

**Two Bid Tender Document**

**For**

**PRINTING OF ICFRE ANNUAL REPORT 2021-22 (English and Hindi)  
(No. 10/PO/Annual Report/Admin/ICFRE/2022-23)**



**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: 0135-2224869/0135-2224814/0135-2750297

Website: <http://icfre.gov.in>

Email: [adg\\_admin@icfre.org](mailto:adg_admin@icfre.org)

Tenders are invited from reputed firms having sufficient facilities for printing of ICFRE Annual Report 2021-22. 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 2021-22 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	05.07.2022 at 03:00 PM	ICFRE website and Central Public Procurement (CPP) Portal
Bid document download / Sale start date	05.07.2022 at 03.30 PM	CPP Portal
Bid submission Start date	05.07.2022 at 04.00 PM	CPP portal
Pre-bid Meeting/ Clarification	11.07.2022 at 3.00 PM	ICFRE Head Qtr, Dehradun
Bid submission End date	25.07.2022 at 04.00 PM	CPP portal
Opening date of Technical bids	26.07.2022 at 04.15 PM	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.



## 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](http://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 DDO, ICFRE Revenue Account A/c No. 496902010084490 payable at Dehradun 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 ICFRE Security money/EMD Account A/c No. 496902010089917 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 matter 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 2021-22 (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.

- Size - A 4
  - 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.
  - Text on imported Matt paper 130 GSM
  - Cover on imported Matt Paper 320 to 350 GSM
  - Lamination on cover
  - Perfect binding with section sewing.
- c) **ICFRE reserves the right to print or not to print Hindi version in second phase of printing, therefore separate rates must be quoted (i.e. two BoQ). Clearly indicating with or without Hindi version of this stage.**
- d) Providing master CD (05 Nos.)/Pendrive of ICFRE Annual Report 2021-22 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 2021-22* 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 2021-22* (English Version 40/100 copies) shall be delivered within 5 days of intimation of approval of press proof.



- c) The duly bound *Annual Report 2021-22* (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.
- 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 for 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/- favour of ICFRE Security money/EMD Account A/c No. 496902010089917 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 DDO, ICFRE Revenue Account A/c No. 496902010084490 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, Uttarakhand.
- p) The successful bidder shall furnish, a Performance Guarantee in favour of ICFRE Security money/EMD Account A/c No. 496902010089917 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 2021-22 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.
  - (iii) **The final print for both the first stage and the final shall be done only after approval of the final draft in Color copy.**



- (iv) ICFRE reserves the right to carry out any number of corrections/modification/alterations in the material at any stage.
- (v) 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.
- (vi) 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. A 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 on or before the closing date. No deviation from the approved matter will be acceptable. <b>Submission of 10 designed pages as above is necessary to qualify.</b>	46	
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 DDO, ICFRE Revenue Account A/c No. 496902010084490 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 ICFRE Security money/EMD Account A/c No. 496902010089917 valid for at least six months the scanned copy of the same should be uploaded in the Portal.	05	
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>	9**	

\* 5 marks each                      \*\* 3 marks for each year

**Note:**

<b>Sl. No. 4:</b>	Excellent work	95% Marks
	Very Good work	80% Marks
	Good work	65% Marks
	Average work	00 Marks

**Sl. No. 9:** One mark for each order

**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.



1. 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.

2. In case of any discrepancy/difference in the amounts indicated in figures and words the amount in words will prevail and will be considered.
3. 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  $S = St \times T\% + Sf \times F\%$ .

  
सहायक महानिदेशक  
Asstt. Director General



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 GST 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.



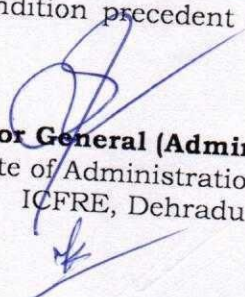
## 8. PENALTY

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



**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 ?
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 :

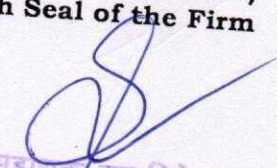


**WORKS OF SIMILAR NATURE & MAGNITUDE  
SUCCESSFULLY COMPLETED DURING LAST 3 YEARS**

Outline of recent experience on assignments of similar nature

Sl. No.	Description of Work	Cost of Assignment	Address of Organisation with Phone No. for which Assignment Done	Samples Attached Yes/No
1	2	3	4	5

