Plant Biodiversity Inventory, Identification of Hotspots and Conservation Strategies for Threatened Species and Habitats in Kanchenjungha-Singhalila Ridge, Eastern Nepal

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REPORT SUBMITTED TO

Critical Ecosystem Partnership Fund (CEPF)

&

WWF Nepal Program

September 2008

Plant Biodiversity Inventory, Identification of Hotspots and Conservation Strategies for Threatened Species and Habitats in Kanchenjungha-Singhalila Ridge, Eastern Nepal

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September 2008

Preface

The Eastern Himalaya stands out as being one of the globally important sites representing the important hotspots of the South Asia. The Eastern Himalaya has been included among the Earth's biodiversity hotspots and it includes several Global 200 eco-regions, two endemic bird areas, and several centers for plant diversity. Kanchenjungha-Singhalila Complex (KSC) is one of the five prioritized landscape of the Eastern Himalaya, possesses globally significant population of landscape species. The complex stretches from Kanchenjungha Conservation Area (KCA) in Nepal, which is contiguous with Khanchendzonga Biosphere Reserve in Sikkim, India, to the forest patches in south and southwest of KCA in Ilam, Panchthar and Jhapa districts. The entire occidental and austral landscapes of Mt. Kanchenjungha is rich in floral diversity. There is an account of over 2900 plant species from KCA and over 600 plant species from Kanchenjungha-Singhalila Ridge (KSR) of Ilam and Panchthar districts.

Inventory and conservation of vascular flora of pristine, rugged and bountiful landscapes of KSR was possible with financial support from Critical Ecosystem Partnership Fund (CEPF), USA. We express our deepest gratitude to CEPF for providing support. The support from local collaborators – Shree High Altitude Herb Growers Group (SHAHGG), Ilam and Deep Jyoti Youth Club (DJYC), Panchthar is in worth. Local people's participation during participatory meetings and interactions and field level research works and implementations is acknowledged. Our special thanks goes to WWF Nepal team (Dr. Sarala Khaling, RC-SE Asia, CEPF and Mr. Ang Phuri Sherpa, NC-Nepal, CEPF) for their facilitation and technical guide. The authors are also grateful to Dr. Tirtha B. Shrestha, Dr. Dinesh Bhuju and Dr. Pushpa R. Shakya for their critical evaluation on reports. Thanks are also due to Dr. Nakul Chettri, ICIMOD, Mr. Jhamak Karki, DNPWC, DFO Ilam, DFO Pancthar, CEPF grantee (*ECCA* – Dr. Rabindra Shrestha, *BCN* - Ms. Nina Thapa, *ICC* – Mr. Ram Rimal, Mr. Bishnu Kafle, *NCDC* – Mr. Kamal Rai) and other workshop/meetings participants for their invaluable input on finalization of plant species conservation strategies.

Authors are particularly grateful to Dr. NN Tiwari, Dr. Ila Shrestha, Mr. Pradeep Maharjan, Mr. Rajendra Shrestha, Mr. Sailesh Ranjitkar, Ms. Urmila Thamsuhang of ESON, Mr. Rajendra Rai, Mr. Mahendra Bir Rai, Mr. Sunil Bantawa and Mr. Nar B Khapangi of DJYC, Panchthar, Mr. Netra B. Magar and Mr. Yub R. Poudel of SHAHGG, Ilam, Mr. Karma Bhutia of TMI for their supports during project development, execution and implementation.

Finally, we owe our sincere thanks to all members of Ethnobotanical Society of Nepal for their direct and indirect supports to ease accomplish of this job.

September 05, 2008

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ABSTRACT

This project *Plant Biodiversity Inventory, Identification of Hotspots, and Conservation Strategies for Threatened Species and Habitats in Kanchenjunga-Singhalila Ridge, Eastern Nepal* was conducted by Ethnobotanical society of Nepal (ESON) with the financial assistance of Critical Ecosystem Partnership Fund (CEPF) and facilitation of WWF Nepal Program. It was carried out in four VDCs of Ilam and five VDCs of Panchthar districts of east Nepal in April 2007 – March 2008 with the implementation support from Shree High Altitude Herb Growers Group, Ilam and Deep Jyoti Youth Club, Panchthar. The objectives of the project were to inventory and document of plant diversity and their associated habitats, identify and assess the rare, threatened, endemic and archaic plant species and key habitats, and develop conservation strategies of the species and habitats through participatory and scientific approaches.

Literatures/specimens review and plant collection expeditions were means for inventorying. Community consultations, rapid field appraisals, and ecological quadrat samplings, permanent plot monitoring, etc. were used for diversity and species richness study and capacity building trainings, conservation strategy workshops, expert consultation meetings, GIS analysis, etc. were taken as tools for ecological assessment and strategy development. Participatory biodiversity monitoring mechanism was designed for identifying the direct and underlying threats of the biodiversity.

The landscapes of the project area are noteworthy for richness of threatened and new plant species and diverse habitats. The opulent biodiversity in combination with the indigenous knowledge and management systems deserve a great scope of research and development in the area. On average, 1430 plant specimens of flowering plants were collected and managed. Since the field on-spot identification, identification at ESON resource centre and identification at National Herbarium (KATH), Godawari, Tribhuvan University Central Herbarium (TUCH), and Royal Botanic Garden, Edinburgh, UK, 786 species were identified from 904 specimens. Among them, 598 plant species under 302 genera and 99 families were confirmed so far. Further taxonomic identification process is going on in Royal Botanical Garden Edinburgh, UK. The comprehensive list of flowering plants and their status was aimed at maintaining and updating CEPF species outcome. The inventory and ecological assessments updated the distribution and population dynamics and contributed in managing the species and landscape outcomes through providing information of conservation status of species and sites.

Among the identified species, there were two endemic, 22 threatened and 13 new record species. New record species constituted two varieties and ten species to Nepal and one new species to the World. The new species to the World was *Begonia* and it was collected from Sirrise, Prangbung, Panchthar district. Some sites viz. Timbu Pokhari, Suke pokhari-Dabale Deurali from Panchthar district and Chhintapu, Hangetham, etc. from Ilam district are exceptionally rich in threatened floral species such as *Sassurea gossypiphora, Rheum nobile, Neopicrorhiza scrophulariiflora, Rhododendron anthopogon, Taxus wallichiana, Michelia champaca*, etc. These species and verdant areas are placed under added stress by anthropogenic activities importantly intense grazing by large herds of domestic livestock. Rampant collection and unsustainable harvesting of forest products including timber and non-timber forest products (NTFPs) are the chronic threats that contribute to the degradation of these sensitive ecosystems.

A total of 122 primary/macro quadrate (plots) (50 in Ilam and 72 in Panchthar district), 244 secondary/meso plots and 366 tertiary/micro plots were laid within elevation 1900-4327m in all nine VDCs representing different resource management systems and bio-climates for ecological and disturbance gradient analysis. Two permanent plots in each VDC were set for participatory biodiversity monitoring. The monitoring was monthly scheduled and done by social mobilizers.

Plant biodiversity management trainings and community level plant biodiversity conservation strategy workshops were organized on 7-8 August, 2007 in Hangetham, Ilam and on 3-4 October, 2007 in Prangbung, Panchthar. A total of 130 participants were participated in the events. Each workshop incepted the 10 most important plant species, sites and threats for plant biodiversity and management strategies. District workshops and national expert consultations refined the village level list and final 26 plant species and 12 sites were concluded as utmost for conservation. Top six prioritized species (*Aconitum spicatum, Michelia champaca, Nardostachys grandiflora, Neopicrorhiza scrophulariflora, Swertia chirayita,* and *Taxus wallichiana*) were further scrutinised and their specific conservation strategies were developed. A total of 13 strategies with 51 sub-strategies were proposed as general conservation strategies and almost all sub-strategies were merited to conserve *Taxus wallichiana* and *Swertia chirayita*. The findings of the project were widely dispatched and circulated through brochures, bulletins, reports, articles and open access webpages.

Knowledge of local communities on identifying rare and threatened species based on their ecological characteristics has been upgraded. Idea of criteria and indicators of sustainability and plant species population maintenance has been gained. Prioritized species *Taxus wallichiana, Michelia champaca, Swertia chirayita, Aconitum spicatum* and habitats Timbu pokhari, Hangetham, Chhintapu, Lam pokhari, Suke pokhari are emphasized for immediate conservation by local communities and the special conservation measures are adopted. Alike to the final level conservation strategies proposed by ESON, the special conservation measures of the other grantees were also congruent in sustainable conservation and wise use of the resources. Both the conservation and wise use measures are incorporated in community forest user groups operational plans and are implemented through forest user groups and village level biodiversity conservation committees. The project proposal proposed by DJYC for CEPF core grant "Conservation of key plant species and their habitats in Kanchenjungha Singhalila Complex for livelihood improvement" is in line of ESON recommendation. The proposal aims at conserving and sustainable use of the key plant resources of the area. Follow up conservation projects and initiatives from local organizations, monitor by social mobilizers, village level biodiversity conservation committees, district biodiversity advisory board and from ESON help to compliment the CEPF outcomes.

The area is heavily doused and strong wind is common. On the flip side, civil societies particularly the community forest user groups and some community based organizations have convincingly rich knowledge on biodiversity, conservation of important plant areas and they have successfully managed some sites enriched with medicinal and archaic plant species. To promote their success, long term impact-oriented and species specific inclusive programs should be lunched in comprehensive and coordinated fashion. Strengthening the capacity of existing institutions on conservation and management regimes and promoting them in pursuing and implementing the recommendations of ESON would be worthwhile for sustainable plant diversity conservation and livelihood improvement of the area.

CHAPTER ONE

1. INTRODUCTION

1.1 Background

The pristine and rugged mountain range of the Himalaya is biologically unexplored, thus the biological diversity of entire Himalaya is not properly known. The Himalaya offers an array of forest types with diversity in forest produce (Chettri *et al.* 2005). The Himalayas, core of the mountain complex, are intricately interwoven with Nepal and share approximately the entire landscape of the country. The country stands at the cross point of western Himalaya and eastern Himalaya that the eastern Himalaya dominates at the scale of about two third. The Eastern Himalaya stands out as being one of the globally important sites representing the important hotspots of the South Asia. It has been included among Earth's biodiversity hotspots and includes several globally significant ecoregions, two endemic bird areas, and several centers for plant diversity. Eastern Himalayas of Nepal have been identified as one of the rich biodiversity hotspots in the world with high species diversity and high levels of endemism (Meyers 1988).

Kanchenjungha-Singhalila Complex (KSC), one of the five prioritized landscapes of the Eastern Himalayas, possesses globally significant populations of landscape species (CEPF 2005). It is designated as one of the WWF 'Global 2000' eco-regions and is declared as a 'Gift to the Earth'. This complex again includes five priority sites and represents transboundary landscapes of eastern Nepal, Sikkim and Darjeeling in India. The complex stretches from Kanchenjungha Conservation Area (KCA) in Nepal, which is contiguous with Khanchendzonga Biosphere Reserve in Sikkim, India, to the forest patches in south and southwest of KCA in Ilam, Panchthar and Jhapa districts. KCA and Singhalila ridge are most important among the priority sites of KSC.

1.2 Biodiversity and biogeography

Kanchenjungha Conservation Area represents the alpine bioclimates and possesses several threatened and endangered plant species including *Taxus wallichiana, Neopicrorhiza scrophulariiflora, Dactylorhiza hatagirea,* etc. KCA along with its lowlands Panchthar, Ilam and Jhapa districts is floristically rich with over 2,900 species of flowering plants (Shakya 1983; Shrestha & Ghimire 1996) of which, several are found to be endemic to the Himalayas. The high floristic diversity of the area is due to the presence of diverse

ecological habitats. It is also interesting phytogeographically due to the effect of Sino-Japanese and Sino-Himalayan elements. Singhalila Ridge transborders Nepal and India and exhibits lush biodiversity particularly of the flora - *Rhododendrons, Castanopsis, Abies, Symplocos, Quercus, Sorbus, Rubus, Begonia, Berberis*, etc. It ranges from temperate to alpine bioclimate and harbors different vegetation types with opulence of plant species richness. The area is rich and pristine in its forests resources and treasured with innumerable non timber forest products (Chettri 2000). Temperate zone of eastern Himalaya marks with the dominance of Laurels, *Rhododendron, Acer, Lyonia, Symplocos,* etc. (Mani 1999).

The richness and diversity of the KCA was studied since 1848 when a British Naturalist J.D Hooker visited the site and documented the plants in his remarkable series, Flora of British India. Then, Banerji (1948-1953), Stainton (1956-1969), Hara (1960-1972), Dobremez (1971-1972), Kanai (1972), Suzuki (1992), etc. led the expedition teams and explored the area. The area is very high in floristic diversity as evidenced from numerous Rhododendrons, Laurel, and Oaks. A total of 19 forest types were enumerated by Stainton (1972) from east Nepal and 6 forest types from Kanchenjungha Conservation Area (Shrestha 1994). Greater species richness and endemism is also due to the effect of Indomalayan and Palaearctic realms at the south (Yonzon 1996). Eastern Nepal harbors about 68 endemic flowering plant species (Shrestha and Joshi 1996) of which about 50 were recorded from KCA only (Shrestha & Ghimire 1996).

1.3 Rationale

The lush biodiversity and endemism in combination with the indigenous knowledge and traditional practices of the area provides a great scope for research and development. However, the biodiversity have been put into extensive pressure beyond their resilience limits. Comprehensive global threat assessments of plants and their respective habitats and sites are needed and should be considered a high priority to compile a complete list of conservation outcomes. Knowledge on conservation status, population, species and accurate data on the distribution of threatened, rare, endemic and archaic species across sites and landscapes level is requisite for defining conservation outcomes.

Present study was therefore, attempted to compile a comprehensive list of flowering plants, habitats, their conservation status and develop conservation strategies of prioritized species and habitats of lower Kanchenjungha-Singhalila Ridge through participatory and scientific approaches. The comprehensive list of flowering plants and their status was aimed at maintaining and updating CEPF species outcome. Important habitats of the area identified during the project are supplement to the CEPF site outcomes and the CEPF corridor outcomes were supported by the conservation strategies of the species and habitats developed through participatory and scientific approaches. The study area Kanchenjungha-Singhalila Ridge is a part of Upper Mai Valley forest (CEPF site outcome) and Kanchenjungha-Singhalila landscape (CEPF corridor outcome).

1.4 Objectives

Present study attained to attempt the following objectives:

1. Inventory and documentation of plant diversity and their associated habitats of lower Kanchenjunga Singhalila Ridge (Panchthar and Ilam districts),

2. Identify and assess the rare, threatened, endemic and archaic plant species and their key habitats, and

3. Develop conservation strategies of species and habitats through participatory and scientific approaches.

CHAPTER TWO

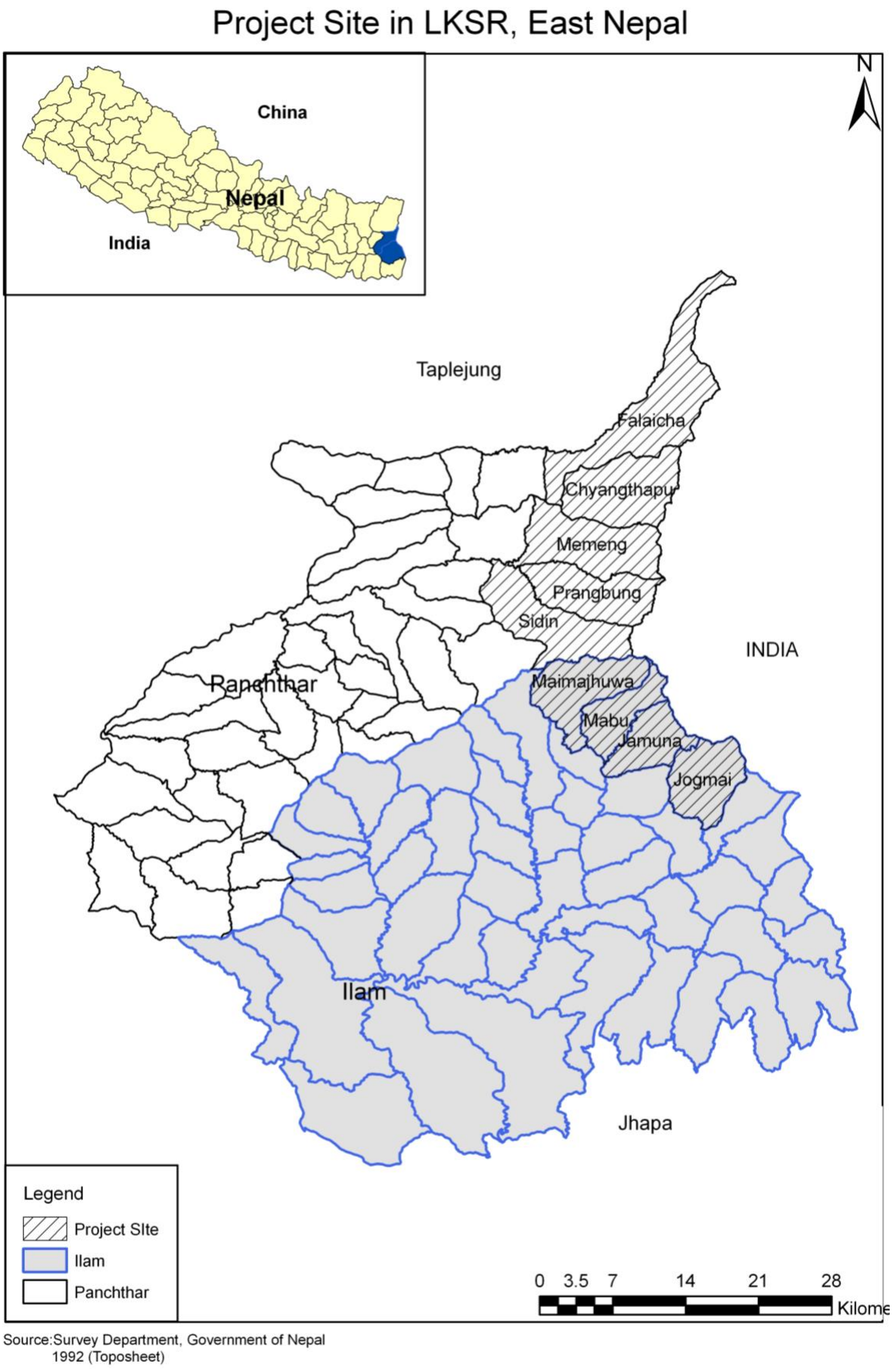
2. MATERIALS AND METHODS

2.1 Study area

The study area encompasses the Nepal part of Kanchenjunga-Singhalila Complex, one of the five prioritized landscapes of the Eastern Himalayas. Four village development committees (VDCs) of Ilam district viz. Maimajhuwa, Mabu, Jamuna and Jogmai and five VDCs of Panchthar district viz. Falaincha, Chyangtharpu, Memeng, Prangbung and Sidin constituted the study area (Map 1).

The VDCs were those bordering with India (Sikkim and/or Darjeeling) and are a vital part of the Eastern Himalayas biodiversity hotspot. Virtually all types of climates exist within the study area, from subtropical monsoon to alpine zones. The monsoon wind causes rain from June through September. In some years scanty rainfall also occurs during mid winter months. The annual precipitation varies from 1440 mm to 2660 mm (av 1775 mm, and falls in between June to September) and temperature ranges within minimum –4.2°C to maximum 25°C.

All the study sites of the area are transboundary VDCs and represents subtropical to alpine vegetations. The sites stretches between latitude 26° 59’ 35” to 27° 20’ 11” and longitude 87° 54’ 47” to 87° 03’ 53” and elevation 1570-4340 m. All the vegetation types and habitats of the area, namely forests, wetlands, river sides, agricultural lands, pastures, transitional areas, etc were surveyed. Walking trails were followed to survey the sites. The area is inhabited by different ethnic groups namely, Gurung, Magar, Limbu, Rai, Tamang, Newar, etc. and other castes such as Brahmin and Chhetri.



Source:Survey Department, Government of Nepal
1992 (Toposheet)

2.2 Review of literature and herbarium specimens

Literature review: Literature review was done throughout the project period. The literatures of policy/strategy and research were reviewed separately (Annex 2). Policy documents of government of Nepal, WWF Nepal, ICIMOD and CEPF were reviewed.

Herbarium specimen review: The specimens collected from Ilam and Panchthar districts were deposited at National Herbarium and Plant Laboratories Godavari, Laitpur (KATH), Tribhuvan University Central Herbarium (TUCH), and Royal Botanic Garden Edinburgh (RBGE), UK. For identification and verification of specimens, the deposited specimens of KATH, TUCH and Royal Botanic Garden Edinburgh (RBGE), UK were reviewed. A total of fifteen days review was done in TUCH and its revision record has been appended in Annex 6. Similarly, a month long revision was made in KATH, Godawari and at the same time the collections/specimens of the present study were also identified and verified. Final level revision and identification of specimens was done at Royal Botanic Garden Edinburgh (RBGE), UK in December, 2007.

2.3 Rapid Appraisal (RA) and Participatory Rural Appraisal (PRA)

Inception and planning workshop and rapid appraisal were conducted earlier in project commencement. It was conducted in February 2007. The appraisal was for selecting the local collaborating partners from the project districts and pre-testing the checklists prepared for the project execution. The Shree High Altitude Herbs Growers Group (SHAHGG) Ilam and Deep Jyoti Youth Club (DJYC) Panchthar were selected after thorough consultation of district level organizations in districts. One social mobilizer from each organization was recruited for follow up actions of the project in the districts.

Participatory resource mapping, informal and formal meetings and consultations, site observations, meetings, discussions, trainings and workshops are major PRA tools adopted for acquiring data and information in the field. The PRA tools were found effective in developing the local strategies and feedback looping for project implementation.

Coordination with local and national level organizations working on conservation and livelihood was essential to integrate the biodiversity and livelihood in project component. This has made the field level activities and implementation of project easier.

2.4 Plant collection expeditions and herbarium management

Plant collection expeditions were made in different seasons, and particularly focusing on monsoon season, because the flower blooms and plant sprouts well in then. Around 70 days were spent in field expeditions for plant species collection and management. Pre-monsoon expedition lasted for 24 days starting from 1st June, 2007. Supplement expedition was done from 23 August to 13 September, 2007 and post-monsoon visit was made from 16 September to 8 October 2007 (Annex 1). All expeditions were facilitated by social mobilizers and local assistants. Participatory mapping and trail fixing was done at outset and community consultations or meetings with leaders were comprehended prior to access the resource site. Three sets of plant specimens were collected along with their taxonomic, phenology and locality data records and geographical coordinates. All the collected specimens were dried on spot by indigenous methods (heating by coal) at respective evening and maintained for identification.

Herbarium management and identification was completed in four levels. On spot identification was possible due to team member expertise and literatures. Further identification and verification was done in ESON's resource center with the help of taxonomic literatures. The specimens were tallied with the housed specimens of KATH and TUCH for further validations of the species name. Identification was made final after comparing and identifying the specimens from the experts of RBGE, UK. Some of the doubtful and potentially new specimens were carefully diagnosed and scrutinized and they were finally verified by experts in Royal Botanic Garden herbarium Edinburgh, UK. The collected herbarium and specimens are deposited in national herbaria (KATH and TUCH) and international herbarium (Royal Botanic Garden herbarium Edinburgh, UK). The identification process was scheduled as follows:

On spot identification → Identification at ESON Resource Center → Identification at TUCH and KATH → Identification at RBGE, UK.

2.5 Ecological assessment

Integrated and in-depth ecological assessment of the vegetation of the site was made by following quadrat sampling methods along the transect line. The line was made along the walking trail and the coverage of transect was 500m left from the center and 500 m right from the center of the road/trail. In order to carry out the ecological assessment, checklist was prepared and the field level data related to micro weather, plant population and associated vegetation/species were noted in checklist (Annex 3.1). Global Positioning System (GPS), Clinometer, pH meter, and other scientific equipments were used for data collection and analysis.

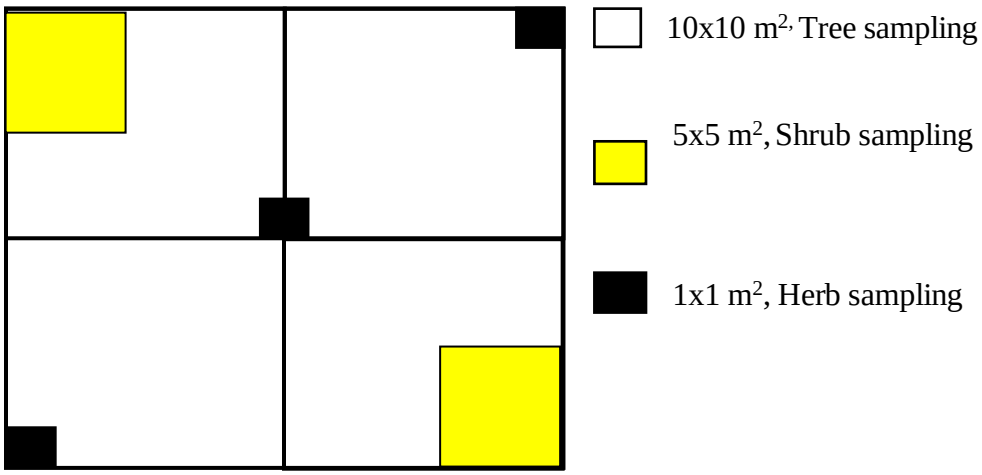


Figure 2: Ecological sampling design strategy

Permanent research plots were laid in different bioclimatic zones representing different management systems for monitoring the disturbance gradients of the site. There were 18 permanent plots laid in different bioclimate and villages. Each VDC had two permanent plots. Permanent plot monitoring protocol was prepared and given to each social mobilizers for data keeping. The protocol was prepared both in Nepali and English language for easy circulation and management (Annex 3.2).

The permanent research plots were participatorily monitored by CFUG members and social mobilizers during the project period and after the project too. The plots were managed to be monitored by village level biodiversity conservation committee. The committees were supported to look after the village biodiversity. The project implementation activities were monitored by district level biodiversity management advisory board.

2.6 Soil analysis

Soil samples were taken from each semi permanent research plot. The set up of plots were established within 2,200 m to 4,300 m. Soil from each plot was collected following standard methods by removing humus soil layer and collecting samples from 15 cm depth of the trench. The soil was collected from two opposite corners of research plot and blended homogenously and prepared a sample for lab test with labeling codes. Soil pH and moisture were noted on site from pH meter and rest attributes Nitrogen, Phosphorus, Potassium, organic matter and soil texture were analyzed in CEMAT Water lab, Baneswor, Kathmandu.

2.7 GIS analysis

All the data of inventory, ecological assessment and soil analysis were plotted in GIS. The important sites and species in terms of conservation and management were plotted in GIS mapping. GIS data analysis was facilitated by GPS system. Two GPS meters were used to calibrate the locality data. Distribution and occurrence of specified species and habitats were calibrated in GPS meters. Distribution of prioritized species and habitats were located by using GIS analysis. Analysis of endemic, threatened and archaic/unique species and habitats was supported by GIS analysis. GIS analysis was pursued in land use data, elevational gradient data and political boundaries data.

2.8 Trainings and capacity building programs

Two plant diversity management trainings were conducted in each district. The trainings were organized in villages and they were focused on building the capacity of local people. Plant species identification, sustainable use, conservation, and management were discussed in trainings. Plant species endemism, richness, threatened, hotspots and landscape importance, corridor, and their conservation strategies, etc were discussed in the trainings.

Six month long plant biodiversity research training was organized for two MSc students of Tribhuvan University. They were trained both in field and resource centers. A week long capacity building and orientation training was organized in Kathmandu for social mobilizers. The social mobilizers were from local collaborating partners and they were from each project district. Sharing literatures and resources to the district level organizations made us more familiar to the districts and project sites. Moreover the project scoping and collaborating with organization was made easier by sharing and networking with district level partners. District forest offices, FECOFUN, CFUGs and district level non-government organizations were consulted for sharing.

2.9 Renewal of community forest user groups operational plans

After accomplishing three expeditions, and analysis the data, some habitats or landscapes were identified as important in terms of plant diversity and existing threats. In each district potential habitats of forest land managed by community forest users were prioritized for better management. One community forest user group possessing high plant species richness and diversity, endemism and threatened plant species population, and conventional management system was selected from each district. The operational plan of the community forest user group was revised and renewed integrating different biodiversity components and management systems. The jurisdiction of the renewed operational plan was managed by respective district forest office.

2.10 Conservation strategy development and advocacy

Species and landscape level conservation strategies were developed through village, district and national level consultations. Village level workshops were organized to develop the village level plant species and habitat conservation strategy. Important habitats and species were identified in workshops and they were preceded for district level workshops. In district level workshop, community forest representatives of the districts, development workers, district forest officers and concerned experts and organizations further refined the information obtained from the village workshops. The final outputs (strategies) of the district workshops were put forward for national workshop. National experts of plant biodiversity and conservation/management worked upon the data of village and district and pooled the final species and landscape that to be conserved necessarily. Moreover the requisite actions to overcome the issues and challenges of the species and habitat conservations were listed. The strategy development process was as follows:

Village → District → National level plant biodiversity conservation strategy workshops

The results and finding from the project was disseminated to all concerned stakeholders including villages and districts of the project sites. Community forest user groups and FECOFUN were taken as facilitators and advocators for sustainable plant species and habitats conservation.

2.11 Dissemination and publication

The results were disseminated through various means. Research articles were published in journals and news and other information were published in newsletters, bulletins and brochures. Findings were also updated in webpages (www.eson.org.np).

2.12 Project leveraging and post project management support

Local collaborating organizations were equipped in terms of knowledge and resources. They were trained to develop the technical proposals for national and international donors and they are now proposing their proposals to the donors. Networking with other local organization was made to follow up the activities of the project in site in future run. Few proposals were developed and forwarded to international donors to carry out the similar works in other parts of the country.

CHAPTER THREE

3. RESULTS (results are in the order of logical framework)

3.1 Plant Species and Their Habitats

3.1.1 Plant list and their associated habitats

Plant species identification was managed through series of identification processes started from field level identification: *on spot* identification, identification at ESON center, identification at KATH and TUCH, and final level identification and verification was done from RBGE, UK. Some species are still in taxonomic progress.

The comprehensive list of flowering plants and their status was aimed at maintaining and updating CEPF species outcome. The inventory and ecological assessments updated the distribution and population dynamics and contributed in managing the species and habitats through providing information of conservation status. On average, 1430 specimens were collected through 3 extensive plant collection expeditions (Annex 1), and to date 904 specimens were identified. Among them 598 plant species under 302 genera and 99 families were confirmed so far (Annex 4). Detail description of new record species is given Annex 5 and figure 2. The analysis revealed that there were two new records of varieties for Nepal, 10 new records of species for Nepal and one new record species for the World. The new record species for the World was *Begonia* and it was collected from Prangbung, Panchthar district. New varieties were from *Asparagus* and *Carex* species and both were from Ilam district.

During identification in both TUCH and KATH, the previously housed specimens of east Nepal were also reviewed and noted their collection details. The review got a record of 259 specimens from KATH and 27 from TUCH. Some of the specimens that we got were already collected by previous researchers from the same place. The revision helps in study of dynamics of species/population (Annex 6).

Of total collection, 572 specimens were submitted to National Herbarium & Plant Laboratories (KATH), Ministry of Forest and Soil Conservation, 624 specimens were submitted to RBGE, UK, and 574 specimens were submitted to Tribhuvan University Central Herbarium (TUCH), Tribhuvan University. The inventory, collection and documentation of plant diversity and their herbarium maintenance was one of the priority strategy of Nepal Biodiversity Strategy 2002.

Table 1. New Record Species to Nepal from Lower Kanchenjungha Singhalila Ridge

SN	Call No.	Family	Species Name	Coll. date	Alt. (m)	Lat	Long	Locality	Remarks
1.	D 257	Umbelliferae	*Acronema ioniostyles* Farille & Lachard	09/29	2702	27 13 21	87 57 25	Dabale Deurali, Ilam	New record
2.	B 155 C 201	Liliaceae	*Asparagus filicinus* Buch.-Ham. ex D.Don. var. *lycopodineus* Bake	06/07 09/06	2245 2334	27.04 27 02 44	88.00 88 00 25	Jamuna 2, Ilam Jamuna-1, Ilam	New record
3.	B 157 B 163	Begoniaceae	*Begonia flaviflora* H. Hara	06/07	2245 2172	27.04	88.00	Jamuna 2, Hangetham, Ilam	New record
4.	D 357	Begoniaceae	*Begonia panchtharensis* S. Rajbhandary & K.K. Shrestha (sp.nov.)	10/02	2248	27 10 01	87 57 17	Prangbung, Panchthar	New species
5.	D 130	Poaceae	*Calamogrostis lahulensis* G. Singh	09/24	4337	27 26 11	88 03 16	Timbu Falaincha-9, Panchthar	New record
6.	C 240	Cyperaceae	*Carex cruciata* Wahlenberg var. *argocarpa* C. B. Clarke	09/12	3210	27 18 45	88 01 22	Bie-Chitre, Jogmai-2, Ilam	New record
7.	D 200	Fagaceae	*Castanopsis longispina* (King ex Hook.f.) C.C.Huang & Y.T.Zhang	09/27	1900	27 16 04	87 57 29	Falaincha-6, Tintine, Panchthar	New record
8.	D 012	Juncaceae	*Juncus clarkei* Buchenau	09/19	3530	27 19 29	88 03 09	Chiwabhanjyang-Major, Panchthar	New record
9.	D 013	Juncaceae	*Juncus khasiensis* Buchenau	09/19	3910	27 23 35	88 02 16	Chiwabhanjyang-Major, Panchthar	New record
10.	A 006	Rosaceae	*Potentialla sundaica* (Blume) Kuntze	06/07	1903	27.06	87.94	Maimajuwa 7, Upper Hatiya, Ilam	New record
11.	D 279	Rubiaceae	*Rubia hispidicaulis* Long	09/29	2450	27 04 21	87 59 29	Narelung CF, Memeng-3, Panchthar	New record
12.	C 191	Acanthaceae	*Strobilanthes helicta* Anderson	09/05	2656	27 04 07	87 59 37	Dobate, Hangetham, Ilam	New record
13.	D 099	Gentianaceae	*Swertia wardii* Marquand	09/23	3910	27 23 35	88 02 16	Paharemeghu, Falaincha-9, Panchthar	New record

Source:Survey Department, Government of Nepal
1992 (Toposheet)

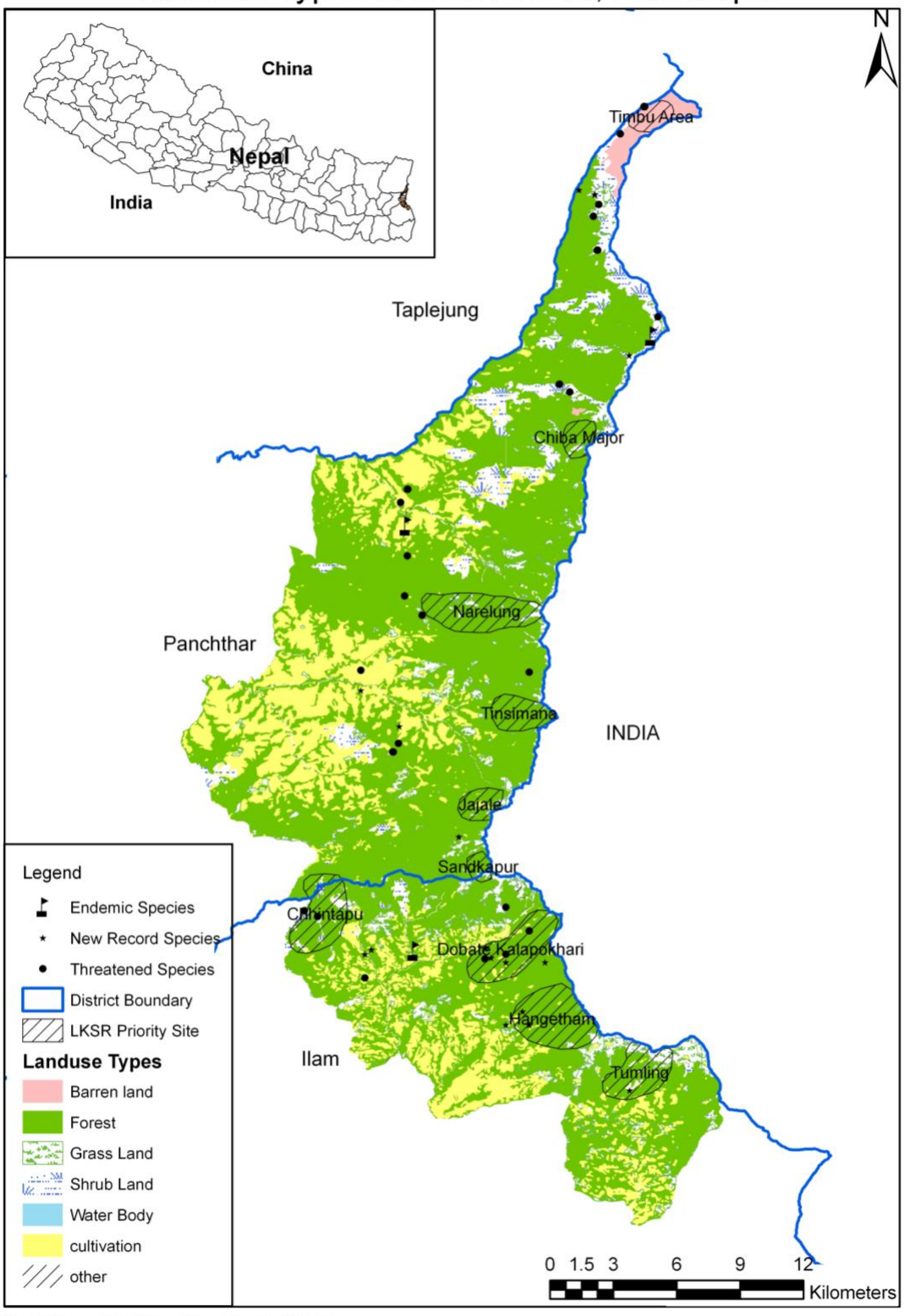
3.1.2 Endemic, rare and threatened (ecologically and commercially) plant species

Among the identified specimens, 22 species were identified as threatened, 2 species as endemic to east Nepal and 13 species as new to Nepal (Figure 3, 4). Threatened species are based on IUCN, CITES and Government of Nepal threat category. Among them, 18 were from IUCN threat category, 10 from CITES category, and 6 from government of Nepal category. Species richness and number of threatened species is highest in Falaincha VDC, Panchthar district. Timbung pokhari area is most in richness of threatened species. Shrestha (2001) prioritized Surumkhim of Taplejung district as most important site for habitat connectivity for conservation of biodiversity of the Kanchenjungha landscape. Surumkhim of Taplejung district is next to Timbung pokhari of Pancthar district.

Table 2. Endemic and threatened plant Species of Lower Kanchenjungha Singhalila Ridge

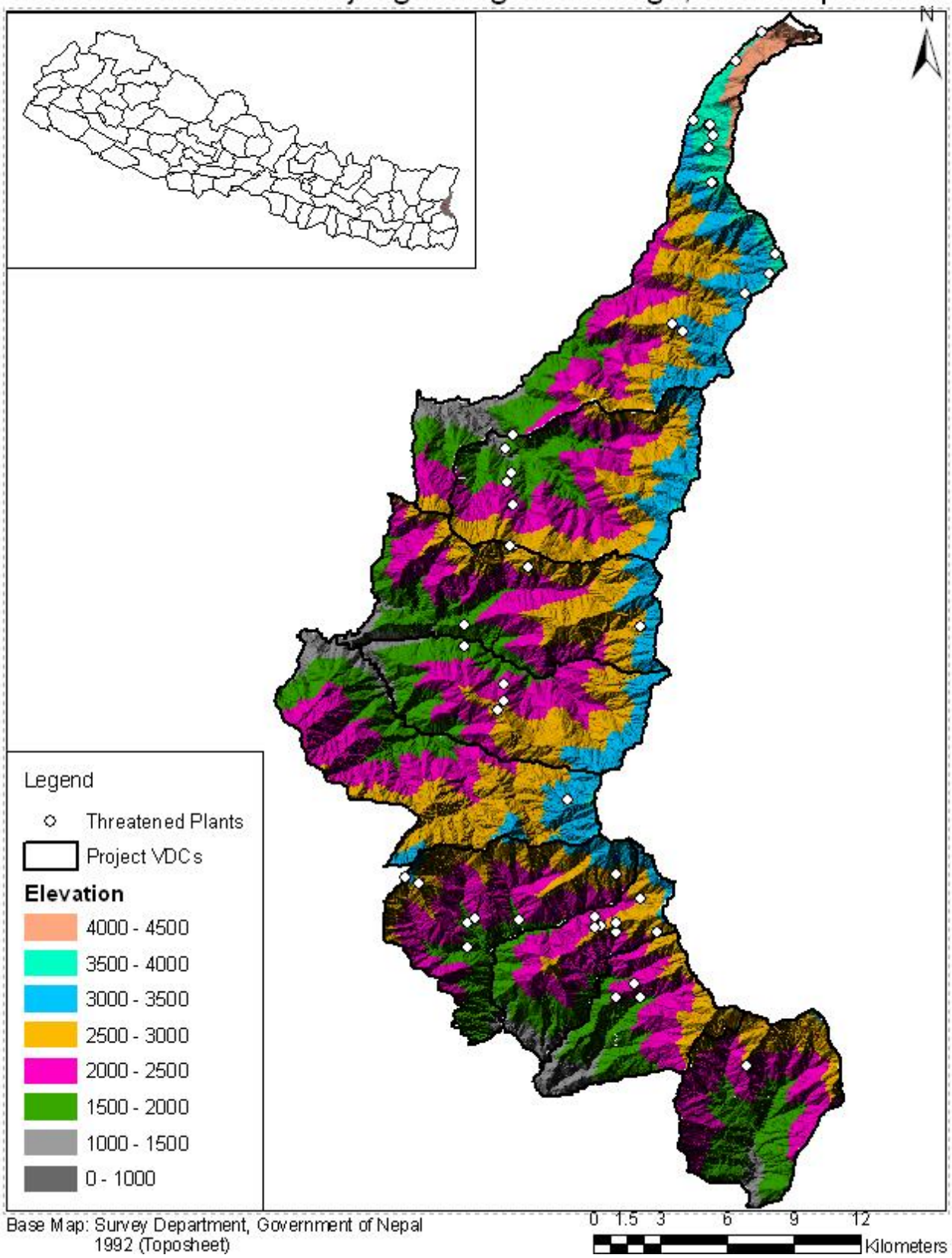
SN	Record	Family	Species Name with threatened category	Alt. (m)	Locality
1.	Threatened	Ranunculaceae	*Aconitum spicatum* (IUCN - CT)	3850	Dund, Falaincha-9, Panchthar
2.	Threatened	Dioscoreaceae	*Dioscorea deltoidea* (IUCN - CT, CITES – II,)	3820	Falaincha, Betini, Panchthar
3.	Threatened	Dioscoreaceae	*Dioscorea prazeri* (IUCN - CT, CITES – II,)	1570	Falaincha, Betini, Panchthar
4.	Threatened	Asclepiadaceae	*Cerpegia hookerii* (CITES - II)	2481	Maklabu, Pancthar
5.	Endemic	Eriocaulaceae	*Eriocaulon trisectoides*	1790	Chamling gaun, Chyangtharpu, Panchthar
6.	Endemic	Umbelliferae	*Heracleum lallii*	3640	Gairi-sukhkhadhap Failaincha-9, Panchthar
7.	Threatened	Fagaceae	*Lithocarpus fenestrata* (IUCN - K)	3210	Faleke-Betini, Falaincha-9, Panchthar
8.	Threatened	Magnoliaceae	*Magnolia campbelli* (IUCN – R, CITES II)	2005	Faleke-Betini, Falaincha-9, Panchthar
9.	Threatened	Magnoliaceae	*Magnolia globosa* (IUCN – R, CITES - II)	2040	Maimajuwa 7, Naule Gaun, Ilam
10.	Threatened	Boraginaceae	*Maharanga emodi* (IUCN - K)	3400	Prangbung 6, Ghamaile, Panchthar
11.	Threatened	Magnoliaceae	*Michelia champaca* (IUCN – E, CITES II, GoN - III)	2040	Maimajuwa 7, Naule Gaun, Ilam
12.	Threatened	Magnoliaceae	*Michelia velutina* (CITES - II)	1870	Newa khola, Mai majhuwa, Ilam
13.	Threatened	Valerianaceae	*Nardostachys grandiflora* (IUCN – V, CITES - II)	3930	Paharemeghu, Falaincha-9, Panchthar
14.	Threatened	Scrophulariaceae	*Neopicrorhiza scrophulariiflora* (IUCN – V, CITES – II, GoN - I)	4335	Timbu pokhari, Falaincha-9, Panchthar
15.	Threatened	Trilliaceae	*Paris polyphylla* subsp *marmorata* (IUCN - V)	2685	Talkharka-Prangbung, Prangbung, Panchthar
16.	Threatened	Trilliaceae	*Paris polyphylla* subsp *polyphylla* (IUCN - V)	3060	Mabu, Near Mai khola, Chauri chowk, Ilam
17.	Threatened	Berberidaceae	*Podophyllum hexandrum* (IUCN - V)	3225	Mabu, Bikhe Bhanjyang, Ilam
18.	Threatened	Polygonaceae	*Rheum nobile* (IUCN - R)	4335	Timbu pokhari, Falaincha-9, Panchthar
19.	Threatened	Gentianaceae	*Swertia chirayita* (IUCN - V)	1900	Menjuwa, Panchthar
20.	Threatened	Taxaceae	*Taxus wallichiana* (IUCN – V, CITES – II, GoN - II)	2702	Dabale Deurali, Panchthar
21.	Threatened	Pinaceae	*Abies spectabilis* (IUCN – V, GoN - II)	3185	Maimajuwa, Dhupi, Ilam
22.	Threatened	Pinaceae	*Pinus roxburghii* (IUCN - V)	2000	Maimajuwa 7, Naule Gaun, Ilam
23.	Threatened	Juglandaceae	*Juglans regia* (Gon – I, III)	2200	Maimajhuwa, Ilam
24.	Threatened	Lauraceae	*Cinnammum glauscescens* (GoN - II)	2870	Sidin 1, Jamle, Pancthar

Distribution Important Plants and Priority Sites in Different Landuse Types in LKSR VDCs, East Nepal



Source:Survey Department, Government of Nepal
1992 (Toposheet)

Distribution of Threatened Plants Along Elevation Gradients in Lower Kanchenjunga-Singhalila Ridge, East Nepal



Base Map: Survey Department, Government of Nepal
1992 (Toposheet)

3.1.3 Key plant species and habitats

Key plant species and habitats were sorted for identifying the species specific conservation priorities. The identification process was participatory and scientific. Important plant species in terms of ecology, socioeconomy, culture, endemism, archaic, unique, threatened, rare, etc were identified in village level consultations. The selection list was further exercised on district level workshops and national workshop (Table 3).

3.1.3.1 Key plant species

Top twenty species prioritized from village level consultations is given below in table 3. Finally, a total of 26 key species for conservation was prioritized after consultations of village, district and national level stakeholders, literatures, organizations conservation priorities, field observations and data analysis, and ecology, soil and threat assessment and given below in Table 4. The prioritized species were important and they were also already identified as key species for sites from previous studies (Shrestha and Ghimire 1996, Shrestha *et al.* 2008) and other organizations (Annex 7).

Table 3. 1 Prioritized species from village, district and national level workshops

SN	Name of Species	VWP	DWP	NWP	Priority score
1.	*Aconitum ferox, A. spicatum* (Ranunculaceae) BIKHMA	+	+	+	3
2.	*Arundinaria* species (Poaceae) MALINGO & NIGALO	+	+	+	3
3.	*Castanopsis hystrix* (Fagaceae) PATALE KATUSH	+	+	+	3
4.	*Cinnamomum glauscescens* (Lauraceae) MALAGIRI	+	+	+	3
5.	*Juglans regia* (Juglandaceae) OKHAR	+	+	+	3
6.	*Michelia* and *Magnolia* spp. (Magnoliaceae) CHAAMP	+	+	+	3
7.	*Rhododendron* spp. (Ericaceae) SUNPATI, CHIMAL, GURANS	+	+	+	3
8.	*Swertia chirayita* (Gentianaceae) CHIRAITO, TITE	+	+	+	3
9.	*Taxus wallichiana* (Taxaceae) LOTH SALLA	+	+	+	3
10.	*Nardostachys grandiflora* (Valerianaceae) JATAMANSI		+	+	2
11.	*Schefflera impressa* (Araliaceae) BHALUCHINDE	+	+		2
12.	*Zanthoxylum acanthopodium* (Rutaceae) TIMUR	+			2
13.	*Asparagus racemosus* (Liliaceae) KURILO			+	1
14.	*Bergenia purpurascens* (Saxifragaceae) PAKHANVED	+			1
15.	*Cardiocrinum giganteum* (Liliaceae) CHAMELI		+		1
16.	*Dactylorhiza hatagirea* (Orchidaceae) PANCHAUNLE			+	1
17.	*Dioscorea deltoidea* (Dioscoreaceae) GITHHA, BHYAKUR			+	1
18.	*Neopicrorhiza scrophulariiflora* (Scrophulariaceae) KUTKI			+	1
19.	*Podophyllum hexandrum* (Berberidaceae) LAGHUPATRA			+	1
20.	*Rheum nobile, R. australe* (Polygonaceae) KYANJO			+	1

+ = prioritized.

3.1.3.2 Key habitats

Species and habitat for prioritization were selected from participatory maps. A total of nine maps of each village were prepared and the requisite sites and their characteristics were identified. The maps were also helpful in identifying walking trails, land use and local resources. Plant collection expeditions were easily accomplished due to participatory maps. Based on the participatory priorities, plant species and their important habitats were

identified scientifically by using GPS system, GIS analysis, ecological assessment, expert feedback and field observation and field data analysis.

The prioritized species/sites from the village, district level workshops or participatory methods were more or less identical to the outcomes of scientific methodologies and previously identified important sites from different organizations (Annex 8). It can be stated from this findings that local people managing species and sites from local customs and rules were rational. Species and habitat identification was primarily based on the occurrence of threatened species and ecological data assessment. Some habitats having relatively low biodiversity with low forest cover, isolated and high fragmentation and nearby settlements were considered as critical and they were also prioritized for conservation.

Table 3.2 Prioritized habitats from village, district and national level workshops (Ilam)

SN	Prioritized sites	Village workshop	District workshop	National workshop	Total	Species
1	Hangetham (Jamuna VDC)	6	7	7	**20**	*Taxus wallichiana, Castanopsis hystrix, Arundinaria* spp.
2	Kala pokhari (Mabu VDC)	3	6	6	**18**	*Michelia* and *Magnolia* spp., *Swertia chirayita, Zanthoxylum acanthopodium*
4	Chintapu (Mai majhuwa VDC)	4	4	5	**13**	*T. wallichiana, Aconitum* spp.
3	Sandakphu (Mai majhuwa VDC)	5	3	4	**12**	*Aconitum* spp.
5	Dhupi- Guranse (Mai Majhuwa)	1	5	3	**9**	*Aconitum* spp., *Rhododendron* spp.
6	Tumling (Jogmai VDC)	2	2	2	**6**	*Arundinaria* spp.
7	Todke Jharana (Mai majhuwa VDC)	1	1	1	**3**	*Michelia* and *Magnolia* spp.

Table 3.3 Prioritized habitats from village, district and national level workshops (Panchthar)

SN	Prioritized sites	Village workshop	District workshop	National workshop	Total	Species
1	Timbu pokhari (Falaincha VDC)	6	2	7	**15**	*Nardostachys grandiflora, Aconitum* spp.
2	Lam pokhari-Suke pokhari-Ose (Chyangthapu VDC)	2	5	6	**13**	*Michelia* and *Magnolia* spp., *Zanthoxylum acanthopodium*
5	Sidin Kanya Devi community forest (Sidin VDC)	1	4	5	**10**	*Juglans regia, Michelia* and *Magnolia* spp., *Taxus wallichiana*
4	Bhaise pokhari - Jaljale-Surketham (Memeng VDC)	4	1	4	**9**	*Michelia* and *Magnolia* spp., *Taxus wallichiana*
3	Mejartham - Chiwabhanjyang (Chyangthapu VDC)	5	1	1	**7**	*Aconitum* spp., *Rhododendron* spp.
6	Narelung – Thaplu (Prangbung VDC)	1	3	3	**7**	*Michelia* and *Magnolia* spp., *Swertia chirayita, Zanthoxylum armatum*
7	Tinsimana-Gorkhepani-Fokte (Memeng VDC)	3	1	2	**6**	*Taxus wallichiana, Castanopsis hystrix*

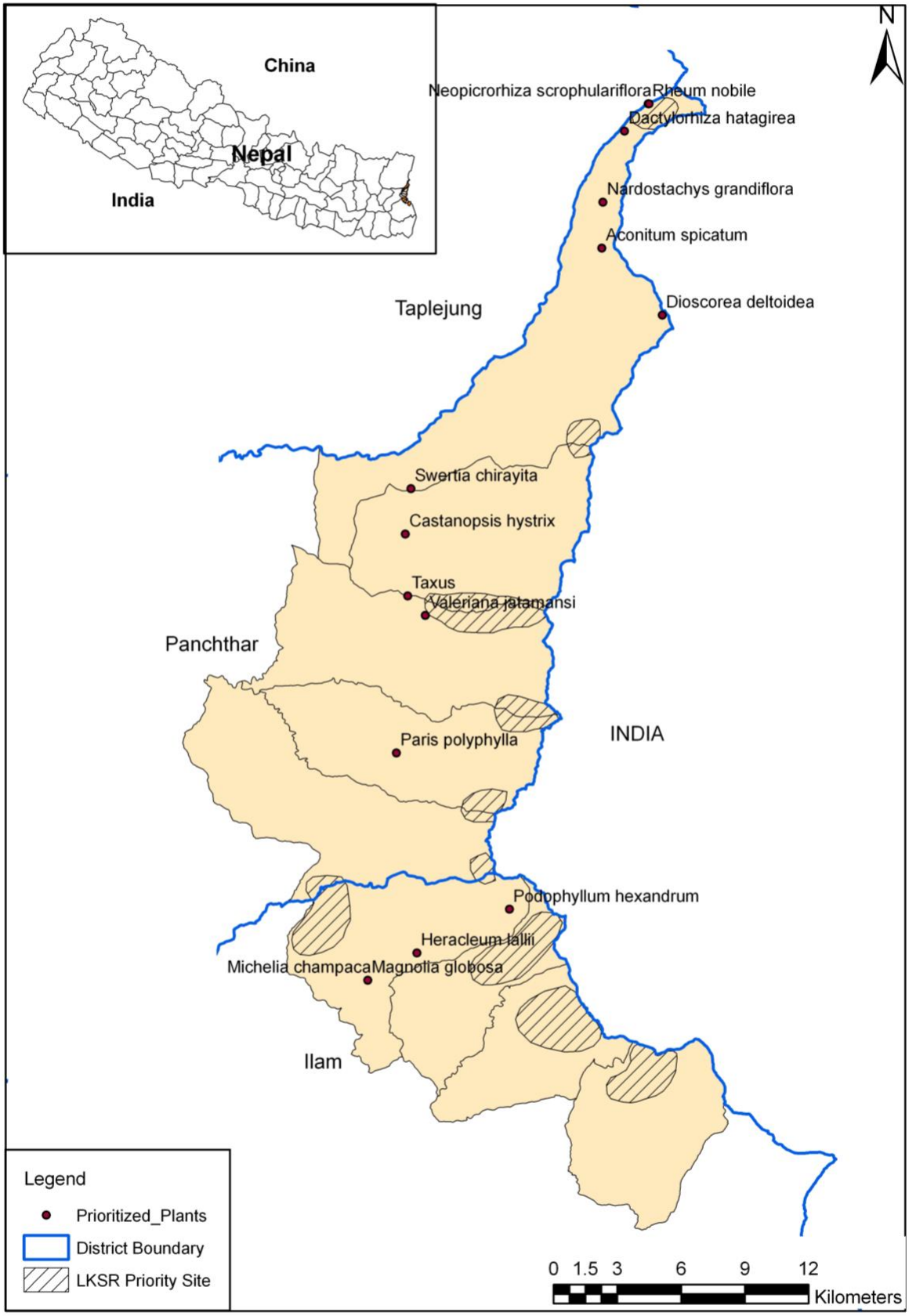
Management of such habitats is in line of habitat connectivity and complement to the CEPF corridor outcome. The prioritized habitats ranged from wetlands to forest lands to pastures and stretched from temperate to alpine bioclimate. The management of these habitats have been managed through community forest user groups, community based organizations and local people. Capacity building programs: trainings, formal and informal discussions and consultations, orientations and workshops were interventions in promoting biodiversity and landscape management. Financial, technical and materialistic supports to those organizations were meant to sustainable conserve the biological treasure of the area.

3.1.3.3 Participatory biodiversity conservation monitoring mechanism

There were 18 permanent plots laid in different bioclimates and villages and they were meant to analyse the disturbance gradients, different management systems, long term monitoring of biodiversity of the area. Each VDC had two permanent plots. Permanent plot monitoring protocol was prepared and given to each social mobilizers for data keeping. The protocol was prepared both in Nepali and English language for easy circulation and management (Annex 3.2). Threat and disturbance regimes were analyzed through both rapid appraisal and semi permanent research plots. The plots were monthly monitored and the disturbance and threats were recorded.

The participatory monitoring mechanism was developed and post project follow up system was developed with coordinating existing village level biodiversity conservation committees. The committees and project implementations were guided and instructed by district level biodiversity advisory board and facilitated by ESON and other CEPF grantees. ESON has provided literatures, materialistic and partial financial supports to them for long term monitoring. It has also been coordinated by ICC for supervising their regular monitoring. The laid permanent plots were monitored by community forest users and social mobilizers of the local collaborators to monitor the threats/disturbance regimes of the site. The social mobilizers are from the local area where the plots were set up so they regularly guide community forest users and orient them to monitor and update the recordings. Local collaborators were proposing conservation projects to the donors with aiming to sustainably conserve the prioritized species and habitats including permanent plots. DJYC, one of the local collaborators, has approached CEPF for a conservation project for managing the sites and species prioritized by ESON. The species, sites and issues of the alpine areas were prioritized in the project.

Prioritized Plant Species and Habitats in LKSR, East Nepal



Source:Survey Department, Government of Nepal
1992 (Toposheet)

All the prioritized species and habitats were supportive to the conservation outcomes of the CEPF. The databases of the flora of the Lower Kanchenjungha Singhalila Ridge can be used as baseline document for the CEPF species outcome and the prioritized habitats were along the border and act as connecting corridors which ultimately compliment to the CEPF site outcomes and corridor outcomes.

Table 4. Prioritized plant species of LKSR for conservation

SN	Prioritized plant species of lower Kanchenjungha Singhalila Ridge	Priority score	Distribution (horiz & vert)
1.	*Taxus wallichiana* (Taxaceae) LOTH SALLA	10	ECW; 2300-3400m
2.	*Swertia chirayita* (Gentianaceae) CHIRAITO, TITE	9	EC; 1500-2500m
3.	*Nardostachys grandiflora* (Valerianaceae) JATAMANSI	9	ECW; 3200-5000m
4.	*Aconitum ferox, A. spicatum* (Ranunculaceae) BIKHMA	9	ECW; 1800-4200m
5.	*Neopicrorhiza scrophulariiflora* (Scrophulariaceae) KUTKI	9	ECW; 3500-4800m
6.	*Michelia* and *Magnolia* species (Magnoliaceae) CHAAMP	8	EC; 2000-2700m
7.	*Dactylorhiza hatagirea* (Orchidaceae) PANCHAUNLE	8	ECW; 2800-3960m
8.	*Rheum nobile, R. australe* (Polygonaceae) KYANJO	7	E; 3200-4300m
9.	*Dioscorea deltoidea* and other species (Dioscoreaceae) BHYAKUR	6	ECW; 500-3100m
10.	*Paris polyphylla* (Liliaceae) SATUWA, LALGEDI	5	EC; 1800-3300m
11.	*Cinnamomum glauscescens* (Lauraceae) MALAGIRI	5	ECW; 2000-2500m
12.	*Juglans regia* (Juglandaceae) OKHAR	5	ECW; 1200-2100m
13.	*Podophyllum hexandrum* (Berberidaceae) LAGHUPATRA	5	ECW; 3000-4500m
14.	*Castanopsis hystrix* (Fagaceae) PATALE KATUSH	4	E; 1000-2500m
15.	*Oroxylum indicum* (Bignoniaceae) TATELO	4	ECW; 400-1400m
16.	*Rhododendron* spp. (Ericaceae) SUNPATI, CHIMAL, GURANS	4	ECW; 1500-5100m
17.	*Schefflera impressa* (Araliaceae) BHALUCHINDE	4	EC; 2000-3400m
18.	*Asparagus racemosus* (Liliaceae) KURILO	4	EC; 600-2100m
19.	*Valeriana jatamansii* (Valerianaceae) SUGANDHWAL	4	ECW; 1500-3300m
20.	*Arundinaria* spp. (Poaceae) MALINGO & NIGALO	3	E; 1500-2000 m
21.	*Heracleum lallii* (Umbelliferae) CHIMPHING	3	ECW; 300-4400
22.	*Tetracentron sinense* (Tetracentraceae) KIMBUK	3	E; 2800-3200m
23.	*Rubia manjith* (Rubiaceae) MAJITHO	3	EC; 1200-2100m
24.	*Bergenia purpurascens/ B. ciliata* (Saxifragaceae) PAKHANVED	2	EC; 3800-4700m
25.	*Zanthoxylum acanthopodium* (Rutaceae) TIMUR	2	ECW; 1100-2500m
26.	*Cardiocrinum giganteum* (Liliaceae) CHAMELI	1	ECW; 1800-3000m

3.1.4 Ecology of important plant species and their habitats

3.1.4.1 Forest types

A total of 122 primary quadrat plots (each measuring 10*10 m) (50 in Ilam and 72 in Panchthar district) consisting 244 meso plots (each measuring 5*5 m) and 366 micro plots (each measuring 1*1 m) were laid within elevation from 1900-4327 m in all nine VDCs for diversity and richness study of plant species. Total twelve major vegetation types (forests) comprising about 100 tree species were observed and studied. The distribution of forest types depends on site specific physiography. There were accounts of

20 forest types from Makalu Barun Landscape complex (Kunwar and Chaudhary 2004) and 14 forest types from Kanchenjungha landscape complex (Shrestha 2001). The profiles of forests of all nine VDCs were prepared that was helpful to design the conservation strategy. The species diversity and richness varies in each forest types. Three forest types: Sub tropical, Lower temperate mixed and Tropical evergreen from Maipokhari – Maimajhuwa to Kanchenjungha Conservation Area are important for conservation based on rainfall and bird diversity (Inskipp 1989, Shrestha 2001).

