CHAPTER-X
HIMALAYAN FOREST RESEARCH INSTITUTE SHIMLA

The Himalayan Forest Research Institute, Shimla came into being during 1977 primarily to investigate the cause of failure of natural regeneration of Spruce and Silver Fir, the most common conifer species of western Himalayas occupying approximately 31.13% of the total area under conifers in the States of Himachal Pradesh (HP), Jammu & Kashmir (J&K) and Uttar Pradesh (UP). At present the mandate of Institute includes studies on various aspects of forestry in different eco-vegetation zones and tackling issues related to agro-forestry and mine-rehabilitation in the states of J&K and HP.

PROJECTS COMPLETED DURING 1999-2000

Sl. No. : 1

Project identification No.: HFRI- 005/ 08 (EBC-02)/UNDP/1995.

Name of the principal investigator : Dr. K.S. Kapoor

Title of the project: Strengthening and developing ICFRE and its Institutes. (UNDP-ICFRE Project).

Year of start of the project: December, 1992.

Cost of the project: Rs.88,000/-

Objectives : To produce genetically superior planting material.

Sub-project (1) HFRI-005-A/01(EBC-02)/UNDP/1995: Increasing forest productivity through production of genetically superior planting material for agroforestry.

Scientific importance of investigations: The project will increase productivity of social forestry/farm forestry plantations by making available superior planting stock.

Results/Achievements: A planting stock of about 8,000 ETPs of Poplars was raised in Johron Research Nursery, under UNDP Programme and was distributed amongst the farmers for mortality replacements in the demonstration plantations as raised earlier in their fields.

Under the programme 200 students of 11 different schools of Distt. Shimla were taken to the field and apprised of the forestry and its related practices. Demonstration plantation of 32 different clones of *Populus deltoides* was raised in the forest area of Kullu valley.

Sub-project (2) HFRI-006/01(EBC-03)/IDRC/1995: Rehabilitation of mine damaged areas with specific micro-interventions.

Scientific importance of investigations: Development of models for eco-restoration of mine damaged areas including improvement in socio-economic status of the rural poor living in or around such sites can be used for rehabilitation of environment.

Results/Achievements: Under Himalayan Eco-Rehabilitation Project (IDRC-ICFRE Project), many activities with specific micro-interventions to rehabilitate the mined and other degraded areas, which included physical

rehabilitation and soil working techniques, and raising of plantations with agro-forestry interventions have been carried out. Apart from providing the technical support, a six months long women's sewing training programme was organised at village Baldalwa, Paonta Sahib Distt. Sirmaur in collaboration with JST Limestone Mine, Baldalwa. A one day's workshop at Sri Renukaji was also organised for the trainees of this programme to make them aware about the environmental issues and the need for conservation of the dwindling natural resources. A film on the activities of the institute under IDRC- ICFRE project was also produced.

OLD PROJECTS CONTINUED DURING 1999-2000

Sl. No. : 1

Project identification No.: HFRI- 001/ 03 (EBC-01)/ WB/ 1995.

Name of the principal investigator : Dr. K.S. Kapoor

Title of the project: Cold desert afforestation and pasture establishment.

Year of start of the project: April, 1995.

Target year of completion: December, 2001

Cost of the project : Rs.2,94,205/-

Objectives : To understand the floral diversity of cold desert areas and select suitable species for afforestation of such sites.

Sub-project (1) HFRI-001-A/03(EBC-01)/WB/1995: Selection of suitable species for planting including trees shrubs and grasses and development of effective establishment techniques.

Component (1) HFRI-001-A/01(EBC-01)/WB/1995: Ecological survey of cold desert areas to select suitable species for afforestation.

Scientific importance of investigations: Indigenous species/ species groups have a high potential for afforestation of harsh sites including cold deserts. The project will evolve methodology for carrying out eco-restoration activities in such areas.

Results/Achievements: Preliminary analysis of phytosociological data as recorded from various sites completed showed great variations in the frequency of occurrence of various species, their density and dominance, etc. with clear indication of the effect of altitude and aspect.

