



INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION

(An Autonomous body under the Ministry of Environment, Forests & Climate Change, Government of India)
P.O. New Forest, DEHRADUN - 248 006 (Uttarakhand)

No. 06/PO/Media / Admin/ICFRE/2017-18

Dated: 22nd January 2018

To,

Sub: Sealed quotations for printing of ICFRE Annual Report 2016-17 – reg.

Sir,

Scaled quotation are invited from reputed printers having latest computer aided printing facility for printing of 300 (100 + 200) copies of ICFRE Annual Report 2016-17. The technical specifications of printing and printing paper shall be as below: -

- a) The designing, layout, planning and printing of the ICFRE Annual Report 2016-17 (English version) must be of superior quality. The approved design is available at Media & Extension Division and may be consulted during office hours. Printer has to adhere to the design available. The rates for printing of cover pages and text pages should be quoted separately.
- b) The printed copies shall be delivered in two stages as mentioned below. Firstly 100 copies of English version as per approved proof and specifications given below shall be delivered, followed by 200 copies incorporating changes conveyed if any.
- c) 300 (100 + 200) copies of as per approved proof and specifications given below shall be delivered:
 - 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 superior quality Matt paper 130 GSM
 - iv. Cover on superior quality imported Matt Paper 320 to 350 GSM
 - v. Lamination on cover
 - vi. Perfect binding.
- d) Providing master CD (05 Nos.)/Pendrive of ICFRE Annual Report 2016-17 chapter-wise (English Version) in PDF format, for uploading on ICFRE website/portal and each file should have size less than 2.MB.

A final draft in Color dummy shall be made available to the ADG (Media & Extension), ICFRE and after approval of colour draft only the magazine shall be printed.

You are requested to submit quotation upto 30th January 2018 at 11.00 AM for Printing of ICFRE Annual Report 2016-17 along with all terms and conditions overleaf.

Yours faithfully,


(Sandeep Kujur)
Asstt. Director General (Admin)

Copy to:

The ADG (Media & Extension), ICFRE, Dehradun

The Head, IT Division, ICFRE please arrange to place the quotation on ICFRE Website.

TERMS AND CONDITION

Bidders may please note that:-

1. Material for the ICFRE Annual Report 2016-17 will be provided to the printer in hard copy as well as in soft copy by the ADG (Media & Extension), ICFRE. However, contents in hard copy shall be treated as valid for all-purposes.
2. Material of ICFRE Annual Report 2016-17 is highly confidential and could not be disclosed to third party in any case. Any violation in this regard will attract legal action.
3. 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.
4. ADG (Media & Extension), ICFRE will approve the proof. Final printing of magazine shall be started by the bidder after the approval of the final draft.
5. ICFRE reserves the right to carry out any number of corrections/modifications alterations in the material at any stage.
6. Printer will be responsible for any error/ difference from the final approved proof. Errors once corrected will not be checked in the later version and if it crops up, it will be the sole responsibility of the printer and would be subject to penalties.
7. Time wasted due to these typographical errors or omissions would be counted and no extension of time would be allowed on this pretext.
8. The printed book/magazine are required to be delivered in full within the stipulated time. Extension of time shall not be permitted.
9. The rates quoted are to be FOR Indian Council of Forestry Research and Education, P.O. New Forest, Dehradun – 248 006. Rates quoted shall be inclusive of all taxes.
10. The firms shall submit samples of the works executed during the last three years.
11. Bidders must have their own infrastructure, which would be inspected by ICFRE for its verification.
12. The offer shall be valid for 12 months from the date of issue of work order.
13. Conditional quotation are liable to be rejected.
14. 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.
15. 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 at Dehradun, Uttarakhand.
16. 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 Quotation notice
- iv. Accept or reject any deviations from these conditions

17. **TIME SCHEDULE OF WORK**

- a) The printer shall submit the press proof (after proof reading by the printer) of the job same day of placement of confirmed order and provision of text material and photographs.
- b) In Case any modification at any time is suggested by ICFRE the revised proof shall be submitted within 24 hours from communication of modification(s) irrespective of number of proofs.
- c) The duly bound 100 copies of ICFRE Annual Report 2016-17 shall be delivered within 2 days of intimation of approval of press proof.

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

18. The Assistant Director General (Admin.) has the powers to cancel the contract at one-weeks notice, if the services of the contractor are found unsatisfactory or otherwise.
19. Appropriately designed 20 pages of the attached matter as per the design available at Media & Extension Division is essentially required to be presented alongwith the quotation in hard copy on prescribed paper. No deviation from the approved design will be acceptable.

20. **PAYMENT TERMS**

- a) Bill for magazine shall be submitted by the successful bidder the ADG (Media & Extension), ICFRE after successful completion and delivery of the specified number of printed book.
- 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 deduction of TDS as per Income Tax Rules / Laws.
- d) The payment as per the contract shall only be released after the complete and satisfactory delivery of the printed material and on verification by the ADG(Media & Extension).

21. **PENALTY**

For delay at any stage of execution of contract, the penalty shall be leviable at the rate of Rs. 200/- for first day and Rs. 100/- for each successive day. If the delay exceeds by 10 days, then it will construed a failure on part of bidder and consequently breach of contract.


(Sandeep Kujur)
Asstt. Director General (Admin)

FINANCIAL PROPOSAL

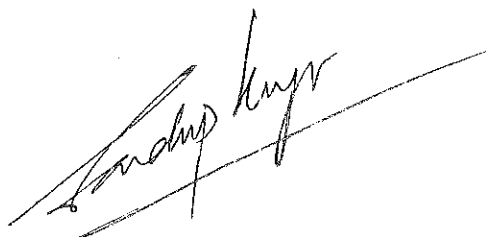
Sl. No.	Items	Specification	Qty.	Quoted Rates (in Rs. and words)	
				Rate per Page	Total
1.	Designing, Layout, Planning of cover and text pages (English Version)	<ul style="list-style-type: none"> Designing, Layout, Planning of cover and text pages needs to be done by a professional for giving a look of high standard to the Annual Report 	Approx. 200 pages of text for English version 4 cover pages for English version.		
2.	Printing of ICFRE ANNUAL REPORT 2016-17	<ul style="list-style-type: none"> Size A4 Approximately 200 pages of text and 4 pages of cover. The designing, layout, planning and printing of the ICFRE ANNUAL REPORT 2016-17 must be of superior quality. The rate for printing of cover pages and text pages should be quoted separately. Text on imported Matt paper 130 GSM Cover on Imported Matt Paper 320 to 350 GSM Lamination on cover Perfect binding. 	300 Nos. 1) Text pages 2) Cover (per copy) 3) Lamination (per copy) 4) Binding (per copy)		
3.	Providing CD of ICFRE Annual Report 2016-17	<ul style="list-style-type: none"> Web format (MS Word/PDF format chapter-wise). Maximum size of a file (2MB). Easily viewable on web. 	Master CD (05 Nos.)/Pendrive English Version.		
Total					
Rates for Extra texts pages – rates per page					

Total Quote in words

Note:

- i. The rates quoted shall be inclusive of GST and FOR O/o ADG (M&E), ICFRE.
- ii. The 300 copies shall be printed and delivered after carrying out the changes suggested by ICFRE.
- iii. Payment will be made on the basis of actual number of pages printed.
- iv. A final draft in Color (Color Dummy) shall be made available to ADG (Media & Extension) and on approval of this only the publication shall be printed.
- v. Printing of copies of Annual Report 2016-17 will be printed and delivered on or before 06.02.2018 positively.

(Signature of Bidder)
With Seal of the Firm



The Institute has also been declared as an **Advanced Centre for Cold Desert Afforestation & Pasture Management** by the Council for taking up advanced research in eco-restoration of these harsh but ecologically interesting sites.

Besides research, extension and training activities pointing towards sustainable development are important functions of the Institute. The main aim behind these activities is to keep the front line staff of the State Forest Departments and other end users abreast of the underlying concepts and research developments in forestry so as to transfer the technologies from laboratory to the land.

Infact, compiting uses of land for agriculture, forestry, pastures, human settlements including industries exerted a tremendous pressure on the country's finite land resources and thus, is adversely impacting forest resources and biodiversity as well. Accordingly, the forestry sector in India further needs to be geared up to deal with these ever emerging and challenging demands through inter-sectoral linkages and conversions. Besides, the use of modern technologies and concepts in natural resource management and compatible changes in governance is also essentially required. With this background, *Indian Council of Forestry Research & Education*, Dehradun has recently revised its research focus to enable its direct linkages to the society and community for their livelihood issues, specifically for the rural tribal poor and marginal sections of the society, apart from looking after contemporary issues and other stakeholders. For achieving the purpose as explained above, following Thrust Areas of research have been finalized.