Table 5: Forest types of Ilam and Panchthar

SN	Forest types	Associated species	Elevation (m)	Location
1	*Quercus semecarpifolia* forest	*Quercus semecarpifolia, Abies spectabilis, Betula utilis, Lithocarpus pachyphylla*	2200 – 3000	Hangetham, Jamuna - Gairibas, Ramite, Jogmai
2	*Castanopsis tribuloides-C. hystrix forest*	*Castanopsis hystrix, C. tribuloides, Eurya accuminata, Quercus* sp.	1800 - 2200	Hangetham, Jamuna
3	*Quercus lamellosa* forest	*Quercus lamellosa, Q. semecarpifolia, Castanopsis tribuloides, Ilex dipyrena*	2000 - 2600	Gairibas khola, Jamuna
4	*Lithocarpus pachyphylla* forest	*Lithocarpus pachyphylla, Quercus semecarpifolia, Q. lamellosa, Litsea* sp., *Lyonia* sp., *Viburnum erubescens*	2400 - 2800	Phusrepokhari - Gupha - Goruaale, Chhintapu Maimajhuwa, Dobate Mabu, Hangetham Jamuna
5	Lower temperate mixed broad-leaved forest	*Machillus odoratissima, Lindera* sp., *Litsea* sp.	1500-2200	Dabale Deurali, Chintapu
6	Upper temperate mixed broad leaved forest	*Quercus semecarpifolia, Q. lamellosa, Symplocos lucida, Litsea* sp., *Acer* sp., *Lindera* sp., *Rhododendron arboreum, Vaccinium nummularia*	2400-3300	Hangetham Jamuna, Chandane, Mabu Manedhunga, Mabu
7	*Rhododendron* forest	*Rhododendron arboreum, Eurya accuminata, Daphniphyllum himalense, Acer* spp., *Lyonia* sp.	2300 - 2800	Goruaale, Dhupi, Chhintapu CF Maimajhuwa, Mabu, Gorkhepani, Memeng
8	*Rhododendron-Betula* forest	*R. arboreum, Betula utilis*	2300 - 3300	Tarsing, Sidin
9	*Abies spectabilis* forest	*Abies spectabilis, Betula utilis, Acer* sp. *Rhohendron barbatum, Daphne bholua*	3000 - 4000	Lampokhari, Maimajhuwa, Pasibhanjyang, Prangbung, Tarsing, Sidin, Pahare meghu, Falaincha
10	Moist alpine scrub	*Rhodendron lepidotum, Iris clarkei, R. anthopogon, R. setosum, Potentilla fructicosa, Primula* sp., *Juniperus recurva*	3000 - 4000	Bikhepani, Phalaut, Memeng, Dund, Pahare Meghu, Ghumne-Falaincha
11	Dry alpine scrub	*Rhodendron lepidotum, Rosa sericea, Rhododendron barbatum, Spirea arcuata, Berberis* sp., *Potentilla* sp.	3000 - 4500	Toriphule, Chyangthapu
12	Alpine meadows	*Rhododendron lepidotum, R. anthopogon, R. setosum, Sassurea* sp., *Rheum nobile, Potentilla* sp.	4000 - 5500	Timbing pophari, Ghumne,

3.1.4.2 Vegetation

Tree species *Lithocarpus pachyphylla, Magnolia campbelli, Symplocos lucida,* etc were dominant in the complex. The species *Taxus wallichiana, Michelia champaca* were rife in the area in last decades and they were heavily exploited respectively for commercial and domestic purposes. With exploring the anti-cancer potentiality of *Taxus*, most of the plant were defoliated and pruned. *Michelia champaca* is one of the most important timber species in household levels and it was irrationally lopped and felled. Because of the overexploitation, the species are scarce in the area and now local people considered the species in priority concerns. In high altitude areas, trees were stunted or sparse and scrub and shrub species: *Rhododendron anthopogon, Caragana* species, *Lonicera* species, etc. were luxuriantly flourished. *Saussurea gossipiphora* and *Rheum nobile* species were abundant in Timbu pokhari area and only above 4000m. Highly prioritized species *Nardostachys grandiflora* and *Neopicrorhiza scrophulariiflora*, etc. are also distributed in the area.

Table 6. Dominant tree species in terms of ecological importance value index

SN	Name of species	Average Density (pl/100m^2)	Average Frequency (%)	Average Basal Area (cm^2)	Average IVI
1.	*Lithocarpus pachyphylla* (Bante)	11.5	31.42	1357.4	94.99
2.	*Magnolia campbelli* (Ghonge champ)	23.99	24.48	619.4	79.39
3.	*Symplocus lucida* (Kholme)	17.0	31.98	365.46	59.71
4.	*Eurya acuminata* (Jhingane)	5.62	17.2	39.59	17.38
5.	*Rhododendron campanulatum* (Chimal)	8.11	7.49	74.2	12.4
6.	*Symplocus glomerata* (Kholme)	3.67	9.98	39.32	11.72
7.	*Acer caudatum* (Kukurpaile)	5.31	20.97	51.96	11.41
8.	*Neolitsea cuipala* (Belase)	2.61	12.26	14.56	10.16
9.	*Persea odoratissima* (Kaulo)	2.45	10.49	13.69	9.44
10.	*Daphniphyllum himalayense* (Chandan)	3.90	7.97	49.30	8.54
11.	*Rhododendron falconeri* (Thulo chimal)	5.00	7.97	26.58	7.57
12.	*Quercus lamellosa* (Bajrath)	1.29	8.73	40.44	7.18
13.	*Rhododendron arboreum* (Lali gurans)	2.52	7.73	15.66	6.73
14.	*Sorbus microphylla* (Pasi)	3.06	9.70	20.29	6.21
15.	*Lyonia ovalifolia* (Angeri)	2.81	10.95	17.96	6.21
16.	***Taxus wallichiana* (Lothsalla)**	**1.64**	**7.98**	**11.97**	**6.09**
17.	*Acer campbelli* (Charipaile)	1.86	11.19	29.23	6.01
18.	*Schefflera impressa* (Khanakpa)	0.07	0.75	0.02	5.4
19.	*Sorbus foliolosa* (Kata)	2.85	5.23	14.46	4.54
20.	***Michelia champaca* (Champ)**	**0.37**	**2.74**	**0.29**	**1.54**

3.1.4.3 Soil

Physicochemical properties of soil were studied. Soil samples from each semi permanent research plots were collected and studied. Soil pH and moisture data were recorded on spot by using pH meter. Rest parameters were analysed in CEMAT water lab, Baneswor, Kathmandu. The result showed that the sites were slightly acidic and sandy loam. The soil of the Ilam district possessed slightly higher alkaline property whereas the potassium content was much higher. There was slightly acidic soil in Panchthar district due to higher organic content. The organic matter was about 8 gm/100 gm in Panchthar district and about 7.5 gm in Ilam district.

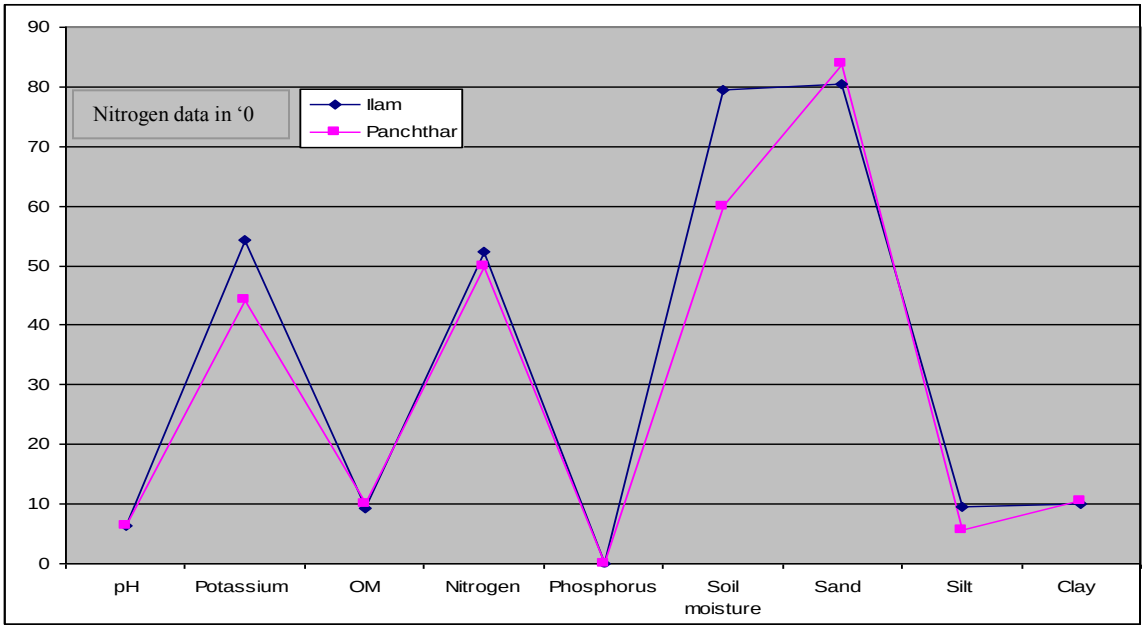


Figure 7. Soil properties of Ilam and Panchthar districts

Table 7. Physicochemical properties of Soil

		Ilam				**Panchthar**						
Parameters	Units	*IMa*	*IJa*	*IMm*	*IJo*	*PC*	*PS*	*PF*	*PM*	*PP*	Average	**Method**
pH		*6.35*	*6.42*	*6.72*	*6.27*	*6.22*	*6.51*	*6.30*	*6.34*	*6.37*	6.38	pH Meter
Potassium	Mg%	*41.8*	*32.7*	*18.5*	*124.2*	*17.0*	*28.5*	*47.8*	*61.3*	*67.1*	78.5	Extraction
OM	Gm%	*9.6*	*7.5*	*6.8*	*13.7*	*3.4*	*9.2*	*10.5*	*11.0*	*16.3*	9.77	Dicromate digestion
Nitrogen	Mg%	*523.9*	*498.2*	*511.4*	*562.6*	*205.9*	*589.9*	*572.0*	*213.0*	*916.0*	510.32	Kjeldahl digestion
Phosphorus	Mg%	< *0.01*	< *0.01*	< *0.01*	*0.01*	< *0.01*	< *0.01*	*0.03*	*0.02*	*0.01*	0.013	Extraction
Soil moisture	%	*85*	*75*	*78*	*80*	*86*	*73*	*89*	*68*	*69*	78.11	pH Meter
Soil texture												Hygrometric
Sand	%	*83*	*83*	*79*	*77*	*75*	*85*	*87*	*87*	*85*	82.33	
Silt	%	*7*	*7*	*11*	*13*	*13*	*6*	*3*	*2*	*4*	7.33	
Clay	%	*10*	*10*	*10*	*10*	*12*	*9*	*10*	*11*	*11*	10.11	
Soil type		*SL*	*SL*	*SL*	*SL*	*SL*	*LS*	*LS*	*LS*	*LS*		

3.2 Threats and Conservation Strategies

3.2.1 Direct threats and underlying threats

Direct and underlying threats to the plant species diversity were identified during informal meetings, consultations and group discussions with local communities. Ranking and scoring of the threats were made in village, district and national workshops. Based on the ranking, uncontrolled grazing and illegal collection and poaching were major threats. The site level threats were also analysed from the semi permanent plot records. Illegal logging, overgrazing and human wildlife conflicts were causing irreversible damage to the biodiversity. The threats were prominent in the biodiversity rich areas such as Chintapu, Timbung pokhari, Meghu, Mejartham, and Dabale-Deurali where the grazing, illegal collection and firing verged the species into endangered. Grazing and irrational exploitation were eminent throughout the area but some threats like tourism and unscientific plantations were site specific. Pilgrimage tourism was one of the most threats in Timbung pokhari, Panchthar because the pokhari was visited by about 2000-3000 pilgrims per year and every visitors collect *Saussurea* and *Rheum nobile* flower as sacred gift. When we were in Timbung pokhari area in 25th September, almost all the *Saussurea* and *Rheum* were nipped.

Table 8. Direct and underlying threats to the plant diversity of LKSR

SN	Threats	Ilam	Pancthar	Total score
1	Uncontrolled Grazing	***	***	***
2	Illegal collection and poaching	**	***	***
3	Lack of Awareness	**	***	***
4	Deforestation	**	***	***
5	Fire	**	**	**
6	Erosion and Landslide	**	**	**
7	Unscientific plantation	**	*	**
8	Open border	*	**	**
9	Forest Encroachment	*	**	**
10	Tourism		*	*

Impact * = low, ** = moderate, *** = high

3.2.2 Policy gaps related to plant conservation

Present study followed rapid appraisal, semi permanent research plot assessment, ecological analysis, GIS analysis and disturbance gradient analysis and identified the current conservation status of the species and their habitats. Based on the status, *Taxus wallichiana, Nardostachys grandiflora, Neopicrorhiza scrophulariiflora, Swertia chirayita, Aconitum spicatum* and *Michelia champaca* species were identified as most

important species for conservation in lower Kanchenjungha Singhalila Ridge, east Nepal. The species were prioritized in terms of sustainable biodiversity conservation and livelihood. According to the threat category, table 9 shows the highly threatened plant species of the lower Kanchenjungha Singhalila Ridge. The species are categorized as threatened by IUCN, CITES and government of Nepal. Despite the richness of plant species particularly the threatened ones in Eastern Himalayas, the species were less emphasized by CEPF. The conservation protocol of CEPF ecosystem profile addresses only the six species (four from Jungermanials and two from angiosperms (*Dalbergia latifolia* and *Ulmus wallichiana*)) for conservation for Nepal which is inadequate and the presence/abundance of species is skeptical. The information generated in this report could be supportive in revising the list of plant species outcome and investment priorities.

Table 9. Highly Threatened Plants in Lower Kanchenjungha Singhalila Ridge

SN	Status	Family	Species Name with threatened category	Alt. (m)	Locality
1	Threatened	Dioscoreaceae	*Dioscorea deltoidea* (IUCN - CT, CITES – II,)	3820	Falaincha, Betini, Panchthar
2	Threatened	Dioscoreaceae	*Dioscorea prazeri* (IUCN - CT, CITES – II,)	1570	Falaincha, Betini, Panchthar
3	Threatened	Magnoliaceae	*Magnolia campbelli* (IUCN – R, CITES II)	2005	Faleke-Betini, Falaincha-9, Panchthar
4	Threatened	Magnoliaceae	*Magnolia globosa* (IUCN – R, CITES - II)	2040	Maimajuwa 7, Naule Gaun, Ilam
5	Threatened	Magnoliaceae	*Michelia champaca* (IUCN – E, CITES II, GoN - III)	2040	Maimajuwa 7, Naule Gaun, Ilam
6	Threatened	Valerianaceae	*Nardostachys grandiflora* (IUCN – V, CITES - II)	3930	Paharemeghu, Falaincha-9, Panchthar
7	Threatened	Scrophulariaceae	*Neopicrorhiza scrophulariiflora* (IUCN – V, CITES – II, GoN - I)	4335	Timbu pokhari, Falaincha-9, Panchthar
8	Threatened	Taxaceae	*Taxus wallichiana* (IUCN – V, CITES – II, GoN - II)	2702	Dabale Deurali, Panchthar
9	Threatened	Pinaceae	*Abies spectabilis* (IUCN – V, GoN - II)	3185	Maimajuwa, Dhupi, Ilam

Ecological assessment of the prioritized and other associated species is given in Annex 9. The prioritized species particularly *Michelia champaca* and *Taxus wallichiana* were least abundant and heavily threatened due to overexploitation whereas the dominance of *Magnolia campbelli* was adequate. Table 8 depicts the ecological importance of tree species of the area. The result shows that *Lithocarpus pachyhylla, Magnolia campbelli, Symplocos lucida, Rhododendron campanulatum, Eurya accuminata,* etc. were luxuriantly dominating in the area with possessing highest ecological importance value. Stand density was highest for *Magnolia campbelli* (2399 individuals per hectare) whereas prioritized tree species *Taxus* and *Michelia* were less than 200 individuals per hectare.

The foremost importance to the plant diversity conservation is plant species databases of the area. Yet, there was no any databases based on the scientific findings. The complete databases, inventory and threat and conservation assessment reports aid on conservation. Conservation assessment evaluates the conservation status of the species and prioritizes for conservation. There were no any site level data or reports of conservation priority of the plant species diversity. However, the conservation status/update of the species and habitats is specific for Eastern Himalaya (Kanchenjungha Singhalila Ridge), it is supplement to the national biodiversity conservation data matrix.

There were some policy gaps in marketing of the forest products. Government of Nepal charges government royalty on forest products. But some of the forest species/products are now grown in homestead areas or farmlands by local people. *Swertia chirayita* and *Aconitum spicatum* are cultivated commercially in homestead areas of some areas of Ilam district, but the district forest office imposes tax to such cultivated products too. There is no customary rule on paying tax on agricultural products but District Forest Offices are reluctant in waiving the taxes for such products. Incentives on cultivation of NTFPs in farmlands (ex-situ conservation measures) for farmers are completely meager. Because of such controversies and inadequacies, local people were harassed and did not motivate to the cultivation and extensive farming of medicinal and aromatic plants in their farmlands. Clear policy on taxation system for forest products and agricultural products conduits local people on biodiversity conservation and commercial cultivation, which, ultimately promotes plant species diversity in natural stands.

3.2.3 Conservation strategies of key plant species and habitats

3.2.3.1 Local community level conservation strategies

Two village level conservation strategic workshops were conducted on 7th August 2007 in Hangetham, Jamuna, Ilam and on 4th October 2007 in Prangbung bazaar, Prangbung, Panchthar for formulating village level conservation strategies. Draft of 20 plant species and twelve sites of the area with major threats for conservation were obtained from consultations, meetings and group discussions with local people, school teachers, students, herders, farmers, and NTFP collectors, forest rangers, etc. Top 13 plant species along with their score is given in Figure 8. Based on the prioritized plant species and habitats and threats; local people, workshop participants and respondents were asked to develop respective conservation strategies for selected species and habitats. The strategies were identified at multiple scales representing users groups, species, time frame and district. Immediate, mild and long term strategies were identified as short, mid and long term strategies and each strategy were directed with each conservation prioritized species. There were five short term strategies, ten mid term strategies and nine long term strategies for sustainable conservation of species and the area (Annex 10).

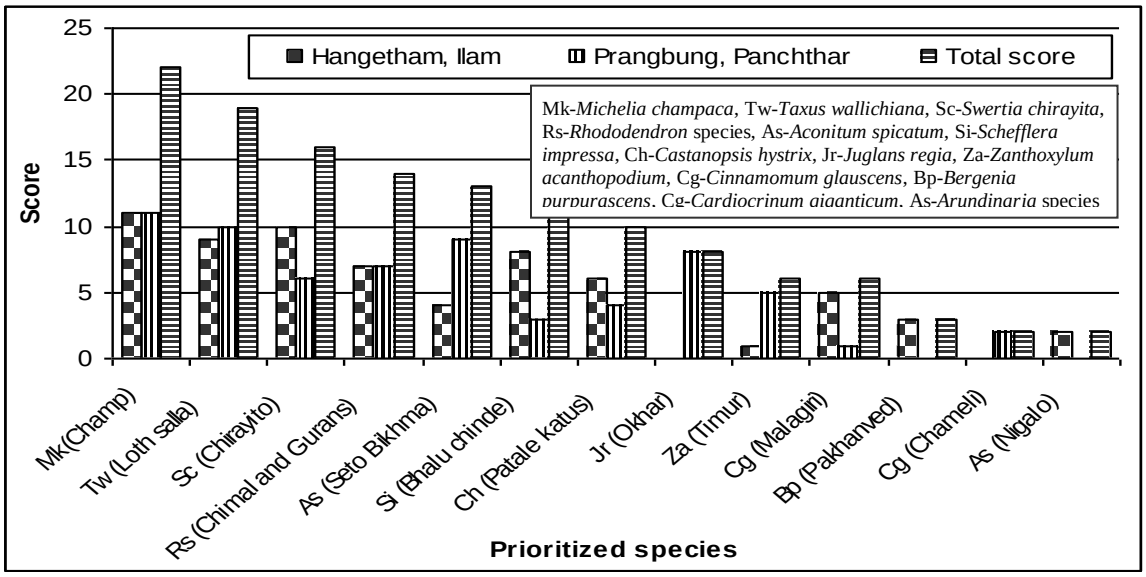


Figure 8. Prioritized species based on village level workshops at Ilam and Panchthar

3.2.3.2 District level conservation strategies

District level workshops worked out on draft list of village workshops and the findings of the district workshop tabled on national plant experts consultation workshop in Kathmandu. All the consultations, workshops, discussions, meetings, interactions, etc. helped on development of final level conservation strategies and sub-strategies. Field level data, GIS data, and analysis verified and critically analysed the strategies and final 13 conservation strategies with 51 recommended activities (sub-strategies) were proposed. Detail of the strategies, species, habitats and threats of each village, district, and consultation workshops were given in Annex 10.

Table 10. Existing and potential threats identified during district workshops and strategic programs suggested to overtop the threats

SN	Threats	Score	Strategies
1	Grazing	18	Controlled grazing
2	Public awareness	16	Capacity building trainings for the locals, Forestation
3	Illegal collection, poaching and illicit collection	14	Awareness raising trainings, control of illegal collection and poaching
4	Fire	12	Regulated tourism
5	Uncontrolled deforestation	10	Control deforestation, Minimize the dependency of local people on forest and provide alternative source of income
6	Soil erosion and landslide	8	Control illegal collection and harvesting of resources from forest especially medicinal plants
7	Deforestation	6	Community forest border delineation
8	Kipat system of Land Management	4	Scientific plantation
9	Unscientific plantation	3	Scientific plantation, local awareness
10	Open border	3	Resolve the trans-boundary conflicts
11	Forest encroachment	2	Explore land management option
12	Weak policies	1	Awareness programs to control fire in dry season

3.2.3.3 Expert level conservation strategies

In expert consultation workshop, experts were divided into two groups (Ilam and Panchthar district groups) based on their field experiences and they were asked to prioritize the particular sites of the complex for conservation. According to their suggestion and priority score, three important sites from each district: Hangetham (Jamuna VDC), Kala pokhari (Mabu VDC), Chintapu (Mai majhuwa VDC) from Ilam district, and Timbu Pokhari (Failaincha VDC), Lam-pokhari – Suke pokhari (Chyangthapu VDC), Sidin-Kanya Devi community forest (Sidin VDC) from Panchthar district were identified as important.

Table 11. Top priority sites and scores provided by consultation workshop participants

SN	Priority sites of Panchthar district	Priority sites of Panchthar district
1	Timbu pokhari (Falaincha VDC) (15)	Hangetham (Jamuna VDC) (20)
2	Lam pokhari-Suke Pokhari-Ose (Chyangthapu VDC) (13)	Kala pokhari (Mabu VDC) (15)
3	Bhaise pokhari-Jaljale-Surketham(Memeng VDC) (9)	Chintapu (Mai majhuwa VDC) (13)
4	Narelung-Thaplu (Prangbung VDC) (9)	Sandakphu (Mai majhuwa VDC) (12)
5	Sidin Kanya Devi Community forest (Sidin VDC) (7)	Dhupi- Guranse (Mai Majhuwa) (9)
6	Mejartham-Chiwabhanjyang (Chyangthapu VDC) (7)	Tumling (Jogmai VDC) (6)
7	Tinsimana-Gorkhepani-Fokte (Memeng VDC) (6)	Todke Jharana (Mai majhuwa VDC) (3)

The major output of the national workshop (expert consultation) was to identify the conservation strategies to conserve the threatened species and habitats in the Kanchenjunga-Singhalila Ridge. Some important conservation strategies identified which would be carried through short-term, mid-term and long term implementation are as follows,

- Further research and developments should be carried out regarding ecology and inventory of prioritized species
- Develop and implement awareness and capacity building programs for cattle herders, community forest users focusing on sustainable harvesting of plant resources.
- Explore management options for *in situ* conservation (Natural site conservation) and promote *ex situ* conservation

Fifteen plant species and 13 threats were prioritized in consultation workshop. Six species, *Michelia* species (Magnoliaceae) Champ; *Taxus wallichiana* (Taxaceae) Loth salla; *Neopicrorhiza scrophulariiflora* (Scrophulariaceae) Kutki; *Nardostachys grandiflora* (Valerianaceae) Jatamasi; *Swertia chirayita* (Gentianaceae) Chiraito; and *Aconitum ferox, A. spicatum* (Ranunculaceae) Bikhma/Kalo bikhma were identified as priority species for Ilam and Panchthar districts for conservation. The discussion for the identification of important sites for both the districts was based on the species richness, abundance of prioritized species, sites' socio-culturally importance and peoples' livelihood.

3.2.3.4 Final level conservation strategies

Participatory planning with the help of local people for area specific development and provisions for economic incentives to them seems to be a promising effort for conservation of the valuable plant resources. Participatory planning, capacity building and awareness raising, controlled grazing, in-situ conservation, and more research and development strategies were accentuated as immediate strategies whereas project leveraging, advocacy, monitoring, institution building, etc, were valued as long term strategies. The strategies were individually prioritized for prioritized species and they were on the basis of village and district level information. Most of the information validated with plant experts suggestions were verified and accommodated in final strategies.

Thirteen major conservation strategies were identified in workshop discussions which would be operated through short-term, mid-term and long term implementation strategies. Among the thirteen, the following three are major strategies: 1) further research and developments should be carried out regarding ecology and inventory of prioritized species; 2) develop and implement awareness and capacity building programs for cattle herders, community forest users focusing on sustainable harvesting of plant resources and 3) explore management options for in situ conservation (Natural site conservation) and promote ex situ conservation. Participatory planning, awareness raising, research and inventory and databases management strategies, etc. were also highly prioritized (Table 12) (Annex 11).

Species specific conservation strategies (Annex 12) showed that *Taxus wallichiana* found to have the highest priority score and it was highly prioritized to conserve through almost all strategies (41 out of 51 sub-strategies). *Swertia chirayita* revealed the second most importance for conservation with possessing 40 sub-strategies and it was followed by *Aconitum spicatum* with 37 sub-strategies. Analysis showed that the species that can be conserved through ex-situ conservation practices were ranked foremost because the local people were interested in both income generating and biodiversity conservation species. Ex-situ conservation practices were impertinent to the high altitude medicinal herbs such as Jatamansi and Kutki because both the species are habitat specific. There are some ex-situ conservation measures of these two species but the quality of cultured species is skeptical. Market related strategies were likely to be futile to the species like *Michelia* and *Magnolia* and Kutki because of their low production scale and low market potentiality. Conservation and wise use were themes of each strategy. Strategies were pertinent to both biodiversity conservation and sustainable livelihoods. The stated strategies and sub-strategies were interrelating each other and each compliment to both livelihood and biodiversity conservation.

Table 12. Final level prioritized conservation strategies

S.N.	Strategies	ST	MT	LT	S	M	T	K	J	A
1	Bottom-up approach planning	√	√	√	3	3	3	3	3	3
2	Awareness /capacity building programs for cattle herders/community forest users focusing on sustainable harvesting	√	√		2	2	2	2	2	2
3	Controlled grazing and resource management	√	√		1	1	2	2	2	2
4	*In- situ* conservation (Natural site conservation)	√	√		8	8	8	8	7	7
5	*Ex situ* conservation		√		5	5	5	1	1	5
6	Livelihood upliftment		√	√	1	0	1	0	1	1
7	Research & Development	√	√	√	4	4	4	4	4	4
8	Introduction/promotion of alternative energy technology		√	√	0	2	2	0	0	0
9	Institution building, networking, coordination, cooperation and mobilization		√	√	6	6	6	5	5	5
10	Market linkage and entrepreneurship		√	√	4	0	3	0	3	3
11	Community based participatory biodiversity monitoring			√	1	1	1	1	1	1
12	Policy enactment, revision and advocacy			√	2	1	1	1	0	1
13	Project leveraging and post management			√	3	3	3	3	3	3
	Total priority score	**5**	**10**	**9**	**40**	**36**	**41**	**30**	**32**	**37**

ST = Short term, MT = Mid term, LT = Long term, S = *Swertia chirayita*, M = *Michelia* and *Magnolia* spp., T = *Taxus wallichiana*, K = Kutki (*Neopicrorhiza scrophulariiflora*), J = Jatamansi (*Nardostachys grandiflora*), A = *Aconitum spicatum.*
Priority score based on sub-strategies given in Annex 11.

3.3 Advocacy and Capacity Building

3.3.1 Awareness and promotional activities

Pioneering from project implementation, two local collaborators were identified. One social mobilizer from each organization was selected and trained throughout field period and even in Kathmandu. The social mobilizers were from project VDCs. Two MSc students from Central Department of Botany, Tribhuvan University were selected based on their merit and trained them in field and Kathmandu. There were series of formal and informal consultations with local people and knowledge of resource management was shared.

Two formal programs *plant biodiversity management training and conservation workshops* in each district (8th August 2007 in Hangetham, Jamuna Ilam and 4th October, 2007 in Prangbung bazaar, Prangbung, Panchthar) were organized. About 130 participants including local people, forest users, cow/sheep herders, NTFP collectors, participants from government and non government line agencies, universities, community based organizations were trained. There were village, district and national level programs for different stakeholders. The training materials were in both Nepali and English languages and in pictorial format (Annex 13).

Taxonomic, ecologic and management interventions were taught in training programs by utilizing resource persons of ESON itself, CEPF grantee and district forest offices. District forest officers trained them about the inventory, sustainable forest management interventions and renewal and implementation procedure of operational plan. Role of institutions, networking, livelihood issues were addressed by CEPF grantee and ESON delivered the taxonomic and ecological paradigm and interpreted the paragon of success. Trainings, workshops, and other formal and informal consultations with local communities made them aware on conservation status and value of individual plant species and their communities and their association. Local communities are now capable on identifying potential and underlying threats of the particular species and they are in a stage of formulating utmost conservation strategies and their implementation procedures. Integrity and sustainability of the species and habitats were considered as foremost in formulating strategies, however the economic/commercial motive was manifested.

Knowledge of identifying rare and threatened species based on their ecological characteristics has been upgraded. Idea of criteria and indicators of sustainability and plant species population maintenance has been gained. Because of the knowledge acquired from the consultations, two community forest user groups approached ESON for better management of their community forests through updating their community forest operational plan and incorporating scientific conservation strategies for high value economic plants, rare plants and threatened plants. They urged on conservation of *Michelia champaca, Taxus wallichiana, Swertia chirayita,* and *Aconitum spicatum* most. Because, the former two species were heavily assaulted and now their distribution is sporadic and latter two were economically important species. The knowledge of local collaborators has been augmented as a result of capacity building and orientation activities. They are mow more knowledgeable on sustainable management of local plant resources and their knowledge particularly on identifying the important plant species and their habitats. As a result, local collaborators were capable on technical proposal writing and application. The proposal of DJYC, Panchthar was short listed in the Nepal Development Market, World Bank funded proposal call. Letter of Inquiry of DJYC merited the CEPF first round securitization.

3.3.2 Local communities commitments

Because of the diversity and richness of the plant species in the Lower Kanchenjungha Singhalila Ridge (LKSR), various organizations have been working in the area. ICIMOD, TMI, WWF Nepal, ESON, ECCA, etc and other district level conservation organizations are working particularly on plant species conservation. Local people and institutions have been complied to do more conservation and protection of important species, as a result of government and non government organizations active role in the area. Government organizations especially the District Forest Office have coordinated all stakeholders in management of biodiversity and plant species of forest lands. District forest office handover the forest lands to the local communities for better management under customary rules and community forest operational plan and constitution.

Community forest user groups have committed and prepared documents to implement the conservation activities of key plant species and their habitats. Technical and financial supports were provided to them by ESON and they have prepared community forest operational plans with notifying important species and sites for conservation (Annex 14). Kanya Devi Community Forest from Sidin Panchthar and Mahadev Kange Community Forest User Group from Jogmai, Ilam revised their operational plan in accordance with the idea and knowledge of the threatened and priority plant species and technical support from forest rangers. The operational plans have separately analysed the timber and non-timber species and made strategic plan accordingly.

Participatory monitoring of the important plant species and the habitats was defined and strategic plans to conserve the species and sustainable use of the resources was clearly valued in operational plans. Total plant species of the area with accounting current conservation status and indigenous uses were noted in operational plans. The habit of each species has also been noted. The species specific conservation strategies which were proposed by ESON were also accommodated in renewed operational plans with emphasizing on implementation. Total 15 species were prioritized for conservation in Kanya Devi Community Forest, Sidin, Panchthar and 13 in Mahadev Kange community forest, Jogmai, Ilam.

3.3.3 Motivations and implementations

All these programs including frequent visits of social mobilizers in sites, literatures and publications in media, and networking meetings helped to create more awareness on local people and enhanced their understanding of plant biodiversity. Networking within the CEPF grantee and coordination committee was instrumental to learn the feedback of the project and local people. District level advisory board was set up and it guided all grantee for proper implementation of project and corrected the duplication of project components.

Local people are knowledgeable on conservation status of plant species and appropriate management strategies. They have idea of selecting priority species and sites following holistic and integrated conservation module. Local people have managed some sites for conservation of unique and archaic species. New white flowered *Rhododendron* conservation site was managed in Dhupi at the border of Sidin and Maimajhuwa VDCs. Some other sites have also been managed by local people in sites for protection of important species with the help of TMI, Nepal.

The updated/renewed community forests (Kanya Devi of Sidin and Mahadev Kange of Jogmai), each contains two permanent plots, are monitored by the user groups of the same forest. Their updated operational plans also guide them for sustainable utilization of the resources of their forest and conserve sustainably. Rest other 14 permanent plots are monitored by village biodiversity conservation committees (VBCC). The committees were set up by Ilam Cooperation Council and equipped by ESON and ICC.

3.3.4 Project leveraging

As guided by the conservation strategies of the project, follow up species specific projects were proposed. Similar kind of project was also proposed in western Terai, Nepal. Similar project is being run in Langtang National Park, Central Nepal with the support from Plantlife International. Five most important medicinal plant species, habitats, and their conservation through participatory methods and monitoring through local collaborators are implementing paradigms of the project. Another medicinal and aromatic plant conservation project is being run by ESON and ICIMOD (financial support from International Center of Integrated Mountain Development) with incorporating participatory and scientific management strategies of medicinal and aromatic plant resources. The ecological and GPS data of each species and habitat of the projects are useful in geo-referencing project.

Local collaborating partners were guided and equipped for post project management activities. One of the collaborators of ESON for CEPF project, Deep Jyoti Youth Club (DJYC), Panchthar has been supported and promoted to develop a follow up project with emphasis of implementation of the recommendations of ESON. DJYC has prepared and proposed a project/proposal for CEPF core grant, as a result. The proposal project "Conservation of key plant species and their habitats in Kanchenjungha Singhalila Complex for livelihood improvement" is in line of ESON recommendation. The technical and other requisite supports have been provided to them to access the CEPF proposal program. ESON has involved in the proposal development and some research staffs will be involved for overall guidance, monitoring and implementation. In particular, the staffs will take care on technical/research aspects of the project. SHAHGG, Ilam has also proposed a follow up project for GEF/UNDP with aiming to address the recommendations of ESON.

3.3.5 Publications and Dissemination

As one of the implementation strategy of the project of ESON, publication and prompt dispatch and dissemination of findings have been accomplished. Publication of ESON and other plant diversity related materials were distributed to District forest offices, collaborating partner organizations, and CEPF grantees. Project findings were periodically submitted/disseminated in grantee meetings, mid term evaluation meetings and monthly reports and quarterly reports. Monthly reports were reported to WWW Nepal and quarterly reports submitted to CEPF. Workshops and meetings were organized to public the findings of the project (Annex 10).

Press conferences, informal consultations, group discussions were remained substantial in circulating and disseminating the results. Brochures and newsletters were provided to all project related institutions, individuals and stakeholders. Feature articles, journal articles and news were published and disseminated. Publications helped in increasing awareness and understanding of plant diversity and management of local people (Annex 15). ESON website has been made public and all findings and glance of the project has been given in web pages.

Following links were important for us for making our findings public and open access.

1. *CEPF Eastern Himalayas Bulletin* Dec 10, 2007 www.cepf.net;
2. *Nepali Times News* January 05, 2008. www.nepalitimes.com;
3. *Nepal Journal of Plant Science* Volume 2: 62-68.
4. *www.eson.org.np* (updated in June 2008).

3.4 Constraints

Poaching, trapping, hunting and irrational exploitation were accounts due to free access, low level of community conservation awareness and absence of government inferences. The absence of security services in fact a government, along the Nepal's side has made the place an easy and lucrative play ground for poachers and let them pursue in their illicit business. The traditional forest and land use system viz. KIPAT is also a great challenge for conservation initiatives and need to be studied and addressed properly. To overcome the impediment, local social mobilizers were mobilized to facilitate the situation. Many community consultations were made for making them aware about the project and conservation and management of plant species.

Conservation initiatives and measures were less effective due to trans-boundary conflict. Decade long political conflict over the resource utilization aggravated the resource management capacity of indigenous community and institutions. Community forest user groups were affected particularly. Plant biodiversity management trainings and consultation workshops were organized to enhance the understanding and capacity of local people on management. Financial and technical supports were delivered to some CFUGs to strengthen and equip the forest management interventions.

CHAPTER FOUR

4. EXECUTIVE SUMMARY

The project is multitudinous in terms of stakeholders and management. It incorporated local community, district level line agencies and management and research institutes. Participatory and active involvement of community level organizations and individuals bolstered the further initiatives and follow up activities in the sites. The community level organizations: collaborative partners were well supported to follow up the management activities of the prioritized species and habitats. The organizations were equipped and strengthened for follow up project execution and new project scoping. Village level institutions were supported financially and technically for building their capacity of proposal management and project execution. Collaborative partner Deep Jyoti Youth Club, Panchthar has been regularly guided for project liaison and leveraging.

The area is a repository of biological resources specifically plant biodiversity along with diversity with respect to culture and indigenous knowledge. Some places viz. Timbu Pokhari area, Chhintapu, Hangetham areas are exceptionally rich in rare, endangered, endemic and archaic floral species. These fragile areas are placed under added stress by anthropogenic activities importantly intense grazing by large herds of domestic livestock. Rampant collection and unsustainable harvesting of forest products including timber and non-timber forest products (NTFPs) were the chronic threats that contribute to exacerbate these sensitive ecosystems.

Sacred Timbu Pokhari area is most prioritized hotspot being it a suitable habitat of endangered species viz. *Saussurea* species, *Rheum nobile, Neopicrorhiza scrophulariiflora,* etc. In addition to pervasive grazing and illegal collection of natural resources, it is being ameliorated from seasonal pilgrimages arrival. The area is heavily doused and strong wind is common at the site and the scheduled expeditions were altered as a result.

On the flip side, civil societies particularly the community forest user groups and some community based organizations have convincingly rich knowledge in biodiversity, conservation and hotspots (important plant areas) and they have successfully managed some sites enriched with medicinal and archaic plant species. It is recognizable that some sites preserved for medicinal plants were mechanically fenced and protected from grazing and other anthropogenic disturbances.

A total of 13 new records, 22 threatened and two endemic species were reported from the area. Because of the richness and diversity of the plant species and critical habitats in the area, the area is important in terms of sustainable management. In order to preserve the endangered species in the area, species, habitat and temporal strategies were developed. Six species *Michelia* species (Magnoliaceae) Champ; *Taxus wallichiana* (Taxaceae) Loth salla; *Neopicrorhiza scrophulariiflora* (Scrophulariaceae) Kutki; *Nardostachys grandiflora* (Valerianaceae) Jatamansi; *Swertia chirayita* (Gentianaceae) Chiraito; and *Aconitum ferox, A. spicatum* (Ranunculaceae) Bikhma/Kalo bikhma were highly prioritized for immediate conservation through series of workshops, consultation and meetings with local level communities to national level experts. In general, 13 strategies with 51 activities were proposed for sustainable management.

Coordination among grantees and stakeholders aided on effective management and implementation of the project activities in sites. Moreover, the multidisciplinary project of the grantees promoted the livelihood of the local people and sustainability of ecosystems. The needs of the locals must be addressed thereby respecting traditional rights over resources and resource use system. To guarantee their success, long term impact-oriented inclusive programs should be lunched in comprehensive and coordinated fashion. Local people must be harmonized to start the conservation initiatives and most importantly for their sustainability in long run. Plant life international, UK and Royal Botanic Garden Edinburgh, UK are approached for collaborative projects for the management of threatened species and upliftment of local livelihood. Collaborators have been supported and promoted in follow up for addressing and implementing the recommendations of ESON.

Knowledge of local communities on identifying rare and threatened species based on their ecological characteristics and idea of criteria, indicators and prompt measures of sustainability and plant species population maintenance has been gained. The species like *Taxus wallichiana, Michelia champaca, Swertia chirayita, Aconitum spicatum* and potential habitats such as Timbu pokhari, Hangetham, Chhintapu, Lam pokhari, and Suke pokhari are emphasized for immediate conservation and the special conservation measures are adopted. Both the conservation and wise use measures are incorporated in community forest user groups operational plans and are implemented through forest user groups and village level biodiversity conservation committees. Local collaborators have been approaching funding agencies for conserving the prioritized species and areas.

Follow up conservation projects and initiatives from local organizations, monitor by social mobilizers, village level biodiversity conservation committees, district biodiversity advisory board and from ESON help to compliment the CEPF outcomes. To promote in sustainable plant resource conservation and livelihood improvement, long term and species specific inclusive participatory projects should be lunched in comprehensive and coordinated fashion. Strengthening the capacity of existing institutions on conservation and management regimes and promoting them in pursuing and implementing the recommendations of ESON would be worthwhile for sustainable plant diversity conservation and livelihood improvement of the area.

CHAPTER FIVE

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Annex 1.1 Itinerary- Lower Kangchenjunga Shinghalila Ridge Expedition (Ist Phase) June 4-24, 2007

Date	Destination and activities
Monday 04/06/2007 (21/02/064)	Kathmandu - **Ilam** Travel from Kathmandu to Ilam for Ist field expedition.
Tuesday 05/06/2007 (22/02/064)	**Ilam** Participatory mapping, trail fixing and orientation to social mobilizers. Field preparation and shopping for field.
Wednesday 06/06/2007 (23/02/064)	Ilam - Maipokhari - Hatiya, **Maimajhuwa** Field preparation. Field visit, lodged at Hatiya, Maimajhuwa.
Thursday 07/06/2007 (24/02/064)	Hatiya - Naule gaun - Sallaghari - Phusrepokhari - Gupha - Goruaale - Banduke, **Maimajhuwa** Research team was divided into two teams and each team was headed by Dr. Krishna K Shrestha and Mr. Ram C Paudel. Collection and specimen management was started there after.
Friday 08/06/2007 (25/02/064)	Banduke - Bharlang - Harkatte - Lampokhari - Dhupi, **Maimajhuwa** Thorough collection was made. Ecological study was started. First ecological sampling study was done in Kanya devi community forest, Goruaale, Sidin. Each ecological study was proceeded by quadrat laying, soil sample collection, and ecological data collection. The site was heterogeneous in species composition and it was composed by lopped and pruned *Taxus wallichiana*, *Magnolia campbelli*, *Daphniphyllum* species and *Rhododendron* species. The specimens of the *Rhododendron grande* and R. *pendulum* were observed and collected on the site. *Berberis hookeri* was associated with Viburnum species.
Saturday 09/06/2007 (26/02/064)	Dhupi - Tarsing - Aahale bhanjyang - Ghale bhanjyang - Chandu, **Prangbung** Plant specimen collection and management continued. Second ecological sampling study was done in Kanya devi community forest, Tarsing, Sidin. The site was dominated by Rhododendron cinnabarinum, Abies spectabilis, Rhododendron arboreum and Betula utilis.
Sunday 10/06/2007 (27/02/064)	Chandu - Surketham - Charrate - Thokam - Pasi bhanjyang, **Prangbung** Third ecological sampling study was done in Charrate, Prangbung. Species Rhododendron grande, R. cinnabarinum, B utilis and A spectabilis were dominant in the site.
Monday 11/06/2007 (28/02/064)	Pasi bhanjyang - Nepal tar - Bikhe pani - Ghyang - Ghamaile - Gorkhepani, **Memeng** Fourth ecological sampling study was done in Pasi bhanjyang. Rhododendron arboreum and Abies spectabilis were dominant. Acer species, Berberis angulosa and B aristata were associated to the site. Nepal tar to Gorkhepani, high altitude site was highly dominated by Iris species.

Tuesday 12/06/2007 (29/02/064)	Gorkhepani - Phaloate - Bhirkuna - Dhupi pakha - Tinsimana (Sikkim, Shinghalila, Nepal), **Memeng** Fifth and sixth quadrats were laid in Gorkhepani, Memeng. Rhododendron arboreum was dominant in Gorkhepani. Meconopsis paniculata and Maharanga emodi were common herbs of the site.
Wednesday 13/06/2007 (30/02/064)	Gorkhepani - Ghamaile - Jhyang - Bikhepani - Nepal tar - Pasi banjyang - Thokam - Charrate - Surketham - Chandu - Ghale bhanjyang - Aahale bhanjyang, **Sidin**
Thursday 14/06/2007 (31/02/064)	Aahale bhanjyang - Sandakphur - Chatubari - Bikhe bhanjyang - Mai khola - Chauri chok - Kalapokhari, **Mabu**
Friday 15/06/2007 (01/03/064)	Kalapokhari - Chauri chok - Bikhe bhanjyang - Cher chere - Mai khola - Hak pare - Kalapokhari, **Mabu** Seventh and eighth quadrats were laid in Hakpare dhunga, Maimajhuwa. The site was homogenously dominant by R arboreum. Kala pokhari - Bikhe bhanjyang site was homogenously dominated by Daphne bholua shrub.
Saturday 16/06/2007 (02/03/064)	Kala pokhari - Mane dhunga - Chandane - Kaiya katta - Hangetham, **Jamuna** Ninth and tenth quadrats were laid respectively in Manedhunga and Chandane, Mabu. The sites were dominated by Quercus species, Castanopsis species and Daphniphyllum species. The sites were enriched with Paris polyphylla, Panax pseudo-ginseng, Rubia manjith, Zanthoxulum armatum, etc. Chandane - Kaiya katta site was dominated by Arundinaria species.
Sunday 17/06/2007 (03/03/064)	Hangetham - Gairibas - Jaubari, **Jamuna** 11th quadrat was laid in Hangetham community forests, Gairibas khola, Jamuna. Quercus species, Castanopsis hystrix, Eurya acuminata, Litsea cubeba, Michelia kisopa and Calicarpa arborea were dominant in the site. The community forest was also enriched with Quercus lamellosa and Acer species. Astilbe rivularis, Dichroa febrifuga, Polygonatum oppositifolia, etc were also common understorey species.
Monday 18/06/2007 (04/03/064)	Jaubari - Nagi - Bikas - Aahale - Ramite - Jogmai, **Jogmai** 12th quadrat`laying was done in Choya tar, Jamuna. The quadrat was laid in Choya tar community forest, Jamuna. The Choya tar CF was dominated by Castanopsis hystrix and Quercus species. Mahonia nepaulensis, Daphne bholua and Ligustrum species were common in the site. 13th and 14th quadrats were laid in Rato Pani community forest, Jogmai. The site was dominated by Acer species, Quercus species and Castanopsis hystrix. Persea species and Eurya accuminata were also associated to the site.
Tuesday 19/06/2007 (05/03/064)	Jogmai - Nayabazar - Fikkal - **Ilam** Jogmai - Nayabazar on foot Nayabazar - Fikkal - Ilam by Jeep.

Wednesday 20/06/2007 (06/03/064)	Fikkal - Kathmandu (KH, JP, NBK and kitchen staffs returned to Kathmandu). Ilam - Biblayte - **Ilam** Stationaries, literatures, and burnt parts were collected.
Thursday 21/06/2007 (07/03/064)	**Ilam** Stakeholder meeting was taken place. It was organized by ICC and all five CEPF grantees and DFO were participated. Focal point members of each organization were selected. District level advisory committee was formulated with the patronage of district forest office, Ilam. Similar meeting will be organized by BCN and ESON in Phidim, Panchthar. Press conference was organized.
Friday 22/06/2007 (08/03/064)	Ilam TOR of the respective collaborating organizations was finaled in Nepali language and agreement was made with SHAHGG. NRs. 15000/ was released as advance to president, Nar B Burja Thapa Magar, SHAHGG.
Saturday 23/06/2007 (09/03/064)	Ilam - Kathmandu RCP returned Kathmandu.
Sunday 24/06/2007 (10/04/064)	Ilam - Kathmandu

Expedition team members

1. K K Shrestha (Project leader)

2. R M Kunwar (Project member, ecologist)

3. R C Paudel (Project member, ethnobotanist/sociologist)

4. S R Rajbhandary (Independent Researcher/ PhD scholar, PhD on Bigonia species)

5. B Adhikari (Independent Researcher/PhD scholar, PhD on Berberis species)

6. K Humagain (Research assistant)

7. J Panday (M Sc student, TU)

8. N B Khatri Chhetri, (MSc student, TU)

9. Y R Poudel, Social mobilizer, SHAHGG, Ilam

10. R K Rai, Social mobilizer, DJYC, Panchthar

Annex 1.3 Itinerary- Lower Kangchenjunga Shinghalila Ridge Expedition (2nd phase) Sept 16 – October 8, 2007

Date AD	Day	Place			Activities and location	Remarks
16 September 30 Bhadra 2064	25	Ilam - Fikkal - Pashupati Nagar - Manebhanjyang, **India**			Hire vehicle	
17 Sept 2007 31 Bhadra 2064	26	Manebhanjyang - Lamidhura - Meghma - Tumling - Sandakfu - Gairibas - Kalapokhari - Pasibhanjyang - Falaut, **Memeng**			Field visit	
		Tumling	27 01 52.5 88 04 05.7	2893		
		Kalapokhari	27 04 49.2 88 01 02.5	3024		
18 Sept 2007 1 Asoj 2064	27	Falaut - Toriphule - Kalijhar - Chiwabhanjyang, **Chyangthapu**				
		Falaut	27 12 26.4 88 00 57.5	3484		
19 Sept 2007 2 Asoj 2064	28	Chiwa - Mejar, **Falaincha**				
		Chiwa	27 16 17.5 88 01 48.3	3190		
		Mejar	27 16 41.9 88 01 54.4	3370		
		Samarjung cf	27 16 51.3 88 01 50.3	3320		
20 Sept 2007 3 Asoj 2064	29	Mejar - Gairhi, **Falaincha**				
		Mejar tham	27 17 15.5 88 02 01.7	3515		Q P12
			27 18 22.5 88 02 41.7	3475		QP 13
		Gairhi/Faleke	27 18 17.4 88 02 16.7	3440		
21 Sept 2007 4 Asoj 2064	30	Gairhi - Sukkhadhap - Dunda, **Falaincha**				
		Sukkhadhap	27 17 29.5 88 02 28.5	3485	Saussurea obvllata	
		Sukkhadhap	27 17 36.8 88 02 38.6	3570	Meconopsis nepaulensis	
		Sukkhadhap	27 19 45.4 88 03 34.3	3600		
		Sukkhadhap-Dunda	27 20 02.7 88 03 46.7	3680		
		Dunda	27 20 28.4 88 03 53	3820		QP 16
22 Sept 2007 5 Asoj 2064	31	Dunda - Pahare Meghu, **Falaincha**			Bergenia purpurascens	
		Dunda		3770		
		Virkuna				
		Odhar	27 20 58.7 88 03 31	3765		QP 18
		Bagare				
		Deurali	27 21 21.2 88 03 25.7	3865		
		Ghopte				
		Phedam				
		Ramite	27 22 10.4 88 02 20.8	3850		
		Budhipani	27 22 37.5 88 02 20.4	3880	Primula site	
		Lamini odhar				
		Taruni pani				
		Tanneri pani	27 23 20.8 88 02 22.5	3930	Nardostachys site	
		Pahare meghu	27 23 38.5 88 02 16.2	3910	Camp site	
23 Sept 2007 6 Asoj 2064	32	Pahare meghu - Fokte - Ghumne, **Falaincha**				
		Fokte		3915	Sedum species, Rhododendron anthopogon	
24 Sept 2007 7 Asoj 2064	33	Ghume - Timbu pokhari - Pahare Meghu, **Falaincha**				
		Timbu pokhari	27 26 14.9 88 03 26.4	4327		
		Timbu pokhari Taplejung pati	27 26 11.8 88 03 16	4337		
		Kali khola	27 24 31 88 02 06.2	3681		
25 Sept 2007 8 Asoj 2064	34	P meghu - Dunda - Faleke, **Falaincha**				
26 Sept 2007	35	Faleke - Betini, **Falaincha**	27 18 27	3385	Paris polyphylla, Panax species, Sorbus	

9 Asoj 2064			88 02 00.9		species, Betula utilis	
		Faleke	27 18 29.6 88 01 56.7	3355		
		Faleke-Betini	27 18 45.9 88 01 22.4	3210		
		Betini khola	27 15 44.6 87 57 44.6	1570	Dobinea species	
27 Sept 2007 10 Asoj 2064	36	Betini - Muklabu - Timtimbu - Chyangthapu - Chamling gaun, **Chyangthapu**			Falaincha VDC	
		Betini	27 17 57 87 59 27.4	1900		QP 27
		Muklabu	27 17 01.4 87 58 14.6	1980		
		Timtimbu	27 16 08.1 87 57 30.5	1925		
		Chyangthapu bazar	27 15 51.5 87 57 28.7	1631		
		Chamling gaun	27 15 08.5 87 57 27.1	1791		
28 Sept 2007 11 Asoj 2064	37	Chamling gaun - Chamling dada - Menjuwa - Dabale Deurali, **Memeng**				
		Chamling dada	27 14 55.1 87 57 21.3	1947		
		Menjuwa	27 14 22 87 57 29.4	2194		
		Dabale, Deurali	27 13 21.5 87 57 25.2	2702		
29 Sept 2007 12 Asoj 2064	38	Dabale - **Memeng**				
		Deurali	27 13 22.9 87 57 36.4	2640		
		Mulchok near sukha pokhari	27 13 26.6 87 57 45.4	2750		
		Narelung cf, memeng	27 30 07.9 87 57 09.3	2585		
		Saili maili odhar				
		Memeng	27 11 27.9 87 56 18.6	2005		
30 Sept 2007 13 Asoj 2064	39	**Memeng**				
		Memeng bich gaun	27 11 27.5 87 56 17.8	1991		
		Narelung nursery	27 11 44.5 87 57 35	2550		
1 Oct. 2007 14 Asoj 2064	40	Memeng - Tal kharka, **Prangbung**				
		Hewa khola	27 10 32.8 87 57 17	1757		
		Tal kharka gaun				
2 Oct. 2007 15 Asoj 2064	41	Tal kharka - Prangbung bazar, **Prnagbung**				
		Tal kharka	27 10 01.8 87 57 17.8	2248		
		Bhainse pokhari	27 09 28.8 87 56 58.4	2577		
		Jaljale cf, prangbung	27 09 22.2 87 57 07.9	2654		
		Ratnaule				
3 Oct 2007 16 Asoj 2064	42	Prnangbung bazar, **Prnagbung**	27 10 33.7 87 54 32.4	1893	Pl. biodiversity mgt training	
4 Oct 2007 17 Asoj 2064	43	Prnangbung bazar, **Prnagbung**			Pl. biodiversity mgt training	
5 Oct 2007 18 Asoj 2064	44	Prangbung - Aakase bhanjyang - Pipal bote, **Nangin** Prangbung - Bhainse - Kartike - Goruaale, **Sidin**				
6 Oct 2007 19 Asoj 2064	45	Pipal bote - Phidim, **Phidim bazar** Goru aale - Hatiya, **Maimajhuwa**	27 06 06.1 87 56 19.3	2745	Meeting with DFO	
7 Oct 2007 20 Asoj 2064	46	Phidim - **Ilam** Maimjhuwa - Ilam - **Jhapa**			Phidim	District level meeting with stakeholders
8 Oct 2007 21 Asoj 2064	47	Ilam -**Kathmandu** Jhapa - **Kathmandu**			Ilam - Ktm (Plane)	Arrival in Kathmandu

Team Members:

KKS (Krishna K Shrestha – Team Leader),
KH (Kamal Humagain), Research Associate
JP (Jeevan Pandey), Research Associate
YRP (Yuv R Poudel), Social Mobilizer, Ilam
RMK (Ripu M Kunwar – Field Coordinator),
MD (Man K Dhamala), Research Associate
NBKC (Nar B KC), Research Associate
RR (Raj K Rai), Social Mobilizer, Panchthar

Annex 1.2 Itinerary- Lower Kangchenjunga Shinghalila Ridge Expedition (Supplement Phase) (Aug 23–Sept 13, 2007)

Date AD	Day	Place			Activities and location	Remarks
23 Aug. 2007 6 Bhadra 2064	1	Kathmandu - Jhapa - Ilam				JP, NB, MD (Team members)
24 Aug 2007 7 Bhadra 2064	2	Kathmandu – Jhapa - **Ilam**				RMK (FC)
25 Aug 2007 8 Bhadra 2064	3	Ilam bazar, **Ilam**			ICC, NCDC, TMI, SHAHGG, DJYC visit, field preparation and shopping	Ilam bazar
26 Aug 2007 9 Bhadra 2064	4	Ilam - Hatiya, **Mai majhuwa**				
27 Aug 2007 10 Bhadra 2064	5	Hatiya, **Mai majhuwa**	27 03 58.9 87 57 04	1838		Field visit (RMK, JP, NB, MD, YP)
		Thulo gaun, Mai majhuwa	27 03 52 87 56 38	1817		
		Naule gaun, Mai majhuwa	27 04 19.3 87 56 34	2100		
		Mane dada, Mai majhuwa	27 04 33.3 87 56 37.3	2187		
		Terse gaun, Mai majhuwa				
		Kamire, Mai majhuwa				
		Rate Khola, Mai majhuwa	27 04 02.7 87 56 22.5	1838		
28 Aug 2007 11 Bhadra 2064	6	Hatiya, **Mai majhuwa**				
		Newa khola, Mai majhuwa	27 04 15.8 87 57 29.1	1837		
			27 04 08 87 57 59.7	1870	Michelia site	
		Sisne, Mai majhuwa	27 04 17.5 87 58 33.8	1974	Ceropegia pubescens (yellow flower)	
		Kalapani, Mai majhuwa	27 04 28.9 87 58 48	2050	Michelia species site	
29 Aug 2007 12 Bhadra 2064	7	Chibe, **Mai majhuwa**	27 04 36.5 87 55 52	2185		
		Sherpe, Mai majhuwa	27 03 45 87 56 12.3			
		Chintapu, Mai majhuwa	27 05 18.6 87 55 37.7	2480		
30 Aug 2007 13 Bhadra 2064	8	Chintapu, **Mai majhuwa**	27 05 28.6 87 55 29.2	2650		
		Chintapu, Mai majhuwa	27 05 22.7 87 54 47.3	3170		
31 Aug 2007 14 Bhadra 2064	9	Chintapu, **Mai majhuwa**	27 05 10.1 87 55 12.6	2861	Polygonatum species, Bergenia species	
		Dhapar, Mai majhuwa	27 05 28.1 87 57 21.3	2792		
		Chibe, Mai majhuwa	27 05 04.5 87 55 39.1	2982	Fritillaria species	
		Gwanse, Mai majhuwa	27 05 10.1 87 55 12.6	2861		
1 Sept. 2007 15 Bhadra 2064	10	Hatiya, Maimajhuwa - Dobate, **Mabu**				Field work
			27 04 30.4 87 58 56.1	2173	Polygala arilata species	
2 Sept. 2007 16 Bhadra 2064	11	Dobate, **Mabu**	27 04 28.8 87 59 17.1	2241		Field work
		Dobate, Mabu	27 04 21.2 87 59 29.2	2450	Gulfa, Singato,	
		Dobate	27 04 05.1 87 59 28.9	2665		
		Lalbas	27 04 19.8 88 00 2.7	2689		
3 Sept. 2007 17 Bhadra 2064	12	Dobate, **Mabu**	27 04 07 87 59 87.6	2656	Chari bhang, Paris polyphylla	
4 Sept. 2007 18 Bhadra 2064	13	Dobate - Chandane, **Mabu**			Flora and quadrat study	
		Lalbas	27 04 19.8 88 00 2.7	2689		
5 Sept. 2007 19 Bhadra 2064	14	Dobate - Piple - Hangetham, **Jamuna**			Flora and quadrat study	

6 Sept. 2007 20 Bhadra 2064	15	Hangetham, **Jamuna**				Field work
		Hangetham	27 02 44.8 88 00 25.6	2334		
		Hangetham	27 02 57.3 88 00 46	2468		
7 Sept 2007 21 Bhadra 2064	16	Hangetham, **Jamuna**				Field work
		Hangetham, Jamuna	27 02 49.8 88 00 43.1	2457		
		Hangetham, Jamuna	27 03 06.4 88 01 18	2683		
8 Sept. 2007 22 Bhadra 2064	17	Hangetham, **Jamuna**			Pl. biodiversity mgt training	
9 Sept 2007 23 Bhadra 2064	18	Hangetham, **Jamuna**			Pl. biodiversity mgt training	
		Hangetham, Jamuna	27 02 38.5 88 00 47	2151		
		Tindobane, Jamuna	27 02 38.6 88 00 47.9	2209		QI 32
		Udaune, Jamuna	27 03 12.3 88 01 25.8	2761		QI 34
			27 02 56.8 88 01 03.2	2616		QI 35
10 Sept 2007 24 Bhadra 2064	19	Hangetham - Ingla, **Jamuna**			Flora collection	
11 Sept 2007 25 Bhadra 2064	20	Ingla-Jogmai, **Jogmai**			Flora and quadrat study	
		Aahale				
		Ramite	27 00 19.5 88 01 24.5	2459		
12 Sept 2007 26 Bhadra 2064	21	Jogmai, Mahatgaun, Kalikhop CF, **Jogmai**			Flora and quadrat study	
		Chitre	27 00 37.1 88 03 17.7	2049	Flora and quadrat study	
		Kalikhop	27 00 42.1 88 03 04.1	2426		Q I 46
13 Sept 2007 27 Bhadra 2064	22	Jogmai - Sanischare - Fikkal - Ilam, **Ilam bazar**			Flora collection	
14 Sept 2007 28 Bhadra 2064	23	**Ilam bazar**				
15 Sept 2007 29 Bhadra 2064	24	**Ilam bazar**				

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Annex 2. Literature Review Synopsis

1. Policy Paper Review

Master Plan for Forestry Sector, 1989

The Master Plan for Forestry Sector (MPFS) 1989 emphasized on meeting the basic needs of the people by sustainably managing the forest resources of the country. It prioritized on policy decentralization, empowerment, employment generation, people's participation, and public/private partnership. Production forestry and livelihood integrity were major concerns of the plan. However, the plan did not spell on research and scientific inventory which was utmost for sustainable management.