Processing and identification of the plant 400 specimens belonging to 55 different families has been done. 5 dominant indigenous species have been selected for standardization of their nursery techniques.

Component (2) HFRI-001-A/02(EBC-01)/WB/1995: Survey to determine the occurrence and extent of *Juniperus macropoda* stands in the Cold Desert Regions of Himachal Pradesh.

Scientific importance of investigations: Junipers stands are getting degraded day by day and therefore, need intensive management to save this species from extinction. This project will devise techniques for conservation and artificial regeneration of this important species.

Results/Achievements: A detailed survey so as to assess the regeneration status and the ecological factors affecting natural regeneration of the species was undertaken.

Additional maps w.r.t. the distribution of *Juniperus macropoda* stands were prepared and detailed comparison of present day status of the species with the relevant details in the compartment history files of various forest divisions was made. Literature was received and sample re-survey in Lahaul & Spiti valley was conducted to fill the gaps in the earlier surveys with special reference to its natural regeneration. Draft report is in the process of finalisation.

Component (3) HFRI- 001-A3 / 03 (EBC-01)/WB/1995: Studies to determine species composition, plant biomass and net primary production in certain alpine pastures of western Himalayas.

Scientific importance of investigations: The study will devise means to conserve natural flora and rehabilitate degraded pastures.

Results/Achievements: Data on phytosociological and phenological characteristics were analyzed. Variations amongst the control plots and plots under different treatments viz., grazing, slopes and irrigation were noted. Biomass potential showed variation with treatments/ sites. Physico-chemical analysis of the soil samples was done. Good correlations amongst bulk density, particle density and sticky point etc. was observed. Additional samples of soil were collected from different depths and analyzed to assess the status of macronutrients. Statistical analysis and comparison of data has been done.

Component (4) HFRI- 001-A4/03 (EBC-01)/WB/1995: Development of Nursery and Planting Techniques of *Fraxinus xanthoxyloides*.

Scientific importance of investigations: The project will standardize nursery and propagation techniques for *Fraxinus xanthoxyloides*.

Results/Achievements: Studies to determine the effect of root clipping on growth and development of seedlings, to assess the effect of irrigation schedule (both for pricked out seedlings and for seed sowing) and to determine the optimum time of sowing (winter and summer) in nursery conditions were repeated. Analysis of the data is in progress. New trials have been laid.

Component (5) HFRI-001-A5/03 (EBC-01)/WB/1995: Development of Nursery and Planting Techniques of *Quercus ilex*.

Scientific importance of investigations: The project will evolve suitable nursery and planting technique for *Quercus ilex* for afforesting cold desert areas.

Results /Achievements: Nursery techniques standardized as far as time, depth of sowing, and spacings etc. Experiments on transplanting techniques did not show encouraging results. Studies to understand the effect of root clipping and the effect of irrigation schedules on growth and development in pricked out seedlings have been initiated.

Component (6) HFRI- 001-A6/03 (EBC-01)/WB/1995: Development of Nursery and Planting Techniques of *Hippophae rhamnoides*.

Scientific importance of investigations: Standardized nursery and planting techniques for *Hippophae rhamnoides* will be evolved for afforestation of cold desert.

Results/Achievements: It has been established from the data that winter sowing of the seeds of the species gives the highest germination percentage in nurseries. Nursery trials on the optimum depth and density of sowing and effect of irrigation schedule on the seed germination were repeated to confirm the results. Trials to assess the growth performance of shoot cuttings of various diameter classes and irrigation regime were also taken up during the period under report. Preliminary trials on allied species i.e *Elaegnus* spp. were also laid out to have some basic information regarding the performance of this species both in nursery and in mist-Chamber conditions.

Component (7) HFRI-001-A1/07 (EBC-01)/WB/1995: Development of Nursery and Planting Techniques of *Juniperus macropoda.*

Scientific importance of investigations: This is an important species which can be recommended for afforestation of Cold Deserts. The project will evolve suitable nursery techniques for taking up large scale afforestation with this species.