THRUST AREA-I:

Managing Forest and Forest Products for Livelihood Support and Economic Growth:

This thrust area has been carved out for sustainable management of the forest and natural resources as well and also with an aim to protect and conserve the natural resources on one hand and provide opportunity for economic well being of the people and the country as well on the other. It requires intergration of environmental issues with the suitable developmental strategies; those will pave the way for sustainability of the resources and providing livelihood support to the people certainly merging with the ecology of the area. The thought process may benefit the million of people living in the poverty especially in the rural and forest fringe areas. The tree resources in the forest may also act as the safety net for millions of such people using diversity of the resources with the aim to enhance food security. It is beyond any doubt that the diversity of products, goods and services that are available from the forest is tremendous. In view of this, the institute under this thrust had undertaken/is implementing the following research project:

A]. Ongoing Research Projects under PLAN

Identification of Superior Chemotypes and *Ex-situ* Conservation of *Podophyllum hexandrum* Royle form Himachal Pradesh and Jammu & Kashmir (Nubra Valley).

Status & Progress Made:

Identified superior genetic stock of *Podophyllum*



hexandrum Royle. after carrying out extensive surveys in 30 sites falling in different geographical locations of Himachal Pradesh and in Ladakh Valley of Jammu & Kashmir. Out of the 30 sources surveyed, significant variations of Podophyllotoxin per cent contents were recorded. 16 of the sources have been found to contain >2 per cent of Podophyllotoxin per cent which further ranged from 2.12 per cent to 6.13 per cent. The remaining sources were found to contain Podophyllotoxin per cent of <2 per cent which ranged from 1.033 per cent to 1.80 per cent.

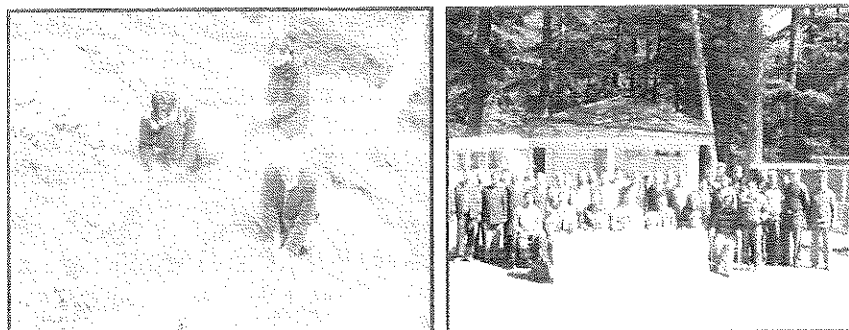
Each of the site was also geo-referenced and characterization of micro-habitat was also recorded. Field Gene Bank (FGB) to conserve the sources as collected during various surveys was also established at Field Research Station, Brundhar, Jagatsukh (HP). Seed and vegetative propagation trials had been established to develop user friendly propagation trials of *P. hexandrum*.

Assessment of optimum harvest limits of *Picrorhiza kurroa* and *Valeriana jatamansi* in Himachal Pradesh.

Status & Progress Made:

Extensive field surveys were conducted to select the experimental site for laying out the field trials and finally five site viz., Chail, Kholighat, Jagat Sukh (for *Valeriana jatamansi*) and Banserudhar and Tino (for *Picrorhiza kurroa*) were selected for detailed investigations. Trials were replicated ex-situ at Field Research Station, Brundhar also. Harvesting trials were established (Control, 25, 50, 75 and 100 per cent harvest of selected medicinal plants) at all the five selected sites to determine the optimum harvest limit of selected plants. Training was organized on Identification, conservation, and sustainable utilization of medicinal plants. Population status growth, regeneration and ability of populations to with-stand the extraction is being monitored closely for *Picrorhiza kurroa* and *Valeriana jatamansi* in all the experimental sites. The population data was recorded regularly from all the identified experimental sites.

During the year, assessment of productivity of already selected medicinal plants was continued in all the identified sites and the population data was recorded. Training cum interaction programme on Identification, utilization and conservation of medicinal plants of Himachal Pradesh was organized for the benefit of field functionaries of State Forest Department. Population status growth, regeneration and ability of population to with stand the extraction is being monitored for *Picrorhiza kurroa* and *Valeriana jatamansi* in all the five experimental sites (in-situ) and at FRS Brundhar (ex-situ).



Recording of Growth Data of *Valeriana jatamansi* and Organizing the Training Programmes

Status, Survey and Mapping of Ashtavarga Group of Medicinal and Aromatics plants (MAPs) in Himachal Pradesh

Status & Progress Made:

A new research project initiated from April, 2012 and accordingly, detailed activity and



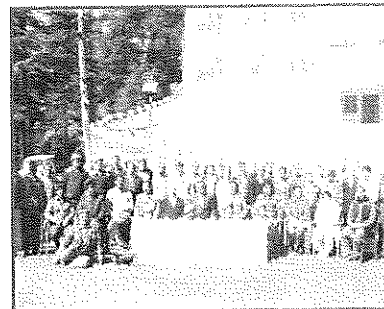
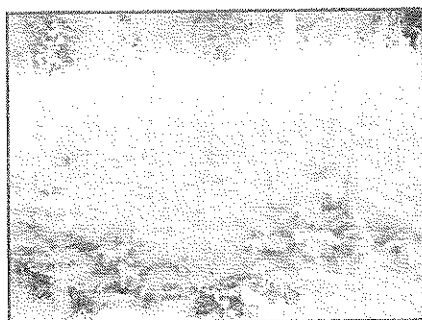
implementation plan including the design of floristic surveys was formulated. Besides, a questionnaire design and survey for ethno-botanical data was also prepared and finalised for collecting information from the stakeholders. Stress was also laid on the literature survey and collection of basic information of the Ashtavarga group of species growing in the region. Baseline survey was conducted in few locations falling in Shimla and Kullu districts of the state of Himachal Pradesh.

Determination of Morphological and Physiological Quality Parameters of Nursery Stock of Deodar (*Cedrus deodara*) and Ban Oak (*Quercus leucotrichophora*).

Status & Progress Made:

Raised and maintained nursery stock of Deodar and Ban Oak at Model Nursery Shimla and also at Field Research Station, Shilly, Solan respectively. Visited nurseries (35nos.) of the State Forest Department of Himachal Pradesh and collected the relevant information from the field functionaries regarding nursery raising and quality parameters being adopted by them for raising eodar and Ban Oak nursery seedlings. Sites selected for carrying out experimental plantations in Shimla and Solan Forest Divisions and carried out experimental plantations as per the morphological parameters of these species during August 2008 & 2009 on six different sites comprising three plantations for each of the species. Interim minimum standards of quality of Deodar and Ban Oak nursery stock were developed in consultation with the field functionaries and officers of the Forest Department following structured interviews and questionnaires. Based upon their morphological gradings initiated studies for judging quality of Deodar & Ban Oak nursery stock. Studies pertaining to Root Growth Potential (RGP) and chlorophyll grading were also aken up and related observations recorded.

During the last one year, maintained the left-over stock of the two species under study at their respective places and work on their physiological assessment was continued particularly with Root Growth Potential (RGP) trial in the nursery. Experimental plantations as established in Shimla and Solan districts maintained and data pertaining to their survival and growth parameters recorded. The trials repeated in gunnybags under this project in the nursery also maintained during October to March 2013 and data recorded regularly. Training programmes on 'Raising Quality Nursery Stock of Deodar and Ban Oak- issues defining Quality Parameters' were successfully organized under the project with a view to reach the end users *i.e.* the State Forest Department more effectively. Data has been compiled and analyzed statistically for drawing logical conclusions.



Deodar Out planting in Gunny bags Training Programme at Chail (HP)

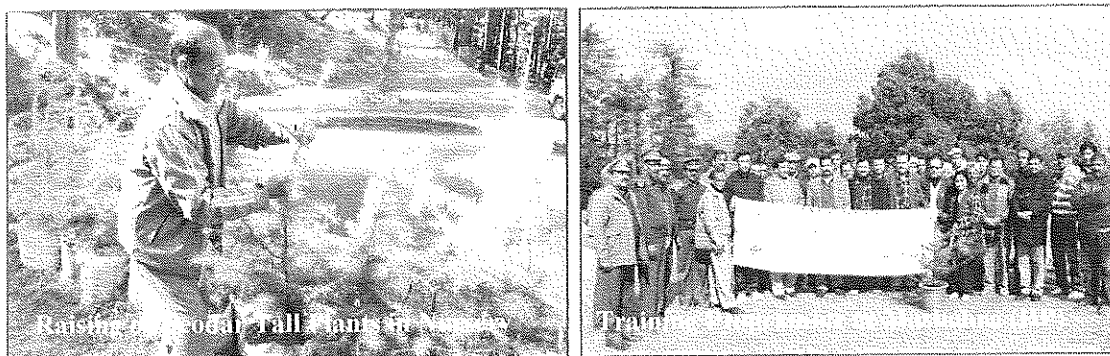
Development of Techniques for Raising Deodar (*Cedrus deodara*) Plantations through Tall Plants.