IUCN, 1994

IUCN (1994) prioritized 60 plant species for conservation with categorizing species in different red list category (cited in Shrestha and Joshi 1996). The list was updated and contained 34 IUCN Red List plant species in its webpage on December 2006 but the species indigenous to Nepal reported in the Red list were 29 (Annex 1). The list contains both the common and uncommon species and it was due to lack of adequate update data of species distribution and their conservation status.

CITES, 1995

Nepal has been a signatory of the Convention on International Trade in Endangered Species (CITES) of Wild Flora and Fauna since 1975 and a number of plant species (15) are listed in CITES under various appendices (CITES 1995). There is one species in Appendix I which was already extinct from Nepal, 9 species in Appendix II and 6 species in Appendix III (Annex 2).

Rare, Endemic and Endangered Plants of Nepal, 1996

The report noted 246 endemic and 60 rare, endangered and threatened plants of Nepal. The central Nepal is rich in species endemism and it shares 70% of country's species endemism. Rare, endangered and threatened plant species is dominant in Central and Eastern Nepal (Annex 4).

Conservation Area Regulation 2000

The regulation lets any area can be declared as conservation area by designing boundary for better protection of natural resources with people's participation. Wise use of lands and resources can be done within conservation area upon the approval of the operational plan and setting of government standards. Integrated land use plan has to be prepared so as to allocate right area for sustainable management. As per need, comparative advantage and biophysical/socioeconomic characteristics of a locality, different conservation units can be constituted within area as per regulation.

Conservation Assessment and Management Planning, 2001

Conservation Assessment and Management Planning (CAMP) 2001 prioritized 51 plant species for conservation. The species prioritized were from midhills and mountain areas. The species were prioritized because the most species were threatened due to overexploitation. Overexploitation was severe due to accelerating commercial demands. This could also seriously impact the population levels of the taxa concerned and has direct bearing on the quality and ultimate loss of habitat (Annex 4).

Protected Plants of Nepal (Government of Nepal), 2001

Under the Forest Act 1993 and Forest Regulation 1995, and their amendment in 2001 in article 70, the Government of Nepal has notified restriction on utilization of plant and their products since February 12, 2001. The Government has imposed restriction on export of 12 pant species and one forest products. Morevoer seven tree species are banned for felling, transportation and export. Of listed species, 7 species are under IUCN and CITES list. Dactylorhiza hatagirea, Nardstachys grandiflora, and Taxus wallichian were common protected species of Government of Nepal, CITES and IUCN (Annex 3).

Ecoregion-based Conservation in the Eastern Himalaya, 2001

Wikramanayake et al (2001) stated ecoregion-based conservation priorities of the Eastern Himalaya. The priorities were identified separately as immediate, short term and long terms. Site delineation, status and distribution knowledge of biodiversity, and specie specific threats, etc. were considered as immediate actions to conserve the biodiversity. Capacity building, cooperation and networking, restoration of habitats, etc were taken as short term actions to be incorporated and successful implementation and equitable empowerment and sharing of benefits, etc were prioritized as long term and sustainable conservation strategies. Many fauna were prioritized as focal and key stone species for conservation in the Eastern Himalaya but the priority for floral species was insignificant. However, rare and endemic plants and *Taxus wallichiana* (*Taxus baccata*) were emphasized on conservation (Wikramanayake et al 1998).

Nepal Biodiversity Strategy, 2002

NBS (2002) emphasized on inventory of species in protected areas, and throughout the country. A species conservation plan that focuses on key stone species was highly prioritized in forest and protected area subsectoral strategies of the strategy. Rangeland management strategy outlined the creation of biodiversity database, rehabilitation of overgrazed areas, incorporating indigenous knowledge into

development plans, control illegal hunting, etc, Ecosystems with high level of species diversity, endemism, and rare, endangered, ands threatened plants species, most pristine and wilderness, uniqueness were given very high priority to conserve under the scientific and ecological criteria.

Nepal Biodiversity Action Plan, 2002

NBAP (2002) emphasized on generation of initial database, human and institutional capacity, public commitment and awareness for further planning and assessment of country's biodiversity. The action plant was mandatory document to develop goal, objectives, selected priority actions and investment priorities country's biodiversity sector.

Herbs and NTFP Development Policy, 2004

Herbs and NTFP Development policy (2004) addressed the holistic development of NTFP sector in Nepal. In this regards, it has set a long-term goal and some specific objectives. The long-term goal of the policy is to substantially contribute to Nepalese economy by conserving and preserving high value herbs and NTFPs and establish Nepal as an enormous source of Herbs and NTFPs internationally by the year 2020. In this context, it has set six (6) objectives such as focusing on regeneration, reproduction, ex-situ conservation of NTFPS; local processing through private sector participation; business development services; inclusion of the disadvantaged groups and earning of foreign currency through the competitive development of NTFPs. In general, the NTFP policy 2004 has still lacking the provision of identifying and mitigating risks but at least it provides some directions and supports to NTFP development. Government of Nepal has prioritized 30 medicinal and aromatic plants for research and cultivation for Nepal.

Tenth Five year plan (2002-2007)

The Tenth Five year plan (2002-2007) gave importance to biodiversity conservation and a means of poverty reduction through sustainable use of its components and broader participation of the local people (GoN/NPC 2059) with considering importance on research in forests and flora and scientific and participatory forest management. Despite the articles were convened in plan, scientific inventory, investment on research and scientific management strategies were least recognized and implemented.

Biological Corridor Development Strategy (NCDC and ICIMOD), 2005

Participatory biological corridor development strategy and action plan for transborder areas along the Kanchenjunga Landscape in Eastern Nepal has been prepared by Namsaling Community Development

Center (NCDC) and International Center for Integrated Mountain Development (ICIMOD) in 2005. The strategies were prepared through the participatory processes focusing on the conservation needs and actions with subsequent income generating activities for improving the livelihood condition of the local community and ensuring biodiversity conservation of the area. Planning outcomes emphasized on implementation and livelihood of the local people. Activities like biological corridor delineation, inventory of wildlife species, developing national policy for biological corridor development, amendments in the current rules and regulations for biodiversity based resources use, awareness raising, promotion of NTFPs and MAPs, promotion of alternate energy, non timber forest products, and medicinal and aromatic plants, eco-tourism were identified as pin points to be addressed.

Important Plant Areas and Species (ESON), 2006

A short list of 30 priority species of medicinal plants was prepared through extensive consultation of the literature using several indicators (commercial demand, rarity, slow growth, potential for regeneration, and difficulty of propagation) (IPA Report 2006). Available information on the geographical distribution of the prioritized medicinal species was then used as the main ingredient to determine the Important Plant Areas (IPAs) for medicinal plants in Nepal. A hierarchical approach was taken to the identification of the IPAs, resulting in recognition of 16 IPA Complexes with 55 IPA sites and 238 IPA niches. The complexes are backed up by the information of presence of prioritized medicinal plants, major vegetation types, threatened, endemic and endangered species, types of threat, etc.

Important Plant Area Complexes of Nepal ***Source: ESON, 2006***

IPA Complexes	Name of Sites	No. of Niches
Karnali	Humla, Mugu, Jumla, Kalikot, Dolpa	36
Upper Mahakali-Seti	Darchula, Bajhang, Bajura	18
Lower Mahakali-Seti	Baitadi, Dadeldhura, Doti, Achham	14
Upper Annapurna-Manaslu	Mustang, Manang, Gorkha	30
Upper Bheri-Rapti	Jajarkot, Rukum	6
Lower Bheri-Rapti	Dailekh, Surkhet, Salyan	6
Terai Arc Landscape-Nepal	Kailali, Bardiya, Banke, Dang, Palpa, Nawalparasi, Chitwan, Parsa, Bara	19
Lower Dhaulagiri-Annapurna	Baglung, Myagdi, Parbat, Kaski, Lamjung	23
Rapti-Lumbini	Pyuthan, Rolpa, Gulmi, Arghakhachi	6
Upper Bagmati	Dhading, Nuwakot, Rasuwa, Sindhupalchok	17
Narayani	Makawanpur, Bara	3
Upper Janakpur	Dolakha, Ramechhap	7
Lower Janakpur	Sindhuli, Sarlahi	4
Udayapur	Udayapur	3
East Himalayan	Solukhumbu, Sankhuwasabha, Taplejung	36
Far Eastern midhills	Terathum, Panchthar, Ilam	10
TOTALS	**Total No. of Sites = 55**	**238**

Nepal Biodiversity Strategy Implementation Plan, 2006

NBSIP (2006) focused on close linkage of biological resources, livelihoods and economic development, and mainstreamed the implementation plans to achieve the goals of Nepal Biodiversity Strategy (NBS) 2002. Conserve the biodiversity within and outside protected areas at landscape level and document and register biological resources and associated traditional knowledge, etc were major implementation plans of the NBSIP. An account of conservation of endangered (threatened) species was stated but it noted only on higher mammals. Even the account did not state on revision of conservation status of species which was most crucial for conservation assessment at regular time interval.

2. Research Document Review

Taplejung and Kanchenjungha Conservation Area are home to 1284 species of plants and of them 810 are flowering plants. The area is also rich in species endemism possessing 7 endemic flowering plants. Very few plants were used as commercial means. However the plant diversity of the area is threatened by anthropogenic interferences (Livestock grazing, tree cutting, forest fires and slash-and-burn, etc). Indiscriminate exploitation threatened *Michelia champaca, Taxus wallichiana, Boehmeria rugulosa, Swertia chirayita,* etc. The high altitude zones are rapidly being converted into semi-natural pasture land (Shrestha and Ghimire 1996).

Flora of Maipokhari and its adjoining areas of Ilam district was carried out by Rai in 1999. Altogether 263 plant species representing from pteridophytes to angiosperms were documented. *Castanopsis hystrix, Alnus nepalensis, Ficus neriifolia, Lyonia ovaliflia, Lithocarpus pachyphylla, Symplocos ramossimaa,* etc were dominant species of the area. Among the recorded species, 16 species were important for timber, 14 for ethnomedicine, 32 as fodder, and 16 as edible. The diversity and richness of the plant species was imperiled due to anthropgenic interferences as means of extensive lpping and free grazing.

Sharma (2000) stated that ilam district is rich in medicinal plants resources and most of the resource is unexploited. Accrding to him, there were 125 medicinal plants in Ilam district and many are threatened. The most threatened medicinal plant species were *Bergenia species, Dioscoreas deltoidea, Michelia champaca, Nardostachys grandiflora, Neopicrorhiza scrophulariflora, Rheum species, Valeriana wallichii,* etc.

Yonzon (2000) studied the opportunities in ecoregion based conservation in east Nepal, Kanchenjungha Complex. Survey of forest areas along with groundtruthing of forest types including NTFPs; thorough review of policies and management regimes of the area for updating, and transboundary conservation, etc. were prioritized as opportunities for conservation in Kanchenjungha Singhalila Complex, East Nepal.

Floral diversity of Kanchenjungha conservation area at landscape level was assessed for resource management strategy (Shrestha 2002). Biodiversity hotspots and key stone species were identified on the basis of species richness, taxonomic uniqueness, endangered species, habitat value, and threat status and use pattern. *Bombax ceiba, Castanopsis hystrix, Lithocarpus pachyphylla, Michelia champaca, Quercus lamellosa*, etc were identified as key stone species of the KCA. Overgrazing, forest degradation and slash-and-burn agriculture were identified as major threats.

Chettri et al (2005) recorded 94 species of non timber forest produce from the Khangchendzonga complex area of Sikkim, India. Overexploitation of the produce and products was most as a threat of the area. Of the recorded species, about 10% of species was found to be a concern for conservation. Some of the high value medicinal plants have potential for value addition as well as domestication. Therefore, a proper strategic plan is needed for conservation of these valuable resources and for sustainable development.

Floral diversity of Maipokhari, Ilam was assessed by Basnet in 2003. He documented 233 plant species from the area that comprises 28 pteridphytes, 6 gymnosperms, 49 monocots and 150 dicot species. There were 6 species of *Rubus* and 4 species of *Rhododendron* in his list. There were 45 plant species which has high medicinal value.

The database of ICIMOD documented 1027 plant species from Kanchenjungha Conservation Area. Among them 72 species were globally significant for protection. *Abies spectabilis, Arundinaria graminifolia, Dactylorhiza hatagirea, Dioscorea deltoidea, Engelhardtia spicata, Juniperus indica, Larix griffithiana, Nardostachys grandiflora, Neopicrorhiza scrophulariflora, ochids, Pinus wallichiana, Pinus roxburghii, Taxus wallichiana, Tetracentron sinense*, etc. were globally significant species of IUCN and CITES. Species *Taxus wallichiana* is only one species prioritized by both CITES and IUCN. A total of 208 plants are medicinal and aromatic and 44 of them are still being used in the Ayurveda (ICIMOD database unpublished).

Ghimire and Nepal (2006) prioritized *Saussurea tridactyla, Dactylorhiza hatagirea, Rheum australe, Swertia chirayita, Neopicrorhiza scrophulariflora, Aconitum bisma* and *Nardostachys grandiflora,* etc. species for conservation in Kanchenjugha Conservation Area.

According to Gurung (2006) project should prepare a comprehensive exit and long term sustainability strategy in full consultation with concerned stakeholders and devise interventions to facilitate the transitional period. He further urged the development, testing and implementing sustainable harvesting protocols need to be developed, tested and implemented with a strong research component in place. A comprehensive database is essential to monitor the status of biological diversity and livelihood of local people.

Plants in the IUCN Red List (2006)

1. *Abies densa* LC v2.3
2. *Abies pindrow* LC v2.3
3. *Abies spectabilis* LC v2.3
4. *Alstonia scholaris* BLACKBOARD TREE (E) LC v2.3
5. *Cedrus deodara* LC v2.3
6. *Chukrasia tabularis* LC v2.3
7. *Cupressus torulosa* NT v2.3
8. *Cycas pectinata* VU v3.1
9. *Dalbergia latifolia* BOMBAY BLACKWOOD (E) VU v2.3
10. *Diplocolea sikkimensis* EN v2.3
11. *Engelhardtia spicata* LC v2.3
12. *Euonymus grandiflorus* LC v2.3
13. *Holarrhena pubescens* BITTER OLEANDER (E) LC v3.1
14. *Juniperus communis* LC v2.3
15. *Juniperus indica* LC v2.3
16. *Juniperus recurva* LC v2.3
17. *Juniperus squamata* LC v2.3
18. *Larix griffithii* LC v2.3
19. *Mangifera sylvatica* LC v2.3
20. *Picea smithiana* LC v2.3
21. *Pinus roxburghii* LC v2.3
22. *Pinus wallichiana* HIMALAYAN PINE (E) LC v2.3
23. *Podocarpus neriifolius* LC v2.3
24. *Shorea robusta* LC v2.3
25. *Sloanea tomentosa* LC v2.3
26. *Sorbus wallichii* LC v2.3
27. *Taxus wallichiana* HIMALAYAN YEW (E) DD v2.3
28. *Tsuga dumosa* LC v2.3
29. *Ulmus wallichiana* VU v2.3

Source: IUCN 2006. 2006 IUCN Red List of Threatened Species. www.iucnredlist.org>. Downloaded on 01 December 2006.

Plants in the CITES Appendices, 1995

1 Orchids	Orchidaceae	II
2 Ceropegia spp.	Asclepiadaceae	II
3 *Cyathea chinensis* Copel.	Cythaeceae	II
4 *Cycas pectinata* Buch.-Ham.	Cycadaceae	II
5 *Dioscorea deltoidea* Wallich ex Kunth	Dioscoreaceae	II
6 *Euphorbia fusiformis* Buch.-Ham. ex D.Don	Euphorbiaceae	II
7 *Gnetum montanum* Markgraf	Gnetaceae	III
8 *Magnolia, Michelia, Manglietia, Talauma spp.*	*Magnoliaceae*	II
9 *Meconopsis regia* G. Taylor	Papaveraceae	III
10 *Nardostachys grandiflora* DC.	Valerianaceae	II
11 *Picrorhiza kurrooa* Royle ex Benth.	Scrphulariaceae	II
12 *Podocarpus neriifolius* D.Don in Lambert	Podocarpaceae	III
13 *Rauvolfia serpentina* Benth. ex Kurz	Apocynaceae	II
14 *Taxus wallichiana* Zucc.	Taxaceae	II
15 *Tetracentron sinense* Oliver	Tetracentaceae	III

Protected Plants and Biomaterials of Government of Nepal

A. Ban on collection, use, sale, distribution, transportation, and export of the following medicinal herbs.

1. *Dactylorhiza hatagirea*	*Pancha ounle*	Salep
2. *Juglans regia* bark	*Okhar ko bokara*	Walnut
3. *Picrorhiza scrophulariflroa*	*Kutki*	Gentian

B. Ban on export outside the country, except the processed product on permission of Department of Forest.

1. *Nardostachys grandiflora*	*Jatamansi*	Spikenard
2. *Rauwolfia sepentina*	*Sarpagandha*	Serpentine
3. *Cinnnamimum glausecens*	*Sugandhakokila*	
4. *Valeriana wallichi*	*Sugandhawal*	Indian Valerin
5. *Lichen species*	*Jhyau*	
6. Rock exude	*Shilajeet*	
7. *Abies spectabilis*	*Talispatra*	Fir
8. *Taxes wallichiana*	*Loth Salla*	Himalayan Yew
9. *Cordyceps sinensis*	*Yarsa gomba*	Caterpillar fungus

C. Ban on transportation, export, felling for commercial purpose.

1. *Michelia champaca*	*Champ*	
2. *Acacia catechu*	*Khayer*	Cutch tree
3. *Shorea robusta*	*Sal*	
4. *Bombax malabaricum*	*Simal*	Silk cotton tree
5. *Dipterocarpus marsupium*	*Satisal*	
6. *Dalbergia latifolia*	*Bijayasal*	
7. *Juglans* species *	*Okhar*	Walnut

*(Only of National Forest)

Source: **MFSC (2007) Protected Plants of Nepal: Plant Resource Index**
http://www.biodivnepal.gov.np/plant_resource.html

Conservation Prioritiy Plant Species of Nepal

SN	Name of species/products	MoFSC/HNCC[1]	CAMP[2]	CITES[3]	IUCN[4,5]	GoN 2001[6]	ESON/PI[7]	ESON/ CEPF[8]	SH[9]	TOTAL
1.	*Abies densa*				+					1
2.	*Abies pindrow*				+					1
3.	*Abies spectabilis*				+	+				2
4.	*Acacia catechu*				+	+	+		+	4
5.	*Aconitum bhalangrense*		+							1
6.	*Aconitum bishma*		+							1
7.	*Aconitum heterophyllum*	+	+		+		+		+	5
8.	*Aconitum laciniatum/ A. gammiei*				+				+	2
9.	*Aconitum spicatum/ A. ferox*	+	+		+		+	+	+	6
10.	*Acorus calamus*	+					+			2
11.	*Aglaia cucullata*				+					1
12.	*Allium hypsistum*		+							1
13.	*Allium prazewalskianum*				+				+	2
14.	*Alnus nitida*				+				+	2
15.	*Alstonia neriifolia*		+		+				+	3
16.	*Alstonia scholaris*		+		+		+		+	4
17.	*Andrewsianthus ferrugenius*				+					1
18.	*Arisaema costatum*		+							1
19.	*Arisaema utile*				+				+	2
20.	*Arnebia benthami*		+							1
21.	*Arundinaria species*							+		1
22.	*Asparagus racemosus*	+	+				+	+		4
23.	*Azadirachta indica*	+					+			2
24.	*Beaumontia grandiflora*				+				+	2
25.	*Bergenia ciliata*	+			+		+		+	4
26.	*Bergenia purpurascens*							+		1
27.	*Bombax ceiba*					+				1
28.	*Butea monosperma*		+		+		+		+	4
29.	*Calamus acanthospathus/ C. latifolius/ C. leptospadix*				+				+	2
30.	*Cardiocrinum giganteum*							+		1
31.	*Castanopsis hystrix*							+		1
32.	*Cedrus deodara*				+					1
33.	*Ceratostigma ulicinum*				+				+	2
34.	*Ceropegia species*			+						1
35.	*Choerospondias axillaris*				+				+	2
36.	*Chukrasia tabularis*				+					1
37.	*Cinnamomum glaucescens*	+				+		+		3
38.	*Cinnamomum tamala*	+					+			2
39.	*Cordyceps sinensis*	+				+	+			3
40.	*Corydalis megacalyx*		+				+			2
41.	*Crateva unilocularis*		+		+				+	3
42.	*Cupressus torulosa*				+					1
43.	*Curculigo orchoides*		+							1
44.	*Cyathea spinulosa*			+						1
45.	*Cycas pectinata*			+	+				+	3
46.	*Dactylorhiza hatagirea*	+	+	+		+	+	+		6
47.	*Dalbergia latifolia*				+	+			+	3
48.	*Delphinium himalayai*		+							1
49.	*Dioscorea deltoidea*	+	+	+	+		+	+	+	7
50.	*Diplocloea sikkimensis*				+					1
51.	*Elaeocarpus sphaericus*				+				+	2
52.	*Engelhardtia spicata*				+					1
53.	*Ephedra intermedia*		+							1
54.	*Ephemerantha macraei*		+							1
55.	*Euonymus grandiflora*				+					1
56.	*Fritillaria cirrhosa*		+							1
57.	*Gaultheria fragrantissima*	+								1
58.	*Gloriosa superba*		+		+		+		+	4
59.	*Gnetum montanum*			+	+				+	3
60.	*Helicia nilagirica*				+				+	2
61.	*Helwingia himalaica*				+				+	2
62.	*Heracleum lallii*		+					+		2
63.	*Holarrhena pubescens*				+					1
64.	*Hoya arnottiana*				+				+	2
65.	*Hydrobryum grifihii*				+				+	2
66.	*Juglans regia*	+				+		+		3

67.	*Juniperus communis/ J. indica*				+					1
68.	*Jurinea dolomiaea*		+							1
69.	*Larix griffithiana/ L. potaninii*				+				+	2
70.	*L. himalaica*				+				+	2
71.	*Lichen species*	+				+				2
72.	*Lilium nepalense*		+							1
73.	*Lilium wallichianum*				+				+	2
74.	*Lithocarpus fenestrata*				+				+	2
75.	*Maharanga bicolor*		+		+					2
76.	*Maharanga emodi*		+		+				+	3
77.	*Mangifera sylvatica*				+					1
78.	*Meconopsis dhwojii*		+							1
79.	*Megacarpea polyandra*				+				+	2
80.	*Michelia and Magnolia species*		+	+	+	+		+	+	6
81.	*Morchella speecies*	+								1
82.	*Nardostachys grandiflora*	+	+	+	+	+	+	+	+	8
83.	*Neopicrorhiza scrophulariiflora*	+	+	+	+	+	+	+	+	8
84.	*Olea ferruginea*				+				+	2
85.	*Operculina termentum*		+							1
86.	*Orchids*		+	+		+				3
87.	*Oroxylum indicum*		+		+		+	+	+	5
88.	*Paenia emodi*				+				+	2
89.	*Panax pseudo-gingseng*		+							1
90.	*Paris polyphylla*		+		+		+	+	+	5
91.	*Passiflora nepalensis*				+				+	2
92.	*Phyllanthus emblica*	+					+			2
93.	*Picea smithiana*				+					1
94.	*Pinus roxburghii/ P. wallichiana*				+					1
95.	*Piper longum*	+	+				+			3
96.	*Pistachia chinensis*				+				+	2
97.	*Podocarpus neriifolius*			+	+				+	3
98.	*Podophyllum hexandrum*	+	+	+	+		+	+	+	7
99.	*Pongamia pinnata*		+							1
100.	*Prunus carmesiana*				+				+	2
101.	*Pterocarpus marsupium*		+			+				2
102.	*Rauvolfia serpentina*	+	+	+	+	+	+		+	7
103.	*Rheum australe/ Rheum nobile/ Rheum moorcroftianum*	+	+		+		+	+	+	6
104.	*Rhododendron species*							+		1
105.	Rock exudates					+				1
106.	*Rubia manjith*	+	+				+	+		4
107.	*Sapindus mukorossii*	+								1
108.	*Scaphophyllum speciosum*				+					1
109.	*Schefflera species*							+		1
110.	*Shorea robusta*				+	+				2
111.	*Solanea tomentsa*				+					1
112.	*Sorbus wallichii*				+					1
113.	*Swertia angustifolia/ S. multicaulis*		+							1
114.	*Swertia chirayita*	+	+		+		+	+	+	6
115.	*Tagetus minuta*	+								1
116.	*Takakia ceratophylla*				+					1
117.	*Talauma hodgsonii*			+	+				+	3
118.	*Taxus wallichiana*	+	+	+	+	+	+	+		7
119.	*Tetracentron sinense*			+	+			+	+	4
120.	*Tinospora sinensis*	+	+				+			3
121.	*Tsuga dumosa*				+					1
122.	*Tylophora belostemma*				+				+	2
123.	*Ulmus wallichiana*				+				+	2
124.	*Valeriana jatamansii*	+	+			+	+	+		5
125.	*Wallichia densiflora*				+				+	2

126.	*Zanthoxylum armatum*	+					+	+		3
	Total species and groups	30	51	15	75	19	30	26	60	

1. GoN/MoFSC/HNCC, 2006. Ministry of Forest and Soil Conservation, 5. IUCN 2006, www.iucnredlist.org,
2. CAMP 2001, Conservation Assessment and Management Plan, 2001, 7. ESON/PI 2006, Important Plant Area, ESON, 3. CITES 1973, www.cites.org, 4. IUCN 1994, 9. Shrestha and Joshi 1996.
6. GoN 2001, Protected plants and biomaterials www.biodiv-nepal.gov.np/plant-resource,
8. ESON/CEPF 2008, Inventory and conservation of plant diversity of Kanchenjungha-Singhalila comple

ANALYTICAL SAMPLE SURVEY DATA SHEET - 2064

Location: Plot code:…… Date……
Aspect:…….. Inclination:…… Topography:…….....
Canopy coverage (%): ..... GPS reading: Altitude……
Latitude……. Longitude……..... Vegetation type:.....
Disturbance gradient:..... Management type: a. CF.....b.GF.....c.Others.....
Disturbance factor: ..... Soil pH:..... Moisture:.....
Litter coverage (%):..... Coverage of the exposed ground (%): .....

Table 1. Tree (DBH>10cm)

SN	Name of Species	DBH cm	Height (m)	Stem(B/U)	Stand (L/D/C)	Stratum	Remarks
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							
32							
33							

Sub plot: 1 **Table-2: Shrubs/sapling** (5m x 5m) Sub-plot: 2

SN	Name of species	No	SN	Name of species	No
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		
15			15		
16			16		
17			17		
18			18		
19			19		
20			20		

ADDITIONAL COMMENTS: .....
.....
.....

Sub plot 1:..... **Table 3. Herbs/seedling (**1m x 1m) Sub plot:2.....

SN	Name of species	Ht	No	Cov	SN	Name of species	Ht	No	Cov
1					1				
2					2				
3					3				
4					4				
5					5				
6					6				
7					7				
8					8				
9					9				
10					10				
11					11				
12					12				
13					13				
14					14				
15					15				
16					16				

Sub plot:3

SN	Name of species	Ht	No	Cov	SN	Name of species	Ht	No	Cov
1					12				
2					13				
3					14				
4					15				
5					16				
6					17				
7					18				
8					19				
9					20				
10					21				
11					22				

Coverage: 0-1: **0.5**; 1-5: **3;** 5-25: **15;** 25-50: **37.5**; 50-75: **62.5;** 75-95: **85;** 95-100: **97.5**

तल्लो कंञ्चनजंगा सिङ्गालिला रिज क्षेत्र भित्र राखिएका
अध्ययन तथा अनुसन्धान प्लटहरुको
नियमित अवलोकन तथा अनुगमन प्रतिवेदन

मिति : **समय :**

प्लट कोड नं : **प्लटको ठेगाना, अवस्थिति :**

महिना : **संस्थाको नाम :**

सामाजिक परीचालकको नाम : **अन्य सहयोगीहरुको नाम :**

तल्कालीन हावापानी/जलवायु : बर्षा/बादलीएको/कुहिरो/घमाइलो

Weather/Climate: Raining, Cloudy, Foggy, Sunny

<u>प्लटको स्थीति :</u>

१. चरीचरन भई रहेको वा भएको :

Livestock grazing (livestock spp???)

चरीचरन गर्ने प्रजातीहरु : चौरि गाई भैसी, भैडा बाख्रा, घोडा खच्चड, आदि

उक्त प्रजातीले चरीचरन गर्ने मुख्य वनस्पति

which spp are most grazed???

……

२. बनस्पतिहरु काटीएको/ढालिएको : (ढालिएको वा काटिएको भए कुन प्रजाती) Cutting (spp???)

……

……

नयाँ ढालिएका वा काटीएका वनस्पतिहरुको प्रजाति अनुरुप सँख्या

पुराना ढालिएका वा काटीएका वनस्पतिहरुको प्रजाति अनुरुप सँख्या

(अघिल्लो रेकर्ड पनि हेर्नुहोस्).

Count cut stumps, see previous records

३. बनस्पतिहरुको हाँगा काटीएको : (हाँगा काटीएको भए कुन प्रजातीहरुको)

……

……

४. घाँस काटिएको : (घाँस काटीएको भए कुन प्रजातीहरुको)

……

……

५. डढेलो लागेको :

६. रोगी, सुकेका वा मरेका र कुहिएका विरुवाहरु

Count 3Ds plants (Diseased, Died and Decayed plants)

७. उक्त प्लटमा वन्यजन्तु, चरा चुरुङ्गी वा तिनीहरुको वासस्थान वा अन्य सबुद भेटिएमा वा देखिएमा तिनीहरुको अवस्था

८. प्लट राखिएको ठाँउको महत्व, स्थानिय वासिन्दाको भनाईमा

Local people argument on importance of the site (selected permanent plot)

९. प्लट राखिएको ठाँउ वरिपरिको क्षति वा विनाशको अवस्था,

Disturbance at adjoining areas

१०. प्लट राखिएको ठाँउ वरिपरिको महत्व, स्थानिय वासिन्दाको भनाईमा

Local people argument on importance of the adjoining areas of the site

११. प्लट राखिएको ठाँउ वरिपरिको वातावरण, जैविक बिबिधता र संरक्षणमा देखिएका फरकहरु

Differences in environment, biodiversity and management of the selected site and its adjoining areas

१२. रुख प्रजातीहरुको पुर्नउत्पादन :

Regeneration of tree species:

राखिएको प्लट भित्र १ x १ मि. का ५ वटा साना प्लटहरु राख्ने र ति प्लटहरु भित्र पाईएका रुखका वेर्नाहरुको स्थिती रेकर्ड गर्ने, (पुराना वेर्नाको बूद्दि)

Lay five 1x1 m quadrats inside permanent plot and observe and record tree species (seedling) regeneration/recruitment, survival, and growth

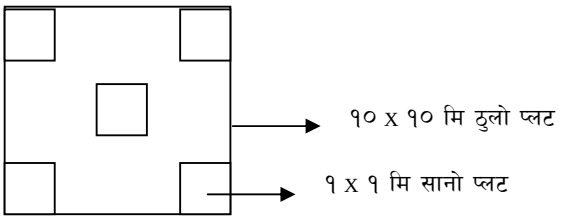
प्लट १ (साईज १ x १ मि)			
रुखको नाम	कति वटा	उचाई	अवस्था

प्लट २ (साईज १ x १ मि)			
रुखको नाम	कति वटा	उचाई	अवस्था

प्लट ३ (साईज १ x १ मि)			
रुखको नाम	कति वटा	उचाई	अवस्था

प्लट ४ (साईज १ x १ मि)			
रुखको नाम	कति वटा	उचाई	अवस्था

प्लट ५ (साईज १ x १ मि)			
रुखको नाम	कति वटा	उचाई	अवस्था



स्थायी अनुसन्धान प्लटमा राखिने साना प्लटहरुको ढाँचा

१३. ति साना प्लटहरु भित्र पाईएका मुख्य जडिबुटी र तिनको उपयोगको सथिती रेकर्ड गर्ने,

Important medicinal plants of the quadrats along with their uses

१४. जडिबुटीको उपयोग रेकर्ड स्थानिय वासिन्दाको सहयोग लिने

Please concern local people to collect other uses of the species

१५. सुचना दिने स्थानिय वासिन्दाहरुको नाम र ठेगाना

Name of respondents with their address

१.

२.

३.

४.

५.

१६. प्लट र वरपरको ठाँउ र विरुवाको बारेमा तपाईको व्यक्तिगत अवलोकन, एवं विचार

Annex 4. Plant species of Ilam and Panchthar districts, Lower Kanchenjungha Singhalila Ridge

SN	RCN	Vernacular name	Family	Plant name	Date	Alt.	Lat.	Long	Location
1.	B 056		Dipsacaceae	*Acanthocalyx nepalensis* (D.Don) M.J.Cannon	06/11	3398	27.19	88.01	Prangbung 6, Ghamaile
2.	D 009		Aceraceae	*Acer campbelli* Hook. f. & Thomson ex Hiern in Hook. f.	09/19	3530	27 19 29	88 03 09.0	Chiwabhanjyang-Major
3.	D 018		Aceraceae	*Acer caudatum* Wall.	09/19	3530	27 19 29	88 03 09.0	Chiwabhanjyang-Major
4.	B 117		Aceraceae	*Acer pectinatum* Wall. ex Pax	06/06	2939	27.07	88.01	Mabu, Kalapokhari
5.	D 190		Amaranthaceae	*Achyranthus sp.*		2450	27 04 21.2	87 59 29	Maklabu
6.	D 033	Bikhma	Ranunculaceae	*Aconitum heterophylloides* (Bruhi) Lauener	09/20	3475	27 18 22	88 02 41.7	Majortham, Falaincha-4
7.	D 127		Ranunculaceae	*Aconitum hookeri* Stapf	09/24	2684	27 09 22	87 57 07.9	Timbu Falaincha-9
8.	C 179		Ranunculaceae	*Aconitum orochryseum* Stapf	09/03	2457	27 02 49.8	88 00 25	
9.	D 072	Bikhma	Ranunculaceae	*Aconitum spicatum* (Bruhi.) Stapf	09/22	3850	27 22 10	88 02 20.8	Dund, Falaincha-9
10.	B 128		Polygonaceae	*Aconogonon campanulatum* (Hook. f.) H. Hara	06/06	2778	27.07	88.01	Mabu, Kalapokhari
11.	C 049		Polygonaceae	*Aconogonum molle* (D. Don) H. Hara	08/28	2861	27 05 10.1	87 55 12	Newa khola, Mai majhuwa
12.	D 159		Polygonaceae	*Aconogonum polystachum*	09/26	1791	27 15 08	87 57 27.1	Faleke-betini, Falaincha-9
13.	D 330		Polygonaceae	*Aconogonum species*	10/01	1893	27 10 33	87 57 32.4	Hiwakhla- \Khaka, Memeng-Prangbung
14.	D 257		Umbelliferae	*Acronema ioniostyles* Faraille & Lachard	09/29	2702	27 13 21	87 57 25.2	Dabale Deurali (New record species)
15.	B 135		Actinidaceae	*Actinidia srigosa* Hook. f. & Thomson ex Benth.	06/06	2772	27.06	88.01	Mabu, Kalapokhari
16.	D 336		Gesneriaceae	*Aeschynanthes hookeri* C.B.Clarke	10/01	2481	27 09 34	87 57 15.4	Hiwakhla- \Khaka, Memeng-Prangbung
17.	C 187		Gesneriaceae	*Aeschynanthes parviflorus* (D.Dn) Spreng. */sikkimensis*(C.B.Clarke) Stapf	09/05	2656	27 04 07.0	87 59 37	Dobate, Hangetham
18.	B 168		Gesneriaceae	*Aeschynanthus species*	06/07	2172	27.04	88.01	Jamuna 2, Hangetham
19.	D 215		Fabaceae	*Aeschynomene indica* L.		1570	27 15 44	87 57 19.0	Falaincha, Betini
20.	B 174		Ericaceae	*Agapetes hookeri* (C.B.Clarke) Sleumer	06/07	2213	27.04	88.02	Jamuna 2, Hangetham
21.	A 014		Ericaceae	*Agapetes serpens* (Wight) Sleumer	06/08	2176	27.07	87.94	Maimajuwa 7, Terse Gaun
22.	D 236		Ericaceae	*Agapetis incurvata*	09/28	1947	27 14 55	87 57 21.3	Chamling danda, Chyangtharpu
23.	D 269		Ericaceae	*Agapetis smithiana* Sleumer	09/29	2500	27 12 58	87 57 05.0	Dabale bhanjyang-Memeng,Memeng
24.	D 361		Asteraceae	*Ageratum conizoides* L.	10/02	1893	27 10 33	87 57 32.4	Prangbung
25.	D 199		Rosaceae	*Agrimonia pilosa* var. *nepalensis* (D.Don) Nakai	09/27	2702	27 13 21	87 57 25.2	Falaincha-6, Tintine
26.	D 005		Poaceae	*Agrostis triaristata* (Hook. f.) Bor	09/18	3490	27 13 17	88 00 54.3	Phalot-Chiwabhanjyang
27.	C 136		Asteraceae	*Ainsliaea aptera* DC.	09/03	2665	27 04 05.1	87 59 28	Dobate, Mabu-8
28.	A 020		Labiatae	*Ajuga lobata* D.Don	06/07	2411	27.08	87.94	Charkhol, Maimajuwa
29.	C 140	Damai kath	Alangiaceae	*Alangium alpinum* (C.B. Clarke) W.W. Sm. & Cave	09/03	2665	27 04 05.1	87 59 28	Dobate, Mabu-8
30.	D 303	Kalo siris	Fabaceae	*Albizia chinensis* (Osbesk) Merr.	09/30	1991	27 11 27	87 56 17.8	Memeng, Bich Gaun
31.	C 100	Ban lasun	Liliaceae	*Allium wallichii* Kunth	08/30	2861	27 05 10.1	87 55 12.6	Chhintapu
32.	D 365		Betulaceae	*Alnus nepalensis* D. Don.	10/02	1893	27 10 33	87 57 32.4	Prangbung
33.	C 057		Asteraceae	*Anaphalis contorta* (D.Don) Hook. f.	08/28	1870	27 04 08	87 57 39	Newa khola, Mai majhuwa
34.	D 177		Asteraceae	*Anaphalis margaritacea* (L.) Benth.	09/26	1980	27 17 01	87 58 14.6	Faleke-betini, Falaincha-9
35.	B 051		Ranunculaceae	*Anemone obtusiloba* D. Don	06/11	3445	27.17	88.01	Prangbung, Bikhepani
36.	B 095		Ranunculaceae	*Anemone rivularis* Buch.-Ham.ex DC.	06/15	3059	27.08	88.01	Mabu, Near Mai khola, Chauri chowk
37.	A 071		Ranunculaceae	*Anemone species*	06/09	3550	27.12	87.98	Prangbung, Chandu
38.	C 030		Ranunculaceae	*Anemone vitifolia* Buch.-Ham.ex DC.	08/27				Kamire, Mai Majhuwa
39.	D 195		Umbelliferae	*Angelica sikkimensis*		1980	27 1701	87 58 14.6	Maklabu
40.	C 192		Linaceae	*Anisadenia saxatilis* Wall. ex. Meisn.	09/05	2656	27 04 07.0	87 59 37.6	Dobate, Hangetham
41.	C 053		Orchidaceae	*Anthogonium gracile* Wall.ex Lindl.	08/28	1837	27 04 15.8	87 57 29.1	Newa khola, Mai majhuwa
42.	C 169		Araceae	*Araesima costatum* (Wall.) Mart. Ex Schott	09/03	2656	27 04 07.0	87 59 37	Dobate, Mabu-8
43.	D 138		Caryophyllaceae	*Arenaria depauperata* (Edgew.) H.Hara	09/25	3280	27 18 33	88 01 38.4	Meghu-Faleke, Falaincha-9
44.	D 114		Caryophyllaceae	*Arenaria globiflora*	09/2	4337	27 26 11	88 03 16.0	Paharemeghu, Falaincha-9

				(Fenzl) Edgew. & Hook.f.	3				
45.	A 017		Caryophyllaceae	*Arenaria* species	06/07	2411	27.08	87.94	Charkhol, Maimajuwa
46.	D 119		Araceae	*Arisaema jacquemontii* Blume	09/23	3210	27 18 45	88 01 22.4	Paharemeghu, Falaincha-9
47.	A 060		Araceae	*Arisaema sp*	06/09	3338	27.1	87.98	Maimajuwa, Above Dhupi
48.	C 141		Aristolochiaceae	*Aristlochia griffithii* Hook. f. & Thomson ex Dutch	09/03	2005	27 11 27	87 56 18.6	Dobate, Mabu-8
49.	D 299		Asteraceae	*Artemisia dubia* Wall. ex Besser	09/30	2005	27 11 27	87 56 18.6	Memeng
50.	D 364		Asteraceae	*Artemisia vulgaris* auct=*Artemisia indica* Willd.	10/02	1893	27 10 33	87 57 32.4	Prangbung
51.	D 289	Banso	Poaceae	*Arundinella pumila* (Hochst.) Steud.	09/29	2390	27 12 51	87 57 51.6	Narelung CF, Memeng-3
52.	B 180		Asclepiadaceae	*Asclepias curssavica* L.	06/08	2621	27.02	88.02	Jamuna, Jowbari
53.	B 155		Asparagaceae	*Asparagus filicinus* Buch.-Ham.ex D.Don.var. *lycopodineus* Bake	06/07	2245	27.04	88.00	Jamuna 2, Hangetham (New record species)
54.	D 298		Asteraceae	*Aster species*	09/30	2005	27 11 27	87 56 18.6	Memeng
55.	B 191		Asteraceae	*Aster tricephalus* C.B.Clarke	06/08	2207	26.99	88.02	Jogmai, Kholagaun
56.	C 059	Budho okhati	Saxifragaceae	*Astilbe rivularis* Buch.-Ham. ex D.Don	08/28	1974	27 04 17.5	87 57 39	Sisne, Mai majhuwa
57.	C 101		Fabaceae	*Astragalus sikkimensis* Benth. ex Bunge	08/30	3210	27 18 45	88 01 22.4	Chhintapu
58.	A 058		Fabaceae	*Astragalus species*	06/09	3338	27.1	87.98	Maimajuwa, Above Dhupi
59.	D 284		Fabaceae	*Astragalus stipulatus* D.Don ex Sims	09/29	2390	27 12 51	87 57 51.6	Narelung CF, Memeng-3
60.	D 237		Begoniaceae	*Begonia cathcartii* Hook. f./ *Begonia josephii*. A.DC.	09/28	1947	27 14 55	87 57 21.3	Chamling danda, Chyangtharpu
61.	C 118		Begoniaceae	*Begonia dioica* Buch.-Ham. ex D.Don	09/01	2450	27 04 21.2	87 59 29	Mabu-8
62.	B 157		Begoniaceae	*Begonia flaviflora* H. Hara	06/07	2245	27.04	88.00	Jamuna 2, Hangetham (New record species)
63.	C 128		Begoniaceae	*Begonia gemmipara* Hook.f.	09/01	2450	27 04 21.2	87 59 29.2	Patarashe, Mabu-8
64.	A 021		Begoniaceae	*Begonia grevillanum (B. lamberthii)*	06/07	2411	27.08	87.94	Charkhol, Maimajuwa
65.	C 086		Begoniaceae	*Begonia josephii* A.DC.	08/30	2650	27 05 28.6	87 55 29.2	Chhintapu
66.	D 357		Begoniaceae	*Begonia panchtharensis* sp. nov.	10/02	2248	27 10 01	87 57 17.8	Prangbung (New to the World)
67.	C 200		Begoniaceae	*Begonia sikkimensis* A.DC.	09/05	2656	27 04 07.0	87 59 37.6	Dobate, Hangetham
68.	D 326		Begoniaceae	*Begonia species*	10/01	2115	27 09 38	87 57 10.5	Hiwakhla- \Khaka, Memeng-Prangbung
69.	B 034		Berberidaceae	*Berberis angulosa* Wall. ex Hook. f. & Thomson	06/09	3357	27.1	87.98	Maimajuwa , Dhupi Chaur
70.	B 195		Berberidaceae	*Berberis aristata* DC.	06/08	2207	26.99	88.02	Jogmai, Kholagaun
71.	B 012		Berberidaceae	*Berberis hookeri* Lem.	06/08	2870	27.10	87.93	Sidin 1, Jamle
72.	B 144		Berberidaceae	*Berberis insignis* Hook. f. & Thomson	06/06	2800	27.06	88.01	Mabu, Kalapokhari
73.	B 067		Berberidaceae	*Berberis petiolaris* Wall. Ex G.Don	06/12	3374	27.20	88.01	Memeng, Gorkhepani
74.	B 131		Berberidaceae	*Berberis species*	06/06	2778	27.07	88.01	Mabu, Kalapokhari
75.	D 137		Berberidaceae	*Berberis tsarica* Ahrendt	09/25	3355	27 18 29	88 01 56.7	Meghu-Faleke, Falaincha-9
76.	D 164		Berberidaceae	*Berberis wallichiana* DC.	09/26	3210	27 18 45	88 01 22.4	Faleke-betini, Falaincha-9
77.	D 093		Saxifragaceae	*Bergenia purpurascens* (Hook.f. & Thomson)	09/22	3930	27 23 20	88 02 22.5	Paharemeghu, Falaincha-9
78.	D 140		Betulaceae	*Betula utilis* D. Don.	09/26	3280	27 18 33	88 01 38.4	Faleke-betini, Falaincha-9
79.	D 362		Asteraceae	*Bidens pilosa var. minor* (Blume) Sherff	10/02	1893	27 10 33	87 57 32.4	Prangbung
80.	C 099	Pakhanbed	Polygonaceae	*Bistorta amplexicaulis* (D. Don) Greene	08/30	2278	27 00 3902	88 01 18	Chhintapu
81.	D 121		Polygonaceae	*Bistorta vivipara* (L.) Gray	09/23	4337	27 26 11	88 03 16.0	Paharemeghu, Falaincha-9
82.	C 160		Cucurbitaceae	*Biswania tonglensis* (C.B.Clarke) Cogn.	09/03	2689	27 04 19.8	88 00 2.7	Dobate, Mabu-8
83.	C 003		Urticaceae	*Boehmeria clidemioides* Miq.	08/27	1817	27 03 52	87 56 38	Thulogaun, Maimajhuwa
84.	D 185		Urticaceae	*Boehmeria macrophylla* D.Don		1980	27 17 01	87 58 14.6	Maklabu
85.	D 184		Urticaceae	*Boehmeria ternifolia* D.Don		1980	27 17 01	87 58 14.6	Maklabu
86.	C 083	Udushe jhar	Rutaceae	*Boenninghaausenia albiflora* (Hook.) Rchb.ex Meisn.	08/30	3170	27 05 22.7	87 54 47.3	Chibe, Chhintapu CF
87.	D 290		Poaceae	*Bothriochloa bladhii*	09/30	2005	27 11 27	87 56 18.6	Memeng
88.	D 272		Urticaceae	*Bouhemaria hamiltoniana* Wedd.	09/29	2500	27 12 58	87 57 05.0	Dabale bhanjyang-Memeng,Memeng

89.	C 135		Orchidaceae	*Bulbophylum retusiusculum* Rchb.f.	09/03	2665	27 04 05.1	87 59 28.9	Dobate, Mabu-8
90.	D 130		Poaceae	*Calamogrostis lahulensis*	09/24	4337	27 26 11	88 03 16.0	Timbu Falaincha-9 (New record species)
91.	B 164		Scrophulariaceae	*Calceolaria gracilis* Kunth *C. tripartina*	06/07	2172	27.04	88.01	Jamuna 2, Hangetham
92.	D 170		Scrophulariaceae	*Calceolaria maxicana* Benth. = *Calceolaria gracilis* Kunth.	09/26	3210	27 18 45	88 01 22.4	Faleke-betini, Falaincha-9
93.	B 057		Ranunculaceae	*Caltha palustris* L.	06/12	3411	27.20	88.01	Memeng, Gorkhepani
94.	D 282		Theaceae	*Camellia kissi* Wall. *(Syn: C. drupifera* auct.*)*	09/29	2390	27 12 51	87 57 51.6	Narelung CF, Memeng-3
95.	C 012		Campanulaceae	*Campanula pallida* Wall.	08/27	2100	27 04 19	87 56 34	Naule gaun, Mai majhuwa7
96.	D 180		Fabaceae	*Campylotropis speciosa* (Royle ex Schindl.) Schindl.	09/26	1900	27 16 04	87 57 29.9	Faleke-betini, Falaincha-9
97.	A 040		Cruciferae	*Cardamine flexuosa* With	06/08	2835	27.1	87.95	Banduke
98.	B 058		Cruciferae	*Cardamine macrophylla* Willd.	06/12	3374	27.20	88.01	Memeng, Gorkhepani
99.	C 240		Cyperaceae	*Carex cruciata* Wahlenb *var. agrocarpa*	09/12	3210	27 18 45	88 01 22	Bie-Chitre, Jogmai-2 (New record species)
100.	D 131		Cyperaceae	*Carex duthiei* C.B.Clarke	09/24	1900	27 16 04	87 57 29.9	Timbu Falaincha-9
101.	A 009		Cyperaceae	*Carex filicina* Nees	06/07	1903	27.06	87.94	Maimajuwa 7, Upper Hatiya
102.	B 192		Cyperaceae	*Carex inanis* C.B. Clarke in Hook.f.	06/08	2207	26.99	88.02	Jogmai, Kholagaun
103.	D 203		Cyperaceae	*Carex species*	09/27	1791	27 15 08	87 57 27.1	Falaincha-6, Tintine
104.	D 110		Ericaceae	*Cassiope fastigiata* (Wall.)D.Don	09/23	4050	27 25 08	88 02 55.3	Paharemeghu, Falaincha-9
105.	B 171	Katush	Fagaceae	*Castanopsis hystrix* Miq.	06/07	2172	27.04	88.01	Jamuna 2, Hangetham
106.	D 200		Fagaceae	*Castanopsis longispina*	09/27	1900	27 16 04	87 57 29.9	Falaincha-6, Tintine (New record species)
107.	C 217		Zingiberaceae	*Cautleya gracilis* (Sm.) Dandy	09/06	2468	27 02 57.3	88 00 46	Jamuna-1
108.	D 240	Patta sherpu	Zingiberaceae	*Cautleya spicata* (Sm.) Baker in Hook.f.	09/28	1947	27 14 55	87 57 21.3	Chamling danda, Chyangtharpu
109.	D 061		Caryophyllaceae	*Cerastium glomeratum* Thuill.	09/21	3910	27 23 35	88 02 16.6	Dund, Falaincha-9
110.	D 182		Asclepiadaceae	*Ceropegia hookerii* C.B. Clarke ex Hook.f.		2481	27 09 34	87 57 15.4	Maklabu
111.	C 207		Asclepiadaceae	*Ceropegia macrantha* Wight	09/06	1980	27 17 01	87 58 14.6	Hangetham, Jamuna-1
112.	C 058		Asclepiadaceae	*Ceropegia pubescens* Wall	08/28	2656	27 04 07.0	87 59 37	Sisne, Mai majhuwa
113.	B 196		Solanaceae	*Cestrum elegans* (Brgn. Ex Neumann) Schltdl.	06/08	2207	26.99	88.02	Jogmai, Kholagaun
114.	D 211		Solanaceae	*Cestrum species*	09/27	1900	27 16 04	87 57 29.9	Falaincha-6, Tintine
115.	C 042		Gesneriaceae	*Chirita macrophylla* Wall./ *C. urticifolia* Buch.-Ham. ex D.Don	08/27	1838	27 04 02	87 56 22	Rate khola, Mai majhuwa
116.	D 338		Gesneriaceae	*Chirita species*	10/01	1974	27 04 17.5	87 57 39	Hiwakhla- \Khaka, Memeng-Prangbung
117.	C 243	Musale	Liliaceae	*Chlorophytum nepalense* (Lindl.) Baker	09/12	2443	27 00 43.7	88 03 09.8	Bie-Chitre, Jogmai-2
118.	D 141	Gaikande	Asteraceae	*Cirsium falconeri* (Hook.f.) Petr.	09/26	3210	27 18 45	88 01 22.4	Faleke-betini, Falaincha-9
119.	C 224		Vitaceae	*Cissus repens* Lam.	09/09	2209	27 02 38.6	88 00 47.9	Hangetham CF
120.	D 041,		Ranunculaceae	*Clematis buchnaniana* DC.	09/20	3735	27 20 57	88 03 30.5	Major-faleke-Gairi, Falaincha-9
121.	D 349		Ranunculaceae	*Clematis connata* DC.	10/02	2588	27 09 45	87 56 18.7	Talkharka-Prangbung, Prangbung
122.	B 053		Ranunculaceae	*Clematis montana* Buch.-Ham.ex DC.	06/11	3445	27.17	88.01	Prangbung, Bikhepani
123.	D 274		Labiatae	*Clinopodium umbrosum* (M.Bieb.) K.Koch	09/29	2005	27 11 27	87 56 18.6	Narelung CF, Memeng-3
124.	C 107		Campanulaceae	*Codonopsis bhutanica* Ludlow	09/01	2665	27 04 05.1	87 59 28	
125.	D 054		Campanulaceae	*Codonopsis thalictrifolia* Wall.	09/21	3680	27 20 02	88 03 46.7	Sukhkhadhap-Dund, Falaincha-9
126.	C 024		Campanulaceae	*Codonopsis viridis* Wall.	08/27	2187	27 04 33	87 56 37	Mane dada, Terse gaun, Mai majhuwa
127.	A 029		Orchidaceae	*Coelogyne species??*	06/07	2812	27.1	87.94	Goruwale, Sidin
128.	D 181		Labiatae	*Colquhonia coccinia* Wall. var. *coccinea*		2390	27 12 51	87 57 51.6	Maklabu
129.	C 186		Commelinaceae	*Commelina paludosa* Blume	09/05	2005	27 11 27	87 56 18.6	Dobate, Hangetham
130.	D 316		Asteraceae	*Conyza stricta* Willd.	09/30	2550	27 11 44	87 57 35	Narelung Nursery, Memeng
131.	D 179		Gesneriaceae	*Corallodiscus lanuginosus* (Wall.ex DC.)Burtt	09/26	1570	27 15 44	87 57 19.0	Faleke-betini, Falaincha-9
132.	D 216		Gesneriaceae	*Corralodiscus species*		2481	27 09 34	87 57 15.4	Falaincha, Betini
133.	D 079		Papaveraceae	*Corydalis cashmeriana* Royle var *cristata*	09/22	3930	27 23 20	88 02 22.5	Near Budhipani Falaincha-9
134.	D 263		Papaveraceae	*Corydalis chaerophylla*	09/29	1991	27 11 27	87 56 17.8	Mulchowk near sukha

				DC.					pokhari
135.	B 068		Papaveraceae	*Corydalis cornuata* Royle	06/12	3374	27.20	88.01	Memeng, Gorkhepani
136.	D 059		Papaveraceae	*Corydalis juncea* Wall.	09/21	3735	27 20 57	88 03 30.5	Dund, Falaincha-9
137.	D 044		Papaveraceae	*Corydalis pachypoda* (Franch.) Hand.-Mazz.	09/20	2480	27 05 18.6	87 55 37.7	Major-faleke-Gairi, Falaincha-9
138.	D 370		Papaveraceae	*Corydalis species*	09/20	3910	27 23 35	88 02 16.6	Majortham, Falaincha-4
139.	D 090		Papaveraceae	*Corydalis stracheyi* Prain	09/22	3910	27 23 35	88 02 16.6	Paharemeghu, Falaincha-9
140.	B 134		Corylaceae	*Corylus ferox* Wall.	06/06	2772	27.06	88.01	Mabu, Kalapokhari
141.	D 297		Convolvulaceae	*Coscuta reflexa* Roxb. var *brachystigma* Engelm.	09/30	2861	27 05 10.1	87 55 12.6	Memeng
142.	C 004	exotic	Asteraceae	*Cosmos bipinnatus*	08/27	1817	27 03 52	87 56 38	Thulogaun, Maimajhuwa
143.	D 165	Gurjo	Rosaceae	*Cotoneaster microphyllus* Wall. ex Lindl.	09/26	1980	27 17 01	87 58 14.6	Faleke-betini, Falaincha-9
144.	C 234			*Craniotome furcata* (Link) Kuntze	09/11	2278	27 00 3902	88 01 18.5	Ramite, Jogmai-1
145.	D 347		Gentianaceae	*Crawfordia species*	10/02	2194	27 14 22	87 57 29.4	Talkharka-Prangbung, Prangbung
146.	C 239		Gentianaceae	*Crawfordia speciosa* Wall.	09/12	2656	27 04 07.0	87 59 37.6	Bie-Chitre, Jogmai-2
147.	D 108		Asteraceae	*Cremanthodium nepalense* Kitam.	09/23	4337	27 26 11	88 03 16.0	Paharemeghu, Falaincha-9
148.	D 307		Fabaceae	*Crotalaria cytisoides* Roxb. ex DC.	09/30	1991	27 11 27	87 56 17.8	Memeng, Bich Gaun
149.	D 309		Fabaceae	*Crotolaria alata* Buch.-Ham. ex D.Don	09/30	2050	27 04 28.4	87 58 48	Memeng, Bich Gaun
150.	D 197		Fabaceae	*Crotolaria albida* Heyne ex Roth	09/27	1570	27 15 44	87 57 19.0	Falaincha-6, Tintine
151.	D 374		Campanulaceae	*Cyananthes inflatus* Hook.f.	09/20	3450	27 17 01	88 01 55.5	Majortham, Falaincha-4
152.	D 001		Campanulaceae	*Cyananthus hookeri* C.B. Clarke	09/18	3580	27 12 50	88 00 49.1	Phalot-Chiwabhanjyang
153.	C 008		Commelinaceae	*Cyanotis fasiculata*	08/27				Thulogaun, Maimajhuwa
154.	D 292		Commelinaceae	*Cyanotis vaga* (Lour.) Schult. & Schult. f.	09/30	2248	27 10 01	87 57 07.8	Memeng
155.	C 171	Biblate kuro	Amaranthaceae	*Cyathula capitata* Moq. c.f.	09/03	2656	27 04 07.0	87 59 37	Dobate, Mabu-8
156.	D 155			*Cyathula tomentosa* (Roth.) Moq					
157.	D 320		Poaceae	*Cymbopogon microtheca* (Hook.f.) A.Camus	09/30	2550	27 11 44	87 57 35	Narelung Nursery, Memeng
158.	D 318		Cyperaceae	*Cyperus iria* L.	09/30	2157	27 02 38.3	88 00 57	Narelung Nursery, Memeng
159.	D 158		Poaceae	*Danthonia cumminsii* Hook.f.	09/26	3210	27 18 45	88 01 22.4	Faleke-betini, Falaincha-9
160.	B 085		Thymelaceae	*Daphne bholua* Buch.-Ham.ex D.Don	06/14	3224	27.09	88.00	Mabu, Bikhe Bhanjyang
161.	A 053		Thymelaceae	*Daphne species*	06/09	3185	27.1	87.98	Maimajuwa, Dhupi
162.	D 196		Thymalaceae	*Daphne sureil* W.W.Sm.& Cave	09/27	1900	27 16 04	87 57 29.9	Falaincha-6, Tintine
163.	B 110		Daphniphyllaceae	*Daphniphyllum himalense* (Benth.) Mull. Arg.	06/16	3053	27.07	88.01	Mabu, Kalapokhari
164.	B 019		Daphniphyllaceae	*Daphniphyllum species*	06/08	3014	27.1	87.94	Maimajuwa 8 , Bharlang
165.	D 157	Tusare	Urticaceae	*Debregeasia longifolia* (Burm.f.)	09/26	3210	27 18 45	88 01 22.4	Faleke-betini, Falaincha-9
166.	D 078		Ranunculaceae	*Delphinium caeruleum* Jacquem.ex Cambess.	09/22	4337	27 26 11	88 03 16.0	Near Budhipani Falaincha-9
167.	D 126		Ranunculaceae	*Delphinium nepalense* Kitam. & Tamura	09/24	4337	27 26 11	88 03 16.0	Timbu Falaincha-9
168.	D 302		Poaceae	*Dendrocalamos hamiltonii* Nees & Arn. ex Munro	09/30	2005	27 11 27	87 56 18.6	Memeng
169.	D 285		Fabaceae	*Desmodium elagans* DC.	09/29	2005	27 11 27	87 56 18.6	Narelung CF, Memeng-3
170.	D 301		Fabaceae	*Desmodium heteropcarpon* (L.)DC.	09/30	1991	27 11 27	87 56 17.8	Memeng
171.	D 304		Fabaceae	*Desmodium microphyllum* (Thunb.)DC.	09/30	1991	27 11 27	87 56 17.8	Memeng, Bich Gaun
172.	D 220		Fabaceae	*Desmodium multiflorum* DC.		2390	27 12 51	87 57 51.6	Falaincha, Betini
173.	C 081	Chili gathi	Papaveraceae	*Dicentra macrocapnos* Prain	08/30	3170	27 05 22.7	87 54 47.3	Chibe, Chhintapu CF
174.	D 232		Papaveraceae	*Dicentra macrocapnos* Prain / *Dicentra scandens* (D.Don) Walp.	09/28	2750	27 13 26	87 57 45.4	Chamling gaun, Chyangtharpu
175.	A 041		Ranunculaceae	*Dichocarpum adiantifolium* (Hook.f. & Thomson) W.T.Wang & P.K.Hsiao	06/08	2835	27.1	87.95	Banduke
176.	B 146		Hydrangeaceae	*Dichroa febrifuga* Lour.	06/07	2238	27.04	88.00	Jamuna 2, Hangetham
177.	C 088	Kumkum	Gesneriaceae	*Didymocarpous aromaticus* Wall.ex D.Don	08/30	2650	27 05 28.6	87 55 29.2	Chhintapu
178.	A 018		Gesneriaceae	*Didymocarpus albicalyx* C.B.Clarke	06/07	2758	27.1	87.93	Uvikchok, Maimajuwa
179.	C 038		Gesneriaceae	*Didymocarpus species*	08/27	1838	27 04 02	87 56 22	Rate khola, Mai majhuwa