Results/Achievements: Laboratory experiments have shown that the seed dormancy in case of *Juniperus macropoda* is due to its seed coat dormancy coupled with the dormancy in its embryo. It has also been observed that scarification of seeds with sulphuric acid and its stratification for approximately fifteen weeks is necessary for breaking up the dormancy in the seeds. Further work is in progress.

Sub-project (2) HFRI-001-B/03(EBC-01)/WB/1995: Improve Establishment of Clonal Wood Species.

Component (1): HFRI-001-B1/03 (EBC-01)/WB/1995: Studies on different soil working techniques for afforestation of slopes and low lying areas in the cold desert regions of Western Himalayas.

Scientific importance of investigations: Measures evolved will lead to successful raising of plantation in cold desert areas.

Results/Achievements: Design were prepared and experiments laid out. Some observations have been made. Further work is in progress.

Component (2) HFRI- 001-B2 / 03 (EBC-01)/WB/1995: Studies on planting techniques of poplars in the cold deserts areas.

Scientific importance of investigations: The findings of the project will be helpful in taking up large scale afforestation with *Populus alba.*

Results/Achievements: Sets of local poplars of diameter class of 18 cm planted in pits of the size of 60 cm^3 give the best results.

During the year the experimental block raised earlier was maintained and observations were made. The draft paper is being finalised.

Component (3) HFRI- 001-B3/03 (EBC-01)/WB/1995: Performance testing of different provenances of *Populus ciliata* and other poplars in nursery and in field conditions.

Scientific importance of investigations: Assessment of the best performer amongst the collection of various provenances will definitely give an insight for recommending the specific provenance while carrying out afforestation activities in the cold deserts.

Results/Achievements: Nursery trials on various provenances of *P. ciliata* and *P. alba* have been completed and the 'Pinder' provenance of *P. ciliata* has shown the best potential for planting in these specific sites. *P. alba* has given very encouraging results in nursery condition. Field trials only in case of *P. ciliata* were taken up. 15 different provenances of this species are under trial. The data on the related growth attributes have also been recorded during the period under report. Casualty replacements were also taken up and the experimental plot was maintained. Literature scanned and data computed for obtaining the statistical significance of the trial. Necessary modifications in the paper done and the same is in the process of finalisation.

Sl. No. : 2

Project identification No.: HFRI- 002/ 04 (SFG-01)/WB/1995.

Name of the principal investigator : R.R. Bhalaik & Dr. K.S. Kapoor

Title of the project: Regeneration of coniferous and broadleaved forests.

Year of start of the project: April, 1995.

Target year of completion: December, 2001

Cost of the project: Rs.3,31,896/-

Objectives : Silver fir and Spruce need over-head shade during the earlier stages of their development. Techniques of protecting the young seedlings from the direct sunlight by providing wooden shades both in the germination and in transplant beds in nurseries have already been standardized. This project will assess the feasibility of hill Poplar (*Populus ciliata*) as a nurse crop for the out planted young seedlings.

Sub-project (1) HFRI- 002 A/ 04 (SFG-01)/WB/1995: To Examine the Effect of introduction of *Populus ciliata* into degraded Coniferous Forests.

Component HFRI- 002-A1 / 04 (SFG-01)/WB/1995: Improvement of Silver Fir and Spruce and regeneration through introduction of *Populus ciliata* as Nurse Crop.

Scientific importance of investigations: There are number of published research findings that Silver fir and Spruce definitely require shade in nursery condition. However, the effect of shade in the earlier phase of establishment in field condition has not been established so far. This project will generate useful information in this regard.

Results/Achievements: The experiment has not yet reached the stage where effect of shade on the early establishment of Silver fir & Spruce seedlings could be established in the field conditions. No changes in the floristic composition were observed in the research plot at Solang Nallah over the period of time. Site for laying out trial for additional shade treatment were developed and planting of Silver fir and Spruce has been carried out. Mortality replacements of both the Poplars and the coniferous species were also carried out.

Sub-project (2) HFRI- 002-B/ 04 (SFG-01)/WB/1995: Development of nursery and planting techniques for fir and spruce.