**(Signature of Bidder)  
With Seal of the Firm**





## 2.3 Genetic Improvement

### Projects under the Theme

Projects	Completed Projects	Ongoing Projects	New Projects Initiated During the Year
Plan	12	36	06
Externally Aided (except CAMPA)	09	31	10

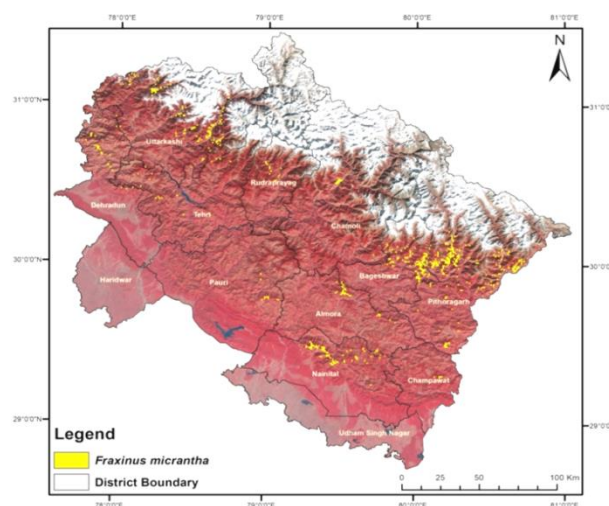
### 2.3.1 Conservation of Forest Genetic Resources

#### Pilot Project on 'Creation of Centre of Excellence on Forest Genetic Resources (CoFGR)' (FRI)

- **FGR species**

Surveys were conducted in 44 Forest Divisions of Uttarakhand to document and assess the species richness and regeneration status for 100 species. Verification of RET species were also carried out in various forest divisions.

Eco-distribution maps for 50 important FGRs species of Uttarakhand are being prepared through RS and GIS based tools.



Eco-distribution map of *Fraxinus micrantha*

#### A. FGR Seed and Germplasm Storage

Seeds of 17 FGR species collected were processed for initial germination determination; and the stored seeds were tested for viability on quarterly basis.



Seed collection in *Lyonia ovalifolia*



*Albizia lucidior* tree with pods





Seed germination in *Myrica esculenta*



Seed germination in *Albizia lucidior*

Seed germination test of FGR species

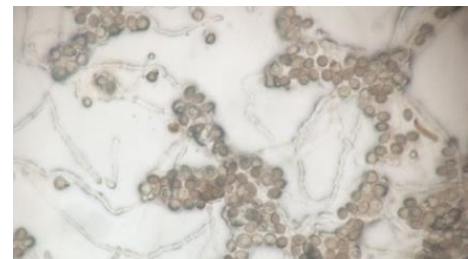
The processed and viability determined seeds of 35 forestry species were desiccated up to safe moisture level and deposited in the Gene bank of ICAR-NBPGR with passport details for long-term storage at -18°C for *ex-situ* conservation. A total of 70 forestry species has been deposited so far in the seed gene bank of ICAR-NBPGR.

To conserve forest genetic resources (FGRs) of very high conservation value or having recalcitrant seeds or both, *in vitro* regeneration protocols were developed for eight species to obtain whole plant regeneration for medium term storage. Different explants were used to induce callus formation which was then sub-cultured and multiplied.



*In vitro* propagation of *Taxus wallichiana*

Pollens of the species of high conservation value i.e. *Heteropanax fragrans*, *Diploknema butyracea* and *Firmiana colorata* (*Sterculia colorata*) were collected, processed, stored in liquid nitrogen and viability tests were conducted periodically.

