

# **Annual Progress Report**

(October 2019 - October 2020)

## **ESTABLISHMENT OF NATURE LEARNING CENTRE, SIKKIM**

**(Funded by NMHS, MoEF&CC, GoI)**

**Submitted to**

**Forest, Environment and Wildlife Management Department,  
Government of Sikkim**



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Sikkim Regional Centre, Pangthang, Sikkim**

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## Background

The Indian Himalayan region (IHR) represents a very significant part of the Indian sub-continent as it supports unique landscape elements, species, populations, communities, and ecosystems along with the ethnic diversity. The IHR also forms the large part of globally recognized Himalayan biodiversity hotspot. However, the regions are identified amongst the most climate change sensitive ecosystem, and the naturalness of this unique ecosystem is severely threatened due to ever increasing human onslaught. In this context, the Ministry of Environment, Forest and Climate Change, Government of India under National Mission on Himalayan Studies (NMHS) promoted establishment the state-of-art Himalayan-Nature Learning Centre (Him-NLC) in all Himalayan states. The NLC would promote the nature conservation, sensitization, enhancing the outreach and producing knowledge base for awareness generation among diverse stakeholders including school students, researchers, and people from local community.

This developmental project focuses on the capacity building of various stakeholders on nature conservation through a holistic and coordinated effort to create an enabled environment for nature based learning and sustainable developmental action. Henceforth, the GBPNIHE, Sikkim Regional Centre, has identified the area of the arboretum rich in bryophytes, ferns, orchids, rhododendrons, medicinal plants and many other angiosperm species in the campus as the site for the establishment of Nature Learning Centre, which would ensure both ex-situ conservation and site for nature exposure and learning for stakeholders. The arboretum of the Institute, located adjacent to the Fambong Lho Wildlife Sanctuary and close to the capital city of Gangtok (approx. 16 km), is ideally placed to be developed as a wholistic Nature Learning Centre owing to the rich repository of bioresources and other natural resources in its surroundings.

Development of a model NLC envisages conservation of sensitive flora and fauna to replicate. Additionally, augmentation of NLC may lead to field laboratory for conservation of Biodiversity and interactive Nature learning. It aims to develop a learning and interpretation centre for biodiversity conservation through various interactive models and demonstrate best practices on sustainable models such as waste management, composting, water harvesting, etc. The proposed NLC would conduct various awareness and sensitization programme to create awareness amongst young minds, officials, tourists and locals on various issues of biodiversity conservation. Likewise, NLC will also provide training to the community members and SHGs for promotion of eco-tourism and livelihood enhancement activities, so

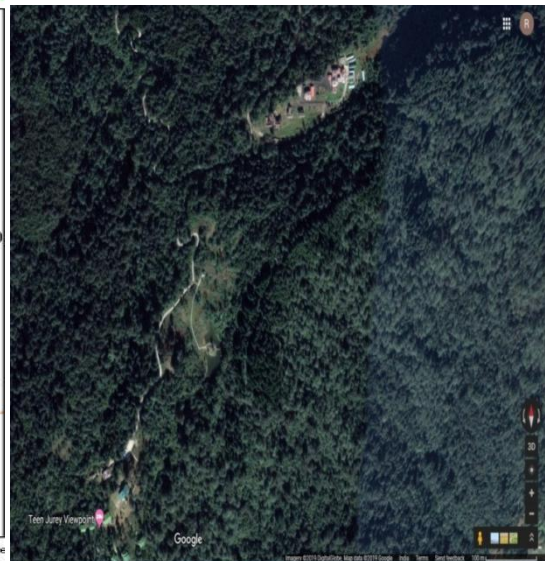
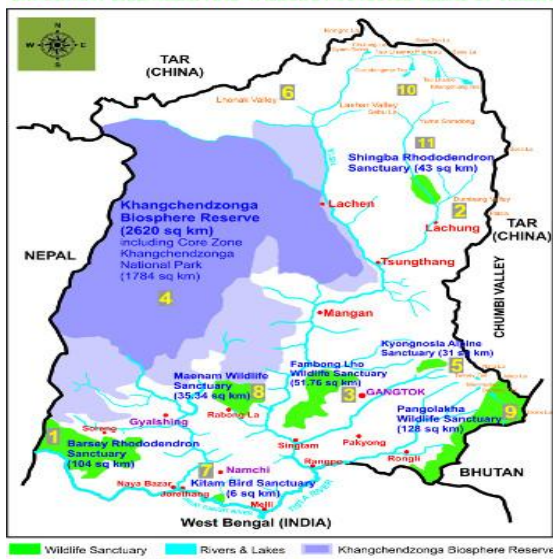
as to reduce the pressure on the forest resources near the protected areas. It will raise protocol for developing propagation of rare and endangered plants difficult to propagate. The main agency for implementation of the Him-NLC project in Sikkim is Department of Forest, Environment and Wildlife management, Government of Sikkim; whereas GBPNIHE, Sikkim Regional Centre is the implementing partner of the project.

### Study Area:

The study area includes arboretum area of GBPNIHE, Sikkim Regional Centre at Pangthang, Gangtok, East Sikkim and part of Fambong Lho Wildlife Sanctuary, Forest Department, GoS. The Sikkim Regional Centre is located near the periphery of the Wildlife Sanctuary in Pangthang. It has an area of 17 acres for field experimentations, herbal garden, nursery development and demonstration site in the Institute campus within an altitude of approximately 2000 m asl. The area of the arboretum is rich in bryophytes, ferns, orchids, rhododendrons, medicinal plants and many other angiosperm species, similar to nearby Fambonglho Wild Life Sanctuary.

