

INSTRUCTIONS TO THE BIDDERS

Two Bid Tender Document

For

**PRINTING OF ICFRE ANNUAL REPORT 2019-20 (English and Hindi)
(No. 02 /Media/PO/Admin/ICFRE/2020-21)**



**INDIAN COUNCIL OF FORESTRY RESEARCH AND EDUCATION
P. O. New Forest, Forest Research Institute
Dehradun-248-006 UTTARAKHAND**



Notice Inviting Tenders
(National Competitive Bidding)
(Indian Council of Forestry Research & Education)
Post- New Forest, Dehra Dun – 248006, Uttarakhand, India

Phone: 0135-2224869/0135-2750297
Website: <http://icfre.gov.in> Email: adg_admin@icfre.org

Tenders are invited from reputed firms having sufficient facilities for printing of ICFRE *Annual Report 2019-20* (English & Hindi). The schedule of tender and the terms and conditions shall be as under:-

1. **Intent:** ICFRE invites tender for facilities for the printing of ICFRE *Annual Report 2019-20* (English & Hindi) and online bids are invited on single stage two bid systems.

The details of the above items and other Terms and Conditions, etc. are available in the Tender Document. The tender forms and specifications are available at **CPPP** site <https://eprocure.gov.in/eprocure/app> and web site <http://www.icfre.gov.in>

2. Tender documents may be downloaded from ICFRE website <http://www.icfre.gov.in> (for reference only) and **CPPP** site <https://eprocure.gov.in/eprocure/app> as per the schedule as given in tender critical date sheet as under:-

Events	Date/Time	Venue
Date of publishing	19.06.2020 at 4.00 PM	ICFRE website and Central Public Procurement (CPP) Portal
Bid document download / Sale start date	19.06.2020 at 4.30 PM	CPP Portal
Bid submission Start date	20.06.2020 at 11.00 AM	CPP portal
Pre-bid Meeting/ Clarification	29.06.2020 at 3.00 PM	ICFRE Head Qtr, Defraud
Bid submission End date	10.07.2020 at 5.00 PM	CPP portal
Opening date of Technical bids	13.07.2020 at 11.00 AM	Online

- The Tender may be either modified or cancelled in part or full, at the discretion of the Assistant Director General (Admin.), ICFRE, without assigning any reason thereof.
- The bidder shall submit all the documents required as per tender document at the time of submitting bid. No document shall be accepted thereafter.

Raj Kumar Bajpai
18.06.2020
ADG (Admin)

1. **INSTRUCTIONS TO THE BIDDERS**

Bids shall be submitted online only at CPPP website: <https://eprocure.gov.in/eprocure/app>. Tenderers/Bidders are advised to follow the instructions provided in the "Instructions to the Tenderer/Bidder for the e-submission of the bids online through the Central Public Procurement Portal for e-Procurement at <https://eprocure.gov.in/eprocure/app>.

Not more than one tender shall be submitted by one tenderer/bidder. Under no circumstances, the father and his sons(s) or other close relations who have business relationship with one another (i.e when one or more partner(s)/director(s) are common) be allowed to tender for the same contract as separate competitors. **A breach of this condition will render the tenders of both parties liable to rejection.**

Tenderer/bidder who has downloaded the tender from the <http://www.icfre.gov.in> and Central Public Procurement Portal (CPPP) website <https://eprocure.gov.in/eprocure/app>, **shall not temper/modify the tender form including downloaded price bid template in any manner.** In case, if the same is found to be tempered/modified in any manner, tender will be summarily rejected and EMD would be forfeited and tenderer/bidder will be liable to be banned from doing business with ICFRE in future.

Intending tenderers/bidders are advised to visit again the ICFRE website <http://www.icfre.gov.in> and CPPP website <https://eprocure.gov.in/eprocure/app> at least 3 days prior to the closing date of submission of tender for any corrigendum / addendum / amendment etc.

Bids will be opened as per date/time as mentioned in the **Tender crucial Date Sheet.**

- The complete tender in PDF format can be downloaded from the website <http://eprocure.gov.in> or www.icfre.gov.in. Following documents are required to be submitted along with bids:
 - ❖ The scanned copy of the DD of the tender fee of (Rs. 1000/- + 18% GST) in the form of Demand Draft in favour of Account Officer, ICFRE payable at Dehradun from any Commercial/ Recognized/ Nationalized Bank in India should be uploaded in **CPPP portal.**
 - ❖ The scanned copy of the DD of Earnest Money Deposit (EMD) of Rs.30,000/- (Rupees Thirty thousand only) in the form of Demand Draft **With Minimum six Months Validity** in favour of Account Officer, ICFRE payable at Dehradun from any Commercial/Recognized/ Nationalized Bank in India. Tenders submitted without EMD will be treated as invalid.
 - ❖ The Bidders are required to submit Tender Fee, EMD. The scanned self certified copies of documents must be uploaded in CPP portal otherwise tender will be rejected.
- Tender Fee, EMD, Samples of papers to be used in text & cover and appropriately designed 10 coloured pages of the attached matter is essentially required to be submitted alongwith the above in hard copy on prescribed paper. (No deviation from the approved design will be acceptable on or before the closing date. **It is necessary to qualify).**

2. SCOPE OF WORK

a) **The designing, layout, planning and printing of the ICFRE Annual Report 2019-20 (both English and Hindi version) must be of superior quality. The rates for printing of cover pages and text pages should be quoted separately. The rates for printing Hindi and English version should be quoted separately.**

b) The printed copies shall be delivered in three stages as mentioned below.

- First phase - 40 copies of English version.
- Second Phase - 100 copies each of English and Hindi version
- Third Phase - Hindi and English versions 200 copies each

Amendment is possible in each stage. The printer must print the next step after all the modification are incorporated as per approved proof and technical specifications given below.