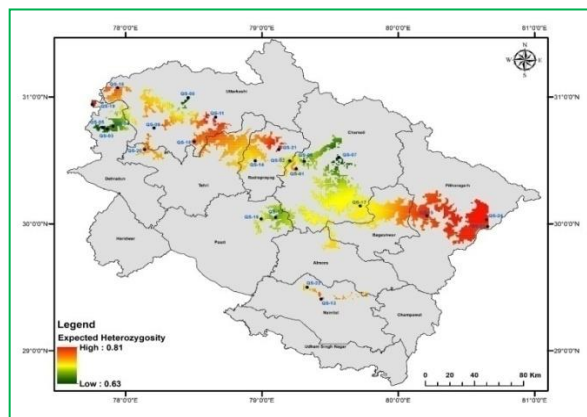


Germination of *Sterculia colorata* pollens after being stored in liquid nitrogen



## B. FGR Characterization

Ten nSSR (nuclear Simple Sequence Repeat) markers were used to assess genetic diversity and population structure of 24 populations of *Quercus semecarpifolia* meta-population from Uttarakhand. Structure analysis indicated that the sampled populations shared their ancestry with two common ancestral gene pools. The gene pool from the eastern region i.e. the Pithoragarh forest area had the highest level of genetic diversity, allelic richness and maximum proportion of private alleles. Thus, *Q. semecarpifolia* in Pithoragarh forest region should be conserved *in situ* and could be considered for conservation programme on top priority.



Spatial distribution of genetic diversity in *Quercus semecarpifolia* populations

## C. FGR conservation and establishment of field gene banks

Germplasm of *Rhododendron arboreum*, *Diploknema butyracea*, *Cinnamomum tamala* and *Taxus wallichiana* collected from different populations were propagated in the nursery for establishment of field gene banks.



Rooted cuttings of *Cinnamomum tamala*



Sprouted cuttings of *Rhododendron arboreum*

Field gene banks for the prioritized species were established at the following Uttarakhand Forest Department sites:

Species	Site
<i>Diploknema butyracea</i>	Kalikumao Range, Champawat Forest Division
<i>Cinnamomum tamala</i>	Manora Range, Nainital Forest Division
<i>Myrica esculenta</i>	Bhowali Range, Nainital Forest Division
<i>Taxus wallichiana</i>	Joshimath Forest Range, Nanda Devi National Park Forest Division, Joshimath
<i>Rhododendron arboreum</i>	Devidhura Range, Champawat Forest Division





Establishment of field gene bank at Champawat Forest Division

### **Genetic improvement of *Thespesia populnea* (IFGTB)**

Two Clonal Trials comprising of 40 clones of *Thespesia populnea* were established at Gudalur FRS, Chennai and Thalavaipettai farm land at Bhavani, Tamil Nadu respectively.

### **Selection and evaluation of *Haldina cordifolia* for higher wood productivity**

IFGTB, Coimbatore identified 15 candidate plus trees of *Haldina cordifolia* in Kollam (Kerala) and seeds were collected for establishing progeny trials. Two candidate plus trees were selected by TFRI, Jabalpur during the surveys in 4 ranges of Dindori Forest Division, M.P for establishment of field trails.

### **Evaluation of *Gmelina arborea* genetics resources for enhancement of productivity and wood quality in Kerala (IFGTB)**

Nine populations of *Gmelina arborea* were identified from different parts of Tamil Nadu and selected 45 CPTs based on growth superiority and tolerance to pest and diseases. The biometric data on total height, GBH, crown diameter and clear bole height were collected. Five superior families were shortlisted based on growth performances from progeny trial at Salem FRS; and seeds were collected from selected 45 CPTs. Quality planting stock of *Gmelina arborea* from 45 open pollinated families were produced and studied for variation in germination percentage and seedling parameters.

### **Germplasm assemblage of *Dalbergia*, its characterization and evaluation (IFGTB)**

Twenty five *Dalbergia* clones were added to the existing collections in the germplasm assemblage established at Varavoor, Kerala. A set of 60 clones were planted in Vanavarayar Institute of Agriculture, Manakkadavu, Tamil Nadu. Molecular marker studies carried out using RAPD markers revealed variation among individual trees rather than between different populations – a typical condition exhibited by out-crossing forest tree species. Considerable variation in secondary metabolites was also recorded among different *Dalbergia* populations identified in Tamil Nadu and Kerala.

### **Selection and screening of germplasm of *Acacia nilotica* L. (Babul) to improve Productivity in Tamil Nadu (IFGTB)**

Identified superior trees from 30 districts covering five agroclimatic zones in association with Tamil Nadu Forest Department. Pods collected from the selected trees and seeds were extracted for raising seedlings. From each of selected 50 CPTs, 150 seedlings were produced for establishment of progeny trials in different locations of Tamil Nadu.