180.	C 203		Gesneriaceae	*Didymocarpus villosus* D.Don */albicalyx* C.B.Clarke	09/06	2334	27 02 44.8	88 00 25.6	Hangetham, Jamuna-1
181.	C 223		Dioscoreaceae	*Dioscorea deltoidea* Wall. ex Griseb	09/09	2005	27 11 27	87 56 18.6	Hangetham CF
182.	D 213	prazeri	Dioscoreaceae	*Dioscorea glabra* Roxb.		1570	27 15 44	87 57 19.0	Falaincha, Betini
183.	D 214	deltoidea	Dioscoreaceae	*Dioscorea kamoonensis* Kunth *cf*		3820	27 20 28	88 03 53	Falaincha, Betini
184.	B 161		Convallariaceae	*Disporum calcaratum* D.Don	06/07	2172	27.04	88.01	Jamuna 2, Hangetham
185.	C 241		Convallariaceae	*Disporum sp*	09/12	2443	27 00 43.7	88 03 09.8	Bie-Chitre, Jogmai-2
186.	D 242		Anacardiaceae	*Dobinea spp*	09/28	1991	27 11 27	87 56 17.8	Chamling danda, Chyangtharpu
187.	C 184		Anacardiaceae	*Dobinea vulgaris* Buch.-Ham ex D.Don	09/05	3210	27 18 45	88 01 22.4	Dobate, Hangetham
188.	C 166	Vale malagiri	Lauraceae	*Dodecania grandiflora* Nees in Wall.	09/03	2656	27 04 07	87 59 37	Dobate, Mabu-8
189.	D 109		Labiatae	*Dracocephalum wallichii* Sealy	09/23	3210	27 18 45	88 01 22.4	Paharemeghu, Falaincha-9
190.	D 057		Droseraceae	*Drosera species*	09/21	2187	27 04 33	87 56 37	Dund, Falaincha-9
191.	C 028		Thymelaceae	*Edgworthia gardneri* (Wall.) Meisn.	08/27	2187	27 04 33	87 56 37	Mane dada, Terse gaun, Mai majhuwa
192.	D 223		Cyperaceae	*Eleocharis congesta* D.Don	09/28	1791	27 15 08	87 57 27.1	Chamling gaun, Chyangtharpu
193.	D 189		Labiatae	*Elsholtzia blanda* (Benth.) Benth.		2390	27 12 51	87 57 51.6	Maklabu
194.	C 113		Labiatae	*Elsholtzia flava* (Benth.) Benth.	09/01	3930	27 23 20	88 02 22.5	Mabu-8
195.	D 175	Basilam	Labiatae	*Elsholtzia fruticosa* (D.Don) Rehder	09/26	1947	27 14 55	87 57 21.3	Faleke-betini, Falaincha-9
196.	D 091		Labiatae	*Elstholzia strobilifera* (Benth.) Benth	09/22	3210	27 18 45	88 01 22.4	Paharemeghu, Falaincha-9
197.	B 113		Ericaceae	*Enkianthus deflexus* (Griff.) C.K.Schneid.	06/06	2969	27.07	88.01	Mabu, Kalapokhari
198.	C 148		Onagraceae	*Epilobium species*	09/03	1838	27 04 02	87 56 22	Dobate, Mabu-8
199.	C 147		Poaceae	*Eragrostis nigra* Nees ex Steud.	09/03	2665	27 04 05.1	87 59 28	Dobate, Mabu-8
200.	D 266		Asteraceae	*Erigeron species*	09/29	2750	27 13 26	87 57 45.4	Mulchowk near sukha pokhari
201.	D 222		Eriocaulaceae	*Eriocaulon viride* Korn.	09/28	1791	27 15 08	87 57 27.1	Chamling gaun, Chyangtharpu
202.	C 072		Fabaceae	*Erythrina arborescens* Roxb.	08/28	2861	27 05 10.1	87 55 12.6	Kalo pani, Mai majhuwa
203.	C 198		Celastraceae	*Eunymous grandiflorus*Wall. In Roxb.	09/05	3515	27 17 15	88 02 41.7	Dobate, Hangetham
204.	D 366		Celastraceae	*Eunyomus species*	09/20	1817	27 03 52	87 56 38	Majortham, Smajun, Sunakhari CF, Falaincha-4
205.	C 158		Celastraceae	*Euonymus porphyreus*Loes.	09/03	2689	27 04 19.8	88 00 2.7	Dobate, Mabu-8
206.	B 172		Theaceae	*Eurya species*	06/07	2172	27.04	88.01	Jamuna 2, Hangetham
207.	D 156		Polygonaceae	*Fagopyrum dibotrys* (D. Don) H. Hara	09/26	3210	27 18 45	88 01 22.4	Faleke-betini, Falaincha-9
208.	B 189		Moraceae	*Ficus hederacea Blume* Roxb./ *F subincisa* Buch.-Ham. ex Sm.	06/08	2278	27.00	88.02	Jamuna, Jowbari
209.	D 281		Moraceae	*Ficus pubigera* (Wall.ex Miq.)Brandis	09/29	1900	27 16 04	87 57 29.9	Narelung CF, Memeng-3
210.	D 060		Rosaceae	*Fragaria rubiginosa* Lacaita	09/21	3735	27 20 57	88 03 30.5	Dund, Falaincha-9
211.	A 068		Liliaceae	*Fritillaria cirrhosa* D. Don	06/09	3564	27.1	87.99	Sidin, Aahale Bhanjyang
212.	A 047		Rubiaceae	*Galium elegens* Wall.ex Roxb.	06/08	2837	27.1	87.95	Banduke
213.	C 007		Rubiaceae	*Galium species*	08/27	1817	27 03 52	87 56 38	Thulogaun, Maimajhuwa
214.	D 310		Rubiaceae	*Gallium hirtifolium* Req.ex DC.	09/30	1817	27 03 52	87 56 38	Memeng, Bich Gaun
215.	B 119		Araliaceae	*Gambelia ciliate* C.B. Clarke	06/06	2939	27.07	88.01	Mabu, Kalapokhari
216.	C 051	Lemchung bung	Ericaceae	*Gaultheria fragrantisima* Wall.	08/28	2480	27 05 18.6	87 55 37.7	Newa khola, Mai majhuwa
217.	D 352	Dhansingre	Ericaceae	*Gaultheria nummularioides* D.Don	10/02	2588	27 09 45	87 56 18.7	Talkharka-Prangbung, Prangbung
218.	B 050		Ericaceae	*Gaultheria pyroloides* Hook.f. & Thomson ex Miq.	06/11	3445	27.17	88.01	Prangbung, Bikhepani
219.	C 206		Ericaceae	*Gaultheria semi-infera* (C.B.Clarke) Airy Shaw	09/06	2468	27 02 57.3	88 00 46	Hangetham, Jamuna-1
220.	D 021		Ericaceae	*Gaultheria trichophyla* Royle	09/19	3530	27 19 29	88 03 09.0	Chiwabhanjyang-Major
221.	D 291		Labiatae	*Geniospermum species*	09/30	2115	27 09 38	87 57 10.5	Memeng
222.	D 097		Gentianaceae	*Gentiana elwesii*	09/23	3850	27 22 10	88 02 20.8	Paharemeghu, Falaincha-9

				C.B.Clarke					
223.	D 002		Gentianaceae	*Gentiana petiolata (Gentiana pedicellata* (D.Don) Griseb.*)*	09/18	2463	27 00 11.3	88 01 22.3	Phalot-Chiwabhanjyang
224.	D 064		Gentianaceae	*Gentiana sikkimensis* C.B.Clarke	09/21	3530	27 19 29	88 03 09.0	Dund, Falaincha-9
225.	A 033		Gentianaceae	*Gentiana species*	06/07	2812	27.1	87.94	Goruwale, Sidin
226.	A 026		Geraniaceae	*Geranium nepalense* Sweet	06/07	1822	27.06	87.94	Goruwale, Sidin
227.	D 026		Geraniaceae	*Geranium polyanthes* Edgew. & Hook.f.	09/20	3450	27 17 01	88 01 55.5	Majortham, Falaincha-4
228.	D 273		Geraniaceae	*Geranium wallichianum* D.Don ex Sweet	09/29	2390	27 12 51	87 57 51.6	Narelung CF, Memeng-3
229.	D 193		Asteraceae	*Gerbera microphylla* Wall. ex C.B. Clarke		1980	27 17 01	87 58 14.6	Maklabu
230.	B 059		Rosaceae	*Geum sikkimense* Prain	06/12	3374	27.20	88.01	Memeng, Gorkhepani
231.	D 254		Rosaceae	*Geum species*	09/29	2640	27 13 22	87 57 36.4	Dabale Deurali
232.	B 016		Urticaceae	*Girardinia species*	06/08	2904	27.10	87.94	Maimajuwa 8 , Bharlang
233.	D 243		Zingiberaceae	*Globba species*	09/28	2194	27 14 22	87 57 29.4	Menjuwa
234.	C 109		Verbenaceae	*Gmelina arborea* Roxb.	09/01	1974	27 04 17	87 57 39	
235.	C 122		Asteraceae	*Gnaphalium species*	09/01	2450	27 04 21.2	87 59 29	Patarashe, Mabu-8
236.	C 143		Orchidaceae	*Goodyera foliosa* (Lindl.) Benth.ex Hook.f. in Hook.f.	09/03	2665	27 04 05.1	87 59 28.9	Dobate, Mabu-8
237.	C 210		Orchidaceae	*Habenaria arietina* Hook.f.	09/06	2468	27 02 57.3	88 00 46	Jamuna-1
238.	C 032		Orchidaceae	*Habenaria species*	08/27	2187	27 04 33	87 56 37	Kamire Mai Majhuwa
239.	B 054		Boraginaceae	*Hackelia uncinata* (Benth. In Royle) C.S.E. Fisch.	06/11	3445	27.17	88.01	Prangbung, Bikhepani
240.	D 286		Araliaceae	*Hedera nepalensis* K. Koch	09/29	1974	27 04 17.5	87 57 39.7	Narelung CF, Memeng-3
241.	D 217		Rubiaceae	*Hedyotis scandens* Roxb.		1570	27 15 44	87 57 19.0	Falaincha, Betini
242.	C 001		Scrophulariaceae	*Hemiphragma species*	08/27	1817	27 03 52	87 56 38	Thulogaun, Maimajhuwa
243.	C 064	ENDEMIC	Umbelliferae	*Heracleum lallii* C. Norman	08/28	1974	27 04 17.5	87 57 39	Sisne, Mai majhuwa
244.	D 004		Umbelliferae	*Heracleum sublineare* C.B.Clarke	09/18	3490	27 13 17	88 00 54.3	Phalot-Chiwabhanjyang
245.	C 161	Ban karela	Cucurbitaceae	*Herpetospermum peduculosum* (Ser.) Baill.	09/03	1980	27 17 01	87 58 14.6	Dobate, Mabu-8
246.	C 115	Gulpha	Lardizabalaceae	*Holboellia latifolia var angustifolia* (Wall.) Hook.f .& Thomson	09/01	2450	27 04 21.2	87 59 29.2	Mabu-8
247.	C 194		Asclepiadaceae	*Hoya linearis* Wall.	09/05	2334	27 02 44.8	88 00 25	Dobate, Hangetham
248.	A 046		Asclepiadaceae	*Hoya longifolia* Wall. ex Wight	06/08	2837	27.1	87.95	Banduke
249.	D 331		Hydrangeaceae	*Hydrangea anomala* D.Don	10/01	3530	27 19 29	88 03 09.0	Hiwakhla- \Khaka, Memeng-Prangbung
250.	D 229		Hydrangeaceae	*Hydrangea aspera* Buch.-Ham. ex D.Don *var robusta*	09/28	1974	27 04 17.5	87 57 39	Chamling gaun, Chyangtharpu
251.	C 065		Hydrangeaceae	*Hydrangea heteromalla* D.Don	08/28	2185	27 04 36.5	87 55 52	Sisne, Mai majhuwa
252.	D 228		Hydrangeaceae	*Hydrangea paniculata*	09/28	2450	27 04 21.2	87 59 29	Chamling gaun, Chyangtharpu
253.	D 256		Umbelliferae	*Hydrocotyle himalaica* P.K. Mukh.	09/29	2702	27 13 21	87 57 25.2	Dabale Deurali
254.	C 230		Umbelliferae	*Hydrocotyle nepalensis* Hook. = *Hydroctyle javanica* Thunb.	09/09	2209	27 02 38.6	88 00 47	Hangetham CF
255.	C 006		Umbelliferae	*Hydrocotyle podantha* Auct = *Hydrocotyle himalaica* P.K.Mukh.	08/27	1817	27 03 52	87 56 38	Thulogaun, Maimajhuwa
256.	D 351		Asteraceae	*Hymenopogon species*	10/02	2684	27 09 22	87 57 07.9	Talkharka-Prangbung, Prangbung
257.	C 018		Hypericaceae	*Hypericum choisianum* Wall.ex N.Robson	08/27	1791	27 15 08	87 57 27.1	Mane dada, Terse gaun, Mai majhuwa
258.	D 246		Hypericaceae	*Hypericum hookeranum* Wight & Arn	09/28	2665	27 04 05.1	87 59 28.9	Menjuwa
259.	A 002		Hypericaceae	*Hypericum japonicum* Thunb.ex Murray	06/06	1861	27.06	87.94	Maimajuwa 7, Upper Hatiya
260.	C 095		Hypericaceae	*Hypericum nepalense* K.Koch = *Hypericum uralum* Buch.-Ham. ex D.Don	08/30	2115	27 09 38	87 57 10.5	Chhintapu
261.	C 078		Hypericaceae	*Hypericum perforatum*	08/29	1791	27 15 08	87 57 27.1	Chibe, Maimajhuwa
262.	C 127		Hypericaceae	*Hypericum petiolulatum* Hook.f. & Thomson ex Dyer	09/01	3515	27 17 15	88 02 41.7	Patarashe, Mabu-8
263.	C 009		Acanthaceae	*Hypoestes triflora* (Forssk.) Roem. & Schult.	08/27	1817	27 03 52	87 56 38	Thulogaun, Maimajhuwa
264.	C 220		Aquifoliaceae	*Ilex dipyrena Wall.*	09/07	3210	27 18 45	88 01 22.4	Hangetham, Jamuna-1

265.	C 155	Seti kaath, patpate	Aquifoliaceae	*Ilex fragilis* Hook. f.	09/03	2689	27 04 19.8	88 00 2.7	Dobate, Mabu-8
266.	D 160	Lise	Aquifoliaceae	*Ilex hookeri* King = *Ilex sikimensis* Kurz	09/26	2656	27 04 07.0	87 59 37	Faleke-betini, Falaincha-9
267.	D 037		Balsaminaceae	*Impatiens bicornuta Wall.*	09/20	3475	27 18 22	88 02 41.7	Majortham, Falaincha-4
268.	D 328		Balsaminaceae	*Impatiens discolors* DC.	10/01	2115	27 09 38	87 57 10.5	Hiwakhla- \Khaka, Memeng-Prangbung
269.	D 006		Balsaminaceae	*Impatiens falcifer* Hook.f.	09/19	3170	27 16 50	88 01 50.3	Chiwabhanjyang
270.	A 008		Balsaminaceae	*Impatiens graciliflora* Hook.f.	06/07	1903	27.06	87.94	Maimajuwa 7, Upper Hatiya
271.	C 017		Balsaminaceae	*Impatiens insignnis* DC.	08/27	2100	27 04 19	87 56 34	Naule gaun, Mai majhuwa7
272.	B 188		Balsaminaceae	*Impatiens leptoceras* DC.	06/08	2278	27.00	88.02	Jamuna, Jowbari
273.			Balsaminaceae	*Impatiens puberula* DC.	08/27	2187	27 04 33	87 56 37	Kamire, Mai Majhuwa
274.	C 015		Balsaminaceae	*Impatiens racemosa* DC.	08/27	2100	27 04 19	87 56 34	Naule gaun, Mai majhuwa7
275.	D 028		Balsaminaceae	*Impatiens species*	09/20	3450	27 17 01	88 01 55.5	Majortham, Falaincha-4
276.	D 234		Balsaminaceae	*Impatiens spirifer* Hook. f. & Thmson	09/28	1947	27 14 55	87 57 21.3	Chamling danda, Chyangtharpu
277.	B 179		Balsaminaceae	*Impatiens stenantha* Hook. f.	06/08	2621	27.02	88.02	Jamuna, Jowbari
278.	A 013		Balsaminaceae	*Impatiens sulcata* Wall.	06/07	2176	27.07	87.94	Maimajuwa 7, Terse Gaun
279.	D 259		Balsaminaceae	*Impatiens urticifolia* Wall.	09/29	2640	27 13 22	87 57 36.4	Dabale Deurali
280.	D 201		Asteraceae	*Inula cappa* (Buch.-Ham. ex D.Don) DC.	09/27	1900	27 16 04	87 57 29.9	Falaincha-6, Tintine
281.	A 078		Iridaceae	*Iris clarkei* Baker ex Hook.f. in Hook.f.	06/09	3550	27.12	87.98	Prangbung, Chandu
282.	D 204		Poaceae	*Isachne albens* Trin.	09/27	1900	27 16 04	87 57 29.9	Falaincha-6, Tintine
283.	D 288		Labiatae	*Isodon lophanthoides* (Buch.-Ham. ex D.Don) H. Hara	09/29	2550	27 11 44	87 57 35	Narelung CF, Memeng-3
284.	C 213			*Isodon scrophulariodes* (Benth.) Murata	09/06	2468	27 02 57.3	88 00 46	Jamuna-1
285.	C 146		Juncaceae	*Juncus benghalensis* Kunth	09/03	3530	27 19 29	88 03 09.0	Dobate, Mabu-8
286.	D 012		Juncaceae	*Juncus clarkei*	09/19	3530	27 19 29	88 03 09.0	Chiwabhanjyang-Major (New record species)
287.	D 011		Juncaceae	*Juncus grisebachii* Buchenau	09/19	3530	27 19 29	88 03 09.0	Chiwabhanjyang-Major
288.	D 013		Juncaceae	*Juncus khasiensis*	09/19	3910	27 23 35	88 02 16.6	Chiwabhanjyang-Major (New record species)
289.	D 103		Juncaceae	*Juncus triglumis* L.	09/23	2187	27 04 33	87 56 37	Paharemeghu, Falaincha-9
290.	D 120		Cupressaceae	*Juniperus recurva*Buch.-Ham. ex D.Don	09/23	2050	27 04 28.4	87 58 48	Paharemeghu, Falaincha-9
291.	D 293		Acanthaceae	*Justicia procumbens* (D. Don) T. Yamaz.	09/30	2005	27 11 27	87 56 18.6	Memeng
292.	D 373		Polygonaceae	*Koenigia nepalensis* D. Don	09/20	1791	27 15 08	87 57 27.1	Majortham, Falaincha-4
293.	D 300		Cyperaceae	*Kyllinga brevifolia* Rottb.	09/30	2550	27 11 44	87 57 35	Memeng
294.	C 014	Gagleto	Urticaceae	*Lecanthus peduncularis* (Royle) Wedd.	08/27	2100	27 04 19	87 56 34	Naule gaun, Mai majhuwa7
295.	C 225	Gandhe	Rubiaceae	*Leptodermis ludlowii*	09/09	3355	27 18 29	88 01 56.7	Hangetham CF
296.	D 235		Labiatae	*Leucas ciliata* Benth.	09/28	2005	27 11 27	87 56 18.6	Chamling danda, Chyangtharpu
297.	D 315		Labiatae	*Leucas mollissima* Wall. ex Benth.	09/30	1991	27 11 27	87 56 17.8	Narelung Nursery, Memeng
298.	B 177		Oleaceae	*Ligustrum confusum* Decne.	06/08	2621	27.02	88.02	Jamuna, Jowbari
299.	C 106		Liliaceae	*Lilium nepalense* D. Don	09/01	2482	27 05 04.5	87 55 39.1	Chibe
300.	D 202		Scrophulariaceae	*Lindenbergia grandiflora* (Buch.-Ham. ex D.Don) Benth.	09/27	1900	27 16 04	87 57 29.9	Falaincha-6, Tintine
301.	D 314		Scrophulariaceae	*Lindenbergia muraria* (Roxb.ex D.Don) Bruhl.	09/30	1980	27 17 01	87 58 14.6	Memeng, Bich Gaun
302.	C 165	Lekh timur	Lauraceae	*Lindera cubeba* (Lour.) Pers.	09/03	2656	27 04 07.0	87 59 37	Dobate, Mabu-8
303.	C 021	Siltimur	Lauraceae	*Lindera neesiana* (Wall.ex Nees) Kurz.	08/27	2656	27 04 07.0	87 59 37.6	Mane dada, Terse gaun, Mai majhuwa
304.	B 185		Lauraceae	*Lindera species*	06/08	2450	27.01	88.02	Jamuna, Jowbari
305.	D 169	Arkhaulo	Fagaceae	*Lithocarpus elegans* (Blume) Hatus. ex Soep	09/26	3210	27 18 45	88 01 22.4	Faleke-betini, Falaincha-9
306.	B 137		Lauraceae	*Litsea kingii* Hook.f.	06/06	2772	27.06	88.01	Mabu, Kalapokhari
307.	B 130		Lauraceae	*Litsea sericea* (Wall. ex Nees) Hook. f.	06/06	2778	27.07	88.01	Mabu, Kalapokhari
308.	C 226		Lobeliaceae	*Lobelia pyramidalis* Wall.	09/09	2173	27 04 30.4	87 58 36.1	Hangetham CF
309.	D 271		Lobeliaceae	*Lobelia seguinii* var. *doniana* (Skottsb.) E.Wimm	09/29	2500	27 12 58	87 57 05.0	Dabale bhanjyang-Memeng,Memeng
310.	D 116		Gentianaceae	*Lomatogonium carianthiacum* (Wulfen) Rchb.	09/23	4050	27 25 08	88 02 55.3	Paharemeghu, Falaincha-9
311.	B 062		Caprifoliaceae	*Lonicera angustifolia* Wall. ex DC.	06/12	3374	27.20	88.01	Memeng, Gorkhepani

312.	D 102		Caprifliaceae	*Lonicera cyanocarpa* var. *porphyrantha* C. Marquand & Airy Shaw in C. Marquand	09/23	3910	27 23 35	88 02 16.6	Paharemeghu, Falaincha-9
313.	C 197		Caprifoliaceae	*Lonicera webbiana* Wall. ex DC.	09/05	2656	27 04 07.0	87 59 37.6	Dobate, Hangetham
314.	D 153		Rubiaceae	*Luculia gratissima* (Wall.) Sweet	09/26	1570	27 15 44	87 57 19.0	Faleke-betini, Falaincha-9
315.	B 077	Angeri	Ericaceae	*Lyonia viliosa* (Hook.f.)Hand.-Mazz.	06/14	3395	27.10	88.00	Mabu 8, Chatu Bari
316.	C 183	Bilaune	Myrsinaceae	*Maesa chisia* Buch.-Ham. ex D.Don	09/05	3210	27 18 45	88 01 22.4	Dobate, Hangetham
317.	B 176	Ghoge champ	Magnoliaceae	*Magnolia campbelli* Hook.f. & Thomson	06/07	2716	27.04	88.03	Jamuna, Gairibas
318.	B 055		Boraginaceae	*Maharanga emodi* (Wall.) A.DC	06/11	3398	27.19	88.01	Prangbung 6, Ghamaile
319.	C 202	Keshari	Berberidaceae	*Mahonia napaulensis*DC.	09/06	3570	27 17 36	88 02 38.6	Hangetham, Jamuna-1
320.	C 134		Convallariaceae	*Maianthemum fuscum* (Wall.) LaFrankie	09/03	2665	27 04 05.1	87 59 28.9	Dobate, Mabu-8
321.	A 024		Convallariaceae	*Maianthemum oleraceum* (Baker) Hook.f. & Thms. ex Hook. f.	06/07	1822	27.06	87.94	Goruwale, Sidin
322.	A 067		Convallariaceae	*Maianthemum tatsiense*	06/09	3548	27.1	87.99	Maimajuwa , Tarunipani
323.	D 317		Cyperaceae	*Mariscus sumatrensis* (Retz.) T. Koyama	09/30	2550	27 11 44	87 57 35	Narelung Nursery, Memeng
324.	A 034		Scrophulariaceae	*Mazus surculosus* D.Don	06/07	2812	27.1	87.94	Goruwale, Sidin
325.	B 070		Papaveraceae	*Meconopsis lyrata* (Cummins & Prain) Fedde ex Prain	06/12	3374	27.20	88.01	Memeng, Gorkhepani
326.	D 034		Papaveraceae	*Meconopsis nepaulensis* DC.	09/20	3820	27 20 28	88 03 53	Majortham, Falaincha-4
327.	C 091		Papaveraceae	*Meconopsis paniculata* Prain	08/30				Chhintapu
328.	D 129		Papaveraceae	*Meconopsis simplicifolia* (D.Don) Walp.	09/24	1791	27 15 08	87 57 27.1	Timbu Falaincha-9
329.	D 367		Papaveraceae	*Meconopsis villosa* (Hook.f.) G.Taylor	09/20	3450	27 17 01	88 01 55.5	Majortham, Sunakhari CF, Falaincha-4
330.	B 132		Sabiaceae	*Meloisoma simplicifolia* (Roxb.) Walp.	06/06	2778	27.07	88.01	Mabu, Kalapokhari
331.	D 191		Cucurbitaceae	*Melothria wallichiana/ Solena heterophylla* Lour.		1791	27 15 08	87 57 27.1	Maklabu
332.	B 108		Araliaceae	*Meriolliopanax alpinus Decne. & Planch. Brassiopsis alpina* C.B. Clarke	06/16	3053	27.07	88.01	Mabu, Kalapokhari
333.	C 071	Rani champ	Magnoliaceae	*Michelia doltsopa* Buch.-Ham.ex DC.	08/28	2861	27 05 10.1	87 55 12.6	Kalo pani, Mai majhuwa
334.	C 055	Tite champ	Magnoliaceae	*Michelia velutiana* DC.	08/28	1870	27 04 08	87 57 39.7	Newa khola, Mai majhuwa
335.	D 325		Labiatae	*Microtoena nepalensis* Stearn.	10/01	2187	27 04 33	87 56 37	Hiwakhla- \Khaka, Memeng-Prangbung
336.	B 011		Boraginaceae	*Microula pustulosa* (C.B.Clarke) Duthie	06/08	2870	27.10	87.93	Sidin 1, Jamle
337.	D 206		Scrophulariaceae	*Mimulus nepalensis* Benth	09/27	1900	27 16 04	87 57 29.9	Falaincha-6, Tintine
338.	D 335	Phurke	Poaceae	*Miscanthus nepalensis* (Trin.) Hack.	10/01	2481	27 09 34	87 57 15.4	Hiwakhla- \Khaka, Memeng-Prangbung
339.	D 225		Pontederiaceae	*Monocoria veginalis* (Burm. f.) C. Presi	09/28	2650	27 05 28.6	87 55 29.2	Chamling gaun, Chyangtharpu
340.	B 175		Monotropaceae	***Monotropa hypopithys*** Linn./*Monotrapastrum humile* (D.Don) H.Hara	06/07	2213	27.04	88.02	Jamuna 2, Hangetham
341.	C 219		Monotrapaceae	*Monotropa species*	09/06	2390	27 12 51	87 57 51.6	Hangetham, Jamuna-1
342.	D 212		Myricaceae	*Myrica esculanta* Buch.-Ham. ex D.Don	09/27	2656	27 04 07.0	87 59 37	Falaincha-6, Tintine
343.	C 229	Bajrath	Myrsinaceae	*Myrsine semiserrata* Wall.	09/09	2209	27 02 38.6	88 00 47.9	Hangetham CF
344.	D 166	Papate/setikath	Myrsinaceae	*Myrsine species*	09/26	1980	27 17 01	87 58 14.6	Faleke-betini, Falaincha-9
345.	D 087	Jatamasi	Valerienaceae	*Nardostachys grandiflora* DC.	09/22	3930	27 23 20	88 02 22.5	Paharemeghu, Falaincha-9
346.	C 043		Rubiaceae	*Neanotis gracilis* (Hook.f.) W.H. Lewis	08/27	1837	27 04 15.8	87 57 29.1	Rate khola, Mai majhuwa
347.	B 138		Rosaceae	*Neillia rubiflora* D.Don	06/06	2777	27.06	88.01	Mabu, Kalapokhari
348.	D 192		Rosaceae	*Neillia thyrsiflora* D.Don		1980	27 17 01	87 58 14.6	Maklabu
349.	C 010		Rubiaceae	*Neohymenopogon parasiticus*	08/27	1838	27 04 02	87 56 22	Thulogaun, Maimajhuwa
350.	C 174	Belase	Lauraceae	*Neolitsea cuipala* (Buch.-Ham. ex D.Don) Kosterm.	09/03	2334	27 02 44.8	88 00 25.6	Dobate, Mabu-8
351.	C 233	Bhale jisi	Lauraceae	*Neolitsea foliolosa*	09/11	1838	27 04 02	87 56 22	Ramite, Jogmai-1
352.	D 134	Kutki	Scrophulariaceae	*Neopicrorhiza scrophulariflora* (Pennell) Hong	09/25	4337	27 26 11	88 03 16.0	Timbu Falaincha-9
353.	D 014		Orchidaceae	*Neottianthe secundiflora*	09/19	3530	27 19 29	88 03 09.0	Chiwabhanjyang-Major

				(Hook.f) Schlr.					
354.	A 048		Pteridaceae	*Notholaena species* R.Br.	06/08	2920	27.09	87.96	Lampokhari
355.	C 102		Oleaceae	*Nyctanthus arbor-tristis* L.	08/30	2861	27 05 10.1	87 55 12.6	Chhintapu
356.	B 193		Umbelliferae	*Oenanthe thomsonii* C.B.Clarke	06/08	2207	26.99	88.02	Jogmai, Kholagaun
357.	C 040			*Ophiopogon sp*					
358.	D 149		Liliaceae	*Ophiopogon wallichianus* (Kunth) Hook.f.	09/26	3280	27 18 33	88 01 38.4	Faleke-betini, Falaincha-9
359.	A 019		Orchidaceae	*Oreorchis micrantha* Lindl.	06/07	2758	27.1	87.93	Uvikchok, Maimajuwa
360.	D 312		Melastomataceae	*Osbekia nepalensis* Hook.	09/30	3210	27 18 45	88 01 22.4	Memeng, Bich Gaun
361.	D 249		Melastomataceae	*Osbekia sikkimensis* Craib	09/28	1991	27 11 27	87 56 17.8	Menjuwa
362.	C 016		Melastomataceae	*Osbekia stellata* Buch.-Ham.ex D.Don	08/27	1837	27 04 15.8	87 57 29.1	Naule gaun, Mai majhuwa7
363.	D 183		Santallaceae	*Osyrus species*		1980	27 17 01	87 58 14.6	Maklabu
364.	D 248	Dar	Melastomataceae	*Oxyspora paniculata* (D.Don) DC.	09/28	2194	27 14 22	87 57 29.4	Menjuwa
365.	B 031		Araliaceae	*Panax pseudo-ginseng* subsp. *Himalaicus* var *angustofolia* (Burkill) Li	06/08	3057	27.10	87.57	Sidin 1, Lampokheri
366.	B 030		Araliaceae	*Panax pseudo-ginseng var bipinnatifidus H. Hara*	06/08	3057	27.10	87.57	Sidin 1, Lampokheri
367.	D 008		Araliaceae	*Pantapanax fragrans* = *Pantapanax leschanultii* (DC.) Seem	09/19	3280	27 18 33	88 01 38.4	Chiwabhanjyang-Major
368.	D 173		Araliaceae	*Pantapanax leschenaultiai* (DC.) Seem	09/26	2390	27 12 51	87 57 51.6	Faleke-betini, Falaincha-9
369.	C 139		Liliaceae	*Paris polyphylla* Sm. subsp *polyphylla*	09/03	2665	27 04 05.1	87 59 28.9	Dobate, Mabu-8
370.	B 123		Liliaceae	*Paris polyphylla* subsp *marmorata* (Stearn) H.Hara	06/06	2845	27.07	88.00	Mabu, Kalapokhari
371.	D 106		Parnassiaceae	*Parnassia nubicola* Wall.ex Royle	09/23	2185	27 04 36.5	87 55 52	Paharemeghu, Falaincha-9
372.	D 048		Scrophulariaceae	*Pedicularis furfuracea* Wall.ex Benth.	09/21	3530	27 19 29	88 03 09.0	Gairi, Failaincha-9
373.	D 051		Scrophulariaceae	*Pedicularis gracilis* Wall.ex Benth.	09/21	3640	27 19 59	88 03 43.6	Gairi-sukhkhadhap Failaincha-9
374.	D 066		Scrophulariaceae	*Pedicularis megalantha* D.Don	09/21	3820	27 20 28	88 03 53	Dund, Falaincha-9
375.	C 094		Scrophulariaceae	*Pedicularis penneliana* P.C.Tsoong	08/30	3170	27 05 22.7	87 54 47.3	Chhintapu
376.	D 122		Scrophulariaceae	*Pedicularis siphonantha* D.Don	09/24	4050	27 25 08	88 02 55.3	Paharemeghu, Falaincha-9
377.	B 027		Araliaceae	*Pentapanax trifoliatus*	06/08	3035	27.10	87.96	Sidin 1, Lampokheri
378.	C 077		Piperaceae	*Peperomia tetraphylla* (G.Forst) Hook. & Arn.	08/29	1980	27 17 01	87 58 14.6	Chibe, Maimajhuwa
379.	D 268		Polygonaceae	*Persicaria chinensis* (Lam.) H. Hara	09/29	2115	27 09 38	87 57 10.5	Dabale bhanjyang-Memeng,Memeng
380.	D 039		Polygonaceae	*Persicaria polystachya* (Wall. ex Meisen.) H. Gross	09/20	3475	27 18 22	88 02 41.7	Major-faleke-Gairi, Falaincha-9
381.	D 227		Polygonaceae	*Persicaria pubescens* (Franch. & Sav.) H. Hara	09/28	2500	27 12 58	87 57 05.0	Chamling gaun, Chyangtharpu
382.	A 007		Polygonaceae	*Persicaria runcinata* (Buch.-Ham. ex D. Don) H. Gross	10/02	3450	27 17 01	88 01 55.5	Prangbung
383.	D 040		Polygonaceae	*Persicaria species*	09/20	3685	27 21 20	88 03 25.7	Major-faleke-Gairi, Falaincha-9
384.	D 077		Polygonaceae	*Persicaria wallichii*	09/22	3850	27 22 10	88 02 20.8	Dund, Falaincha-9
385.	B 107		Labiatae	*Phlomis macrophylla* Wall.ex Benth.	06/16	3053	27.07	88.01	Mabu, Kalapokhari
386.	D 324		Euphorbiaceae	*Phyllanthes parvirolius* Buch.-Ham. ex D.Don	10/01	1775	27 10 32	87 57 17.0	Hiwakhla- \Khaka, Memeng-Prangbung
387.	C 079		Ericaceae	*Pieris formosa* (Wall.) D. Don	08/30	2450	27 04 21.2	87 59 29.2	Chibe, Chhintapu CF
388.	C 039		Urticaceae	*Pilea anisophylla* Wedd.	08/27	1838	27 04 02	87 56 22	Rate khola Mai majhuwa
389.	C 080		Urticaceae	*Pilea bracteosa* Wedd.	08/30	2480	27 05 18.6	87 55 37.7	Chibe, Chhintapu CF
390.	A 044		Urticaceae	*Pilea scripta* (Buch.-Ham.ex D.Don) Wedd. / *Pilea symmeria* Wedd.	06/08	2837	27.1	87.95	Banduke
391.	C 044		Urticaceae	*Pilea species*	08/27	1838	27 04 02	87 56 22	Rate khola Mai majhuwa
392.	A 016		Urticaceae	*Pilea ternifolia* Wedd.	06/08	2264	27.07	87.94	Maimajuwa 7, Above Terse Gaun
393.	D 186		Piperaceae	*Piper mellesua* Buch.-Ham. ex D.Don		1893	27 10 33	87 57 32.4	Maklabu
394.	B 018		Fabaceae	*Piptanthus nepalensis* (Hook.)D. Don	06/08	3014	27.1	87.94	Maimajuwa 8 , Bharlang
395.	D 363		Plantaginaceae	*Plantago erosa* Wall.	10/02	1974	27 04 17	87 57 39	Prangbung

396.	A 063		Plantaginaceae	*Plantago species*	06/09	3338	27.1	87.98	Maimajuwa, Above Dhupi
397.	A 023		Orchidaceae	*Pleione hookeriana* (Lindl.) J.Moore	06/07	1822	27.06	87.94	Goruwale, Sidin
398.	D 105		Umbelliferae	*Pleurospermum apiolens* C.B.Clarke	09/23	3910	27 23 35	88 02 16.6	Paharemeghu, Falaincha-9
399.	B 084		Berberidaceae	*Podophyllum hexandrum* Royle	06/14	3224	27.09	88.00	Mabu, Bikhe Bhanjyang
400.	C 111		Polygalaceae	*Polygala arillata* Buch.-Ham. ex D. Don	09/01	1991	27 11 27	87 56 17.8	
401.	D 308		Polygalaceae	*Polygalla persicarifolia* DC.	09/30	1837	27 04 15.8	87 57 29.1	Memeng, Bich Gaun
402.	B 142		Convallariaceae	*Polygonatum cathcartii* Baker	06/06	2777	27.06	88.01	Mabu, Kalapokhari
403.	A 043		Liliaceae	*Polygonatum leptophyllum* (D.Don) Royle = *P. verticillatum* (L.) All.	06/08	2837	27.1	87.95	Banduke
404.	C 209		Liliaceae	*Polygonatum punctatum* Royle ex Kunth	09/06	2468	27 02 57.3	88 00 46	Hangetham, Jamuna-1
405.	A 074		Liliaceae	*Polygonatum sibiricum* auct. = *P. cirrhifolium* (Wall.) Royle	06/09	3550	27.12	87.98	Prangbung, Chandu
406.	D 063		Liliaceae	*Polygonatum singalilense* H.Hara	09/21	3820	27 20 28	88 03 53	Dund, Falaincha-9
407.	D 145		Liliaceae	*Polygonatum verticillatum* (L.) All.	09/26	3280	27 18 33	88 01 38.4	Faleke-betini, Falaincha-9
408.	C 005		Orchidaceae	*Poneroorchis species*	08/27	1817	27 03 52	87 56 38	Thulogaun, Maimajhuwa
409.	A 054		Rosaceae	*Potentialla kleniana* Wight	06/09	3185	27.1	87.98	Maimajuwa, Dhupi
410.	A 011		Rosaceae	*Potentialla lineata* Trev.	06/07	2124	27.07	87.94	Maimajuwa 7, Terse Gaun
411.	B 064		Rosaceae	*Potentialla species*	06/12	3374	27.20	88.01	Memeng, Gorkhepani
412.	A 006		Rosaceae	*Potentialla sundaica*	06/07	1903	27.06	87.94	Maimajuwa 7, Upper Hatiya (New record species)
413.	D 088		Rosaceae	*Potentilla fruticosa var rigida* (Wall.ex Lehm.)Wolf	09/22	3910	27 23 35	88 02 16.6	Paharemeghu, Falaincha-9
414.	D 128		Rosaceae	*Potentilla peduncularis* D.Don	09/24	3210	27 18 45	88 01 22.4	Timbu Falaincha-9
415.	A 004		Urticaceae	*Pouzolzia hirta* (Blume) Hassk. = *Gonostegia hirta* (Blume) Miq.	06/06	1861	27.06	87.94	Maimajuwa 7, Upper Hatiya
416.	A 003		Urticaceae	*Pouzolzia zeylanica* (L.) Benn. &R.Br.	06/06	1861	27.06	87.94	Maimajuwa 7, Upper Hatiya
417.	C 235		Campanulaceae	*Pratia nummularia* (Lam.) A.Braun & Asch.	09/11	2278	27 00 3902	88 01 18	Ramite, Jogmai-1
418.	B 080		Primulaceae	*Primula floribunda L.*	06/14	3268	27.09	88.01	Mabu, Bikhe Bhanjyang
419.	C 089		Primulaceae	*Primula glomerata* Pax	08/30	3850	27 22 10	88 02 20.8	Chhintapu
420.	D 092	Gidde pwankh	Primulaceae	*Primula ianthina*	09/22	4050	27 25 08	88 02 55.3	Paharemeghu, Falaincha-9
421.	D 118		Primulaceae	*Primula primulina* (Spreng.) H. Hara	09/23	2187	27 04 33	87 56 37	Paharemeghu, Falaincha-9
422.	B 111		Labiatae	*Prunella vulgaris* L.	06/16	3053	27.07	88.01	Mabu, Kalapokhari
423.	B 026		Rosaceae	*Prunus cerasoides* D.Don	06/08	3035	27.10	87.96	Sidin 1, Lampokheri
424.	D 019		Rosaceae	*Prunus cornuata* (Wall.ex Royle)	09/19	3820	27 20 28	88 03 53	Chiwabhanjyang-Major
425.	D 068		Rosaceae	*Prunus rufa* var. *trichantha* (Koehne) H.Hara	09/22	3735	27 20 57	88 03 30.5	Dund, Falaincha-9
426.	C 074		Cyperaceae	*Pycreus flavidus* (Retz.) T. Koyama	08/28	2443	27 00 43.7	88 03 09.8	Kalo pani, Mai majhuwa
427.	D 224		Cyperaceae	*Pycreus saguinolentus* (Vahl) Nees ex C.B.Clarke in Hook.f.	09/28	2005	27 11 27	87 56 18.6	Chamling gaun, Chyangtharpu
428.	D 322		Rosaceae	*Pyracantha crenulata* (D.Don) M. Roem.	10/01	1775	27 10 32	87 57 17.0	Hiwakhla- \Khaka, Memeng-Prangbung
429.	D 178		Fagaceae	*Quercus glauca* Thunb. = *Cyclobalanopsis glauca* (Thunb.) Oersted	09/26	3210	27 18 45	88 01 22.4	Faleke-betini, Falaincha-9
430.	D 332		Fagaceae	*Quercus lamellosa* Roxb.= *Cyclobalanopsis lamellosa* (Sm.) Oersted	10/01	2481	27 09 34	87 57 15.4	Hiwakhla- \Khaka, Memeng-Prangbung
431.	D 277		Fagaceae	*Quercus semicarpifolia* Sm.	09/29	2390	27 12 51	87 57 51.6	Narelung CF, Memeng-3
432.	A 079		Ranunculaceae	*Ranunculus adoxifolius* Hand.-Mazz.	06/09	3420	27.12	87.98	Prangbung 6, Pasi Bhanjyang
433.	A 049		Ranunculaceae	*Ranunculus brotherusi* Freyn	06/08	2920	27.09	87.96	Lampokhari
434.	A 027		Ranunculaceae	*Ranunculus diffusus* DC.	06/07	1822	27.06	87.94	Goruwale, Sidin
435.	A 072		Ranunculaceae	*Ranunculus pulchellus* C.A.Mey	06/09	3550	27.12	87.98	Prangbung, Chandu
436.	A 055		Ranunculaceae	*Ranunculus species*	06/09	3185	27.1	87.98	Maimajuwa, Dhupi
437.	C 199		Araceae	*Remusatia hookeriana* Schott	09/05	4050	27 25 08	88 02 55.3	Dobate, Hangetham

438.	D 132	Kyanjo	Polygonaceae	*Rheum nobile* Hook. f. & Thomson	06/07	4337	27 26 11	88 03 16.0	Timbu Falaincha-9
439.	C 096		Crassulaceae	*Rhodiola chrysansanthemefolia* subsp. *Sacra* (Raym.-Hamet) H. Ohba	08/30	3475	27 18 22	88 02 41.7	Chhintapu
440.	D 073		Crassulaceae	*Rhodiolla himalensis* (D.Don) S.H.Fu	09/21	4050	27 25 08	88 02 55.3	Dund, Falaincha-9
441.	D 112		Crassulaceae	*Rhodiolla oreades*	09/23	4050	27 25 08	88 02 55.3	Paharemeghu, Falaincha-9
442.	D 071		Crassulaceae	*Rhodiolla species*	09/22	2689	27 04 19.8	88 00 2.7	Dund, Falaincha-9
443.	D 086	Sunpati	Ericaceae	*Rhododendron anthopogon* D.Don	09/22	3930	27 23 20	88 02 22.5	Paharemeghu, Falaincha-9
444.	C 137		Ericaceae	*Rhododendron arboreum* Sm. var. *arboreum*	09/03	2665	27 04 05.1	87 59 28	Dobate, Mabu-8
445.	C 215		Ericaceae	*Rhododendron ciliatum* Hook.f.	09/06	2463	27 00 11.3	88 01 22.3	Hangetham, Jamuna-1
446.	B 078		Ericaceae	*Rhododendron cinnabarinum* Hook.f.	06/14	3395	27.10	88.00	Mabu 8, Chatu Bari
447.	D 010		Ericaceae	*Rhododendron falconeri* Hook.f.	09/19	3530	27 19 29	88 03 09.0	Chiwabhanjyang-Major
448.	D 016		Ericaceae	*Rhododendron grande* Wight	09/19	3530	27 19 29	88 03 09.0	Chiwabhanjyang-Major
449.	C 132		Ericaceae	*Rhododendron griffithiana* Wight	09/03	2665	27 04 05.1	87 59 28	Dobate, Mabu-8
450.	B 043		Ericaceae	*Rhododendron hodgsonii* Hook.f.	06/10	3454	27.13	87.99	Prangbung, Surketham
451.	A 051		Ericaceae	*Rhododendron lepidotum* Wall.ex G.Don	06/08	2920	27.09	87.96	Lampokhari
452.	B 013		Ericaceae	*Rhododendron lindleyi* T.Moore	06/08	2870	27.10	87.93	Sidin 1, Jamle
453.	B 033		Ericaceae	*Rhododendron species*	06/09	3357	27.1	87.98	Maimajuwa , Dhupi Chaur
454.	B 162		Ericaceae	*Rhododendron thomsonii* Hook.f.	06/07	2172	27.04	88.01	Jamuna 2, Hangetham
455.	C 204		Ericaceae	*Rhododendron vaccinoides* Hook.f.	09/06	2334	27 02 44.8	88 00 25.6	Hangetham, Jamuna-1
456.	C 011		Commelinaceae	*Rhopalephora scaberrima*	08/27	2100	27 04 19	87 56 34	Naule gaun, Mai majhuwa 7
457.	D 171		Anacardiaceae	*Rhus chinensis* Mill. = *Rhus javanica* L.	09/26	1947	27 14 55	87 57 21.3	Faleke-betini, Falaincha-9
458.	D 311	Khanakpa	Anacardiaceae	*Rhus sp (Rhus wallichii??)*	09/30	2457	27 02 49.8	88 00 25.6	Memeng, Bich Gaun
459.	C 121		Anacardiaceae	*Rhus succedanea* L.	09/01	2656	27 04 07.0	87 59 37.6	Mabu-8
460.	D 368		Rosaceae	*Rosa sericea* Lindl.	09/20	1991	27 11 27	87 56 17.8	Majortham, Smajun, Sunakhari CF, Falaincha-4
461.	A 037		Zingiberaceae	*Roscoea alpina* Royle	06/08	2827	27.1	87.94	Upper Maimajuwa
462.	C 142		Rubiaceae	*Rubia cordifolia* Auct	09/03	2209	27 02 38.6	88 00 47.9	Dobate, Mabu-8
463.	D 279		Rubiaceae	*Rubia hispidicaulis*	09/29	2450	27 04 21.2	87 59 29	Narelung CF, Memeng-3 (New record species)
464.	D 148		Rubiaceae	*Rubia wallichiana* Decne.	09/26	3210	27 18 45	88 01 22.4	Faleke-betini, Falaincha-9
465.	B 092		Rosaceae	*Rubus acuminatus* Sm.	06/15	3032	27.08	88.01	Mabu, Kalapokhari
466.	C 149		Rosaceae	*Rubus calycinoides* Kuntze	09/03	2689	27 04 19.8	88 00 2.7	Dobate, Mabu-8
467.	B 124		Rosaceae	*Rubus calycinus* Wall.ex D.Don	06/06	2845	27.07	88.00	Mabu, Kalapokhari
468.	D 136		Rosaceae	*Rubus gracilis* auct. = *Rubus griffithii* Hook.f.	09/25	2187	27 04 33	87 56 37	Meghu-Faleke, Falaincha-9
469.	D 323		Rosaceae	*Rubus griffithii* Hook.f.	10/01	2684	27 09 22	87 57 07.9	Hiwakhla- \Khaka, Memeng-Prangbung
470.	B 024		Rosaceae	*Rubus hypargyrus var niveus* (Wall. Ex. G.Don) H.Hara	06/08	3007	27.10	87.96	Sidin 1, Lampokheri
471.	C 119		Rosaceae	*Rubus lineatus* Reinw.	09/01	2689	27 04 19.8	88 00 2	Mabu-8
472.	D 265		Rosaceae	*Rubus paniculatus* Sm.	09/29	2390	27 12 51	87 57 51.6	Mulchowk near sukha pokhari
473.	B 167		Rosaceae	*Rubus pentagonus* Wall.ex Focke	06/07	2172	27.04	88.01	Jamuna 2, Hangetham
474.			Rosaceae	*Rubus rugosus* Sm.					
475.	C 150		Rosaceae	*Rubus splendidissimus* H.Hara	09/03	2689	27 04 19.8	88 00 2.	Dobate, Mabu-8
476.	B 143		Rosaceae	*Rubus treutleri* Hook.f.	06/06	2777	27.06	88.01	Mabu, Kalapokhari
477.	D 319		Poaceae	*Sacciolepis indica* (L.) Chase	09/30	2550	27 11 44	87 57 35	Narelung Nursery, Memeng
478.	D 117		Salicaceae	*Salix lindeylina* var. *microphylla* Anderson	09/23	4050	27 25 08	88 02 55.3	Paharemeghu, Falaincha-9
479.	B 029		Salicaceae	*Salix sikkimensis* Anderson /*Salix disperma* Rxb.ex D.Don	06/08	3057	27.10	87.57	Sidin 1, Lampokheri
480.	C 130	Charibhang	Sambucaceae	*Sambucus adnata* Wall. ex DC.	09/03	2665	27 04 05.1	87 59 28.9	Dobate, Mabu-8
481.	B 194		Umbelliferae	*Sanicula elata* Buch.-Ham.ex D.Don	06/08	2207	26.99	88.02	Jogmai, Kholagaun
482.	D 176		Buxaceae	*Sarcococca hookeriana*	09/26	3210	27 18 45	88 01 22.4	Faleke-betini, Falaincha-9

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483.	C 238		Buxaceae	*Sarcococca wallichii* Stapf	09/09	2209	27 02 38.6	88 00 47	Hangetham CF
484.	C 097	Kukur aalu	Orchidaceae	*Sartyrium nepalense* D.Don	08/30	2861	27 05 10.1	87 55 12.6	Chhintapu
485.	D 133		Asteraceae	*Saussurea gossypiphora* D.Don	09/24	3280	27 18 33	88 01 38.4	Timbu Falaincha-9
486.	D 065		Asteraceae	*Saussurea taraxisifoliaI* Wall. ex DC.	09/21	3855	27 24 33	88 02 26.1	Dund, Falaincha-9
487.	D 031		Asteraceae	*Saussurea uniflora* Wall. ex Sch. Bip.	09/20	3485	27 17 29	88 02 28.5	Majortham, Falaincha-4
488.	D 053		Asteraceae	*Saussurrea species*	09/21	3680	27 20 02	88 03 46.7	Sukhkhadhap-Dund, Falaincha-9
489.	D 371		Saxifragaceae	*Saxifraga brachypoda* D.Don	09/20	3450	27 17 01	88 01 55.5	Majortham, Falaincha-4
490.	D 003		Saxifragaceae	*Saxifraga diversifolia* Wall. ex Ser.	09/18	3580	27 12 50	88 00 49.1	Phalot-Chiwabhanjyang
491.	D 081		Saxifragaceae	*Saxifraga kingiana* Engl.& Irmsch.	09/22	3850	27 22 10	88 02 20.8	Near Budhipani Falaincha-9
492.	A 061		Saxifragaceae	*Saxifraga kumaunensis* Engl. /*Parnasia kumaonica* Nekr.	06/09	3338	27.1	87.98	Maimajuwa, Above Dhupi
493.	D 083		Saxifragaceae	*Saxifraga species*	09/22	3850	27 22 10	88 02 20.8	Near Budhipani Falaincha-9
494.	B 160		Schisandraceae	*Schisandra elongata* Hook.f. & Thomson = *Schisandra neglecta* A.C.Sm.	06/07	2243	27.04	88.01	Jamuna 2, Hangetham
495.	B 102		Schisandraceae	*Schisandra grandiflora* (Wall.) Hook. f. & Thomson	06/15	3059	27.08	88.01	Mabu, Near Mai khola, Chauri chowk
496.	A 028		Scrophulariaceae	*Scrophularia species*	06/07	1822	27.06	87.94	Goruwale, Sidin
497.	B 125		Scrophulariaceae	*Scruphularia urticifolia* Wall.ex Benth	06/06	2778	27.07	88.01	Mabu, Kalapokhari
498.	B 178		Loranthaceae	*Scurrula elata* (Edgew.) Danser	06/08	2621	27.02	88.02	Jamuna, Jowbari
499.	C 110		Loranthaceae	*Scurulla parasitica* L.	09/01	2241	27 04 28.8	87 59 17	
500.	D 295		Labiatae	*Scutellaria repens* Buch.-Ham. ex D.Don	09/30	2450	27 04 21.2	87 59 29	Memeng
501.	C 216		Labiatae	*Scutellaria scandens* Buch.Ham. ex D.Don	09/06	2468	27 02 57.3	88 00 46	Hangetham, Jamuna-1
502.	C 214		Labiatae	*Scutellaria violacea* Heyne ex Benth.	09/06	3855	27 24 33	88 02 26.1	Hangetham, Jamuna-1
503.	D 113		Crassulaceae	*Sedum oreades* (Decne.) Raym.-Hamet	09/23	2702	27 13 21	87 57 25.2	Paharemeghu, Falaincha-9
504.	D 035		Crassulaceae	*Sedum triactina* Berger	09/20	3735	27 20 57	88 03 30.5	Majortham, Falaincha-4
505.	C 026	Chhiru	Umbelliferae	*Selinum species*	08/27	2187	27 04 33	87 56 37	Mane dada, Terse gaun, Mai majhuwa
506.	D 151		Umbelliferae	*Selinum wallichianum* (DC.) Raizada & Saxena	09/26	3280	27 18 33	88 01 38.4	Faleke-betini, Falaincha-9
507.	C 151	Jaringo	Asteraceae	*Senecio acuminatus* Wall. ex DC.	09/03	2689	27 04 19.8	88 00 2.7	Dobate, Mabu-8
508.	C 157		Asteraceae	*Senecio alatus* Wall. ex DC.	09/03	2689	27 04 19.8	88 00 2.7	Dobate, Mabu-8
509.	C 152		Asteraceae	*Senecio chrysanthemoides* DC.	09/03	2689	27 04 19.8	88 00 2	Dobate, Mabu-8
510.	D 062		Asteraceae	*Senecio quinquelobus* (DC.) Hook.f. & Thomson ex C.B. Clarke	09/21	3820	27 20 28	88 03 53	Dund, Falaincha-9
511.	C 175	Lekali kuro	Asteraceae	*Senecio scandens* Buch.-Ham. ex D.Don	09/03	2656	27 04 07.0	87 59 37	Dobate, Mabu-8
512.	D 007		Asteraceae	*Senecio tetranthus* DC.	09/19	3170	27 16 50	88 01 50.3	Chiwabhanjyang-Major
513.	D 027		Asteraceae	*Senecio wallichi* DC.	09/20	3450	27 17 01	88 01 55.5	Majortham, Falaincha-4
514.	D 296		Poaceae	*Setaria glauca* (L.) P. Beauv.	09/30	2005	27 11 27	87 56 18.6	Memeng
515.	D 306		Malvaceae	*Sida rhombifolia* L.	09/30	1775	27 10 32	87 57 17.0	Memeng, Bich Gaun
516.	D 372		Umbelliferae	*Sinocarum clarkeanum*	09/20	3450	27 17 01	88 01 55.5	Majortham, Falaincha-4
517.	D 052		Umbelliferae	*Sinocarum pulchellum* C.Norman ex M.F.Watson	09/21	3640	27 19 59	88 03 43.6	Gairi-sukhkhadhap Failaincha-9
518.	D 142		Rutaceae	*Skimmia laureola* (DC.) Siebold & Zucc. subsp. *laureola*	09/26	4050	27 25 08	88 02 55.3	Faleke-betini, Falaincha-9
519.	B 173		Smilacaceae	*Smilax aspera* L.	06/07	2172	27.04	88.01	Jamuna 2, Hangetham
520.	D 353		Smilacaceae	*Smilax elegans* Wall.ex Kunth subsp *elegans*	10/02	2588	27 09 45	87 56 18.7	Talkharka-Prangbung, Prangbung
521.	D 334		Smilacaceae	*Smilax ferox* Wall.ex Kunth	10/01	2481	27 09 34	87 57 15.4	Hiwakhla- \Khaka, Memeng-Prangbung
522.	D 167		Smilacaceae	*Smilax menispermoides* A.DC.	09/26	3210	27 18 45	88 01 22.4	Faleke-betini, Falaincha-9
523.	C 212	Lekh kukurdaina	Smilacaceae	*Smilax minutiflora* A.DC.	09/06	2468	27 02 57.3	88 00 46	Hangetham, Jamuna-1
524.	D 305		Fabaceae	*Smithia ciliata* Royle	09/30	1991	27 11 27	87 56 17.8	Memeng, Bich Gaun

525.	C 164		Rosaceae	*Sorbus cuspidata* (Spach) Hedl.	09/03	2656	27 04 07.0	87 59 37.6	Dobate, Mabu-8
526.	D 075		Rosaceae	*Sorbus foliolosa* (Wall.) Spach	09/21	3930	27 23 20	88 02 22.5	Dund, Falaincha-9
527.	B 090		Rosaceae	*Sorbus hedlundii* C.K. Schneid	06/14	3121	27.09	88.01	Mabu, Bikhe Bhanjyang
528.	B 093		Rosaceae	*Sorbus kurzii* (Wall ex Prain) C.K.Schneid	06/15	3032	27.08	88.01	Mabu, Kalapokhari
529.	D 094		Rosaceae	*Sorbus microphylla* Wenz.	09/23	3910	27 23 35	88 02 16.6	Paharemeghu, Falaincha-9
530.	D 261		Rosaceae	*Sorbus rhamnoides* (Decne.) Rehder	09/29	2750	27 13 26	87 57 45.4	Dabale Deurali
531.	A 066		Rosaceae	*Spiraea bella* Sims	06/09	3548	27.1	87.99	Maimajuwa , Tarunipani
532.	A 012		Rosaceae	*Spiraea micrantha* Hook.f.	06/07	2124	27.07	87.94	Maimajuwa 7, Terse Gaun
533.	B 039		Rosaceae	*Spiraea sppecies*	06/09	3418	27.10	87.98	Sidin 1 , Tarsing
534.	C 025		Orchidaceae	*Spiranthes sinensis* var. *amoena* (M.Bieb.)H.Hara	08/27	2187	27 04 33	87 56 37	Mane dada, Terse gaun, Mai majhuwa
535.	D 124		Caryophyllaceae	*Stellaria decumbens* Edgew.	09/24	2702	27 13 21	87 57 25.2	Timbu Falaincha-9
536.	D 348		Caryophyllaceae	*Stellaria himalayensis* Majumdar	10/02	2656	27 04 07.0	87 59 37	Talkharka-Prangbung, Prangbung
537.	D 252		Caryophyllaceae	*Stellaria monosperma*Buch.-Ham. ex D.Dn (c.f.)	09/29	2684	27 09 22	87 57 07.9	Dabale Deurali
538.	D 369		Caryophyllaceae	*Stellaria sikkimensis* Hook.f. ex Edgew. & Hook.f.	09/20	3450	27 17 01	88 01 55.5	Majortham, Falaincha-4
539.	D 096		Caryophyllaceae	*Stellaria subumbellta* Edgew. ex Edgew.& Hook.f.	09/23	4050	27 25 08	88 02 55.3	Paharemeghu, Falaincha-9
540.	D 283		Menispermaceae	*Stephania elegans* Hok.f. & Thomson	09/29	2457	27 02 49.8	88 00 25.6	Narelung CF, Memeng-3
541.	D 161	Gujjar gano	Menispermaceae	*Stephania glabra* (Roxb.) Miers	09/26	1900	27 16 04	87 57 29.9	Faleke-betini, Falaincha-9
542.	C 108		Commelinaceae	*Streptolirion volubile* Edgew.	09/01	2656	27 04 07.0	87 59 37	
543.	C 191		Acanthaceae	*Strobilanthes helicta*	09/05	2656	27 04 07.0	87 59 37.6	Dobate, Hangetham (New record species)
544.	D 287		Acanthaceae	*Strobilanthus capitata* (Nees) T. Anders.	09/29	2390	27 12 51	87 57 51.6	Narelung CF, Memeng-3
545.	D 042		Gentianaceae	*Swertia aungustifolia* Buch.Ham.ex D.Don	09/20	3580	27 12 50	88 00 49.1	Major-faleke-Gairi, Falaincha-9
546.	C 188		Gentianaceae	*Swertia bimaculata* (Siebold & Zucc.) C.B.Clarke	09/05	2689	27 04 19.8	88 00 2.	Dobate, Hangetham
547.	D 210		Gentianaceae	*Swertia bimaculata* (Siebold & Zucc.) C.B.Clarke	09/27	1900	27 16 04	87 57 29.9	Falaincha-6, Tintine
548.	D 244		Gentianaceae	*Swertia chirayita* (Roxb.ex Fleming) H.Karst	09/28	1900	27 16 04	87 57 29.9	Menjuwa
549.	D 101		Gentianaceae	*Swertia cuneata* D.Don	09/23	3910	27 23 35	88 02 16.6	Paharemeghu, Falaincha-9
550.	D 058		Gentianaceae	*Swertia nepalensis* J.Shah	09/21	3820	27 20 28	88 03 53	Dund, Falaincha-9
551.	C 061		Gentianaceae	*Swertia nervosa* (G.Don) C.B.Clarke	08/28	2684	27 09 22	87 57 07.9	Sisne, Mai majhuwa
552.	C 103	Bhale chiraito	Gentianaceae	*Swertia paniculata* Wall.	08/30	2650	27 05 28.6	87 55 29.2	Chhintapu
553.	D 085		Gentianaceae	*Swertia teres* (G.Don) J.Shah	09/22	3820	27 20 28	88 03 53	Near Budhipani Falaincha-9
554.	D 099		Gentianaceae	*Swertia wardii*	09/23	3910	27 23 35	88 02 16.6	Paharemeghu, Falaincha-9 (New record species)
555.	C 227	Falame	Symplocaceae	*Symploccus species*	09/09	2209	27 02 38.6	88 00 47.9	Hangetham CF
556.	D 168	Kholme	Symplocaceae	*Symplocos glomerata* King ex C.B.Clarke	09/26	3210	27 18 45	88 01 22.4	Faleke-betini, Falaincha-9
557.	D 341		Symplocaceae	*Symplocos lucida* (Thunb. ex Murray) Siebold & Zucc.	10/01	2481	27 09 34	87 57 15.4	Hiwakhla- \Khaka, Memeng-Prangbung
558.	C 232		Symplocaceae	*Symplocos ramosissima* Wall. ex G.Don	09/11	2278	27 00 3902	88 01 18	Ramite, Jogmai-1
559.	C 156	Vale kholme	Symplocaceae	*Symplocus dryophila* C.B.Clarke	09/03	2689	27 04 19.8	88 00 2.	Dobate, Mabu-8
560.	A 064		Asteraceae	*Taraxacum* species	06/09	3338	27.1	87.98	Maimajuwa, Above Dhupi
561.	C 112		Loranthaceae	*Taxillus cuneatus*	09/01	3450	27 17 01	88 01 55.5	Mabu-8
562.	D 333	Loathsalla	Taxaceae	*Taxus wallichiana* Zucc.	10/01	2481	27 09 34	87 57 15.4	Hiwakhla- \Khaka, Memeng-Prangbung
563.	C 178	Panilahare	Vitaceae	*Tetrastigma serrulatum* (Roxb.) Planch.	09/03	2656	27 04 07.0	87 59 37	Dobate, Mabu-8
564.	D 029		Ranunculaceae	*Thalictrum reniforme* Wall.	09/20	3485	27 17 29	88 02 28.5	Majortham, Falaincha-4
565.	C 082		Ranunculaceae	*Thalictrum species*		2480	27 05 18.6	87 55 37.7	
566.	B 086		Ranunculaceae	*Thalictrum virgatum* Hook.f.&Thomson	06/14	3224	27.09	88.00	Mabu, Bikhe Bhanjyang
567.	A 036		Liliaceae	*Theropogon species*	06/08	2827	27.1	87.94	Upper Maimajuwa
568.	D 321	Ban kapash	Malvaceae	*Thespesia lampas* (Cav.)	10/01	2100	27 04 19	87 56 34	Hiwakhla- \Khaka, Memeng-

				Dalzell & Gibson					Prangbung
569.	C 189		Acanthaceae	*Thunbergia coccinea* Wall. ex D.Don	09/05	2656	27 04 07.0	87 59 37.6	Dobate, Hangetham
570.	C 123		Acanthaceae	*Thunbergia species*	09/01	2450	27 04 21.2	87 59 29.2	Patarashe, Mabu-8
571.	A 022		Saxifragaceae	*Tiarella species/Saxifraga species*	06/07	1822	27.06	87.94	Goruwale, Sidin
572.	B 049		Liliaceae	*Tofieldia himalaica* Baker	06/11	3445	27.17	88.01	Prangbung, Bikhepani
573.	C 013		Scrophulariaceae	*Torenia diffusa* D.Don	08/27	2100	27 04 19	87 56 34	Naule gaun, Mai majhuwa7
574.	D 207		Scrophulariaceae	*Torenia violacea* (Azaola ex Blanco) Pennell	09/27	1900	27 16 04	87 57 29.9	Falaincha-6, Tintine
575.	D 344		Commelinaceae	*Tradescantia virginiana*	10/02	2665	27 04 05.1	87 59 28	Talkharka-Prangbung, Prangbung
576.	D 327		Cucurbitaceae	*Trichosanthes himalensis* C.B.Clarke	10/01	2248	27 10 01	87 57 17.8	Hiwakhla- \Khaka, Memeng-Prangbung
577.	C 076		Liliaceae	*Tricyrtis maculate* (D.Don) J.F.Macbr.	08/29	2185	27 04 36.5	87 55 52	Chibe, Maimajhuwa
578.	D 198		Gentianaceae	*Tripterospermum sp*	09/27	3280	27 18 33	88 01 38.4	Falaincha-6, Tintine
579.	D 123		Gentianaceae	*Tripterospermum volubile* (G.Don) H.Hara *subsp volubile*	09/24	4337	27 26 11	88 03 16.0	Timbu Falaincha-9
580.	D 015		Dipsacaceae	*Triptostegia glanduliferaWall.* ex DC.	09/19	3530	27 19 29	88 03 09.0	Chiwabhanjyang-Major
581.	D 219		Tiliaceae	*Triumphetta annua* L.		1570	27 15 44	87 57 19.0	Falaincha, Betini
582.	D 294		Malvaceae	*Urena lobata* L.	09/30	1991	27 11 27	87 56 17.8	Memeng
583.	D 360		Urticaceae	*Urtica dioica* L. var *atrichocaulis*	10/02	1893	27 10 33	87 57 32.4	Prangbung
584.	C 041		Urticaceae	*Urtica species*	08/27	1838	27 04 02	87 56 22	Rate khola Mai majhuwa
585.	B 025		Ericaceae	*Vaccinium nummularia* Hook.f. & Thmson ex C.B. Clarke	06/08	3007	27.10	87.96	Sidin 1, Lampokheri
586.	A 031		Ericaceae	*Vaccinium retosum* (Griff.) Hook.f. ex C.B. Clarke	06/07	2812	27.1	87.94	Goruwale, Sidin
587.	B 009		Ericaceae	*Vaccinium species*	06/08	2870	27.10	87.93	Sidin 1, Jamle
588.	D 038		Valarianaceae	*Valariena hardwickii* Wall.	09/20	3475	27 18 22	88 02 41.7	Major-faleke-Gairi, Falaincha-9
589.	B 079		Scrophulariaceae	*Veronica deltigera* Wall. ex Benth	06/14	3268	27.09	88.01	Mabu, Bikhe Bhanjyang
590.	A 032		Scrophulariaceae	*Veronica retusum* CF	06/07	2812	27.1	87.94	Goruwale, Sidin
591.	A 062		Scrophulariaceae	*Veronica umbelliformis* Pennel	06/09	3338	27.1	87.98	Maimajuwa, Above Dhupi
592.	C 019		Sambucaceae	*Viburnum coriaceum* Blume	08/27	2187	27 04 33	87 56 37	Mane dada, Terse gaun, Mai majhuwa
593.	B 005		Sambucaceae	*Viburnum erubescens* Wall.ex. DC.	06/07	2042	27.06	87.94	Maimajuwa 7, Naule Gaun
594.	C 116		Sambucaceae	*Viburnum mullaha* Buch.-Ham. ex D.Don	09/01	2450	27 04 21.2	87 59 29	Mabu-8
595.	D 036		Sambucaceae	*Viburnum nervosum* D.Don	09/20	3475	27 18 22	88 02 41.7	Majortham, Falaincha-4
596.	A 050		Violaceae	*Viola biflora* L.	06/08	2920	27.09	87.96	Lampokhari
597.	B 154	Boke timur	Rutaceae	*Zanthoxylum acanthopodium* DC.	06/07	2245	27.04	88.00	Jamuna 2, Hangetham
598.	B 156		Rutaceae	*Zanthoxylum oxyphyllum* Edgew.	06/07	2172	27.04	88.01	Jamuna 2, Hangetham

Annex 5. Description of new records to Nepal flora

1. *Acronema ioniostyles* Farille & Lachard (Apiaceae/Umbelliferae)

Small herb 25-30 cm high. ***Stems*** erect, slender and glabrous. ***Leaves*** compound with 3-5 leaflets, lobes ovate-linear, leaflets deeply lobed, 6-15 x 5-11 mm, acute, margin serrate. ***Umbel*** 3-7 rayed, branched, lateral umbels developed along whole axis, laxly 4-5 flowered, green; bracteoles 3-5, linear, apex pointed. ***Petals*** ca. 2 mm, purplish with pink, acuminate. ***Stylopodium*** brownish orange, flat, conical; style long, bifurcated with rolling tips. *Acronema ioniostyles* is allied to *Acronema tenerum*.