- i. Size - A 4
- ii. Approximately 200 pages of text and 4 pages of cover in multicolor system planning. Payment will be made on the basis of actual pages printed.
- iii. Text on imported Matt paper 130 GSM
- iv. Cover on imported Matt Paper 320 to 350 GSM
- v. Lamination on cover
- vi. Perfect binding.

c) ICFRE reserves the right to print or not to print Hindi version in second phase of printing

d) Providing master CD (05 Nos.)/Pendrive of ICFRE Annual Report 2019-20 chapter-wise (English Version and Hindi Version each) in PDF/MS word for uploading on ICFRE website/portal and each file should have size less than 2 MB.

e) The printed items are required to be delivered in full within the stipulated time. Extension of time shall not be permitted.

3. TIME SCHEDULE OF WORK

a) The printer shall submit the press proof (after the proof reading by the printer) of the *Annual Report 2019-20* both in English and Hindi Version within **15** days of placement of confirmed order and provision of text material and photographs.

b) The duly bound *Annual Report 2019-20* (English Version 40/100 copies) shall be delivered within 5 days of intimation of approval of press proof.

c) The duly bound *Annual Report 2019-20* (after carrying out the necessary changes of English Version 200 copies and Hindi Version 200 copies) shall be delivered within 5 days of intimation of change and final approval of the English version and approval of the press proof of the Hindi version.

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- d) **Time is of essence in this contract. Therefore, no extension of time for whatsoever reason shall be permitted in the above schedule.**

4. TERMS AND CONDITIONS

Necessary proof for having the office/set-up in the Dehradun last five year in the field of the printing will have to be submitted.

- a) In order to maintain consistency across the printing the job for the publication shall be considered as a single job and will not be allocated to different bidders.
- b) The tender for printing of publications is to be submitted in two parts viz. **'Technical Proposal'** and **'Financial Proposal'** in two bids.
- c) Only prices are to be quoted in digits and in words wherein the detailed specifications of the above printing are given. In case of a discrepancy in the two, that quoted in words will be taken as valid.
- d) The rates quoted are to be FOR ADG (Media & Extension), Indian Council of Forestry Research and Education, P.O. New Forest, Dehradun - 248 006.
- e) The Tender should be accompanied with a Bank Draft or FDR of a nationalized bank of Rs. 30,000/- payable to Account Officer, ICFRE, Dehradun as Earnest Money Deposit. Tenders submitted without Earnest Money Deposit will be treated as invalid
- f) The Tender should be accompanied with a Bank Draft or FDR of a nationalized bank of (Rs. 1000/- + 18% GST) in the form of Demand Draft in favour of Account Officer, ICFRE payable at Dehradun from any Commercial/ Recognized/ Nationalized Bank in India should be uploaded in **CPPP portal**.
- g) All pages of the tender document are to be signed and stamped by the tendering firm.
- h) Bidders must have their own infrastructure, which may be inspected by ICFRE for verification.
- i) Short-listing of a bidder do not confer any rights on any bidder, it only means that the offer made is under consideration.
- j) While submitting the bid, the bidder shall be deemed to have read, understood and accepted all the terms and conditions stated in this Tender Document.
- k) The bidder shall indicate the complete address of the firm / Office and work along with the name(s) of the contact person(s) and their Telephone / Fax / E-mails/Mobile Nos.(s) and other particulars as per the Pro forma at **Annexure - 1**.
- l) Conditional Tenders are liable to be rejected.
- m) The offers submitted by Fax/Email/offline shall not be considered. No correspondence will be entertained in this matter.
- n) In case of any dispute, the Director General, ICFRE shall decide the issue and his decision will be final and shall be the binding on the parties.

- o) No legal proceedings to enforce any claim and no suit arising out of this work contract shall be instituted except in a court of competent jurisdiction over Dehradun, Uttaranchal.
- p) The successful bidder shall furnish, a Performance Guarantee in favour of Account Officer, ICFRE, Dehradun, for an amount equivalent to 15% of the contract value. The performance Guarantee shall be in the form of B.G./Bank Draft issued by the Nationalized Bank. The Performance guarantee must be submitted along with the letter of acceptance within the stipulated time. The performance guarantee shall be released after ensuring the complete and satisfactory delivery of the printed material.
- q) EMD is liable to be forfeited, if wrong information is furnished as regards the qualifying, technical and financial proposals of the successful bidder fails to furnish the performance guarantee within the stipulated period, the EMD shall be liable to be forfeited.
- r) The Assistant Director General (Admin.), ICFRE, Dehradun, reserves the right without assigning any reasons thereof, to:
- i. Accept or reject whole or any part of an offer
 - ii. Reject any or all offers partly or wholly,
 - iii. Cancel or withdraw the Tender notice
 - iv. Accept or reject any deviations from these conditions
- s) Proof reading will be done by the bidder. Printer will be solely responsible for ensuring exactly same format of material provided by ICFRE which includes inter-alia names in italics, numerals, special characters, punctuation marks and words/phrases in Dev Nagri/Roman; proper placements of photographs /diagrams/table etc. in the first press proof as well as in subsequent press proof.
- t) The offer shall be valid for 12 months from the date of issue of work order.
- (i) Material for ICFRE Annual Report 2019-20 (English & Hindi) will be provided to the printer in hard copy as well as in soft copy by the Asstt. Director General (Media and Extension), ICFRE. However, contents in hard copy shall be treated as valid for all-purpose.
 - (ii) Proof reading will be done by the bidder. Asstt. Director General (Media & Extension), ICFRE will approve the proof.
 - (ii) The final print for both the first stage and the final shall be done only after approval of the final draft in Color copy.**
 - (iii) ICFRE reserves the right to carry out any number of corrections/modification/alterations in the material at any stage.
 - (iv) Printer will be responsible for any error/difference from the final proof. Errors once corrected will be not checked in later version and if cropped up it will be sole responsibility of the printer and subject to penalties.

(v) Time wasted due to these typographical errors or omissions would be counted and no extension of time would be allowed on this pretext.

(vii) The representative(s) of the Asstt. Director General (Media & Extn.), ICFRE shall be in constant touch with the bidder for finalizing the final drafts after very stages.

- u) All attachments should be neatly numbered and indexed. An serial numbered Index sheet showing the numbers given to the attachment and title should be enclosed
- v) All certificates should be signed along with the seal/stamp on the letter head of the bidding firm/organization.
- w) Affidavit of partnership firm.
- x) Copy of Power of Attorney if any.
- y) Authorization of the bidder for signing the tender documents.