### **Establishment and evaluation of provenance cum progeny trial of *Aquilaria malaccensis* (Agar) in Karnataka and Goa (Phase-I) (IWST)**



Sixty four trees were selected from different locations of North East India for establishment of provenance cum progeny trial. Fruits were collected from 42 trees. Significant variations were observed in the size of fruit and seeds collected from various locations. Seed storage experiments indicated that seeds stored at 15°C gave 30% germination after 21 days. Provenance cum progeny trials with 42 families were established in two locations; Iruvakkki experimental station of University of Agricultural and Horticultural Sciences, (UAHS) Shimoga, Karnataka and near Valikini-Nursery (Goa Forest Department) Sanguem, South Goa. The progenies were planted in 4 replications, with 3 trees per family per replication with spacing of 3 x 3 meters in completely randomized block design.

**Assess variability in growth, heartwood color, oil yield and chemical profiling for Indian Sandalwood (*Santalum album*) in Kerala (IWST)**

Surveyed seven sandal reserves in Marayoor, Kerala and recorded passport data and growth data for the sandal reserves. A total of 225 core samples were collected using increment borer for estimating variation in bar thickness and the content and colour of heartwood. Oil extraction was done and samples were ranked based on oil content in 225 samples. Methodology for molecular analysis has been standardised.

**Population dynamics, structure and genetic diversity of *Pterocarpus marsupium* in the tropical forests of Madhya Pradesh (TFRI)**

Diversity assessment using DNA markers was completed. One hundred and twenty one trees from different forest divisions of Madhya Pradesh were genotyped using 20 ISSR markers. Samples from seven study sites were analysed for Pterostilbene (a marker compound) using HPLC.



Regeneration of *Pterocarpus marsupium* from Balaghat forest division

**Conservation of RET species of Chhattisgarh – *Plumbago zeylanica* and *Celastrus paniculatus* and production of quality planting material (TFRI)**

Survey conducted in different forest areas of Chhattisgarh for collection of planting material of *Plumbago zeylanica* and *Celastrus paniculatus*. In *C. paniculatus*, Nitrate Reductase Activity (NRA), flavanoid, carbohydrate, phenols and sugar was estimated during organogenesis through leaves. In *P. zeylanica*, protein, tannins and carbohydrates were estimated in leaves. Planting material was produced through stem cuttings; and shoot multiplication and rooting experiments were carried out in both species.



Shoot cultures of *Plumbago zeylanica*



Shoot cultures of *Celastrus paniculatus*

**Development of value chain for bamboos for mass multiplication, popularization in farmers field and industrial linkages in Central India (TFRI)**



Bamboo plantations were established and maintained in various farmers fields located at different villages of Umaria, M.P. Field trial was established at TFRI, Jabalpur with the objective of comparing the performance of two superior clumps (genotypes) of six different bamboo species. *In vitro* shoot cultures *Pseudooxytenanthera stocksii* were established and maintained on MS medium supplemented with 4.5 mg l<sup>-1</sup> kinetin.

### **Selection and evaluation of natural population of *Terminalia bellirica* for its active ingredient content (TFRI)**

Thirty two phenotypically superior candidate plus trees of *Terminalia bellirica* (Baheda) were selected from natural populations in Bhandara forest division, Maharashtra (14 trees) and Dhamteri forest division, Chhattisgarh (18 trees). GPS location, height, girth, spreading pattern of the tree and length and breadth of leaves and other morphological characters were recorded and seedlings were raised in the FRCSD nursery.

### **Improvement of survival rate in *Capparis decidua* (Kair) under field planting conditions by architecting root biomass and *in situ* moisture management (AFRI)**

Fruit collection in winter season from two places namely Khari Khurd village and AFRI experimental field of, Jodhpur were carried out. Also sites with wild plants of Kair were selected for the collection of fruits. The data revealed that large, medium and small size fruits varied from 10.50mm to 18.22mm, 9.89mm to 11.68mm and 5.82mm to 9.69mm respectively, whereas the number of seeds ranged from 16 to 36, 18 to 62 and 2 to 6 in respective size class after depulping. Moisture per cent ranged from 42.63 to 69.79 % with the mean value of 55.25 %.