Distribution: NW Himalaya (Uttaranchal), E. Nepal

Habitat: Under mixed broad leaved forest, moist place

Flowering & fruiting: Aug – Sept

Voucher specimens: Panchthar, Dabale Deurali, 27 13 21, 87 57 25.2, 2700 m, September 29, 2007, K.K. Shrestha *et al.* D 257 (KATH, E)

2. *Asparagus filicinus* Buch.-Ham. ex D. Don var. *lycopodineus* Baker (Asparagaceae)

Nepali: Satavari, Kurilo

Stout herb. ***Stems*** herbaceous, without spines upto 2m. ***Cladodes*** (Leaves) in whorls of 3, curved, unequal very narrow, 4 – 20 x 0.5-1.5 mm. ***Flowers*** 2-4 mm, white or greenish, born singly in pairs in axil of cladode whorls in middle and upper parts of main stem and ultimate branches; ***Fruits*** (berries) black, globose, c.7mm.

Distribution: Bhutan, Darjeeling, E. Nepal

Habitat: Mixed broad leaved forest, 1680-2100 m

Flowering & Fruiting: May - August

Voucher specimens: Ilam, Jamuna 2, Hangetham, 27.04, 88.00, 2250 m, June 07, 2007, K.K. Shrestha *et al.* B 155 (KATH, E)

3. *Begonia flavifora* H. Hara (Begoniaceae)

Nepali: Magarkanche

Rhizomatous herb. ***Stems*** upright, 20–30 cm tall, usually not branched. ***Leaves*** with long petioles, leaf blade obliquely ovate-cordate, 8-23 × 7-18 cm, base asymmetrical, apex long acuminate. ***Flowers*** pale yellow, 3–6 in dichasial cyme, peduncle up to 11 cm, pedicels 2–3 cm. *Male flowers*: tepals 4, 1–2 cm, stamens numerous. *Female flowers*: tepals 5, styles 2, short. ***Fruit*** not seen.

Distribution: Darjeeling, Sikkim, E. Nepal

Habitat: Moist mixed forest, 2350-2400 m

Flowering & Fruiting: July – September

Voucher specimens: Ilam, Jamuna 2, Hangetham, 27.04, 88.01; 2170-2250 m, June 07, 2007, K.K. Shrestha *et al.* B 157, B 163 (KATH, E)

4. *Begonia panchtharensis* S. Rajbhandary & K.K. Shrestha, *sp. nov*. (Not yet published) (Begoniaceae)

Nepali: Magarkanche

Rhizomatous herb, 30-35cm. ***Rhizomes*** elongate, 2.5-6.5 cm in diam. ***Leaves*** all basal, petiole 10–12 cm, glabrous, green with red stripes; blades 14-18 x 10.5-14 cm, 5- or 6-veined, lobes 5 or 6, apex. ***Inflorescence*** 12–25 cm. *Male flowers* tepals 4, pedicel 1–3.5 cm, white to pinkish, outer 2 broadly ovate, 1.7–2.5 × 1.2–1.8 cm, abaxially glarous, inner 2 oblong, 14–18 × 7–10 mm; stamens numerous. ***Female flowers*** and ***fruit*** not seen.

Distribution: E. Nepal (Panchthar)

Habitat: Cardamom cultivated moist and shady places

Flowering & Fruiting: August – September

Voucher specimens: Panchthar, Prangbung, 27.10.01, 87.57.17; 2250 m, September 02, 2007, K.K. Shrestha *et al.* D 357 (KATH, E).

5. *Calamagrostis lahulensis* G. Singh (Poaceae/Gramineae)

C. pulchella Grisebach, non sauter ex Reichenbach ; *Deyeuxia pulchella* Hook. f.

Grass up to 25 cm. ***Rhizomes*** slender, spreading. ***Leaves*** mainly basal blades erect , 3-13 cm, 0.5-3 mm wide, enrolled or sometimes flat, linear. ***Sheaths*** papery, persistent, sheath narrow, ligule 2-4 mm. ***Inflorescence*** dark purple, erect, 3-6 x 1-2.5 cm, dense, branches short, erect, lowest I whorls of 1-5, the longest 1-3 cm. ***Spikelets*** 3.7-5.7 mm, hyaline tipped. *Glume* dark purple, 1-veined, 3.5-5.5 mm. *Lemma* 2.5-5 mm, apex irregularly 4-toothed. *Palea* 2-3.5 mm, linear, blunt.

Distribution: Bhutan, Darjeeling, Sikkim, Chumbi, E. Nepal

Habitat: Alpine meadows and hill tops, sometimes among scrubs, 2380 - 4830 m

Flowering & Fruiting: July – October

Voucher specimens: Panchthar, Falaincha 9, Tumbung pokhari, 27.26.11, 88.03.16; 4340 m, September 24, 2007, K.K. Shrestha *et al.* D 130 (KATH, E)

6. *Carex cruciata* Wahlenberg var. *argocarpa* C. B. Clarke (Cyperaceae)

Nepali: Harkate

Herb up to 70cm. ***Rhizomes*** woody, stems clothed at apex with remains of old leaves. ***Leaves*** sub- basal and on lower part if culm, blades exceeding infl.; 6-9 mm wide. ***Culm*** 67-92 cm. ***Inforescence*** 23-49 cm, narrowly cylindric, nodes 4-6. *Bracts* short, longest to 1 cm, predominantly female (longest with up to 10 auricles); male portion 2.5-5 mm. *Utricles* 2.5-3.7x0.8-1.4 mm, pale orange streaked dark red. *Male glumes* lanceolate, 2-3.2 mm.

Distribution: Bhutan, Darjeeling, Sikkim, E. Nepal

Habitat: Damp rocky banks and wet cliffs in sub tropical & oak forest, 1500-2200 (-3210) m

Flowering and fruiting: May/Aug – January

Voucher specimens: Ilam, Jogmai, Bichitre, 27.18.45, 88.01.22; 3210 m, September 12, 2007, K.K. Shrestha *et al.* C 240 (KATH, E)

7. *Castanopsis longispina* (King ex Hook.f.) C.C.Huang & Y.T.Chang (Fagaceae)

Castanopsis tribuloides Smith var. *longispina* King ex Hook.f.

Nepali : Kurkure Katush

Small evergreen tree, 5-10 m high; young shoots purple-brown. **Leaves** usually obovate-oblong to ovate-lanceolate, 8.5-15 x 3.5-8 cm long, pubescent or glabrous beneath, margin entire, apex acuminate, nerves 10-12 pairs. **Inflorescence** rachis ca. 20 cm. Involucre larger, 2.5 cm in diameter, spines very long and stout, often 1.2 cm. **Nuts** ellipsoid, 1-3, light brown.

Distribution: E. Nepal

Habitat: Warm broad leaved forest

Flowering & Fruiting: Apr – Sep

Voucher specimens: Panchthar, Falaincha 6, Tintine, 27.16.04, 87.57.29.9; 1900 m, September 27, 2007, K.K. Shrestha *et al.* D 200 (KATH, E).

8. *Juncus clarkei* Buchenau (Juncaceae)

Herb. ***Stem*** to 30cm. ***Leaves*** gradually tapered to acute apex, upper usually over-topping inflorescence narrowly membranous, to 23 cm, 2-4.5 mm wide. **Sheath** often reddish. ***Inflorescence*** 1-4 unequally peduncled 4-12-flowered, lowest leaf-like bract greatly exceeding inflorescence. ***Flowers*** shortly peduncled more or less erect. *Tepals* lanceolate, outer 4.1-7.5 mm, inner 4.9-7.5 mm, pale straw-coloured. ***Capsule*** pale straw-coloured. narrowly ovoid, to 1.2 cm.

Distribution: Bhutan Darjeeling, Sikkim, E. Nepal

Habitat: Wet mostly rock, 1830 - 3760 m

Flowering and Fruiting: August – October

Voucher specimens: Panchthar, Memeng, Chiwabhanjyang, Majortham, 27.19.29, 88.03.09; 3530 m, September 19, 2007, K.K. Shrestha *et al.* D 012 (KATH, E)

9. *Juncus khasiensis* Buchenau (Juncaceae)

Herb. ***Stems*** 6-28 cm, slender. ***Scale leaves*** 1 or 2, pale. ***Stem leaf*** 1, sub-basal, Y- or X-shaped in cross-section, to 10 cm, 0.4-0.7 mm wide. ***Inflorescence*** with 1-5 unequally peduncled, 3 -5 flowered, lowest bract leaflike, half length to equalling longer peduncle. ***Tepals*** narrowly lanceolate, outer 3.5-4.5 mm, inner 4-4.9 mm, pale straw-colored. ***Capsule*** narrowly ellipsoid, exceeding tepals, 4.9-5.7 mm, golden brown. ***Seed*** 0.8-0.9 mm, 2-tailed.

Distribution: Bhutan, Sikkim, E. Nepal

Habitats: Wet cliffs and rocks in open or in juniper or fir forest, 2290-3510 m

Flowering & Fruiting: August – September

Voucher specimen: Panchthar, Memeng, Chiwabhanjyang, Major, 27.2.35, 88.02.16.6; 3910 m, September 19, 2007, K.K. Shrestha *et al.* D 013 (KATH, E)

10. *Potentilla sundaica* (Blume) Kuntze (Rosaceae)

Potentilla kleiniana Wight

Rosette herb with spreading prostrate stems up to 45 cm. ***Leaves*** palmately 3-5 foliate, leaflets ovate 0.5-2.0 X 0.3-1.2 cm, apex rounded, base cuneate, margin serrate, petioles up to 7 cm. ***Stipules*** lanceolate 1-1.5 cm. ***Flowers*** 2-5 in small terminal cymes. *Calyx* lobes 3-4 mm. *Corolla* with obovate petals 3-5 X 2 mm, yellow. ***Achenes*** ellipsoid 1mm, glabrous.

Distribution: Bhutan, Sikkim, Darjeeling, E. Nepal.

Habitats: Roadsides and margins of cultivation, 800-2600 m

Flowering & Fruiting: March – July

Voucher specimen: Ilam, Maimajhuwa 7, Upper Hatiya, 27.06, 87.94; 1900 m, June 07, 2007, K.K. Shrestha *et al.* A 006 (KATH, E)

11. *Rubia hispidicaulis* Long (Rubiaceae)

Rubia cordifolia L. forma *strigosa* Deb & Malick.

Climbing herb to 3 m, reddish-tinged throughout especially when dry. ***Stems*** quadrangular, weak with prickles and hispid hairs. ***Leaves*** in whorl of 4, weakly reddish-tinged, 5-11 x 3-7 cm, hispid on both surface, petioles 3-10cm. ***Flowers*** 5-merous, 5-6 mm across, red or orange in color, pedicel 3.5 mm. *Corolla* tube 0.5-6 mm, lobes sparsely hispid outside. ***Fruit*** black when ripe.

Distribution; Bhutan, Darjeeling, Sikkim, E. Nepal

Ecology: Climbing over shrubs & rocks at margins of oak/broad leaved forest, 1950-3050 m

Flowering & Fruiting: June – August

Voucher specimen: Panchthar, Memeng 3, Narelung Community Forest, 27.04.21.2, 87.59.29; 2450 m, September 29, 2007, K.K. Shrestha *et al.* D 279 (KATH, E)

12. *Strobilanthes helicta* Anderson (Acanthaceae)

Echinacanthus calycinus (Nees) Nees; *Pteracanthus calycinus* (Nees) Bremekamp

Nepali: Ankla; Sha; Khamtagmutsee

Under shrub, 0.5-1 m. ***Stem*** erect, usually glabrous. Leaves nearly equal, 5-12 x 1-6 cm, petioles 0.2-5 cm. ***Flowers*** usually solitary, 0.6-1 cm apart, in 1-sided, rachis 2-8 cm, often zigzag. ***Bracts*** linear, 5-13 mm, persistent, bracteoles linear, 2-3 mm. *Calyx* 13-25 mm, glabrous. *Corolla* white or flushed pale purple, 35-40 mm. ***Capsule*** 1.8 – 2 cm, glabrous.

Distribution: Bhutan, Darjeeling, Sikkim, E. Nepal

Ecology: Moist broad leaved hill forest, 1600-2300 m

Flowering & Fruiting: Sep - Oct, flowering in 12 year cycles

Voucher specimen: Ilam, Jamuna, Hangertham, Dobate 27.04.07, 87.59.37.6; 2660 m, September 05, 2007, K.K. Shrestha *et al.* C 191 (KATH, E)

13. *Swertia wardii* Marquand (Gentianaceae)

Nepali: Mahaguru

Perennial herb, 50-60cm. ***Stems*** unbranched. ***Leaves:*** *Basal leaves* lanceolate, 6-14 x 3-4.5 cm, with broad petiole 6-12cm; *Stem leaves* narrowly elliptical or lanceolate, 9-17 x 2.5-4.5 cm. ***Flowers*** 5-merous, in elongated panicle of cymes. *Calyx* tube 1-1.5 mm. with short hairs in inner surface of base; lobes elliptical-lanceolate, ***Capsule*** ellipsoid, 16 – 20 x 5-7 mm.

Distribution: Bhutan, Sikkim, E. Nepal

Habitat: On shady grounds and damp stony valley beds, 3800 - 4570 m

Flowering & Fruiting: July - September

Voucher specimen: Panchthar, Falaincha 9, Paharemeghu, 27.23.35, 88.02.16.6; 3910 m, September 23, 2007, K.K. Shrestha *et al.* D 009 (KATH, E)

Annex 6. Specimens and Herbaria Review

Housed specimens of the national herbarium center, Godawari (KATH), Tribhuvan University Central Herbarium (TUCH), and Royal Botanical Garden, Edinburgh UK were reviewed for proper identification. A total of 2 weeks (every Thursday and Friday of the week) revision was made for TUCH and 4 weeks (Dec 08, 2007 –Jan 08, 2008) revision was made for National Herbarium, KATH. About 1,000 deposited specimens of KATH were reviewed and tallied with the collected specimens for identification and verification. Of reviewed specimens, the information of 259 species/specimens is given in Annex 6.1. After identification, a total of 572 specimens collected from Kanchenjunga-Singhalila field were submitted to KATH, Ministry of Forest and Soil Conservation. Similarly, about 500 specimens of the East Nepal deposited in TUCH, Kirtiupur were review and information of only 27 species was colleted (Annex 6.2). Specimen identification, tallying and submission in TUCH was done in November, 2007. After identification and tallying, 574 specimens were submitted to TUCH, Kirtipur, Kathmandu. Final level identification was done in RBGE in December, 2007 by tallying the collected specimens with deposited specimens and verifying the identified species list. A total of 624 specimens were submitted to RBGE, UK after identification.

Annex 6.1 Reviewed specimens with their previous notes in KATH, Godawari, Lalitpur

SN	RCN	V name	Family	*Taxon name*	Date	Alt.	Lat.	Long	Location	Previous notes
1.	D 173		Araliaceae	*Pantapanax leschenaultii*	09/26	2390	27 12 51	87 57 51.6	Faleke-betini, Falaincha-9	(Alukure-Sankhuwasabha; 1950)
2.			Berberidaceae	*Podophyllum hexandrum*						27 44, 88 01, Barun, Yalung
3.	C 087		Gentianaceae	*Tripterospermum volubile volubile*	08/30	1974	27 04 17.5	87 57 39.7	Chhintapu	Aahale, Sankhuwasabha, 2550m, Sukepokhari, Ilam 2650m
4.	B 020		Lardizabalaceae	*Holboellia latifolia var angustifoliaWall.*	06/08	3014	27.10	87.94	Maimajuwa 8 , Bharlang	Akase, Panchthar, 2100m. 1967
5.	C 015		Balsaminaceae	*Impatiens racemosa*	08/27	2100	27 04 19	87 56 34	Naule gaun, Mai majhuwa7	Arun Valley Ridge-1930m
6.	D 179		Gesneriaceae	*Corallodiscus lanuginosus*	09/26	1570	27 15 44	87 57 19.0	Faleke-betini, Falaincha-9	ARUN VALLEY,
7.	D 313		Papaveraceae	*Corydalis chaerophylla*	09/30	3475	27 18 22.	88 02 417	Memeng, Bich Gaun	Arun Valley, Majhang Khola-10500ft; Topke Gola, Mouwa Khola-11000ft
8.	B 179		Balsaminaceae	*Impatiens stenantha ?*	06/08	2621	27.02	88.02	Jamuna, Jowbari	Arun, Khandabari, Tashigaun,
9.	B 160		Schisandraceae	*Schisandra elongata*	06/07	2243	27.04	88.01	Jamuna 2, Hangetham	Arun, Sankhuwasabha
10.	C 018		Hypericaceae	*Hypericum chioisianum*	08/27	1791	27 15 08	87 57 27.1	Mane dada, Terse gaun, Mai majhuwa	Arun, Sankhuwasabha, Chitre Ilam, Kharikhola Solu
11.	A 049		Ranunculaceae	*Ranunculus brotherusi*	06/08	2920	27.09	87.96	Lampokhari	Arun, Tamor watershed; Mewa khola; Tamor valley,
12.	D 079		Papaveraceae	*Corydalis cashmeriana var cristata*	09/22	3930	27 23 20	88 02 22.5	Near Budhipani Falaincha-9	Arun, Tamor, Inkhu khola
13.	B 108		Araliaceae	*Meriolliopanax alpinus Decne. & Planch. Brassiopsis alpina*	06/16	3053	27.07	88.01	Mabu, Kalapokhari	B glomerata from Chyangthapu 27 16; 87 57.
14.	D 236		Ericaceae	*Agapetis incurvata*	09/28	1947	27 14 55	87 57 21.3	Chamling danda, Chyangtharpu	Banduke Bahnjyang
15.	B 050		Ericaceae	*Gaultheria pyroloides*	06/11	3445	27.17	88.01	Prangbung, Bikhepani	Banduke Ilam, Sankhuwasabha
16.	D 007		Asteraceae	*Senecio tetranthus*	09/19	3170	27 16 50	88 01 50.3	Chiwabhanjyang-Major	Banduke, Biblyate, Sankhuwasabha
17.	C 021	Siltimur	Lauraceae	*Lindera neesiana*	08/27	2656	27 04 07.0	87 59 37.6	Mane dada, Terse gaun, Mai majhuwa	Banduke, Memeng, Panchthar, Sindhuwa, Dhankuta
18.	C 195		Papaveraceae	*Corydalis chaerophylla*	09/05	2334	27 02 44.8	88 00 25.6	Dobate, Hangetham	Banduke, Yamphudin, Arun, Mulpokhari, Topegola
19.	D 091		Labiatae	*Elstholzia strobilifera*	09/22	3210	27 18 45	88 01 22.4	Paharemeghu, Falaincha-9	Barun khola, Chhintapu, Ilam
20.	D 192		Rosaceae	*Neillia thyrsiflora*		1980	27 17 01	87 58 14.6	Maklabu	Basantapur (Tehrathum)-2100m; Arun Valley
21.	B 186		Gesneriaceae	*Aeschynanthus hookeri Jack*	06/08	2278	27.00	88.02	Jamuna, Jowbari	Basantpur, Dhankuta, Maipokhari, Ilam
22.	C 161	Ban karela	Cucurbitaceae	*Herpetospermum peduculosum*	09/03	1980	27 17 01	87 58 14.6	Dobate, Mabu-8	Basantpur, Tehrathum; Sindhuwa, Dhankuta
23.	B 94		Labiatae	*Ajuga lobata D.Don*	06/15	3059	27.08	88.01	Mabu, Near Mai khola, Chauri chowk	Bhalukhop, Halhale, Junbesi, Tinjure,
24.	D 087	*Jatamasi*	Valerienaceae	*Nardostachys grandiflora*	09/22	3930	27 23 20	88 02 22.5	Paharemeghu, Falaincha-9	*Bhalukhop-Jumley-13,500ft; Topke Gola-4000m*
25.	A 002		Hypericaceae/ Clusiaceae	*Hypericum japonicum*	06/06	1861	27.06	87.94	Maimajuwa 7, Upper Hatiya	Bhojpur, Toribari Ilam, Goruaale Ilam, Maipokhari
26.	D 276		Rosaceae	*Rubus acuminatus*	09/29	1775	27 10 32	87 57 17.0	Narelung CF, Memeng-3	BhoteKoshi-7000ft; Dhankuta-1700m
27.	B 149		Rosaceae	*Rubus paniculatus*	06/07	2238	27.04	88.00	Jamuna 2, Hangetham	Bhuspate dada, Ilam; Bhakundey, Maimajhuwa, Rakse
28.			Rosaceae	*Rubus diffusus*						Biblatey Ilam
29.	C 095		Hypericaceae	*Hypericum nepalense*	08/30	2115	27 09 38	87 57 10.5	Chhintapu	Biblyate, Ilam
30.	C 116		Sambucaceae	*Viburnum mullaha*	09/01	2450	27 04 21.2	87 59 29	Mabu-8	Biblyate-2200m; Mulpokhari-2300m
31.	C 019		Sambucaceae	*Viburnum coriaceum*	08/27	2187	27 04 33	87 56 37	Mane dada, Terse gaun,	C and W Nepal

									Mai majhuwa	
32.	C 209		Liliaceae	*Polygonatum punctatum*	09/06	2468	27 02 57.3	88 00 46	Hangetham, Jamuna-1	C and W Nepal
33.	C 004		Asteraceae	*Cosmos bipinnatus*	08/27	1817	27 03 52	87 56 38	Thulogaun, Maimajhuwa	C Nepal
34.	C 012		Campanulaceae	*Campanula pallida*	08/27	2100	27 04 19	87 56 34	Naule gaun, Mai majhuwa7	C Nepal
35.	C 049		Polygonaceae	*Aconogonum molle*	08/28	2861	27 05 10.1	87 55 12	Newa khola, Mai majhuwa	C Nepal
36.	C 099	*Pakhanbed*	Polygonaceae	*Bistorta amplexicaulis*	08/30	2278	27 00 3902	88 01 18	Chhintapu	C Nepal
37.	C 119		Rosaceae	*Rubus lineatus*	09/01	2689	27 04 19.8	88 00 2	Mabu-8	C Nepal
38.	C 126		Buxaceae	*Sarcocca hookeriana*	09/01	2450	27 04 21.2	87 59 29.2	Patarashe, Mabu-8	C Nepal
39.	C 210		Orchidaceae	*Habanaria arietina*	09/06	2468	27 02 57.3	88 00 46	Jamuna-1	C Nepal
40.	D 027		Asteraceae	*Senecio wallichi*	09/20	3450	27 17 01	88 01 55.5	Majortham, Falaincha-4	C Nepal
41.	D 061		Caryophyllaceae	*Cerasteum glomeratum*	09/21	3910	27 23 35	88 02 16.6	Dund, Falaincha-9	C Nepal
42.	D 065		Asteraceae	*Saussurea taraxisifolia*	09/21	3855	27 24 33	88 02 26.1	Dund, Falaincha-9	C Nepal
43.	D 114		Caryophyllaceae	*Arinaria globiflora*	09/23	4337	27 26 11	88 03 16.0	Paharemeghu, Falaincha-9	C Nepal
44.	D 176		Buxaceae	*Sarcococca hookeriana*	09/26	3210	27 18 45	88 01 22.4	Faleke-betini, Falaincha-9	C Nepal
45.	D 180		Fabaceae	*Campylotropis speciosa*	09/26	1900	27 16 04	87 57 29.9	Faleke-betini, Falaincha-9	C Nepal
46.	D 201		Asteraceae	*Inula cappa*	09/27	1900	27 16 04	87 57 29.9	Falaincha-6, Tintine	C Nepal
47.	D 303	*Kalo siris*	Fabaceae	*Albizia chinensis*	09/30	1991	27 11 27	87 56 17.8	Memeng, Bich Gaun	C Nepal
48.	D 316		Asteraceae	*Coniza stricta*	09/30	2550	27 11 44	87 57 35	Narelung Nursery, Memeng	C Nepal
49.	D 324		Euphorbiaceae	*Phyllanthes parvirolius*	10/01	1775	27 10 32	87 57 17.0	Hiwakhla- \Khaka, Memeng-Prangbung	C Nepal
50.	D 340		Asclepiadaceae	*Ceropegia pubescens (c.f.)*	10/01	3820	27 20 28	88 03 53	Hiwakhla- \Khaka, Memeng-Prangbung	C Nepal
51.	D 282		Theaceae	*Camellia kissi (Syn: C. drupifera)*	09/29	2390	27 12 51	87 57 51.6	Narelung CF, Memeng-3	*C Nepal; Taplejung-6000ft*
52.	D 233		Balsaminaceae	*Impatiens puberula (c.f.)*	09/28	1947	27 14 55	87 57 21.3	Chamling danda, Chyangtharpu	C Nepal-7000ft
53.	C 033		Balsaminaceae	*Impatiens puberula*	08/27	2187	27 04 33	87 56 37	Kamire, Mai Majhuwa	C Nepal-7500ft
54.	C 117		Balsaminaceae	*Impatiens puberula*	09/01	2450	27 04 21.2	87 59 29	Mabu-8	C Nepal-7500ft
55.	A 40		Cruciferae	*Cardamine flexuosa*	06/08	2835	27.1	87.95	Banduke	C yunanensis Panchthar, Chyangthapu 6000ft.
56.	D 348		Caryophyllaceae	*Stellaria himalainsis*	10/02	2656	27 04 07.0	87 59 37	Talkharka-Prangbung, Prangbung	C. Nepal
57.	D 145		Liliaceae	*Polygonatum verticilatum*	09/26	3280	27 18 33	88 01 38.4	Faleke-betini, Falaincha-9	*Cand W Nepal*
58.	A 54		Rosaceae	*Potentialla kleniana*	06/09	3185	27.1	87.98	Maimajuwa, Dhupi	Chainapur, Mulpokhari, Seduwa, sankhusabha; Arun valley, Sindhuwa
59.	C 016		Melastomataceae	*Osbekia stellata*	08/27	1837	27 04 15.8	87 57 29.1	Naule gaun, Mai majhuwa7	Chauribas, Dhankuta
60.	C 150		Rosaceae	*Rubus splendidissimus?*	09/03	2689	27 04 19.8	88 00 2.	Dobate, Mabu-8	Chhintapu (Ilam); Arun Valley-10000ft
61.	D 225		Pontederiaceae	*Monocoria veginalis*	09/28	2650	27 05 28.6	87 55 29.2	Chamling gaun, Chyangtharpu	Chhintapu (Ilam)-8000ft; Topke Gola- 4000m
62.	D 174		Magnoliaceae	*Magnolia campbelli*	09/26	2005	27 11 27	87 56 18.6	Faleke-betini, Falaincha-9	Chhintapu, Ilam
63.	C 051	Lemchung bung	Ericaceae	*Gaultheria fragrantisima*	08/28	2480	27 05 18.6	87 55 37.7	Newa khola, Mai majhuwa	Chhintapu-2750m, Milkedada, Dingla
64.	D 210		Gentianaceae	*Swertia binaculata*	09/27	1900	27 16 04	87 57 29.9	Falaincha-6, Tintine	Chichila, Sankhuwasabha 2020m
65.	D 244		Gentianaceae	*Swertia chirayita*	09/28	1900	27 16 04	87 57 29.9	Menjuwa	Chichila, Sankhuwasabha 2020m
66.	D 161	*Gujjar gano*	Menispermaceae	*Stephania glabra*	09/26	1900	27 16 04	87 57 29.9	Faleke-betini, Falaincha-9	Chindekhola, Sankhuwa, Zolok, Taplejung
67.	D 023		Hypericaceae	*Hypericum petiolatum*		3210	27 18 45	88 01 22.4		Chirre, Maipokhari, Ilam, Ramite Sankhuwa 3600m.
68.	C 077		Piperaceae	*Peperomia tetraphylla*	08/29	1980	27 17 01	87 58 14.6	Chibe, Maimajhuwa	Chitre ilam
69.	C 071	*Rani champ*	Magnoliaceae	*Michelia doltsopa*	08/28	2861	27 05 10.1	87 55 12.6	Kalo pani, Mai majhuwa	Chitre odhar, Sankhuwa, Basantpur, Tehrathum, Sindhuwa, Dhankuta
70.	D 271		Lobeliaceae/ campanulaceae	*Lobelia sequinii*	09/29	2500	27 12 58	87 57 05.0	Dabale bhanjyang-Memeng,Memeng	Chitre, Biblyate
71.	D 345		Trilliaceae/Liliaceae	*Paris polyphylla var marmorata*	10/02	2684	27 09 22	87 57 07.9	Talkharka-Prangbung, Prangbung	*Chitre, Sankhuwasabha-2260m*
72.	B 177		Oleaceae	*Ligustrum confusum CF*	06/08	2621	27.02	88.02	Jamuna, Jowbari	Chyangthapu
73.	B 106		Ericaceae	*Pieris formosa D. Don*	06/15	3084	27.09	88.01	Mabu, Chauri Chowk	Chyangthapu pass Taplejung, Maipokhari Ilam, Sankhuwasabha
74.	D 331		Hydrangeaceae	*Hydrangea anomala*	10/01	3530	27 19 29	88 03 09.0	Hiwakhla- \Khaka, Memeng-Prangbung	Chyangthapu, Panchthar, Topkegola, Taplejung
75.	A 027		Ranunculaceae	*Ranunculus diffusus*	06/07	1822	27.06	87.94	Goruwale, Sidin	Chyangthapu, Panchthar; Arun vallety, Mangalbare, Lampokhari, Ilam, Sirindham, Tamor, Chyangthapu,
76.	D 156		Polygonaceae	*Fagopyrum dibotrys*	09/26	3210	27 18 45	88 01 22.4	Faleke-betini, Falaincha-9	Chyantharpu-7000ft; Near Pakse (Ilam)-2050m
77.	A 16		Urticaceae	*Pilea tenuifolia*	06/08	2264	27.07	87.94	Maimajuwa 7, Above	Darjeeling

									Terse Gaun	
78.	C 009		Acanthaceae	*Hypoestes triflora (Forssk)*	08/27	1817	27 03 52	87 56 38	Thulogaun, Maimajhuwa	Deorali foorest, EN 2800 Nessum, EN 1200
79.	D 169	*Arkhaulo*	Fagaceae	*Lithocarpus elegans*	09/26	3210	27 18 45	88 01 22.4	Faleke-betini, Falaincha-9	Deurali (Sankhuwasabha)-1970m
80.	D 347		Gentianaceae	*Crawfordia species*	10/02	2194	27 14 22	87 57 29.4	Talkharka-Prangbung, Prangbung	Deurali bhanjyang, Dudhkoshi
81.	C 020	*Budho okhati*	Saxifragaceae	*Astilbe rivularis*	08/27	2187	27 04 33	87 56 37	Mane dada, Terse gaun, Mai majhuwa	Dhankuta, Mude-2500m;
82.	B 158		Vitaceae panilahare	*Tetrastigma serrulatum Planch. CF*	06/07	2243	27.04	88.01	Jamuna 2, Hangetham	Dhankuta, Tehrathum, Hanspokhari, Ilam, Hatiya, Arun Sankhuwa
83.	C 111		Polygalaceae	*Polygala arillata*	09/01	1991	27 11 27	87 56 17.8		Dhankuta-1200m
84.	B 051		Ranunculaceae	*Anemone obtusiloba*	06/11	3445	27.17	88.01	Prangbung, Bikhepani	Dhapa kharka, Arun, Kasuwa khola, Sankhuwasabha
85.	D 042		Gentianaceae	*Swertia aungustifolia*	09/20	3580	27 12 50	88 00 49.1	Major-faleke-Gairi, Falaincha-9	Dharapani, Dhankuta
86.	D 288		Labiatae	*Rhabdosia lopanthoides*	09/29	2550	27 11 44	87 57 35	Narelung CF, Memeng-3	Dharapani, Ilam
87.	D 036		Sambucaceae	*Viburnum nervosum*	09/20	3475	27 18 22	88 02 41.7	Majortham, Falaincha-4	*Dharmasala kharka (Sankhuwasabha)-3520m; Ghunsa-3200m*
88.	D 062		Asteraceae	*Senecio quiqueloves*	09/21	3820	27 20 28	88 03 53	Dund, Falaincha-9	Dobate, Sankhuwasabha-4250
89.	D 312		Melastomataceae	*Osbekia nepalensis*	09/30	3210	27 18 45	88 01 22.4	Memeng, Bich Gaun	Dumhan, Taplejung, Ekteen, Panchthar, Num, Sankhuwasabha
90.	D 365		Betulaceae	*Ulnus nepalensis*	10/02	1893	27 10 33	87 57 32.4	Prangbung	E Hile, Pakhribas-1740m; Udupu, Sankhuwasabha;
91.	C 163	Kalo ainselu	Rosaceae	*Rubus paniculatus*	09/03	2656	27 04 07	87 59 37	Dobate, Mabu-8	E Nepal
92.	D 261		Rosaceae	*Sorbus rhamnoides*	09/29	2750	27 13 26	87 57 45.4	Dabale Deurali	E Nepal
93.	C 238		Buxaceae	*Sarcococca wallichii*	09/12	2463	27 00 11	88 01 22	Bie-Chitre, Jogmai-2	E; Nayam Range-12000ft
94.	D 278		Campanulaceae	*CODONOPSIS VIRIDIS*	09/29	2390	27 12 51	87 57 51.6	Narelung CF, Memeng-3	E;Terhathum-2100m, Ektin (Panchthar)
95.	D 277		Fagaceae	*Quercus semicarpifolia*	09/29	2390	27 12 51	87 57 51.6	Narelung CF, Memeng-3	Ektin (Panchthar)-2400m; Chyantharpu-7500ft, Ghunsa (Taplejung)-2470m
96.				*Tetracentron sinense*						Esuwa, Tashigaun, Sankhuwa
97.	B 98		Boraginaceae	*Hackelia uncinata Opiz*	06/15	3059	27.08	88.01	Mabu, Near Mai khola, Chauri chowk	Falaut, Chiyabhanjyang, Gurase dada
98.	D 246		Hypericaceae/ Clusiaceae	*Hypericum hookerianum*	09/28	2665	27 04 05.1	87 59 28.9	Menjuwa	Gaikharka, Sankhuwa, Bhujulate Taplejung
99.	D 001		Campanulaceae	*Cyananthus hookeri*	09/18	3580	27 12 50	88 00 49.1	Phalot-Chiwabhanjyang	Ghunsa
100.	D 110		Ericaceae	*Cassiope fastigeata*	09/23	4050	27 25 08	88 02 55.3	Paharemeghu, Falaincha-9	Ghunsa
101.	C 072		Fabaceae	*Erythrina arborescens*	08/28	2861	27 05 10.1	87 55 12.6	Kalo pani, Mai majhuwa	Ghunsa (Taplejung)-2700m; Sankhuwasabha, 1880m.
102.	D 229		Hydrangeaceae	*Hydrangea aspera var robusta*	09/28	1974	27 04 17.5	87 57 39	Chamling gaun, Chyangtharpu	Ghunsa, Taplejung, Maipokhari, Ilam, Arun, Sankhuwa
103.	D 370		Papaveraceae	*Corydalis species*	09/20	3910	27 23 35	88 02 16.6	Majortham, Falaincha-4	Ghyak, Barun Valley; Yangla-3710m
104.	D 100		Ericaceae	*Rhododendron lepidotum*	09/23	3910	27 23 35	88 02 16.6	Paharemeghu, Falaincha-9	Gokyo-5000m
105.	D 241		Fagaceae	*Castanopsis hystrix*	09/28	1947	27 14 55	87 57 21.3	Chamling danda, Chyangtharpu	Goruale (Panchthar)-Hile-8000ft; Biblate, Maipokhari (Ilam)-1600m; Sindhuwa (Dhankuta)-2000m
106.	C 135		Orchidaceae	*Bulbophylum-retusiusculum*	09/03	2665	27 04 05	87 59 28.9	Dobate, Mabu-8	Gufa, Taplejung-2500m
107.	C 204		Ericaceae	*Rhododendron vaccinoides*	09/06	2334	27 02 44.8	88 00 25.6	Hangetham, Jamuna-1	Guphapokhari-2870m
108.	D 353		Smilacaceae/Liliaceae	*Smilax elegans subsp elegans*	10/02	2588	27 09 45	87 56 18.7	Talkharka-Prangbung, Prangbung	*Guphapokhari-2870m; Yamphudin-2380m*
109.	D 026		Geraniaceae	*Geranium polyanthes cf*	09/20	3450	27 17 01	88 01 55.5	Majortham, Falaincha-4	Guransedanda, Sankhuwasabha 3060m, Topke, Taplejung
110.	D 057		Droseraceae	*Drosera species*	09/21	2187	27 04 33	87 56 37	Dund, Falaincha-9	Halhale Danda (Ilam)-7000ft
111.	C 217		Zingiberaceae	*Coutleya gracilis*	09/06	2468	27 02 57.3	88 00 46	Jamuna-1	Hanspokhari (Ilam)-5000ft
112.	C 187		Gesneriaceae	*Aeschynanthes parviflorus/sikkimensis*	09/05	2656	27 04 07.0	87 59 37	Dobate, Hangetham	Hanspokhari, Ilam
113.	C 006		Umbelliferae	*Hydrocotyle podantha*	08/27	1817	27 03 52	87 56 38	Thulogaun, Maimajhuwa	Helok (Solu)-5000ft; Ethung, Phidim-2400m; Hile (Dhankuta)-1900m
114.			Ranunculaceae	*Aconitum ferox*						Hile to Chinthapu, Ilam 27 33, 87 57 THREATENED
115.	B 60		Geraniaceae	*Geranium nepalense*	06/12	3374	27.20	88.01	Memeng, Gorkhepani	Hile to Chyangthapu, Ilam, 8900 ft.
116.	A 034		Scrophulariaceae	*Mazus surculosus*	06/07	2812	27.1	87.94	Goruwale, Sidin	Hile, Seduwa, Ilam
117.	A 011	New Record	Rosacerae	*Potentialla lineata*	06/07	2124	27.07	87.94	Maimajuwa 7, Terse Gaun	Hile, Sinbdhuwa, Guranse Dhankuta; Chichila, Sankhuwasabha; Thakma khola
118.	C 125		Ericaceae	*Agapetes hookeri*	09/01	2665	27 04 05.1	87 59 28	Patarashe, Mabu-8	Hile-Chhintapu (Ilam)-7900ft
119.	D 361		Asteraceae	*Ageratum conizoides*	10/02	1893	27 10 33	87 57 32.4	Prangbung	Jaljale forest, Mai pokhari
120.	C 014	Gagleto	Urticaceae	*Lecanthus peduncularis*	08/27	2100	27 04 19	87 56 34	Naule gaun, Mai majhuwa7	Jire Khimti (Tehrathum), Sankhuwasabha-1300m
121.	D 052		Umbelliferae	*Sinocarum pulchellum*	09/21	3640	27 19 59	88 03 43.6	Gairi-sukhkhadhap Failaincha-9	*Jugal Himal-4150m*
122.	D 118		Primulaceae	*Primula primulina*	09/23	2187	27 04 33	87 56 37	Paharemeghu,	Kalapokhari, Sankuwasabha

									Falaincha-9	
123.	D 175		Labiatae	*Elsholtzia fruticosa*	09/26	1947	27 14 55	87 57 21.3	Faleke-betini, Falaincha-9	Kalopatal, Sankhuwa, Namche, Solu
124.	D 092	*Gidde pwankh*	Primulaceae	*Primula ianthina*	09/22	4050	27 25 08	88 02 55.3	Paharemeghu, Falaincha-9	Kalopokhari (sankhuwasabha)-3800m; Ghunsa- 4000m; Bhalukhop Jaljale (tehrathum)
125.	D 034		Papaveraceae	*Meconopsis nepalensis*	09/20	3820	27 20 28	88 03 53	Majortham, Falaincha-4	Kalopokhari, Sankhu-3900m; Topke gola-3300m; Khappare, Chhintapu (ilam)-9300ft
126.			Aceraceae	*Acer spicatum*						Khappare, Ilam 9100 ft, Barun Khola Sankhuwa, THREATENED
127.	B 100		Scrophulariaceae	*Pedicularis furfuracea*	06/15	3059	27.08	88.01	Mabu, Near Mai khola, Chauri chowk	Khongma, Sankhuwasabha; Gaikharka Solu
128.	C 002		Rosaceae	*Agrimonia pilosa*	08/27	2450	27 04 21.2	87 59 29	Thulogaun, Maimajhuwa	Kyaureni, Tehrathum 1400m.
129.			Rosaceae	*Rubus thomsonii*						Lampokhari, ilam
130.	B 053		Ranunculaceae	*Clematis montana*	06/11	3445	27.17	88.01	Prangbung, Bikhepani	Lampokhari, Jaljale, Arun, Hatiya
131.	D 006		Balsaminaceae	*Impatiens falcifer*	09/19	3170	27 16 50	88 01 50.3	Chiwabhanjyang	Mai khola, Ilam 600m (JDA Stainton), Betii Panchthar 2000m (Nashiro et al)
132.			Rosaceae	*Rubus rugosus*						Mai Pokhari ilam
133.	C 183		Myrsinaceae	*Maesa chisia*	09/05	3210	27 18 45	88 01 22.4	Dobate, Hangetham	Mai pokhari, Ilam, Seduwea Sankhuwa, Bhojpur,
134.	A 008		Balsaminaceae	*Impatiens graciliflora CF*	06/07	1903	27.06	87.94	Maimajuwa 7, Upper Hatiya	Mai poklhari, Ilam
135.	B 115		Symplocaceae	*Symploccus lucida*	06/06	2969	27.07	88.01	Mabu, Kalapokhari	Mai poklhari, Sirindham, Yekteen, Aalubari Ilam, Sankhuwa
136.	D 322		Rosaceae	*Pyracantha crenulata*	10/01	1775	27 10 32	87 57 17.0	Hiwakhla- \Khaka, Memeng-Prangbung	MaiMajhuwa (Ilam)
137.	D 274		Labiatae	*Clinopodium umbrosum*	09/29	2005	27 11 27	87 56 18.6	Narelung, Memeng-3	Maimajhuwa, Ilam
138.	B 169		Rutaceae	*Zanthoxylum oxyphyllum L.*	06/07	2172	27.04	88.01	Jamuna 2, Hangetham	Maimajhuwa, Ilam; Chyangthapu Panchthar, Arun, Solu
139.	B 174		Ericaceae	*Agapetes hookeri*	06/07	2213	27.04	88.02	Jamuna 2, Hangetham	Maimajhuwa, Ilam; Sirindham, Dhankuta; Sankhuwasabha
140.	A 031		Ericaceae	*Vaccinium retosum*	06/07	2812	27.1	87.94	Goruwale, Sidin	Maipokhari
141.	C 159		Rosaceae	*Rubus pentagonus*	09/03	2689	27 04 19.8	88 00 2.7	Dobate, Mabu-8	Maipokhari (Ilam)2120m
142.	D 283		Menispermaceae	*Stephania elegans*	09/29	2457	27 02 49.8	88 00 25.6	Narelung CF, Memeng-3	Maipokhari, Ilam
143.	D 336		Gesneriaceae	*Aeschynanthes hookeri*	10/01	2481	27 09 34	87 57 15.4	Hiwakhla- \Khaka, Memeng-Prangbung	Maipokhari, Ilam, Mulghat, Dhankuta, Basantpur, Tehrathum, Chitre, Ilam
144.	B 154		Rutaceae	*Zanthoxylum acanthopodium*	06/07	2245	27.04	88.00	Jamuna 2, Hangetham	Maipokhari, Ilam; Hima Khola Panchthar
145.	A 014		Ericaceae	*Agapetes serpens (Wight) Sleumer*	06/08	2176	27.07	87.94	Maimajuwa 7, Terse Gaun	Maipokhari, Maimajhuwa, Hanspoklhari, ISumbuk, lam; Taplejung; Sankhuwasabha; Bhojpur, Basantpur, Tehrathum; Dhankuta; Solokhumbu
146.			Rosaceae	*Rubus hexahygnus/griffithii*						Maipokhari, Maimajhuwa, Ilam
147.	C 137		Ericaceae	*Rhododendron arboreum subsp arboreutum*	09/03	2665	27 04 05.1	87 59 28	Dobate, Mabu-8	MaiPokhari-7000ft; Topke gola 3860m
148.	B 078		Ericaceae	*Rhododendron cinnabarinum*	06/14	3395	27.10	88.00	Mabu 8, Chatu Bari	Makalu-Barun, Ramite, Taplejung, Lampokhari, Ilam
149.	B 086		Ranunculaceae	*Thalictrum virgatum*	06/14	3224	27.09	88.00	Mabu, Bikhe Bhanjyang	Mewa khola, Wallanchugola, Tinjure, Jaljale,
150.	C 027	Dhansingre	Ericaceae	*Gaultheria nummlandoides*	08/27	1837	27 04 15.8	87 57 29	Mane dada, Terse gaun, Mai majhuwa	Milke Danda, Dingla-8500ft
151.	D 200	New record	Fagaceae	*Castanopsis longispina*	09/27	1900	27 16 04	87 57 29.9	Falaincha-6, Tintine	Mudhe, Sankhusabha-2720; Dingla (Bhojpur), Chitre (Ilam), Yamphudin (Taplejung)-1860, Memeng (Panchthar), Basantapur (Tehrathum)-1750
152.	D 194		Rosaceae	*Rubus accuminata*		1900	27 16 04	87 57 29.9	Maklabu	Mulapani (Tehrathum)-5500ft
153.	D 199		Rosaceae	*Agimonia pilosa*	09/27	2702	27 13 21	87 57 25.2	Falaincha-6, Tintine	Mulpani, Tehrathum 5500 ft.
154.	C 050		Melastomataceae	*Oxyspora paniculata*	08/28	2194	27 14 22	87 57 29.4	Newa khola, Mai majhuwa	Mulpani, Tehrathum; Gurja, Taplejung, Aitbare, Ilam, Hanspokhari, Ilam
155.	B 032		Schisandraceae	*Schisandra grandiflora (Wall.) Hook. f. & Thomson*	06/08	3057	27.10	87.57	Sidin 1, Lampokheri	Namche
156.	A 10		Labiatae	*Nepeta lamiopsis L. CF*	06/07	2124	27.07	87.94	Maimajuwa 7, Terse Gaun	Namche, Sankhuwasabha, Sirindham, Barun khola
157.	B 025		Ericaceae	*Vaccinium nummularia*	06/08	3007	27.10	87.96	Sidin 1, Lampokheri	Namche, Solu; Sirindham, Dhankuta, Sankhusabha; Chyangthapu, Panchthar
158.	A 072		Ranunculaceae	*Ranunculus pulchellus*	06/09	3550	27.12	87.98	Prangbung, Chandu	Namche, Syangboche, Solu; Sirindham, Gokyo
159.	D 043		Lobeliaceae	*Lobelia pyramidalis*	09/20	3475	27 18 22	88 02 41.7	Major-faleke-Gairi, Falaincha-9	Near Taplejung-5000ft
160.	D 130	New record	Poaceae	*Calamogrostis lanulensis*	09/24	4337	27 26 11	88 03 16	Timbu Falaincha-9	*New to Nepal*
161.	B 155	New record	Asparagaceae/Liliaceae	*Asparagus filicinus Buch.-Ham.exD.Don.var.lycopodineus Bake*	06/07	2245	27.04	88.00	Jamuna 2, Hangetham	New to Nepal
162.	B 173		Smilacaceae	*Smilax aspericaulis*	06/07	2172	27.04	88.01	Jamuna 2, Hangetham	New to Nepal

163.	D 012	New record	Juncaceae	*JUNCUS CLARKEI*	09/19	3530	27 19 29	88 03 09.0	Chiwabhanjyang-Major	New to Nepal
164.	D 013	New record	Juncaceae	*JUNCUS KHASIENSIS*	09/19	3910	27 23 35	88 02 16.6	Chiwabhanjyang-Major	New to Nepal
165.	D 290	New record	Poaceae	*Bothriochloa bladhii*	09/30	2005	27 11 27	87 56 18.6	Memeng	*New toNnepal*
166.	D 035		Crassulaceae	*Sedum triactina*	09/20	3735	27 20 57	88 03 30.5	Majortham, Falaincha-4	No record from E Nepal
167.	D 073		Crassulaceae	*Rhodiolla himalensis*	09/21	4050	27 25 08	88 02 55.3	Dund, Falaincha-9	No reports from E Nepal.
168.	B 180		Asclepediaceae	*Asclepias curssavica*	06/08	2621	27.02	88.02	Jamuna, Jowbari	No specimens from E Nepal
169.	D 212		Myricaceae	*Myrica esculanta*	09/27	2656	27 04 07	87 59 37	Falaincha-6, Tintine	No specimens from E Nepal
170.	C 144		Asteraceae	*Cirsium falconeri*	09/03	2665	27 04 05	87 59 28.9	Dobate, Mabu-8	Not clearly mentioned
171.			Magnoliaceae	*Michelia kisopa*						Num Sankhuwa, Gola Sankhuwa THREATENED
172.			Ericaulaceae	*Eriocaulon staintonii*		6000 ft				Num, Hatiya, Arun
173.	D 295		Labiatae	*Scutellaria repens*	09/30	2450	27 04 21.2	87 59 29	Memeng	Num, Sankhuwa, Taplethok, Taplejung, Dharapani, Ilam
174.	D 186		Piperaceae	*Piper mellesua*		1893	27 10 33	87 57 32.4	Maklabu	Num, Sankhuwa, Yamphudin, Taplejung
175.	D 020		Campanulaceae	*Cyananthes inflatus*	09/19	3530	27 19 29	88 03 09.0	Chiwabhanjyang-Major	Olanchun gola
176.	D 102		Caprifliaceae	*Lonicera cyanocarpa*	09/23	3910	27 23 35	88 02 16.6	Paharemeghu, Falaincha-9	Olanghungola-12200ft
177.			Rosaceae	*Rubus pentaformis*						Panchthar Chyangthapu
178.			Ranunculaceae	*Aconitum gammei*						Pemathang kharka THREATENED
179.	D 181		Labiatae	*Colquhonia coccinia var.coccinea*		2390	27 12 51	87 57 51.6	Maklabu	Phedichauki, Sankhuwa, Biblyate, Tehathum,
180.	D 170		Scrophulariaceae	*Calcolaria maxicana*	09/26	3210	27 18 45	88 01 22.4	Faleke-betini, Falaincha-9	*Phidim-2400; Hile, Chhokre (Ilam)-7700ft; Maipokhari, Maimajhuwa*
181.	B 092		Rosaceae	*Rubus acuminatus*	06/15	3032	27.08	88.01	Mabu, Kalapokhari	*R glaciale* from Memeng to Chyangthapu, 2400m
182.	B 024		Rosaceae	*Rubus hypargyrus var niveus*	06/08	3007	27.10	87.96	Sidin 1, Lampokheri	*R lineatus* from Taplejung, Yamphudin
183.	B 167		Rosaceae	*Rubus pentagonus*	06/07	2172	27.04	88.01	Jamuna 2, Hangetham	*R macilentus* from Maipokhari Ilam.
184.	B 170		Rosaceae	*Rubus pentagonus*	06/07	2172	27.04	88.01	Jamuna 2, Hangetham	*R niveus var rosaefolius* from Chyangthapu, Panchthar
185.	B 143		Rosaceae	*Rubus treutleri*	06/06	2777	27.06	88.01	Mabu, Kalapokhari	*R nutaniflorus* from Taplejung
186.	D 296		Poaceae	*Setaria glauca*	09/30	2005	27 11 27	87 56 18.6	Memeng	*Rajarani 570m, Morang; Arun Sankhuwa 1090m.*
187.	D 294		Malvaceae	*Urena lobata*	09/30	1991	27 11 27	87 56 17.8	Memeng	Rajarani, Dhankuta; Arun, Sankhuwa, Hanspokhari, Ilam
188.	D 116		Gentianaceae	*Lomatogonium carianthiacum*	09/23	4050	27 25 08	88 02 55.3	Paharemeghu, Falaincha-9	Ramje, Taplejung
189.	C 081	*Chili gathi*	Papaveraceae	*Dicentra macrocapnos*	08/30	3170	27 05 22.7	87 54 47.3	Chibe, Chhintapu CF	Rifuk, Sankhu-3820m; Jaljale, Bhalukhop-13400ft; Chatarwa-3840m
190.	A 25		Boraginaceae	*Microula pustulata CF*	06/07	1822	27.06	87.94	Goruwale, Sidin	Rolwaling
191.	B 091		Rosaceae	*Sorbus foliolosa*	06/15	3032	27.08	88.01	Mabu, Kalapokhari	S microphylla from Taplejung, Wolangchunggola, Ghunsa
192.	B 102		Schisandraceae	*Schisandra grandiflora*	06/15	3059	27.08	88.01	Mabu, Near Mai khola, Chauri chowk	Saldim, Sankhuwa, Chyangthapu
193.	D 080		Primulaceae	*Primula glomerata*	09/22	3930	27 23 20	88 02 22.5	Near Budhipani Falaincha-9	Sandaphu
194.	D 149		Liliaceae	*Ophiopogon intermidius*	09/26	3280	27 18 33	88 01 38	Faleke-betini, Falaincha-9	*Sanguri bhanjyang-4500ft, Ghunsa Khola-2480m*
195.	D 202		Scrophulariaceae	*Lindenbergia grandiflora*	09/27	1900	27 16 04	87 57 29.9	Falaincha-6, Tintine	*Sankhu-860m; Lalikharka, Phidim-2000m; Dharapani, Ilam; Dhankuta-1050*
196.	C 079	Balu	Ericaceae	*Pieris formosa*	08/30	2450	27 04 21	87 59 29.2	Chibe, Chhintapu CF	Sankhusabha-1970m
197.	D 304		Fabaceae	*Desmodium microphyllum*	09/30	1991	27 11 27	87 56 17.8	Memeng, Bich Gaun	Sankhusabha-2030m
198.	D 086	*Sunpati*	Ericaceae	*Rhododendron anthopogon*	09/22	3930	27 23 20	88 02 22.5	Paharemeghu, Falaincha-9	Sankhuwabha, Ghunsa-3300m
199.	D 284		Fabaceae	*Astragalus stipulatus*	09/29	2390	27 12 51	87 57 51.6	Narelung, Memeng-3	Sankhuwasabha
200.	D 309		Fabaceae	*Crotolaria alata*	09/30	2050	27 04 28.4	87 58 48	Memeng, Bich Gaun	Sankhuwasabha-1880m
201.	C 028		Thymelaceae	*Edgworthia gardneri*	08/27	2187	27 04 33	87 56 37	Mane dada, Terse gaun, Mai majhuwa	Sankhuwasabha-2220m
202.	D 369		Caryophylaceae	*Stellaria sikkimensis*	09/20	3450	27 17 01	88 01 55.5	Majortham, Falaincha-4	Sankhuwasabha-3000m
203.	D 075		Rosaceae	*Sorbus foliolosa*	09/21	3930	27 23 20	88 02 22.5	Dund, Falaincha-9	Sankhuwasabha-3500m
204.	D 068		Rosaceae	*Prunus rufa var trichantha*	09/22	3735	27 20 57	88 03 30.5	Dund, Falaincha-9	Sankhuwasabha-3520m
205.	D 323		Rosaceae	*Rubus griffithii*	10/01	2684	27 09 22	87 57 07.9	Hiwakhla- \Khaka, Memeng-Prangbung	Sankhuwasabha-7000ft
206.	D 107		Rosaceae	*Sorbus micropjylla*	09/23	4337	27 26 11	88 03 16.0	Paharemeghu, Falaincha-9	Sankhuwasavbha-4040m
207.	D 249		Melastomataceae	*Osbekia sikkimensis*	09/28	1991	27 11 27	87 56 17.8	Menjuwa	Sankrate, Sankhuwa, 1800m, Maipokghari, Ilam,
208.	D 358		Polygonaceae	*Persicaria runcinata (Buch.-Ham. ex D. Don) H. Gross CF*	10/02	3450	27 17 01	88 01 55.5	Prangbung	Sarkhu Dhap-3560m
209.				*Talauma hodgsonii*						Seduwa Sankhuwa, 1330m, Wobak Sankhuwa
210.	B 095		Ranunculaceae	*Anemone rivularis*	06/15	3059	27.08	88.01	Mabu, Near Mai khola, Chauri chowk	Seduwa, Dhankuta, Simbukhola
211.			Rosaceae	*Rubus nepalensis*						Simbuah Taplejung
212.	D 206		Scrophulariaceae	*Mimulus nepalensis*	09/27	1900	27 16 04	87 57 29	Falaincha-6, Tintine	*Sindhuwa (Dhankuta)-1100m*
213.	D 151		Umbelliferae	*Selinum wallichianum*	09/26	3280	27 18 33	88 01 38.4	Faleke-betini, Falaincha-9	*Sindhuwa (Dhankuta)-2100m*
214.	D 162		Hypericaceae	*Hypericum choisinum*	09/26	2194	27 14 22	87 57 29.4	Faleke-betini,	Sindhuwa, Dhankuta, Nunthala,

