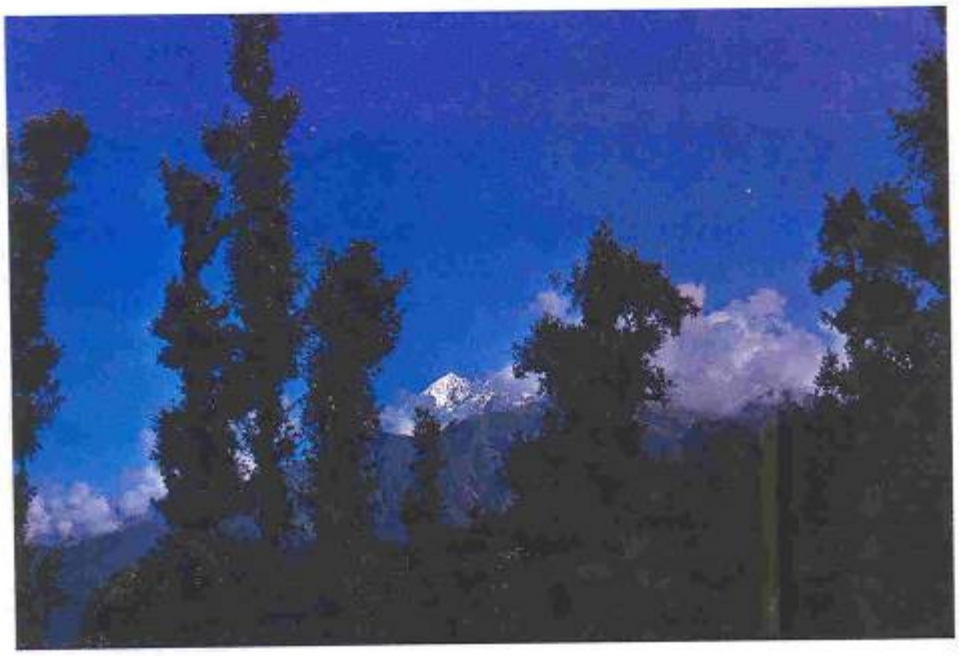
GOVIND BALLABH PANT HIMALAYA PARYAVARAN EVAM VIKAS SANSTHAN

(G.B. Pant Institute of Himalayan Environment and Development)

ANNUAL REPORT
1989-90



Ministry of Environment & Forests
GOVERNMENT OF INDIA

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1. BACKGROUND

Govind Ballabh Pant Himalaya Paryavaran Evam Vikas Sansthan (Govind Ballabh Pant Institute of Himalayan Environment and Development), an autonomous organization of the Ministry of Environment and Forests, Government of India, came into existence in August, 1988. The Institute is identified as a focal agency for evolving effective strategies for management of natural resources and development in the Himalayan region of India. The mandate of the Institute is to undertake in-depth research and development studies and to develop/demonstrate appropriate technology packages aimed for integrated and sustainable development in the entire Himalayan region. In view of a vast ecological and socio-cultural diversity characterizing a region stretching over an area of about 3000 km in length and 250 km in breadth, the Institute aims at achieving its objectives through its own programmes and also entering into collaboration with and seeking support from other relevant organizations and expertise available in the region. The Institute started functioning from Kosi-Katarmal in Kumaon in the first year (1988-89) of its establishment. In the following year, efforts were made to strengthen and expand the Institute, as a decentralised set-up so as to facilitate the execution of the programmes in different regions of the Himalaya.

2. ORGANIZATIONAL SET UP

While the Institute at Kosi-Katarmal was strengthened in terms of both infrastructure and man-power, programmes were also executed from Srinagar in the Garhwal Himalaya, Gangtok in the Eastern Himalaya and Mokokchung in the North-East ranges. The Institute could execute its programmes at places other than Kosi-Katarmal through infrastructural support from governmental and non-governmental organizations. It operates from High Altitude Plant Physiology Research Centre, Hemwati Nandan Bahuguna University, Srinagar in Garhwal and Nagaland Gandhi Ashram, village Chu Chu Yimlang, District Mokokchung in Nagaland. At Sikkim, Department of Agriculture, Government of Sikkim provided infrastructural support to start with. Subsequently the Institute took possession of a small building on rent at Tadong, Gangtok. There are 15 scientific personnel and 26 supporting staff distributed over the 4 centres of the Institute. All centres are centrally controlled from the Institute at Kosi-Katarmal, Almora.

The construction of the Institutes's own infrastructure has yet to take off. Efforts were made to get the land transferred from the Uttar Pradesh Government to the Institute. The Institute could get legal possession of 8 ha of land at Kosi-Katarmal in January, 1990.

3. RESEARCH AND DEVELOPMENT PROGRAMMES

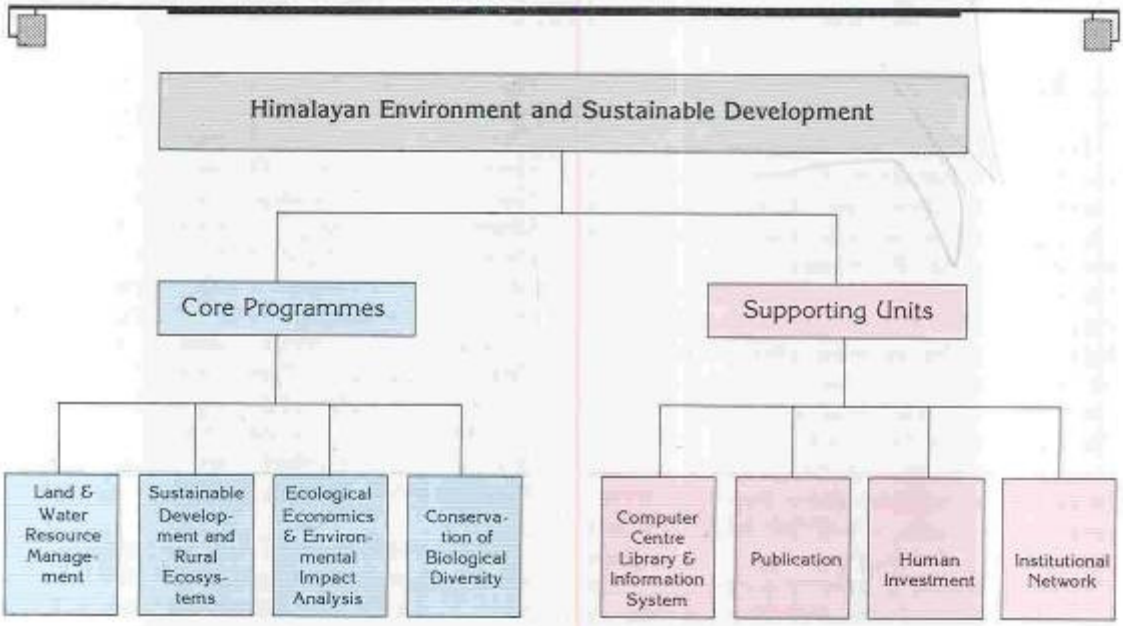
A number of research and development projects were launched to strengthen and expand the core programmes identified by the Institute.

3.1. Projects funded by the Institute

3.1.1. Restoration of Degraded Land and Sustainable Rural Development at Katarmal (Almora) in Kumaon Himalaya

Background

Exploitation of natural resources ignoring the principles of sustained production in the past resulted in problems of environmental degradation faced at present. Improvement in



the biological productivity of degraded land is a prerequisite for betterment of Himalayan environment. Although sporadic instances of rejuvenation of degraded land through plantation forestry and modified agricultural practices have been documented by various agencies, yet the success achieved so far in this sphere is too little. Very often a land management technology prescribed in a region clashes with the socio-economic set-up of the hill people. Under such situations, the Science/Technology fails to deliver goods to the rural mass. An integrated approach, taking into consideration the magnitude of degradation, physical environmental constraints in rejuvenating the land, holistic vision of development has to be identified if development planning aims for achieving environmental and socio-economic stability simultaneously. This project was undertaken to develop and demonstrate an ecologically sound land and water resource management technology in a highly degraded site at Kosi-Katarmal in the Kumaon Himalaya.

Objectives

(i) Improvement of productivity in degraded land by application of available science and technology,

(ii) Undertaking research for refining the existing science and technology of restoration,

(iii) Promotion of environmental awareness through direct involvement of local people in the project.

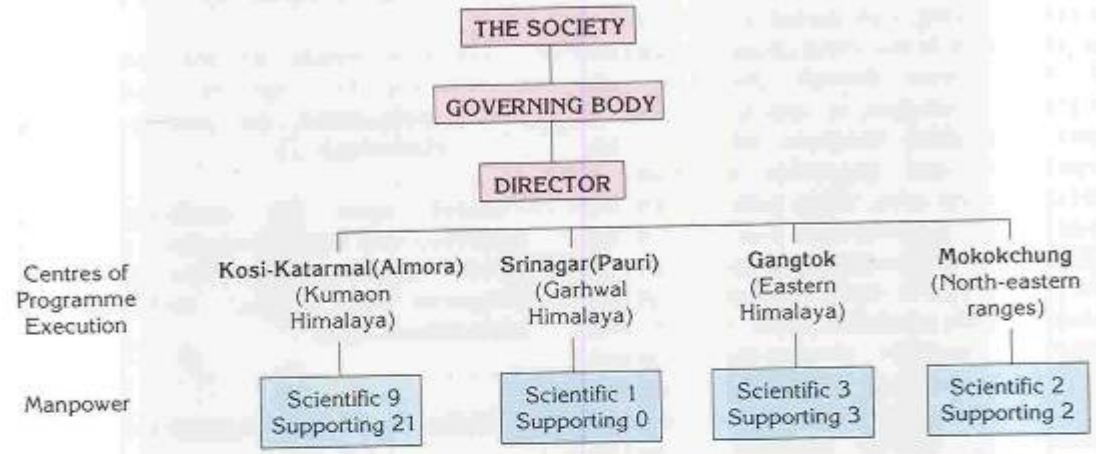
Approach

In view of a sparse scrubby vegetation and poor soil fertility of the site, establishing a dense and diverse plant-cover was identified to be a priority task so as to arrest ongoing process of degradation.