### **Conservation and evaluation of bamboo genetic resources of NE India (RFRI)**

A total of 495 accessions of high yielding and fast-growing genotypes of 15 commercially important bamboos in North Eastern States were collected. The germplasm bank of the same is maintained at RFRI, Jorhat and FRCBR-LE Agartala. Estimation of alcohol-toluene solubility test and holocellulose content test for *B. tulda* and *B. balcooa* has been completed.

### **Exploration and identification of genetic resources and strategies for sustainable management of *Paris polyphylla* in Arunachal Pradesh, Manipur, Mizoram and Nagaland in Northeast India (RFRI)**

51 populations of *Paris polyphylla* were explored from Arunachal Pradesh, Mizoram and Nagaland and collected ethno-botanical information of *P. polyphylla* used by communities. Identified 4 different forms of *P. polyphylla* and conserved the genetic resources at FRCBR, Aizawl.



*Paris polyphylla* collected from Tiwari village, Arunachal Pradesh



*Paris polyphylla* collected from Vapar village, Champhai, Mizoram



**Identification, Ecological Assessments for Selection and Screening of Superior and Insect-Pest Resistant Clones of *Salix* for their Cultivation, Production Trends and Conservation in the Cold Deserts of Himachal Pradesh and Jammu & Kashmir (HFRI)**

In order to select superior genotypes of *Salix* and to assess genetic variability survey of populations at Yeche, Darcha in Lahaul valley has been carried out. Observations on morphological traits viz., stem color and form, catkin

formation, bark pattern and leaf formation were recorded in selected trees at FRS, Tabo. Isozyme analysis of 5-10 samples each of 10 populations for assessing genetic variability using four enzyme systems (6PGDH, SKDH, IDH and MNR) completed.

Attack of aphid (*Cavariella ageopodii*) was observed on *Salix* trees. *Salix* in Tailing, Guiling 1<sup>st</sup> and Giu sites were found highly susceptible for the aphid. Lepidoptera larvae (*Cerura vinula*) was reported on mud site.

The survival and growth data of nursery trials were recorded at Field Research Station, Tabo, where 450 cuttings of different sizes collected from local sites in Spiti valley-cold desert region were planted in nursery.



Tabo village



*Salix* variants showing difference at germplasm bank

**Genetic improvement of *Pterocarpus marsupium* Roxb through germplasm collection and conservation in eastern India (IFP)**

Germplasm collection was done in diverse areas falling in three agro climatic zones of Bihar, Jharkhand and West Bengal. A total of 227 CPTs were selected and seeds from 37 CPTs were collected and seedlings raised.