5. Submission of tender

The tender should be submitted in two parts, viz.,

a. TECHNICAL BID.

b. FINANCIAL BID.

5.1 Technical Bid (as well as qualifying for technical evaluation)

The following documents are to be furnished by the Tenderer /Bidder along with **Technical Bid** as per the tender document:

S. No.	Particular	Max. Marks	Marks
1	Proof of having own establishment of offset/latest printing machine with modern infrastructure and other facilities.	05	
2	Proof of registration with Directorate of Industries from OEM or equivalent.	05	
3	Signed and scanned copy of GST clearance Certificate for last 3 financial years.	05	
4	Appropriately designed 10 coloured pages of the attached matter is essentially required to be presented alongwith the above in hard copy on prescribed paper. No deviation from the approved design will be acceptable on or before the closing date. (It is necessary to qualify)	35	
5	Turnover certificate of CA of Rs. 50,00,000.00, copy of Income Tax return filed/ copy of audited balance sheet filed with the income tax department for last three assessment year.	10	
6	Tender fee: The tender form downloaded from above websites must include Rs. 1000/- + GST by crossed Demand Draft in favour of Account Officer, ICFRE, Dehradun as tender fee along with the tenders (valid for at least six months) submitted and the scanned copy of the same should be uploaded in the Portal.	05	
7	Earnest Money Deposit equivalent of Rs. 30,000/-, in the form of DD/FDR/Bank Guarantee issued by any nationalised bank located at Dehradun, in favour of Account Officer, ICFRE Dehradun valid for at least six months the scanned copy of the same should be uploaded in the Portal.	05	

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 Research & Education
 P.O. New Forest, Dehradun

8	The enclosed, Annexure 1 and 2 duly filled in must be submitted along with proposal.	10	
9	The bidding firm must have undertaken work of similar magnitude during past three financial years. <u>Enclose Client List alongwith work orders.</u>	20	

Note:

Sl. No. 4: Excellent work 95% Marks
 Very Good work 80% Marks
 Good work 65% Marks

Sl. No. 9: 21 and above Clients & work order 95% Marks
 16 to 20 Clients & work order 80% Marks
 11 to 15 Clients & work order 65% Marks
 Below 10 Clients & work order 40% Marks

5.2 FINANCIAL BID.

The financial proposal must be submitted in the format BoQ_1.xls along with this tender document at <https://eprocure.gov.in/epublish/app> separately as it is and quote their offer/rates in the permitted column and upload the same in the commercial bid. **Bidder shall not tamper/modify downloaded price bid template in any manner.** In case, if the same is found to be tempered/modified in any manner, tender will be completely rejected and EMD would be forfeited and tenderer is liable to be banned from doing business with Indian Council of Forestry Research & Education, Dehradun.

- Administrative Charge/Service Charge will be inclusive of all taxes, fees, levies, etc. and any revision in the statutory taxes, fees, etc will be the responsibility of the Bidder and the same may be filled in the BoQ xls.

GST should be clearly mentioned in the online financial proposal. It will be paid as per govt. norms.
- In case of any discrepancy/difference in the amounts indicated in figures and words the amount in words will prevail and will be considered.
- The quoted rates shall remain firm throughout the tenure of the contract and no revision is permissible for any reason.

Authorized Signatory
 (Signature of the Authorized Person)

(i) Stage - 1 EVALUATION OF TECHNICAL PROPOSAL

Checking of qualifying documents and technical documents submitted along with the bid. This will be the first envelope, which shall be checked, and disqualification amongst these documents will lead to rejection of the proposal in Toto.

The technical evaluation criteria will include the firms **relevant experience, technical manpower (qualifications, availability and experience) and availability of necessary infrastructure machinery etc.** The technical evaluation also includes examination of the quality of samples submitted

with the proposal. Evaluation will be carried out for total technical score (St) of 100 and scoring 70 points out of 100 will be the eligible criteria for financial evaluation.

(ii) **Stage - 2 EVALUATION OF FINANCIAL PROPOSAL**

The evaluation committee will determine if the financial proposals are complete and without computational errors. The lowest financial proposals (FM) (The currency is in Indian Rupees) will be given a financial score (Sf) of 100 points. The financial scores of other proposals will be computed as follows:

$Sf = 100 \times FM/F$ (Where F is amount of financial proposal, FM is lowest financial proposal).

(iii) **Stage - 3 FINAL EVALUATION OF THE BID**

Proposal will finally be ranked according to their combined technical (St) and financial (Sf) scores using the weights $S = St \times T\% + Sf \times F\%$.

The weight (T%) given to the Technical Proposal is 65%

The weight (F%) given to the Financial Proposal is 35%

6. REGARDING CONTRACT

- a) If any part of the contract does not correspond or agree with any other part, or if any question arises as to the meaning of the terms of the contract or as to the performance of the work, Director General, ICFRE shall determine the matter and his decision shall be final and binding upon the parties hereto.
- b) The contract when executed by the parties hereto shall constitute the entire contract between the parties in connection with the works covered, and shall be binding upon the parties hereto or upon either of them unless the said modification shall be in writing and duly executed by ICFRE and the firm.
- c) The contract shall not be assigned or sublet in whole or in part by the firm without prior written consent of Assistant Director General (Admin), ICFRE. Any assignment or subletting of this contract by the firm without prior written consent of Assistant Director General (Admin.), ICFRE or any interest therein, or of any money due or to become due by reason of the terms hereof, shall be null and void.
- d) The Assistant Director General (Admin.) has the powers to cancel the contract at one-week notice, if the services of the contractor are found unsatisfactory or otherwise.
- e) The printed material under this contract shall not be deemed an asset in any form by the successful bidder.

7. PAYMENT TERMS

- a) **No claim on account of sales tax, service tax, VAT, work contract tax or any other taxes and duties presently in force for the material used for execution of the work awarded under the contract, will be entertained and all such taxes and duties shall be borne by the Contractor himself.**

b) **The ICFRE shall deduct such taxes, duties and any other statutory levies imposed by the Government on such charges as may arise from the implementation of the contract.**

c) The payment is subject to TDS as per Income Tax Rules / Laws.

d) If the contractor violates any of these terms and conditions, the Performance Guarantee shall be liable for forfeiture, wholly or partly, as decided by Assistant Director General (Admin.) and the contract may be cancelled.

e) The payment as per the contract shall only be released after the complete and satisfactory delivery of the printed material of all the stages as per clause 2 (b) of this tender document and on verification by the ADG(Media & Extension), ICFRE.