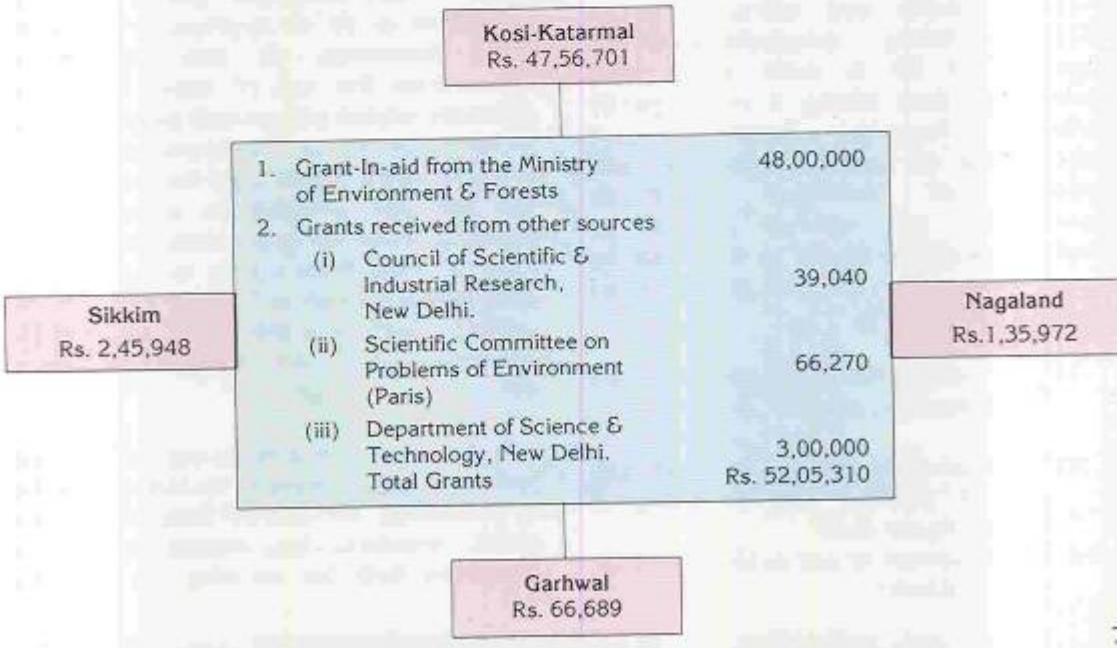
Since degradation in the area has approached an extreme stage, hydrological cycling is highly disrupted. Adequate availability of moisture therefore becomes a

G.B. PANT INSTITUTE OF HIMALAYAN ENVIRONMENT AND DEVELOPMENT

Organizational set-up
(as in 1989-90)



Grants made available to the Institute and its allocation to various centres of programme execution during 1989-90



fundamental necessity to any restoration programme in the area where climate is seasonal with dry spells. A feasible technology for the storage of run-off water and its utilization during lean period was planned to be introduced. In the initial phase, introduction of tree species through plantation, was attempted. Selection of species was based upon ecological concepts of community organization and vegetation dynamics as relevant to the area. While selecting the tree species, due consideration was given to the utility values of tree species as recognized by the rural mass in order to motivate people towards such activities and ensure their maximum possible cooperation. Attempts were made not only to arrest the ongoing degradation, but also to hasten the restoration process by limited mechanical/biological amendments. Nutritional attributes of the species planted were planned to be looked into from the point of their possible role in maintaining/improving the fertility level.

On the basis of ecological concepts of diversity, stability and efficient resource utilization, raising mixed-plantation is advocated to be a more sound land management than raising a mono-specific plantation. However, knowledge and understanding of spatial configuration and proportion of individual constituents characterizing an 'optimal mixture' is practically negligible as far as the trees are concerned. Plantation work was planned to get answer to the following:

(i) Is mechanical preparation for plantation necessary?

(ii) What should be the size of the pit dug out for planting from the point of optimizing the cost?

(iii) Is amendment of soil necessary? If so, what and how?

(iv) Can species of the mature forest be planted straightway or one has to move essentially from early successional tree species to the late successional ones?

(v) What should be the proportion of constituent species and planting configuration for raising a mixed plantation?

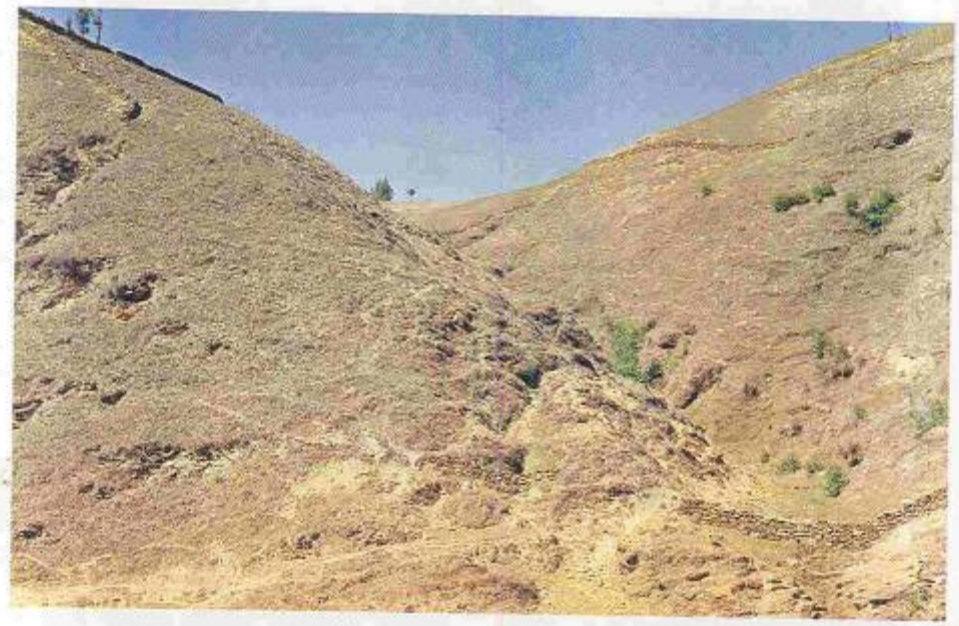
Based upon the available literature supported with field observations, the species selected were tentatively classified into three categories *viz.*, early, mid and late successional ones.

Results and achievements

Introduction of water harvesting Technology:

While surveying the area a natural spring with perennial flow, located at a distance of about 1 km from the project site was considered to be an appropriate source for water harvesting. It was planned to demonstrate the use of water which was otherwise wasted and created problems in the vicinity of its source. The source was situated at an elevation higher than that of the study site and that provided an opportunity for diverting water by gravitational force itself. Flow of water from source to the site was channelized through a PVC pipe of 2.5 cm diameter placed at a depth of 50-60 cm in the soil and stored in a tank of 6 m X 4 m X 1.5 m size.

In the absence of a dense vegetation cover, surface run-off is likely to be high. Possibility of harvesting the run-off from the slopes could, therefore, be another appropriate alternative both for reducing the erosional



Excessive exploitation of land resources leads to extreme degradation. Rehabilitation of such degraded areas requires an integrated resource management approach.

Harvesting the rain and surface water and its utilization for regeneration of vegetation cover—a view of the degraded site being worked at Katarmal, Almora.

losses and also ensuring adequate availability of water to planted seedlings and agricultural crops during dry period. After a careful survey of the site, a tank of 9 m X 5 m X 1.5 m was constructed within a massive bedrock of micaschist. This spot was selected from the point of minimal possible seepage of water and facilitating the collection of rainwater. Inner wall of the tank was lined by polythene sheet (canal lining) of 250 micron thickness to ensure the stability of the construction.

Nursery Development:

A nursery has been developed over an area of about 1 acre at Katarmal and about 1.5 acres at Kosi. Sufficient quantities of healthy seeds of 26 tree species and 6 grass species were collected from the Central Himalayan region. Seeds were sown after pre-treatment and seedlings at 5-6 leaf stage were transplanted to polythene bags. Over 35,000 bags were filled with soil free of gravels (1 kg) and mixed with farm yard manure (200 g) and insecticide (3 g Thymatin-G-10). Based upon the extent of hardiness of the species, saplings of some plant species like *Celtis australis* (Kharik), *Grevia optiva* (Bhimal), *Pyrus pesia* (Mehal), *Sapindus mukorosii* (Ritha) etc., were kept in the beds, whereas other species were transplanted in the bags. Majority of the tree species in the nursery are relevant to the local needs and so once established will benefit the local people.

Plantation:

Plantation activity was completed during August-September, 1989. Saplings were collected from Forest Department nurseries and from natural forests in and around Almora. A total of 10540 healthy saplings were planted over an area of 2 ha. In general, survival is better and growth is more vigourous in mechanically prepared and amended soil than in the situation where saplings were planted simply through dibbling. The response of a species, in terms of survival, towards soil amendments was most prominent in case of *Quercus leucotrichophora* (Banj) and *Quercus glauca* (Feliyat). Transplantation of plants raised in polythene bags was more successful than the transplantation of naked rooted plants. This response was more marked for species like *Alnus nepalensis* (Utish) than others. Further, survival and growth are being measured periodically to arrive at a precise conclusion on impact of plantation efforts.

In general, growth of *Alnus nepalensis* (Utish), *Melia azederach* (Baken), *Prunus cerasoides* (Padam), *Celtis australis* (Khrik) and *Robinia pseudoacacia* (Acacie) was more promising than others. Three species *viz.*, *R. pseudoacacia*, *Rosa muscata* (Kunj) and *Agave sissiliosa* (Ram Bans) proved to be effective for biological fencing. Application of systemic insecticides (Ecalux EC 25, 1%) and fungicides (Bavistin, 5% & Dithane M-45, 5%) was found to be essential to control the insects, larvae, seed fungi and foliage fungal diseases.

Before project execution, the area was virtually barren. Surface irrigation through the water stored in the project site alongwith protection from grazing led to luxuriant growth of grasses even during the dry season. Grass component was periodically cut and given to project workers free of cost.

A number of other species were identified for introduction trial in the next growing season. Seeds of such species identified were acquired either from other organizations or from field collection. These species are *Chimnobambusa falcata* (Ghad Ringal) *Thamnocalamus spathiflorus* (Deo Ringal) *Dalbergia sissoo* (Sesham), *Ougeinia dalbergioides* (Sanan), *Juglans regia* (Akhrot)

Ficus auriculata, *Ficus cunia* (Khuni), *Ficus bengalensis* (Bargad), *Ficus roxburghii* (Timle), *Ficus rumphii* (Kabhar), *Ficus religiosa* (Pipal), *Ficus palmata* (Bedu), *Bauhinia retusa* (Semla), *Bauhinia varigata* (Kuiral), *Diploknema butyrea* (Cheura) etc.

It is observed that the amount and availability of water all through the year following introduction of water harvesting technology is adequate to sustain agriculture in addition to making water available to the planted saplings, promoting grass growth and developing a nursery. Introduction of crop cultivation on a small plot during the year showed that vegetables like *Phaseolus vulgaris* (Bean), *Pisum sativum* (Mater), *Cucurbita maxima* (Kaddu), *Luffa cylindrica* (Lauki) etc., could be successfully grown with the input of farm yard manure while crops like *Raphanus sativus* (Muli) and *Cucurbita maxima* etc., could be sustained only if farm yard manure is supplemented with inorganic fertilizers.

Direct benefit to the villagers: A total of 6855 man days of direct employment was generated through the execution of this project and Rs. 1,59,379 were earned by the villagers. Added to this, nursery would meet to some extent the plantation requirement of the people.

3.1.2. Designing Ecologically Sound Natural Resource Management Strategies for Sustainable Rural Development in Kapkot Block, Almora District in Central Himalaya

Background:

During the discussions of the Director with administrators/planners in Kumaon during January-April, 1989, the grave situation of bamboo resource based small scale industry in Almora district was highlighted. Consequently, spot survey was made for self-assessment of the situation. It was observed that there are attractive handicrafts being used for day to day needs in the rural systems in the high altitude areas. These handicrafts could significantly add to the rural economy if promoted as decorative items elsewhere. 'Ringal', the bamboo used as raw material to make these items is restricted to temperate climate of high hills in Central Himalaya. The common local name ringal refers to four species of bamboo *viz.*, *Chimnobambusa falcata* (ghad or gol ringal), *Thamnocalamus spathiflorus* (deo ringal), *Thamnocalamus jaunsarensis* (jhumra) and *Thamnocalamus falconeri* (tham).