Name	Sikkim Regional Centre, GBPNIHE	
Location	Co-ordinates	N 27° 10' to 27° 11' and E 88° 29' to 88° 31'
	State	Sikkim
	District	East
Extent of the area	17 acres	
Altitude	2000-2100 m asl	

IMPORTANT BIRD AREAS AND WILDLIFE PROTECTED AREAS OF SIKKIM



## **Objectives:**

- i. To develop a learning and interpretation centre for biodiversity conservation through various interactive models.
- ii. To develop and demonstrate best practices on sustainable models such as, waste management, composting, water harvesting etc.
- iii. To promote participatory conservation action and efficient utilization and management of natural resource base for livelihood generation,
- iv. To promote eco-tourism for biodiversity conservation for livelihood generation
- v. To build capacity of diverse stakeholders on conservation of resource base and develop of knowledge product for dissemination and awareness generation.

## **Methodology & Approach**

- A year wise activities to be carried out under the project has been carefully listed outlining the strategy for completing the project.
- For the establishment and development of orchid conservation site, orchid trail with 30 epiphytic species of orchid has been procured from BSI (Botanical Survey of India), Sikkim. And, other 20 species of orchid has been rescued from the felled trees from road widening and landslide site from east parts of Sikkim.
- In order to quantify and analyze vegetation pattern and plant species diversity complete enumeration of trees were performed using a standard quadrat method. Hence, the quantitative analysis such as frequency, density, basal area, Importance Value Index and abundance of the recorded species were determined. Shannon-Wiener index of diversity is calculated. The plot of 10mx10m for tree, a 5mx5m for shrubs and regeneration and lastly, 1mx1m were laid for enumeration of herbs. Preparation of herbarium of shrub and herb species has been initiated for the identification of the species.
- To conduct sensitization programme for community in Solid waste management .A one day training-cum-awareness programme was carried out giving detailed hands-on-training on Vermi-composting and bio-composting wherein participants to be taught on construction of composting pits and its dimensions, use of household waste on composting, duration of compost preparation, raw material for composting, lifecycle of earthworm etc. Followed by an exposure visit to the RTC of the campus and cleanliness

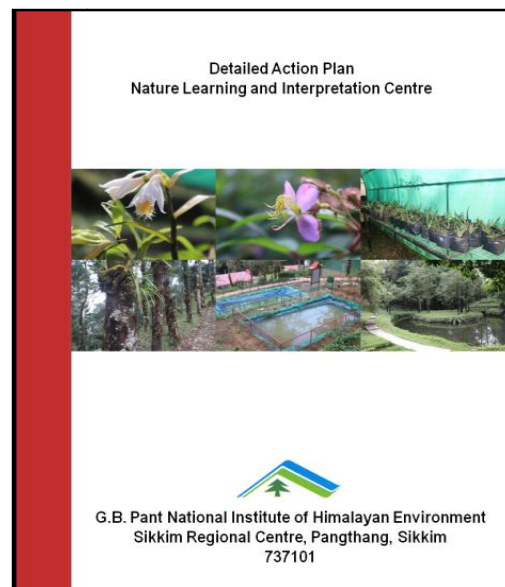
drive on 1 km stretch of the nearby village. A post and pre assessment forms were circulated amongst the participants to see the change in perspective through a program.

- To conduct a need assessment a questionnaire survey was carried out interviewing one family member from each households by asking them a series of question pertaining to their interest in running or upgrading a homestay, their involvement in any tourism activity .

## **Achievements**

### **1. Draft Action Plan for development of NLC**

A year wise activities to be carried out under the project has been carefully listed outlining the strategy for completing the project in the draft action plan (Fig 1). Execution of plan approaches to make the work more intentional and accomplishable. An approach for participatory activities has been drafted. Furthermore, identification of stakeholders and Capacity building programme for targeted stakeholder is under process. In order to make the Nature Learning Centre more meaningful Knowledge products for dissemination and awareness generation among different stakeholders has been developed. The draft summarizes the requisite outcome of the activities carried out on the tenure of first year of the project.



**Fig1: A detailed Action plan**

## 2. Establishment and development of Orchid conservation site

The orchid diversity in Sikkim has always remained in the fore front in the context of its exploration, conservation and propagation as Sikkim alone, only next to Arunachal Pradesh having 620 species of orchids. But when land to species ratio is considered, Sikkim perhaps is the world's richest orchid diversity hot spot. They are prized for their incredible diversity in the size, shape, colour and attractiveness of their flowers .Indeed, considering the richness of orchid diversity in the State, as a part of first year activity under the project; an orchid trail (Fig 2.) has been identified and established, in order to facilitate ex-situ conservation of orchid diversity of the State. The present orchid trail house a total of 50 orchids species, planted on the trees along the trail in the arboretum of the campus (Fig 3.).Of these 30 epiphytic species of orchid has been procured from BSI (Botanical Survey of India)(Table 1), Sikkim. Other 20 species of orchid has been rescued from the felled trees from road widening and landslide site from east parts of Sikkim namely Rorethang, Pakyong, Ranipool, Singtam and Rumtek under the supervision of Forest Department (Fig 4.). Furthermore, detailed studies in better understanding of the location, distribution and status of the orchid flora, will be taken up which to equip us better for their long term conservation.



Fig 2: An orchid trail developed at the arboretum of GBPNIHE, SRC campus, Pangthang



*Cryptochilus sanguine*



*Agrostophyllum callosum*

Fig 3: Photographs showing flowerings in orchid at GBPNIHE, SRC campus, Pangthang