8. **PENALTY**

In case the bidder fails to execute the order of printing of ICFRE Annual Report within the stipulated schedule the performances guarantee shall be forfeited, and the work got done through some other printer. In case of any increase in the cost of printing of the Annual Report incurred by the ICFRE, the same shall be the liability of the bidder who failed to execute the order.

The printer has to furnish the corrected press proof each time within 02 days irrespective of the number of proofs. Delay in submission of the corrected press proof will attract a penalty of Rs 200.00 per day each time. Delay in submission of printed copies will attract a penalty of Rs. 500.00 per day. In addition, the printer may also be blacklisted for a period deemed suitable by ADG (Admin.) ICFRE, in case the delay goes beyond a week.

9. **ARBITRATION**

(a) Except where otherwise provided in the contract all questions and disputes whatsoever in any way arising out of or relating to the contract or otherwise concerning the work or the execution or failure to execute the same whether arising during the progress of the warranty period or after the completion or abandonment thereof shall be referred to the sole arbitration of the person appointed by the Director General, Indian Council of Forestry Research and Education, (DG, ICFRE) Dehradun on this behalf at the time of dispute. There will be no objection to any such appointment that the arbitrator so appointed is an employee of ICFRE, or government servant or that he had to deal with the matters to which the contract relates or that in the course of his duties as employee of ICFRE, or government servant, he had expressed views on all or any of the matters in dispute of differences. The arbitrator to whom the matter is originally referred being transferred or vacating his office or being unable to act for any reason, shall be replaced by another person as decided by DG, ICFRE, to act as arbitrator in accordance with the terms of the contract. Such person shall be entitled to proceed with the reference from the stage at which it was left by his predecessor. It is also a term of this contract that no person other than a person appointed by the Director General, ICFRE should act as arbitrator and if for any reason, that is not possible, the matter is not to be referred to arbitration at all in all cases where the amount of the claim in dispute is Rs. 50,000/- and above, the arbitrator shall give reasons for the award.

(b) Subject as aforesaid, the provisions of the Arbitration and Conciliation Act 1996 or any statutory modifications or re-enactment thereof and the rules

made there under and for the time being in force shall apply to the arbitration proceeding under this clause.

- (c) Services under the contract shall, notwithstanding the existence of any such dispute, question or controversy, continue during arbitration proceedings and no payment, due or payable by ICFRE or the firm shall be withheld on account of such proceedings unless such payments are the direct subject of the arbitration. Reference to arbitration shall be a condition precedent to any other action at law.

Assistant Director General (Admin)
Directorate of Administration
ICFRE, Dehradun

Asstt. Director General (Admin.)
Indian Council of Forestry
Research & Education
P.O. New Forest, Dehradun

Annexure - 1

PARTICULARS OF THE FIRM

1. Name of the company : _____
2. Head / Regd. Office Address : _____
 - a) Postal : _____
 - b) Fax. No. : _____
 - c) Telephone No.s (s) : _____
 - d) E-mail Address : _____
 - e) Website Address : _____
3. Former name of company (if any): _____
4. Dehradun Office Address : _____
 - a) Postal : _____
 - b) Fax. No. : _____
 - c) Telephone No.s (s) : _____
 - d) E-mail Address : _____
5. Type of Organization : Individual / Partnership / Incorporated
6. (i) Year of establishment: _____
ii) Year in which printing:
work started _____
7. Amount of EMD deposited
 - a) Draft / Bank Guarantee No.: _____
 - b) Bank Detail : _____
 - c) Amount : _____
8. Period of validity of Tender: _____
9. Details of supporting : _____
documents enclosed : _____
: _____
10. Name and address of the : _____
authorized signatory / : _____
contact person for this Tender : _____
11. Whether letter of Authority for : _____
attending bid opening
enclosed with Tender ?

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12. GST Certificate: _____
13. Whether the company has : _____
 ISO Certification ?
 If yes / whether document attached
 in technical bid
14. Turn over of the firm : _____
15. Detailed qualification and experience : _____
 of professional available for designing,
 layout, planning of cover and text pages
 of the report
16. Experience of the firm is undertaking : _____
 works similar to printing of Annual
 Report. Best sample work needs to
 be attached
17. Proof of the fact that firm own printing : _____
 facility/have MOU for printing with
 an established firm who own their
 printing facility
18. Proof of solvency : _____
19. Time Schedule for accomplishment of Job: _____
20. Relevant additional information, if any,
 (use extra sheet if necessary) : _____

**Signature of Bidder
 Name
 With Seal of the Firm**

Date :
 Place :

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 Indian Council of Forestry
 Research & Education
 P.O. New Forest, Dehradun

**SAMPLE PAGES FOR DESIGNED FOR
ANNUAL REPORT**

2.1 Ecosystem Conservation and Management

2.1 Projects under the Theme

Projects	Completed Projects	Ongoing Projects	New Projects Initiated During the Year
Plan	3	18	5
Externally Aided	12	17	10
Total	15	35	15

2.1.1 Climate Change

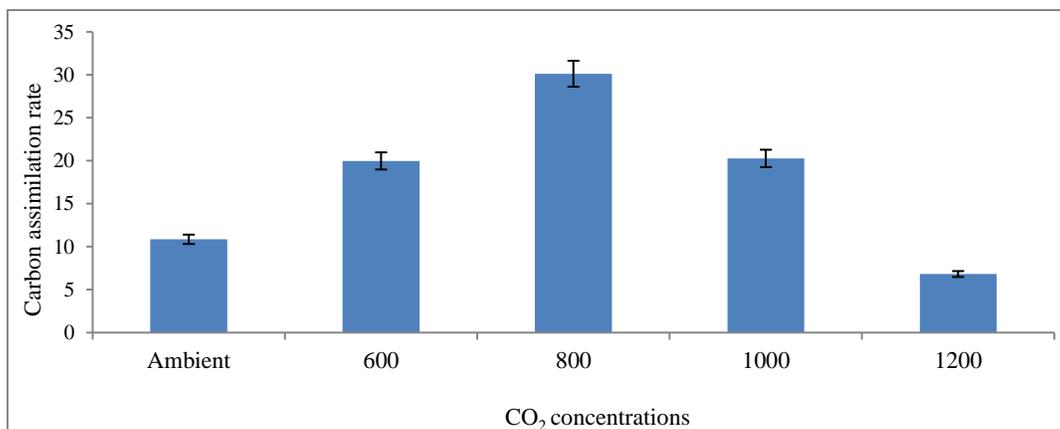
Study on adaptive response of plants to elevated CO₂ conditions (FRI)