This project was formulated to develop and demonstrate science/technology for the long term and sustainable development in a few villages in Kapkot Block, with focus on the ringal and its role in the rural economy and ecology.

Objectives:

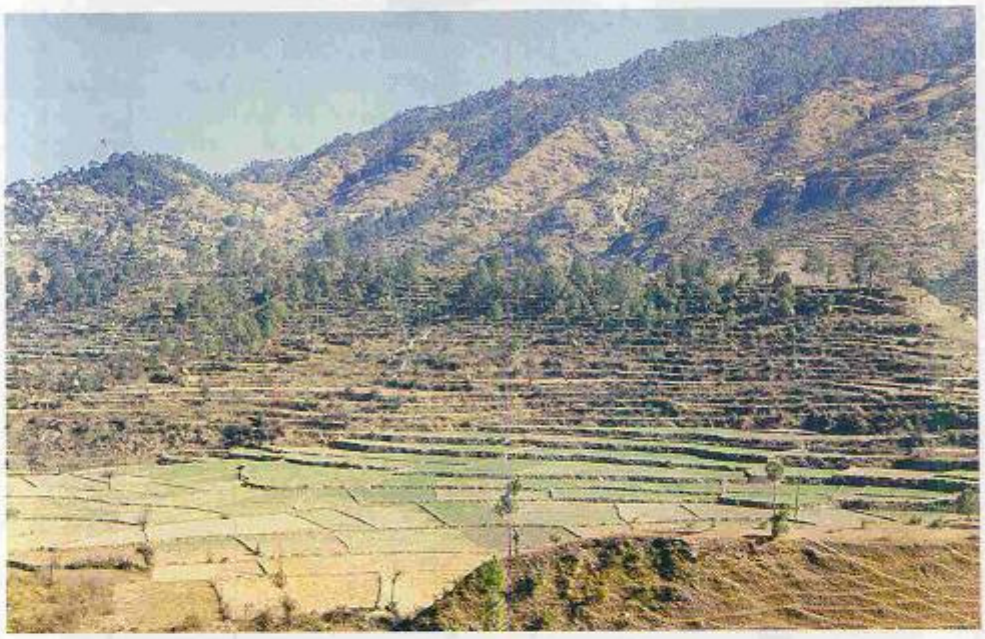
(i) analysing the current problems and consequences of ringal based cottage industry,

(ii) identifying appropriate land management practices so as to solve the current problems and

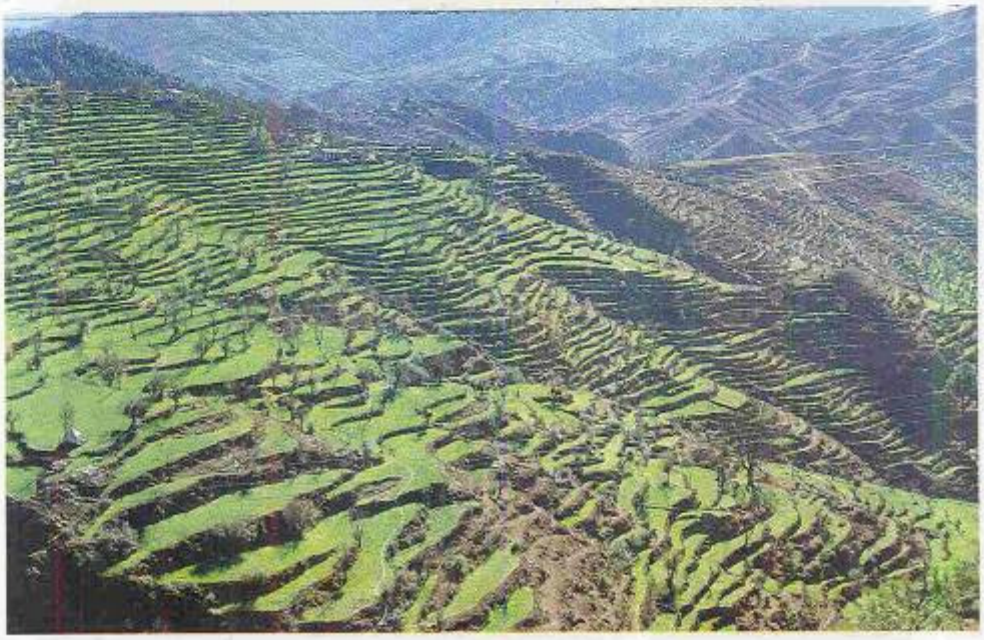
(iii) defining integrated resource management on a geographical unit vis-a-vis administrative unit.

Approach:

Kapkot is the largest Block in Almora district of the Kumaon Himalaya. About 2/3 area of the block lies in the higher reaches



Crop cultivation in the valley land and on terraced land on the hill slopes are the contrasting agricultural systems in the hills. Management of each agricultural system needs to be looked from the available opportunities and constraints.



where snow is present all through the year. Terrain is rough with poor transportation and communication networks. After extensive survey and interactions at various fora, villages *viz.*, Chowda, Khathi, Khaljhuni, Mikhila-Khalpatta were selected for intensive studies. These villages are located between the Sarayu and Pindari rivers and lie in an altitudinal zone of 1000 m to 4000 m. Jhumra was abundant on the way to Pindari from Khathi whereas ghad and deo ringal were abundant at lower altitude, between Khathi and Kapkot. Tham is very scarce. Only ghad and deo ringal are extensively used for handicrafts. Jhumra and tham are used as pipes and rods.

Gramin Utthan Samiti (GUS), an NGO at Kapkot came forward to collaborate in the project, specifically to ensure people's participation in the proposed work. This was accepted by the Institute with an understanding, that the GUS will arrange for 1/3 contribution towards plantation efforts planned in the project. The GUS ensured its contribution as promoting voluntary involvement of the inhabitants in token of Institute's contribution in terms of scientific expertise and financial expenditure. Experimental plantations were undertaken in Chowda, Khaljhuni and Mikhila-Khalpatta. Pits of 0.45 m X 0.45 m X 0.45 m at 1 m X 1 m distance were dug. Two kgs of broad leaved forest litter manure was mixed with the soil in each pit. Material for planting was collected from village forests with permission of village forest panchayat. The areas were protected from grazing animals by constructing 1 m high stone wall.

Ways and means of approaching sustainable development are aimed to be identified and presented at both micro-level (i.e., resource availability per unit area) and macro-level (i.e., at a level of geographical/ management/administrative units). To achieve this, survey was planned:

(i) to quantify the demand and supply of ringal resources.

(ii) to develop a package of practices for the sustained use of the existing resources.

(iii) to explore and introduce possible alternative resources to ease the problems.

(iv) preparation of maps depicting spatial variation in climate, relief, slope, aspect, soil, geology, vegetation, current land use, management practices and economy at a scale of 1:50,000.

(v) studying the interaction of physical, biological and socio-economic attributes.

(vi) to raise awareness among people about rational utilization of the natural resources.

(vii) synthesis of the above information and subsequently preparation of land suitability/optimal land use map considering opportunities and constraints in the area.

Results and Achievements:

Micro-level Studies:

(i) About 30 ha of degraded land has been planted with ringal planting material. 82,646 ringal plants were planted. The percentage of survival varied between 80 to 50.

(ii) Rs. 1,60,185/- was earned by the villagers by working in the project. The

project provided 1483 man days of direct employment which included 751 man days of employment to women labour and that of 923 man days to SC/ ST people of these villages.

(iii) 23 models of ringal products were prepared for display.

(iv) Awareness among the people was generated through close and frequent interactions.

Macro-level Studies:

(i) Considerable data has been collected but is yet to be processed.

(ii) Slope map of the Kapkot block has been prepared: Scale 1:50,000; 7 classes of slope.

(iii) Physiography map of the Kapkot block has been prepared: Scale 1:50,000; 9 classes of altitude zonation.

3.1.3. Development of Agroforestry Model at Sumari Village in Garhwal Himalaya

Background:

Excessive exploitation of natural resources in the past is considered to be the basic cause of scarcity of fundamental needs, *viz.*, food, fodder and fuelwood, and degradation of environment at present in the hills. These problems have led to adverse socio-economic consequences. Migration of people from rural areas in the hills to the plains is one of such consequences. Further, since this is the predominantly male population which migrates in search of other means of livelihood, degraded areas are invariably characterized by an imbalance in the sex ratio of the population. Considerable information on the impacts of past and present land use/ management practices have accumulated. However, the knowledge on science/ technology as relevant to prescribing solutions to current problems remains poor. Designing research and development for improving upon the resource availability and carrying capacity through integrated resource management was priortized. The area (Sumari village) covered in this project is a representative test site in Garhwal Himalaya.

Objectives:

(i) to identify land management and land use practices as suited to the ecological and socio-economic attributes of the area and its field demonstration as a pilot project.

(ii) to collect base line information for formulating a large scale programme to achieve sustainable development in a cluster of villages in Garhwal.

Approach:

Sumari village situated at a distance of 24 km. from Srinagar township, was selected for this study. The village is characterized by mass migration in the recent past. While 65 families were recorded in the area in a survey made in 1972, only 157 families exist at present. The cropped area decreased by 88% during the period 1972-1988. The land holdings are highly fragmented. The area was dominated by rainfed agriculture on terraces. Acreage of abandoned agricultural land was many times more than the cropped area. The production as such was found to be poor. Possibilities of improvement were realized by appropriate storage of water and its utilization for crop production during stress periods.

Based upon the review of the current problems in the area, agro-forestry was suggested to be a more sound land use rather than practicising agriculture and forestry in isolation. Thus the approach was centered around a task of converting current agricultural system to agroforestry system.

Results and Achievements:

A survey of the area and information already available with High Altitude Plant Physiology Research Centre, Srinagar formed the basis of species selection. While selecting tree species, emphasis was laid on those species which are native and have multiple utility values. This seemed advantageous from the point of motivating farmers who often resist planting trees in croplands with the fear of negative impact on crop production. Leguminous trees with nitrogen fixing capability were also planted so as to improve fertility of soil.

An area of 3 ha. was worked. Pits of 1.5 ft X 1.5 ft X 1.5 ft size were dug out. Five kgs of animal dung manure was added in each pit and plants were watered once or twice in a month. Trees were introduced in varied combinations and configurations. Species like *Bauhinia variegata, Ficus glomerata, Eugenia dalbergioides* were most successful while species like *Alnus nepalensis* and *Boehmeria regulosa* showed quite low values in the cropped land. *Celtis australis* was observed to be the most successful followed by *Grevia optiva* and *Ficus glomerata* and *Ficus roxburghii* on land abandoned for crop production. Following facts have been observed during this study:

(i) There are a few species suitable on biological and ecological criteria like *Celtis australis* and *Grevia optiva* but are resisted by the inhabitants for fear of their adverse impacts. This needs to be resolved through detailed investigations.

(ii) Any action oriented programme such as the one attempted in this project must ensure a full co-operation of the inhabitants. It was quite a difficult task to motivate people towards land management for sustainable development which required some alterations in the land use being practised by them. There was substantial damage to the planted seedlings as a result of careless attitude of farmers who owned the crop fields.