Status & Progress Made:

After extracting wildlings of deodar from the adjoining forests of Shillaru and Kandyali, district Shimla, an experimental plantation using these wildlings on the basis of their height and root collar diameter classes was established near Shillaru during August, 2008 and February, 2009 and was repeated during August, 2009 and August, 2010. Experiments were also carried out in view of the Root Exposure Time and Root Desiccation Protecting Substances while extracting and planting wildlings directly in the field as well as in the nursery conditions in Gunny bags. Besides this, deodar seeds were also sown in nursery during December, 2009 and were maintained for further growth and development of the seedlings in the nursery conditions. Nursery raised seedlings after attaining height of more than two feet were transplanted to gunny bags or plastic buckets for further growth, development and stabilization in the nursery. Experiments were also conducted on pruning, root exposure time during transplanting and root desiccation protecting substances similarly as were done in case of direct planting. Both field and nursery experiments were maintained properly and survival data of the trials recorded on regular basis.

Plantation success through these wildling still remaining a critical issue and with no breakthrough achieved in this regard -may be attributed to severe transplantation shock in those wildlings at the time of lifting the seedlings from the wild- experiments were repeated and maintained in the final year of the project and nursery studies were also continued for raising tall plants of deodar in the plastic containers and gunny bags during this period. Survival data recorded on regular basis for both nursery and field trials. For reaching out more effectively amongst the end-users *i.e.* State Forest Department, a training and demonstration programme

on 'Modern Nursery Techniques and Production of Tall Plants of Deodar' was successfully organized in active collaboration with Divisional Forest Officer, Shimla at Mashobra near Shimla. Data pertaining to field and nursery trials was compiled and analyzed statistically for drawing logical conclusions. The final project report is under preparation.



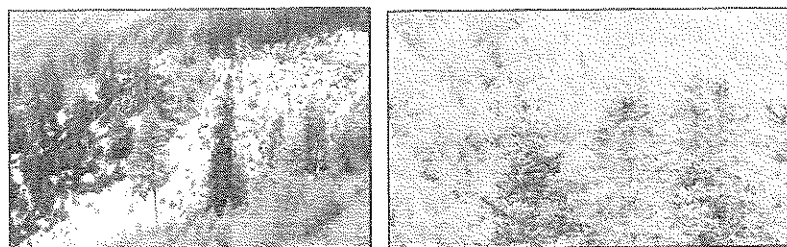
Studies on Seed Germination and Longevity of *Abies spectabilis* (D.Don) Spach

Status & Progress Made:

During the last two years of implementation of this project, extensive surveys were conducted for identifying the natural populations of *Abies spectabilis* in five forest divisions of Himachal Pradesh. In the process, identified nine natural population of *Abies spectabilis* respectively in Churdhar area of Sarpet Beat in Nohradhar Range of Shimla Wild Life Division, Budhavanh and Chowagor area of Tosh Beat in Kasol Range of Parvati Forest Division, Rahla area of Kothi Beat in Manali Range of Kullu Forest Division, Ula Kanda area of Ula Beat in Kalpa Range and Chot Kanda area of Nichar Beat in Nichar Range of Kinnaur Forest Division, Uchpago area of Chhitkul Beat and Barda Kanda area of Rakchham Beat in Sangla Range of Sarahan Wild Life Division, Dangiabe area of Yangpa Beat in Katgaon Range of Sarahan Wild Life Division. The data pertaining to geographical coordinates of the identified sites i.e., altitude, latitude and longitude along with associated species of *Abies spectabilis* were also recorded. The soil samples were also collected from the identified sites and analyzed in the laboratory for estimation of soil pH, organic carbon, moisture content, electrical conductivity, nitrogen and potassium. The cones of *Abies spectabilis* were collected from the two identified locations i.e., Chhitkul and Churdhar forest and seeds were extracted from the cones. The morphological data of the cones and seeds i.e., cone length, cone width, cone weight, specific gravity of the cones and seed length, seed breadth, 100 seed weight and moisture content of seeds collected during the period recorded. The nursery beds prepared and seed germination trials laid out in the laboratory and nursery. The seed storage trials also initiated by using different storage containers and storage environment and germination and viability data recorded.

During the year 2012-13, survey was continued for identifying the natural populations of *Abies spectabilis* and accordingly, added eight more natural populations of the species to the already existing data. Natural populations of the species as identified during the year include populations of Sushang forest of Chhitkul beat in Sarahan Wild Life Division, Kalingo forest of Jani beat in Kungshai forest of Bhabanagar beat, Foktodhar forest of Panvi beat in Kinnaur Forest Division, Phancha Kanda forest of Phancha beat in Rampur Forest division, Kumba forest of Kumba beat

in Shamshi Forest division, Bakar Thatch of Malana beat in Parvati Forest division and Heunthupin Thatch, Ropru of Neri beat in Kullu Forest Divisions of Himachal Pradesh. The data pertaining to geographical coordinates of the identified populations along with associated species of *Abies spectabilis* was also recorded. Till date, a total of 17 natural populations of *Abies spectabilis* identified from different Forest Divisions of Himachal Pradesh. The soil samples collected from the identified sites for estimation of soil pH, organic carbon, moisture content, electrical conductivity, nitrogen and potassium content to know the site characteristics of the identified locations. The germination trials of the seeds carried out in the laboratory and germination data recorded. The seeds of *Abies spectabilis* treated with different pre-sowing treatments recorded around 40 per cent germination under laboratory condition. It was however, observed that almost 60-65 per cent seeds were found to be empty. The seed storage trials were maintained and viability of stored seeds tested periodically in the laboratory. The viability of *Abies spectabilis* seeds stored in different type of storage containers and storage environment showed decreasing trend in seed viability. The seeds of *Abies spectabilis* stored in air tight polysac container in refrigerator at -5°C retained around 26% viability after 9 months of storage compared to other storage container and storage environment that showed less seed viability.

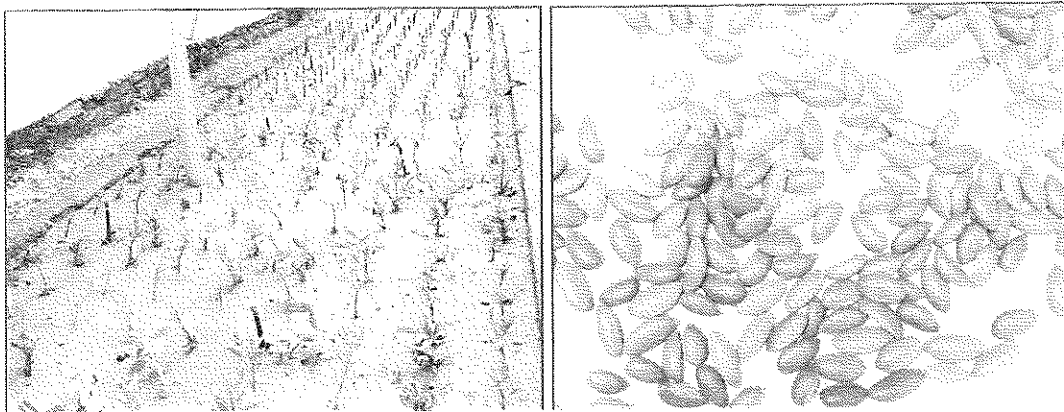


Tress of *Abies spectabilis* growing in Jani Beat and at Foktodar, Panvi Beat
Determination of Nursery Requirements and Initial Planting Performance of *Diploknema butyracea* (Roxb.) H.J. Lam and *Myrica esculenta* Buch. Ham under Mid-hill Conditions of Himachal Himalayas

Status & Progress Made:

The project was initiated during April, 2012 and during the period, seeds of *Myrica esculenta* commonly known as Kaphal were collected from Shimla and Solan districts of Himachal Pradesh and subsequently, germination studies were initiated both in the nursery and in laboratory conditions. Also initiated vegetative propagation studies in Kaphal under semi-controlled conditions at Model Nursery Baragaon, Shimla. Juvenile leafy cuttings treated with auxins were also tried and planted during spring season and marked mother trees of Kaphal in and around Model nursery, Shimla and Shilly Nursery, Solan for collection of cuttings in the subsequent stages. Similarly, seeds of *Diploknema butyracea* (Cheura) collected from Champaran district of Uttarakhand was sown in two nurseries namely Shilly (Solan) and Bir Plassi (Nalagarh) of the institute falling in mid and lower Himalayas respectively. However, late collection and sowing of Cheura lead to failure in its germination at both these nurseries but to establish demonstration plantation for assessing nursery requirements 600 nos. of Cheura plants were brought from FRI, Dehradun and subsequently, planted at two locations falling in Sirmaur and Solan districts during August, 2012. In both these locations initial survival was encouraging

but later on Cheura plants were extensively damaged by frost in the winter. After first winter only around 30 per cent plants rejuvenated and were maintained intensively.