Fig 4: NLC team rescuing orchids from the felled tree

Table 1. A List of orchid species conserved at orchid trail of SRC

Sl. No.	Scientific name	Sl. No.	Scientific name
1	<i>Acampe papillosa</i>	16	<i>Dendrobium bicameratum</i>
2	<i>Agrostophyllum callosum</i>	17	<i>Dendrobium densiflorum</i>
3	<i>Bulbophyllum affine</i>	18	<i>Dendrobium fimbriatum</i>
4	<i>Bulbophyllum leopardinum</i>	19	<i>Dendrobium nobile</i>
5	<i>Bulbophyllum reptans</i>	20	<i>Dendrobium ochreatum</i>
6	<i>Coelogyne corymbosa</i>	21	<i>Dendrobium stuposum</i>
7	<i>Coelogyne cristata</i>	22	<i>Eria lasiopetala</i>
8	<i>Coelogyne flaccida</i>	23	<i>Liparis bistrata</i>
9	<i>Coelogyne fuscescens</i>	24	<i>Otochilus albus</i>
10	<i>Coelogyne ovalis</i>	25	<i>Otochilus fuscus</i>
11	<i>Coelogyne prolifera</i>	26	<i>Otochilus lancilabius</i>
12	<i>Coelogyne stricta</i>	27	<i>Pholidoto pallida</i>
13	<i>Cryptochilus sanguine</i>	28	<i>Pleione praecox</i>
14	<i>Dendrobium amoenum</i>	29	<i>Pleione maculate</i>
15	<i>Dendrobium aphyllum</i>	30	<i>Vanda cristata</i>

### 3. Inventorisation and documentation of plant species of the conservation area of SRC

In the arboretum, in order to quantify and analyze vegetation pattern and plant species diversity complete enumeration of trees were performed using a standard quadrat method. The plot of (10mx10m) size was laid after undertaking trails in the field upon the site feasibility. Within the main plot, all the standing tree species were enumerated and girth (1.37 m above the ground) were measured for the individual trees having (gbh>30 cm) for the determination of tree basal area. Therefore, within a total of 163 main plot, 50 tree species has been recorded. In which 51 species belonging to 37 genera and 29 families were recorded (Fig 5.). Among 29 different families, Ericaceae with 6, Lauraceae with 5 and Fagaceae with 4 species were the most species families. While *Eurya acuminata* (84.66%), *Ficus neriifolia* (68.1%) and *Daphniphyllum himalayense* (60.73%) were the most frequently occurring species in the arboretum, *Eurya acuminata* (438 stem/ha), *Ficus neriifolia* (161 stem/ha) and *Castanopsis lanceifolia* (137 stem/ha) were the densest ones. Hence, the quantitative analysis such as frequency density, basal area, Importance Value Index and abundance of the recorded species were determined. Diversity index was calculated using Shannon-Wiener index of diversity.

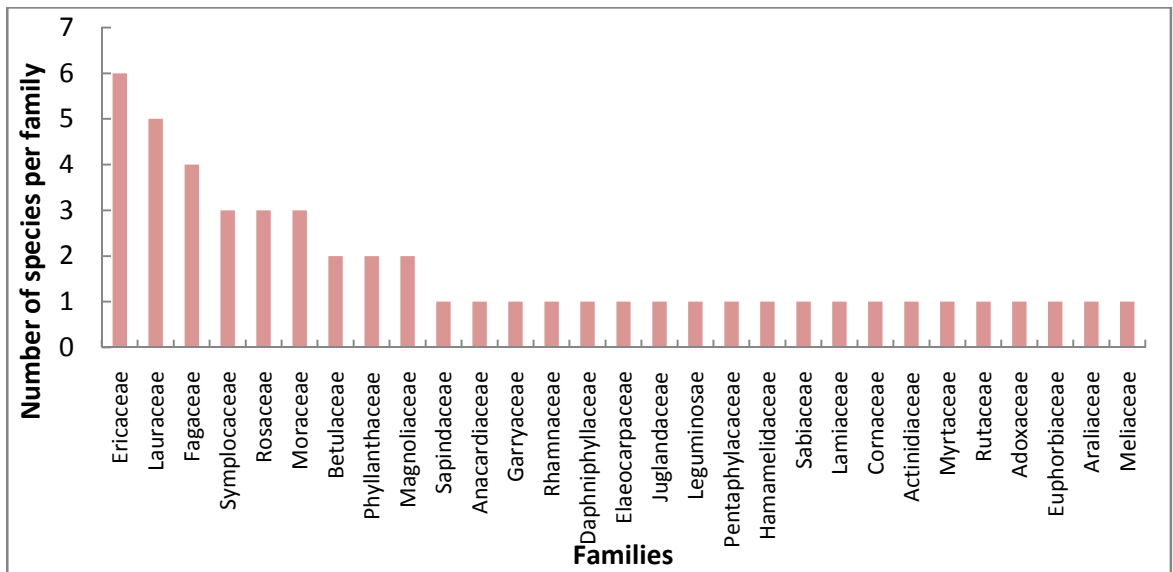


Fig 5: Number of tree species per family

Additionally, a total of 100 quadrat of 5m x 5m were laid randomly for enumeration of shrubs, and the same plot was used to record the presence of the regeneration. Likewise, a total of 50 quadrat of 1m x 1m were laid for enumeration of herbs. Thus, a total of 26 shrub species followed by 43 herb species and 20 species regeneration were recorded. Floras were identified in the field using previous field experiences as well as the published references including standard floras. Correspondingly, collection and preparation of herbarium of shrub and herb species (63 herb and shrub) has been started for the identification of the species. Identically, collection preparation of herbarium specimen of more than 15 species of fern has been begun and under process (Fig 6).

General listings of all the tree species around the institute were done and tree tags are to be prepared. As, different varieties of Rhododendron are available in the arboretum, an eco-friendly trail is identified to pass through it. Also, a suitable site for Orchiderium has been identified. Furthermore repairing of walk path, a trail connecting different sites of arboretum is under progress.



