CHAPTER-VIII

HIMALAYAN FOREST RESEARCH INSTITUTE SHIMLA

The Himalayan Forest Research Institute, Shimla addresses specific research issues of Western Himalayan states of Himachal Pradesh and Jammu & Kashmir. The major fields of research here are regeneration of natural temperate forests, eco-restoration of cold deserts, re-habilitation of degraded areas, and development and popularization of agroforestry alongwith research on planting stock improvement.

This Institute has made significant contribution to artificial regeneration of Silver fir (*Abies pindrow*) and Spruce (*Picea smithiana*) by carrying out research on their seed, nursery practices and planting technology. Other notable achievements include development of nursery and planting techniques of broad-leaved associates of conifers like, Birdcherry, Horsechestnut, Oak, Acer, Maple and few sepcies endemic to the cold desert areas.

Activities of this Institute during the year are summarized below :-

RESEARCH ON NATURAL FORESTS

The forests in the states of Himachal Pradesh and Jammu & Kashmir can be broadly classified under conifers and broad-leaved categories. Distribution of various species shows fairly regular altitudinal stratification except where the micro-climatic changes due to aspect, exposure and variation in the rock and soil cause vegetational inversion. The vegetation varies from dry scrub forests at lower altitude to alpine pasture at higher elevation. In between these two extremes, distinct vegetational zones, mainly coniferous forests having interspersed vegetation of broad-leaved forests with species such as *Prunus cornuta, Aesculus indica, Alnus nitida, Quercus* species, *Populus ciliata, Juglans regia,* etc. also occur. These broad-leaved species facilitate natural regeneration of mature coniferous over-wood. The following research activities were taken up/continued during the period under report to look into this aspect.

Silver fir and spruce

Silver fir (*Abies pindrow*) and Spruce (*Picea smithiana*) cover extensive area in the Western Himalayas. Both of these species need over-head shade in early stages of establishment. In nurseries, the shade to the seedlings of these species is being provided with wooden shades but some mechanism for their proper establishment in field conditions needs to be established. Hence, efforts are being made to introduce hill Poplar - a fast growing species of the Western Himalayas in the plantation of Silver fir and Spruce as a nurse crop for young seeldings.

Planting stock of hill poplar, silver fir and spruce was raised and maintained at two different research stations : Bruhandhar (Kullu Valley) and Narkanda (Shimla Hills), and plantations were raised at two degraded sites one in Solang Nallah (Kullu Valley) and the other in Narkanda (District Shimla) to encourage regeneration of fir and spruce. Quarterly survival of the Poplar and Silver fir seedlings was recorded alongwith various growth attributes. Phytosociological studies were also undertaken during the years to ascertain changes in floristics composition and other phytosociological attributes.

Silver fir and Spruce seedlings less than 7.5 cm and 12.5 cm, respectively do not perform well on transplanting hence, culling of such seedlings was recommended while transplanting them from germination beds. Similarly, culling of low-grade/under-sized plants is also desirable in the field. Therefore, studies have been made during the rainy season of 1996 to assess the optimum height of seedlings fit for planting, in order to have maximum survival rate.

Initial height and collar diameter were measured in the beginning and quarterly survival of Silver fir was recorded. Growth data were also registered for the seedlings planted out in the field. Seed collection was made for raising seedlings for further trials. Further observations are in progress.

Himalayan edible pine (*Pinus gerardiana*)

Pinus gerardiana is a highly prized cash crop and an important species growing in xerophytic conditions. Its study in natural conditions needs special attention because natural regeneration in the species is mostly absent due to various reasons such as unrestricted seed collection, destruction by birds, insects, rodents and trampling by grazing animals. Therefore, some of the important aspects are being studied.

Experiments were undertaken to evaluate the effect of fertilizer application on early establishment and growth of plants and also to determine the optimum doses of various fertilizers.

Moreover, planting stock was raised and maintained for taking up the studies on standardization of grafting techniques and to see if homoplastic grafting could induce early flowering in the seedlings of *Pinus gerardiana*.

The data on germination percent of different seed sources/provenances of *Pinus gerardiana* are being collected in respect of poly-bag seedlings. These will be planted out to assess the performance of different provenances in the natural habitat.

West-Himalayan yew (*Taxus baccata*)

The Himalayan-yew locally known as BRAHMI or RAKHAL grows between altitude 1850 to 3350 m but chiefly above 2150 m. The tree is evergreen and of moderate height ranging from 5 to 10 m. The natural regeneration of this endangered Yew is very poor for reasons not yet known. The species came into prominence with the discovery of Taxol - an anti-cancerous drug, and this started its over-exploitation also.

Seeds of *Taxus baccata* are characterised by their delayed germination, probably becuase of their tough, unpermeable seed coat. The seeds were collected from natural forests to carry out experiments for shortening the embryo dormancy of the seeds.

Himalayan pine (*Pinus roxburghii*)

Seedlings were raised and maintained from the seeds of various provenances (38 Nos) which were collected from the states of Himachal Pradesh and Jammu-Kashmir. The field trials were laid-out in Chir zones at different locations in Himachal Pradesh after screening the seedlings in the nursery conditions. Casualty replacement was done during the year. The data on growth and survival are being recorded on half yearly basis.

CONSERVATION OF INDIGENOUS POPLARS IN INDIA

This project was initiated with the over-all objectives of conserving India's indigenous poplars throughout their range for future breeding and improvement programmes. A survey was carried out during the previous year and a preliminary report on the species of three indigenous poplars viz., *Populus alba*, *P. euphratica* and *P. cilaita* was submitted to FAO during the year. This report mainly focussed on occurrence, crop conditions, crop composition, utilization and threats (both real and perceived) for these indigenous species.