Vegetative Propagation Studies in Kaphal and Chaura Seeds Collected from Champawat (UK)

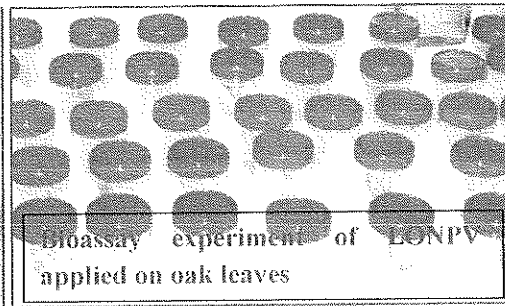
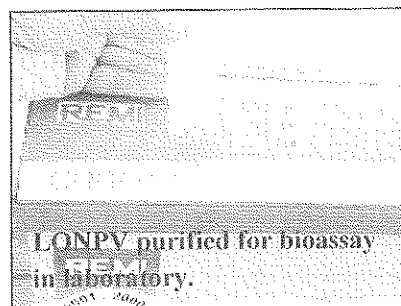
Management of Indian Gypsy Moth (*Lymantria obfuscata*) in Himachal Pradesh.

Status & Progress Made:

Through repetition of bioassay experiments, eg., Dose-Mortality-Bioassay for determining lethal dose i.e. LD^{50} of LONPV (*Lymantria Obfuscata* Nuclear Polyhedrosis Virus) were determined by calculating experimental data in Probit Analysis through SPSS (Ver.5) statistical software during the project period. The LD^{50} of LONPV to kill caterpillars of 3rd instar to 6th Instar stage feeding on leaves of *Quercus leucotrichophora* was established as $1.88E+08$ occluded bodies or virus crystals in 1ml of aqueous solution.

The efficacy of female sex pheromone in trapping and killing male gypsy moths were ascertained

during mating season of Indian Gypsy Moth (May-June). 1 μ l of crude extract of female sex



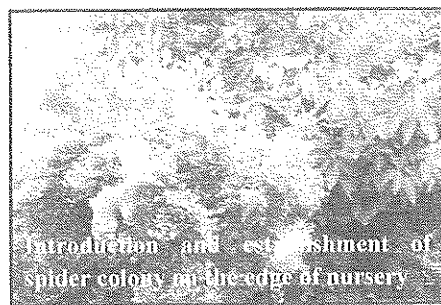
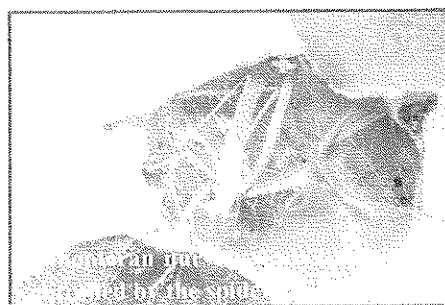
pheromone was used in micro-ampules of Pheromone-Trap which was place in the experimental plots in Shamshi, Kullu, H.P. The result indicates that each trap can kill in average 13 males in an area of 100sqm.

Predatory Efficiency of *Stegodyphus Sarasinorum* Karsch (Arachnida: Araneae: Eresidae) against Insect Pests of Plants in the Forest- Nursery.

Status & Progress Made:

For the evaluation of predatory efficiency of the social spider, so far 25 mature colonies were reared in the laboratory as well as insectery of the institute. Communal hunting and feeding as well as magnitude of prey-species were determined during this study.

Experimental plots were set up in Nogli, near Rampur, district Shimla by taking approximately, 50 nos. nursery beds of oak, deodar and kail. New colonies were placed in and around beds on the bamboo poles. The result indicated that for a nursery plot of the size of 10 m X 10 m, 5 nests of the social spider of the size of 8"x5" are sufficient to trap aerial insect-pests. This was also observed that retaining hedges and shrubs around the nursery encourage the establishment of spider colony when introduced, which would enhance trapping & killing of insect pest by this predatory social spider.

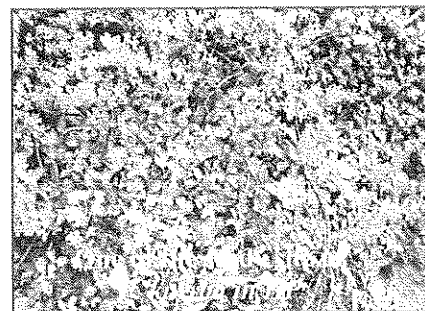


BJ. Ongoing Externally Aided Research Projects (EAPs)

Population Assessment and Identification of Superior Genetic Stock of *Picrorhiza Kurrooa* Royle Ex. Benth and *Valeriana Jatamansi* Jone by Screening Different Populations From North-western Himalayas (Himachal Pradesh and Uttarakhand).

Status & Progress Made:

Identified the Superior Genetic Stock of *P. kurrooa* and *V. jatamansi* from different geographical locations all along the zones of these specie from the states of Himachal Pradesh and Uttarakhand. Geo-referencing along with characterization of micro-habitat has been carried out. In case of *P.kurrooa* amongst the 41 sources studied from Himachal Pradesh and Uttrakhand, as many as 11 sources have been found to contain total picroside content of more than 10 per cent whereas the remaining sources were having total picroside content varying between 7 to10 per cent. However, in case of *Valeriana jatamansi* out of 51 sources identified from different geographical locations of Himachal Pradesh and Uttrakhand, valeopotriates per cent ranged from 1.34% to 4.7%. Highest valeopotriates content was recorded in the sample HFRI/VJ/07/KDL having 4.7% content and significant variations for valeopotriates contents were found amongst different sources. Higher valeopotriates content (3.5% and above) have been found in case of 14 sources. DNA fingerprint profiling of superior genetic stock of both these species of medicinal importance i.e. *P. kurrooa* and *V. Janmansi* had also been carried out. Besides, Field Gene Banks (FGBs) in the Field Research Stations/ Nurseries of HFRI, Shimla (HP) and High Altitude Plant Physiology Research Centre (HAPPRC), Garhwal (UK) were also established. In-fact, the institute alongwithits



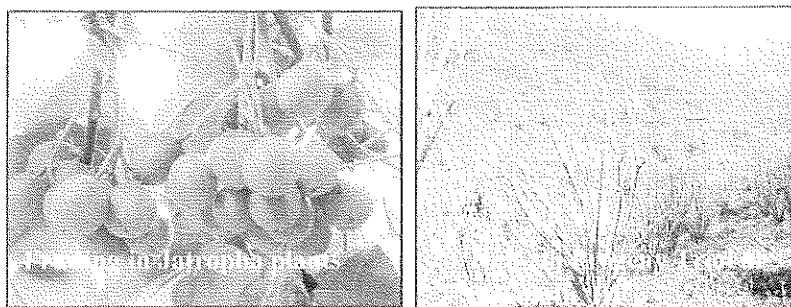
network partners identified the superior genetic stock of *Picrorhiza kurroa* Royle ex Benth and *Valeriana jatamansi* Jones by screening different populations throughout from North-Western Himalayas (Himachal Pradesh and Uttarakhand). Similarly, the superior chemo-types of *Podophyllum hexandrum* Royle by screening different populations throughout from Himachal Pradesh and Jammu & Kashmir (Ladakh Valley) were also identified.

Field Evaluation of Superior Accessions of *Jatropha Curcas* L. Under Micro-Mission Programme In Himachal Pradesh

Status & Progress Made:

Department of Biotechnology, New Delhi funded project under its micro-mission programme where, field evaluations of superior accessions of *Jatropha curcas* L. are being carried out simultaneously in various parts of the country by the network partners and HFRI, Shimla being one of them, executing this project in the state of Himachal Pradesh. Under this project first multi-locational trial was established at Solag village of Bilaspur district, Himachal Pradesh in October 2008. The material for this trial *i.e.* rooted plants of 10 accessions were brought from Bio-tech Park Lucknow (UP) and other partners. Those rooted plants were planted according to the layout design (RBD) as finalized by the funding agency. As per the design plants were planted at a spacing of 3mX 3m whereas border rows were planted with rooted cuttings of local accessions. All the growth parameters were recorded regularly and the plantation were maintained. However, poor survival was recorded by the end of 2010 owing to the frost injury, drought conditions and followed by termite attack. Accordingly, the similar trial was re-established at Jawalaji with same accessions and design in September, 2010. This trial also failed mainly due to poor survival of the rooted cuttings resulted into under rain-fed and planting stock of tropical region of the country planted directly in the field directly under sub-temperate conditions under new set of environmental conditions. The second plantation carried out under this project is that of half-sib trial, for which 20 different accessions were raised from the seeds at Bir Plassi, Nalagarh. Seeds of 18 accessions were provided by National Bureau of Plant Genetic Resource, New Delhi whereas the remaining two accessions were the local collections. Six months old nursery raised plants were transported upto the already identified site at Jawalaji for establishing half-sib trial. The plantation was carried out in August, 2009 in Randomized Block Design as decided by the *Jatropha* National Coordinator. The survival and growth of various accessions are being recorded regularly. Fruiting was also noticed in some of the plants of half-sib trial during 2nd & 3rd years of plantation. The pruning of plants in the trial was done in the month of February, 2011. *Jatropha* experimental plantations were maintained intensively during 2011-12. After pruning, vigorous branching was recorded in the half-sib progeny trial, however that also resulted into less fruit yield. Various fruit and seed parameters were measured analysed and reported.