CPT of *Pterocarpus marsupium* form Bihar

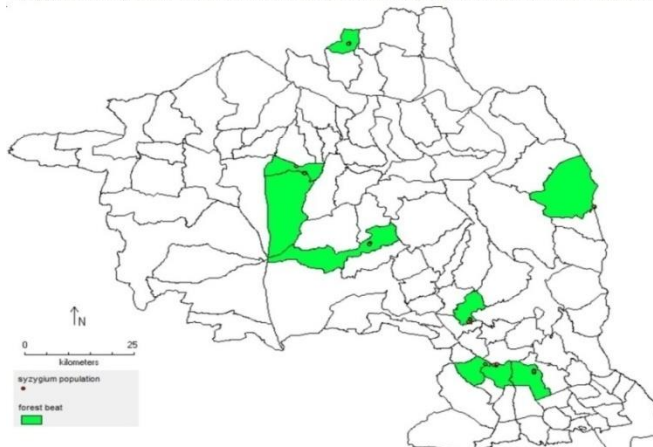
*Pterocarpus marsupium* seedlings

CPT of *Pterocarpus marsupium* form Jharkhand

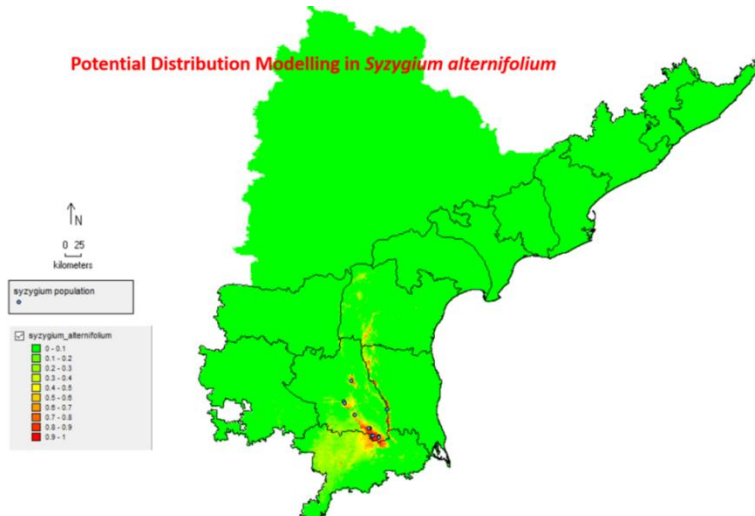
### Recovery programme for *Syzygium alternifolium*-an endangered species from Eastern Ghats (IFB)

Distribution map were generated for *Syzygium alternifolium* populations to identify potential areas beyond the recorded locations having similar climatic conditions using Niche modeling and MaxEnt modeling algorithm. The generated model had an AUC (Area Under Curve) value >0.9, indicating excellent prediction.

*Syzygium alternifolium* distribution map in Tirupati WLM, Rajampet and Kadapa Forest Divisions



Population mapping of *S. alternifolium* in three Forest Divisions of Andhra Pradesh



Potential distribution modelling in *Syzygium alternifolium*



A comparative chemical analysis was taken up for five samples of *S. alternifolium* and one sample of *S. cumini* recorded higher phenols, flavanoids and alkaloid content in bark for *S. alternifolium* as compared to *S. cumini* bark. Population variation was also observed for these parameters in *S. alternifolium*. Bark samples from Gadela and Sanipaya populations had higher phenols, flavanoids, alkaloid content as compared to Siddavatham population.

**Selection, evaluation, conservation and documentation of genetic resources of Teak and other important tree species for enhancement of productivity (IFGTB)**

35 Teak Seed Production (TSP) areas in 9 districts of Kerala were evaluated to understand the genetic diversity. Leaf samples collected from 30 TSP areas were tested for molecular characterization. Approximately 250 accessions were characterized from the TSP. A total of 20 SPA of Teak have been evaluated for biochemical and morphometric variations. Study on the variation in plantations and natural population revealed best plantations and populations for conservation in Ranni and Konni divisions.



Aruva Pulam - Teak Plantation



Bourdillon's Teak Permanent Preservation Plot

**Development of SSR markers and assessment of genetic diversity of natural populations of *Pterocarpus santalinus* distributed in the Eastern Ghats, India (IWST)**

Sixteen leaf samples of *Pterocarpus santalinus* (Red sanders) were collected from natural populations of 17 forest ranges of Andhra Pradesh distributed in the Eastern Ghats of India based on the girth size. DNA extraction of all these samples was carried out. PCR was carried out with twelve DNA samples and 26 primers (24 SSRs and 2 RAPD). As the extracted DNA contained more impurities, purification steps (kit method and others like repalleting) are carried out at the University of trans-disciplinary Health Sciences of Technology, Bengaluru (TDU). Whole genome sequencing is also being carried out.

**2.3.2 Tree Improvement**

**All India Coordinated Project on genetic improvement of *Melia dubia* (FRI)**

Evaluation of various progenies for the trials in the states of Haryana, Punjab, Uttarakhand and Uttar Pradesh was carried out. Low to moderate heritability coupled with moderate genetic advance and genetic gain was exhibited for CD and DBH. However, moderate to high heritability coupled with high genetic gain was exhibited for fiber length and specific gravity. The reproductive biology research work was carried out and various steps for hybridization were also made operational. Various wood related parameters and fiber length showed significant correlation with specific gravity with values ranging from 0.42 to 0.60. Non-significant correlation among growth and wood traits indicated that there was no influence of growth on wood properties upto age of 6 years.