The cuttings (both from male and female trees) were also collected from the identified provenances of *P. ciliata* and raised and maintained thereafter at two different research stations to assess the growth performance in nursery conditions. Cuttings of *P. alba* were also collected and maintained accordingly.

COLD DESERT AFFORESTATION AND PASTURE ESTABLISHMENT

About 0.01 million sq. km. area of India is under cold deserts. Afforestation of these areas to arrest further desertification is an important priority of this Institute. Ecological studies on different shrubs indigenous to this area viz., *Hippophae rhamnoides*, *Ephedra gerardiana*, *Rosa webbiana* are being conducted. Work on standardization of nursery and planting techniques of indigenous flora is also being taken-up.

Ecological survey at different locations in Chandra, Bhaga and Chandra-Bhaga Valleys of district Lahaul-Spiti was taken-up to select suitable species for afforestation. Herbarium sheets of different plant specimens thus collected during the survey were prepared and the species got identified from FRI and BSI, Dehra Dun. Phytosociological attributes/ details of the data collected were also computed.

Two sites viz., Asrang-Kanda and Labrang-Kanda of 5 ha. each were selected in the alpine areas of Upper Sutlej Valley of district Kinnaur. Studies on floristics, life-form composition, phenodynamics, phytosociology, biomass production, etc. were carried out. Soil and vegetation samples were collected and analysed. Compilation of data, etc. is in progress.

Development of nursery and planting techniques for indigenous species like, *Fraxinus xanthoxyloides*, *Hippophae rhamnoides* and *Quercus ilex* was also given due attention during the year. Experiments were conducted on the optimum depth of sowing, optimum time of sowing, optimum time of seed collection, and pricking requirement of the species. Data compilation is in progress. In addition, some laboratory experiments were performed on *Juniperus macropoda* to determine the factors responsible for absence of regeneration because natural regeneration in this case is either absent or deficient. Besides, performance trials on various provenances of *P. ciliata* and *P. alba* were also repeated for the second year in succession.

Field trials were carried out to improve upon the existing propagation techniques of *P. alba* and *P. ciliata* to ascertain optimum time of insertion, size of planting stock, soil working methods to mitigate the water-stress conditions, etc.

PLANTING STOCK IMPROVEMENT PROGRAMME

Seed production areas (SPAs)

The matter for allowing culling operations in the selected stands of Chil (*Pinus roxburghii*) for raising SPAs has been taken up with the State Forest Department of Himachal Pradesh and a Memorandum of Understand (MOU) was signed with the competent authority.

An Action Plan has been prepared involving. Silviculture Division of State Forest Department and funds have been advanced to them for initiating various activities with respect to culling operations and further development of areas into SPAs.

Seed orchards (SOs)

A total target of 10 ha. (5 ha. each) has been given to this Institute for raising Seedling Seed Orchards (SSOs) of *Dalbergia sissoo* (Shisham) and *Pinus roxburghii* (Chil). Futher, 8 ha. of Clonal Seed Orchards (CSO) of Shisham is also to be raised.

The issue of raising SSOs and CSOs was taken-up with the State Forest Department with a request for handing over some areas for raising such specific type of plantations. 2.27 ha. of CSOs of Shisham has been raised during the period.

ECO-REHABILITATION OF MINED AREAS

During the period under report, the sites at Deolan, Badbas, Baldlwa and Hiyona, taken-up earlier for rehabilitation studies, were maintained and prepared for planting after developing terraces with the aid of earth movers. Soil rich in organic matter was transported from nearby forests and spread over the terrace. Deep and wide pits were dug, and filled-up with farm-yard mannure and the imported soil before taking up the plantation activities. The species for raising plantation included *Robinia pseudacacia, Bauhinia variegata, Grewia optiva, Populus deltoides, Vitex negundo, Rumex hastatus* and *Ipomea carnia.* Rehabilitation works included construction of check-dams, gabbion structures, toe-wall, etc. The results in nut-shell have shown that these mined areas can be ecologically rehabilitated and biologically rejuvinated for sustained production of produce of economic value to local populace within a period of 8-9 years.

AGROFORESTRY

This Institute has been conducting research in introduction of high yielding clones of *Populus deltoides* in agricultural system in lower hills and valleys of Himachal Pradesh. The agroforestry models in Paonta Valley concentrated on maximum out-put in terms of tree/crop and simultaneously restoring the environment. This year 20,000 ETPs of *P. deltoides* (G-3 & G-48 clones) have been distributed and got planted in the fields of farmers. The Institute received distinction in enlisting the support of the whole farming community and has become very popular amongst the beneficiaries. The farmers, initially preferring planting only on bunds and on marginal lands, have now come round in a big way to raise the species in their agricultural fields. It has been seen that the farmers of these areas are now even purchasing planting stock from the out-side agencies. Demonstration plantations during the year were raised along bunds in lines and also in blocks in combination with wheat and sugar-cane. Wheat is to be replaced by maize in rotation. This will give scope to study tree-crop production system; spatial geometries and their effects on production of goods; and ecological impacts.

PERFORMANCE TRIALS

During the year, performance trials of some clones of *P. deltoides* in nursery conditions in different edapho-climatic conditions of Himachal Pradesh have been initiated. Trials on introduction of two species viz., *Paulownia fortunei* and *P. tomentosa* and their multiplication have also been taken up.

EXTENSION

A short-term field training course was organized by this Institute for the benefit of farmers. The farmers of the state of Himachal Pradesh were also exposed to the various agroforestry activities as taken up by the Forest Research Institute, Dehra Dun in neighbouring state of Haryana. Guest lectures were organized exposing the farmers to various aspects of agroforestry. Demonstration plantations of various clones of *P. deltoides* have been raised and maintained in forest lands at two different locations.