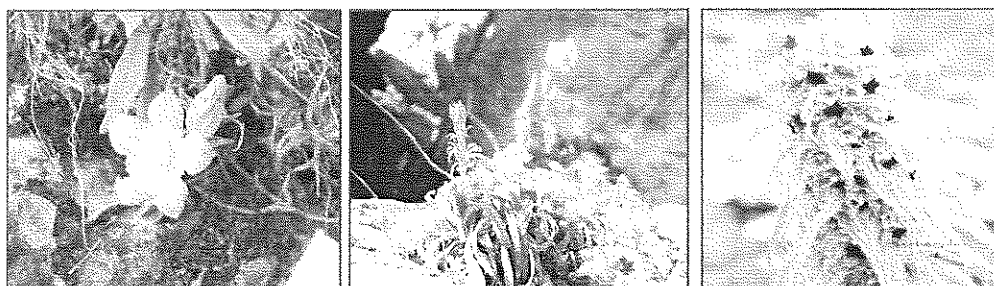
During the year 2012-13 maintained the trials and the related observations pertaining to growth and survival data of these field trials were recorded regularly. Compiled the progress of the project during February, 2013 and submitted the detailed report to *Jatropha* National Coordinator of DBT, New Delhi. As the project was in extended phase and emphasis was laid on the seed yield. Therefore, fruits/ seeds collected from different accessions during October- November 2012 from half-sib progeny trial and processed accordingly. Various fruit and seed parameters were also measured.



National Medicinal Plants Board (NMPB)-

Status & Progress Made:

For effective implementation of this project a Memorandum of Understanding (MoU) for active



collaboration between Himachal Pradesh Medicinal Plant Society (HPMPS) – an autonomous body of the Himachal Pradesh State Forest Department – and Himalayan Forest Research Institute as the collaborating institute was signed in the month of February, 2013. As an outcome of signing of this MoU, a dedicated project team was constituted at the institute for undertaking the various works under the study as per the agreed terms. Also a detailed activity implementation plan was formulated including the design of floristic surveys. Literature was reviewed from various sources and the proceeding of the CAMP workshop was edited for its publication in the book form. A field survey was undertaken to Sirmour district of Himachal Pradesh during March, 2013 to identify viable wild populations of medicinal plants assessed as ‘threatened’ in the Shimla CAMP Workshop, 2010. During this survey *Gentiana kurroo* was found to be as the main specie.

THRUST AREA-II:

Biodiversity Conservation and Ecological Security:

Biodiversity is the variety of life on the Mother Earth and a steady stream of ecosystem services supported and maintained by it are essentially required for the ultimate benefit of human welfare and survival. It is beyond any doubt that though the compelling theoretical knowledge about essential connections between ecosystem service generation, biodiversity and resilience in socio-ecological systems already exists yet, it has been convincingly shown that ecosystem flows are continuously being eroded, but we still to a great extent lack spatially explicit quantitative assessments for translating this theoretical knowledge into practice.

Himalayas - one of the largest and youngest mountain chains in the world - cover roughly 10% of India total land surface. Variations in terms of its size, climate and altitudinal ranges have created environments those are unique and characteristic to this region only. The diverse climate

and the varied environmental conditions of Himalayas support diverse habitat and ecosystems with equally diverse life forms. It provides an important habitat to the flora and fauna including 9,000 species of angiosperms and hence, is considered as the hot spot of biodiversity. There are about 3,470 species considered exclusively endemic to the Himalayas. This biological diversity providing subsistence to the human race in terms of food, medicine, housing, etc. is continuously being depleted due to intense anthropogenic pressures on forests owing to Population Explosion mainly for expansion of agriculture, over exploitation of forests, over grazing, illicit felling, shifting cultivation, development activities like, irrigation, construction of hydro-electric dams, road construction, mining excavation, etc. all leading to dysgenic selection. Accordingly, the wealth needs to be protected from further degradation so as to conserve the endemic diversity before it is completely wiped out from nature.

As far as faunal diversity is concerned, only few concerted attempts to document the faunal diversity have been made since the publication of The Fauna of British India, Including Ceylon and Burma series. To explain in brief, there are about 2,546 species of fishes (about 11% of the world species) found in Indian waters, about 197 species of amphibians (4.4% of the world total) and more than 408 reptile species (6% of the world total) are found in India. Among these groups the highest levels of endemism are found in the amphibians. There are about 1,250 species of birds from India with some variations depending on taxonomic treatments therefore, accounting for about 12% of the world species. There are about 410 species of mammals known from India, which is about 8.86% of the world species.

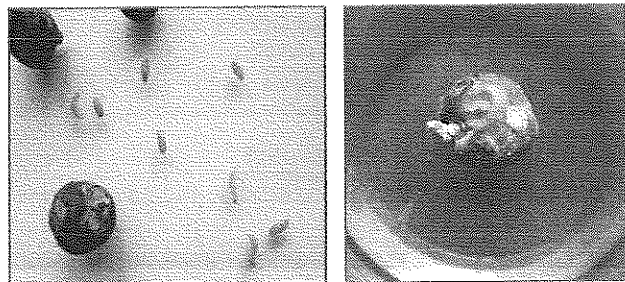
Keeping the above in view and in absence of any detailed documentation on this account attempts are necessarily required to assess, conserve and sustain the bio-diversity for food, water and ecological security in different ecosystems for suggesting suitable conservation measures and the institute is also on these lines.

A). **Ongoing Research Projects under PLAN**

Biology and Management of Insect Pest of Seeds of *Juniperus polycarpus* C. Koch and Evaluation the Insect-pests Resistance Performance in the Nursery

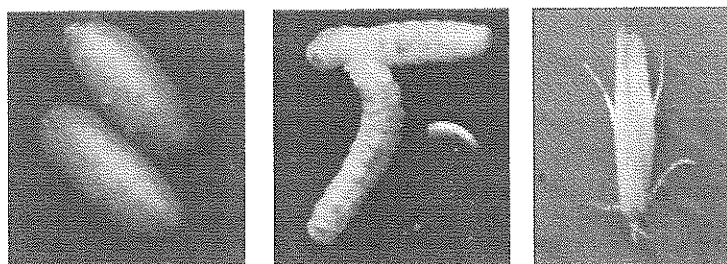
Status & Progress Made:

The project was been initiated from April, 2012 and to accomplish the objectives under the project, field surveys were conducted to assess seasonal abundance and biology of pre and post harvest insect-pests of berries and seeds of *Juniperus polycarpus*. Juniper berries both immature and ripe were collected



from the juniper forests during the months of October and November. They have been/will be monitored on regular interval for check against insect pests attack. The larvae attacking the berries were extracted from the damaged berries and thereafter, were kept for continuous observations. The larvae are being monitored to study the complete biology and behavior of the insect and will be identified after emergence. To observe insect-pest incidences, the seeds were kept in different containers such as Cotton bag and airtight containers and different

concentrations of Neem based pesticides and safer chemicals were also applied to analyze the control of insect pests during storage. Nursery trials of the healthy, infected and treated seed are being established to study the impact of insect pests in developing nursery stock. Seeds were extracted from the Juniper berries collected from two sources of Lahaul and Kinnaur and the seeds thus extracted were also observed for the emergence of insect pests. Larvae of lepidopteran insects were observed feeding on the seeds and two lepidopteran borer species had been identified causing damage to the seeds. Replications of treated Juniper Seeds have been kept under observation to study the impact of treatments. Field trial of treated seeds was established at Baragaon Model Nursery, Shimla and two similar trials will be initiated subsequently in the Field Research Stations located at Shilly, Solan and Shillaru, Narkanda.