Fig 6: A preparation of herbarium for ferns

Table. List of tree species at the arboretum, SRC

Sl. No.	Scientific name	Local Name	Family
1	<i>Lyonia ovalifolia</i>	Angeri	Ericaceae
2	<i>Viburnum erubescence</i>	Asaray	Adoxaceae
3	<i>Elaeocarpus lanceifolius</i>	Badrasay	Elaeocarpaceae
4	<i>Berchemia floribunda</i>	Bangii	Rhamnaceae
5	<i>Toxicodendron hookeri</i>	Bhalayo	Anacardiaceae
6	<i>Quercus lamellosa</i>	Buk	Fagaceae
7	<i>Daphniphyllum himalayense</i>	Chandan	Daphniphyllaceae
8	<i>Meliosma arnottiana</i>	Dabdabay	Sabiaceae
9	<i>Castanopsis indica</i>	Dhalnay Kattus	Fagaceae
10	<i>Ficus neriifolia</i>	Dudhilo	Moraceae
11	<i>Saurauia nepaulensis</i>	Gagun	Saurauiaceae
12	<i>Leucoscepttrum canum</i>	Ghurpis	Lamiaceae
13	<i>Aporosa sp.</i>	Hade	Phyllanthaceae
14	<i>Eurya acuminata</i>	Jhiganay	Pentaphylacaceae
15	<i>Aucuba himalaica</i>	Kali Kat	Garryaceae

16	<i>Symplocos sp.</i>	Kalo Kholmay	Symplocaceae
17	<i>Syzygium nervosum</i>	Kyamuna	Myrtaceae
18	<i>Acer campbellii</i>	Kapasay	Sapindaceae
19	<i>Acer sterculiaceum</i>	Pat kapsey	Sapindaceae
20	<i>Machilus gammieana</i>	Chiple Kawlo	Lauraceae
21	<i>Tetradium fraxinifolium</i>	Khanakpa	Rutaceae
22	<i>Ficus semicordata</i>	Khanyu	Moraceae
23	<i>Symplocos theifolia</i>	Kharanay	Symplocaceae
24	<i>Symplocos glomerata</i>	Kholmay	Symplocaceae
25	<i>Glochidion thomsonii</i>	Lati Kat	Phyllanthaceae
26	<i>Nyssa javanica</i>	Lek Chelawnay	Cornaceae
27	<i>Macaranga denticulata</i>	Malata	Euphorbiaceae
28	<i>Engelhardtia spicata</i>	Mawa	Juglandaceae
29	<i>Eriobotrya japonica</i>	Maya	Rosaceae
30	<i>Ficus auriculata</i>	Nebara	Moraceae
31	<i>Castanopsis lanceifolia</i>	Pattlay Kattus	Fagaceae
32	<i>Prunus cerasoides</i>	Payiu	Rosaceae
33	<i>Quercus glauca</i>	Phalant	Fagaceae
34	<i>Erythrina arborescens</i>	Phaledo	Leguminosae
35	<i>Machilus edulis</i>	Phunche	Lauraceae
36	<i>Brassaiopsis hispida</i>	Phutta	Araliaceae
37	<i>Exbucklandia populnea</i>	Pipli	Hamamelidaceae
38	<i>Magnolia doltsopa</i>	Rani Chanp	Magnoliaceae
39	<i>Persea odoratissima</i>	Rani Kawlo	Lauraceae
40	<i>Betula alnoides</i>	Saur	Betulaceae
41	<i>Cinnamomum obtusifolium</i>	Sisi	Lauraceae
42	<i>Beilschmiedia sikkimensis</i>	Tarsing	Lauraceae
43	<i>Magnolia cathcartii</i>	Tetay Chanp	Magnoliaceae
44	<i>Toona ciliata</i>	Tooni	Meliaceae
45	<i>Alnus nepalensis</i>	Utis	Betulaceae
46	<i>Rhododendron dalhousie</i>	Lal Chimal	Ericaceae
47	<i>Rhododendron arboreum</i>	Gurans	Ericaceae
48	<i>Rhododendron griffithianum</i>	Seto Chimal	Ericaceae
49	<i>Rhododendron grande</i>	Patle Korlingo	Ericaceae
50	<i>Rhododendron maddenii</i>	Madden Ko Chimal	Ericaceae

#### 4. Development of Herbal garden- medicinal plant conservation and demonstration site

For millennia medicinal plants have been used by mankind. The range of species used and their scope for healing is vast. Conservation is challenging, since majority of the population of medicinal plants occurs in wide range of habitats and geographic regions. Accordingly, the herbal garden has been established and enriched as model for ex-situ biodiversity conservation of important rare, endangered and threatened high value medicinal plants of the region at Sikkim regional Centre, Pangthang (Fig.1). To promote demonstration and cultivation of medicinal plants for conservation and sustainable utilization, a total of 26 species of medicinal plants belonging to 20 families have been conserved in herbal garden in the campus. Different species of medicinal plants were collected from in and around the surrounding of campus and from different sites in the Sikkim in order to facilitate further propagation of plant species in the campus. The collected medicinal plants are raised in an open bed under partial shade. With addition of required watering time to time and weekly weeding. The raised plants in the herbal garden are used as medicine by local community of this region. These plants purportedly cure diseases such as epilepsy, leprosy, paralysis, asthma, typhoid, diabetes, and haemorrhages during childbirth, cholera, etc. Some of these plants are also used as food items and play a significant role in the rural economy. A few of these medicinal plants are believed among ethnic people to prolong life and are part of local tradition. Additionally, it also aims at conservation of bio-diversity for the present and future generation through sustainable use of natural resources without plundering it.