Component (1) HFRI- 002-B1/04 (SFG-01)/WB/1995 (a) Determination of seedling grade for field planting of Silver fir. (b) To assess the size of Root Trainers for raising standard sized Silver fir and Spruce Seedlings.

Scientific importance of investigations: The experiment will provide actual assessment of the planting stock culling before planting out in the field. Reduction in nursery time will save labour and cost.

Results/Achievements: The data recorded from the experiments laid out at Narkanda indicated better survival of the large sized seedlings. It has been concluded that the seedlings of Silver Fir of the size below 20 cm should not be planted in the field. Field trial for determination of seedling grade in case of Spruce was laid out at Chhichar Forest near Narkanda.

The sowing experiment with respect to the different sized root trainers was repeated and seeds were sown during October 1999. The trial is being maintained and the related parameters are being observed carefully.

Component-(2) HFRI- 002-B2/04 (SFG-01)/WB/1995: Studies on grafting techniques of *Pinus gerardiana*.

Scientific importance of investigations: The project will enable producing large quantity of better quality seeds of *Pinus gerardiana.*

Results/Achievements: The nursery stock of seedlings raised from different provenances was maintained in the nursery for taking up further grafting. Different treatments of the grafts including bud grafting were worked out and experiments to assess the performance of various grafts was repeated during February/ March, 2000.

Component-(3) HFRI- 002-B3/ 04 (SFG-01)/WB/1995: Improving growth and establishment of *Pinus gerardiana.*

Scientific importance of investigations: The results will help speeding up establishment and growth of this naturally select growing species.

Results/Achievements: Application of nitrogen fertilizers was found to considerably improve the establishment of *Pinus gerardiana* seedlings in the initial stages of the development in the field conditions. Further trials and observations are on.

Component-(4) HFRI- 002-B4/ 04 (SFG-01)/WB/1995: Studies to evaluate the performance of different seed sources in *Pinus gerardiana* in nursery and in the field.

Scientific importance of investigations: On the basis of the results, some specific recommendations for using particular provenances for carrying out afforestation activities can be made.

Results/Achievements: Nursery trials showed that seeds collected from 'Jungi' area of district Kinnaur gave the highest germination percent and most vigorous seedlings. Further observations are in progress.

Component-(5) HFRI- 002-B5/04 (SFG-01)/WB/1995: (a) Studies on seed dormancy of *Taxus baccata*. (b) Propagation of *Taxus baccata* through branch cuttings.

Scientific importance of investigations: The project will suggest measures to overcome the dormancy of seeds to get adequate germination and regeneration.

Results/Achievements: Experiments have shown that in case of *Taxus baccata*, the seed dormancy is due to the under developed embryo.

Therefore, seeds were collected and new experiments were initiated to assess the germination behaviour in different conditions.

Sl. No. : 3

Project identification No.: HFRI- 003/ 03 (EBC-01)/WB/1995.

Name of the principal investigator: G.S. Goraya

Title of the project: Agroforestry and silvipasture in lower hills.

Year of start of the project: April, 1995.

Target year of completion: December, 2000

Cost of the project: Rs.1244/-

Objectives : To ascertain most suitable species for agroforestry/silviculture in the lower hills of Himachal Pradesh.

Sub-project (1) HFRI- 003-A/ 03 (AGF-01)/WB/1995: Selection of species most suited for agroforestry/ silvipasture in the lower hills and development of appropriate models with people's participation.

Scientific importance of investigations: The project findings will give a boost to agroforestry in the region.

Results/Achievements: Various models have been laid out and performance is being assessed. A report will be brought out very soon.

Sl. No. : 4

Project identification No.: HFRI- 004/ 05 (SFG-02)/WB/1995.

Name of the principal investigator : R.R. Bhalaik

Title of the project: Planting stock improvement programme.

Year of start of the project: April, 1995.

Target year of completion: December, 2001

Cost of the project: Rs. 25.00 lakhs

Objectives : To develop seed production areas of *Pinus roxburghii.*

Sub-project (1) HFRI- 004 –A-/ 05 (SFG-02)/WB/1995.: Identification and Location of Seed Stands.