Lepidopteran Larvae, pupae and adult of infected Juniper berries

B]. Concluded Research Projects under PLAN

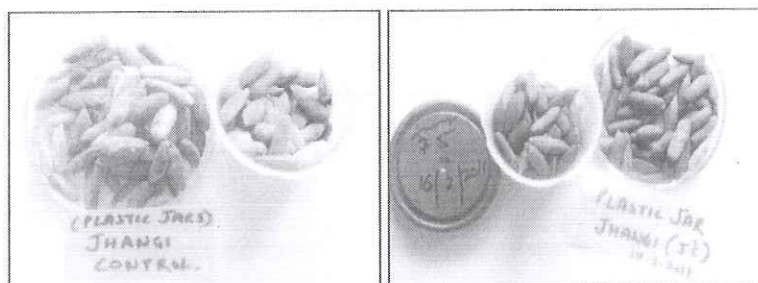
Management of Insect-pest and Pathogens of Seeds of *Pinus gerardiana* Wall. in Storage

Status & Progress Made:

The project was aimed at developing management strategies for insect-pests and pathogens attacking the seeds of Chilgoza-pine by applying different methods in the laboratory conditions. To study the impact of control measures, regular data was recorded and during observations bio-pesticides and safe chemicals were used to test their impact in controlling the insect pests and pathogen attack. Heavy mite attack was also observed subsequently in the stored chilgoza seeds even in controlled conditions. The data of seed damage was recorded fortnightly and was also observed randomly to check any serious borer effects and pathogens.

The findings reflected the presence of seed borer during the month of July, which was later identified as *Cateremna tuberculosa* Meyrick and reported for the first time infesting the seeds of the Chilgozapine. Due to its attack upto 50 per cent of seeds were found damaged within a month and the borer attack was recorded in between the months of July and December. Different treatments were given to the seeds to tests their efficacy against different insect-pests and diseases. The seeds were also kept under observation in different storage containers to assess the impact of various containers and freezing treatment in controlling the effect of pests and fungal attacks. The promising results were obtained with some treatments against the insect-pests and pathogens of chilgoza seeds which will be helpful in developing management practices against the attacks. Statistical analysis of the data on various treatments applied to stored chilgoza seeds revealed that the freezing treatments are very successful against insect pests attack since, no insect-pest attack was found in the seeds when stored at 0⁰C and 5⁰C in all the stored conditions. Neem powder was found to be most effective while managing the seed damage with mean values of 25.22(1.363) followed by Robust 29.33(1.423), Fursa 36.11(1.423) and Praghat

40.22(1.556) respectively when stored in cotton bags for the seeds stored for three years. The same treatments on Chilgoza seeds when applied in plastic jars showed that Robust 28.33 (1.396), Fursa 27.89 (1.383) and Neem 28.0 (1.390) have almost the same impact whereas Praghat 41.089 (1.573) has shown lowest impact. Since, it is not feasible for a common farmer to store Chilgoza seeds in freezing conditions, it is therefore advised that they may use most suitable treatment for effective storage of Chilgoza seeds during storage.



Seeds with Fungal infestation and Unaffected Seeds

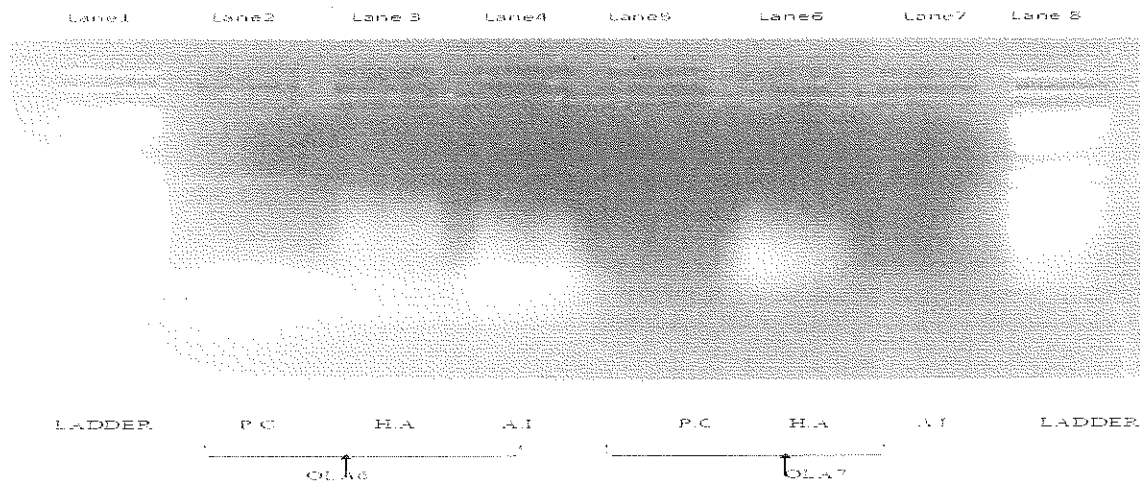
C]. Ongoing Externally Aided Research Projects (EAPs)

Taxonomy and Molecular Analysis (through RAPD-PCR) of Moths (Lepidoptera) in Cold Deserts (Spiti and Leh) of Indian Himalayas

Status & Progress Made:

Sites under the project were selected at Keylong (Lahaul), Pooh (Kinnaur), Tabo, Kaza (Spiti) and Leh (J&K) and were visited for collections of moths coinciding with their various stages of growth and development. Moths thus collected were stretched and stored for permanent preservations and some duplicate specimens had been kept at -20°C for RAPD-PCR study. Morphological study of moths was also carried out for their taxonomical identifications. Wing preparation and genitalia of 10 species i.e. *Agrois ypsilon*, *G. operculella*, *Y. rorella*, *S. litura*, *Plusia orechalsea*, Diamond back moth, *Polyphaenis confecta*, *Helicoverpa armigera*, *Xestia C-nigrum*, *Ochropleuravallesioca* had been taken up in the laboratory alongwith 04 species those have been identified for RAPD-PCR analysis in the laboratory and another 4 specimens of moths were treated for molecular analysis. PCR analysis of moths is in progress which is a new initiative to analyse the moths of cold deserts for their molecular characterization. Unlike traditional PCR analysis, RAPD (pronounced "rapid") does not require any specific knowledge of the DNA sequencing of the target organism: the identical 10-mer primers will or will not amplify a segment of DNA, depending on positions that are complementary to the primers' sequencing. After the PCR study Gel Electrophoresis will also be carried for studying the band length difference, molecular weight characterization and base pair differentiation. A total of 170 specimens of moth (Lepidoptera) species has been collected from various localities of cold deserts of Leh and Spiti till date. 10 species of has been identified i.e. *Agrois ypsilon*, *G. operculella*, *Y. rorella*, *S. litura*, *Plusia orechalsea*, Diamond back moth, *Polyphaenis confecta*, *Helicoverpa armigera*, *Xestia C-nigrum*, *Ochropleuravallesioca*.

On the basis of the results obtained from the data collected and analysed till date it is observed



ANNOTATIONS of figure 1 FROM LEFT TO RIGHT:

- 1) Ladder : ladder used was DNAmark™ 100bp ladder in lane 1 & lane 8
- 2) P.C: *Plucia Orechalcia*
- 3) H.A: *Helicoverpa Armigera*
- 4) A.I: *Agrotis Ipsilon*
- 5) OLA6: Universal random primer oligon series 6 in lane 2,3 & 4
- 6) OLA7: Universal random primer oligon series 7 in lane 5,6 & 7

that many species which look alike similar when seen from the naked eye but vary in their genetic constitution, which interprets that these may be very closely related to each other morphologically but are entirely different species and may not be designated as the same species. Random primers have been selected for the study and primers OLA-6 and Primer OLA-7 are giving promising results. PCR applications on three different species viz. *Plucia Orechalcia*, *Helicoverpa Armigera* & *Agrotis Ipsilon* with two different universal primers of Operon Series viz OLA6 & OLA7 revealed that all the three species showed the band variance when applied with OLA6 primer whereas when applied with OLA7 only *Helicoverpa Armigera* produced bands while others were not able to produce the variance which further concluded that OLA6 is much better primer to carry out the RAPD-PCR studies. Data on vegetation & environmental factors had also been collected and compiled.

TIRUST AREA-III:

Forests and Climate Change:

Systematic and scientific studies in respect of forest ecology have become inescapable in the present times when climate change is impinging upon the dynamics of forest ecosystem. It is important to understand behaviour of ecosystems in the wake of changing climatic patterns. Climate change has multi-faceted implications, accordingly addressing the related issues in a scientific manner requires good scientific understanding in maintaining the flow of goods and services from existing forests both at national as well as at global level. The efforts and the provisions in the past under United Nation's Framework Convention on Climate Change in Kyoto-Protocol are mainly at broader levels and are inadequate to address the challenges and adaptive capacity of communities (human floral & faunal) at ground level especially in the developing countries. Even as per the prediction by Intergovernmental Panel on Climate Change (IPCC), the GDP of the country like, India can decline up to 9 per cent due to shifting of growing seasons, which will have catastrophic impact on more than 400 million people, largely

India's poor. The available studies have pointed out average increase in the temperature of 2°C in last over two decades resulting in drying of rivers, vanishing of glaciers from the locations where forest dependent communities are habited and thus the food production is falling in such situations. Most vulnerable to such drastic changes in climatic factors are the poorest vulnerable population of forest dependent rural poor especially in hilly regions of Himalayas, though shrinking of their livelihood options, apart from its negative impact on productivity downstream. Accordingly, it is beyond any doubt that research on climate change is by nature interdisciplinary and multi-disciplinary in view of the large impacts the climate change has on all the aspects of forest eco-system. Thus, there is an essential need for an intergated approach to study the problem cutting across disciplines of physical, biological and social sciences. The institute is contributing a bit on this thrust too which can be seen in the following paras.