The seedlings of forestry species such as *Grevillea robusta*, *Acacia auriculiformis*, *Shorea robusta* and *Gmelina arborea* were exposed to elevated levels of CO₂ concentration i.e., ambient, 600, 800, 1000 and 1200 ppm in open top chamber conditions to study the adaptive response of plants to elevated CO₂ conditions, to analyze their CO₂ sequestration rate. Species showed increased growth under elevated CO₂ level, growth varied from species to species. *Grevillea robusta* and *Acacia auriculiformis* showed enhanced growth upto 800 ppm CO₂, while *Shorea robusta* and *Gmelina arborea* showed enhanced growth upto 1000 ppm and 1200 ppm respectively.



Ambient (~ 400 ppm) CO₂ (600 ppm) CO₂ (800 ppm) CO₂ (1000 ppm) CO₂ (1200 ppm)

Effect of elevated CO₂ concentrations on growth of *Acacia auriculiformis*

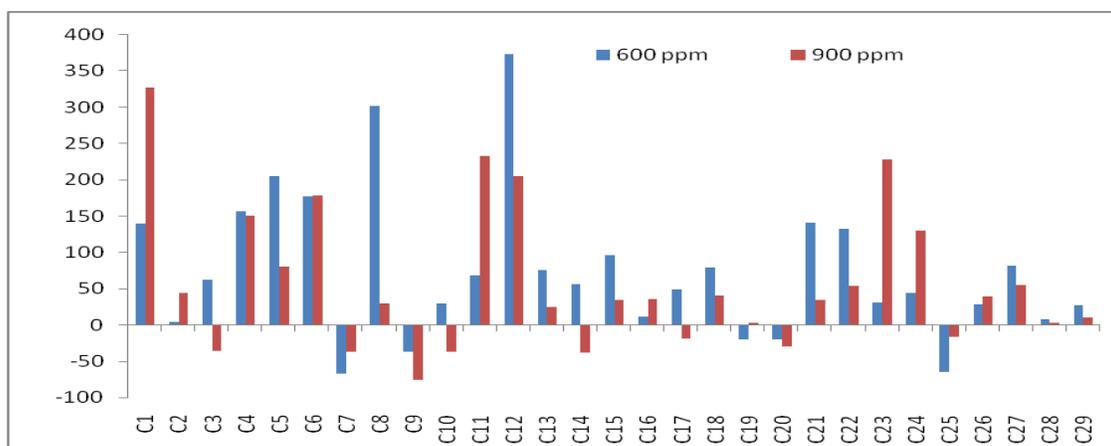


Climate change vulnerability of Indian Forest (FRI)

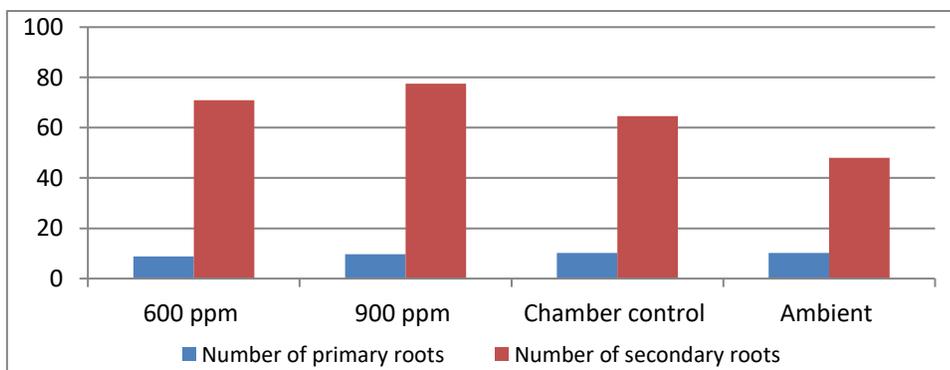
Vulnerability of Indian Western Himalayan Region (IWH) were analyzed by using simulations of Joint UK Land Environment Simulator (JULES) vegetation model under projected climate change scenarios of CORDEX South Asia regional simulations of REMO2009 forced with Coupled Model Intercomparison Project Phase 5 (CMIP5), Atmosphere-Air General Circulation Model (AOGCM) for the Representative Concentration Pathway (RCP) 4.5 (mid-range emissions). Undisturbed species rich forests were found to be resilient to climate change. As per the models, alterations in phenology, impact on regeneration and upward movement of species were identified as major impacts of changing climate on forests. Under the present scenario forests of Champawat, Pauri Garhwal, Bageshwar, Almora, Tehri Garhwal, and Dehradun districts of Uttarakhand, Rajouri, Poonch, and Kupwara of Jammu & Kashmir and Shimla of Himachal Pradesh are most vulnerable to climate change.

Screening tree species for intra-specific variation in carbon sequestration potential under elevated CO₂ (IFGTB)

Studies have shown that different tropical tree species exhibit varied growth in response to elevated CO₂. Clones of eucalypts (Safeda), Casuarina (Junglisaru) and teak (Sagun) selected for higher productivity are being further screened for C sequestration potential under ambient and elevated CO₂ levels. Selection of clones adapted to elevated CO₂ levels can be used for future breeding programmes aimed at developing 'climate change ready genotypes'. Preliminary results show intra-specific variation in growth of the species to elevated CO₂.