(iii) The results obtained and experience gained suggest that the Institute should acquire some abandoned area in the village on lease from the District Authorities. In such a situation, the Institute will have a full control over the land for a period of 10 years or so to develop and demonstrate a model of agroforestry system. Once such a model system is established, the local inhabitants will be motivated suitably for replicating similar models in the land owned by them.

3.1.4. Integrated Watershed Management: A Case Study in Sikkim

Background:

Despite a considerable rainfall (annual average rainfall - 2000 mm) in the state of Sikkim, availability of usable water lags far behind the requirements. An objective analysis of the problem can be achieved by taking watershed as a unit of study. Forest cover in most of the watersheds is believed to be receding while agricultural land use is supposed to to have expanded during the recent past. These generalized conclusions, however, are put forward on the basis of subjective assessments instead of an authentic land use analysis. This project was conceived

for analysing the problem of demand - supply of natural resources, their interactions and impacts, taking watershed as a management unit in the Eastern Himalaya. Further, it was aimed to identify and demonstrate integrated resource management strategies for development of the region.

Objectives:

(i) structural analysis of the watershed - studies on vegetation, soil, geology, and socio-economic interactions,

(ii) Intensive studies on the dominant land use systems,

(iii) analysis of interactions of hydrological cycling and current land uses,

(iv) assessment of the identified models on the test sites.

Approach:

Milti-disciplinary approach involving scientists of the disciplines like ecology, geography, geology, animal husbandry, agriculture and forestry has been envisaged to pursue the objectives.

Results and Achievements:

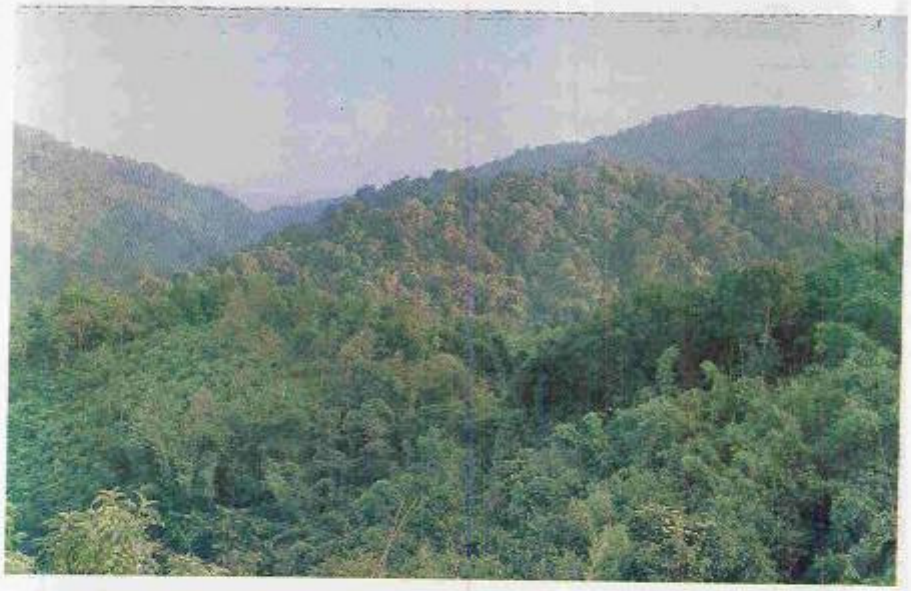
Mamley watershed located near Namchi, in South district of the state, was idjentified as the project area. The watershed covers about 812 ha of land area in an elevation range 200 to 2500 m amsl. A reconnaissance survey was done to plan the work. Diverse forest types and agricultural practices are encountered in the region inhabited by three ethnic groups *viz.*, Lepchas, Nepalis and Bhutias. Preliminary information on cropping patterns and cultural practices in the agricultural systems have been collected. In such a small area people grow as many as 39 crop species. *Amomum subulatum, Citrus aurantium* and *Gingiber officianalis* are the three main cash crops. *Ficus hookerii, Ficus nemolaris* and *Thysanolaena maxima* were found to be the crucial sources of fodder used during lean period of the year. Livestock is fed largely on crop residues. Stall feeding was found to be more common than open grazing. Three major forest types *viz.*, (i) Sub-tropical natural forest, (ii) Temperate natural forest and (iii) Temperate semi-natural forest were recognized and mapped. Floristic survey of each forest type is completed.

Seeds of a number of species useful to the region were collected. Land preparation is completed to develop a nursery of the species which are usually not supplied by the governmental agencies. Collection of data on the structure, function and ecological relationships of the agricultural systems and forest types was initiated.

3.1.5. Jhum and Sustainable Development of a Village Cluster in Nagaland

Background:

Shifting agriculture, referred locally as Jhum, is the chief land use in hilly tracts of north-east India. This system of land use which sustained the tribal population for centuries, is now considered to be the major cause of degradation of the environment in the region. However, it is not the shifting agricultural system itself but the distortions appeared therein in the recent past due to heavy pressure on land, which are the basic causes of degradation. In fact, shifting agricultural system which used to be considered primitive and inefficient on economic considerations, is discovered to be more efficient than many other systems,



Dense and diverse potential forest vegetation in the North-east is at present threatned by the frequent and intense disturbances of shifting agriculture.

including the so called modern ones, in terms of ecological considerations. Tribals who prefer isolation and are conservative by virtue of their culture, ought to be made aware of that the traditional agricultural practices in their distorted forms no more fit into the current scenario. Simultaneously one has to develop and demonstrate technology packages which ensure the requirements of and acceptable to this weaker section of the society, on sustainable basis. The available studies and managerial experiences are indicative of a scope and feasibility of development planning based on these considerations. Nagaland Gandhi Ashram, Chu Chu Yimlang came forward to colloborate and provide infrastructural support to the Institute in executing such a research/ development programme.

Objectives:

(i) to find out ways and means of hastening the process of recovery in soil fertility under jhum cultivation,

(ii) to explore the possibilities of introducing new crops in the agricultural systems adopted in the area,

(iii) to identify fast growing native tree species valuable to the local tribals and to standardise the cultural techniques and their field testing,

(iv) to develop low cost water harvesting technology ensuring availability of water during the lean period,

(v) to develop, demonstrate and popularise suitable small scale enterprises to supplement the family income,

(vi) to create awareness on the consequences of forest degradation, exploitation and conservation through direct involvement of local people in the project.

Approach:

After discussing the problems and issues extensively and survey of the area in Nagaland, three villages *viz.*, Yaongyimsen, Salulmang and Chu Chu Yimlang were selected to be taken up in the initial phase. The villages have a commanality in that all are inhabited by Ao tribe and all have shifting agriculture as the predominant land use. However, they differ with respect to the opportunities available for possible improvement in the ecology and economy.

Yaongyimsen is near Chagtongya on Amguri to Mokokchung road. This village consists of about 500 households and is split into two habitations, the old village and its recent outgrowth. Besides the hilly tract, the village covers 50 ha of flat land, called Wangpangloo. A small river passes through the village and provides an opportunity of establishing a micro hydel system, which in-turn can help in intensive cultivation on the flat land.

Village Salulamang is inhabited by 80 families and is located at a distance of 14 km from Chu Chu Yimlang where Nagaland Gandhi Ashram is situated. This village has 15 ha of orange orchard area. Other fruit crops such as pineapple, jackfruit, pears, banana and guava are also grown but not as much as the oranges.

Chu Chu Yimlang is situated on Mokokchung-Amguri road. The village consists of about 500 families. Because of the

road connections, this village differs considerably from the typical traditional villages like Yongyimsen and Salulamang occupying remote and isolated localities.

Results and Achievements:

Cropping and yield patterns in the project area were analysed. A bench mark socio-economic study of the selected villages was undertaken. Data processing is in progress.

Alnus nepalensis was found to be a species which could significantly help in maintaining the fertility of soil under Jhum. Seeds of the species were collected from various sources. Land preparation over an area of about 0.5 ha was done to establish a nursery. Preliminary data on viability of seeds, germination requirements and favourable transplanting conditions were collected. Added to this, species viz., Hollock (*Terminalia chrysophylla*), pines (*Pinus kesiya, Pinus roxburghii*), silver oak (*Grevillia robusta*), *Celtis australis, Rosa moschata, Pyrus pasia, Grevellia oppositifolia*, wild rose were raised in nursery. These species were found to satisfy the fuel/fodder needs of the local people. Arrangements were made to obtain citronella grass slips free of cost from the Directorate of Industries, Government of Nagaland for introduction in the degraded areas. This activity is planned to be tested for improving the returns from Jhum. Efforts were made to develop a model of mixed forestry in village Chu Chu Yimlang. The model aims at cultivating trees, shrubs and grasses of diverse utility/values together.

The empirial knowledge of Nagas on the use of plants, an aspect which has more or less been neglected, was looked into. About 50 plant species used by the Ao Nagas for food, fodder, vegetables, medicine, decoration, poison, fish stupefying etc., were collected. Similarly many insects and caterpillars of food value were collected and identified.

The Institute provided technical guidance to Nagaland Gandhi Ashram in preparation/ execution of following programmes that fall within the mandate of the Institute.

Mulberry plantation was rised over an area of 2 ha. A project on sericulture for generating employment for the rural women was prepared for submission to the Department of Science & Technology, New Delhi.

Crops like sugarcane, soyabean, turmeric were studied for their suitability for introduction making comparisions with traditional crops grown in the region.

A low cost technology to harvest surface water was demonstrated. The water stored was brought to a settlement site using open bamboo pipes. It is now being used for drinking, washing and irrigation purposes. Inhabitants were made aware of how could they benefit from the resources available locally.

A proposal was submitted to National Research Development Corporation, New Delhi, to install a solar photo voltaic system for lifting water for irrigation and domestic purposes during the lean season. The proposal once executed will provide electricity to the proposed site also.

3.1.6. Mechanisms of the Maintenance of Biological Diversity and their Role in Ecosystem Organization and Function in Conservation Areas.

Background:

The criteria for evaluation of 'conservation' and 'conservation areas' are many and varied.

Identification of a reserve which includes 'every possible species' is argued to be a prerequisite to any attempt of preserving 'maximum' biological diversity in a given bio-geographical domain. Unfortunately, the meaning and perception of attributes like diversity, rarity, naturalness, size and representativeness still remain ambiguous, when viewed in an objective perspective. Although conservation oriented management is being prioritized at a massive scale, more so in the hills, yet the knowledge on the design parameters such as shape, size and acreage of conservation areas, the impact of such management on the sociology, economy and ecology remains poor. The advantages associated with conservation oriented management need to be objectively analysed not only to enrich the science behind conservation but also to motivate people's participation. This will ensure socio-economic stability of the inhabitants effected by notifying an area for conservation.

While several attempts have been made to describe diversity as a community property in varied contexts, the mechanisms which contribute towards the apparent biological diversity and its role in ecosystem organization have more or less been overlooked. The latter aspect would be more relevant for making proper utilization of conservation areas such as Sanctuaries and National Parks in favour of sustainable development of mankind. This project was launched as an attempt to fill the lacunae in our understanding of conservation oriented management and conservation ecology.

Approach:

Activities were planned to execute the work in and around Binsar Sanctuary (29° 39' - 29° 44' North and 79° 41' - 79° 49' East), representative of an 'undisturbed' ecosystem in Kumaon Himalaya. The area covered in the sanctuary area was notified as Reserve Forest by British Government in 1880 and got the status of sanctuary in 1988. The geographical area of the sanctuary is reported to be 45.59 km^2.