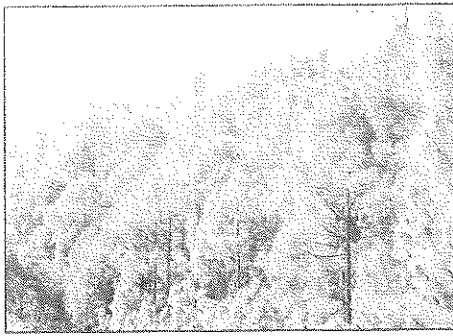
A]. Ongoing Research Projects under PLAN

Assessment of Carbon Stock in Forest Types of Shimla Forest Circle, Himachal Pradesh.

Status & Progress Made:

During first year of the project survey was undertaken to identify the sites representing different forest types falling in Shimla forest circle in the State of Himachal Pradesh. The major forest types as identified in Shimla circle were viz; Chirpine forest, ban oak, deodar, silver fir & spruce, Kharsu oak forest and alpine pasture. The sites for alpine pasture were identified at Chansel (3600-4000m) and Kawar (2800-3000m) of Rohru forest division and Talra (3000-3300m) of Chopal forest division. The sites for mixed forest of Silver fir and Spruce were selected at Deya (2500-2800m) in Chopal forest division and Larot (3200m) in Rohru forest division. The sites for ban oak forest were identified at Taradevi (2000m) and Koti (2100m) in Shimla forest division whereas for deodar forest sites were identified at Deya (1950-2300m) in Chopal forest division, Garakufer (2250m) in Theog forest division and Koti (2150m) in Shimla forest division. For chirpine forest sites were identified at Dhami (1500m) and Taradevi (1900m) in Shimla forest division whereas, for Kharsu oak site was identified at Chansel (3500m) in Rohru forest division. After finalization of the sites and methodologies etc., collected the relevant data from each of the forest types from Shimla, Theog, Chopal and Rohru forest divisions of the circle under reference.

The data collected from alpine pasture of Chansel, Kawar and Talra were analysed for biomass and soil carbon stock. Total biomass for Kawar, Chansel and Talra pasture was 3.80 t/ha, 5.5 t/ha and 10.40 t/ha whereas, carbon stock for these pastures was 1.99 t C/ha, 2.75 t C/ha and 5.40 t C/ha respectively. Total soil carbon stock for Kawar, Chansel and Talra pasture was 133.11 t C/ha, 160.00 t C/ha and 132.16 t C/ha respectively. The field study was conducted for *Pinus roxburghii* forest at Dhami and Guma; for *Quercus leucotrichophora* forest at Taradevi and Koti and *Cedrus deodara* forest at Koti. To estimate stem biomass all the trees falling in the plot of size 0.1 ha were enumerated for height, diameter and collected wood, leaf/needle samples. The biomass of understorey was determined by destructive method by following standard techniques for shrub and herb species. Soil samples were collected from selected sites of different forest species for three depth intervals for estimation of organic carbon.



Chirpine Forest, Dhami (Shimla Division)



Close View of Chirpine Forest, Dhami



Deodar Forest, Kail (Shimla Division)



Ban oak forest, Taradevi (Shimla Division)

Study on the Influence of Climate on Bionomics of *Pityogenes Scitus* Blanford (Coleoptera: Scolytidae) in Himachal Pradesh.

Status & Progress Made:

Pityogenes scitus completed three generations starting from February month and thereafter, by the end of October. Insect life-cycle was completed within the period varying from 56.2 to 75.2 days and entered into hibernation in pupal stage. It passes about 80 per cent of time during its life cycle from egg, larval and pupal stages below the bark of the tree. Forest stand of selected tree species below 80 cm GBH was found to be highly susceptible to the attack of *P. scitus* while compared to the higher girth classes. Growth and development of *P. scitus* was found to be faster at lower altitude while compared to the higher altitudes. Larval Growth Index was reported to be the maximum (4.0) in *P. wallichiana* and a minimum of 1.6 was recorded in *Pinus gerardiana*. Maximum damage (65.3%) was reported in *P. wallichiana* (Kail) in comparison to the other pine species with its minimum (1.0%) in *Cedrus deodara*. Insect live and work in association with other bark and wood borer species i.e. *P. scitus*, *C. longifolia*, *C. Rufescens* and *P. biformis*. Pupal stage- the hibernating stage- of the insect showed statistically significant variation in their abundance and survival in all the three altitudes, which may be due to the effect of particular climatic conditions on the Bionomics of the insect.

Bj. Ongoing Externally Aided Research Projects (EAPs)

High Altitude Transition Zones in Himachal Pradesh: Long-term Studies to Assess the Effects of Global Warming and Trials to Rehabilitate Degraded Sites in this zone

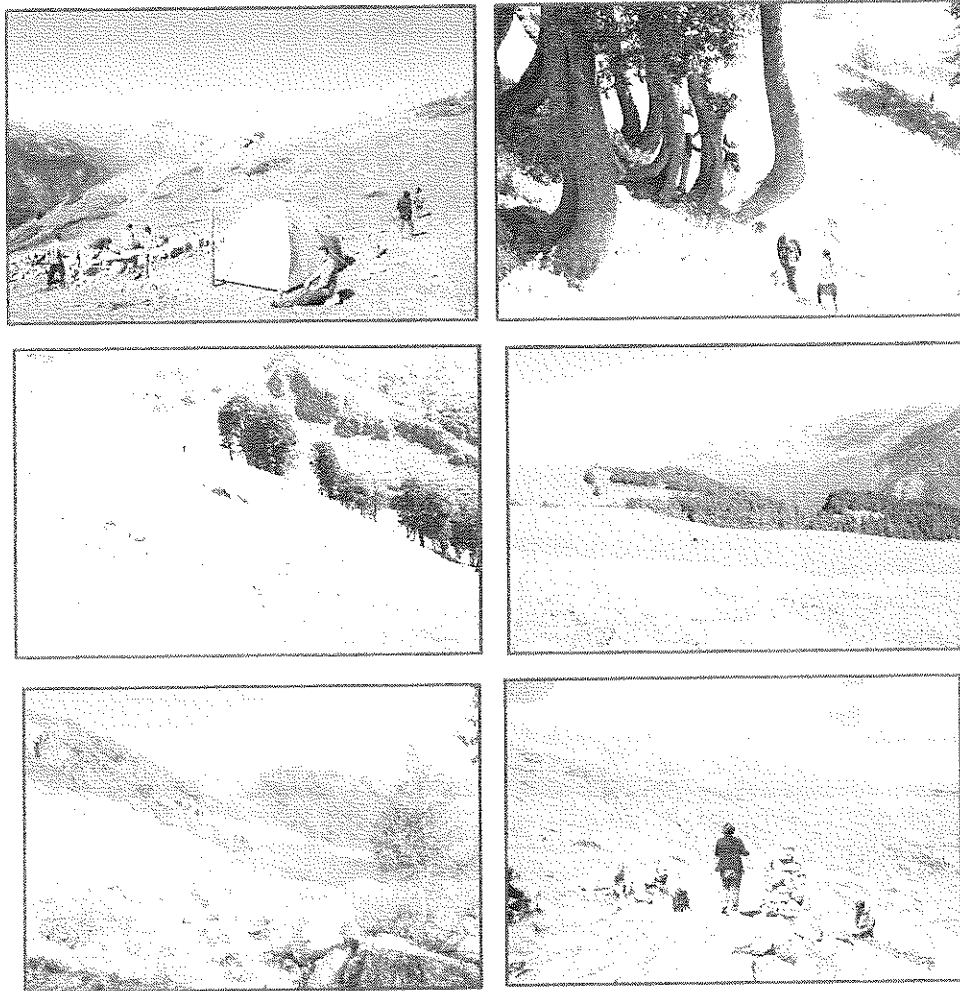
Status & Progress Made:

The basic concept under the project is to study the floristic composition in carefully selected plots in high altitude transition zones in the project area and monitor any changes in this composition over a period of time so as to arrive at any conclusions about the impact of global warming in the area. The first activity under the project, therefore, was to short-list potential sites and select the most appropriate sites for laying permanent study plots. For this purpose, the methodology defined under the project was followed.

Before starting the reconnaissance of transition zones in the project area, brain storming exercise was carried out to plan the reconnaissance. Detailed literature consultation was thereafter, done to short-list the potential sites for the purpose. On the basis of this exercises, 5 permanent plots (3 in the Satlej Basin and 1 each in Ravi and Beas Basins) were identified for carrying out the detailed studies.

