Research ICFRE / Director of the Nodal Institutes of the ICFRE and National Coordinator will as act as convenor. In the absence of the chairman of any project the members present in the meeting shall elect one of the member (PI) to chair the specific meeting. The RC will review the progress of the project at least once in 3 months. At least 50% of the membership of the Review Committee will constitute the quorum. The progress report approved by the chairman of the meeting shall be submitted to the Project Expert Group within 4 weeks of the meeting.
4. A Project Expert Group (MC) comprising of: **(i) _____ (ii) _____; (iii) _____ and (iv) _____**. (in their personal capacity) is constituted to monitor the project for achieving the defined project objectives in the time and costs projected. The Project Expert Group will meet at least once in six months. The meetings of the Project Expert Group will be facilitated and convened by ADG (M&E), Directorate of Research of the ICFRE. The Project Expert Group is empowered to foreclose or drop the non-viable sub projects/ project components or modify the objectives within the approved budget and time as warranted. A minimum of 2/3 members will constitute the quorum.
5. Out of the total budget allocation for the project of Rs. _____ lakhs (**_____Name of the Institute/Organizations**) is sanctioned a sum of **Rs. _____** lakhs as grant-in-aid /loan as per details given hereunder:

Rs. In lakhs

Head of expenditure	Allocation		2 st Year	Total
	1 st Year	2 st Year		
Recurring				
Salary				
M&S (Consumables)				
Travel				
Forest Research Expenses (FRE)				
Contingencies				
Capital				
Equipment & Accessories				
Total				

6. The grant/loan to (____Name of the Institute/organization) is debitable to the ICFRE budget head _____.
7. The institution/ organization receiving the grant/loan will maintain a separate account of the project expenditure and shall submit a utilization certificate for the period ending 31st March and 30th September by 30th April and 31st October of the year respectively (format enclosed). ICFRE shall have the right to inspect the accounts of all the institutions/organizations pertaining to grant/loan for the project.
8. The terms and conditions as detailed in the Agreement executed by the institutions and industries with CSIR for the project shall be read together with the terms and conditions mentioned herein.

 Directorate of Research
 (Name of the PI with full address)

Copy to:

1. DG,ICFRE - for information
2. DDO/Account Officer, ICFRE - for information
3. Directorate of Administration, ICFRE – (one copy of each to Cash and Audit Sections)
 - Cash section: with a request to raise a bill equivalent to the first year allocation.
 - Audit section: with a request to prepare a cheque for the amount equivalent to the first year allocation.
4. Concerned Institute –for information
5. Directorate of Research
6. Master File (2 copies)
7. Review Committee File
8. Project Expert Group File

Framework for Organizing Periodical Seminars/ Conferences at Institute /Regional/ National Levels

Organizing periodical seminars and conferences to discuss research status on identified topics is important for improving the quality of research. It also gives an opportunity to share knowledge and ideas with the stakeholders as well as provide an in-depth analysis of themes and future research directions for ICFRE.

Broad formats for organizing such seminars/conferences at various levels are given below:

I. Institute Level Research Seminars

Venue	Location of Institute itself
Theme	One or more of the broad subject/ priority areas (Appendix-I) or any specific subject.
Presentation Team	The presentation team will consist of officers/ scientists of the respective Institute working in the subject area. Researchers from other organizations/ stake holders may be invited, if required.
Broad structure	It will be in seminar format for discussion/brain storming on current research/future strategies.
Periodicity	Once in a month
Duration	Half day/Full day
Expected outcome of the seminar	i) Identification of research needs ii) Formulation of future strategies/ road map iii) Networking research options & opportunities
Coordinator	Director of the respective institutes or DDG(R) in case of ICFRE HQ/FRI
Proceedings	Outcome of the seminar shall be communicated to DDG(R), ICFRE in the form of proceedings within 7 days

II. Regional Research Conference (RRC)

Venue	Any convenient/appropriate location in the regional states in consultation with ICFRE HQ. For this purpose, country shall be divided into Northern, Southern, Eastern and Western regions.
Theme	As per the agenda approved by ICFRE.
Participation	i) Officers/ Scientists of ICFRE Institutes. ii) Various stakeholders (State Forest Deptt. Officials, representatives of industries, other research organizations, universities, NGOs etc.)

Broad structure	<ul style="list-style-type: none"> i) ICFRE HQ and the institutes in region will present research & extension initiatives, followed by discussions. ii) Speakers from various stakeholder groups will discuss issues related to them. iii) Working groups on identified themes.
Periodicity	Once in a year in each of the four regions
Duration	1-2 days
Expected outcome of the presentation:	<ul style="list-style-type: none"> i) Status of knowledge ii) Research needs of the region iii) Future directions/ recommendations iv) Networking research options & opportunities v) New concepts leading to new research projects
Coordinator	Director of concerned ICFRE Institute, as decided by ICFRE HQ.
Proceedings	Outcome of the conference shall be communicated to ICFRE in the form of proceedings with 7 days.

III. National Forestry Research Conference (NFRC)

Venue	Any of the ICFRE Institutes or any other convenient location as decided by ICFRE HQ.
Theme	Any of the issues of contemporary/national significance.
Periodicity	Once in a year
Duration	One/two day(s)
Expected outcome of the presentation:	<ul style="list-style-type: none"> i) Strategy paper on the subject ii) Future directions/ recommendations iii) Networking research options/ opportunities and national level presence
Coordinator	DDG(R) & Director of the designated host Institute
Proceedings	Outcome of the seminar shall be communicated to MoEF&CC in the form of proceedings and strategy paper.



**Indian Council of
Forestry Research
and Education**