(A)



(B)

Fig. (A&B): Photographs showing herbal garden developed at GBPNIHE, SRC campus, Pangthang

Table . List of medicinal plants species conserved at Herbal garden of SRC

Sl. No	Botanical name	Local name	Family	Uses
1	<i>Acorus calamus</i> L.	Bojho	Acoraceae	Fever, cough, bronchitis, rheumatism.
2	<i>Aloe vera</i> (L.) Brum f.	Gheukumari	Liliaceae	Tonic, high fever to reduce body temperature
3	<i>Allium hookeri</i> Thwaites	Dung dunge	Amaryllidaceae	Gastritis, diarrhea, indigestion
4	<i>Allium wallichii</i> kunth.	Ban lasun	Alliaceae	Cholera, dysentery, cold and cough and reducing altitude sickness.
5	<i>Amomum acre</i> Valetton	Churumpha	Zingiberaceae	Used to treat and prevent sore and bronchitis.
6	<i>Astilbe rivularis</i> Buch.-Ham. ex D.Don	Buro okhati	Saxifragaceae	Rhizomes chewed and used as pain relief.
7	<i>Begonia</i> sp.	Mangar kachi	Begoniaceae	Lukewarm leaf juice is used against ulceration in mouth , colic and dysentery
8	<i>Bergenia ciliata</i> (Haw.) Sternb.	Pakhaan bed	Saxifragaceae	To dissolve kidney stones, rhizomes to treat fractured bones, fresh cuts, wounds, diarrhea
9	<i>Cautleya spicata</i> (Sm.) Baker	Gagletto	Zingerberaceae	Young shoot consume as vegetables in gastritis
10	<i>Clematis buchananiana</i> DC.	Pinasay lahara	Ranunculaceae	Fresh roots are mashed and the effluvium is used to cure sinusitis and nose blocks
11	<i>Costus speciosus</i> (Koen. ex. Retz.) Sm.	Bet lauri	Costaceae	Juice extract used for urinary tract infections.
12	<i>Curcuma longa</i> L.	Haldi	Zingiberaceae	Sprain and wounds, remedy for cough and cold , anti parasitic for skin infections.
13	<i>Curcuma zedoaria</i> Roxb.	Phachyeng	Zingiberaceae	Cough, fever, dyspepsia, sinusitis and stomach ache
14	<i>Euodia fraxinifolia</i> (D.Don) Hook.f.	Khanakpa	Rutaceae	Dysentery and fever
15	<i>Hedychium spicatum</i> Sm.	Saro	Zingiberaceae	Root used as tooth powder, cough, Bronchitis, ulcers , inflammation etc.

16	<i>Heracleum nepalense</i> D.Don	Chimphing	Apiaceae	Fruits are used as pickle, anti-typhoid, nausea and vomiting
17	<i>Houttuynia cordata</i> Thunb.	Raktha-jhar/Hillary jhar	Saururaceae	Urinary troubles
18	<i>Kaempferia rotunda</i> L.	Bhui champa	Zingiberaceae	Bone fracture, reduce swelling
19	<i>Phytolacca acinosa</i> Roxb.	Jarango	Phytolaccaceae	Body ache, sore throats, tonsillitis.
20	<i>Piper longum</i> L.	Pipla	Piperaceae	Respiratory problems, muscular sprains
21	<i>Rumex nepalensis</i> Spreng	Halhalay	Polygonaceae	Colic pain, applied to syphilis, ulcer, the root paste used in wounds
22	<i>Schisandra neglecta</i> A.C.Sm.	Singgowti	Scisandraceae	Fruit used as tonic and given in insomnia
23	<i>Swertia chirata</i> Ham.	Chirato	Gentianaceae	Decoction of roots taken against fever and body ache. Juice taken in jaundice and gastritis
24	<i>Taxus wallichiana</i> Zucc.	Dhengresalla	Taxaceae	Young shoots used for the treatment of headache, giddiness, feeble and falling pulse, diarrhea and severe biliousness.
25	<i>Tinospora sinensis</i> (Lour.) Merr.	Giloy/Gurju lahara	Menispermaceae	Diabetes, menstrual disorders piles and fever.
26	<i>Tupistra nutans</i> Wall. Ex Lindl.	Nakima	Asparagaceae	Diabetes, relieve body ache



*Hedychium spicatum* Sm.



*Tupistra nutans* Wall.Ex Lindl.



*Heracleum nepalense* D.Don





*Astilbe rivularis* Buch.Ham.ex D.Don      *Evodia fraxinifolia*(D.Don) Hook.f.      *Amomum acre* Valetton

## 5. Development and demonstration models for waste management, composting, and water harvesting

In the first year of the project, the low cost sustainable models such as waste management, composting, water harvesting, etc., was planned and accomplished at the RTC (Rural Technology Centre) of the institute. Through the project NLC one unit of bio-composting model and Vermi-composting model, two unit of Polythene lined rain water harvesting pond were developed and successfully made functional. Vermi-composting promotes organic farming, therefore, using earthworms to transform organic waste into a nutrient-rich fertilizer, which is less expensive and easy to prepare. Likewise, bio-composting reduces and utilizes waste. Also, it is use to conserve soil biodiversity and clean up contaminants. Correspondingly, low cost-water-harvesting tank, wherein collects the rain drops directly and can be harvested and stored easily addressing water scarcity in rural ecosystem for various purpose. Therefore, these afore mentioned models aim for the improvement in the quality of life by efficient conservation and management of natural resources.



Fig: A view of Bio-composting unit



Fig: A view of vermi-composting unit at the RTC



Fig: Rain water harvesting Unit at the RTC

#### **6. Training-cum-awareness programme on Solid waste Management**

As a part of first year activity to promote participatory conservation action and efficient utilization and management of natural resource base for livelihood generation a one day Training cum awareness programme on Solid Waste Management was organized by GBPNIHE, SRC, Pangthang following requisite covid-19 norms. Training mainly focused on understanding the perception of local villagers on Solid waste management and to impregnate the knowledge and practice of solid waste management (such as composting, waste segregation etc) at the household and community level. A few participants from the nearby Village namely Railgaon , official from Forest Department, Government of Sikkim namely Block officer Pangthang Territorial range and Block officer Wildlife, Fambonglho wildlife Sanctuary and staff, Scientist, technical officers and research scholar from institute participated in the programme. In the training dissemination of knowledge through training on various technologies such as bio composting, vermi-composting etc. was carried out at the RTC of the campus. A detailed hands-on-training on Vermi-composting and bio-composting wherein participants were taught on construction of composting pits and its dimensions, use of household waste on composting, duration of compost preparation, raw material for composting, lifecycle of earthworm and importance of composting in Organic farming and waste management was expounded. Also, an exposure on other technologies of RTC such as