									Falaincha-9	Solu 2105m.
215.	B 103		Aceraceae	*Acer campbelli*	06/15	3084	27.09	88.01	Mabu, Chauri Chowk	Singalila, Mai pokhari, Hile, Chyangthapu, Solu, Sankhuwa
216.	B 089		Ericaceae	*Rhododendron falconeri Wight*	06/14	3121	27.09	88.01	Mabu, Bikhe Bhanjyang	Siringdham, Simbhuwa khola
217.	D 010		Ericaceae	*Rhododendron falconeri*	09/19	3530	27 19 29	88 03 09.0	Chiwabhanjyang-Major	Siringdham-10000ft
218.	B 070		Papaveraceae	*Meconopsis lyrata*	06/12	3374	27.20	88.01	Memeng, Gorkhepani	Solu, Arun, Tamor 86 30, 27 30
219.	A 57		Ericaceae	*Rhododendron lepidotum Wall. ex G. Don*	06/09	3185	27.1	87.98	Maimajuwa, Dhupi	Solu, Sankhuwasabha, Ghjunsa, Taplejung, Khappare Ilam,
220.	D 165	*Gurjo*	Rosaceae	*Cotoneaster microphyllus*	09/26	1980	27 17 01	87 58 14.6	Faleke-betini, Falaincha-9	Solukhumbu 3090m.
221.	D 128		Rosaceae	*Potentilla peduncularis*	09/24	3210	27 18 45	88 01 22.4	Timbu Falaincha-9	Solukhumbu-3090
222.	D 054		Campanulaceae	*Codonopsis thalictrifolia*	09/21	3680	27 20 02	88 03 46.7	Sukhkhadhap-Dund, Falaincha-9	Syangeboche-14000ft
223.	D 085		Gentianaceae	*Swertia teres*	09/22	3820	27 20 28	88 03 53	Near Budhipani Falaincha-9	Tamoor
224.	D 063		Liliaceae	*Polygonatum singalilense*	09/21	3820	27 20 28	88 03 53	Dund, Falaincha-9	*Tamor 3070m;*
225.	C 017		Balsaminaceae	*Impatiens insignnis*	08/27	2100	27 04 19	87 56 34	Naule gaun, Mai majhuwa7	Tamor River-1550m
226.	C 053		Orchidaceae	*Anthogonium gracile*	08/28	1837	27 04 15.8	87 57 29.1	Newa khola, Mai majhuwa	Tamor, Sankhusabha-1100m; Hanspokhari, Ilam-5200ft
227.	D 215		Fabaceae	*Aeschynomene indica*		1570	27 15 44	87 57 19.0	Falaincha, Betini	Tamur-6000ft
228.	B 113		Ericaceae	*Enkianthus deflexus*	06/06	2969	27.07	88.01	Mabu, Kalapokhari	Taplejung Lamidada, Ramite, Sirindham, Khokim, Solukhumbu, Yeektin, Panchthar, Milke
229.	B 117		Aceraceae	*Acer pectinatum*	06/06	2939	27.07	88.01	Mabu, Kalapokhari	Taplejung, Chyangthapu, Arun, Mewakhola, Payang Solu
230.			Rosaceae	*Rubus tructlari*						Taplejung, Tamor valley
231.	B 138		Rosaceae	*Neillia rubiflora*	06/06	2777	27.06	88.01	Mabu, Kalapokhari	Taplejung, Tamor valley, Mewa khola 5000ft. 1956
232.	D 350		Rosaceae	*Rubus pentagonus*	10/02	3475	27 18 22	88 02 417	Talkharka-Prangbung, Prangbung	Taplejung; Phidim-2400m, Hile (Dhankuta)-1676m; Terhathum 5500ft
233.	C 048		Fabaceae	*Crotollaria alata*	08/28	1820	27 03 58	87 56 04	Hatiya, Mai majhuwa	Taplejung-700m
234.	C 124	Patta sherpu	Zingiberaceae	*Coutleya spicata*	09/01	2450	27 04 21.2	87 59 29.2	Patarashe, Mabu-8	Taplejung-8000ft; Bhalukhop-2390m
235.	D 216		Gesneriaceae	*Corralodiscus spp.*		2481	27 09 34	87 57 15.4	Falaincha, Betini	TAPLETHOK, TAPLEJUNG
236.	D 307		Fabaceae	*Crotalaria cytisoides*	09/30	1991	27 11 27	87 56 17.8	Memeng, Bich Gaun	Tashigaon (Sankhuwasabha)-2160m; Dabale (Panchthar)-2690m; Memeng-8500ft; Mewa Khola (Taplejung)-2050m
237.	A 080		Aceraceae	*Acer caudatum*	06/11	3218			Prangbung 6, Pasi Bhanjyang	Tashigaun, Sankhuwa, Solu, Barun, Tal pokhari, Milke
238.	B 126		Hypericaceae /Clusiaceae	*Hypericum choisiaium*	06/06	2778	27.07	88.01	Mabu, Kalapokhari	Tashigaun, Sindhuwa Dhankuta, Arun, Solu
239.	A 44		Urticaceae	*Pilea scripta /P symmeria*	06/08	2837	27.1	87.95	Banduke	Tate, Hesingnasa
240.	C 160		Cucurbitaceae	*Biswerea tonglensis cf*	09/03	2689	27 04 19.8	88 00 2.7	Dobate, Mabu-8	Terhathum, Basantapur, Dhankuta
241.	A 079		Ranunculaceae	*Ranunculus adoxifolius*	06/09	3420	27.12	87.98	Prangbung 6, Pasi Bhanjyang	Thudam
242.	D 003		Saxifragaceae	*Saxifraga diversifolia*	09/18	3580	27 12 50	88 00 49.1	Phalot-Chiwabhanjyang	*Thulopokhari-4040m; Ghopte-Gosainkunda-4400; Chhintapu-2900m*
243.	D 038		Valarienaceae	*Valariena hardwickii*	09/20	3475	27 18 22	88 02 41.7	Major-faleke-Gairi, Falaincha-9	*Tinjure danda-2800m*
244.	D 022		Hydrangeaceae	*Hydrangea heteromala*	09/19	3170	27 05 22.7	87 54 47.3	Chiwabhanjyang-Major	Tinjure, Ghunsa, Taplejung, Chhintapu, Ilam
245.	D 371		Saxifragaceae	*Saxifraga brachypoda (c.f.)*	09/20	3450	27 17 01	88 01 55.5	Majortham, Falaincha-4	*Tinjure, Hile-Chhintapu (Ilam)-8800ft*
246.	A 050		Violaceae	*Viola biflora L.*	06/08	2920	27.09	87.96	Lampokhari	Tinjure, Jaljale, Thulopokhari, Sankhuwasabha
247.	B 077		Ericaceae	*Lyonia viliosa Nutt. CF*	06/14	3395	27.10	88.00	Mabu 8, Chatu Bari	Tinjure, Milke, Taplejung, Solu, Sirindham, Guphapokhari, Bhojpur
248.	C 088		Gesneriaceae	*Didymocarpous aromaticus*	08/30	2650	27 05 28	87 55 29.2	Chhintapu	Tinjure, Num, Sankhuwasabha
249.	B 153		Symplocaceae	*Symploccus ramosissima*	06/07	2245	27.04	88.00	Jamuna 2, Hangetham	Tinjure, Tashigaun Sankhuwa, Bhojpur, Tehrathum
250.	B 063		Rosaceae	*Prunus rufa*	06/12	3374	27.20	88.01	Memeng, Gorkhepani	Topke gola, Barun, Arun,
251.	D 090		Papaveraceae	*Corydalis stracheyi*	09/22	3910	27 23 35	88 02 16.6	Paharemeghu, Falaincha-9	Topke gola-12000ft; Hile, chok, Talpokhari, Pancha-3450m; Solu Pike-3560m
252.	D 021		Ericaceae	*Gaultheria trichophyla*	09/19	3530	27 19 29	88 03 09.0	Chiwabhanjyang-Major	TopkeKhola (Sankhuwasabha)-3240m
253.	C 100	*Ban lasun*	Liliaceae	*Allium wallichii*	08/30	2861	27 05 10	87 55 12.6	Chhintapu	W Nepal
254.	C 158		Celastraceae	*Euonymus porphyreus*	09/03	2689	27 04 19	88 00 2.7	Dobate, Mabu-8	W Nepal
255.	C 201		Liliaceae	*Asparagus filicinus*	09/06	2334	27 02 44	88 00 25.6	Hangetham, Jamuna-1	W Nepal
256.	C 139		Trilliaceae/Liliaceae	*Paris polyphylla var polyphylla*	09/03	2665	27 04 05	87 59 28.9	Dobate, Mabu-8	Wolangchung Gola-3100m;
257.	C 090		Papaveraceae/Geraniaceae	*Corydalis stracheyi/Geranium lambertii*	08/30	3170	27 05 22.7	87 54 47.3	Chhintapu	Yamphudin, Taplejung 3060m.
258.	D 256		Umbelliferae	*Hydrocotyle himalaica*	09/29	2702	27 13 21	87 57 25.2	Dabale Deurali	*Yamphudin-2050m; Arun Valley-1930m*
259.	D 267		Valerienaceae	*Valariena hardwikii*	09/29	2500	27 12 58	87 57 05.0	Dabale bhanjyang-Memeng,Memeng	*Yamphudin-2300m*

Annex 6.2 Reviewed specimens with their previous notes in TUCH, Kirtipur, Kathmandu, Nepal

SN	RCN	V name	Family	*Taxon name*	Date	Alt.	Lat.	Long	Location	Previous notes
1.	C 157		Asteraceae	*Senecio alatus* Wall. ex DC.	09/03	2689	27 04 19	88 00 2.7	Dobate, Mabu-8	Tinjure, Tehrathum)
2.	D 140		Betulaceae	*Betula utilis* D. Don.	09/26	3280	27 18 33	88 01 38.4	Faleke-betini, Falaincha-9	Thanku, Makalu-Barun, NP
3.	D 360		Urticaceae	*Urtica dioica* L. var *atrichocaulis*	10/02	1893	27 10 33	87 57 32.4	Prangbung	*Tanku, Makalu- Barun NP*
4.	B 016		Urticaceae	*Girardinia species(G diversifolia CF)*	06/08	2904	27.10	87.94	Maimajuwa 8 , Bharlang	Tankin, Makalu- Barun NP
5.	D 332		Fagaceae	*Quercus lamellosa* Roxb.= *Cyclobalanopsis lamellosa* (Sm.) Oersted	10/01	2481	27 09 34	87 57 15.4	Hiwakhla- \Khaka, Memeng-Prangbung	Tanigaun, Makalu-Barun NP,2100m
6.	B 047		Berberidaceae	*Berberis wallichiana* DC.	06/11	3236	27.15	88.00	Prangbung 6, Pasi Bhanjyang	Santapur, Ilam
7.	C 001		Scrophulariaceae	*Hemiphragma species(H. heterophyllous)*	08/27	1817	27 03 52	87 56 38	Thulogaun, Maimajhuwa	Ranigaun, Makalu Barun NP
8.	A 014		Ericaceae	*Agapetes serpens* (Wight) Sleumer	06/08	2176	27.07	87.94	Maimajuwa 7, Terse Gaun	Maipokhari, Maimajhuwa, Hanspoklhari, ISumbuk, lam; Taplejung; Sankhuwasabha; Bhojpur, Basantpur, Tehrathum; Dhankuta; Solokhumbu, (Maipokhari, Laxmipur Ilam:
9.	B 003		Magnoliaceae	*Michelia velutiana* DC.	06/07	2042	27.06	87.94	Maimajuwa 7, Naule Gaun	Maipokhari, Ilam
10.	C 055	*Tite champ*	Magnoliaceae	*Michelia velutiana* DC.	08/28	1870	27 04 08	87 57 39.7	Newa khola, Mai majhuwa	Maipokhari, Ilam
11.	B 152		Berberidaceae	*Berberis aristata* DC.	06/07	2238	27.04	88.00	Jamuna 2, Hangetham	Maipokhari, Ilam 2100 m
12.	B 195		Berberidaceae	*Berberis aristata* DC.	06/08	2207	26.99	88.02	Jogmai, Kholagaun	Maipokhari, Ilam 2100m
13.			Rosaceae	*Rubus rugosus* Sm.						Mai Pokhari ilam Pokharikharka Ilam 1600m
14.	D 265		Rosaceae	*Rubus paniculatus* Sm.	09/29	2390	27 12 51	87 57 51.6	Mulchowk near sukha pokhari	Kalpokhari, Ilam
15.	B 004		Magnoliaceae	*Michelia doltsopa* Buch.-Ham.ex DC.	06/07	2042	27.06	87.94	Maimajuwa 7, Naule Gaun	Jasbire, ILam
16.	C 056		Magnoliaceae	*Michelia doltsopa* Buch.-Ham.ex DC.	08/28	2050	27 04 28.4	87 58 48	Newa khola, Mai majhuwa	Jasbire, ILam
17.	C 071	*Rani champ*	Magnoliaceae	*Michelia doltsopa* Buch.-Ham.ex DC.	08/28	2861	27 05 10.1	87 55 12.6	Kalo pani, Mai majhuwa	Jasbire, ILam
18.	B 193		Umbelliferae	*Oenanthe thomsonii* C.B.Clarke	06/08	2207	26.99	88.02	Jogmai, Kholagaun	Ilam, pashupati
19.	A 034		Scrophulariaceae	*Mazus surculosus* D.Don	06/07	2812	27.1	87.94	Goruwale, Sidin	Hile, Seduwa, Ilam, Kanyam
20.	C 059	*Budho okhati*	Saxifragaceae	*Astilbe rivularis* Buch.-Ham. ex D.Don	08/28	1974	27 04 17.5	87 57 39	Sisne, Mai majhuwa	Hatiya,Makalu-Barun NP
21.	D 025	*Budho okhati*	Saxifragaceae	*Astilbe rivularis* Buch.-Ham. ex D.Don	09/20	3450	27 17 01	88 01 55.5	Majortham, Falaincha-4	Hatiya,Makalu-Barun NP
22.	C 163		Rosaceae	*Rubus paniculatus* Sm.	09/03	2656	27 04 07.0	87 59 37	Dobate, Mabu-8	E Nepal Kalpokhari, Ilam
23.	C 020	*Budho okhati*	Saxifragaceae	*Astilbe rivularis* Buch.-Ham. ex D.Don	08/27	2187	27 04 33	87 56 37	Mane dada, Terse gaun, Mai majhuwa	Dhankuta, Mude-2500m; Hatiya,Makalu-Barun NP
24.	D 266		Asteraceae	*Erigeron species?? (E.lellidiodes)*	09/29	2750	27 13 26	87 57 45.4	Mulchowk near sukha pokhari	Dhaijan, Jhapa (Nutan Shrestha)
25.	D 272		Urticaceae	*Boehemaria hamiltoniana* Wedd. *CF / B. platyphylla*	09/29	2500	27 12 58	87 57 05.0	Dabale bhanjyang-Memeng,Memeng	*Chulachuli, ilam*
26.	B 149	Kalo ainselu	Rosaceae	*Rubus paniculatus* Sm.	06/07	2238	27.04	88.00	Jamuna 2, Hangetham	Bhuspate dada, Ilam; Bhakundey, Maimajhuwa, Rakse Kalpokhari, Ilam
27.	D 185		Urticaceae	*Boehmeria macrophylla* D.Don *cf*		1980	27 17 01	87 58 14.6	Maklabu	*Arun valley*

Annex 7. Prioritized plant species for conservation in Kanchenjungha-Singhalila Ridge, Eastern Nepal

SN	Prioritized plant species for lower Kanchenjungha Singhalila Ridge	IUCN 1994	CITES 1973	GoN 2001	CAMP 2001	GoN 2006	ESON/ PI 2007	Locally Thrd.	End.	VWP	DWP	NWP	ESON Priority	Priority score	Distribution (horiz & vert)
1.	*Taxus wallichiana* (Taxaceae) LOTH SALLA		+	+	En	+	+	+		+	+	+	+	10	ECW 2300-3400m
2.	*Nardostachys grandiflora* (Valerianaceae) JATAMANSI	R		+	V	+	+	+			+	+	+	9	ECW 3200-5000m
3.	*Aconitum ferox, A. spicatum* (Ranunculaceae) BIKHMA	Ct			V	+	+	+		+	+	+	+	9	ECW 1800-4200m
4.	*Neopicrorhiza scrophulariiflora* (Scrophulariaceae) KUTKI	V	+	+	V	+	+	+				+	+	9	ECW 3500-4800m
5.	*Swertia chirayita* (Gentianaceae) CHIRAITO, TITE	V			V	+	+	+		+	+	+	+	9	EC 1500-2500m
6.	*Michelia* and *Magnolia* species (Magnoliaceae) CHAAMP	E		+	Cr			+		+	+	+	+	8	EC 2000-2700m
7.	*Dactylorhiza hatagirea* (Orchidaceae) PANCHAUNLE		+	+	En	+	+	+				+	+	8	ECW 2800-3960m
8.	*Rheum nobile, R. australe* (Polygonaceae) KYANJO	R			V	+	+	+				+	+	7	E 3200-4300m
9.	*Dioscorea deltoidea* and other species (Dioscoreaceae) GITHHA, BHYAKUR	T	+		En	+						+	+	6	ECW 500-3100m
10.	*Paris polyphylla* (Liliaceae) SATUWA, LALGEDI	V			V		+	+					+	5	EC 1800-3300m
11.	*Cinnamomum glauscescens* (Lauraceae) MALAGIRI			+		+				+	+	+		5	ECW 2000-2500m
12.	*Juglans regia* (Juglandaceae) OKHAR			+		+				+	+	+		5	ECW 1200-2100m
13.	*Podophyllum hexandrum* (Berberidaceae) LAGHUPATRA	V	+		V	+						+		5	ECW 3000-4500m
14.	*Castanopsis hystrix* (Fagaceae) PATALE KATUSH							+		+	+	+		4	E; 1000-2500m
15.	*Oroxylum indicum* (Bignoniaceae) TATELO	V			En		+	+						4	ECW 400-1400m
16.	*Rhododendron* species (Ericaceae) SUNPATI, CHIMAL, GURANS							+		+	+	+		4	ECW 1500-5100m
17.	*Schefflera impressa* (Araliaceae) BHALUCHINDE							+		+	+		+	4	EC; 2000-3400m
18.	*Asparagus racemosus* (Liliaceae) KURILO				V	+	+					+		4	EC; 600-2100m
19.	*Valeriana jatamansii* (Valerianaceae) SUGANDHWAL			+	V	+	+							4	ECW 1500-3300m
20.	*Arundinaria* species (Poaceae) MALINGO & NIGALO									+	+	+		3	E; 1500-2000 m
21.	*Heracleum lallii* (Umbelliferae) CHIMPHING				+				+				+	3	ECW 300-4400
22.	*Tetracentron sinense* (Tetracentraceae) KIMBUK	R	+					+						3	E 2800-3200m
23.	*Rubia manjith* (Rubiaceae) MAJITHO				V	+	+							3	EC 1200-2100m
24.	*Bergenia purpurascens/ B. ciliata* (Saxifragaceae) PAKHANVED					+				+				2	EC 3800-4700m
25.	*Zanthoxylum* species (Rutaceae) TIMUR					+				+				2	ECW 1100-2500m
26.	*Cardiocrinum giganteum* (Liliaceae) CHAMELI										+			1	ECW 1800-3000m

Annex 8.1. Prioritized plant species of Ilam and Panchthar districts for conservation

jg:ktL÷hl8j'6L	Score	jt{dfg cj:yf lfdtfx?	lfdtfsf] cj:yf	cj;/x?
;'uGwsf]lsnf Cinnamomum glaucescens	5	k|fKt 5	36\bf] s|ddf	;+/lf0f tyf lj:tf/df hf]8 lbg' kg]{
kmnf6 Quercus glauca	5	k|fKt 5	36\bf] 5	;+/lf0f ug''{ kg]{
kx]n]	5	k|fKt 5	36\b} uPsf]	;+/lf0fdf hf]8 lbg' kg]{ .
nf]8 ;Nnf Taxus wallichiana	5	k|fKt 5 t/ kof{Kt xf]O{g\	nf]k eO{/x]sf] -SofG;/sf] cf}ifwL _	dxTj jf/]df hfgsf/L k|bfg ul/ ;+/lf0f lj:tf/df hf]8 lbg' kg]{ .
;t'jf Paris polyphylla	3	k|fKt 5	36\bf] s|ddf	;+/lf0f ul/g' kg]{ .
;'uGwjfnf Valeriana wallichii	3	k|fKt 5	yf]/} lj:tf/ x'b} uPsf]	;+/lf0f tyf lj:tf/df hf]8 lbg' kg]{
‰of}+ Lichen species	3	k|fKt 5	36bf] s|ddf	;+/lf0f ul/g' kg]{ .
af]em]f Acorus calamus	3	k|fKt 5	36\bf] s|ddf	;+/lf0f tyf lj:tf/ / o;sf] dxTj df hf]8 lbg' kg]{ .
af]s] cfn' Polygonatum species	3	k|fKt 5	36\bf] s|ddf	;+/lf0f tyf o;sf] dxTj df hf]8 lbg' kg]{ .
afF; Dendrocalamus species	3	k|fKt 5	j9bf] 5	k|of]u df hf]8 lbg' kg}{ .
c/ls8\ ;'gfv/L Orchids	3	k|fKt 5	36\bf] s|ddf	;+/lf0fdf hf]8 lbg' kg]{ .
dflnËf] Arundinaria species	3	k|fKt 5	36\bf] 5	;+/lf0f ug'{ kg]{
dlemtf] Rubia manjith	3	k|fKt 5	36\bf] s|ddf	;+/lf0f tyf k|of]u df hf]8 lbg' kg]{
efn] lr08] Scheffelra species	3	k|fKt 5	nf]kpGd'v	;+/lf0f ug'{ kg]{
kbd rfn Rheum australe	3	k|fKt 5	yf]/} lj:tf/df –Hj/f] /ut ;kmf ug]{ _	;+/lf0fdf hf]8 lb'g kg]{ .
kfFr cf}n] Dactylorhiza hatagirea	3	nf]kpGd'v cj:yfdf /x]sf]	;d'bfon] o;sf] dxTj s|dz j'emL lj:tf/df cfpb} u/]sf]	k|fljlws 1fg ;d'bfodf k|bfg ul/ ;+/lf0fdf hf]8 lbg' kg]{ .
kfvgj]b Bergenia purpurascens	3	k|fKt 5	nf]kpGd'v cJ:yfdf	;+/lf0f tyf v]lt lj:tfdf hf]8 lbg' kg]{ / k|fljlws 1fgsf] x:tfGt/0f .
l6Dd'/ Zanthoxylum armatum/oxyphyllum	3	k|fKt 5	36\bf] s|ddf	;+/lf0f tyf lj:tf/df hf]8 lbg' kg]{
ljv'df Aconitum spicatum	3	nf]kpGd'v cj:yfdf	s]lx j[4L x'b} uPsf] -k]6 b'Vbfsf] df k|of]u x'g] _	v]lt lj:tf/ ,ul/g' kg]{ ,;+/lf0f ul/g' kg]{ .
lr/}tf] Swertia chirayita	3	k|fKt 5 -j9\bf] s|ddf _	lj:tf/ x'b} uPsf]	;+/lf0f,k|of]u ,k|;f]wg / Kofs]lhËdf hf]8 lbg' kg]{ . k|fljlws 1fgsf] x:tfGt/0f x'g' kg]{ .
lrËlkmª Heracleum lallii	3	k|fKt 5	36\b} uPsf]	;+/lf0f tyf ;Dj{wgdf hf]8 lbg' kg]{ .

Annex 8.2 Prioritized sites of Ilam and Panchthar districts for conservation

VDC	Proposed Sites as corridor for conservation
Jamuna	Hangetham, Lalidanda, Kaiyakata, Nunthala, Nunde
Maimajhuwa	Ward 2-Alubari, ward 5 Serpe, ward 4- Tal Pokhari, Sandanda, ward 6- Lam Pokhari, ward 8-Guranse, ward 9- Sisne, Bharkharke, Sandakpur
Mabu	Wards 3, 4, 5, 8, 9. Sayangba, Lalibas danda, Batase, Siranji, Kalpokhari
Jogmai	Thaple, Chipchhipe, Bhasme, Kuwapani, Tal Pokhari, Phatak, Guranse, Megma, Lamidhura

Falaicha	Wards 7, 8 & 9.Jumla Pokhari, Garakhet bhanjyang, Tarunipani, Pheduntham, Lampharam, Sukachuli, Tarebhir, Kholme danda, Mejarthumka, Tamakharka
Chyangthapu	Timbure, Pakhola, Soladanda, Phedi, Lampokhari, Gunte Pokhari, Dable Bhanjhyang, Lasune, Menjuwa jharana
Memeng	Ward 4, 6, 3 &1. Chulidanda, Pancthere danda, Sukhadhap, Bhirkuna, Sole danda, Chulthe danda, Simaihaila danda, Gorkhepani
Prangbung	Wards 6 & 7 Imkhim, Thuloghyan, Nepaltar, Phakletar, Surketham, Jaljale,
Sidin	Wards 6,5,3 & 1.Sandakpur danda, Serpeni, Batase bhanjhyang, Laptenpati bhanjhyang, Likhuregaun

Source: NCDC/ICIMOD/ICC 2005

Annex 9. Ecological study of forest vegetations of Lower Kanchenjungha-Singhalila Ridge

METHODS

Quantitative sample survey comparing forests at different intensities of distribution and representing different bioclimates and management system was done by quadrat method following Zobel *et al* (1987). It was intended to derive where important differences exit among them. Quadrats of 10m x 10m were laid by using systematic random sampling following Kent and Coker (1995) to study woody species (trees of DBH >10cm), 5m x 5m to study shrubs and 1m x 1m to study herbs. The diameter of trees at breast height-DBH (using DBH tape-Kinglon Diameter Tape No. DP 10) and height (using Clinometer-Silva 150) of the tree species were measured. The diameter of the cut stumps were also measured and noted the age. Basal area was calculated as m^2 per hectare and density estimate was made calculating no of trees (individuals) per area following Kent and Coker (1995) and Zobel *et al* (1987).

1. Density

$$\text{Densisty of a Species (No/ha)} = \frac{\text{Mean number of individual of a species (x)}}{\text{No of studied x Area of a quadrate in m}^2\,(A)} \times 1000$$

$$\text{Relative Density (\%)} = \frac{\text{Density of a Species}}{\text{Total density of all Species}} \times 100\%$$

2. Frequency

It is defined as the number of sampling units a particular species occur. It can be determined by-

$$\text{Frequency} = \frac{\text{Number of quadrates in which a particular species occur}}{\text{Total number of quadrate studied}} \times 100\%$$

Frequency depends on the homogeneity of the distribution of various species in the ecosystem. There are 5 frequency classes as described by Raunkier (1934).

$$\text{Relative Frequency of a Species (\%)} = \frac{\text{Frequency of a Species}}{\text{Total Frequency of all Species}} \times 100\%$$

3. Basal area

Basal area refers to the ground area actually penetrated by the stem or the area of the ground covered by the stem. It is measured at the level of breast height from the ground level. It is one of the chief characteristics to determine the dominance. The basal area was calculated from the relation:

$$\text{Basal Area} = \frac{\prod D^2}{4}$$

Where, D = diameter of each tree

$$\text{Relative Basal Area} = \frac{\text{Basal Area of a Tree Species}}{\text{Total Basal Area of all Species}} \times 100\%$$

In order to express the dominance and ecological success of any species, with a single value, the concept of Important Value Index has been developed. It can be calculated by adding the relative values of the three parameters density, frequency and basal area (Curtis, 1959).

4. Importance Value Index

The dominancy of any species in an area is estimated with respect to its importance value which is the combined effect of relative basal area, relative frequency and relative density. The basal area is replaced by coverage in case of shrubs and herbs. It was calculated with following equation. $$IVI = RD + RF + RBA$$

FINDINGS

Species diversity and dynamics in Panchthar district

Structural characteristics of forest vegetation in Panchthar District were studied by calculating the Importance Value Indices (IVI) of all tree species following Zobel *et al* (1987). A total of 48 tree species were recorded in Panchthar District and IVI was calculated by adding the relative values of the three parameters density, frequency and basal area (Curtis, 1959). The table 1 below shows the IVI calculation and respective IVI values in descending order. *Lithocarpus pachyphylla* (Local-Bante) was found to be most dominant of all trees with IVI value of 73.94. It was then followed by *Rhododendron campanulatum* (24.74), *Symplocus lucida* (23.32), *Daphniphyllum himalayense* (13.21), *Sorbus microphylla* (12.43), and *Acer campbelli* (12.03) and so on. Figure 1 below shows the IVI chart for top seven species for Panchthar. The two prioritized species viz. *Magnolia campbelli* and *Taxus wallichiana* were with IVI values of 7.25 and 3.36 respectively. It is shown in the figure 2 below.

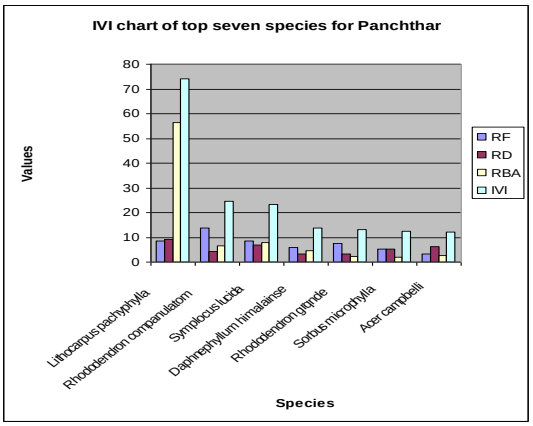

Figure 1: IVI chart of top seven species for Panchthar

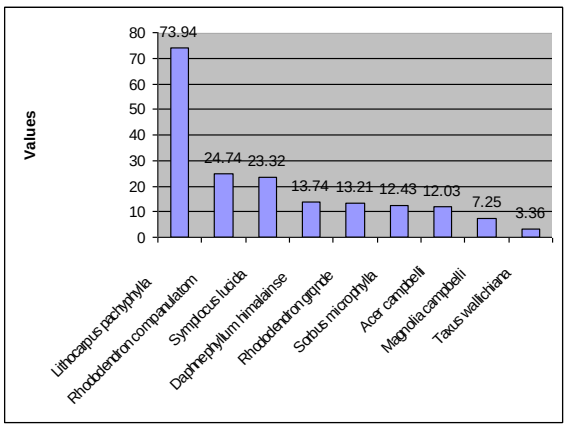

Figure 2: IVI of *Magnolia campbelli* and *Taxus wallichiana*, two prioritized and threatened species compared to other species

Plant species diversity and dynamics in Ilam district

A total of 31 tree species were recorded in Ilam and the Important Value Indices for each species were calculated as above and presented in the table 2 below. It shows that *Magnolia campbelli* was found to be dominant with IVI value of 74.8 and was followed by *Lithocarpus pachyphylla* (58.04), *Symplocus sp* (48.05), *Acer sp* (15.5), *Eurya acuminata* (14.82), *Symplocus glomerata* (10.54), *Neolitsea cuipala* (9.36) and so on. The IVI chart for top seven species for Ilam is shown in the figure 3 below. The other prioritized species of *Taxus wallichiana* possessed IVI value of 4.41. The figure 4 below shows the IVI of *Taxus wallichiana*, a prioritized species as compared to other top valued species

Table 1: Structural characteristics of vegetation in Panchthar district

SN	Name of species	D	RD	F	RF	BA	RBA	IVI
1	***Rhododendron companulatum***	16.27	13.89	14.93	4.13	148.41	6.72	**24.74**
2	***Lithocarpus pachyphylla***	10.00	8.54	32.84	9.09	1244.10	56.32	**73.94**
3	***Symplocus lucida***	10.00	8.54	25.37	7.02	171.48	7.76	**23.32**
4	***Daphniphyllum himalainse***	7.01	5.99	11.94	3.31	98.29	4.45	**13.74**
5	***Sorbus microphylla***	6.12	5.22	19.40	5.37	40.58	1.84	**12.43**
6	*Lyonia ovalifolia*	5.23	4.46	17.91	4.96	35.77	1.62	11.03
7	*Rhododendron thomsoni*	3.58	3.06	10.45	2.89	9.07	0.41	6.36
8	*Acer caudatum*	3.43	2.93	11.94	3.31	24.01	1.09	7.32
9	*Prunus cornuata*	2.54	2.17	10.45	2.89	7.50	0.34	5.40
10	*Eurya accuminata*	2.24	1.91	10.45	2.89	7.30	0.33	5.13
11	*Vibernum nervosum*	2.09	1.78	8.96	2.48	3.02	0.14	4.40
12	***Taxus wallichiana***	**1.49**	**1.27**	**5.97**	**1.65**	**9.67**	**0.44**	**3.36**
13	*Quercus semicarpifolia*	1.49	1.27	1.49	0.41	5.94	0.27	1.96
14	*Abies spectabilis*	1.34	1.15	7.46	2.07	51.89	2.35	5.56
15	*Vibernum mullah*	1.34	1.15	8.96	2.48	1.61	0.07	3.70
16	*Rhododendron barbatum*	1.34	1.15	5.97	1.65	3.33	0.15	2.95
17	*Quercus lamellosa*	1.19	1.02	7.46	2.07	68.04	3.08	6.17
18	*Alangium alpinum*	1.19	1.02	7.46	2.07	1.49	0.07	3.15
19	*Cinnamomum glaucescense*	0.45	0.38	4.48	1.24	1.11	0.05	1.67
20	*Euonymus sp.*	0.45	0.38	1.49	0.41	0.29	0.01	0.81
21	*Rhus javanica*	0.45	0.38	1.49	0.41	0.12	0.01	0.80
22	*Persea odoratissima* (kaulo)	0.30	0.25	2.99	0.83	1.61	0.07	1.15
23	*Quercus glauca*	0.30	0.25	2.99	0.83	0.28	0.01	1.09
24	*Bakhreghas (Nundhiki)*	0.30	0.25	1.49	0.41	0.10	0.00	0.67
25	***Michelia champaca***	**0.15**	**0.13**	**1.49**	**0.41**	**0.18**	**0.01**	**0.55**
26	*Macaranga* sp.	0.15	0.13	1.49	0.41	0.15	0.01	0.55
27	*Ficus pubigera*	0.15	0.13	1.49	0.41	0.05	0.00	0.54
28	*Hydrangia heteromala*	0.15	0.13	1.49	0.41	0.01	0.00	0.54
29	*Sauraria napaulensis*	0.15	0.13	1.49	0.41	0.01	0.00	0.54
30	*Schefflera impressa*	0.15	0.13	1.49	0.41	0.05	0.00	0.54
31	*Schima wallichii*	0.15	0.13	1.49	0.41	0.02	0.00	0.54
32	*Magnolia campbelli*	2.99	2.55	8.96	2.48	49.12	2.22	7.25
33	*Myrsine sp. (Setikath)*	1.94	1.66	8.96	2.48	23.23	1.05	5.19
34	*Rhododendron arboreum*	2.84	2.42	7.46	2.07	22.47	1.02	5.50
35	***Rhododendron falconeri***	8.81	7.52	11.94	3.31	52.78	2.39	**13.21**
36	***Acer campbelli***	3.73	3.18	22.39	6.20	58.46	2.65	**12.03**
37	*Sorbus foliolosa*	5.67	4.84	10.45	2.89	28.92	1.31	9.04
38	*Betula utilus*	1.64	1.40	5.97	1.65	8.81	0.40	3.45
39	*Pentapanax fragrans*	0.90	0.76	7.46	2.07	2.95	0.13	2.96
40	*Ilex sikkemensis*	0.75	0.64	5.97	1.65	2.27	0.10	2.39
41	*Symplocus glomerata*	0.75	0.64	5.97	1.65	1.56	0.07	2.36
42	*Prunus rufa*	0.60	0.51	4.48	1.24	1.93	0.09	1.84
43	*Neolitsea cuipala (belase)*	0.60	0.51	2.99	0.83	6.07	0.27	1.61
44	*Alnus nepalensis*	0.75	0.64	1.49	0.41	0.50	0.02	1.07
45	*Corylus ferox (pasa)*	0.60	0.51	1.49	0.41	0.38	0.02	0.94
46	*Lindera neesiana*	0.60	0.51	1.49	0.41	0.32	0.01	0.94
			100.00		**100.00**		**100.00**	

Plant species diversity and dynamics in Ilam district

A total of 31 tree species were recorded in Ilam and the Important Value Indices for each species were calculated as above and presented in the table 2 below. It shows that *Magnolia campbelli* was found to be dominant with IVI value of 74.8 and was followed by *Lithocarpus pachyphylla* (58.04), *Symplocus sp* (48.05), *Acer sp* (15.5), *Eurya acuminata* (14.82), *Symplocus glomerata* (10.54), *Neolitsea cuipala* (9.36) and so on. The IVI chart for top seven species for Ilam is shown in the figure 3 below. The other prioritized species of *Taxus wallichiana* possessed IVI value of 4.41. The figure 4 below shows the IVI of *Taxus wallichiana*, a prioritized species as compared to other top valued species.

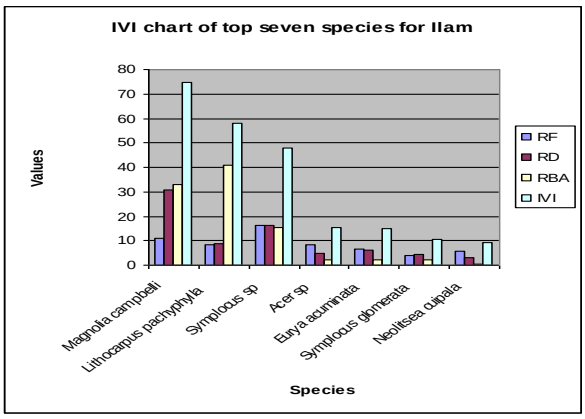

Figure 3: IVI chart of top seven species for ILAM

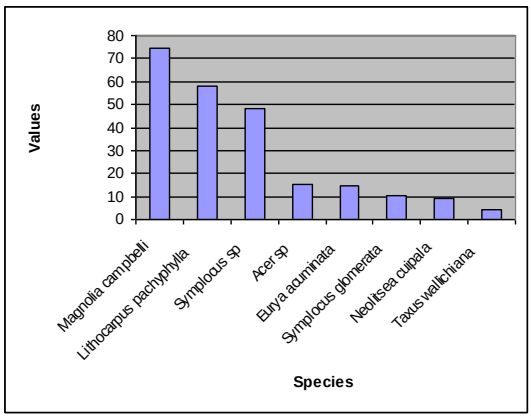

Figure 4: IVI of *Taxus wallichiana*, a prioritized and threatened species as compared to other top valued species

Table 2: Structural characteristics of forest vegetation in Ilam District

SN	Name of species	D	RD	F	RF	BA	RBA	IVI
1	***Magnolia campbelli***	45	30.61	40	11.17	1189.70	33.017	**74.80**
2	***Lithocarpus pachyphylla***	13	8.84	30	8.38	1470.77	40.817	**58.04**
3	***Symplocos sp***	24	16.33	58	16.20	559.45	15.526	**48.05**
4	***Acer sp***	7.2	4.90	30	8.38	79.92	2.218	**15.50**
5	***Eurya accuminata***	9	6.12	24	6.70	71.89	1.995	**14.82**
6	***Symplocos glomerata***	6.6	4.49	14	3.91	77.09	2.139	**10.54**
7	***Neolitsea cuipala***	4.6	3.13	20	5.59	23.06	0.640	**9.36**
8	*Persea odoratissima*	4.6	3.13	18	5.03	25.77	0.715	8.87
9	*Litsea sp (siltimur)*	8.2	5.58	6	1.68	3.76	0.104	7.36
10	*Castanopsis hystrix*	4.2	2.86	10	2.79	13.98	0.388	6.04
11	*Cryptomeria japonica*	2.4	1.63	8	2.23	35.34	0.981	4.85
12	***Taxus wallichiana***	**1.8**	**1.22**	**10**	**2.79**	**14.28**	**0.396**	**4.41**
13	*Quercus lamellosa*	1.4	0.95	10	2.79	12.84	0.356	4.10
14	*Rhododendron arboreum*	2.2	1.50	8	2.23	8.86	0.246	3.98
15	*Rhododendron barbatum*	2.6	1.77	4	1.12	3.70	0.103	2.99
16	*Litsea sp*	0.8	0.54	8	2.23	4.26	0.118	2.90
17	*PATPATE*	1.2	0.82	6	1.68	2.22	0.061	2.55
18	*Myrsine sp*	0.8	0.54	6	1.68	2.92	0.081	2.30
19	*Quercus glauca*	0.6	0.41	6	1.68	0.42	0.012	2.10
20	*Lindera sp*	1.2	0.82	4	1.12	0.59	0.016	1.95
21	*Rhododendron falconeri*	1.2	0.82	4	1.12	0.38	0.011	1.94
22	*Daphniphyllum himalaynse*	0.8	0.54	4	1.12	0.31	0.009	1.67
23	***Michelia champaca***	**0.6**	**0.41**	**4**	**1.12**	**0.41**	**0.011**	**1.54**
24	*Vibrunum mullah*	0.6	0.41	4	1.12	0.47	0.013	1.54
27	*BHADRASE*	0.4	0.27	4	1.12	0.05	0.001	1.39
26	*Castanopsis tribuloides*	0.4	0.27	4	1.12	0.07	0.002	1.39
25	*Lyonia ovalifolia*	0.4	0.27	4	1.12	0.15	0.004	1.39
28	*Rhus sp*	0.4	0.27	4	1.12	0.04	0.001	1.39
29	*Viburnum* sp.	0.4	0.27	2	0.56	0.04	0.001	0.83
30	*Alangium alpinum*	0.2	0.14	2	0.56	0.57	0.016	0.71
31	*Ilex sp*	0.2	0.14	2	0.56	0.01	0.000	0.70
			100.00		**100.00**		**100.000**	

Annex 10.1 Village Level Workshops on Development of Plant Biodiversity Conservation Strategies

7-8th August, 2007 Hangetham, Jamuna, Ilam

3-4th September, 2007 Prangbung, Panchthar

Village level consultations and meetings were organized in project site with the help of local collaborators: Deep Jyoti Youth Club, Panchthar and Shree High Altitude Herb Growers Group, Ilam. Informal meetings and consultations were made throughout the field period. Moreover there were two social mobilizers from local collaborating organization in field and they interacted with local community year around. The mobilizers monitored the permanent plots set by ESON Research Team in each village development committees. The monitoring was specially designed to record the disturbance regime of the site. Based upon the monitoring plots and record data sheet and consultations (workshops, meetings, trainings), seven major threats were identified.

The conservation strategy workshops were organized in Hangetham, Jamuna, Ilam and Prangbung bazaar, Prangbung, Panchthar. The workshop of Hangetham, Jamuna, Ilam was on 7-8th August, 2007 and of Prangbung bazaar, Prangbung, Panchthar was on 3-4th September, 2007. There were about 40 participants in Ilam workshop and about 45 participants in Panchthar workshop. The participants were from various backgrounds and represented different institutions and organizations. They were government official, school teacher, student, development workers, herders, farmers, medicinal plant collectors, mobilizers, community forest users, etc.

In order to frame the strategies for species and habitat conservation, community prioritized species and habitats were identified and respective conservation strategies were developed. The identification of species and habitats was based on the taxonomic uniqueness, endemism, rarity, socioeconomic importance, culturally and indigenously value, richness, uses value etc. The identification following given criteria put forwarded 13 plant species as important.

Table1: Prioritized species based on village level workshops at Ilam and Panchthar

SN	Prioritized Species of Ilam & Panchthar district	Hangetham, Ilam	Prangbung, Panchthar	Score
1	*Michelia kisopa* (Champ)	11	11	22
2	*Taxus wallichiana* (Loth salla)	9	10	19
3	*Swertia chirayita* (Chirayito)	10	6	16
4	*Rhododendron species* (Chimal and Gurans)	7	7	14
5	*Aconitum species* (Seto Bikhma)	4	9	13
6	*Schefflera species* (Bhalu chinde)	8	3	11
7	*Castanopsis hystrix* (Patale katus)	6	4	10
8	*Juglans regia* (Okhar)	-	8	8
9	*Zanthoxylum* species (Timur)	1	5	6
10	*Cinnamomum glauscescens* (Malagiri)	5	1	6
11	*Bergenia purpurascens* (Pakhanved)	3	-	3
12	*Cardiocrinum giganteum* (Chameli)	-	2	2
13	*Arundinaria* species (Nigalo)	2		2

After identifying the species and based on their abundance and occurrence, the important sites were also identified. Moreover the criteria of species were used for selection of the sites. The habitats selection process was based on prioritized species availability, different land use and habitat types, socio-economic and ecologically important. A total of 12 sites six from each district were identified as important.

Table 2: Prioritized habitats from village workshops of Ilam and Panchthar

Prioritized habitats	
Ilam district	**Panchthar district**
Hangetham, Jamuna	Timbu pokhari, Falaincha
Sandakphu	Mejartham-Chiwa bhanjyang
Chintapu, Mai majhuwa	Bhaise pokhari - Jaljale-Surketham
Kala pokhari, Mabu	Tinsimana-Gorkhepani-Fokte
Tumling, Jogmai	Lam pokhari-Suke pokhari-Ose
Todke Jharana	Narelung – Thaplu

After identifying important species and sites/habitats through active community participation in workshops, the respective conservation strategies and their threats were also identified. Most of the threats were common but few were different because of the different land use system. However the over grazing and illegal collection and poaching threats were considered as common and most. Prioritized species and habitat specific conservation strategies were identified in workshops. The strategies were in reference to the major threats.

Table 3: Potential threats identified during workshops

SN	**Threats**	**Hangetham, Ilam**	**Prangbung, Panchthar**
1	Uncontrolled Grazing	√	√
2	Lack of Awareness		√
3	Illegal collection and poaching	√	√
4	Fire	√	√
5	Deforestation		√
6	Erosion and Landslide	√	√
7	Tourism-Fuel wood/path used by tourists	√	√
8	Unscientific plantation	√	
9	Open border	√	√
10	Lack of livelihood options	√	√
11	Forest Encroachment		√
12	Weak policies, laws and their enforcement	√	
13	Kipat system of Land Management	√	√

Table 4: Vital conservation strategies identified during the workshops

SN	**Strategies**	**Hangetham, Ilam**	**Prangbung, Panchthar**
1	Minimize the dependency of local people on Forest	√	√
2	Controlled grazing		√
3	Forestation	√	√
4	Awareness raising trainings	√	√
5	Regulated tourism		√
6	Trained security forces in the border	√	√
7	Alternative source of income for the locals	√	√
8	Control illegal collection and harvesting of resources from forest especially medicinal plants	√	
9	Community forest border delineation	√	√
10	Scientific plantation	√	√
11	Capacity building trainings for the locals		√
12	Explore land management option	√	
13	Awareness programs to control fire in dry season	√	√

List of participants in Village Level Workshop at Hangetham, Jamuna

Date: September 8-9, 2007 Place: Hangetham, Jamuna-1, Ilam

SN	Name of participants	Organization/Address	Designation
1	Rajeswar Rijal	ICC	
2	Udaya Gurung	Pokhari Danda CF	
3	Tara Neupane	Biodiversity Conservation Committee	Coordinator
4	Til B Khamdak	Hangetham CF, Jamuna	
5	Yajna B Gurung	Hangetham CF, Jamuna	
6	Ganga Lal Rai	Bhagawati Ma Vi, Jamuna	
7	Manjit Khandak	Jamuna-3, Ilam	
8	Rudra Thebe	Jamuna-1, Piple Ilam	
9	Deepak Rai	Mabu-8, Ilam	
10	Dharanidhar Bhattarai	Hangetham CF	Member
11	Ganesh B Gurung	Bal Bikash Kendra, Jamuna	
12	Udaya Gurung	Hangetham CF	Member
13	Pasang Temba Sherpa	Jamuna-1, Ilam	
14	Chandra P Tamu	Jamuna-2, Ilam	
15	Gopal Rai	Jamuna-1, Ilam	
16	Tirtha K Khamdak	Jamuna-3, Ilam	
17	Antu Tamu	Jamuna-2, Ilam	
18	Nirmala Devi Bhattarai	Sachet Bachat Tatha Hrina Sahakari Sanstha Ltd, Jamuna-2	
19	Dawalamu Sherpa	Jogmai-7	
20	Amrita Rai	Puwamajhuwa-7	
21	Narayan Bhattarai	Jamuna-2	
22	Ramesh Bhattarai	Jamuna	
23	Siddibal Gurung	Choyatar CF, Jamuna 8/9	Secretary
24	Tara Rai	Choyatar CF, Januna 8/9	Member
25	Lalita Rai	Choyatar CF, Jamuna 8/9	Member
26	Bir Dhwaj Khamdak	Community Forest User	
27	Netra B Gurung	Bhanudaya Pra. Vi.	
28	Rohit P Bhattarai	Nawa Pratibha Samaj	Member
29	Nim Temba Sherpa	User	
30	Jyongmeng Sherpa (Lama)	Gompa Committee	President
31	Chitra B Rai	Hangetham	Nursery
32	Agni P		
33	Phurlamu Sherpa	Jamuan-1	
34	Tirthu Khamdak	Jamuna-3	
35	Chandra P Gurung	Bhagawati Ma Vi	

List of participants in Village Level Workshop of Panchthar district

Date: October 3-4, 2007 Venue: Kalika Higher Secondary School, Prangbung-3

SN	Name of Participants	Address/Organization	Designation
1	Mr. Birendra K. Mandal	Prangbung Health Post	Incharge
2	Mr. Agni P Lamichhane	Shree Kalika Ma Vi	Teacher
3	Mr. Bidya Nandan Jha	Police Station	Incharge
4	Mr. Pramananda Shrestha	Yangnam, Panchthar	
5	Mr. Bisheshwor Begha	Chyangthapu	
6	Mr. Machhindra Begha	Mangenalung Pashupalan Samuha, Falaincha	
7	Mr. Pradip Rai	Sidin VDC-1	
8	Mr. Tikaram Nepal	Prangbung-4	
9	Mr. Suk B Rai	Sidin-1	
10	Mr. Tej K Rai	Falaincha-9	
11	Ms. Saraswoti Gurung	Falaincha-4	
12	Ms. Sangeeta Rai	Faliancha-9	
13	Mr. Bal B Rai	Chyangthapu-3	
14	Mr. Som Adhikari	Chyanthapu-9	
15	Mr. Kamal Rai	Prangbung-2	
16	Mr. Matrika Rijal	Prangbung-4	
17	Mr. Kamal Khapangi	Prangbung-4	
18	Mr. Ojaswi Rai	Singha Devi CF, Prangbung-1	
19	Mr. Abinarayan Rai	Singha Devi CF, Prangbung-1	
20	Mr. Nathu Gurung	Shree Jaljale Shrijanashil Jadibuti Utpadak Samuha, Prangbung-9	Chairman
21	Mr. Netra B Thamsuhang	Prangbung-3	Peon, VDC
22	Mr. Udaya Timalsina	Prangbung VDC	Technical Assistant, VDC`Office
23	Mr. Khadka Gyangmi Magar	Prangbung-4	Representative, CPN-UML
24	Mr. Nar P Khapangi	Prangbung-3	Incharge, Post Office
25	Ms. Rekha Gurung	Jaljale CFUG, Prangbung-7	Joint Secretary
26	Ms. Tarawati Rai	Phalelung Agriculrural Cooperative, Prangbung-1	President
27	Ms. Jaya Maya Rana	Prangbung-3	Social Mobilizer
28	Mr. Ram Chandra Gurung	Memeng-7	
29	Mr. Santabir Rai	Ban Banyajantu jadibuti Utpadak Samuha, Memeng	Secretary
30	Mr. Rup B Rai	Chyanthapu-6	
31	Ms. Pabitra Thamsuhang	Prangbung-3	
32	Mr. Jagat B Jabegu	Sidin-1, Gwala Samuha	President
33	Mr. Devi Prasad Nepal	Prangbung-4	VDC Chairman
34	Ms. Man Kumari Tamang	Prangbung-3	
35	Ms. Shiva Kala Thamsuhang	Prangbung-3	
36	Mr. Dilli Kerung	Prangbung-5	
37	Dr. K.K. Shrestha	ESON, Kathmandu	President
38	Mr. Ripu M Kunwar	ESON, Kathmandu	Field Coordinator
39	Mr. Kamal Humagain	ESON, Kathmandu	Research Associate
40	Mr. Man K Dhamala	ESON, Kathmandu	Research Associate
41	Mr. Jeevan Pandey	Central Department of Botany, Kirtipur	M. Sc. Student
42	Mr. Nar B Khatri	Central Department of Botany, Kirtipur	M. Sc. Student
43	Mr. Yub Raj Poudel	Shree High Altutude Herbal Growers Group(SHAHGG), Ilam	Social Mobilizer
44	Mr. Rajendra Rai	Shree Dipjyoti Youth Club, Panchthar	Social Mobilizer

Annex 10.2 District Level Workshops on Development of Plant Biodiversity Conservation Strategies

16th March, 2008 Hotel Orchid, Tripureshwor, Kathamandu

Initially district level workshop was proposed to organize in Ilam. But due to prevailing political turmoil and instability (strikes) throughout the country, in particular, and in Eastern Nepal, in specific, it was not possible to organize district level workshop in Ilam. It was then organized in Kathmandu. The objective of the workshop was to select and reprioritize the plant species and their habitats identified during the village level workshops held at Hangetham, Jamuna-1, Ilam (September 8-9, 2007) and Kalika Higher Secondary School, Prangbung-3, Panchthar (October 3-4, 2007). Representatives from local implementation partners (Shree High Altitude Herbs Growers' Group, SHAHGG Ilam and Deep Jyoti Youth Club, Pancthar), CEPF grantees, District Forest Offices and local residents of the districts actively participated in the workshop (Annex I provides the list of participants).

Field Coordinator of the project, Mr Ripu M Kunwar presented a paper to highlight the project's activities and key findings, and workshop's objectives. Research Associate Mr Man Kumar Dhamala and Mr Kamal Humagain and M Sc students Mr Nar Bahadur KC and Mr Jeevan Pandey presented the technical papers in the workshop. It was then followed by participatory discussion and consultations to get the local knowledge regarding the important plants and the habitats. The workshops were commented by CEPF national coordinator Mr Angphuri Sherpa, NCDC project coordinator Mr. Kamal Rai and cooridinator DJYC, Me. Mahrndra Bir Rai. In the workshops, the conservation strategies were discussed for those selected species and habitats from the village level workshops. The plant species and their habitats, and strategies discussed and resoluted over the district workshops were to be presented in the central level expert consultation workshop.

OUTCOMES

1. Prioritized species and Habitats (hot spots)

Participatory Rural Appraisal (participatory resource mapping, discussion) in combination with the scientific method was used to find the prioritized species and associated habitats for conservation and strategy development. PRA tool was applied at three levels viz. village, district and national level. Conservation and management needs perceived by local people based on their own observations were identified during the workshops. The criteria used to prioritize the plants species are

1. Biodiversity values (based on rarity, dispersal, propagation, plant populations in the wild)
2. Socio-cultural values (potentials for ethno-medicinal uses, cultural and indigenous uses)
3. Economic values (potentials for markets, trade, poverty alleviation)

The following tables show the prioritized plant species (table 1) and prioritized habitats (table 2). Participatory discussions were organized to find the existing and potential threats that need to be addressed appropriately for the conservation initiatives in the areas. Table 4 shows the threats identified during the participatory discussion and local strategies to overtop the threats.

Table 1a: Plant species ranked (descending order) by the District level workshop (Ilam)

SN	Prioritized Species	Nepali Name	Score
1.	*Michelia* species	Champ	13
2.	*Taxus wallichiana*	Loth salla	12
3.	*Aconitum* species	Kalo/ Seto Bikhma	11
4.	*Swertia chirayita*	Chirayito	10
5.	*Castanopsis hystrix*	Patale katus	9
6.	*Cinnamomum glauscescens*	Malagiri	8
7.	*Bergenia purpurascens*	Pakhanved	7
8.	*Rhododendron* species	Chimal /Gurans	6
9.	*Juglans regia*	Okhar	5
10.	*Arundinaria* species	Panchaunle	4
11.	*Cardiocrinum giganteum*	Chameli	3
12.	*Zanthoxylum* species	Timur	2
13.	*Schefflera* species	Bhalu chinde	1

Table 1b: Plant species ranked (descending order) by the District level workshop (Panchthar)

SN	Prioritized Species	Nepali Name	Village workshop Score	District workshop Score	National workshop Score	Total Score
1	*Michelia* species	Champ	25	16	**16**	**57**
2	*Taxus wallichiana*	Loth salla	24	15	**15**	**54**
3	*Aconitum* species	Kalo/ Seto Bikhma	23	9	**14**	**46**
4	*Cinnamomum glauscescens*	Malagiri	15	13	**10**	**38**
5	*Nardostachys grandiflora*	Jatamansi	14	12	**12**	**38**
6	*Swertia chirayita*	Chirayito	20	10	**7**	**37**
7	*Juglans regia*	Okhar	22	14	**0**	**36**
8	*Castanopsis hystrix*	Patale katus	18	11	**2**	**31**
9	*Rhododendron* species	Chimal /Gurans	21	8	**1**	**30**
10	*Neopicrorhiza scrophulariflora*	Kutki	13	6	**11**	**30**
11	*Dactylorhiza hatagirea*	Panchaunle	12	5	**13**	**30**
12	*Zanthoxylum* species	Timur	19	1	**0**	**20**
13	*Cardiocrinum giganteum*	Chameli	16	3	**0**	**19**
14	*Schefflera* species	Bhalu chinde	17	0	**0**	**17**
15	*Rheum* species	Padamchal/Kenjo	9	0	**6**	**15**

Table 2a: Habitat/Sites ranked (descending order) by the District level workshop (Ilam)

SN	Prioritized habitats	VDC	Scores
1	Hangetham	Jamuna	6
2	Chintapu	Mai majhuwa	5
3	Sandakphu	Mabu and Maimajhuwa	4
4	Kala pokhari and/or Mabutham	Mabu	3
5	Tumling	Jogmai	2
6	Todke Jharana	Jogmai	1

Table 2a: Habitat/Sites ranked (descending order) by the District level workshop (Panchthar)

SN	Prioritized sites (VDC)	Village workshop Score	District workshop Score	National workshop Score	Total Score
1	Timbu pokhari (Falaincha VDC)	6	2	7	**15**
2	Lam pokhari-Suke Pokhari-Ose (Chyangthapu VDC)	2	5	6	**13**
3	Sidin Kanya Devi Community forest (Sidin VDC)	1	4	5	**10**
4	Bhaise pokhari-Jaljale-Surketham(Memeng VDC)	4	1	4	**9**
5	Mejartham-Chiwabhanjyang (Chyangthapu VDC)	5	1	1	**7**
6	Narelung-Thapu (Prangbung VDC)	1	3	3	**7**
7	Tinsimana-Gorkhepani-Fokte (Memeng VDC)	3	1	2	**6**

2. Potential threats and strategies for the conservation of the important plant species

Workshop was organized at district level to find existing and potential threats and develop the conservation strategies for the conservation and management of plants and their habitats in the areas. Attention was paid to develop the conservation strategies based on the species outcomes and site outcomes. The table 3 shows the general strategies to conserve the plant species and their habitats in the area.

Table 3: Existing and potential threats identified during the workshops and strategic programs suggested to overtop the threats

SN	Threats	Score	Strategies
1	Grazing	18	Controlled grazing
2	Public awareness	16	Capacity building trainings for the locals, Forestation
3	Illegal collection, poaching and illicit collection	14	Awareness raising trainings, control of illegal collection and poaching
4	Fire	12	Regulated tourism
5	Uncontrolled deforestation	10	Control deforestation, Minimize the dependency of local people on forest and provide alternative source of income
6	Soil erosion and landslide	8	Control illegal collection and harvesting of resources from forest especially medicinal plants
7	Deforestation	6	Community forest border delineation
8	Kipat system of Land Management	4	Scientific plantation
9	Unscientific plantation	3	Scientific plantation, local awareness
10	Open border	3	Resolve the trans-boundary conflicts
11	Forest encroachment	2	Explore land management option
12	Weak policies	1	Awareness programs to control fire in dry season

CONCLUSION

On the basis of the recorded species, this can be concluded that study area is a rich area in terms of the plant resources along the Kanchenjungha - Singhalila ridge. The areas provide habitats for important plants in the sense that the plants documented are threatened, endemic and medicinally important plants. However, unfortunately, the flora of the area not well documented and it needs detail explorations. Further, several existing threats including grazing, illegal collection, invasion of alien species, fire, erosion etc. have jeopardized their existence and are in depleting condition. There are several strategies developed from the different level for the conservation of the plants and their habitats in the region. Until and unless the strategies are applied to the local level, the threats for the rich biodiversity are not going to be alleviated.