Component HFRI- 004 –A-1/ 05 (SFG-02)/WB/1995: Identification and location of seed stands of *Pinus roxburghii* and their development into Seed Production Areas (SPAs).

Scientific importance of investigations: The SPAs created will provide the best seeds for raising future stock and lead to increase in productivity.

Results/Achievements: Seed Production Areas (SPA) established in Kopra in Nurpur Forest Division were maintained. Culling operations have been completed in 22 ha in Bairkot Forests (Suket Forest Division).

Sub-Project (1) HFRI- 004 –B2/ 05 (SFG-02)/WB/1995: Establishment of Seedling Seed Orchards (SSOs)/ Seedling Seed Production Areas (SSPAs).

Component-(1) HFRI- 004 –B1/ 05 (SFG-02)/WB/1995: Establishment of CSO of Shisham (*Dalbergia sissoo:* 8 ha.)

Scientific importance of investigations: Seed quality has major impact on the benefits obtainable from plantation forestry. Healthy and genetically superior planting stock will be available on completion of this project.

Results/Achievements: CSOs of Shisham at Gondpur (3ha); Laliya, J. & K. (3.5 ha); and Bir Plasi (1.5 ha) were maintained. Observations were made and data analysis is in progress.

Component-(2) HFRI- 004-B1/ 05 (SFG-02)/WB/1995: Establishment of SSO/SSPA of *Pinus roxburghii* (5 ha.) and *Dalbergia sissoo* (7 ha.)

Scientific importance of investigations: Healthy and genetically superior planting stock will be available for raising plantations.

Results/Achievements: Seedling Seed Production Area (SSPA/SSO) measuring 5 ha established in Shun Forest of Kuthar Range (Kunihar Forest Division) during August 1999 was maintained. Casualty replacements were also taken up. The areas of SSO of Shisham established earlier were maintained and growth data were recorded.

Sub-Project (2) HFRI-004-B3/05 (SFG-02)/WB/1995: Establishment of Vegetative Multiplication Gardens (VMGs).

Component : Establishment of VMG of *Dalbergia sissoo* (2 ha.)

Scientific importance of investigations: VMGs are essentially required for production of large-scale quality planting material. This project will ensure supply of quality planting stock.

Results/Achievements: Planting Stock for establishing VMG of Shisham raised earlier was maintained. Planting in 1.5 ha area to establish VMG of Shisham was done in Bir-Plasi forest falling in the Nalagarh Forest Division. Planting stock of Shisham for achieving the remaining targets of 0.5 ha of VMG has been raised.

Sl. No. : 5

Project identification No.: HFRI- 009/ 08 (EBC-04)/PLAN/1998.

Name of the principal investigator : Dr. K.S. Kapoor

Title of the project: Increasing productivity of man- made forests.

Year of start of the project: April, 1998.

Target year of completion: December, 2001

Cost of the project: Rs. 0.70 lakhs

Objectives: To multiply germ-plasm of superior poplar species.

Sub-Project (1) HFRI- 009/ 08 (EBC-04)/PLAN/1998: 'Introduction and Performance Trials on some Broadleaved Tree Species for Afforestation and Agroforestry.

Component: Screening of different provenances of *Populus ciliata* by evaluating their performance in nurseries with special reference to Himachal Pradesh and maintenance/ multiplication of their germ-plasm.

Component: Screening of different clones of *Populus deltoides* by evaluating their performance in nurseries with special reference to Himachal Pradesh and maintenance/multiplication of their germ-plasm.

Scientific importance of investigations: Superior planting stock will be available for large scale afforestations.

Results/Achievements: The results of nursery trials of *Populus ciliata* and *Populus deltoides* are in the stage of compilation. A field trial for these two species has been laid out.

Sl. No. : 6

Project identification No.: HFRI- 007/ 04 (SFG-03)/PLAN/1998.

Name of the principal investigator : Rajesh Sharma & R.R. Bhalaik

Title of the project: Nursery evaluation of different provenances of *Cedrus deodara*.

Sub-Projects : Identification of Provenances and collection of Half-sib Seed. Nursery Evaluation of Different Provenances of *Cedrus deodara*.