Tea propagation through cutting, Yacon (*Smallanthus sonchifolius*) cultivation and product diversification, Medicinal Plant cultivation, Rain water harvesting technique, large cardamom curing technique was briefed and interactive training session was conducted by answering doubts of the participants with the assistance of J. Dhakal. Additionally, a cleanliness drive was conducted as a part of Swachh Bharat Abhiyan on 1 km stretch of the nearby village. At the end, the participants were well briefed and made acquainted with waste segregation method. In a short verbal feedback session with the participants, the change in the perception towards managing solid waste was witnessed. Participants highlighted on the issue of waste dumping in the village due to unavailability of proper dumping site for the villages. For which a provision for recovery centre in the community has been requested. Also, few of the participants showed willingness to adapt the composting technologies in their household. Furthermore, interested participants were identified for development of model technologies in the village for vermi/bio compost; polyhouse based vegetable farming and water conservation tank, assuring 30% of the requisite material assistance and technical help from the project. Subsequently, NLC team has visited the site of the candidates for further establishment of technologies. From the total participants trained, 5 number of beneficiaries has been identified and a regular follow up of the enthusiast candidates is under consideration.

Fig: pre and post assessment form of Solid Waste Management Programme

Table. Pre and Post assessment of the training on solid waste management

Parameter	Pre-assessment		Post-assessment	
	Yes (%)	No (%)	Yes (%)	No (%)
Knowledge on waste segregation method	34	66	94	06
Knowledge on Bio and Vermi composting	12	88	79	21
Whether practicing composting at home	1	96	-	-
Willingness to take up composting at home	-	-	85	15





Fig: activities during training programme at SRC

Table . List of identified beneficiary

Sl. No	Name of Beneficiary	Activities
1	Mr. Basant Rai	composting
2	Mr. Dil Kumar Rai	Poly-house
3	Mr. Saran Subba	Composting and Polyhouse
4	Mr. Buddha Rai	Poly-house
5	Mr. Man Bahadur Pandey	Composting

### 7. Need assessment of home-stays owners / enthusiast in nearby villages

Homestay program is one of key strategies for enhancing rural income and biodiversity conservation. The main aim of carrying this need assessment was to educate the villagers about the crux of homestay program, to approach and identify interested individual/household and to motivate villagers to start a homestay program and generate income from this program for local community. The study was conducted in the neighboring villages namely Lingdok, Samdong, Rangdong-Tintek and Pangthang. In this study we need assessed the enthusiast household from four villages namely for the homestay program. All together 49 household was surveyed from 4 villages. We interviewed one family member from each of 49 households by preparing a questionnaire including a series of question pertaining to their interest in running or upgrading a homestay, their involvement in any tourism activity such as (tour guide, tour operator, porter, travel agent, tourist vehicle etc.), support to start/upgrade their homestay or any tourism based activities. We also had informal discussions with the panchayat of Lingdok Namphong and Samdong Kambal GPU to get insight into overall status and needs involved in the start up of homestay program in the villages. Also, to figure out enthusiast individual to take up the homestay program and to work out local communities need.

Our results showed that from the four village surveyed 96% household were not running a homestay, with only 4% household showed involvement in the homestay business so far. We found that 19% of household were involved in other tourism activities (such as tour guide, tourist vehicle operator, etc.). We further found that 78% of household expressed interest in getting involved in the homestay program and rest 22% of the household took back to get involved in the homestay program from which genuinely enthusiast beneficiary has been identified .Although majority of household showed interest in starting up homestay business. However, external challenges for operating homestay in the villages such as transportation, communication, internet connection and enough capital to improve their

housing facilities. Additionally, they have highlighted on the need for capacity and skill development training such as training in hospitality, cooking, tourist guide. A need of appropriate networking channel and linking of homestay with tourist and tourism department and an exposure visit to established homestay for further enriching their knowledge in homestay program. Hence, an identified beneficiary will be followed up and requisite technical support and capacity building support will be provided by the project.

Homestay Tourism  
Assessment form  
Nature Learning and Interpretation Centre  
G.B. Pant National Institute of Himalayan Environment

Name: Sarmila Tamang Contact No. 7870 052053  
Village/Ward/GPU: Pangthang

1. Are you running a homestay/hotel?  
 YES  
 NO

2. Are you involved in any tourism industry?  
 YES  
 NO

3. If yes how  
 a. Tour guide  
 b. Tour operator  
 c. Travel agent  
 d. Porter  
 e. Taxi-Tourist vehicle  
 f. Others.

4. Are you interested in starting/upgrading your homestay?  
 YES  
 NO

5. What kind of support do you need from us to start upgrade your home-stay or in any other tourism activities?  
 Interested in Eco-tourism.  
 Training  
 Linking to tourism (Himalayan Homestay) website.  
 =

Fig . A picture of questionnaire prepared for the need assessment

Sl. No.	Name of identified Beneficiary	Village	Activity
1	Rajeev Pandey	Pangthang	Homestay
2	Sarmila Tamang	Pangthang	Homestay
3	Sapana Limboo	Pangthang	Homestay
4	Kopila Pandey	Pangthang	Homestay
5	Tobden Tshering Lepcha	Upper Raktong	Homestay
6	Roshan Chettri	Lindok	Homestay
7	Santosh Ojha	Lindok	Homestay
8	Shila Shikder	Lindok	Homestay
9	Tika Devi Sharma	Upper Samdong	Homestay
10	Binita Gautam	Khese	Homestay