Objectives:

(i) Preparation of thematic maps of the study area at different scales

(ii) Phytosociological analysis of vegetation in different ecological zones

(iii) Population dynamics of the tree species

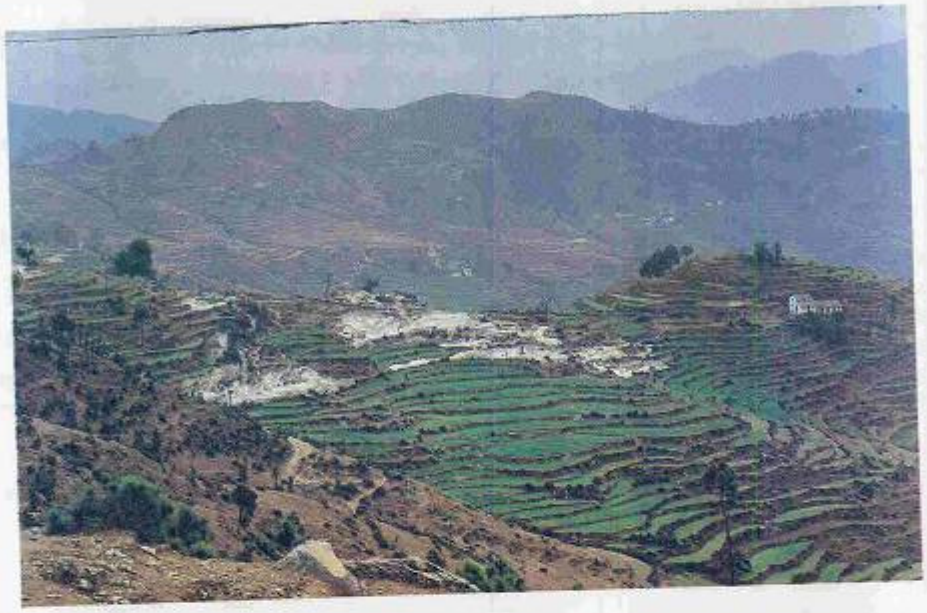
(iv) Growth and regeneration patterns of individual tree species

(v) Data analysis and synthesis to identify mechanisms of maintaining biological diversity and associated attributes in and around the sanctuary.

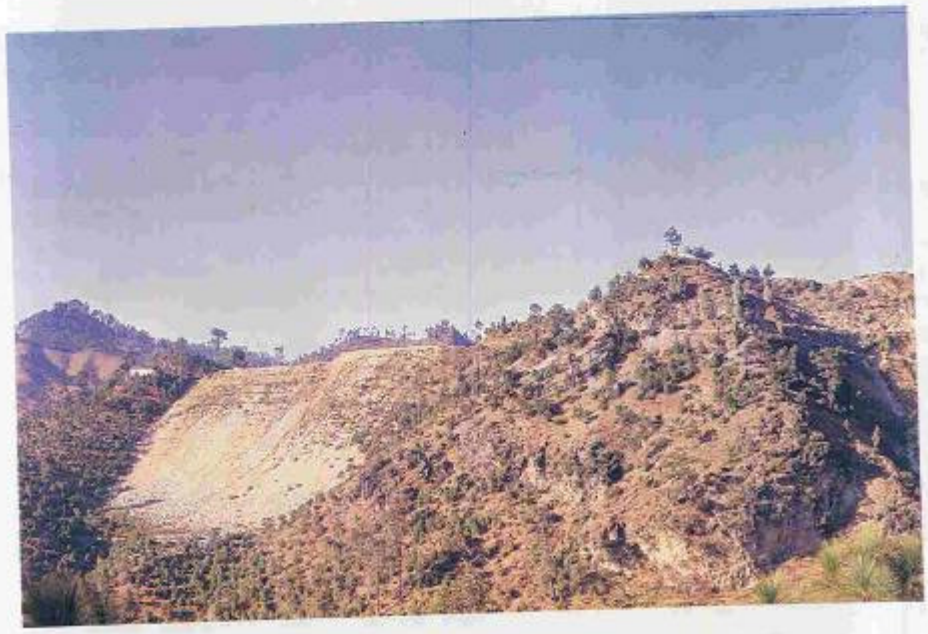
Results and Achievements:

A few conclusions could be generalized from the data collected on phytosociology and regeneration. So far, the data was collected along an altitudinal gradient covering six different forest types: (i) Pine (*Pinus roxburghii*) forest (ii) Mixed Pine-Banj oak (*Quercus lucotrichophora*) forest (iii) Mixed Banj oak-Pine forest (iv) Banj oak forest (v) Tilonj oak (*Quercus floribunda*) forest (vi) Deodar (*Cedrus deodara*) forest.

In general, top canopy species show an optimum range of expansion at a certain elevation. It is apparent that along an altitudinal gradient, abundance of the emergent species in terms of total basal area



Damage to the land resources as a result of mining—loss of good agricultural land and degradation of natural vegetation.



(TBA) increases gradully to a 'maximum' level followed by a decline. Basal area of all the species taken together for a given forest type also follows a similar trend for a majority of forest types. Evenness is more prominent in the higher elevation area than in lower elevations.

The species richness and equitibility coefficient increased with an increase in elevation. Within a given forest type, TBA decreased with increase in elevation. This trend, however, cannot be generalized for the sanctuary as a single system, e.g., in Banj oak forest type, occupying an elevation zone of 2200m to 2300m TBA ranged from 5271 $cm^2/100m^2$ to 4222.76 $cm^2/100m^2$, whereas in Tilonj oak forest, occupying the zone of 2300m to 2500m TBA ranged from 5117.09 $cm^2/100m^2$ to 3732.78 $cm^2/100m^2$. Maximum species richness is observed in Tilonj oak forest occuring at an elevation of 2300-2500m. It is also observed that these are the most diverse forest types which are most dense and stocked.

3.1.7. Environmental Impact Assessment and Rehabilitation of Jhiroli Magnesite Mining Operation in Himalayas

Background:

Exploitation of mineral resources in the hills have both positive and negative impacts. Conventional economic cost-benefit analysis ignores the environmental costs associated with a given activity. Himalayan region is naturally blessed with a variety of valuable geochemical reserves. The economic returns gained through mining must be assesed against the extent of degradation of environment caused by such acts. Environmental quality can be maintained only when adequate rehabilitation of the damaged ecosystem is ensured. This project was aimed to refine the current methodologies of impact assessment and the technology of rehabilitation taking Magnesite mining area at Jhiroli (Almora district) as a test site. The project was conceived as a collaborative venture of the Institute and Almora Magnesite Limited.

Objectives:

(i) to assess the impacts of magnesite mining on the ecosystem in a holistic perspective,

(ii) to identify ways and means of rehabilitating the mined areas,

(iii) to promote people's participation in environmental management and protection in the area.

Approach:

A collaborative approach undertaking the activities related to the Impact Assessment of the mined area simultaneously with rehabilitation work was attempted. It was planned to undertake a detailed analysis of the impacts of mining on various components of the ecosystem and biological responses to the resultants of mining activity to create a strong data base for identifying appropriate rehabilitation packages.

Results and Achievements:

(i) Extensive survey of the mined area was conducted.

(ii) Three sites were identified for detailed studies: (a) Very highly degraded land: This is representative of the land after

dumping of overburden and ore rejects. Vegetation cover is altogether absent, (b) Highly degraded land: This covers the areas damaged not by the mining itself but due to toxic emissions, and (c) Normal land: There is no impact of mining on this land.

(iii) Rehabilitation work was undertaken on 2 ha. of very highly degraded land.

(iv) The land was terraced and a drainage system was designed so as to check erosion. Tree species *viz.*, *Quercus leucotrchophora*, *Pinus roxburghii*, Silver oak were tried for afforesting the area. Several species of grasses were also tried. Love grass (*Eragrostis curvula*), Kudju (*Puraria hirsuta*) and Kikui (*Pennisetum clandestinum*) were found to be promising.

(v) The area was fenced by a mix of biological and mechanical means.

(vi) Harvesting of rain water was attempted so as to ensure on-site availability of water. Soil was amended with the application of farm yard manure.

(vii) Environmental awareness camps were organized in the area affected by mining.

3.1.8. Publication on 'Agricultural Economy of Kumaon'

Although considerable data relevant to economy of Kumaon Region are collected by various agencies/workers, a comprehensive analysis of the data has not been attempted and documented. This Institutional publication was planned to facilitate the accessibility of information to planners, administrators, scientists, managers and decision makers. Information on demography, land use, cropping pattern, production and marketing, land holdings, livestock, input uses etc. were collected from secondary sources. The analysis of data showed several discrepencies and inconsistencies. Attempts were made to filter out such errors as far as possible. Data were edited and arranged in logical sequences and then analytical techniques were applied. The framework of the proposed publication was finalised. Time schedule envisaged for bringing out this publication could not be adhered to because of some unavoidable circumstances. With the current stage of development it is expected that the publication is released in 1991.

3.1.9. Audio-Visual Production on 'Ecology and Sustainable Development in the Himalayan Region'

Background:

Dessemination of scientific/technological information base is vital in making an impact of any organization or programme. Conventionally, the scientific studies are published and documented as research papers which often fail to reach the policy framers decision makers and managers. Further the academic publications are in general not in a form compatible to the requirement and perception of the decision makers and the planners.

The Institute initiated this project on production of a documentary film to demonstrate an effective way of disseminating the meaning, perception and needs of science/technology as relevent to integrated resource management and sustainable development in the Himalayan region.

Significance of linkages between physical, biological, social, cultural and economic components in the hills are the key points that are planned to be highlighted. The production would be a 16 mm U matic colour film of 35 minutes duration when screened.

3.1.10. Environmental Management Information System for the Himalayan Region

Storage, retrieval and processing of data collected through research and development programmes undertaken by the Institute itself and those available from other sources are conceived as important tasks to be undertaken by the Institute. Efforts were made to establish a Management Information System for the Himalayan Region at the Institute. The information on research and development activities and agencies executing these activities have been pooled, classified and coded. The operation of the envisaged Information System could not be achieved in the absence of a Computer system. The thrust in developing and establishing such an information system is to ensure that the data collected is put to proper use.

3.2. Projects sponsored by other funding agencies:

3.2.1. Introduction of Rainwater Harvesting Technology for Sustainable Rural Development in Himalayas

Background:

Acute shortage of water is a serious problem in the Himalaya. Adverse effects of this fundamental problem are expressed as poor health, economy and environment of the rural people. The problem is an interactive outcome of: (i) indiscriminate deforestation, (ii) ignorance of ecological principles in the land use practices, and (iii) geomorphic forces and the resultant dramatic alterations in the hydrological cycling.

Undulating topography provides opportunities for harvesting and storage of the surface water. An appropriate water harvesting technology economically viable and acceptable to the people is required to be introduced and propogated to mitigate the crisis. This project was formulated to identify, develop and introduce such a technology in a few selected villages in the Central Himalayan region.

Objectives:

(i) survey of the existing surface water harvesting techniques,

(ii) designing the water harvesting tanks (in terms of shape, size, capacity and construction specifications) as suited to the prevailing requirements and environmental conditions,

(iii) assessment of performance and impact of the introduced technology and possible refinements, if needed.