During reconnaissance survey broad floristic composition, especially with respect to the occurrence of keystone treeline species, occurrence of any red listed plant species and their population status, incidence of biotic pressures and degradation status including recording of the GPS coordin

Glimpses of the Survey and Selection of Sites under the Project



THRUST AREA-IV:

Forest Genetic Resource Management and Tree Improvement:

Forests are the world's most important and most valuable renewable natural resource, evolved and conserved over millions of years in their natural habitat. However, increase in the world's population, together with higher standards of living has resulted/ is resulting in continuous pressure to transfer areas previously under forest to agricultural or other uses. The resulting large scale disappearance of natural forests is leading to an accelerated loss of valuable or potentially valuable germplasm. Forest Genetic Resources (FGRs) has been understood as genetic variation in trees of potential or present benefits to humans. The forest genetic resources directly or indirectly support the livelihoods of human and also cater to the raw material needs of numerous forest based industries. In addition, FGRs are the source material for the development of improved varieties and their conservation is of critical importance for sustaining the tree improvement programme. These genetic resources face several threats due to adverse abiotic and biotic stresses, habitat degradation, destruction, forest fires, climate change and invasive weeds resulting in damage to the forest ecosystem. The objectives of conserving forest genetic resources are to secure the ability of forest tree species to adapt to environmental changes and to maintain the basis for improving production and other benefits of growing trees through future selection and breeding activities. In Western Himalayas, where the tree vegetation is mainly confined to the northern-aspect and the southern slopes are devoid of vegetation, the ever increasing human and cattle population over the years has put lot of pressure on forests especially of middle Himalayas mainly on *Pinus roxburghii* (chir pine), *Cedrus deodara* (deodar), *Abies pindrow* (silver fir) and *Picea smithiana* (spruce), consequently, resulting in decreased density of these forests though over all forest area may have increased. Hence, FGR are indispensable elements for effective and long term conservation for the betterment of the society, sustainable utilization and conservation. Contribution of the institute under this thrust is as under:

A]. Ongoing Research Projects under PLAN

Population Genetic Analysis of Himalayan Banj Oak (*Quercus leucotrichophora*) forests and its pertinence to Genetic Conservation.

Status & Progress Made:

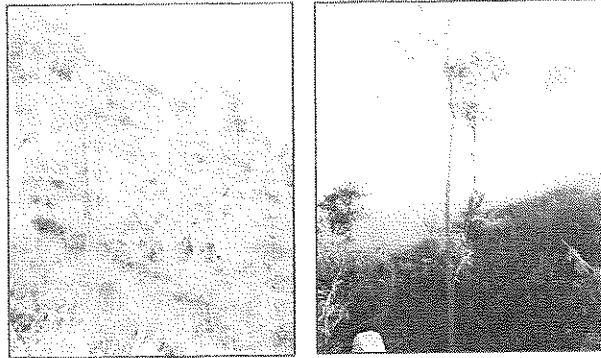
The primary consideration to bring about genetic improvement in a particular species is the development of a sound scientific programme based upon the available genetic variability and application of appropriate breeding methods to utilize the variability. The knowledge of genetic variability and association among seed quality traits is considered to provide considerable help in the genetic improvement of the species by way of making available reliable information on nature, extent and direction of selection. So far the progress in improvement in temperate species in the country is poor due to the failure to utilize the existing variability in tree improvement programme. Hence a, basic understanding of the genetic architecture of natural variation for traits in a species is imperative before initiating an effective tree improvement programme. Once this structure is understood and the level of inheritance is known for a trait, response to selection for the trait can be predicted.

Productivity Enhancement through Selection of Superior Clones of *Dalbergia sissoo*.

Theme: Conservation of Forest Genetic Resources

Status & Progress Made:

In the present study the selected clones were analysed for genetic variation in quantitative traits and through isozyme analysis as well. Besides this the resistance of these were also tested for stress and for their insect-pest. These clones have been found to possess genetic variation which has been also reflected in their growth performance in the field at two different sites. Advance generation orchards raised with these selected clones are being maintained and growth data being recorded periodically.

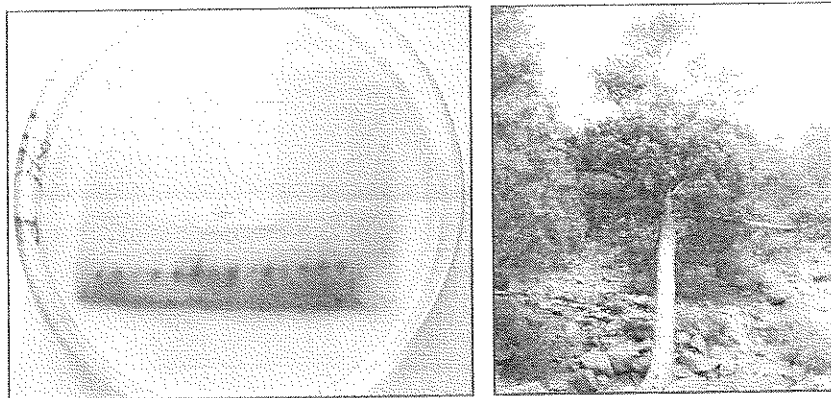


Growth Performance of Selected Clones in the Field

Isozyme Variation in Natural Populations of *Pinus gerardiana* (NEOZA PINE). [

Status & Progress Made:

In addition to the surveys of the populations for selection of Plus Trees and morphometric trait variation, regeneration status of the populations was also assessed. Cones were collected from selected individuals within the populations with cooperation of the local people as the rights of seed collection are reserved with them. Due to flash floods the nursery stock got washed away, hence raising of the progeny trial was done afresh. For genetic variation studies through isozymes six populations were assayed with stable enzyme systems like MDH, IDH, MNR, 6PGDH, GDH and SKDH.



Isozyme Variation Studies and Plus Tree of *Pinus gerardiana*

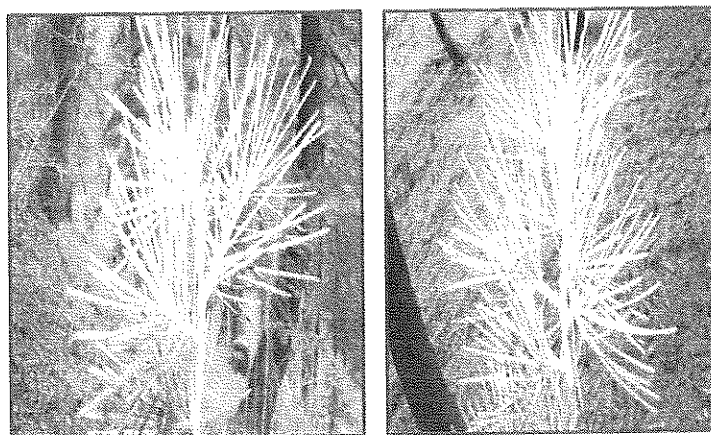


Regeneration Status in *Pinus gerardiana*

B]. Concluded Externally Aided Research Projects (EAPs)

Identification of Distinct Traits for DUS for conifers

Three populations each of *Pinus roxburghii* and *Cedrus deodara* were surveyed for distinct traits. The observations with regard to needle length and colour were found to vary considerably. The distinctness in traits for bark pattern and crown form and cone size in both the species were studied to identify distinct genotypes. Variants of the species with distinctness for morphometric traits have been identified.



Needle Colour variations in *Cedrus deodara*

Forestry Education and Policy Research to Meet Emerging Challenges

No project was undertaken under this specific category.

6.1 Improving Formal Forestry Education:

- **Research Advisory Committee (RAC)** of the institute in its meeting held on **25th May, 2012** for conducting **Pre-thesis Submission Seminar** of the **Mrs. Shalu Devi Thakur**, Research Scholar of FRI Deemed University, approved her thesis titled **Ecological Assessment and Conservation Prioritization of Floristic Diversity in Tirthan Wildlife Sanctuary, Himachal Pradesh : Material for Management Strategy** for its submission to

the Registrar, FRIDU for the award of Ph.D. Degree in Forestry (Forest Ecology & Environment).

- Another **Pre-thesis Submission Seminar** of the **Mr. Viraj Man** was conducted on **14th December, 2012**. Later the scholar submitted his thesis titled **Studies on Phyto-diversity of Lippa-Asrang Wildlife Sanctuary in District Kinnaur, Himachal Pradesh** to the Registrar, FRIDU for the award of Ph.D. Degree in Forestry (Forest Ecology & Environment).

6.2 Accreditation of the Universities:

Not applicable to the institute.

6.3 Networking Forestry Education with Research & Extension

6.3.1 Participation in Seminars/ Symposium/ Workshops/ Trainings

- As per the invitation received by the institute, Dr. VRR Singh, IFS Director, HFRI, Shimla attended the **Consultative Meeting on the ICIMOD Strategic Framework** on 10th April, 2012 at India Habitat Centre, New Delhi, thereby, enabling the council in general and institute in particular to develop ties with this international organization.