Table 5. List of identified beneficiaries for home stay from four villages





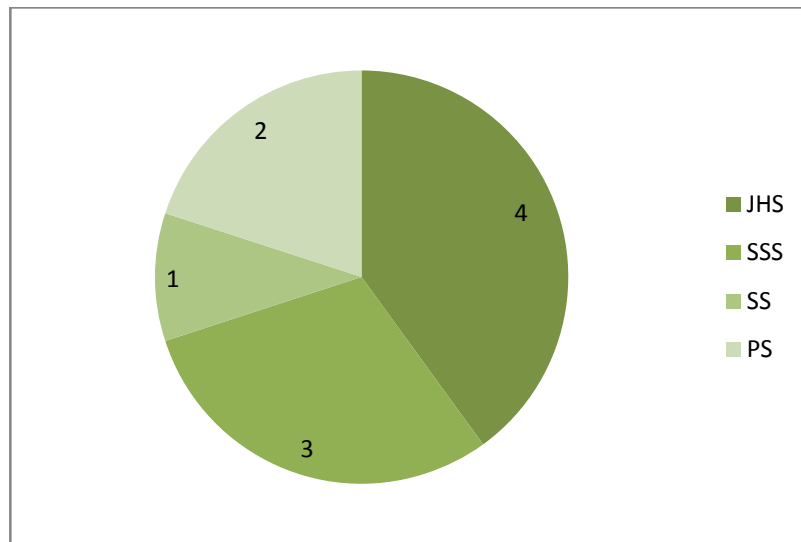
Fig : A pictures depicting an carrying homestay survey and informal discussions with the panchayat

## 8. Need Assessment of the Eco-clubs in nearby Schools

The Eco-Clubs are a part of schools with their primary aim to generate environment consciousness among school and college students. The section of the report presents findings of the need assessment carried out of the nearby schools for development of Eco-clubs. The survey mainly focused on the schools lying in periphery of Fambonglho Wildlife Sanctuary. The main objective of this assessment was to identify the current status of the eco-clubs and find ways to successfully link them with Nature Learning Centre, strengthen the activities in the eco-clubs and reformation of dormant eco-clubs in the school. A questionnaire was developed including current Eco-club status, activities, problems conducting activities, and needs for the development of Eco-club. An informal interaction with teacher-in-charge from selected schools, to understand the activities taking place in their respective school and the engagement of student participation was performed. Thus, first hand information from teacher-in-charge and head of the school was acquired and notes were prepared during the interview process along with their contact details for further follow up. Amongst the total school surveyed, four were Junior High School, three senior secondary, one secondary and two private. The eco-clubs were active in six schools, inactive in one, and rests of the school from total school surveyed were without an eco-club.



Fig: questionnaire prepared for the survey



(A)

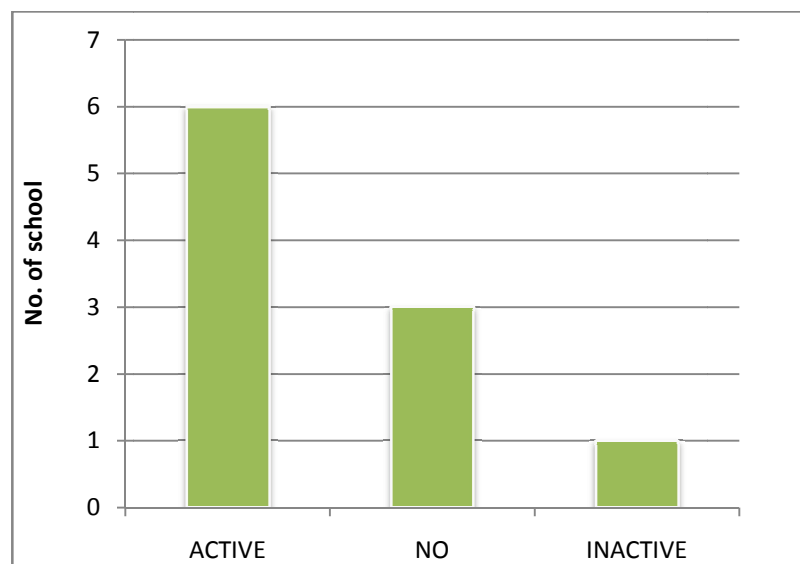


Fig (A&B): A graph depicting number and status of the eco-club

The active eco-clubs consists members of students from class six and above supervised by a concerned teacher-in-charge. Chiefly, in Junior High School students above class 6 are included in the eco-clubs, followed by students above class 8 in senior secondary and secondary school. Each active Eco-club is link with ENVIS which provides a financial assistance of Rs. 5000 per school for undertaking different environment related activities of their choice depending on their local conditions and course of action for improvement of the environment. Accordingly, an informal interaction with teacher-in-charges divulges fascinating facts about participation of students and contribution of schools towards conservation of environment. In case of school with active eco-club set up reported the establishment for more than 5 years with equal participation by teachers and students. Markedly, various activities conducted by active eco-clubs included observed meaningfully the International, National and State environment calendar days like World Forestry Day, World Environment Day, Paryavaran Mahotsav, Swachh Baharat Abhiyan, etc organize eco-competitions on seminars, debates, painting, essay, slogan writing etc. Organize popular talks, morning assembly speech on environmental issues in the school. Organize rallies, marches, human chains, and street theater at public places with a view to spread environmental awareness. Action based activities like tree plantation, cleanliness drives both within and outside the school campus. Maintenance of public places like parks, gardens both within and outside the school campus. Mobilize action against environmentally unsound practices like garbage disposal in unauthorized places, unsafe disposal of hospital waste etc.

It was enthralling to find schools investing in conservation models like organic farming, herbal garden and technologies like bio composting. Unquestionably, they expressed strong desire for strengthening their activities and sensitize more students to promote environmental conservation. Another key finding of the need assessment was the majority of the eco-clubs teachers-in-charge had lack of technical knowledge to further motivate and stimulate active participants of the students in the eco-club in order to increase their eco-consciousness. Few of the students showed minimal interest and involvement during activities for which the eco-clubs could be sensitized about issue related to environment and development through field visit and practical demonstration. Mentioned eco-clubs also lacked funds to organize programme and maintain the sustainability of eco-club activities. Drastic decline in the enrolment has hindered the eco-club on performing activities because of decreased in man power and major reason for eco-club being inactive. Also, partly because of time constraint in balancing eco-club activities with the regular curriculum. A school with in-active eco-club felt and expressed the need of reformation of eco-club and functionalization of the activities in the eco-club.