**All India Coordinated Project for Genetic Improvement of *Melia dubia* (RFRI)**

Fruits from selected 41 CPTs from Manipur and Nagaland were collected. Morphological characterization was carried out in the progeny trial at RFRI. Variation was observed in bark, drupe, and stone within the trial and also in the new selections. *In vitro* cultures were initiated successfully from nodal cuttings, getting multiple shoot formation in modified MS medium. *In vitro* root formation was



obtained and thereafter rooted propagules were successfully hardened. To optimize the vegetative propagation techniques coppice shoots were used and success rate of 90% rooting within 30 days was obtained.

### **Collection, Conservation and Evaluation of *Melia dubia* germplasm from North-Bengal, Odisha hills and other parts of India for identification and release of superior clones (IFP)**

Around 110 different accessions of *M. dubia* from different parts of the country have been collected. Germplasm bank with 88 different accessions was established. Two field trials each in Bihar and Jharkhand with 21 genotypes were also established. Genetic diversity of the collected materials has been evaluated using 37 SSR primers (microsatellite markers) and the populations were found to group into two clusters. It was also observed that the genetic distance between South Indian germplasm and North Indian germplasm was more compared to the North Indian and Eastern Indian germplasm.

The areas in Nuapada, Nabrangpur, Bolagiri, Puri and Nayagarh in Odisha have been surveyed for the presence of *M. dubia* and seven CPTs in Nayagarh were identified. Collected one clone from Forest College, Mettupalayam under TNAU Tamil Nadu. Three progeny trials with six to 18 families have been established in June 2020 and two more trials including 18 families were established during September, 2020 at Torpa Khunti (Jharkhand). Demonstration plots have been established at IARI Barhi (Hajaribag) and FREC, Jadia Hajipur. A silvo-horticulture model has been established at Torpa (Khunti) to estimate economics of the model after harvest of the crop. A subsistence agroforestry model has been established at Lalgutwa to demonstrate intensive agroforestry system to the farmers and obtaining maximum return per unit area.

### **Assessment of *Melia dubia* for growth performance in multi-location trials in Kerala (IFGTB)**

IFGTB has established provenance resource stands, progeny trials, seed orchards and evaluation trials of *Melia dubia* to develop new high-yielding clones and seed sources. Pest and disease problems in nursery and plantations have been identified and control measures have been developed. A Vegetative Multiplication Garden (VMG) has been established from which clones are being vegetatively propagated for clonal trials. A field gene bank of *M. dubia* is being maintained in the VMG.

### **Development of seed production systems of commercially exploited trees species (IFGTB)**

The species studied were five Dashamula tree species namely *Aegle marmelos*, *Gmelina arborea*, *Oroxylum indicum*, *Premna integrifolia* and *Sterospermum suaveolens*; two Triphala myrobalans namely *Terminalia bellirica* and *T. chebula* along with *Saraca asoca*, *Pterocarpus marsupium*, *Strychnos nux-vomica*, *S. potatorum* and *Santalum album*. Seedlings were raised to establish Seed production systems (SPS) for selected medicinal plants. SPS have been established at four locations in Kerala and Tamil Nadu in an area of about one ha at a spacing of 5 x 5 m in randomized design.

### **Genetic Diversity Analysis and Conservation of Threatened *Salvadora oleoides* (FRI)**

The *S. oleoides* is a keystone and economically important species in the desert biome of the Indian subcontinent and the species decline has been observed during field surveys (2016–2019) conducted in states of Punjab, Haryana, Rajasthan and Gujarat. For species distribution mapping, geospatial data of 683 trees were recorded, out of which 70.28% were used for training the MaxEnt model and the rest to validate. The statistically significant AUC value ranged from  $0.92 \pm 0.02$  (LGM) to  $0.93 \pm 0.01$  Representative Concentration Pathways (RCPs) 2.6±70) with an average of  $0.92 \pm 0.00$ . The bioclimatic variables, contributed significantly for predicting the species distribution, which ranged from 60.3% (Last Glacial Maximum, LGM) to 85.5% (Current) with an average of 75.82%. For the climate change scenario (2050s and 2070s), a sharp decline in the species distribution area was observed for all RCPs (when compared with the current estimate of 8638.01 km<sup>2</sup>), which ranged from 2102.90 (RCP 2.6±70) to 5494.23 km<sup>2</sup> (RCP 8.5±70).