Increase or decrease in total dry weight (%) under different levels of CO₂ as percentage over that of ambient grown respective clones of *Casuarina equisetifolia*



Number of primary and secondary root production under elevated CO₂ in *Casuarina equisetifolia*

Carbon sequestration through afforestation at Rourkela Steel Plant, Odisha (TFRI)

Plantation comprising of 12 tree species, having higher carbon sequestration potential was raised at Rourkela Steel Plant in four hectares. After two years, the plantation stocked 28.6 t carbon in the form of above and below ground biomass. Highest carbon sequestration was recorded in *Peltophorum pterocarpum* (19.51 kg per sapling), followed by *Melia azedarach* (18.54 kg per sapling) and *Neolamarckia cadamba* (18.32 kg per sapling). Training programme on 'Carbon sequestration through afforestation' was organized at Rourkela Steel Plant on 8-9 November 2017 for capacity building of the stake holders, 30 officers of SAIL from Durgapur, Bhilai, Bokaro, Burahnpur, Ranchi, Rourkela and officials from Odisha state forest department attended the training.



Plantation raised by TFRI at RSP

Studies on the effects of MPOWER programme on mitigation and adaptation towards Climate Change in western Rajasthan-Phase II (AFRI)

Assessment was undertaken to study the impact of project implementation, of "Mitigating Poverty in Western Rajasthan (MPOWER)" towards community-based adaptation to climate change in Sirohi, Pali, Jalore, Jaisalmer, Jodhpur and Barmer district of Rajasthan. People of the project area are chiefly dependent on agriculture and animal husbandry for livelihood. Promotion of vegetable and fruit cultivation, fertilizer and seed distribution, use of sprinkler etc., helped in increasing income of farmers. Adaptive agriculture using crops resilient to drought and heat stresses, increased water availability through canal, revival of traditional rain water harvesting structures 'Saran' and water-efficient irrigation added to climate change adaptation. Distribution of energy efficient stoves, LPG and solar cooker has decreased use of biomass as fuel.



People interaction (left) and plantation of *Punica granatum* (pomegranate) as climate change adaptation (right)

High Altitude Transition Zone in Himachal Pradesh (HATZ); long term studies to assess the effects of global warming and trails to rehabilitate degraded sites in this zone (HFRI)

Floristic diversity of High Altitudinal Transitional Zone (HATZ) range (3400-3900m above msl) was recorded at five sites in Kinnaur and Chamba district of Himachal Pradesh region. 418 plant species belonging to 225 genera and 59 families were documented. The collected germplasm of threatened medicinal plants is being maintained at Western Himalayan Temperate Arboretum (WHTA), Potters Hill, Shimla for *ex-situ* conservation. 350 herbarium sheets were prepared, and submitted to the Interpretation Centre (APCCF Office, Sundernagar). The findings of the present study will contribute as a baseline for future studies on global warming and climate change.



Dhei Thatch (Kullu) 3600m-3800m



Chakah (Kalpa-Kanda) 3700m-3900m

REDD+ Himalayas: Developing and using experience in implementing REDD in the Himalayas (RFRI)

The project is being undertaken as the pilot study for implementation of REDD+ in the Himalayan region under the auspices of Integrated Mountain Development (ICIMOD). Awareness programme on climate change and REDD+ was organized for stakeholders in collaboration with State Forest Department. Training and workshops on Monitoring, Reporting and Verification of REDD+ was conducted in project villages. Drivers of deforestation and forest degradation were identified through stakeholders meetings. Shade grown coffee plantations was initiated, to retain the forest cover. A solar dryer of 150 kg. capacity was installed for turmeric growers, in Reiek village, to wean them away from shifting cultivation.



Inauguration of Solar dryer at Project site

2.1.2 Ecology & Environment

Identification and reclamation of 10 hectares of degraded land & biodiversity development at NCL, Singrauli, Madhya Pradesh (FRI)

Model plantations for Eco-restoration of mine spoils were undertaken at Nigahi and Krishnashila project site of Northern Coalfields Limited, Singrauli. 14,000 plants of different species including horticulture species have been planted in an area of 10ha (5 ha at each site). *Dalbergia sissoo*, *Azadirachta indica*, *Emblica officinalis*, *Bauhinia variegata*, *Albizia lebbek*, and *Albizia procera* were among the most successful species in the plantations. Grasses like *Pennisetum purpureum*, *Pennisetum pedicellatum*, *Cymbopogon martini*, *Cenchrus ciliaris*, *Cenchrus setigerus*, *Arundo donax* have been widely and successfully propagated in the site which has led to the enrichment of the soil nutrient. Horticulture species such *Mangifera indica* (aam), *Syzygium cumini* (jamun), *Emblica officinalis* (aonla) and *Psidium guajava* (amrud) have successfully adapted to the prevailing site condition. The faunal species such as birds, butterflies, insects and mammals have also been found to visit the ecological restoration sites.

Transfer of technology for eco-restoration of mine spoils to the stakeholders

The technology for eco-restoration of mine spoil developed by ICFRE and institutes is being extended to the stakeholder. FRI is providing technical support and assistance to BCCL for ecorestoration of OB dumps/mined out areas (44.0 ha) As a technical advisor/expert. FRI is also preparing Road-map for ecological restoration work in Coal Mines of NCL, Singrauli.



Preparation of seed mixed soil balls



View of restored overburden site

Research to assess performance of pelletized sandal seeds in nursery and field for comparative performance assessment of pelletized, non-pelletized and planted seedlings in the field (IFGTB)

IFGTB is working on nursery and plantation technique of *Santalum album*. Mature fruits of *Santalum album* were collected from Marayoor (Kerala), Bangalore (Karnataka) and Coimbatore (Tamil Nadu), seedling vigour tests revealed that Kerala seed source are superior to Tamil Nadu and Karnataka. Seed pelleting composition of GA3 (500ppm for 24hours) +PVP (1g in 10 ml water) + Charcoal (2g/100seeds) was found to be most suitable, *Trichoderma viridae* was identified as most suitable bioinoculant. Host specificity experiments were conducted using different nurse plant with Sandal, the three shortlisted suitable hosts identified were *Pithecellobium dulce*, *Duranta repens* and *Casuarina junghuhniiana*. Pilot trail for field establishment of sandal has been initiated at IFGTB.