The overall findings of the need assessment revealed the different perception and status of eco-clubs in school. Consequently, show causing various needs of the schools owing to various barriers that impeded the activities effectiveness. Most of the eco-clubs mentioned the need for capacity building trainings for teachers-in-charge of eco-clubs, logistic support for exposure visit, financial assistance to run activities ,training programmes to impart knowledge on technology such as recycling and rain-water harvesting model. A supply of plant saplings to facilitate plantation in and around the school and needful resource material for school library to educate students on environment issues. A regular follow up will be carried out in surveyed schools for strengthening the eco-club.

Table. List of surveyed school

<b>Sl. No.</b>	<b>SCHOOL NAME</b>
1	ENLIGHTEN ACADEMY ENGLISH MEDIUM SCHOOL
2	BOJOGHARI GOVT.SENIOR SECONDARY SCHOOL
3	PENLONG GOVT.SECONDARY SCHOOL
4	MAYAL ENGLISH MEDIUM SCHOOL
5	RAKDONG JUNIOR HIGH SCHOOL
6	SAMDONG GOVT. SR. SEC

7	PHALAICHADARA GOVT. JHS
8	LINGDOK GOVT.SENIOR SECONDARY SCHOOL
9	NAMPONG GOVT.JHS
10	PANGTHANG J.H.S



Fig 7: A pictures depicting meeting with the teacher-in-charge of the Eco-club



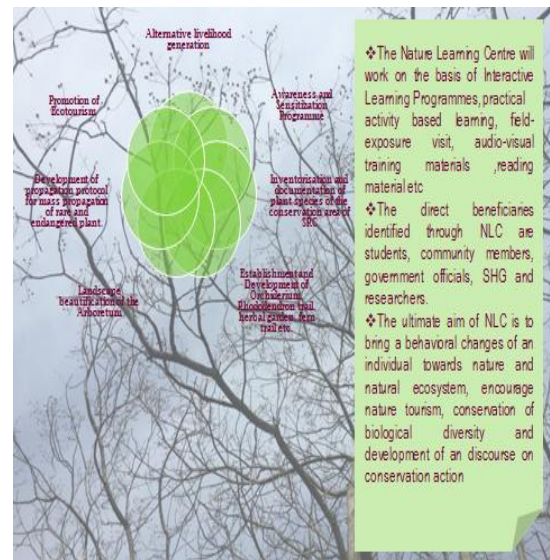
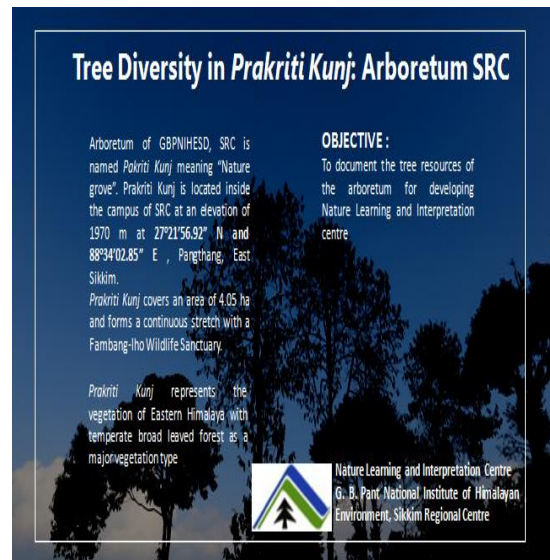
Fig: A pictures of herbal garden and composting pit established by the Eco-club

## 9. Develop of knowledge product for dissemination and awareness generation

Introductory poster for orchid has been prepared which will be displayed at the starting of orchid trail.4 fliers; one on introduction of NLC, one on tree diversity of arboretum, one each on herbal garden and rhododendron of Sikkim has been prepared.1 booklet ON orchids of orchid trail is being developed.30 orchid tags and 100 tree tags has been prepared. These posters, fliers and booklets will be distributed in schools.



(A)



(B)



### *Coelogyne cristata* Lindl.

COMMON NAME	: The Crested Coelogyne
DIAGNOSTIC FEATURES	: Inflorescence long, weakly erect; flowers pure white with shade of yellow on lip; sepals and petals erect-patent, with entire undulating margin
FLOWERING	: March-April
HABITAT	: 1330-2000 m, Epiphytic or Epithitic
IUCN STATUS	:
DISTRIBUTION	: NE India, Eastern Himalaya, Central Himalaya
USES	: Pseudobulbs used in constipation, aphrodisiac, wound, boils and sores



Ex-situ conservation of medicinal plants  
Nature Learning and Interpretation Centre  
G.B Pant National Institute of Himalayan Environment, SRC

Sikkim, Himalaya represents an tremendously unique ecosystem rich in medicinal plant. It is reported to have more than 424 species of medicinal plants which have potent traditional system of medicines in Sikkim. It harbors enormous biodiversity of medicinal plants ranging from the humid river valleys to the cold trans-himalayan desert. In addition, local inhabitants use numerous herbal remedies for treatment of various ailments. However, the biodiversity of medicinal plants is critically threatened by anthropogenic activities such as destructive harvesting, loss of habitat, unscientific gathering from the wild, eventually leading to extinction of medicinal plants, it is of utmost necessity to take up ex-situ cultivation and conservation of these medicinal plant species.

Therefore, the herbal garden is developed for ex-situ conservation of important rare, endangered and threatened high value medicinal plants of the region at Sikkim regional Centre, Pangthang. Herbal garden holds twenty-six species of medicinal plants belonging to twenty families.

(C)

Fig (A&B&C): A pictures of prepared knowledge products