Approach:

(i) Identification of villages selected for introducing the technology was based on (i) predominance of weaker section of the society, (ii) acute shortage of water, (iii) co-operation of village people. Work was undertaken in four villages *viz.*, Mainy, Panchgaon, Kapkot (District Almora) and Banswara (District Chamoli).

(ii) All these villages are representative of an extreme stage of environmental degradation. Demand and supply of water however differ as a result of variation in land cover and elevational effects of climate.

(iii) Site for constructing a tank and its designing in a village was marked looking over erodibility and water retaining capacity of the soil and topography in conjunction with climatic and land use attributes. Many of these parameters were assessed subjectively due to paucity of location specific data.

Results and Achievements:

Technology introduced for harvesting the surface water has been made operational at all the four sites. While introducing a technology primarily aimed for harvesting the rain water from mini-catchments, ample scope was observed for increasing the on-site availability of water through harvesting the water being wasted from the perennial springs located in the vicinity. A mix of harvesting the surface run off and water available from the perennial springs was found to ensure the supply of water for deserve uses such as drinking water, irrigation all through the year. Apart from improving the on-site availability of water at a given site, the project generated 1000 man days employment to the local people.

3.2.2. All India Co-ordinated Project on Water, Health and Sanitation (Involvement of Rural Women)

Background:

Availability of adequate potable water is basic to life. Fetching and carrying water is one of the important chores of women, especially in rural areas. With depletion of water resources this is becoming a drudgery for women, who have to over-spend their time and energy on this activity. Often the water procured with hardship, gets contaminated during transportation and storage. Water is also needed for cleaning. Insanitary conditions due to improper drainage have now become common. This in turn has severe implications for pollution of surface as well as ground water and frequent incidences of water borne diseases. Hence it is important that women, especially in the rural areas, are made aware of the linkages between water, health and sanitation.

An All India Co-ordinated Project was launched by the Department of Science & Technology for developing appropriate site-specific sanitation measures and their field testing on an experimental scale in different agroclimatic regions of the country. The Institute was identified as an agency to undertake the work in the Central Himalaya Region.

Objectives:

(i) to develop strategies for involving women in implementing projects on water, health and sanitation,

(ii) to field test integrated models with womens' participation in various agroclimatic regions of the country,

(iii) to create awareness in rural areas on water, health and sanitation related issues,

(iv) to carry out an impact analysis for feedback and future planning and implementation.

Results and Achievements:

Two villages *viz.*, Katarmal and Uttaroda (Almora District) representing different agro-climatic regimes were selected for this project.

Bench mark survey of each village was conducted. An objective analysis of the awareness among women towards water, health and sanitation was made.

3.2.3. Ecology of Earthworms and Soil Arthropods in Central Himalayan District of Almora

Background:

Soil fauna play a significant role in regulating the fertility of soil. Amongst a variety of animals constituting the soil fauna, earthworms are considered to be most crucial. A clear understanding of the decomposition processes and their rates performed by these animals would help in improving soil fertility levels in the managed ecosystems. Except for a few stray preliminary reports, information on these aspects in the Himalayan region is altogether lacking. This project aims to generate information on the role of earthworms and soil arthropods in regulating the fertility of soil in managed and natural ecosystems in the Kumaon Himalaya.

Objectives:

(i) to identify the earthworm species in a few selected ecosystems representative of varied level of disturbance regimes,

(ii) to analyse the population dynamics of earthworms in the identified ecosystems,

(iii) to estimate the contribution of earthworms in the nutrient cycling under different disturbance regimes,

(iv) to analyse the response of earthworms towards soil management practices.

Results and Achievements:

(i) Survey and identification of earthworms inhabiting different ecosystems has been completed.

(ii) Considerable data on the abundance of earthworms and their population dynamics have been collected.

(iii) Regular sampling of soil-plant and animal components was done. Analytical process has just been initiated but could not be completed.

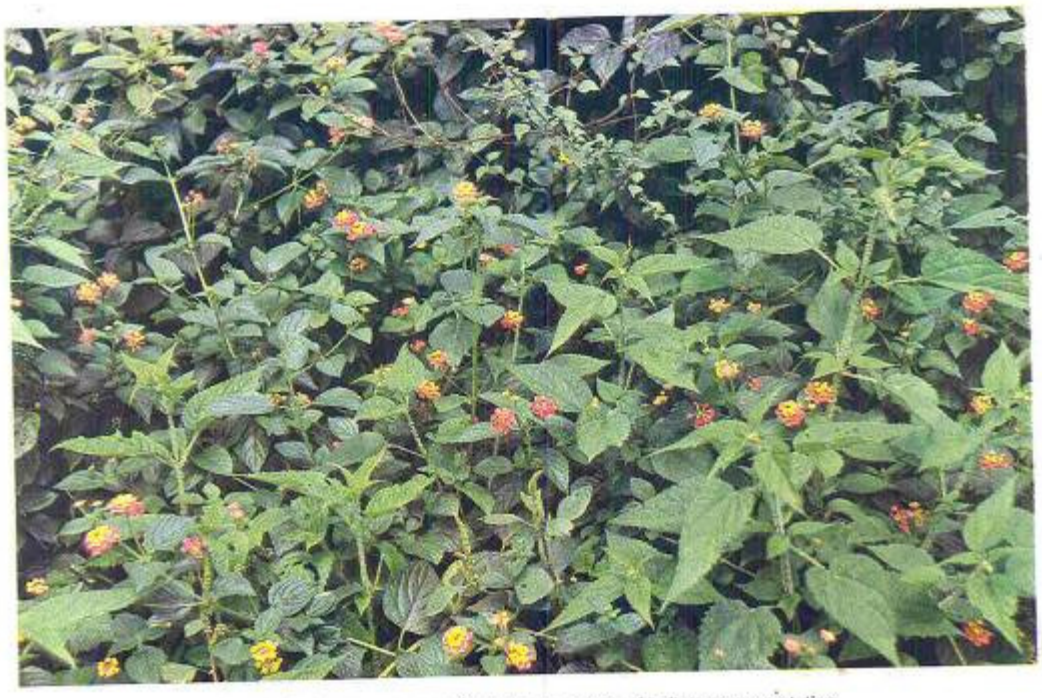
3.3. Workshops/Symposia

3.3.1. International workshop on "Ecology of Biological Invasions in the Tropics", September, 18-20, 1989.

This workshop was organised by the Institute with financial support from Scientific Committee on Problems of the Environment (SCOPE), Paris and organisational support from Kumaon University, Nainital. There were 15 experts including 12 overseas participants who formed the core group. Director and a Scientist of the Institute were represented in the core group. Besides the participants in the core group, over 40 young scientists were invited as observers from the point of creating an initiative for research and development on the workshop theme in the Himalayan Region.

Papers on "Ecosystems level consequences of biological invasions in the tropics" and "A review of plant invasions in the Indian sub-continent" were presented by the Director and a Scientist of the Institute, respectively.

Based on the discussions during the workshop three priority areas of research were identified:



Invasion by *Lancana camara* Prevents the growth of indigeneous vegetation and reduces utility value of the land.

(i) Comparative study of invasiveness of introduced *Eucalyptus* species.

(ii) Comparative study of the introduced *Tilapia* species.

(iii) Formulating biological control programme on *Lantana camara* and *Chromolaena odorata* (*Eupatorium*).

It was emphasised that the socio-economic component ought to be integrated in the biological research programmes in the tropics. The rural poor are largely influenced adversely by invasive species, though it may be the invasive species themselves that become important to the local community. It was suggested that the local community and the scientists should work together for the long term success of tropical land use research programme. A decision was taken to publish the proceedings of the workshop and this task was entrusted to the Ex-Director of the Institute.

The first issue of the Institute's Newsletter "Hima Paryavaran" was released in the inaugaural function of the workshop. A special function was organised by the Austrian Embassy as a commemoration for Prof. K. Lorrance, a distinguished Austrian Environmentalist.

3.3.2. Group Monitoring Workshop on "DST Funded Projects for Young Scientists", October 15-17, 1989.

This workshop was organised by the Institute with financial support from the Department of Science and Technology (DST), Government of India. Ten subject experts and sixty Principal Investigators participated directly in the workshop. In addition thirty young scientists were invited to create an awareness and initiative towards th Research and Development programme supported by the DST. Director of the Institut was represented as Chairman of the Advisor Committee of Young Scientists Scheme of th DST. He outlined the frontier areas where DS would be interested to fund Research an Development activities in the Himalaya region.

One Scientist of the Institute was among th experts identified by the DST for projec evaluation and monitoring. The proceedings c the workshop were compiled and published b the Institute.

4. LABORATORY AND LIBRARY

Efforts were made to establish an equippe laboratory and library at the Institute. Out c the total allocation of 48 lakhs grant-in-aid t the Institute, expenditure on creating th laboratory and library facilities at Kosi Katarmal were 10 lakhs and 5 lakhs respectively. The Institute procured 32 standard reference books and subscribed 1 standard journals/periodicals during the year.

5. ACTIVITIES ON ENVIRONMENTAL AWARENESS

A number of informal villge level meetings were held in Kumaon, Garhwal, Sikkim and Nagaland to create awareness and to understand the people's perception o environmental problems and their possible solutions. These interactions facilitated in the development and execution of research/ development programmes with a value which people can understand, appreciate, assimilate and thereby ensure their participation.

World Environment Day (June 05, 1989) was celebrated with participation by the local school level students and villagers. An essay competition on "Himalayan Environment and Development", both in Hindi and English was organised. Over 50 students from various schools of Almora district participated in the competition.

A major planting activity formed an important component of the celebrations on the occasion.

6. ACADEMIC ACTIVITIES

6.1. Publications

Ahmad, A. 1990. Eutrophication with special reference to Himalayas and strategies for its rehabilitation. In: *Management of Aquatic Ecosystems*. Edited by V.P. Agrawal, B.N. Desai and S.A.H. Abidi. Narendra Publishing House, Delhi, pp 363-399.

Ahmad, A., Ramakrishnan, P.S. and Rao, K.S. 1989. Management and conservation of wildlife: Environmentalist's view point. In: *Environmental Conservation and Development*. Edited by P.R. Singh, O.P. Sharma and Ram Boojh, Directorate of Environment, U.P., pp. 81-90.

Ahmad, A., Ramakrishnan, P.S. and Rao, K.S. 1989. Environmental Impact Assessment of water resources projects in Himalayas: an urgent need for sustainable development. In: *Environmental Conservation and Development*. Edited by P.R. Singh, O.P. Sharma and Ram Boojh, Directorate of Environment, U.P., pp. 91-102.

Ramakrishnan, P.S. 1989. Socio-cultural studies of the sacred groves at Cherrapunji and adjoining area in north-eastern India. *Man in India*. 69: 64-71.

Ramakrishnan, P.S. 1989. Nutrient cycling in forest fallows in India. In: *British Ecological Society Symposium (Special Volume)*. Blackwell Scientific Publications, Oxford. pp 337-352.