Phytoremediation of soil for productivity enhancement during land disposal of effluent (AFRI)

Survey was conducted on effluent disposal along the river basin Jojari in Jodhpur and Bandi in Pali districts. Effluents, soil and plant samples were collected from effluent disposal area and analyzed for different physico-chemical parameters. Plantation in field (split plot design) and lysimeter experiment (CRD) have been maintained by applying different treatments. Growth data in field (yearly basis) and lysimeter experiment (monthly basis) was recorded. Application of effluents leads to increase in soil pH, EC, NH₄-N, NO₃-N and PO₄-P. Plantation of *Prosopis juliflora*, *Salvadora persica* and *Azadirachta indica* improved the soil quality and showed enhanced growth when irrigated with effluent water and bore well water in ratio of 3:1. These plants also accumulated the heavy metals like, Cr, Ni, Cu, Se, Cd, Pb, Mn and micronutrients Mg, Fe, Co and Zn found in the effluent water.



Experimental plantation in lysimeter (left) and field condition (right) utilizing treated wastewater

Assessment of carbon stock and carbon sequestration potential of major land use sectors in Nagaland and Upper Assam. (RFRI, Jorhat)

As part of a nation-wide programme to map carbon under agriculture, forestry and other land uses (AFOLU) studies were undertaken by RFRI in Nagaland and Upper-Assam. Preliminary observations carried out in major land uses revealed that soil organic carbon (SOC) in Nagaland ranged from 42.5 to 141.8Mg ha⁻¹. Land use like terrace cultivation and plantation were recorded high SOC stock per unit area. In Upper Assam SOC stock ranged from 38.5 Mg ha⁻¹ in Eastern Alluvial Secondary Semi Evergreen forest to 48.4 Mg ha⁻¹ in Assam Valley Tropical Wet Evergreen forest. Land use with high SOC were tea garden with 53.4 Mg ha⁻¹ and horticulture with 43.4 Mg ha⁻¹. Highest SOC was recorded in East Himalayan Moist Mixed Deciduous Forest (141.8 Mg ha⁻¹)



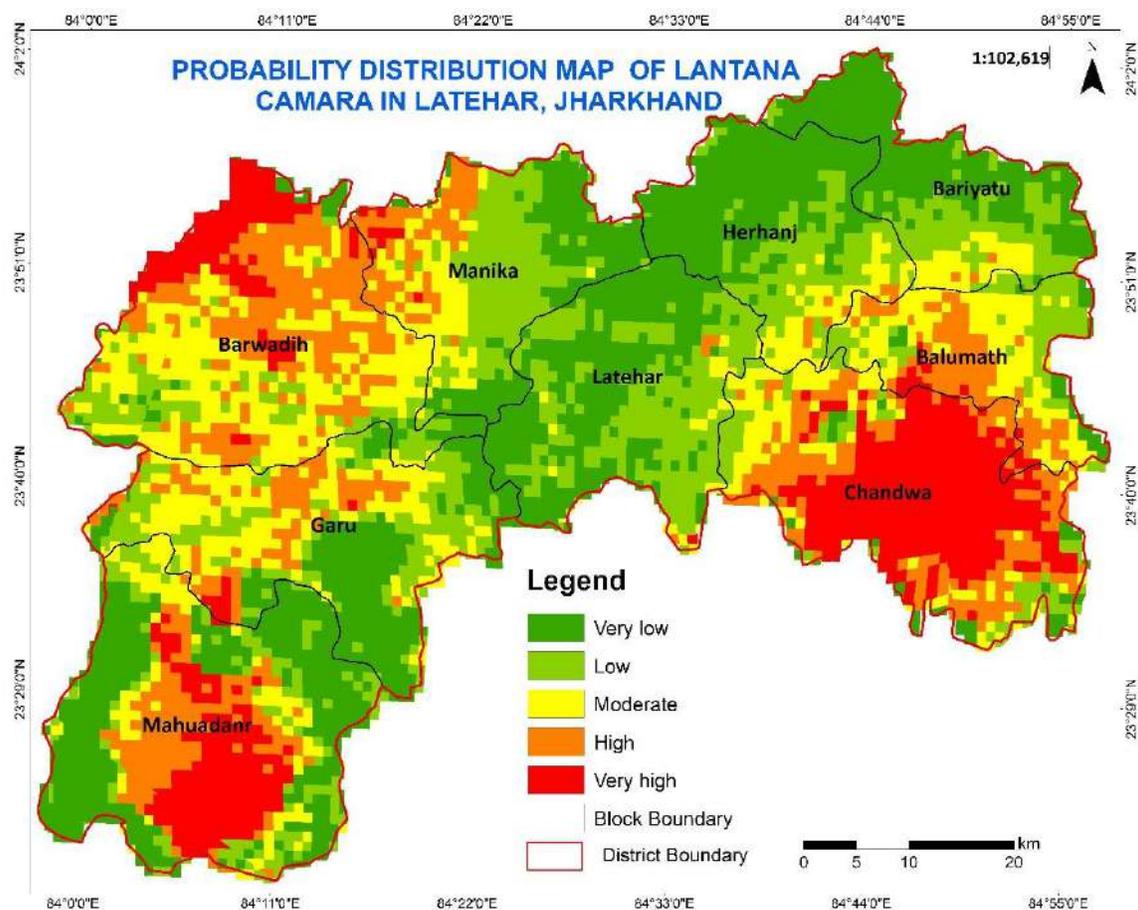
Terrace cultivation in Nagaland



Collection phyto-sociological data of a dense forest in Upper Assam

Risk assessment of *Lantana camara* (Putush) using spatial distribution modelling approach in Latehar district (IFP, Ranchi)

On the basis of field data collected from *Lantana* invaded sites of Latehar districts, base layer was prepared using Environmental Niche Model for 19 environmental variable and 6 geographical variables using Bioclim and SRTM-DEM. Model simulation using MAXENT showed probable distribution map of *L. camara* for Latehar district. The study has been extended to other sites in Hazaribagh, Bokaro, Godda, Dumka, Sahebganj and Pakur districts of Jharkhand.