List of participants in District Level Workshop (Ilam)

Date: March 16, 2008 Place: Hotel Orchid, Tripureswar, Kathmandu

SN	Name of participants	Address/organization	Designation
1	Mr Angphuri Sherpa	WWF Nepal Program	National Coordinator, CEPF
2	Mr Netra Bahadur Thapa (Burja) Magar	SHAHGG	President
3	Mr Ripu M Kunwar	ESON	Field Coordinator
4	Mr Kamal Raj Rai	NCDC	Program Coordinator
5	Mr Bishnu Kaphle	ICC	Program Officer
6	Mr Bishal Rijal	Panchthar	Researcher
7	Mr Nar Bahadur KC	Central Department of Botany, TU	M Sc Student

List of participants in District Level Workshop (Panchthar)

SN	**Name of Participants**	**Address/Organization**	**Designation**
1	Ms. Sangeeta Rajbhandary	ESON	Treasurer
2	Mr. Man K. Dhamala	ESON	Research Associate
3	Mr. Kamal Humagain	ESON	Research Associate
4	Ms. Urmila Thamsohang	ESON	Office Secretary
5	Mr. Jeevan Pandey	Central Department of Botany,Kirtipur	Student
6	Mr. Krishna Chandra Adhikari	Panchthar	Panchthar Representative
7	Mr. Bishal Rijal	Khwopa College, Environmental Science, Bhaktapur	M.Sc. Student
8	Mr. Bhagwan P. Gupta	Panchthar	DFO
9	Mr. Mahendra Bir Rai	Shree Dipjyoti Youth Club, Panchthar	Program Coordinator
10	Mr. Sunil Bantawa	Shree Dipjyoti Youth Club, Panchthar	Accountant
11	Mr. Pradeep Maharjan	Winrock International	

Annex 10.3 National Level Workshop on Development of Plant Biodiversity Conservation Strategies

18th March, 2008 Hotel Grand, Tripureshwor, Kathamandu

National level workshop on development and finalization of priority plant species and their habitats and their conservation strategies was organized in 18th March, 2008 in Hotel Grand, Tahachal, Kathmandu, Nepal. The workshop was based on the baseline data of village level workshops and district level workshops. Priority order was set to the village level and district level prioritized plant species and habitats and scores of all village, district and national workshops were compiled. After compiling the scores, their priority order was finalized. The national workshop was participated by national level plant experts and conservationists. A total of 33 participants including Dr. Tirtha B. Shrestha, Dr. PR Shakya, Dr. Dinesh Bhuju, Dr Krishna K. Shrestha, Dr. Sarala Khaling, Mr Angphuri Sherpa, etc were actively participated. Draft data and report was sent a week earlier to the participants to have critical comment over the draft. Dr. Tirtha B Shrestha, Dr. Dinesh Bhuju and Dr Sarala Khaling were principal commentator and contributed great extent over the draft. The idea and contribution of other participants was also substantial. The whole workshop team was divided into two panels; Ilam and Panchthar panel and each panel was facilitated by ESON members to emphasize on final priority species, habitats and conservation strategies. Representatives from local implementation partners (Shree High Altitude Herbs Growers' Group, SHAHGG Ilam and Deep Jyoti Youth Club, Pancthar), CEPF grantees, District Forest Offices (Ilam and Panchthar), Department of Plant Resources, Department of National Park and Wildlife Conservation., Department of Forest, NTNC, Natural History Museum, local residents of the districts, etc actively participated in the workshop (Annex I provides the list of participants).

Field Coordinator of the project, Mr Ripu M Kunwar presented progress report and a highlight of the project was presented by Dr. Krishna K Shrestha (Team Leader of the Project). Research Associate Mr Man Kumar Dhamala and Mr Kamal Humagain and M Sc students Mr Nar Bahadur KC and Mr Jeevan Pandey were facilitators.

OUTCOMES

1. Prioritized species and Habitats (hot spots)

The criteria used to prioritize the plants species were

1. Biodiversity values (based on rarity, dispersal, propagation, plant populations in the wild)
2. Socio-cultural values (potentials for ethno-medicinal uses, cultural and indigenous uses)
3. Economic values (potentials for markets, trade, poverty alleviation)

The following tables show the prioritized plant species (table 1) and prioritized habitats (table 2). Participatory discussions were organized to find the existing and potential threats that need to be addressed appropriately for the conservation initiatives in the areas. Table 4 shows the threats identified during the participatory discussion and local strategies to overtop the threats.

Table 1: Top priority sites and scores provided by workshop participants

SN	Priority sites of Panchthar district	Priority sites of Panchthar district
1	Timbu pokhari (Falaincha VDC) (15)	Hangetham (Jamuna VDC) (20)
2	Lam pokhari-Suke Pokhari-Ose (Chyangthapu VDC) (13)	Sandakphu (Mai majhuwa VDC) (12)
3	Sidin Kanya Devi Community forest (Sidin VDC) (7)	Chintapu (Mai majhuwa VDC) (13)
4	Bhaise pokhari-Jaljale-Surketham(Memeng VDC) (9)	Kala pokhari (Mabu VDC) (15)
5	Mejartham-Chiwabhanjyang (Chyangthapu VDC) (7)	Tumling (Jogmai VDC) (6)
6	Narelung-Thaplu (Prangbung VDC) (9)	Todke Jharana (Mai majhuwa VDC) (3)
7	Tinsimana-Gorkhepani-Fokte (Memeng VDC) (6)	Dhupi- Guranse (Mai Majhuwa) (9)

Table 2: Top specie ranked on the basis of score provided by workshop participants

SN	Prioritized Species	Nepali Name	Ilam score	Panchthar Score	Total
1	*Michelia* species	Champ	11	16	**27**
2	*Taxus wallichiana*	Loth salla	9	15	**24**
3	*Aconitum* species	Kalo/ Seto Bikhma	4	14	**18**
4	*Swertia chirayita*	Chirayito	10	7	**17**
5	*Cinnamomum glauscescens*	Malagiri	5	10	**15**
6	*Dactylorhiza hatagirea*	Panchaunle	0	13	**13**
7	*Nardostachys grandiflora*	Jatamansi	0	12	**12**
8	*Neopicrorhiza scrophulariflora*	Kutki	0	11	**11**
9	*Castanopsis hystrix*	Patale katus	6	2	**8**
10	*Rhododendron* species	Chimal /Gurans	7	1	**8**
11	*Schefflera* species	Bhalu chinde	8	0	**8**
12	*Rheum* species	Padamchal/Kenjo	0	6	**6**
13	*Bergenia purpurascens*	Pakhanved	3	0	**3**
14	*Arundinaria species*		2	0	**2**
15	*Zanthoxylum* species	Timur	1	0	**1**

Table 3 Threats on plant diversity identified from national level workshop

SN	Threats	Ilam	Panchthar	Remarks
1	Deforestation	√	√	
2	Uncontrolled Grazing	√	√	
3	Erosion and Landslide	√	√	
4	Lack of Awareness	√	√	
5	Tourism-Fuel wood/path used by tourists		√	
6	Open border		√	
7	Lack of livelihood options	√	√	
8	Illegal collection and poaching	√	√	
9	Forest Encroachment			
10	Unscientific plantation	√	√	
11	Weak policies, laws and their enforcement	√	√	
12	Kipat system of Land Management			
13	Fire	√	√	

Table 4 Proposed conservation strategies from national level workshop

SN	Activities	Ilam	Panchthar
1.	Awareness /capacity building program for cattle herders/community forest users focusing on sustainable harvesting	√	√
	• Refresh visits	√	
	• Trainings/workshops	√	√
2.	Controlled grazing	√	
	• Gradual removal of cow sheds with providing alternative means of livelihood	√	√
	• Introduction of productive livestock and improvement of indigenous varieties	√	
3.	In situ conservation (Natural site conservation)	√	
	• Area delineation and site reservation for species conservation	√	
	• Protect and acknowledge ITK and implement	√	
	• Involvement of local communities in management	√	
	• Control of irrational exploitation and rotational harvesting	√	√
	• Restoration & rehabilitation	√	√
	• Control of alien species	√	
	• Control fire	√	√
4.	*Ex situ* conservation	√	
	• Cultivation in community forests and common pool resources	√	
	• Nursery development & Private farming	√	
	• Scientific plantation, afforestation & reforestation	√	√
	• Seed banking & demonstration plots	√	
	• Information centers	√	
5.	Livelihood upliftment	√	
	• Alternative income generation activities	√	√
	• Agro and community based tourism and ecotourism	√	√
6.	Research & Developments	√	
	• Ecology of prioritized species	√	
	• Survey and strategies development	√	
	• Publication and dissemination	√	
7.	Alternative energy technology introduction/promotion	√	

	• Minimize fuel wood pressure by providing alternative energy sources (solar panel, improved cooking stoves, bio briquettes etc)	√	
	• Alternative source of Timber	√	
8.	Institution building, networking, coordination and mobilization	√	
9.	Market linkage and entrepreneurship	√	
	• Value addition and processing opportunities	√	
	• Develop market linkage and entrepreneurship	√	
	• Institutionalization and cooperative mechanism	√	
	• Organic products and certification	√	
10.	Gradual handover the resources to the local communities for wise use and conservation	√	√
	• Proper delineate the community forest lands and handover to local community	√	√
11.	Resource management	√	
	• Local anti poaching unit development/security force set up	√	
	• Regulate tourism	√	√
	• Promote local level cooperation	√	
	• Easy access route (Mane – Sandakphu – Falut – Timbu pokhari)	√	
	• Local committees on local land management interventions	√	√
	• National committees, regional and international commissions for trans-boundary conflict resolution	√	
	• Set up security forces for controlled resource exploitation	√	√
12.	Community based participatory biodiversity monitoring	√	
13.	Policy enactment, revision and advocacy	√	
14.	Project leveraging and post management	√	
	• Collaboration	√	
	• Post management	√	

Table 5. List of participants in National Level Workshop

Date: March 18, 2008 Place: Hotel Grand, Tahachal, Kathamandu

SN	Name of Participants	Address/Organization	Designation
1.	Dr TB Shrestha	National Acedemy, Kamaladi, Ktm	Academician
2.	Dr PR Shakya	Nature Dot Com	
3.	Dr SR Baral	National Herbarium and Plant Laboratories, Godawari, Lalitpur	Chief
4.	Dr Rabindra Shrestha	ECCA, Lalitpur	President
5.	Dr NN Tiwari	ESON, New Road, Ktm	Vice-President
6.	Dr Dharma Dangol	IAAS, Chitwan	Associate Professor
7.	Mr Angphuri Sherpa	WWF Nepal, Baluwatar	Country Coordinator/ CEPF
8.	Mrs Ila Shrestha	Patan Multiple Campus, Patandhoka, Lalitpur	Lecturer
9.	Ms Rudriksha Rai	WWF, Baluwatar, Ktm	SHL Program Officer
10.	Mr Bishnu Kafle	ICC, Ilam	Program Officer
11.	Mr Kamal Raj Rai	NCDC, Ilam	Program Coordinator
12.	Mr Bishal Rijal	Khwopa College, Environmental Science, Bhaktapur	M.Sc. Student
13.	Mr Madan K Suwal	Central Department of Botany, Kirtipur, Ktm	M.Sc. Student
14.	Mr Netra B Burja Thapa Magar	Shree High Altutude Herbal Growers Group(SHAHGG), Ilam	President
15.	Mr Kirti Poudel	NTNC, Lalitpur	Program Officer
16.	Mr Nar B Khatri	Central Department of Botany, TU, Kirtipur, Ktm	M.Sc. Student
17.	Mr Ripu M Kunwar	ESON, New Road, Ktm	Field Coordinator
18.	Mr Kamal Humagain	ESON, New Road, Ktm	Research Associate
19.	Dr. K. K. Shrestha	ESON, New Road, Ktm	President
20.	Dr. Dinesh Bhuju	Resources Himalaya Foundation, Kumaripati, Lalitpur	Chief Executive
21.	Dr. Mohan Shiwakoti	Central Department of Botany, Kirtipur Ktm	Associate Professor
22.	Dr. Keshav Shrestha	Natural History Museum, Swambhu, Ktm	Chief
23.	Dr. Sarala Khaling	WWF, Baluwatar, Ktm	Regional Coordinator /CEPF Himalaya
24.	Mr. Jhamak Karki	DNPWC, Babarmahal, Ktm	Conservation Officer
25.	Ms. Sangeeta Rajbhandary	ESON, New Road, Ktm	Treasurer
26.	Mr. Devendra Thamsuhang	Prangbung,Panchthar	School Teacher
27.	Mr. Sunil Bantawa	Shree Dipjyoti Youth Club, Panchthar	Accountant
28.	Mr. Mahendra Bir Rai	Shree Dipjyoti Youth Club, Panchthar	Program Coordinator
29.	Mr. Man K Dhamala	ESON, New Road, Ktm	Research Associate
30.	Mr. Jeevan Pandey	Central Department of Botany, Kirtipur Ktm	M.Sc. Student
31.	Ms. Urmila Thamsuhang	ESON, New Road, Ktm	Office Secretary
32.	Mr. R.M. Joshi	Kathmandu	Free Lance Conservationist
33.	Mr. Bhagwan P. Gupta	District Forest Office, Panchthar	DFO

Annex 10.4 National Workshop (Resolution)

Plant Biodiversity Inventory, Identification of Hotspots, and Conservation Strategies for Threatened Species and Habitats in Kanchenjunga-Singhalila Ridge, Eastern Nepal

March 18, 2008 (Chaitra 5, 2064) Venue: Grand Hotel, Kathmandu, Nepal

Ethnobotanical Society of Nepal (ESON) has organized National workshop on "*Plant Biodiversity Inventory, Identification of Hotspots, and Conservation Strategies for Threatened Species and Habitats in Kanchenjunga-Singhalila Ridge, Eastern Nepal*" on Chaitra 5, 2064 (March 18, 2008) in Kathmandu. The workshop is a part of the CEPF project activity that was carried out in the Lower Kanchenjunga-Singhalila Ridge, Eastern Nepal covering four VDCs of Ilam district (Maimajhuwa, Mabu, Jamuna and Jogmai) and five VDCs of Panchthar district (Falaincha, Chyangthapu, Memeng, Prangbung, and Sidin). The project was funded by Critical Ecosystem Partnership Fund (CEPF) USA through WWF Nepal. Nearly 50 experts representing 20 organizations had participated the program.

The Inauguration program started with the welcome address from ESON Treasurer Ms. Sangeeta Rajbhandary, followed by program highlights by President of ESON Prof. Krishna K. Shrestha. Theme paper on "*Plant Biodiversity Inventory, Identification of Hotspots, and Conservation Strategies for Threatened Species and Habitats in Kanchenjunga-Singhalila Ridge, Eastern Nepal*" was presented by Ripu M. Kunwar, Field Coordinator for the Project. After the theme paper, floor was open for queries/questions to the presentation, with critical comments from Dr. Dinesh Bhuju (Chief Executive, Resources Himalaya Foundation); Dr. Sarala Khaling (Regional Coordinator, CEPF/WWF Nepal); and Dr. Tirtha B. Shrestha (Academician, Nepal Academy). The short inauguration program was closed by the vote of thanks from the Vice-president Dr. Narendra Nath Tiwari.

The second session started immediately after tea break. This group discussion session was preceded by division of participants into two groups (Ilam groups and Panchthar groups) and discussion on three different themes; species, habitats and conservation strategies.

1. Identification of priority species for conservation in Ilam and Panchthar districts
2. Identification of important sites for conservation in Ilam and Panchthar districts
3. Identification of conservation strategies to conserve the threatened species and habitats.

In the first issue, ESON presented a list of 26 prioritised plant species for conservation in the Kanchenjunga-Singhalila Ridge, Eastern Nepal. The list was prepared from the village level workshops, district level workshops and ESON's field observations and data analysis. The participants were allowed to choose the priority species based on the following scientific indicators: endemism, threatened, richness, archaic and commercially importance. At the end of the discussion plant species were arranged according to the score in order basis. From the group discussion six priority species, *Michelia* species (Magnoliaceae) Champ; *Taxus wallichiana* (Taxaceae) Loth salla; *Neopicrorhiza scrophulariiflora* (Scrophulariaceae) Kutki; *Nardostachys grandiflora* (Valerianaceae) Jatamasi; *Swertia chirayita* (Gentianaceae) Chirait; and *Aconitum ferox, A. spicatum* (Ranunculaceae) Bikhma/ Kalo bikhma were identified as priority species for Ilam and Panchthar districts.

Second issue of discussion was focused on seven important sites for both Ilam and Panchthar districts proposed by ESON. The discussion for the identification of important sites for both the districts was based on the species richness, abundance of prioritised species, sites' socio-culturally importance and peoples' livelihood. Three important sites from each district: Hangetham (Jamuna VDC), Kala pokhari (Mabu VDC), Chintapu (Mai majhuwa VDC) from Ilam district, and Timbu Pokhari (Failaincha VDC), Lam-pokhari – Suke pokhari (Chyangthapu VDC), Sidin-Kanya Devi community forest (Sidin VDC) from Panchthar district were identified.

Other major output was to identify the conservation strategies to conserve the threatened species and habitats in the Kanchenjunga-Singhalila Ridge, Eastern Nepal. Twelve major conservation strategies were identified which would be carried through short-term, mid-term and long term implementation. Among the twelve, the three major strategies are:

- Further research and developments should be carried out regarding ecology and inventory of prioritized species
- Develop and implement awareness and capacity building programs for cattle herders, community forest users focusing on sustainable harvesting of plant resources.
- Explore management options for *in situ* conservation (Natural site conservation) and promote *ex situ* conservation

At the end of the program, the group discussion was followed by the presentation of the resolution of workshop by the President of ESON.

The Resolutions of the Workshop are as follows

1. Collate a very brief summary of the discussion groups and disseminated to each stakeholder with the draft workshop resolution; and the effort done in the scientific research should be linked into economic sector.
2. Five priority species (ESON, March 2008) were identified; for the prioritized species clear justification should be provided.
3. Selection of three important sites in each district for Ilam and Panchthar was identified; and for the prioritized sites clear justification should be provided.
4. Twelve major conservation strategies to conserve the threatened species and habitats in the Kanchenjunga-Singhalila Ridge, Eastern Nepal were identified.
5. Develop a workshop publication (short report, 10 pages) including the results and examples from the workshop that will be aimed at all levels, such as species, habitats, and strategies.
6. The resolution of this workshop would be useful as guideline for revising/making policies in this sector.

2008-03-22, Ethnobotanical Society of Nepal

Annex 10.5 Plant Biodiversity Inventory, Identification of Hotspots, and Conservation Strategies for Threatened Species and Habitats in Kanchenjunga-Singhalila Ridge, Eastern Nepal
(Ilam district report)

Kanchenjunga-Singalila Complex, one of the five prioritized landscapes of the Eastern Himalayas, possesses globally significant populations of landscape species (CEPF 2005) with the several centers for plant diversity. The complex stretches from Kanchenjunga Conservation Area (KCA) in Nepal, which is contiguous with Khanchendzonga Biosphere Reserve in Sikkim, India, to the forest patches in south and southwest of KCA in Ilam, Panchthar and Jhapa districts. Kanchenjunga Conservation Area along with its lowlands Panchthar, Ilam and Jhapa districts is floristically rich with over 2900 species of flowering plants (Shakya 1983) of which, several are found to be endemic to the Himalayas. Eastern Nepal harbors about 68 endemic flowering plant species (Shrestha and Joshi 1996) of which about 50 were recorded from KCA only (Shrestha & Ghimire 1996).

Ethnobotanical Society of Nepal (ESON) has the privilege to conduct a research project on **Plant Biodiversity Inventory, Identification of Hotspots, and Conservation Strategies for Threatened Species and Habitats in Kanchenjunga-Singhalila Ridge, Eastern Nepal.** The project, being supported by Critical Ecosystem Partnership Fund (CEPF/WWF Nepal), was undertaken in four VDCs of Ilam District and five VDCs of Panchthar District along the Kanchenjunga-Singhalila Ridge and those bordering with India. Regarding Ilam, the study was focused on four VDCs along the Kanchenjunga-Singhalila Ridge viz. Jogmai, Jamuna, Mabu and Maimajhuwa. These four VDCs border either with Sikkim or Darjeeling, India. Due to the high dependency of the local people on the forest and other natural resources, the active participation of the local people is the main responsible factor for the inception of the research. So it is necessary to give the main priority for the local knowledge. There is indeed a need of the conservation of the important species and the important sites. The very first step for this important perspective is to find out the places of importance that is to say inventory. So the main purpose of the study is to document plant diversity and their associated habitats in those four VDCs and identify the rare, threatened and endemic plant species and their habitat along with the development of conservation strategies for those important plants and habitats. The conservation strategy helps on management of the species outcome of the research.

METHODS

The first step for the research was the review of the related literature and the herbarium specimens of the related area. After prepared from the previous literatures, the field study was the next step. The field study was fixed such that it was the flowering season for most of the plants and the season was monsoon. PRA (Participatory Rural Appraisal) along with participatory resource mapping, informal meetings and consultations, site observations was followed to get the local knowledge regarding the important plants and the habitats. Capacity building training about the conservation of the natural resources was held at Hangetham, Jamuna. After these works in the villages, the team along with few local was in the forest for two times: June and September/October, 2007.

The samples of the plant species (Herbarium) were collected in the field followed by on-spot identification, pressing and drying. Besides the herbarium preparation, the ecological study (quadrat sampling employing GPS, Clinometer, pH meter, and other scientific equipments) of the different habitats along with the laying of permanent research plots at different places for monitoring. A total of 58 macroplots ($10x10m^2$), 116 mesoplots ($5x5m^2$), and 174 microplots ($1x1m^2$) were laid down between 2100m-3200m of which 12 macro plots on Government forests and 46 on Community forests. The soil samples were also collected.

After the field visit, the next step followed was the identification of the herbarium specimens in this order: Identification at ESON Center → Identification at TUCH /KATH →Identification at RBGE, UK. Then the herbaria were submitted to TUCH, Kirtipur; KATH, Godawari and RBGE, UK. The collected soil samples were subjected for the analysis (Soil pH, NPK, Moisture, Texture). The GIS analysis was done for the study area regarding the important plants and habitats. Village level, district level and national level workshops were organized to find the prioritized plants and the hotspots. In these workshops, consulting with the national level experts and the locals (Annex I, II and III show the lists of participants at village, district and national level workshops respectively), the conservation strategies were discussed for those selected species and habitats. Lastly the strategies were finalized on the basis of those developed from the three levels.

FINDINGS

Among the several findings, one of the findings explains the floral richness. The diversity of the collected specimens includes 80 Families, 150 Genera and 200 species are recorded and further taxonomic process is going on. Rosaceae was found to be the largest family with 20 spp. followed by Ericaceae (18 species), Asteraceae (11 species) and so on. Regarding the largest genera, *Rhododendron* and *Impatients* with eight species each followed by *Rubus* with seven spp. and so on.

1. Endemic, threatened and new records

One endemic, 13 threatened and 10 new species to checklist of Nepal are recorded so far from the project areas. As the plant identification process has not over till date, the possibility of addition to the list is open.

There were seven different forest types viz. *Quercus semicarpifolia* forest, *Castanopsis tribuloides-Castanopsis hystrix* forest, *Quercus lamellosa* forest, *Lithocarpus pachyphylla* forest, Lower temperate mixed broad leaves forest, Upper temperate mixed broad leaved forest and *Rhododendron* forest, were identified during the study such as types *Rhododendron* forest, *Abies – Betula* forest, *Daphniphyllum – Lithocarpus* forest and so on. 38 tree spp. and 42 shrub spp. and more than 130 herbs spp. are reported under quadrat study.

From the ecological analysis, it was found that highest frequency among the trees was of Lithocarpus *pachyphylla* (Bante) follower by *Symplocus lucida* (Kharane), *Acer campbelli* (Kukurpaile) and so on. Least frequencies were of *Taxus buccata* (Louthsalla), *Magnolia* sp. and *Michelia* sp. (Champ), *Scheflera impressa* (Bhaluchinde) etc. Regarding the shrubs, *Vibernum mullah* (Asare) was with the highest frequency followed by *Daphne bholua* (Lokta), Sarcococa *hookeriana* and so on. Lowest frequency holding species were *Heracleum lallii* (Chimphing), *Edgeworthia gardneri* (Argeli), *Gerardinia diversifolia* (Allo) etc. Among the herbs *Pilea sp.* (Gagleto), *Impatiens sp*. (Padke) and *Persicaria sp.* (Ratneulo/Thotne) came under the highest frequency. *Swertia chirayita* (Chirayito), *Nardostachys grandiflora* (Jatamansi), *Paris polyphylla* (Satuwa) are the herbs with the lower frequencies. Regarding the existing management systems of the forest, there was government managed forest in a relatively small area. There were community forests as well in the study area and the pre-existing Kipat system of management in some places. Concept of private nursery was also observed.

Table 1: List of Endemic, threatened and new record plant species of the study area

SN	RECORD	Family	Species Name	Alt.	Lat.	Long.	Locality
1.	END	Umbelliferae	*Heracleum lallii*	1974	27 04 17.5	87 57 39	Sisne, Mai majhuwa
2.	NR	Asparagaceae	*Asparagus filicinus* Buch.-Ham.exD. Don. var. *lycopodineus* Bake	2245	27.04	88.00	Jamuna 2, Hangetham
3.	NR	Asparagaceae	*Asparagus filicinus* var.*lycopodineus*	2334	27 02 44.8	88 00 25.6	Hangetham, Jamuna-1
4.	NR	Begoniaceae	*Begonia flaviflora*	2245	27.04	88.00	Jamuna 2, Hangetham
5.	NR	Begoniaceae	*Begonia flaviflora*	2172	27.04	88.01	Jamuna 2, Hangetham
6.	NR	Rosacerae	*Potentialla lineata*	2124	27.07	87.94	Maimajuwa 7, Terse Gaun
7.	NR	Rosaceae	*Potentialla sundaica*	1903	27.06	87.94	Maimajuwa 7, Upper Hatiya
8.	NR	Smilacaceae/Liliacea e	*Smilax aspericaulis*	2172	27.04	88.01	Jamuna 2, Hangetham
9.	NR	Acanthaceae	*Strobilanthes helicta*	2656	27 04 07.0	87 59 37.6	Dobate, Hangetham
10.	NEW GENUS TO NEPAL	Commelinaceae	*Rhopalophora scaberrima*	2100	27 04 19	87 56 34	Naule gaun, Mai majhuwa7
11.	NEW VARIETY TO NEPAL	Cyperaceae	*Carex cruciata* var. *agrocarpa*	3210	27 18 45	88 01 22	Bie-Chitre, Jogmai-2
12.	THD	Ranunculaceae	*Aconitum spicatum*	3170	27 05 22	87 54 47	Chhintapu
13.	THD	Dioscoreaceae	*Dioscorea deltoidea*	2005	27 11 27	87 56 18.6	Hangetham CF
14.	THD	Magnoliaceae	*Magnolia campbelli*	3210	27 18 45	88 01 22.4	Chhintapu
15.	THD	Magnoliaceae	*Magnolia globosa*	2042	27.06	87.94	Maimajuwa 7, Naule Gaun
16.	THD	Magnoliaceae	*Michelia champaca*	2050	27 04 28.4	87 58 48	Newa khola, Mai majhuwa
17.	THD	Magnoliaceae	*Michelia champaca*	2042	27.06	87.94	Maimajuwa 7, Naule Gaun
18.	THD	Trilliaceae	*Paris polyphylla* subsp *polyphylla*	2665	27 04 05.1	87 59 28.9	Dobate, Mabu-8
19.	THD	Trilliaceae	*Paris polyphylla* subsp *polyphylla*	3059	27.08	88.01	Mabu, Near Mai khola, Chauri chowk
20.	THD	Trilliaceae	*Paris polyphylla* susp *marmorata*	2845	27.07	88.00	Mabu, Kalapokhari
21.	THD	Trilliaceae	*Paris polyphylla* subsp *polyphylla*	2194	27 14 22	87 57 29.4	Menjuwa
22.	THD	Berberidaceae	*Podophyllum hexadrum*	3224	27.09	88.00	Mabu, Bikhe Bhanjyang
23.	THD	Gentianaceae	*Swertia chirayita*	1900	27 16 04	87 57 29.9	Menjuwa

Note: *END-Endemic; NR-New Record; THD-Threatened*

2. Prioritized species and Habitats (hot spots)

Participatory Rural Appraisal (participatory resource mapping, discussion) in combination with the scientific method was used to find the prioritized species and associated habitats for conservation and strategy development. PRA tool was applied at three levels viz. village, district and national level. Conservation and management needs perceived by local people based on their own observations were identified during the workshops. The criteria used to prioritize the plants species are

1. Biodiversity values (based on rarity, dispersal, propagation, plant populations in the wild)
2. Socio-cultural values (potentials for ethno-medicinal uses, cultural and indigenous uses)
3. Economic values (potentials for markets, trade, poverty alleviation)

The following tables show the prioritized plant species (table 2) and prioritized habitats (table 3) for Ilam district. Participatory discussions were organized to find the existing and potential threats that need to be addressed appropriately for the conservation initiatives in the areas. Table 4 shows the threats identified during the participatory discussion and local strategies to overtop the threats.

Table2: Plant species ranked (descending order) on the basis village level, district level and national level priority

SN	Species	Vernacular (Nepali/local)	Scores
1	*Michelia kisopa*	Champ	11
2	*Swertia chirayita*	Chirayito	10
3	*Taxus wallichiana*	Loth salla	9
4	*Schefflera species*	Bhalu chinde	8
5	*Rhododendron species*	Chimal and Gurans	7
6	*Castanopsis hystrix*	Patale katus	6
7	*Cinnamomum glauscescens*	Malagiri	5
8	*Aconitum species*	Seto Bikhma	4
9	*Bergenia purpurascens*	Pakhanved	3
10	*Arundinaria* species	Nigalo	2
11	*Zanthoxylum* species	Timur	1

Table3: Habitat/Sites ranked (descending order) on the basis village level, district level and national level priority

SN	Prioritized habitats	VDC	Scores
1	Hangetham	Jamuna	6
2	Sandakphu	Maimajhuwa	5
3	Chintapu	Mai majhuwa	4
4	Kala pokhari	Mabu	3
5	Tumling	Jogmai	2
6	Todke Jharana	Jogmai	1

Table 4: Potential threats identified during the workshops and programs suggested to overtop the threats

SN	Threats	Score	Local strategies
1	Grazing	22	Grazing management
2	Public awareness	18	Control deforestation
3	Illegal collection, and poaching	14	Resolve the trans-boundary conflicts
4	Fire	14	Awareness, control of illegal collection and poaching
5	Uncontrolled deforestation	12	Forest management
6	Soil erosion	9	Raise public awareness
7	Unscientific plantation	6	Scientific plantation, local awareness

3. Strategies for the conservation of the important plant species (combined from the different level workshops)

Workshops were organized at village, district and national level to develop the conservation strategies for the conservation and management of plants and their habitats in the areas. Attention was paid to develop the conservation strategies based on the species outcomes and site outcomes. The table 5 shows the general strategies to conserve the plant species and their habitats in the area.

Table 5: Conservation strategies developed from the Village, District and National level workshop

SN	Strategies
1.	Awareness /capacity building program for cattle herders/community forest users focusing on sustainable harvesting
	• Refresh visits

	• Trainings/workshops
2.	Controlled grazing
	• Gradual removal of cow sheds with providing alternative means of livelihood
	• Introduction of productive livestock and improvement of indigenous varieties
3.	In situ conservation (Natural site conservation)
	• Area delineation and site reservation for species conservation
	• Protect and acknowledge ITK and implement
	• Involvement of local communities in management
	• Control of irrational exploitation and rotational harvesting
	• Restoration & rehabilitation
	• Control of alien species
4.	*Ex situ* conservation
	• Cultivation in community forests and common pool resources
	• Nursery development & Private farming
	• Plantation, afforestation & reforestation
	• Seed banking & demonstration plots
	• Information centers
5.	Livelihood upliftment
	• Alternative income generation activities
	• Agro and community based tourism and ecotourism
6.	Research & Developments
	• Ecology of prioritized species
	• Survey and strategies development
	• Publication and dissemination
7.	Alternative energy technology introduction/promotion
	• Minimize fuel wood pressure by providing alternative energy sources (solar panel, improved cooking stoves, bio briquettes etc)
	• Alternative source of Timber
8.	Institution building, networking, coordination and mobilization
9.	Market linkage and entrepreneurship
	• Value addition and processing opportunities
	• Develop market linkage and entrepreneurship
	• Institutionalization and cooperative mechanism
	• Organic products and certification
10.	Gradual handover the resources to the local communities for wise use and conservation
11.	Resource management
	• Local anti poaching unit development/security force set up
	• Promote local level cooperation
	• Easy access route (Mane – Sandakphu – Falut – Timbu pokhari)
	• National committees, regional and international commissions for trans-boundary conflict resolution
12.	• Community based participatory biodiversity monitoring
13.	Policy enactment, revision and advocacy
14.	Project leveraging and post management
	• Collaboration
	• Post management

CONCLUSION

On the basis of the recorded species, this can be concluded that Ilam district is a rich area in terms of the Plant resources along the Kanchenjungha - Singhalila ridge. The areas provide habitats for important plants in the sense that the plants documented are threatened, endemic and medicinally important plants. However, unfortunately, the flora of the area not well documented, need detail explorations. Further, several existing threats including grazing, illegal collection, invasion of alien species, fire, erosion etc. and potential threats such as climate change, have jeopardized their existence and are in depleting condition. The threat measures if not applier on time; the concluded fact may not last for a long time. There are several strategies developed from the different level for the conservation of the plants and their habitats in the region. Until and unless the strategies are applied to the local level, the threats for the rich biodiversity are not going to be alleviated.

Annex I

List of participants in Village Level Workshop at Hangetham, Jamuna

Date: September 8-9, 2007 Place: Hangetham, Jamuna-1, Ilam

SN	Name of participants	Organization/Address	Designation
1	Rajeswar Rijal	ICC	
2	Udaya Gurung	Pokhari Danda CF	
3	Tara Neupane	Biodiversity Conservation Committee	Coordinator
4	Til B Khamdak	Hangetham CF, Jamuna	
5	Yajna B Gurung	Hangetham CF, Jamuna	
6	Ganga Lal Rai	Bhagawati Ma Vi, Jamuna	
7	Manjit Khandak	Jamuna-3, Ilam	
8	Rudra Thebe	Jamuna-1, Piple Ilam	
9	Deepak Rai	Mabu-8, Ilam	
10	Dharanidhar Bhattarai	Hangetham CF	Member
11	Ganesh B Gurung	Bal Bikash Kendra, Jamuna	
12	Udaya Gurung	Hangetham CF	Member
13	Pasang Temba Sherpa	Jamuna-1, Ilam	
14	Chandra P Tamu	Jamuna-2, Ilam	
15	Gopal Rai	Jamuna-1, Ilam	
16	Tirtha K Khamdak	Jamuna-3, Ilam	
17	Antu Tamu	Jamuna-2, Ilam	
18	Nirmala Devi Bhattarai	Sachet Bachat Tatha Hrina Sahakari Sanstha Ltd, Jamuna-2	
19	Dawalamu Sherpa	Jogmai-7	
20	Amrita Rai	Puwamajhuwa-7	
21	Narayan Bhattarai	Jamuna-2	
22	Ramesh Bhattarai	Jamuna	
23	Siddibal Gurung	Choyatar CF, Jamuna 8/9	Secretary
24	Tara Rai	Choyatar CF, Januna 8/9	Member
25	Lalita Rai	Choyatar CF, Jamuna 8/9	Member
26	Bir Dhwaj Khamdak	Community Forest User	
27	Netra B Gurung	Bhanudaya Pra. Vi.	
28	Rohit P Bhattarai	Nawa Pratibha Samaj	Member
29	Nim Temba Sherpa	User	
30	Jyongmeng Sherpa (Lama)	Gompa Committee	President
31	Chitra B Rai	Hangetham	Nursery
32	Agni P		
33	Phurlamu Sherpa	Jamuan-1	
34	Tirthu Khamdak	Jamuna-3	
35	Chandra P Gurung	Bhagawati Ma Vi	
36			

Annex II

List of participants in District Level Workshop (Ilam)

Date: March 16, 2008 Place: Hotel Orchid, Tripureswar, Kathmandu

SN	Name of participants	Address/organization	Designation
1	Mr Angphuri Sherpa	WWF Nepal Program	National Coordinator, CEPF
2	Mr Netra Bahadur Thapa (Burja) Magar	SHAHGG	President
3	Mr Ripu M Kunwar	ESON	Field Coordinator
4	Mr Kamal Raj Rai	NCDC	Program Coordinator
5	Mr Bishnu Kaphle	ICC	Program Officer
6	Mr Bishal Rijal	Panchthar	Researcher
7	Mr Nar Bahadur KC	Central Department of Botany, TU	M Sc Student

Annex III

List of participants in National Level Workshop (Ilam)

Date: March 18, 2008 Place: Hotel Grand, Tahachal, Kathamandu

SN	Name of Participants	Address/Organization	Designation
1	Dr TB Shrestha	National Acedemy, Kamaladi, Ktm	Academician
2	Dr PR Shakya	Nature Dot Com	
3	Dr SR Baral	National Herbarium and Plant Laboratories, Godawari, Lalitpur	Chief
4	Dr Rabindra Shrestha	ECCA, Lalitpur	President
5	Dr NN Tiwari	ESON, New Road, Ktm	Vice-President
6	Dr Dharma Dangol	IAAS, Chitwan	Associate Professor
7	Mr Angphuri Sherpa	WWF Nepal, Baluwatar	Country Coordinator/ CEPF
8	Mrs Ila Shrestha	Patan Multiple Campus, Patandhoka, Lalitpur	Lecturer
9	Ms Rudriksha Rai	WWF, Baluwatar, Ktm	SHL Program Officer
10	Mr Bishnu Kafle	ICC, Ilam	Program Officer
11	Mr Kamal Raj Rai	NCDC, Ilam	Program Coordinator
12	Mr Bishal Rijal	Khwopa College, Environmental Science, Bhaktapur	M.Sc. Student
13	Mr Madan K Suwal	Central Department of Botany, Kirtipur, Ktm	M.Sc. Student
14	Mr Netra B Burja Thapa Magar	Shree High Altutude Herbal Growers Group(SHAHGG), Ilam	President
15	Mr Kirti Poudel	NTNC, Lalitpur	Program Officer
16	Mr Nar B Khatri	Central Department of Botany, TU, Kirtipur, Ktm	M.Sc. Student
17	Mr Ripu M Kunwar	ESON, New Road, Ktm	Field Coordinator
18	Mr Kamal Humagain	ESON, New Road, Ktm	Research Associate

Plant Biodiversity Inventory, Identification of Hotspots, and Conservation Strategies for Threatened Species and Habitats in Kanchenjunga-Singhalila Ridge, Eastern Nepal
(Panchthar district report)

Kanchenjunga-Singalila Complex, one of the five prioritized landscapes of the Eastern Himalayas, possesses globally significant populations of landscape species (CEPF 2005) with the several centers for plant diversity. The complex stretches from Kanchenjunga Conservation Area (KCA) in Nepal, which is contiguous with Khanchendzonga Biosphere Reserve in Sikkim, India, to the forest patches in south and southwest of KCA in Ilam, Panchthar and Jhapa districts. Kanchenjunga Conservation Area along with its lowlands Panchthar, Ilam and Jhapa districts is floristically rich with over 2900 species of flowering plants (Shakya 1983; Shrestha & Ghimire 1996) of which, several are found to be endemic to the Himalayas. Eastern Nepal harbors about 68 endemic flowering plant species (Shrestha and Joshi 1996) of which about 50 were recorded from KCA only (Shrestha & Ghimire 1996).

Regarding Panchthar, the study was focused on five VDCs along the Kanchenjunga-Singhalila ridge viz. Falaincha, Chyangthapu, Memeng, Prangbung and Sidin. These five VDCs border with Sikkim, India. Due to the high dependency of the local people on the forest and other natural resources, the active participation of the local people is the main responsible factor for the inception of the research. So it is necessary to give the main priority for the local knowledge. There is indeed a need of the conservation of the important species and the important sites. The very first step for this important perspective is to find out the places of importance that is to say inventory. So the main purpose of the study is to document plant diversity and their associated habitats in those five VDCs and identify the rare, threatened and endemic plant species and their habitat along with the development of conservation strategies for those important plants and habitats. The conservation strategy helps on management of the species outcome of the research.

METHODS
The first step for the research was the review of the related literature and the herbarium specimens of the related area. After prepared from the previous literatures, the field study was the next step. The field study was fixed such that it was the flowering season for most of the plants and the season was monsoon. PRA (Participatory Rural Appraisal) along with participatory resource mapping, informal meetings and consultations, site observations was followed to get the local knowledge regarding the important plants and the habitats. Capacity building training about the conservation of the natural resources was held at Prangbung, Panchthar. After these works in the villages, the team along with few local was in the forest for two times: June and September/October, 2007. The samples of the plant species (Herbarium) were collected in the field followed by on-spot identification, pressing and drying. Besides the herbarium preparation, the ecological study (quadrat sampling employing GPS, Clinometer, pH meter, and other scientific equipments) of the different habitats along with the laying of permanent research plots at different places for monitoring. The soil samples were also collected.

After the field visit, the next step followed was the identification of the herbarium specimens in this order: Identification at ESON Center → Identification at TUCH /KATH →Identification at RBGE, UK. Then the herbaria were submitted to TUCH, Kirtipur; KATH, Godawari and RBGE, UK. The collected soil samples were subjected for the analysis (Soil pH, NPK, Moisture, Texture). The GIS analysis was done for the study area regarding the important plants and habitats.

Village level, district level and national level workshops were organized to find the prioritized plants and the hotspots. In these workshops, consulting with the national level experts and the locals, the conservation strategies were discussed for those selected species and habitats. Lastly the strategies were finalized on the basis of those developed from the three levels.

FINDINGS
Among the several findings, one of the findings explains the floral richness. The diversity of the collected specimens includes 91 families, 239 genera and 398 plant species. Rosaceae was found to be the largest family with 27 species followed by Asteraceae (25 species), Ericaceae (19 species), Ranunculaceae (16 species), Gentianaceae (15 species) and so on. Regarding the largest genera, *Impatiens, Begonia* and *Rhododendron* were the largest with 8 species each followed by *Swertia* and *Corydalis* with 7 species each and so on.

1. Endemic, threatened and new records species of Panchthar district

The collected specimens were identified at different levels and few important records were found, yet the identification is going on. Of the recorded species, there were 2 endemic, 13 threatened and 11 new species to checklist of Nepal as mentioned in the Table 1.

There were 12 different forest types identified during the study such as types *Rhododendron* forest, *Abies – Betula* forest, *Daphniphyllum – Lithocarpus* forest and so on. About 50 types of trees, 58 types of shrubs and 129 shrubs were documented from quadrat study. From the ecological analysis, it was found that highest frequency among the trees was of Lithocarpus *pachyphylla* (Bante) follower by *Symplocus lucida* (Kharane), *Acer campbelli*(Kukurpaile) and so on.

Least Frequencies were of *Taxus buccata* (Louthsalla), *Magnolia* sp. and *Michelia* sp. (Champ), *Scheflera impressa* (Bhaluchinde) etc. Regarding the shrubs, *Vibernum mullah* (Asare) was with the highest frequency followed by *Daphne bholua* (Lokta), *Sarcococa hookeriana* and so on. Lowest frequency holding species were *Heracleum lallii* (Chimphing), *Edgeworthia gardneri* (Argeli), *Gerardinia diversifolia* (Allo) etc. Among the herbs *Pilea sp.* (Gagleto), *Impatiens sp*. (Padke) and *Persicaria sp.* (Ratneulo/Thotne) came under the highest frequency. *Swertia chirayita* (Chirayito), *Nardostachys grandiflora* (Jatamansi), *Paris polyphylla* (Satuwa) are the herbs with the lower frequencies.

Table 1: List of Endemic, threatened and new record plant species of Panchthar district

SN	Record	Family	Name of the Species	Alt.(m)	Locality of Panchthar
1.	Endemic	Eriocaulaceae	*Eriocaulon viride* Korn.	1790	Chamling gaun, Chyangtharpu
2.	Endemic	Umbelliferae	*Heracleum lallii* C.Norman	3640	Gairi-sukhkhadhap Failaincha-9
3.	New record	Gentianaceae	*Swertia wardii*	3910	Paharemeghu, Falaincha-9
4.	New record	Umbelliferae	*Acronema ioniostyles*	2700	Dabale Deurali
5.	New record	Poaceae	*Bothriochloa bladhii*	2005	Memeng
6.	New record	Poaceae	*Calamogrostis lahulensis*	4335	Timbu Falaincha-9
7.	New record	Fagaceae	*Castanopsis longispina*	1900	Falaincha-6, Tintine
8.	New record	Juncaceae	*Juncus clarkei*	3530	Chiwabhanjyang-Major
9.	New record	Juncaceae	*Juncus khasiensis*	3910	Chiwabhanjyang-Major
10.	New record	Liliaceae	*Polygonatum sibiricum*	3550	Prangbung, Chandu
11.	New record	Commelinaceae	*Tradescantia virginiana*	2665	Talkharka-Prangbung, Prangbung
12.	New to world	Begoniaceae	*Begonia* sp. nov.	2250	Prangbung
13.	Threatened	Ranunculaceae	*Aconitum spicatum* (Bruhi.) Stapf	3850	Dund, Falaincha-9
14.	Threatened	Dioscoreaceae	*Dioscorea deltoidea* Wall. ex Griseb	3820	Falaincha, Betini
15.	Threatened	Dioscoreaceae	*Dioscorea deltoidea* Wall. ex Griseb	1570	Falaincha, Betini
16.	Threatened	Fagaceae	*Lithocarpus grandifolius* (DC.) S.N.Biswas	3210	Faleke-Betini, Falaincha-9
17.	Threatened	Magnoliaceae	*Magnolia campbelli* Hook.f. & Thomson	2005	Faleke-Betini, Falaincha-9
18.	Threatened	Boraginaceae	*Maharanga emodi* (Wall.) A.DC.	3400	Prangbung 6, Ghamaile
19.	Threatened	Valerianaceae	*Nardostachys grandiflora* D.C.	3930	Paharemeghu, Falaincha-9
20.	Threatened	Scrophulariaceae	*Neopicrorhiza scrophulariiflora* (Pennell) Hong	4335	Timbu Falaincha-9
21.	Threatened	Trilliaceae	*Paris polyphylla* subsp *marmorata* (Stearn) H.Hara	2685	Talkharka-Prangbung, Prangbung
22.	Threatened	Trilliaceae	*Paris polyphylla* Sm. subsp *polyphylla*	3060	Mabu, Near Mai khola, Chauri chowk
23.	Threatened	Berberidaceae	*Podophyllum hexandrum* Royle	3225	Mabu, Bikhe Bhanjyang
24.	Threatened	Polygonaceae	*Rheum nobile* Hook. f. & Thomson	4335	Timbu Falaincha-9
25.	Threatened	Gentianaceae	*Swertia chirayita* (Roxb.ex Fleming) H.Karst	1900	Menjuwa

Regarding the existing management system of the forest, there was government managed forest in a relatively small area. There were six community forests as well in the study area and the pre-existing Kipat system of management in some places. Concept of private nursery was also observed.

2. Prioritized species and habitats on the basis of different level workshops

2.1 Village level workshop

Village level workshop was organized by ESON in collaboration with Dipjyoti Youth Club (DJYC), Panchthar and Shree High Altitude Herbs Grower's Group (SHAHGG), Ilam at Kalika Higher Secondary School, Prangbung-3, Panchthar. The two day workshop was held in October 3-4, 2007. Including the representatives of ESON, altogether 44 participants were present (Appendix I). During the workshop, resource mapping of the different CFs was done focused on the plant diversity. Plant species along with the important habitats/sites were ranked during the workshop on the basis of importance in different respects (Table 2a, 2b). Similarly, with the active participation of the local people, the threats and the conservation strategies were also formulated for the species ranked (Table 3a, 3b).

2.2 District level workshop

Due to the difficult political situation, district level workshop was organized by ESON at Hotel Orchid Tripureshwor, Kathmandu. During the one day program held on the 16th March, 2008, representatives from Panchthar district were present in addition to the ESON team. There were altogether 11 participants including the DFO of Panchthar (Appendix II). Due to different constraints, the number of participants was quite less. As in the village level workshop, the species and the habitats were ranked (Table 2a, 2b).The threats were recognized (Table 3a) and the conservation strategies were also developed with the idea of the different participants (Table 3b).

2.3 National level workshop

National level workshop was organized at Hotel Grand, Tahachal, Kathmandu on 18th March, 2007. Altogether 15 participants were present for Panchthar including the different expertise of the plant diversity field (Appendix III). On the basis of consultation with the national level scholars of the plant diversity field, the different species were ranked on the basis of their importance at local level and national level. Similarly different habitats/sites were also ranked. The conservation strategies were formulated for the important species and as a whole.

Table 2a: Species (Top 15) ranked on the basis village level, district and national level priority

SN	Prioritized Species	Nepali Name	Village workshop Score	District workshop Score	National workshop Score	Total Score
1	*Michelia* species	Champ	25	16	**16**	**57**
2	*Taxus wallichiana*	Loth salla	24	15	**15**	**54**
3	*Aconitum* species	Kalo/ Seto Bikhma	23	9	**14**	**46**
4	*Cinnamomum glauscescens*	Malagiri	15	13	**10**	**38**
5	*Nardostachys grandiflora*	Jatamansi	14	12	**12**	**38**
6	*Swertia chirayita*	Chirayito	20	10	**7**	**37**
7	*Juglans regia*	Okhar	22	14	**0**	**36**
8	*Castanopsis hystrix*	Patale katus	18	11	**2**	**31**
9	*Rhododendron* species	Chimal /Gurans	21	8	**1**	**30**
10	*Neopicrorhiza scrophulariflora*	Kutki	13	6	**11**	**30**
11	*Dactylorhiza hatagirea*	Panchaunle	12	5	**13**	**30**
12	*Zanthoxylum* species	Timur	19	1	**0**	**20**
13	*Cardiocrinum giganteum*	Chameli	16	3	**0**	**19**
14	*Schefflera* species	Bhalu chinde	17	0	**0**	**17**
15	*Rheum* species	Padamchal/Kenjo	9	0	**6**	**15**

Table 2b: Habitat/Sites ranked on the basis of village, district and national level priority

SN	Prioritized sites (VDC)	National workshop Score	Total Score
1	Timbu pokhari (Falaincha VDC)	7	**15**
2	Lam pokhari-Suke Pokhari-Ose (Chyangthapu VDC)	6	**13**
3	Sidin Kanya Devi Community forest (Sidin VDC)	5	**10**
4	Bhaise pokhari-Jaljale-Surketham(Memeng VDC)	4	**9**
5	Mejartham-Chiwabhanjyang (Chyangthapu VDC)	1	**7**
6	Narelung-Thapu (Prangbung VDC)	3	**7**
7	Tinsimana-Gorkhepani-Fokte (Memeng VDC)	2	**6**

Table 3a: Threats on plant diversity identified from village, district and national level workshops

SN	Threats	Village level	District level	National level
1	Deforestation	√	√	√
2	Uncontrolled Grazing	√	√	√
3	Erosion and Landslide	√		√
4	Lack of Awareness		√	√
5	Tourism-Fuel wood/path used by tourists			√
6	Open border	√	√	√
7	Lack of livelihood options		√	√
8	Illegal collection and poaching	√	√	√
9	Forest Encroachment	√	√	
10	Unscientific plantation			√
11	Weak policies, laws and their enforcement		√	√
12	Kipat system of Land Management	√	√	
13	Fire	√	√	√

Table 3b: Overarching conservation strategies for conservation of plant species from village, district and national level workshops of Panchthar district

SN	Strategies	Village level	District level	National level
1	Minimize the dependency of local people on Forest		√	
2	Controlled grazing	√	√	√
3	Forestation	√	√	√
4	Awareness raising trainings		√	√
5	Regulated tourism		√	√
6	Trained security forces in the border			√
7	Alternative source of income for the locals	√	√	√
8	Control illegal collection and harvesting of resources from forest especially medicinal plants	√	√	√
9	Community forest border delineation		√	√
10	Scientific plantation		√	√
11	Capacity building trainings for the locals		√	√
12	Explore land management option		√	√
13	Awareness programs to control fire in dry season	√	√	√

Conclusion

On the basis of the tenure study by ESON team in collaboration Dipjyoti Youth Club (DJYC), Panchthar and Shree High Altitude Herbs Grower's Group (SHAHGG), in can be concluded that the contiguous five VDCs of Panchthar along the Lower Kanchenjungha Singhalila ridge are the rich areas for the diversity of plants. The areas provide habitats for important plants as the plants documented are threatened, endemic and medicinally important plants. The flora of the area was not well documented previously, so this work might be the important brick for the flora of this area, yet there is a need of detailed explorations. But due to different threats mentioned above, they are forced to vulnerable condition. So there is an urgent need of the conservation measures as suggested from the different level workshops. If those strategies are not applied at the local level, there is the chance that the richness may not last for a long. Immediate measures are the main solutions for the preservation and the protection of the present status of the diversity of the plants in the region.

Appendix: I. List of participants in Village Level Workshop (Panchthar)

Date: October 3-4, 2007 Venue: Kalika Higher Secondary School, Prangbung-3

SN	Name of Participants	Address/Organization	Designation
1	Mr. Birendra K. Mandal	Prangbung Health Post	Incharge
2	Mr. Agni P Lamichhane	Shree Kalika Ma Vi	Teacher
3	Mr. Bidya Nandan Jha	Police Station	Incharge
4	Mr. Pramananda Shrestha	Yangnam, Panchthar	
5	Mr. Bisheshwor Begha	Chyangthapu	
6	Mr. Machhindra Begha	Mangenalung Pashupalan Samuha, Falaincha	
7	Mr. Pradip Rai	Sidin VDC-1	
8	Mr. Tikaram Nepal	Prangbung-4	
9	Mr. Suk B Rai	Sidin-1	
10	Mr. Tej K Rai	Falaincha-9	
11	Ms. Saraswoti Gurung	Falaincha-4	
12	Ms. Sangeeta Rai	Faliancha-9	
13	Mr. Bal B Rai	Chyangthapu-3	
14	Mr. Som Adhikari	Chyanthapu-9	
15	Mr. Kamal Rai	Prangbung-2	
16	Mr. Matrika Rijal	Prangbung-4	
17	Mr. Kamal Khapangi	Prangbung-4	
18	Mr. Ojaswi Rai	Singha Devi CF, Prangbung-1	
19	Mr. Abinarayan Rai	Singha Devi CF, Prangbung-1	
20	Mr. Nathu Gurung	Shree Jaljale Shrijanashil Jadibuti Utpadak Samuha, Prangbung-9	Chairman
21	Mr. Netra B Thamsuhang	Prangbung-3	Peon, VDC
22	Mr. Udaya Timalsina	Prangbung VDC	Technical Assistant, VDC`Office
23	Mr. Khadka Gyangmi Magar	Prangbung-4	Representative, CPN-UML
24	Mr. Nar P Khapangi	Prangbung-3	Incharge, Post Office
25	Ms. Rekha Gurung	Jaljale CFUG, Prangbung-7	Joint Secretary
26	Ms. Tarawati Rai	Phalelung Agriculrural Cooperative, Prangbung-1	President
27	Ms. Jaya Maya Rana	Prangbung-3	Social Mobilizer
28	Mr. Ram Chandra Gurung	Memeng-7	
29	Mr. Santabir Rai	Ban Banyajantu jadibuti Utpadak Samuha, Memeng	Secretary
30	Mr. Rup B Rai	Chyanthapu-6	
31	Ms. Pabitra Thamsuhang	Prangbung-3	
32	Mr. Jagat B Jabegu	Sidin-1, Gwala Samuha	President
33	Mr. Devi Prasad Nepal	Prangbung-4	VDC Chairman
34	Ms. Man Kumari Tamang	Prangbung-3	
35	Ms. Shiva Kala Thamsuhang	Prangbung-3	
36	Mr. Dilli Kerung	Prangbung-5	
37	Dr. K.K. Shrestha	ESON, Kathmandu	President
38	Mr. Ripu M Kunwar	ESON, Kathmandu	Field Coordinator
39	Mr. Kamal Humagain	ESON, Kathmandu	Research Associate
40	Mr. Man K Dhamala	ESON, Kathmandu	Research Associate
41	Mr. Jeevan Pandey	Central Department of Botany, Kirtipur	M. Sc. Student
42	Mr. Nar B Khatri	Central Department of Botany, Kirtipur	M. Sc. Student
43	Mr. Yub Raj Poudel	Shree High Altutude Herbal Growers Group(SHAHGG), Ilam	Social Mobilizer
44	Mr. Rajendra Rai	Shree Dipjyoti Youth Club, Panchthar	Social Mobilizer

Appendix: II. List of participants in District Level Workshop (Panchthar)

Date: March 16, 2008 Venue: Hotel Orchid, Tripureshwor, Kathamandu

SN	Name of Participants	Address/Organization	Designation
1	Ms. Sangeeta Rajbhandary	ESON	Treasurer
2	Mr. Man K. Dhamala	ESON	Research Associate
3	Mr. Kamal Humagain	ESON	Research Associate
4	Ms. Urmila Thamsohang	ESON	Office Secretary
5	Mr. Jeevan Pandey	Central Department of Botany,Kirtipur	Student

6	Mr. Krishna Chandra Adhikari	Panchthar	Panchthar Representative
7	Mr. Bishal Rijal	Khwopa College, Environmental Science, Bhaktapur	M.Sc. Student
8	Mr. Bhagwan P. Gupta	Panchthar	DFO
9	Mr. Mahendra Bir Rai	Shree Dipjyoti Youth Club, Panchthar	Program Coordinator
10	Mr. Sunil Bantawa	Shree Dipjyoti Youth Club, Panchthar	Accountant
11	Mr. Pradeep Maharjan	Winrock International	

Appendix: III. List of participants in National Level Workshop (Panchthar)

Date: March 18, 2008 Venue: Hotel Grand, Tahachal, Kathamandu

SN	**Name of Participants**	**Organization /Address**	**Designation**
1	Dr. K. K. Shrestha	ESON, New Road, Ktm	President
2	Dr. Dinesh Bhuju	Resources Himalaya Foundation, Kumaripati, Lalitpur	Chief Executive
3	Dr. Mohan Shiwakoti	Central Department of Botany, Kirtipur Ktm	Associate Professor
4	Dr. Keshav Shrestha	Natural History Museum, Swambhu, Ktm	Chief
5	Dr. Sarala Khaling	WWF, Baluwatar, Ktm	Regional Coordinator /CEPF Himalaya
6	Mr. Jhamak Karki	DNPWC, Babarmahal, Ktm	Conservation Officer
7	Ms. Sangeeta Rajbhandary	ESON, New Road, Ktm	Treasurer
8	Mr. Devendra Thamsuhang	Prangbung,Panchthar	School Teacher
9	Mr. Sunil Bantawa	Shree Dipjyoti Youth Club, Panchthar	Accountant
10	Mr. Mahendra Bir Rai	Shree Dipjyoti Youth Club, Panchthar	Program Coordinator
11	Mr. Man K Dhamala	ESON, New Road, Ktm	Research Associate
12	Mr. Jeevan Pandey	Central Department of Botany, Kirtipur Ktm	M.Sc. Student
13	Ms. Urmila Thamsuhang	ESON, New Road, Ktm	Office Secretary
14	Mr. R.M. Joshi	Kathmandu	Free Lance Conservationist
15	Mr. Bhagwan P. Gupta	District Forest Office, Panchthar	DFO

Annex 11. General conservation strategies of prioritized species and habitats of Ilam and Panchthar districts of Lower Kanchenjungha Singhalila Ridge

S.N.	Strategies	Short-term	Mid-term	Long-term	SPECIES						P. SITES	
					Swertia	Michelia	Taxus	Kutki	Jatamansi	Aconitum	Ilam	Panchthar
1	**Bottom-up approach planning**											
	• Develop conservation goal, vision and plan at multiple scales and time.		√	√	√	√	√	√	√	√	√	√
	• Identify gap in knowledge of status and distribution of biodiversity and resources and activities.	√	√	√	√	√	√	√	√	√	√	√
	• Identify the resource constraints and requirements that are needed to effectively implement the conservation actions.	√	√	√	√	√	√	√	√	√	√	√
2	**Awareness /capacity building programs for cattle herders/community forest users focusing on sustainable harvesting**											
	• Refresh visits	√	√		√	√	√	√	√	√	√	√
	• Trainings/workshops and human resource development to build capacity to undertake conservation actions.	√	√		√	√	√	√	√	√	√	√
3	**Controlled grazing and resource management**											
	• Gradual removal of cow sheds with providing alternative means of livelihood		√	√			√	√	√	√		√
	• Introduction of productive livestock and improvement of indigenous varieties	√	√	√							√	√
	• Local anti poaching unit development/security force set up		√	√	√						√	√
	• Promote local level cooperation					√	√	√	√	√	√	√
	• Easy access route (Mane – Sandakphu – Falut – Timbu pokhari)		√	√								√
4	***In- situ* conservation (Natural site conservation)**											
	• Identify the critical linkages for conservation and define conservation area boundaries and site reservation using land use maps for species conservation with designing buffer zone to reduce pressures.		√	√	√	√	√	√	√	√	√	√
	• Restoration & rehabilitation of critical habitats and linkages through peoples participation		√	√	√	√	√				√	√
	• Promote natural regeneration and enrichment planting and propagation		√	√	√	√	√	√	√	√	√	√
	• Identify and promote land use options to provide habitat connectivity that will let the species dispersal even at transboundary levels.		√	√				√	√	√	√	√
	• Protect and acknowledge indigenous traditional knowledge and implement		√	√	√	√	√	√	√	√	√	√
	• Empower and promote local communities in biodiversity management programs		√	√	√	√	√	√	√	√	√	√
	• Identify the specific threats of the priority species and landscapes		√	√	√	√	√	√	√	√	√	√
	• Control irrational exploitation and emphasis given to rotational harvesting systems	√	√	√	√	√	√	√	√	√		√
	• Control alien species and fire				√	√	√	√			√	
5	***Ex situ* conservation**											
	• Cultivation in community forests and common pool resources	√	√	√	√	√	√			√	√	√
	• Nursery development & private farming		√	√	√	√	√			√	√	√
	• Scientific plantation, afforestation & reforestation	√	√	√	√	√	√			√	√	
	• Seed banking & demonstration plots			√	√	√	√			√	√	√
	• Information centers			√	√	√	√	√	√	√	√	√
6	**Livelihood upliftment**											
	• Alternative income generation activities		√	√			√		√	√	√	√
	• Agro and community based tourism and ecotourism		√	√	√						√	√
7	**Research & Development**											
	• Develop and implement inventory programs and protocols including open access databases.	√	√	√	√	√	√	√	√	√	√	√
	• Participatory action research		√	√	√	√	√	√	√	√	√	√
	• A comprehensive database is essential to monitor the status of biological		√	√	√	√	√	√	√	√	√	√

	diversity and livelihood of local people											
	• Publication and dissemination	√	√	√	√	√	√	√	√	√	√	√
8	**Introduction/promotion of alternative energy technology**											
	• Minimize fuel wood pressure by providing alternative energy sources (solar panel, improved cooking stoves, bio briquettes etc)		√	√		√	√				√	√
	• Alternative source of Timber		√	√		√	√				√	
	• Transfer scientific technologies at farmer level for sustainable management and production											
9	**Institution building, networking, coordination, cooperation and mobilization**											
	• Gradual handover the resources to the local communities for wise use and conservation.		√	√	√	√	√				√	√
	• Strengthen existing organizations that can undertake and direct conservation efforts		√	√	√	√	√	√	√	√	√	√
	• Institutionalization and good governance mechanisms (accountable, responsible, transparent, participatory, equitable, record keeping etc.)		√	√	√	√	√	√	√	√	√	√
	• Proper delineate the community forest lands and handover to local community.		√	√	√	√	√	√	√	√	√	√
	• Liaise government and line agencies to have collaborative projects on sustainable biodiversity management and livelihood well being.			√	√	√	√	√	√	√	√	√
	• Networking and regular communication among staketakers and holders.		√	√	√	√	√	√	√	√	√	√
	• Transboundary cooperation and provide fora to discuss transboundary issues.			√							√	√
	• Set up national committees, regional and international commissions for trans-boundary conflict resolution		√	√							√	√
10	**Market linkage and entrepreneurship**											
	• Value addition and processing opportunities		√	√	√		√		√	√	√	
	• Develop market linkage and entrepreneurship				√		√		√	√	√	
	• Institutionalization and cooperative mechanism			√	√						√	√
	• Organic products and certification		√	√	√		√		√	√	√	
11	**Community based participatory biodiversity monitoring**											
	• Biodiversity/ecosystem monitoring at multiple scales and time.		√	√	√	√	√	√	√	√	√	√
12	**Policy enactment, revision and advocacy**											
	• Formulate/amend policies and legislation for equitable benefit sharing, taxation, resource access, empowerment and good governance.			√	√	√	√	√			√	√
	• Agree on national, regional and international legislations on transboundary scales.		√	√	√					√	√	√
13	**Project leveraging and post management**											
	• Secure sustainable funding mechanism and collaborative efforts		√	√	√	√	√	√	√	√	√	√
	• Prepare a comprehensive exit and long term sustainability strategy in full consultation with concerned stakeholders and devise interventions to facilitate the transitional projects			√	√	√	√	√	√	√	√	√
	• Design project for post management of the project			√	√	√	√	√	√	√	√	√

Annex 12.1 Aconitum spicatum (Bruehl) Stapf

Scientific Name Aconitum spicatum (Bruehl) Stapf.
[Syn. Aconitum ferox var spicata Bruhl

Family Name Ranunculaceae

English Name Nepali Aconite

Vernacular Names Atibish, Aikh, Aulo bikh, Bish (Nepali); Bish, Batsnav, Kalkut (Sanskrit); Bish (Hindi); Chendu, Glantu (Gurung).