Ramakrishnan, P.S. 1990. Ecosystem level consequences of biological invasions in the tropics. *International Journal of Ecology and Environmental Sciences (Special Volume)*. (In Press)

Ramakrishnan, P.S., Saxena, K.G., Kothyari, B.P. and Rao, K.S. 1990. Ecological evaluation of agricultural systems for development planning in the Himalayas. In: Special Publication of Himalayan Adventure Trust and Indian Mounteneering Foundation, New Delhi.

Rao, K.S. and Ramakrishnan, P.S. 1989. Role of bamboos in nutrient conservation during secondary succession following slash and burn agriculture (jhum) in north-east India. *Journal of Applied Ecology*, 26: 625-633.

Saxena, K.G. 1990. A review of plan invasions in the Indian sub-continent *International Journal of Ecology an Environmental Sciences (Special Volume)*. (I Press).

Saxena, K.G., Ramakrishnan, P.S. and Rao K.S. 1989. Shifting agriculture and it implication in north-eastern India. I *Proceedings of National Workshop o Himalayan Ecology*, D.S.T., Manali. (In Press)

Saxena, K.G., Rao, K.S. and Kothyari, B.I 1990. Social forestry in a broad perspective integrated resource management an sustained production. *International Journal Ecology and Environment*, 16: 14-26.

6.2. Participation of Scientists in Symposia/Workshops/Conferences

Director of the Institute participated in the Workshop on "Ganga as a world Heritage Site" organised by National Academy of Sciences at Delhi in April, 1989.

Director of the Institute delivered a series of lectures in the MAB-Regional Training Workshop on "Tropical Forest Ecosystem Conservation and Development in South and South-East Asia" organised at Kerala Forest Research Institute, Peechi, Kerala in May, 1989.

Three Scientists of the Institute participated in the Seminar on "Role of Youth in Environmental Awareness" organised by Lok Chetna Manch at Ranikhet in June, 1989.

A Scientist of the Institute participated in the workshop on "Watershed Management and Flood Control" organised at Madan Mohan Malviya Engineering College, Gorakhpur University, Gorakhpur in July, 1989.

A Scientist of the Institute attended and presented a paper on "Environmental Impact Analysis" in the National Seminar on "Ecological Economics" held at Pune in July, 1989.

Director of the Institute participated in the workshop of "Peoples' Participation for Environment and Development" organised by Himalaya Seva Sangh at Ranichauri in August, 1989.

Director of the Institute attended the "Steering Committee Meeting of International Union for Conservation of Nature and Natural Resources" in September, 1989 at Sienna, Italy. Research and Development programmes of the Institute in the field of conservation Ecology were discussed during the meeting.

Director of the Institute was invited by the USSR Academy of Sciences to participate in the International Conference on "Transformation of Mountain Environment" sponsored jointly by the East-West Environment and Policy Institute, East-West Centre, Honolulu, Hawaii, USA, the USSR Academy of Sciences USSr and the United Nations University, USA. The Conference was held at Yerevan, Armenia, USSR in October, 1989. Academic activities of the Institute were discussed during the conference.

Two Scientists of the Institute participated in a seminar on "Environment and Mankind" sponsored by the Sikkim Government College and the Ministry of Environment and Forests, Government of India, in September, 1989 at Gangtok.

A Scientist of the Institute participated in the meeting of the "Task Force on Forest Biotechnology" of Department of Biotechnology, Government of India in January, 1990 at New Delhi.

A Scientist of the Institute delivered a series of lectures on "Nature Conservation and Remote Sensing Data Inputs in Planning Nature Reserves" at Indian Institute of Remote Sensing, Dehra Dun, in February, 1990.

Three Scientists of the Institute participated in "Environment Training Camp", organised by Kurmanchal Seva Sansthan, Samajik Chetna Kendra, Kanda, Almora with support of Ministry of Environment and Forests in March, 1990. The Scientists outlined the various aspects of smokeless ovens, nursery development, water management and sanitation in the hill villages.

Acting Director attended the 12th meeting of the "Expert working Group on Integrated Eco-Development Research programme in

Himalayan Region" at Paryavaran Bhawan, New Delhi, in March, 1990.

A Scientist of the Institute delivered lectures in GDR on Environmental Impact Analysis in United Nations Environment Programme (UNEP)/United Nations Educational Scientific and Cultural Organisation (UNESCO) course on "Environmental Management and Protection" in March, 1990.

A Scientist of the Institute participated in the International Seminar on "Asian Urban Environment - Issues and Challanges" held at Banaras Hindu University, Varanasi, in March, 1990.

A Scientist of the Institute participated in the Regional Workshop on "Indian Remote Sensing Satellite - 1A (IRS-1A) Mission and its Application Potential" held at Gangtok in March, 1990.

Two Scientists of the Institute participated in a seminar on "Solar Energy Heating System" organised by the Sikkim Science Society at Gangtok in March, 1990.

Scientists of the Institute were deputed to deliver lectures on critical themes of environmental management and education in "Refresher Courses for Teachers" organised by the Regional Education & Training Institute, Almora during the year 1989-90.

Three Scientists of the Institute were invited by the Department of Science & Technology, Government of India to participate in the process of formulating an All India Co-ordinated Research Project on Biological Maintenance of Soil Fertility.

7. MISCELLANEOUS

7.1. The Prime Minister visits the Institute

The Prime Minister visited the Institute at Kosi-Katarmal on June 9, 1989. The Prime Minister was impressed with the exhibition and appreciated the progress of work, involving peoples' participation. The Union Minister of Environment & Forests and the Chief Minister of Uttar Pradesh Government were among the dignitories present during the Prime Minister's visit.

7.2 Other visitors/activities:

A number of distinguished scientists and public representatives visited the Institute.

Linkages with national and international organizations/agencies with aims and objectives similar to those of the Institute were strengthened.

8. GOVIND BALLABH PANT HIMALAYA PARYAVARAN EVAM VIKAS SANSTHAN: MEMBERSHIP OF THE SOCIETY

Minister in-charge — Presider
Union Cabinet
Ministry of Environment
& Forests
Government of India
New Delhi

Ministry of State in-charge Ministry of Environment & Forests Government of India New Delhi	Vice-President
Two Members of the Parliament (to be nominated by the Government of India every three years or upon sooner determination of the Membership of the Lok Sabha)	Members
Minister in-charge Environment Government of Jammu & Kashmir	Member
Minister in-charge Environment Government of Sikkim	Member
Minister in-charge Environment Government of Himachal Pradesh	Member
Minister in-charge Environment Government of Uttar Pradesh	Member
Minister in-charge Environment Government of West Bengal	Member
Minister in-charge Environment Government of Assam	Member
Minister in-charge Environment Government of Arunachal Pradesh	Member
Minister in-charge Environment Government of Mizoram	Member
Two Members of Legislative Assembly State of Uttar Pradesh (to be nominated by the Government of India every three years or upon sooner determination of the membership of Uttar Pradesh Legislative Assembly of an incumbent Member)	Membe
Five non-officials (to be nominated by the Government of India)	Membe
A representative from Indian Institute of Forest Management Bhopal	Membe
Secretary Ministry of Environment & Forests New Delhi	Membe
Secretary Department of Science & Technology New Delhi	Membe
Secretary Department of Scientific & Industrial Research New Delhi	Membe
Secretary Ministry of Human Resource Development New Delhi	Member
Secretary Department of Rural Development New Delhi	Member
Secretary Department of Urban Development New Delhi	Member

Secretary Department of Biotechnology New Delhi	Member
Secretary Department of Non-Conventional Energy Sources New Delhi	Member
Secretary Department of Mines New Delhi	Member
Secretary Department of Water Resources New Delhi	Member
Secretary Department of Agricultural Research & Education New Delhi	Member
Secretary Planning Commission New Delhi	Member
Chief Secretary Government of Uttar Pradesh Lucknow	Member
President Forest Research Institute Dehradun	Member
Inspector General of Forests New Delhi	Member
Director Botanical Survey of India Calcutta	Member
Chairman Indian Council of Social Science Research New Delhi	Member
Director Centre for Social Development New Delhi	Member
Director Govind Ballabh Pant Himalaya Paryavaran Evam Vikas Sansthan Almora	Member

9. GOVERNING BODY

Secretary Ministry of Environment & Forests, Paryavaran Bhawan, C.G.O. Complex, Lodi Road, New Delhi-110 003.	Chairman
Secretary Department of Biotechnology, C.G.O. Complex, Lodi Road, New Delhi-110 003.	Member
Chief Secretary Government of Uttar Pradesh, Government Secretariat, Lucknow.	Member
Inspector General (Forests) Ministry of Environment & Forests, Paryavaran Bhawan, C.G.O. Complex, Lodi Road, New Delhi-110 003.	Member
Joint Secretary & Financial Advisor Ministry of Environment & Forests, Paryavaran Bhawan, C.G.O. Complex, Lodi Road, New Delhi-110 003.	Member
Prof. A.K. Sharma Department of Botany, University of Calcutta, 35 Ballygunge Circular Road, Calcutta-700 019.	Member

Prof. S. Ramaseshan — Member
Department of Civil Engineering,
Indian Institute of Technology,
Kanpur-208 016.

Prof. S.K. Sinha — Member
Water Technology Centre,
Indian Agricultural Research Institute,
New Delhi.

Prof. K.S. Valdiya — Member
Department of Geology,
Kumaun University,
Nainital, U.P.

Director — Member Secretary
G.B. Pant Institute of Himalayan
Environment and Development,
Kosi, Almora.

10. SCIENCE ADVISORY COMMITTEE

Dr. M.S. Swaminathan — Chairman
B4/142, Safdarjung Enclave,
New Delhi.

Prof. K.S. Valdiya — Member
Department of Geology,
Kumaun University, Nainital, U.P.

Dr. V.V. Dhruva Narayana — Member
Director,
Central Soil and Water Conservation
Research Institute,
Dehra Dun, U.P.

Prof. A.N. Purohit — Member
Director,
High Altitude Plant Physiology
Research Centre,
Srinagar (Garhwal), U.P.

Prof. A. Ahmad — Member
Vice-Chancellor,
Sher-e-Kashmir University of
Agricultural Science & Technology
Srinagar, Kashmir.

Dr. D.R. Thakur — Member
Vice-Chancellor,
Y.S. Parmar University,
Solan, H.P.

Shri S. Deb Roy — Member
Chief Conservator of Forests,
Rehabari,
Guahati-781 008, Assam.

Dr. B.P. Ghildyal — Member
Liaison Scientists,
International Rice Research Institute,
Room No. 382, Samrat Hotel,
New Delhi.

Prof. B.L. Deekshitulu — Member
Director,
National Remote Sensing Agency,
Department of Space,
Balanagar, Hyderabad, A.P.

Shri Chandi Prasad Bhat — Member
Dasoli Gram,
'Swaragya and Sarvodaya'
P.O. Gopeshwar, Garhwal.

Dr.(Mrs) Manju Sharma — Member
Chief, Science,
Planning Commission,
Yojna Bhavan, New Delhi.

Mrs. Chubla Ao — Member
Kohima, Nagaland.

Prof. S.L. Bhatt — Member
Indian Statistical Institute,
New Mehrauli Road, New Delhi.

Shri R.K. Dar — Member
Principal Secretary,
Hill Development,
Government of Uttar Pradesh,
Lucknow, U.P.

Shri S.K. Pandey — Member
Director,
Indira Gandhi Institute of
Forest Education,
Dehradun, U.P.