Probability distribution map of *Lantana camara* in Latehar, Jharkhand

2.1.3 Biodiversity

Study-cum-survey to assess the demand and supply of medicinal plants in India-in the national perspective, as well as in respect of the international market (ICFRE)

Important research findings of the project are given below:

- The total demand of herbal raw drugs, estimated 5,12,000 MT for the year 2014-15, is expected to grow to 6,50,000 MT by the year 2020.
- The estimated consumption of herbal raw drugs by the domestic herbal industry grew from 1,77,000 MT in 2004-05 to 1,95,000 MT in 201-15.
- Total number of 907 medicinal plant species were recorded in consumption of domestic herbal industries out of which 198 species were recorded in active consumption which constitute 95% of the total consumption. Remaining 709 medicinal plant species constitute only 5% of the total consumption.

Butterflies associated with different forest types/ sub-types in Uttarakhand (FRI)

Data was collected on 127 species of butterflies associated with 9 forest sub-types in Garhwal, (Uttarakhand). Barred Wood brown, *Lethe maitrya* de Nicéville. (Lepidoptera: nymphalidae: satyrinae) was determined as typical of species found in the forest sub-type "12/C1e Moist Temperate Deciduous Forest" in Kedarnath Musk Deer Reserve while Tiger Wood brown, *Orinoma damaris* (Gray) (Lepidoptera: Nymphalidae: Satyrinae) was determined as associate of ringal bamboo *Arundinaria falcata* in 12/C1a Ban oak forest in Garhwal.



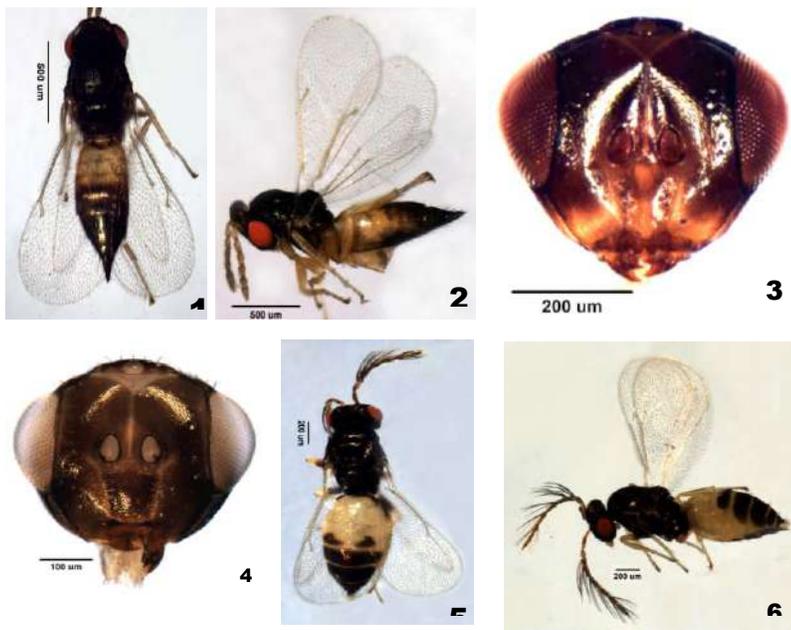
Barred Wood brown, *Lethe maitrya*



Tiger Woodbrown, *Orinoma damaris*

Digitization and enrichment of National Forest Insect Collection (NFIC) of Forest Research Institute-Phase-II (FRI)

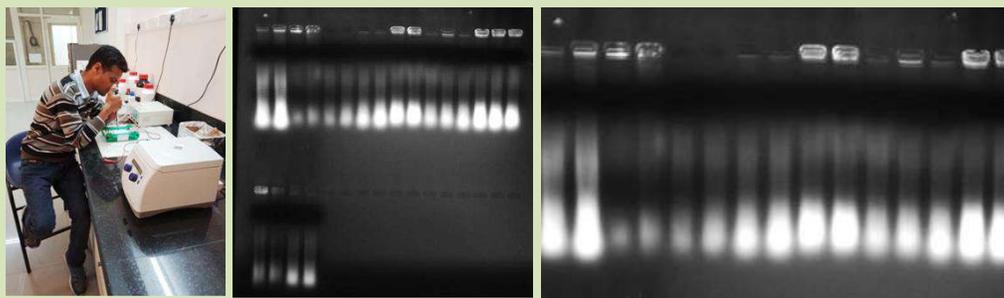
National Forest Insect Collection (NFIC) database is being updated and digitized for creation of virtual NFIC. A new species *Aprostocetus doonensis* Singh, new to science was described. Taxonomic clarification and neo-type designation for three Indian xyleborine species was done.



Figures *Aprostocetus doonensis* Singh sp. nov. (1) Female in dorsal view; (2) Female in lateral view; (3) Female head in frontal view; (4) Male head in frontal view; (5) Male in dorsal view; (6) Male in lateral

Bio-piracy Cell, FRI: Molecular characterization of selected medicinal plants of Uttarakhand

Samples of *Aconitum heterophyllum*, *Aconitum balfourii* (meethavish) and *Dactylorhiza hatagirea* (hatajari, salempanja) were received by Bio-piracy Cell, FRI pertaining to illicit trade. Fresh samples of the plants were collected from their natural habitat. DNA has been extracted from the samples received from the Bio-piracy Cell and fresh samples. Barcoding of the samples is being carried out



Assessment of plant biodiversity of Silent Valley Buffer zone (IFGTB)

Survey was conducted in the buffer zone of Silent Valley National Park, Plant species growing in the buffer zone were enumerated, and 310 specimens belonging to 144 species were collected from the buffer area for Herbarium preparation and identification.



Antistrophe serratifolia - an endemic species from Buffer zone of Silent Valley National Park



Syzygium laetum - an endemic species from Buffer zone of Silent Valley National Park

Taxonomic study of Orthoptera of Tamilnadu (IFGTB)

Orthoptera diversity study has been conducted in different habitats (forestlands, grasslands, arable lands and wastelands) under seven agro climatic zones of Tamil Nadu. 68 species of Orthoptera representing 51 genera from 4 families were indentified during the survey.

A mobile application for identification of Orthoptera of Tamilnadu has been developed using 13 main key characters.