Year of start of the project: October, 1998.

Target year of completion: December, 2001

Cost of the project: Rs. 75,000/-

Objectives : To identify the best stands for collection of seeds of *Cedrus deodara* and assess the performance of various provenances both in nursery and field conditions.

Scientific importance of investigations: Quality planting stock will be available on large scale for raising plantations of *Cedrus deodara*.

Results/Achievements: Growth data of 19 provenances of deodar have been recorded and are being analysed.

Sl. No. : 7

Project identification No.: HFRI- 008/ 06 (FPT-01)/PLAN/1998.

Name of the principal investigator : A. Karthikeyan

Title of the project: Assessing the impact of diseases and insect-pest attacks both in nursery and in field conditions and working out control measures thereof.

Sub-Project (1): Studies on the Growth and Pathogenecity of *Phytophthora cinnamomi*, Rands on Deodar and Standardization of Control Measures thereof.

Component: Mode of infection and growth rate of fungi in diseased Deodar Forests.

Component: Impact of edaphic and climatic factors on the growth and development of causal organism.

Component: Biological and chemical control in the laboratory and in nursery conditions.

Component: Studies on the effect of mulching in containing the diseased Deodar forests and Physical control of disease by way of trenching.

Year of start of the project: October, 1998.

Target year of completion: December, 2001

Cost of the project: Rs. 1.00 lakhs

Objectives : Large scale mortality of deodar due to some disease in Chail forest was reported during 1998. The cause of this mortality has been attributed to *Phytophthora cinnamomi.* This study is being taken up to study the growth characteristics of fungal pathogen causing disease and to know about the mode of its infection.

Scientific importance of investigations: The studies will identify the factors influencing the disease in *Cedrus deodara* and suggest some measures for containing the disease in field.

Results/Achievements: After identifying the root rot disease caused by *Phytophthora cinnamomi* in *Cedrus deodara* the, effects of soil pH and soil moisture were studied in detail.

It was also observed that fungi sites as applied in the field conditions showed control over 50% of the total mortality.

NEW PROJECT TAKEN UP DURING 1999-2000

Nil

EXTENSION

Transfer of Technology

Training :

- A group of farmers including women farmers of Paonta Valley were taken to WIMCO, and Rudrapur where they were apprised of the various modern trends under Agroforestry practices.
- About 200 students of 11 different schools of district Shimla were taken to the forestry field trips. During these excursions, lectures on environmental awareness, forest uses and their Management, biodiversity conservation, nursery practices of coniferous species etc. were delivered.

Demonstration – Plantations

Demonstration plantations were raised in the farmers field, forest areas and also in the Mine damaged sites.

Seminars, Workshops etc.

A two day's Workshop on Modern Nursery Techniques was organized during November, 1999.

FINANCIAL STATEMENT FOR THE YEAR 1999-2000.

I. PLAN			
Sl. No.		SUB HEAD	EXPENDITURE (Rs. in Lakh)
1	A	**REVENUE EXPENDITURE**	
		a. Research	53.24
		b. Administrative Support	24.20
		c. Other specify	-
		Total	**77.44**
	B)	**LOANS AND ADVANCES**	
		a. Loan Advances (Conveyance)	-
		b. House Building Advance	2.80
		Total	**2.80**
	C	**CAPITAL EXPENDITURE**	
		a. Building & Roads	0.40
		b. Equipments, Library Books	1.99
		c. Vehicles	-
		d. Other specify	2.47
		Total	**4.86**
		Grand Total	**85.10**
II. NON PLAN			
2	A	**REVENUE EXPENDITURE**	
		a. Research	-
		b. Administrative Support (Salary)	-
		Total Non- Plan	-
III. FUNDED PROJECTS			
3	A	World Bank Project	37.30
	B	UNDP Project	0.88
	C	NABARD Project	-
	D	FORTIP	-
	E	Other Specify (IDRC)	2.17
	F	ACR (FRI)	0.12
		GRAND TOTAL FOR (A+B+C+D+E+F) FUNDED PROJECTS	**40.47**