Dr. V.C. Thakur — Member
Director,
Wadia Institute of Himalayan Geology,
Dehra Dun, U.P.

Miss Mukti Datta — Member
NGO,
Binsar, Almora.

Dr. Lalit Pandey — Member
Manorath Sadan,
Champa Naula,
Almora-263 601.

Prof. Padma Vasudevan — Member
Centre of Appropriate Rural Technology,
Indian Institute of Technology,
Hauz Khas, New Delhi-110 016.

Prof. Vijay Paranjpye — Member
Research Fellow,
Gokhale Institute, Durga,
92/2 Erandawana,
Pune-411 004.

Director — Member
G.B. Pant Institute of Himalayan
Environment and Development,
Kosi, Almora-263 643, U.P.

11. SCIENTIFIC PERSONNEL IN THE INSTITUTE

1. Prof. P.S. Ramakrishnan, Director (till October 31, 1989)
2. Dr. Afroz Ahmad
3. Mr. A. Kumar
4. Dr. A.K. Gangwar
5. Dr. B.P. Kothyari
6. Dr. D. Asthana
7. Dr. D.S. Rawat
8. Dr. E. Sharma
9. Dr. J.S. Rawat
10. Dr. K.G. Saxena
11. Dr. K.S. Rao
12. Dr. R.C. Sundariyal
13. Dr. R.K. Maikhuri
14. Dr. R. Swaroop
15. Mr. S. Sharma
16. Dr. S.C. Rai
17. Dr. S.C. Ram
18. Dr. T. Kumar

(Except the Director, all were appointed on ad-hoc/contract basis).

12. AUDITED STATEMENT OF ACCOUNTS

Utilisation Certificate

Certified that out of Rs. 49,52,112.33 (Rs. 48,00,000 Grants in-aid Rs 1,48,943.80 unspent balance of last year + Rs. 3168.53 as miscellaneous re ceipts), received during the year ending 31.3.1990 in favour of Govind Bal labh Pant Himalaya Paryavaran Evam Vikas Sansthan, a sum of Rs 49,13,621.84 has been utilised for the purpose for which it was sanctione subject to "excess-deficit" as shown in the Annexure "A" of Receipts & Pay ments Account annexed hereto and that the balance of Rs. 38,490.49 re maining unutilised at the end of the year will be adjusted towards the Grants in-aid payable during the next year 1990-91.

Certified that we have audited the books of account for the year ende 31.3.1990 and further certified that the Receipt and Payment account and In come & Expenditure Accounts for the year ended 31.3.90 and the Balanc Sheet as on 31.3.90 annexed hereto are correct to the best of our knowledge information and belief and are in accordance with the books of account an vouchers produced before us and explanations given to us during the cours of our audit.

Sd/-
(Rajesh Sethi)
Partner
For J.C. Bhalla & Co.
Chartered Accountants.

New Delhi
Dated: 4.10.1990

G.B. PANT INSTITUTE OF HIMALAYAN ENVIRONMENT & DEVELOPMENT

Kosi-Katarmal, Almora-263 643 (U.P.)

Receipts & Payments Account for the year ending 31st March, 1990

Particulars Receipts	Amount Rs.	Amount Rs.	Amount Rs.	Particulars Payments	Amount Rs.	Amount Rs.	Amount Rs.	Amount Rs.
Opening Balance	1,48,943.80	—	1,48,943.80	Salary to Staff	8,73,905.05	—	—	—
By Cheque (ME&F)	10,00,000.00	—	—	T.A.	80,014.35	—	—	—
By Cheque (ME&F)	15,00,000.00	—	—	Wages	32,842.25	—	—	9,86,761.65
By Cheque (ME&F)	10,00,000.00	—	—					
By Cheque (ME&F)	13,00,000.00	—	48,00,000.00	**Office Expenses:**				
By Cheque (SCOPE)	66,270.00	(-)66,216.47	53.53	Postage	16,002.95	—	16,002.95	—
By Cheque (CSIR fellowship of Dr. Tuneera)	36,400.00	(-)36,400.00	—	Conveyance	7,644.63	—	7,644.63	—
				Stationery	65,635.40	—	65,635.40	—
				Petrol/Fuel	1,46,068.73	—	1,46,068.73	—
By Cheque (DST Workshop)	2,00,000.00	-2,00,000.00	—	Telephone	18,704.00	—	18,704.00	—
				Electric & Water	74,525.17	(-)2,777.00	71,748.17	—
By Cheque (DST Project)	1,00,000.00	-1,00,000.00	—	Vehicle Maintenance	88,720.53	(-)5,412.00	83,308.53	—
				Hospitality	10,690.75	—	10,690.75	—
By Cheque (CSIR R.A., HR)	2,640.00	(-)2,640.00	—	Building Maintenance	56,065.42	—	56,065.42	—
				Rent & Taxes	42,300.00	—	42,300.00	—
By Cheque (Vehicle Insurance Claim)	5,412.00	(-)5,412.00	—	Advertisement	9,117.60	—	9,117.60	—
				Other Contingency	99,274.13	—	99,274.13	6,26,560.31
By Cash (Excess payment of Elect. bill)	2,147.00	(-)2,147.00	—					
				Office Equipments	1,95,522.25	—	1,95,522.25	1,95,522.25
				Research & Devel.	12,26,725.31	—	12,26,725.31	12,26,725.31
By Cash (Katarmal) lodging charges)	495.00	—	495.00	Workshop/Seminar	3,71,196.49	(-)2,66,216.47	1,04,980.02	1,04,980.02
				Furniture	4,94,030.75	—	4,94,030.75	4,94,030.75
By Cash (Recovery of excess payment of T.A. 1988-89)	40.00	—	40.00	Library	5,02,748.10	—	5,02,748.10	5,02,748.10
				Building	70,920.10	—	70,920.10	70,920.10
				Laboratory	6,90,223.35	—	6,90,223.35	6,90,223.35
By Recovery of HR	2,580.00	—	2,580.00	Dr. Tuneera	38,170.00	(-)38,170.00	—	—
By Recovery of Elect. Charges	630.00	(-)630.00	—	Security A/c	15,150.00	—	15,150.00	15,150.00
				Cash in Hand:				
				Balance in Bank (CSIR)	870.00	(-)870.00	—	—
				Balance in Bank (DST)	1,00,000.00	(-)1,00,000.00		
				as per Cash Book	9,421.85	—	9,421.85	9,421.85
				as per Advances	29,068.64	—	29,068.64	29,068.64
Grand Total	53,65,557.80	4,13,445.47	49,52,112.33		53,65,557.80	4,13,445.47	—	49,52,112.33

(Rajesh Sethi)
Partner
For J.C. Bhalla & Co.
Chartered Accountants.

Sd/
(C.P. Kapoor)
Finance Officer

Sd/
(K.G. Saxena)
Officer Incharge

Sd/-
(A.N. Purohit)
Director

G.B. Pant Institute of Himalayan Environment & Development

Kosi-Katarmal, Almora-263643 (U.P.)

Appropriation account for the year ending 31.3.90

Figures in Lakh

Sl. No.	*Head*	*Sanction grants*	*Expenditure*	*Excess*	*Savings*
1.	Salaries	9.99	9.86	—	0.13
2.	Workshop/Seminar	—	1.04	1.04	—
3.	Furniture	6.25	4.94	—	1.31
4.	Office Equipment	1.50	1.96	0.46	—
5.	Research & Development	9.00	12.26	3.26	—
6.	Library	6.00	5.03	—	0.97
7.	Laboratory	7.00	6.90	—	0.10
8.	Office expenses	9.75	6.26	—	3.49
9.	Building	—	0.71	0.71	—
	Total	49.49	48.96	5.47	6.00

Re-appropriation account

From		*To*	
Furniture	1.14	Office Equipment	0.46
Salaries	0.13	Research & Development	3.26
Office Expenses	3.49	Workshop/Seminar	1.04
Library	0.71	Building	0.71
Total	5.47		5.47

Sd/-

(C.P. Kapoor)
Finance Officer

Sd/-

(K.G. Saxena)
Officer Incharge

Sd/-

(A.N. Purohit)
Director

G.B. Pant Institute of Himalayan Environment & Development
Kosi-Katarmal, Almora (U.P.)

Income & Expenditure Account for the year ended 31.3.1990

Expenditure	*Amount*	*Income*	*Amount*
Salary	8,73,905.05	By Miscellaneous Receipt	3,168.53
T.A.	80,014.35	,, Excess of Expenditure over income carried over to the Balance Sheet	29,41,858.76
Wages	32,842.25		
Postage	16,002.95		
Conveyance	7,644.63		
Petrol/Fuel	1,46,068.73		
Vehicle Maintenance	83,308.53		
Telephone	18,704.00		
Electricity & Water	71,748.17		
Stationery	65,635.40		
Hospitality	10,690.75		
Advertisements	9,117.60		
Rents & Taxes	42,300.00		
Research & Development (including Capital expenditure)	12,26,725.31		
Workshop/Seminar	1,04,980.02		
Building maintenance	56,065.42		
Other Contingency	99,274.13		
	29,45,027.29		29,45,027.29

Note: All items of income as well as expenditure are accounted for on cash basis.

Sd/-
(Rajesh Sethi)
Partner
For J.C. Bhalla & Co.
Chartered Accountants.

New Delhi
Dated:4.10.90

Sd/-
(C.P. Kapoor)
Finance Officer

Sd/-
(K.G. Saxena)
Officer Incharge

Sd/-
(A.N. Purohit)
Director

G.B. Pant Institute of Himalayan Environment & Development
Kosi-Katarmal, Almora (U.P.)
Balance Sheet as on 31st March, 1990

Liabilities	as on 31.3.89 amount(Rs.)	During 1989-90, Amount(Rs.)	as on 31.3.90 Amount (Rs.)		Assets	as on 31.3.89 Amount (Rs.)	During 1989-90, Amount (Rs.)	as on 31.3.90 Amount (Rs.,
Ministry of Environment & Forests, Govt. of India	42,82,771.39	—	42,82,771.39	***	Office Equipments	2,22,122.73	1,95,522.25	4,17,644.98
Grand in Aid Account Balance as per last balance sheet					Furniture & Furnishing	4,65,592.57	4,94,030.75	9,59,523.32
					Vehicles	6,49,186.78	—	6,49,186.78
Grant in Aid ME&F during 1989-90	—	48,00,000.00	48,00,000.00		Library	1,53,997.51	5,02,748.10	6,56,745.61
			90,82,771.39		Building	26,42,928.00	70,920.10	27,13,848.10
				***	Laboratory Includes Rs. 73,240/- on account of advance payment of computer delivery of which is still to be received)	—	6,90,223.35	6,90,223.35
Less: Excess of expenditure over receipts	—	29,41,858.76	29,41,858.76					
					Security Deposit	—	15,150.00	15,150.00
					Cash in hand	—	38,490.49	38,490.49
Total			61,40,912.63					61,40,912.63

Place: New Delhi
Dated: 04.10.1990

Sd/-

(Rajesh Sethi)
Partner
For J.C. Bhalla & Co.
Chartered Accountants

Sd/-

(C.P. Kapoor)
Finance Officer

Sd/-

(K.G.Saxena)
Officer Incharge

Sd/-

(A.N. Purohit)
Director