Introduction

Plant is a straight perennial and robust herb attaining up to 1-2 m tall. Stem brown or almost black when dry. Leaves simple, alternate, stalked, tri partite, and deeply cut into ovate lobes which are further cut into toothed and pointed segments. Flowers are purple to greenish white in 15-40 cm long dense terminal spike.

Distribution and habitat

It is distributed throughout Nepal at elevation range 1800-4200 m. It is also found in China, Tibet, India and Bhutan.

Flowering and fruiting

It starts flowering in August and continues up to September. Fruiting occurs in October.

Parts used

Tubers

Indigenous use

Tuberous roots are deadly poisonous, antipyretic and analgesic.

Chemical constituents

1) Bikhaconitine, 2) Oleic acid, 3) Linolenic acid, etc.

Conservation status

- Ministry of Forests and Soil Conservation, Department of Plant Resources, Thapathali, Kathmandu has listed plant under the national priority herb species for cultivation and conservation.
- IUCN Nepal and CAMP Nepal have listed plant under threatened category for conservation.

Government royalty

According to the Forest Regulation 1995 Appendix 3, the royalty rate of Aconitum root is NRs 5/kg.

Species specific conservation strategies of *Aconitum spicatum*

- Aconitum is collected from natural stocks. For commercial marketing, farming has also been done. Collection from national forest is endorsed by district forest offices and from community forests is by community forest user groups.
- Harvesting of both seeds and rhizome can be done after maturing and dispersal of seeds in October to December.
- Selecting harvesting and reserving few (about 20-25%) individuals in field promote sustainable production.
- Mature rhizome collection should be taken place only after dispersing the seeds. The dispersed seeds remain dormant until the beginning of the summer season (March) and start germination during spring.
- Extensive cultivation can be done in farmlands. Farmers and private sectors industries should be promoted in commercial farming through providing extensive extension materials and update information.
- Management of species through forest user groups should be preceded by including the species in CFUG operational plan. Collection grant should be given on the basis of species distribution and availability.
- Further research and studies should be initiated by governmental, non governmental and private sector organizations for promotion of species and forest dependant locale.

Cultivation

It is propagated either by seeds or by rhizomes but seed cultivation or transplanting the seedling from natural site to agricultural lands is common in east Nepal. In August/September, when the plant begins to mature, the leaves become yellow and the seeds start to mature. For cultivation purpose, the mature seed should be collected during October/November. The collected seeds can be directly sown in nursery beds or stored in cloth bags and sown as per necessary. Implanting of seedlings at a space of 75 cm in field in rainy season is appropriate for propagation. The seedlings after attaining height about 15 cm (4 or 5 leaved seedling) in nursery bed should be transplanted to the cultivation plot during rainy season.

Table 1. Conservation strategies of *Aconitum spicatum*

	Conservation Strategies	Short-term	Mid-term	Long-term
1	**Bottom-up approach planning**			
	• Develop conservation goal, vision and plan at multiple scales and time.	√		
	• Identify gap in knowledge of status and distribution of biodiversity and resources and activities.	√	√	
	• Identify the resource constraints and requirements that are needed to effectively implement the conservation actions.	√	√	
2	**Awareness /capacity building programs for cattle herders/community forest users focusing on sustainable harvesting**			
	• Refresh visits		√	
	• Trainings/workshops and human resource development to build capacity to undertake conservation actions.		√	
3	**Controlled grazing and resource management**			
	• Gradual removal of cow sheds with providing alternative means of livelihood		√	√
	• Local anti poaching unit development/security force set up		√	√
	• Promote local level cooperation among stakeholders and producers/collectors		√	√
4	***In- situ* conservation (Natural site conservation)**	√		
	• Identify the critical linkages for conservation and define conservation area boundaries and site reservation using land use maps for species conservation with designing buffer zone to reduce pressures.		√	√
	• Restoration & rehabilitation of critical habitats and linkages through peoples participation	√	√	√
	• Promote natural regeneration and enrichment planting and propagation		√	
	• Identify and promote land use options to provide habitat connectivity that will let the species dispersal even at transboundary levels.		√	√
	• Protect and acknowledge indigenous traditional knowledge and implement		√	√
	• Empower and promote local communities in biodiversity management programs		√	√
	• Identify the specific threats of the priority species and landscapes	√	√	
	• Control irrational exploitation and emphasis given to rotational harvesting systems	√	√	
	• Control alien species and fire	√	√	
5	***Ex situ* conservation**			
	• Cultivation in community forests and common pool resources	√	√	
	• Nursery development & private farming	√	√	
	• Seed banking & demonstration plots			√
	• Information centers			√
6	**Livelihood upliftment**			
	• Alternative income generation activities		√	√
	• Agro and community based tourism and ecotourism		√	√
7	**Research & Development**			
	• Develop and implement inventory programs and protocols including open access databases.	√	√	
	• Participatory action research		√	√
	• A comprehensive database is essential to monitor the status of biological diversity and livelihood of local people	√	√	
	• Publication and dissemination		√	√
8	**Introduction/promotion of alternative energy technology**			
	• Transfer scientific technologies at farmer level for sustainable management and production		√	√
9	**Institution building, networking, coordination, cooperation and mobilization**			
	• Gradual handover the resources to the local communities for wise use and conservation.		√	√
	• Strengthen existing organizations that can undertake and direct conservation efforts		√	√
	• Institutionalization and good governance mechanisms (accountable, responsible, transparent, participatory, equitable, record keeping etc.)		√	√
	• Proper delineate the community forest lands and handover to local community.	√	√	
	• Liaise government and line agencies to have collaborative projects on sustainable biodiversity management and livelihood well being.			√
	• Networking and regular communication among staketakers and holders.		√	√
	• Transboundary cooperation and provide fora to discuss transboundary issues.			√
	• Set up national committees, regional and international commissions for trans-boundary conflict resolution		√	√
10	**Market linkage and entrepreneurship**			
	• Value addition and processing opportunities		√	√
	• Develop market linkage and entrepreneurship		√	√
	• Institutionalization and cooperative mechanism			√
	• Organic products and certification		√	√
11	**Community based participatory biodiversity monitoring**			
	• Biodiversity/ecosystem monitoring at multiple scales and time.		√	√
12	**Policy enactment, revision and advocacy**	√		
	• Formulate/amend policies and legislation for equitable benefit sharing, taxation, resource access, empowerment and good governance.			√
	• Agree on national, regional and international legislations on transboundary scales.			√
13	**Project leveraging and post management**			
	• Secure sustainable funding mechanism and collaborative efforts			√
	• Prepare a comprehensive exit and long term sustainability strategy in full consultation with concerned stakeholders and devise interventions to facilitate the transitional projects		√	√
	• Design project for post management of the project			√

Annex 12.2 Nardostachys grandiflora DC.

Scientific Name	Nardostachys grandiflora DC.
	[Syn. Nardostachys jatamansi DC.]
Family Name	Valerianaceae
English Name	Spikenard, Musk root
Vernacular Names	Jatamansi, Bhulte, Bhutle, Balchhad, Masijara (Nepali); Pang poe, Dak poe (Tibetan, Amchi); Naswan (Newari); Gandhamansi, Jatamansi (Sanskrit); Germasi, Jatamansi (Gurung); Pangbu (Sherpa); Poi (Tamang); Kanshykuo (Japanese); Balchhar, Jatamansi (Hindi)

Introduction

Spikenard is a sturdy perennial, erect, rhizomatous herb growing up to 75 cm high. It is locally called as Jatamansi, which refers to the bearded appearance of rhizomes. It has distinct and lingering smell; rhizome 7 cm long, 3 cm thick, aromatic, dark grey in color, internally whitish, covered with bundle of fine reddish brown fibers of old leaves and flowering stems. The oil extracted from these aromatic fibrous rhizomes has high commercial value.

Distribution and habitat

Spikenard is found at 3000–5300 m altitude from east to west Nepal and extending up to India, Bhutan, and Southwest China. Birch forests with rocky texture soil and 25°-45° sloppy land is suitable for natural growth. It is mostly found in eastern to western regions of Nepal and abundant in Dolpa, Humla, Jumla, Mugu, Taplejung districts. Nardostachys grandiflora DC. is only one species of the genus Nardostachys found in Nepal[2].

Flowering and fruiting

It starts flowering in July and flowering continues up to September. Fruiting occurs in October-November. In the beginning of November all leaves start to turn yellow and become perennation.

Harvesting

Collection of 3-4 years fibrous mature red rhizome during October-December is appropriate in terms of sustainable production. It is imperative to do selective harvesting or 3-4 years rotational harvesting. The rotational harvesting can be done by dividing the entire area into 3-4 blocks and managing its collection per block per year in rotational basis.

Parts used

Underground rhizome and leaves are indigenously used for various purposes. Rhizome is traded.

Store and value addition

Collected parts (root/rhizome) should be cleaned; air dried then packed in jute bags or other ventilated bags and stored in well air circulated dry places. Some air-dried rhizomes are processed locally as far as possible. It yields up to 0.5–2 % of a pale yellow essential oil with pleasant odor if the collection is made during August/September. Oil contains Valeric acid, which attains better color according to its maturity.

Indigenous use

Traditionally Jatamansi rhizome was used together with Juniper and Rhododendron leaves as incense in monasteries and till today it is practiced. In Amchi medicine, leaf is used in headache, high altitude sickness, fever, etc. and rhizome is considered in wound, cough, cold and fever (heart fever, fever due to poisoning), gastritis and swelling. In the Ayurvedic medicine, rhizome is taken as tonic. It is used in epilepsy, insomnia, indigestion, dysentery, gastritis, respiratory problem, diuretics, measles, skin diseases, and ulcer, etc. Paste of rhizome is applied to treat hemorrhoids. Dried plant parts are used as incense. Rhizome juice promotes growth and imparts blackness of the hair, etc.

Scientific use

The aromatic oil from Jatamansi rhizome is commercially used in perfume industries. Commercially it is used as an aromatic adjunct in the preparation of medicinal oils, perfumery and cosmetics products. It is used as laxative, carminative, antispasmodic, tonic, and stimulant, antiseptic, diuretic and used against cholera, and intestinal colic. Roots are aromatic, bitter, tonic, stimulant, antiseptic in properties and are used for treatment of epilepsy, hysteria and convulsive affection. Once dried, the rhizomes are steam distilled to yield essential oil (Spikenard oil). It can be used with advantage as perfume as oriental basis, heavy florals, animal amber types, etc. The oil reinsifies on exposure to air.

Chemical constituents

The following are the chemical constituents obtained in rhizomes, leaves and stems of Jatamansi:

1) Nardal, 2) Calarene, 3) Aristolene, 4) Oleum jatamansi, 5) Nardostachone, 6) Actinidine, 7) Seychellene, 8) Hexacosone, 9) Isovalerate, 10) Jatamansone, 11) Maaliene, 12) Gurjunene, 13) Calarenol, 14) Pinene, 15) Valeranal, etc.

Government royalty

According to the Forest Regulation 1995 Appendix 3, the royalty rate of Jatamansi rhizome is NRs 15/kg.

Marketing information

Jatamansi is the second largest medicinal plant species exported from Nepal in India and abroad. There is demand of about 800 tons of Jatamansi per year in international markets[42]. The price fluctuation due to the seasonal supply can be observed in Nepalese markets by NRs. 5-10/kg for raw material and 100-1000/kg for essential oil of Jatamansi. According to Ministry of forests and soil conservation notification (2001), the crude drugs obtained from Jatamansi rhizome are banned to export but the processed extracts are exported after certification and permission. But the collection and trade within Nepal is permissible.

Conservation status

- According to Ministry of Forests and Soil Conservation notification 2001, Forest Act 1993, Forest Regulation 1995, the crude products of Jatamansi are banned to export but the processed extracts are exported after certification and permission from respective district forest offices or government.
- Ministry of Forests and Soil Conservation, Department of Plant Resources, Thapathali, Kathmandu has listed Jatamansi under the national priority herb species for cultivation and conservation.
- Dabur Nepal has prioritized 19 medicinal plants for cultivation.
- IUCN Nepal and CAMP Nepal has respectively listed Jatamansi under Endangered and Vulnerable species category. It is recently included in the CITES appendix II.

Species specific conservation strategies of Jatamansi

- Generally Jatamansi is collected from natural stocks. For collection from national forests, permission should be obtained from district forest office whereas it should be granted from community forest user groups for collection and management of forest products (both timber and non timber) of community forests.
- Harvesting of hairy rhizome is preferred to collect from mature Jatamansi plant during the month of October to December.
- About 20-25% of rhizome (10-12 cm long rhizome potential for regeneration) should be left in the field and covered by a layer of soil for sustainable regeneration. Conserving 20% of the field as a protected plot is also important for seeding purpose.
- Mature rhizome collection should be taken place only after dispersing the seeds in October-December and immature and small rhizomes without hairs should be left in the field for regeneration. The dispersed seeds remain dormant until the beginning of the summer season (March) and start germination after melting the snow.
- Possible farming particularly the commercial one alternative should be scoped. Farmers and private sectors industries should be promoted in Jatamansi farming through providing extensive extension materials and update information.
- It is imperative to do selective harvesting or 3-4 years rotational harvesting. The rotational harvesting can be done by dividing the entire area into 3-4 blocks and managing its collection per block per year.
- Management of species through forest user groups should be preceded by including the species in CFUG operational plan. Collection grant should be given on the basis of species distribution and availability.
- Promotion of species can be done by defining reserve species as a in-situ conservation measure.
- Increase awareness and capacity building for sustainable harvesting.
- Establishment of value addition mechanism at the multiple scales and market linkage for products.
- Further research and studies should be initiated by governmental, non governmental and private sector organizations for promotion of Jatamansi and forest dependant locale.

Cultivation/propagation

Jatamansi is propagated either by seeds or by rhizomes. It spreads by the multiplication of ramets which are more or less compactly arranged and attached to each other forming at their base a thick rhizome. Plant starts growing from the dormant underground rhizomes in the beginning of summer. In August/September, when the plant begins to mature, the leaves become yellow and the seeds start to mature. For cultivation purpose, the mature seed should be collected during October/November.

The collected seeds can be directly sown in nursery beds or stored in cloth bags and sown as per necessary. It is very necessary to chill the seeds in water about 12 hours before sowing to the nursery or poly bags to increase the percentage of germination.

Implanting of rhizome cuttings at a space of 50 cm in field in rainy season is appropriate for propagation. The seedlings after attaining height about 15 cm (4 or 5 leaved seedling) in nursery bed should be transplanted to the cultivation plot during rainy season (June – July) with spacing 30 cm apart.

Table 1. General conservation strategies of Jatamansi

SN	Conservation strategies	Short-term	Mid-term	Long-term
1	**Bottom-up approach planning**			
	• Develop conservation goal, vision and plan at multiple scales and time.	√		
	• Identify gap in knowledge of status and distribution of biodiversity and resources and activities.	√	√	
	• Identify the resource constraints and requirements that are needed to effectively implement the conservation actions.	√	√	
2	**Awareness /capacity building programs for cattle herders/community forest users focusing on sustainable harvesting**			
	• Refresh visits		√	
	• Trainings/workshops and human resource development to build capacity to undertake conservation actions.	√	√	
3	**Controlled grazing and resource management**			
	• Gradual removal of cow sheds with providing alternative means of livelihood		√	√
	• Promote local level cooperation among stakeholders and producers/collectors		√	√
4	***In- situ* conservation (Natural site conservation)**			
	• Identify the critical linkages for conservation and define conservation area boundaries and site reservation using land use maps for species conservation with designing buffer zone to reduce pressures.		√	√
	• Restoration & rehabilitation of critical habitats and linkages through peoples participation		√	√
	• Promote natural regeneration and enrichment planting and propagation		√	√
	• Identify and promote land use options to provide habitat connectivity that will let the species dispersal even at transboundary levels.		√	√
	• Protect and acknowledge indigenous traditional knowledge and implement		√	√
	• Empower and promote local communities in biodiversity management programs		√	√
	• Identify the specific threats of the priority species and landscapes		√	√
	• Control irrational exploitation and emphasis given to rotational harvesting systems	√	√	√
	• Control alien species and fire			
5	***Ex situ* conservation**			
	• Cultivation in community forests and common pool resources	√	√	√
	• Nursery development & private farming		√	√
	• Scientific plantation, afforestation & reforestation	√	√	√
	• Seed banking & demonstration plots			√
	• Information centers			√
6	**Livelihood upliftment**			
	• Alternative income generation activities		√	√
	• Agro and community based tourism and ecotourism		√	√
7	**Research & Development**			
	• Develop and implement inventory programs and protocols including open access databases.	√	√	√
	• Participatory action research		√	√
	• A comprehensive database is essential to monitor the status of biological diversity and livelihood of local people			
	• Publication and dissemination	√	√	√
8	**Introduction/promotion of alternative energy technology**			
	• Minimize fuel wood pressure by providing alternative energy sources (solar panel, improved cooking stoves, bio briquettes etc)		√	√
	• Alternative source of Timber		√	√
	• Transfer scientific technologies at farmer level for sustainable management and production			
9	**Institution building, networking, coordination, cooperation and mobilization**		√	√
	• Gradual handover the resources to the local communities for wise use and conservation.		√	√
	• Strengthen existing organizations that can undertake and direct conservation efforts		√	√
	• Institutionalization and good governance mechanisms (accountable, responsible, transparent, participatory, equitable, record keeping etc.)		√	√
	• Proper delineate the community forest lands and handover to local community.		√	√
	• Liaise government and line agencies to have collaborative projects on sustainable biodiversity management and livelihood well being.			√
	• Networking and regular communication among staketakers and holders.		√	√
	• Transboundary cooperation and provide fora to discuss transboundary issues.			√
	• Set up national committees, regional and international commissions for trans-boundary conflict resolution		√	√
10	**Market linkage and entrepreneurship**			
	• Value addition and processing opportunities		√	√
	• Develop market linkage and entrepreneurship			
	• Institutionalization and cooperative mechanism			√
	• Organic products and certification		√	√
11	**Community based participatory biodiversity monitoring**			
	• Biodiversity/ecosystem monitoring at multiple scales and time.		√	√
12	**Policy enactment, revision and advocacy**			
	• Formulate/amend policies and legislation for equitable benefit sharing, taxation, resource access, empowerment and good governance.			√
	• Agree on national, regional and international legislations on transboundary scales.		√	√
13	**Project leveraging and post management**			
	• Secure sustainable funding mechanism and collaborative efforts		√	√
	• Prepare a comprehensive exit and long term sustainability strategy in full consultation with concerned stakeholders and devise interventions to facilitate the transitional projects			√
	• Design project for post management of the project			√

Annex 12.3 Neopicrorhiza scrophulariiflora Pennell

Scientific Name	Neopicrorhiza scrophulariiflora Pennell
	(Syn. Picrorhiza scrophulariiflora Pennell, Veronica lendleyana Wallich)
Family Name	Scrophulariaceae
English Name	Picrorhiza, Gentian
Vernacular Names	Kutki, Katuki, Katuko (Nepali); Arishta, Asokrohini, Katuka, Matsyapitta, Tikta, Vamaghni (Sanskrit); Hunling (Sherpa); Honglen (Amchi, Tibetan); Kutaki, Gorki (Gurung); Kuraki (Tamang); Hung gung (Bhotia), Kutki, Kadu, Kadvi (Hindi); Ko ohren (Japanese)

Introduction

It is one of the major income generating and one of the oldest medicinal plants traded in alpine Himalayas. It is a stout hairy perennial herb up to 5-10 cm tall with woody, elongated creeping rootstock covered with a withered old leaf bases. Rootstock is grey-brown color having strong bitter taste; finger sized, slightly curved and 10-30 cm long and 5-8 mm thick. Leaves are 5-6 cm long, 4-15 mm wide, almost radical, spathulate to narrow elliptic, narrowed below to a winged leaf stalk, margin sharply serrate. The plant is bitter in taste when is cooking. The dried rhizome is cylindrical, deep greyish brown and longitudinally wrinkled with annulations at the tip.

Distribution and habitat

Kutki is distributed abundantly in alpine Himalayas between 2700 – 4800 m altitudes. It prefers growing on rocky crevices on slopes and cliffy mountains, grassy slopes mostly north facing slopes. In Nepal, it is distributed through out the country i.e. from east to west Nepal. Its distribution is concentrated mainly in northern Himalaya around India, Nepal, China, Bhutan and Burma. In Nepal, it has been reported from Humla, Jumla, Dolpa, Mugu, Taplejung, Tehrathum, Panchthar districts, etc. at above 4000 m altitude.

Flowering and fruiting

Budding starts in June-July. Flowers start to bloom in July and continue up to August. Fruiting occurs in September-October and matured seeds are ready to harvest in October before falling. Matured seeds are dispersed in month of November-December.

Harvesting

Matured rhizome is ready to harvest after 3/4 years of cultivation. The time of seed and rhizome harvesting is better in October and November-December respectively. In October, the seeds are matured and the plant is light yellow. Most of the herders collect this plant during rainy season when they stay in herd (Kharka - Goth).

Store and value addition

The collected parts (root/rhizome) should be cleaned, air dried, graded, chopped then packed in jute bags or other ventilated bags and stored in well air circulated dry places. After complete drying, the dried materials have 9.52% less weight than the fresh ones. The rhizome is used for making aromatic oil therefore the collection and processing should be done with better care.

Parts used

Underground roots and rhizomes are used indigenously and scientifically. In trade rhizomes are used.

Indigenous use

Rhizome part is used locally in mountain areas as expectorant, antipyretic, antidiabetic, cardiotonic, laxative, purgative, and in jaundice for millennia. The usage covers in dyspepsia, and scorpion sting. It is used in stomachache and is believed to promote appetite. Amchi use the rhizomes mixed with other plants for bile diseases, intestinal pain, high blood pressure, sore throat, gastritis etc. Root juice is also applied in snake bite, scorpion bite, and eye problems. In rheumatism, blood disorder, spleen troubles, and leprosy, etc. its rhizome is useful. It is reported to be an important liver protectant. In the Ayurvedic medicine the rhizomes are considered as cooling, carminative, digestive, expectorant, antipyretic, and antiperiodic. They are also useful in constipation, colic, skin diseases, cough, diabetes and jaundice.

Scientific use

Kutki has high demand in and outside Nepal for its valuable rootstocks. It furnishes the drug, picrorhizin, obtained as dried rhizomes and roots; which is used as an adulterant of or as a substitute for Indian gentian (Gentiana kurroo). The dried rhizomes and roots of the plant consist of bitter principles, mainly a glucoside named picrorhizin. Alcoholic extracts of the roots are active against Micrococus pyogenes var. aureus and Escherichia coli.

Chemical constituents

The following are the chemical constituents obtained in rhizomes, leaves and stems of Kutki:
1) Kutkin (bitter) 3.4%, 2) Kurin (non bitter), 3) Kursin, 4) Kutkiol, 5) Picrorhizin, 6) Kutkisterol, 7) Picrorhizitin, 8) Picroside, 9) Vanilic acid 10) Picroliv, 11) Kuthoside, 12) Androsin, 13) Total ash 2.61%, 14) Aucubin, 15) Catalpol, etc.

Government royalty

Forest Regulation 1995 and its amendment 2005 has excised revenue for the non-timber forest products and according to the regulation the government royalty of dried Kutki root is Rs. 10/kg.

Conservation status

- Nepal Government, Ministry of Forests and Soil Conservation notification (2001), the rhizome of Kutki is banned to collect, trade and process.
- MoFSC, Department of Plant Resources, Thapathali, Kathmandu has listed the plant under the national priority species of medicinal herbs for cultivation and conservation.
- IUCN Nepal and CAMP (Conservation Assessment and Management Plan) Nepal has listed the plant under Endangered and Vulnerable respectively. It is also locally endangered.

Species specific conservation strategies of *Neopicrorhiza scrophulariflora*

For sustainable production, 10-20% of the rhizome is needed to be left in ground or 20% of the total production area should be kept as protected plot. Small and immature rhizomes are essential to leave in ground for regeneration. Rhizome collection should always be done in later autumn November-December after dispersal of seeds and the plant start to withers and dry. Dense and thick stump should be harvested and juveniles should be left for further growth. If the whole plant is uprooted, then separate the relatively young rhizomes with few roots and replant in the original habitats.

It is imperative to do selective harvesting or 3-4 years rotational harvesting. The rotational harvesting can be done by dividing the entire area into 3-4 blocks and managing its collection per block per year. Once the area is collected, it should be prohibited for 3-4 years for its sustainability. Therefore the combination of selective harvesting and replanting of juvenile or young shoots seems to be the best option for sustainable management. Natural regeneration takes place by rhizomes and seeds. During winter the above ground part dries and gets buried under the snow. In the beginning of summer (after melting the snow) the plant starts growing from the dormant underground rhizomes.

The propagation and cultivation of Kutki is better in shady and moist areas. Rhizome cultivation is considered faster than seed cultivation. The plant easily regenerates from the underground propagules that are left during harvesting. The rhizomes with 3-4 cm in length from 2-3 years matured plant are appropriate for cultivation. Rhizomes are implanted in nursery in November/December. Rhizome cultivation should be done during monsoon season when the new leaves are sprouting from the clone. The seedlings or vegetative clone collected from wild habitats can be implanted in field in July.

The matured and ripen seeds from the 2-3 years matured mother plant should be collected during October and stored in dry places. The seeds can be sown in nursery during March-April. Total half or one kg of seeds is required for one hectare Kutki cultivation. Only 52-60% seeds are germinated. The seedlings attaining 5-7 cm height can be transplanted in field during July-August.

Table 1. General conservation strategies of Kutki

SN	Conservation strategies	Short-term	Mid-term	Long-term
1	**Bottom-up approach planning**			
	• Develop conservation goal, vision and plan at multiple scales and time.	√		
	• Identify gap in knowledge of status and distribution of biodiversity and resources and activities.	√	√	
	• Identify the resource constraints and requirements that are needed to effectively implement the conservation actions.	√	√	
2	**Awareness /capacity building programs for cattle herders/community forest users focusing on sustainable harvesting**			
	• Refresh visits		√	
	• Trainings/workshops and human resource development to build capacity to undertake conservation actions.	√	√	
3	**Controlled grazing and resource management**			
	• Gradual removal of cow sheds with providing alternative means of livelihood		√	√
	• Local anti poaching unit development/security force set up		√	√
	• Promote local level cooperation among stakeholders and producers/collectors		√	√
4	***In- situ* conservation (Natural site conservation)**			
	• Identify the critical linkages for conservation and define conservation area boundaries and site reservation using land use maps for species conservation with designing buffer zone to reduce pressures.		√	√
	• Restoration & rehabilitation of critical habitats and linkages through peoples participation		√	√
	• Promote natural regeneration and enrichment planting and propagation		√	√
	• Identify and promote land use options to provide habitat connectivity that will let the species dispersal even at transboundary levels.		√	√
	• Protect and acknowledge indigenous traditional knowledge and implement		√	√
	• Empower and promote local communities in conservation programs		√	√
	• Identify the specific threats of the priority species and landscapes	√	√	√
	• Control irrational exploitation and emphasis given to rotational harvesting systems	√	√	√
	• Control alien species and fire	√	√	
5	***Ex situ* conservation**			
	• Cultivation in community forests and common pool resources	√	√	
	• Nursery development & private farming	√	√	
	• Seed banking & demonstration plots			√
	• Information centers		√	√
6	**Livelihood upliftment**			
	• Alternative income generation activities		√	√
	• Agro and community based tourism and ecotourism		√	√
7	**Research & Development**			
	• Develop and implement inventory programs and protocols including open access databases.	√	√	
	• Participatory action research		√	√
	• A comprehensive database is essential to monitor the status of biological diversity and livelihood of local people	√	√	
	• Publication and dissemination		√	√
8	**Introduction/promotion of alternative energy technology**			
	• Transfer scientific technologies at farmer level for sustainable management and production		√	√
9	**Institution building, networking, coordination, cooperation and mobilization**			
	• Gradual handover the resources to the local communities for wise use and conservation.		√	√
	• Strengthen existing organizations that can undertake and direct conservation efforts		√	√
	• Institutionalization and good governance mechanisms (accountable, responsible, transparent, participatory, equitable, record keeping etc.)		√	√
	• Proper delineate the community forest lands and handover to local community.	√	√	√
	• Liaise government and line agencies to have collaborative projects on sustainable biodiversity management and livelihood well being.			√
	• Networking and regular communication among staketakers and holders.		√	√
	• Transboundary cooperation and provide fora to discuss transboundary issues.			√
	• Set up national committees, regional and international commissions for trans-boundary conflict resolution		√	√
10	**Market linkage and entrepreneurship**			
	• Value addition and processing opportunities		√	√
	• Develop market linkage and entrepreneurship		√	√
	• Institutionalization and cooperative mechanism			√
11	**Community based participatory biodiversity monitoring**			
	• Biodiversity/ecosystem monitoring at multiple scales and time.		√	√
12	**Policy enactment, revision and advocacy**			
	• Formulate/amend policies and legislation for equitable benefit sharing, taxation, resource access, empowerment and good governance.			√
	• Agree on national, regional and international legislations on transboundary scales.			√
13	**Project leveraging and post management**			
	• Secure sustainable funding mechanism and collaborative efforts		√	√
	• Prepare a comprehensive exit and long term sustainability strategy in full consultation with concerned stakeholders and devise interventions to facilitate the transitional projects			√
	• Design project for post management of the project			√

Annex 12.4 Michelia champaca L.

Scientific Name	Michelia champaca L. [Syn. Michelia aurantiaca Wall.]
Family Name	Magnoliaceae
English Name	Champak, Golden champa
Vernacular Names	Champ, Rani Champ (Nepali); Champa (Sanskrit); Champak (Hindi); Sapu, Soyemba (Limbu); Lukbhung (Rai); Chempe (Tamang); Tsam paka (Tibetan)

Introduction

It is evergreen tree up to 30 m height, bark dark grey, branches densely tomentose, buds grayish brown. Leaves ovate-lanceolate to elliptic, coriaceous, shiny above, minutely pubescent, lateral nerves 12-18 pairs, silky stipules, flowers solitary, axillary, pale yellow, large. Oblong fruitlet is identifying characters.

Distribution and habitat

Champ is distributed in central Nepal at 600-1500 m, and planted on private lands. It is also found in India and China.

Flowering and fruiting

It starts flowering in May and continues up to July. Fruiting occurs in August.

Parts used

Bark, leaves, seeds, wood, fruits, flowers

Indigenous use

Seeds are used to treat chapped skin. Wood is durable and is mainly used for furniture. Flowers are used in some religious ceremonies and are indispensable on certain functions. The flower produces yellow dye and it is indigenously used as perfume. Bark is febrifuge, astringent, stimulant and expectorant. Flower oil is useful in opthalmia and gout.

Chemical constituents

1) Liriodenine, 2) Custonolide, 3) Parthenolide, 4) Micheliolide, 5) Beta sitosterol, 6) Pinocamphene, 7) Cineole, 8) Linslool, 9) Pinocamphenol, 10) Phallaandrene, 11) Champacene, 12) Geraniol, 13) Myristic acid, 14) Palmitic acid, 15) Oleic acid, 16) Linolenic acid, etc.

Conservation status

- According to Ministry of Forests and Soil Conservation notification 2001, Forest Act 1993, Forest Regulation 1995, the Champ is banned to cut, fell and trade.
- IUCN Nepal and CAMP Nepal have respectively listed Michelia under endangered and critically threatened species category.

Species specific conservation strategies of *Michelia champaca*

- Natural regeneration should be promoted and natural sites of Michelia should be conserved by defining them as reserve site. It has very slow growth rate 2 m height and 1 cm diameter per year.
- In-situ conservation should be highly prioritized. Private plantation in private lands or homestead areas should be highly promoted as ex-situ conservation.
- Seed collection is done in May June and the collected seeds are stored in sand till sowing in nursery. Manual seed collection is best for sustainable conservation and high germination rate. Seed germination can be done but it should be done in soil/nursery bed only. Seeds viability is about 2 weeks. Seed germination capacity ranges from 20-50%. There are about 10000 seeds in a kg.
- Community based conservation and monitoring and controlled illegal harvesting should be promoted.
- Alternative source of timber/fuelwood should be managed.
- Over grazing and trampling degenerate the Michelia population therefore the grazing should be arrested.
- Increasing awareness level of local people on plant communities particularly on threatened and endangered species should be made. Archaic, threatened and rare species should be emphasized on protection and conservation.
- Further research and inventory studies should be initiated by governmental, non governmental and private sector organizations.

Table 1. General conservation strategies of *Michelia champaca*

SN	Conservation strategies	Short-term	Mid-term	Long-term
1	**Bottom-up approach planning**			
	• Develop conservation goal, vision and plan at multiple scales and time.	√		
	• Identify gap in knowledge of status and distribution of biodiversity and resources and activities.	√	√	
	• Identify the resource constraints and requirements that are needed to effectively implement the conservation actions.	√	√	
2	**Awareness /capacity building programs for cattle herders/community forest users focusing on sustainable harvesting**			
	• Refresh visits		√	
	• Trainings/workshops and human resource development to build capacity to undertake conservation actions.	√	√	
3	**Controlled grazing and resource management**			
	• Gradual removal of cow sheds with providing alternative means of livelihood		√	
	• Introduction of productive livestock and improvement of indigenous varieties		√	
	• Local anti poaching unit development/security force set up		√	
	• Promote local level cooperation among stakeholders and producers/collectors		√	
4	***In- situ* conservation (Natural site conservation)**			
	• Identify the critical linkages for conservation and define conservation area boundaries and site reservation using land use maps for species conservation with designing buffer zone to reduce pressures.		√	√
	• Restoration & rehabilitation of critical habitats and linkages through peoples participation		√	√
	• Promote natural regeneration and enrichment planting and propagation		√	√
	• Identify and promote land use options to provide habitat connectivity that will let the species dispersal even at transboundary levels.		√	√
	• Protect and acknowledge indigenous traditional knowledge and implement		√	√
	• Empower and promote local communities in biodiversity management programs	√	√	√
	• Identify the specific threats of the priority species and landscapes	√	√	
	• Control irrational exploitation and emphasis given to rotational harvesting systems	√	√	
	• Control alien species and fire		√	
5	***Ex situ* conservation**			
	• Cultivation in community forests and common pool resources	√	√	
	• Nursery development & private farming	√	√	
	• Scientific plantation, afforestation & reforestation		√	√
	• Seed banking & demonstration plots			√
	• Information centers		√	
6	**Livelihood upliftment**			
	• Alternative income generation activities		√	√
	• Agro and community based tourism and ecotourism		√	√
7	**Research & Development**			
	• Develop and implement inventory programs and protocols including open access databases.	√	√	√
	• Participatory action research		√	√
	• A comprehensive database is essential to monitor the status of biological diversity and livelihood of local people		√	√
	• Publication and dissemination		√	√
8	**Introduction/promotion of alternative energy technology**			
	• Minimize fuel wood pressure by providing alternative energy sources (solar panel, improved cooking stoves, bio briquettes etc)	√	√	√
	• Alternative source of Timber	√	√	√
	• Transfer scientific technologies at farmer level for sustainable management and production		√	√
9	**Institution building, networking, coordination, cooperation and mobilization**			
	• Gradual handover the resources to the local communities for wise use and conservation.		√	√
	• Strengthen existing organizations that can undertake and direct conservation efforts		√	√
	• Institutionalization and good governance mechanisms (accountable, responsible, transparent, participatory, equitable, record keeping etc.)		√	√
	• Proper delineate the community forest lands and handover to local community.	√	√	√
	• Liaise government and line agencies to have collaborative projects on sustainable biodiversity management and livelihood well being.			√
	• Networking and regular communication among staketakers and holders.	√	√	√
	• Transboundary cooperation and provide fora to discuss transboundary issues.			√
	• Set up national committees, regional and international commissions for trans-boundary conflict resolution			√
10	**Market linkage and entrepreneurship**			
	• Value addition and processing opportunities		√	√
	• Institutionalization and cooperative mechanism		√	√
11	**Community based participatory biodiversity monitoring**			
	• Biodiversity/ecosystem monitoring at multiple scales and time.		√	√
12	**Policy enactment, revision and advocacy**			
	• Formulate/amend policies and legislation for equitable benefit sharing, taxation, resource access, empowerment and good governance.			√
	• Agree on national, regional and international legislations on transboundary scales.		√	√
13	**Project leveraging and post management**			
	• Secure sustainable funding mechanism and collaborative efforts		√	√
	• Prepare a comprehensive exit and long term sustainability strategy in full consultation with concerned stakeholders and devise interventions to facilitate the transitional projects			√
	• Design project for post management of the project			√

Conservation of Plant Resources in Kanchenjunga-Singhalila Ridge, Eastern Nepal

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Abstract

The present paper entails the preliminary findings of the plant diversity inventory research conducted in the Nepal part of Lower Kanchenjunga Singhalila Ridge of the Eastern Himalayas, one of the global biodiversity hotspots. During three ecological expeditions (pre-monsoon, monsoon and post-monsoon) conducted from June-October 2007, plant specimens were collected without duplication and identified. The preliminary findings presented an account of 598 species of flowering plants representing 302 genera and 99 families. Over grazing and unsustainable harvesting have jeopardized the richness and diversity of plant species and their products of the area. The results presented here are considered to be a baseline data for synergistic conservation efforts and investments of all stakeholders working on biodiversity conservation sustainable livelihood.

Key words: Eastern Himalaya, inventory, plant specimens, species richness, conservation

Introduction

Biodiversity hotspots are areas that contain a superabundance of plant and animal species and are at the same time threatened by human activities (UNFPA, 2001). The Eastern Himalaya stands out as being one of the globally important sites representing the important hotspots of the South Asia. Eastern Himalaya has been included among Earth's biodiversity hotspots (Myers *et al*., 2000) and includes several Global 200 ecoregions (Olson and Dinerstein 1998), two endemic bird areas (Stattersfield *et al*., 1998), and several centers for plant diversity (WWF/IUCN, 1995). Kanchenjunga-Singhalila Complex, one of the five prioritized landscapes of the Eastern Himalayas, possesses globally significant populations of landscape species (CEPF, 2005). The complex stretches from Kanchenjunga Conservation Area (KCA) in Nepal, which is contiguous with Khanchendzonga Biosphere Reserve in Sikkim, India, to the forest patches in south and southwest of KCA in Ilam, Panchthar and Jhapa districts. Kanchenjunga Conservation Area along with its lowlands Panchthar, Ilam and Jhapa districts is floristically rich with over 2000 species of flowering plants (Shrestha and Ghimire, 1996) of which several are found to be endemic to the Himalayas. According to Shrestha and Joshi (1996) East Nepal is enriched with 27% endemic flora but more than 30% endemic flora is estimated. An account of 108 and 26 endemic flora is estimated respectively from East Nepal and Taplejung–Jhapa corridor.

Many reports on exhaustive research works on the flora of KCA were reported but none of the studies were from lower parts. The site's biodiversity in combination with the indigenous knowledge and traditional practices provides a great scope for research and development. However the biodiversity of the area is reported to be under etensive pressure beyond their resilience limits (CEPF, 2005). Knowledge on conservation status, population, species and accurate data on the distribution of threatened, rare, endemic and archaic species across sites and landscapes level is pre-requisite for defining conservation outcomes. Present study was therefore, attained to compile a comprehensive list of flowering plants along with their community and habitats characteristics. Understanding of plant richness and the composition of particular forests in relation to other, the effects of past impacts on the present status of the forest with surrounding land uses is required for conservation management of forest habitats and landscapes and for transboundary level conservation (Geldenhuys and Murray, 1993).

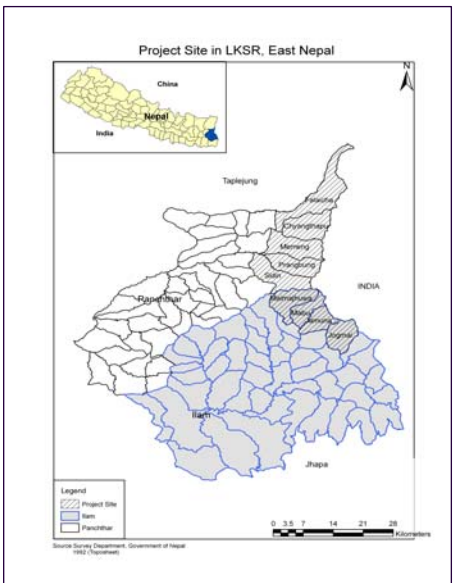
Materials and Methods

Dual method of both primary and secondary data and information collection was undertaken for study. Secondary information was collated from various published and unpublished literatures. Primary data and information were collected through both participatory rural approach and conventional ecological approach. Rapid appraisal, field observations, informal meetings and discussions were used for acquiring information of status, management characteristics of forests, vegetation and plant species. Two

village level participatory resource mappings, a bottom up approach in resource identification and conservation, were held in each district to derive the locals' perceptions on the plant resource availability and their status in the study area. Total three plant hunting expeditions (pre-monsoon: June, monsoon: August and post-monsoon: September and October, 2007) were executed for collecting all representative species voucher specimens. Concentration was also made during visits for updating status and management of forests and vegetation of study area.

Global positioning system (GPS - Garmin 2000-2002), Clinometer (Silva 15), soil tester (Takemura Ltd.), herbarium presses, corrugated sheets, blotters, tags, etc. were used in field for spot pressing and drying. Field notes, photos and GPS and soil data were maintained for each species records. Three sets of voucher specimens were collected and managed; and they were processed for housing in Royal Botanical Garden, Edinburgh, UK (E), National Herbarium and Plant Laboratories (KATH), Godawari, Kathmandu and Tribhuvan University Central Herbarium (TUCH), Kirtipur, Kathmandu. Ecological analysis and species identification process is still on going and it is being accomplished comparing with the deposited specimens of the herbaria. Species identified to date is presented herewith as preliminary findings.

Study area and objectives



Map 1: Project Sites in Lower Kanchenjunga-Singhalila Ridge, Eastern Nepal

The study area encompasses the Nepal part of Kangchenjunga-Singhalila Complex, one of the five prioritized landscapes of the Eastern Himalayas. Four village development committees (VDC) of Ilam viz. Maimajhuwa, Mabu, Jamuna and Jogmai and five VDCs of Panchthar viz. Falaincha, Chyangtharpu, Memeng, Prangbung and Sidin constituted the study area (Map 1). The VDCs were those bordering with India (Sikkim and/or Darjeeling) and are a vital part of the Eastern Himalayas biodiversity hotspot. Virtually all types of climates exist within the study area, from subtropical monsoon to alpine zones. Average annual precipitation in the area rounds 1774 mm (Shrestha and Ghimire, 1996). The study was carried out to prepare the inventory of the plant diversity of the area and develop the conservation strategy of the important species and their habitats.

Results

Forest types and vegetation

A total of 12 forest types (Table 1) were observed in the study area within the elevation range of 1900-4330m. The vegetations in the lower altitude include *Castanopsis tribuloides-C. hystirx* forest within elevation range of 1800-2000m. It was found in Hangetham, Jamuna associated with *Castanopsis hystrix*, *C. tribuloides*, *Eurya accuminata*, *Quercus* species, *Symplocos* species, *Daphniphyllum* species. Forest of *Lithocarpus pachyphylla*, an eastern endemic species, was observed in Phusrepokhari - Gupha - Goruaale, Chhintapu (Maimajhuwa), Dobate (Mabu), Hangetham Jamuna areas within the elevation of 2400-2800m. *Quercus semicarpifolia*, *Q. lamellosa*, *Litsea* species, *Lyonia ovaliflia*, *Viburnum* species, *Rhododendron* species etc. form the associated vegetation in the forest types.

Upper temperate mixed broad leaved forest comprising vegetation such as *Quercus semecarpifolia*, *Q. lamellosa*, *Symplocos* species, *Litsea* species, *Acer* species, *Lindera* species, *Rhododendron arboreum*, *Vaccinium nummularia*, *V. retosum* was observed in Hangetham (Jamuna), Chandane (Mabu), Manedhunga (Mabu) within elevation of 2400-3300m. Rhododendron forest consisting species of *Rhododendron arboreum*, *Eurya acuminata*, *Daphniphyllum himalense*, *Acer* species, *Lyonia* species was found in Goruaale, Dhupi, Chhintapu CF (Maimajhuwa), Mabu, Gorkhepani (Memeng). *Rhododendron* spp. was found associated with *Betula utilis* in Tarsing Sidin

giving different type of forest i.e. *Rhododendron-Betula* forest around 2300-3300m. Forest of *Abies spectabilis* was observed in Lampokhari (Maimajhuwa), Pasibhanjyang (Prangbung), Tarsing (Sidin), Pahare Mechu (Falaincha) elevation ranging 3000-4000m. *Rhododendron lepidotum*, *R. anthopogon*, *R. setosum*, *Potentilla fructicosa*, *Iris clarkei* and other species *Primula* species, *Juniperus recurva* form the moist alpine scrub at 3000-4000m around Bikhepani, Phalaut, Memeng, Dund, Pahare Meghu, Ghumne-Falaincha while *Rhododendron lepidotum*, , *R. barbatum*, *Rosa sericea*, *Spirea arcuata*, *Berberis* species, *Potentilla* species formed the dry alpine scrub at an elevation of 3000-4500m around Toriphule, Chyangthapu. Alpine meadows composed of several species of cushion forming plants viz. *Rhododendron*, *Primula*, *Potentilla*, *Saxifraga*, *Rheum*, *Bistorta*, *Sassurea* was observed above Pahare Meghu, Ghumne and around Timbu Pokhari areas.

Species richness and diversity

The area is rich in plant biological diversity. We got an account of 598 plant species under 302 genera and 99 families so far and further taxonomic examination of species is in progress in Royal Botanical Garden Edinburgh (RBGE) UK. The database of ICIMOD documented 1027 plant species from KCA (ICIMOD undated). Among them 72 species were globally significant. In terms of species richness, Rosaceae, Asteraceae and Ericaceae were the most dominant families, represented by 38, 31 and 29 species respectively. It was followed by the Liliaceae (28 species), Lamiaceae (25 species) and Ranunculaceae (23 species) etc. *Rhododendron*, *Impatiens* and *Rubus* were dominant genera and each contributing 13, 12 and 11 species respectively. *Swertia*, *Berberis* and *Begonia* were also dominant and each possessed 9, 8, and 8 species respectively.

Table 1: Major forest types and associated species in the study area

SN	Forest types	Associated species	Elev. range(m)	Location
1	Lower temperate mixed broad-leaved forest	*Machillus odoratissima*, *Lindera* species, *Litsea* species	1500 - 2100	Dobate, Mabu, Ilam Memeng, Panchthar
2	*Castanopsis tribuloides-C. hystrix* forest	*Castanopsis hystrix*, *C. tribuloides*, *Eurya accuminata*, *Quercus* species	1800 - 2200	Hangetham, Jamuna Chyangthapu, Panchthar
3	*Quercus lamellosa* forest	*Quercus lamellosa*, *Q. semecarpifolia*, *Castanopsis tribuloides*, *Ilex dipyrena*	2000 - 2600	Gairibas khola, Jamona
4	*Quercus semicarpifolia* forest	*Quercus semicarpifolia*, *Abies spectabilis*, *Betula utilis*, *Lithocarpus pachyphylla*	2200 - 3000	Hangetham, Jamuna - Gairibas, Ramite, Jogmai – Ilam Memeng-Dabale, Panchthar
5	*Rhododendron* forest	*Rhodoenndron. arboreum*, *Eurya* species, *Daphniphyllum himalense*, *Acer* species, *Lyonia* species	2300 - 2800	Goruaale, Dhupi, Chhintapu CF Maimajhuwa, Mabu, Gorkhepani, Memeng
6	*Rhododendron-Betula* forest	*Rhododendron arboreum*, *Betula utilis*, *Acer caudatum*, *Abies spectabilis*	2300 - 3300	Tarsing, Sidin, Pahare meghu, Panchthar
7	*Lithocarpus pachyphylla* forest	*Lithocarpus pachyphylla*, *Quercus semicarpifolia*, *Q. lamellosa*, *Litsea* species, *Lyonia* species, *Viburnum* species	2400 - 2800	Phusrepokhari - Gupha - Goruaale, Chhintapu Maimajhuwa, Dobate Mabu, Hangetham Jamuna
8	Upper temperate mixed broad leaved forest	*Quercus semicarpifolia*, *Q. lamellosa*, *Symplocos* species, *Litsea* species, *Acer* species, *Lindera* species, *Rhodendron arboreum*, *Vaccinium nummularia*, *V. retosum*	2400 - 3300	Hangetham Jamuna, Chandane, Mabu Manedhunga, Mabu
9	*Abies spectabilis* forest	*Abies spectabilis*, *Betula utilis*, *Acer* species, *Rhododendron barbatum*, *Daphne bholua*	3000 - 4000	Lampokhari, Maimajhuwa, Pasibhanjyang, Prangbung Tarsing, Sidin, Pahare Mechu Falaincha
10	Moist alpine scrub	*Rhodendron. lepidotum*, *R. anthopogon*, *R. setosum*, *Iris clarkei*, *Potentilla fructicosa*, *Primula* species, *Juniperus recurva*	3000 - 4000	Bikhepani, Phalaut, Memeng, Dund, Pahare Meghu, Ghumne-Falaincha
11	Dry alpine scrub	*Rhodendron lepidotum*, *Rosa sericea*, *R. barbatum*, *Spirea arcuata*, *Berberis* species, *Potentilla* species	3000 - 4500	Toriphule, Chyangthapu
12	Alpine meadows	Several cushion forming plants, *Primula* species, *Potentilla* species, *Saxifraga* species, *Rheum* species, *Bistorta* species, *Saussurea* species	4000 - 5500	Above Pahare Meghu around Ghumne, Timbu Pokhari area (Falaincha, Panchthar)

Threats to the biodiversity

The ecotonal position (of several biogeographic realms) of the region is represented by several overlapping species of flora and fauna of individual realm (CEPF, 2005). The rugged and largely inaccessible landscape makes biological surveys in the region extremely difficult. The undulating mountains and deep gorges have annexed a repository of the endemic biological diversity to the Himalayas throughout. The poor state of the ecologically sensitive hotspot is resulted directly from growing population and their subsistence activities (UNFPA, 2001). The opulent biological diversity of the region is jeopardized from several anthropogenic activities. The biggest cause of the loss of biological diversity of the Himalayan region particularly of eastern Himalaya is logging & grazing by domestic stock, which is the profound second most important threats of the plant diversity (Hamilton and Hamilton, 2006). It has been reported that chronic form of disturbances are found in the Himalayas in which people exploit resources only in a small fraction in the form of grazing, looping, surface burning and litter removal at a time (Singh, 1998). The problem with the chronic form of forest is that plants or ecosystems often do not get recover adequately because the human onslaught no longer stops. The table 2 depicts the important threats identified in village level workshops for the conservation. Grazing and overexploitation were major threats of the area and similar observations were recorded by NCDC/ICIMOD (2005) and Chettri *et al*., (2005).

Conservation status and prioritized species and habitats

The area harbors several rare, endangered, endemic and archaic and ecologically and economically important plant species: *Michelia* species, *Rhododendron* species, *Rheum nobile*, *Saussurea* species, *Cinnamomum glauscescens*, *Swertia* species, *Taxus wallichiana*, *Schefflera* species, *Aconitum* species, *Juglans regia* are just few to name. Since the scientific identification process is still going on, more are expected. But the village level participatory resource mapping revealed the important species and habitats (based on locals' perceptions of economical, scientific, socio-cultural values) of the area and need special consideration. The species and habitats outcomes of the study (Table 3 & 4) is hoped to be helpful while designing and developing conservation strategies and implementing the conservation program. The prioritized species and habitats at village levels were put forward to district level workshops and sorted out more important ones with defining management and identifying criteria. Prioritized species varied in district level workshops and it is attributed due to participants from different district level organizations at management and policy levels and ethnic resource user groups. The species were prioritized with relevance to the livelihood, local economy and biodiversity, religious/cultural values, endemism, uniqueness, rarity and indigenous. The species of *Schefflera* and *Arundinaria* were emphasized on protecting for securing the harmony of plant-wildlife especially of Red Panda. *Rhododendron* and *Castanopsis* species were merited due to endemism and *Swertia*, *Juglans* and *Zanthoxylum* species were identified for their economic potential. The compiled and short listed species and habitats from district and village level consultations were discussed at national level workshop. The national experts on plant diversity and conservation put forward their views and idea over the short listed species and habitats and prioritized the species and habitats accordingly.

Table 2: Potential threats identified during the workshops and programs suggested to overtop the threats

Sn	Threats	Score	Programs needed to overtop the threats
1	Grazing	22	Grazing management
2	Public awareness	18	Deforestation control
3	Illegal collection, and poaching	14	Adoption of scientific knowledge on plant resource management
4	Fire	14	Control of illegal collection and poaching
5	Uncontrolled deforestation	12	Sustainable forest management and *in-situ* conservation
6	Soil erosion	9	Raise public awareness
7	Unscientific plantation	6	Fire management

Note: The score is based on the votes of the participants during participatory resource mappings in order of highest (22) to lowest (6)

Table 3a: Prioritized species of Ilam based on village level participatory workshops

SN	Prioritized Species	Scores
1	*Michelia kisopa* (Champ)	11
2	*Swertia chirayita* (Chirayito)	10
3	*Taxus wallichiana* (Loth salla)	9
4	*Schefflera* species (Bhalu chinde)	8
5	*Rhododendron* species (Chimal and Gurans)	7
6	*Castanopsis hystrix* (Patale katus)	6
7	*Cinnamomum glauscescens* (Malagiri)	5
8	*Aconitum* species (Seto Bikhma)	4
9	*Bergenia purpurascens* (Pakhanved)	3
10	*Arundinaria* species (Nigalo)	2
11	*Zanthoxylum* species (Timur)	1

Table 3b: Prioritized species of Panchthar based on village level participatory workshops

SN	Prioritized Species	Scores
1	*Michelia kisopa* (Champ)	11
2	*Taxus wallichiana* (Loth salla)	10
3	*Aconitum* species (Bikhma)	9
4	*Juglans regia* (Okhar)	8
5	*Rhododendron* species (Chimal and Gurans)	7
6	*Swertia chirayita* (Chirayito)	6
7	*Zanthoxylum* species (Siltimur)	5
8	*Castanopsis hystrix* (Patale katus)	4
9	*Schefflera* species (Bhalu chinde)	3
10	*Cardiocrinum giganteum* (Chameli)	2
11	*Cinnamomum glauscescens* (Malagiri)	1

Table 3c: Prioritized habitats based on village level participatory workshops in Ilam

SN	Prioritized Habitats/Sites	Scores
1	Hangetham, Jamuna	6
2	Sandakphu	5
3	Chintapu, Mai majhuwa	4
4	Kala pokhari, Mabu	3
5	Tumling, Jogmai	2
6	Todke Jharana (Mai majhuwa VDC)	1

Table 3d: Prioritized habitats based on village level participatory workshops in Panchthar

SN	Prioritized Habitats/Sites	Scores
1	Timbu pokhari, Falaincha	6
2	Mejartham-Chiwa Bhanjyang	5
3	Bhaise Pokhari – Jaljale-Surketham	4
4	Tinsimana-Gorkhepani-Fokte	3
5	Lam Pokhari-Suke Pokhari-Ose	2
6	Narelung – Thaplu	1

Community level prioritized habitats were representative habitats of the prioritized species. The habitats were ranged from mountain range pastures to wetlands, lakes, forests to ecotourism sites. The overall feedback of the local respondents and workshops participants revealed the conservation concerns of the local populace. Since acknowledging the concerns of local communities and plant biodiversity management institutions, we came to the conclusion that the following top ten species (Table 4) demands the greatest management concerns in Kanchenjunga-Singhalila ridge. Along with the prioritized species and habitats, endemic species and their habitats also seek simultaneous management interventions. The prioritized sites were species and habitat specific. Out of the prioritized sites, four sites of the Ilam district were community forest lands whereas the four sites of the Panchthar district were government managed lands. However the government managed lands were irrationally exploited and it was as no man's land because of the lack of government control.

Conclusion

As recognized biodiversity hotspots, the lower part of Kanchenjunga-Singalila Ridge (especially Ilam and Panchthar districts) of the Eastern Himalayas is rich in plant diversity and habitats. However the existing threats of the area imperiled the diversity and distribution of the plant species and jeopardized the productivity and sustainability of the plant products. Rampant grazing and unsustainable collection of forest products (fodder, fuelwood, timber and non-timber forest products) were mostly responsible for exacerbating the biodiversity of the ridge. A need of integrated conservation efforts and investments from all stakeholders working on conservation of biodiversity is imperative.

Acknowledgements

The authors would like to thank critical ecosystem partnership fund (CEPF/WWF) for providing the financial support to undertake the research. Thanks are also due to Mr Raj K Rai of Deep Jyoti Youth Club (DJYC, Panchthar) and Mr Yuba R PC of Shree High Altitude Herbs Growers Group (SHAHGG, Ilam) for assisting the field work. National Herbarium and Plant Laboratory (KATH), Godavari and Royal Botanical Garden, Edinburgh, UK are highly acknowledged for providing the facilities to identify and tally the collected specimens with the preserved/housed species.

Table 4: Prioritized plant species for conservation in Lower Kanchenjunga Singhalila Ridge, Eastern Nepal

SN	Name of Species	IUCN 1994	CITES 1973	GoN 2001	CAMP 2001	IPA 2007	Locally Thrd.	End.	Village Prior.	Dist. prior	ESON Prior.	Nat. prior.	Prior. score	Dist. (Hori & Vert)
1.	*Taxus wallichiana* Zucc. LOTH SALLA (Taxaceae)	-	+	+	En	+	+	-	+	+	+	+	9	ECW 2300-3400m
2.	*Michelia* and *Magnolia* species CHAAMP (Magnoliaceae)	E	-	+	Cr		+	-	+	+	+	+	8	EC 2000-2700m
3.	*Nardostachys grandiflora* DC. JATAMANSI (Valerianaceae)	R	-	+	V	+	+	-	-	+	+	+	8	ECW 3200-5000m
4.	*Aconitum ferox* Wall. ex Seringe and *A. spicatum* Stapf. BIKHMA (Ranunculaceae)	Ct	-	-	V	+	+	-	+	+	+	+	8	ECW 1800-4200m
5.	*Neopicrorhiza scrophulariiflora* (Pennell)Hong KUTKI (Scrophulariaceae)	V	+	+	V	+	+	-	-	-	+	+	8	ECW 3500-4800m
6.	*Swertia chirayita* (Roxb.ex Fleming) H.Karst CHIRAITO, TITE (Gentianaceae)	V	-	-	V	+	+	-	+	+	+	+	8	EC 1500-2500m
7.	*Dactylorhiza hatagirea* (D.Don)Soo. PANCHAUNLE (Orchidaceae)	-	+	+	En	+	+	-	-	-	+	+	7	ECW 2800-3960m
8.	*Rheum nobile* Hook. f. & Thomson and *R. australe* D.Don KYANJO/PADAMCHAL (Polygonaceae)	R	-	-	V	+	+	-	-	-	+	+	6	E 3200-4300m
9.	*Dioscorea* species GITHHA,	T	+	-	En	-	-	-	-	-	+	+	5	ECW 500-
10.	*Paris polyphylla* Sm. SATUWA, LALGEDI (Liliaceae)	V	-	-	V	+	+	-	-	-	+	-	5	EC 1800-3300m

GoN = Government of Nepal, CAMP = Conservation, Assessment and Management Planning, IPA = Important Plant Area, Thrd. = Threatened, End. = Endemic, Prior. = Priority, Dist. = District, Nat. = National experts priority, Hor. = Horizontal, Vert. = Vertical

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Plate 1: Landscape of the Kanchenjungha-Singhalila Complex, Panchthar, Nepal

Plate 2: An endangered plant, *Rheum nobile* (Kyanzo) at Timbupokhari, Panchthar 4340 m.

Plate 3: Herbarium preparation and data recording in field, Paharemeghu, Panchthar

Plate 4: Destruction of *Rhododendron* species (Chimal) due to illicit felling

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CRITICAL ECOSYSTEM PARTNERSHIP FUND

Eastern Himalayas Bulletin

A quarterly newsletter of the Critical Ecosystem Partnership Fund (CEPF) Issue 3, October 2007

Training on sustainable agriculture

Training on vegetable gardening © Kamal Rai / NCDC

A 5-day training on agriculture management was organized by the Namsaling Community Development Centre (NCDC) to train farmers on sustainable agriculture technology with special emphasis on commercial vegetable production management. 286 active farmers (165 men and 120 women) participated in the training which included concepts of soil improvement and conservation, ecological pest management, vermiculture and nursery management.

NCDC has been awarded a 2-year CEPF grant to work on conservation and alternative livelihood issues in eastern Nepal.

For more information
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Newspaper spreads environmental awareness

Kuensel, a leading English language daily in Bhutan, has been featuring environmental issues for a month. To make learning about the environment fun, the newspaper has introduced a regular quiz on the flora and fauna of Bhutan. Winners of the quiz receive books on the environment. The newspaper also includes thumbnail sketches of the parks and sanctuaries in the country.

Kuensel is the recipient of a 3-year CEPF grant for environmental advocacy in Bhutan.

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Training on biodiversity monitoring

Two trainings were organized in Mabu and Jamuna villages, in eastern Nepal, by the Ilam Cooperation Council (ICC) between 12th and 14th August, to build resource inventory skills of community forest users. Over 30 participants, representing user groups from 3 community forests, now have sufficient knowledge to act as key local contacts to monitor biodiversity and resource use in their forests. Methods of monitoring key species, richness and diversity of species, illegal trafficking, illicit harvesting, habitat destruction and encroachment of forest areas were discussed at the training.

ICC Ilam has been awarded a 2-year CEPF grant to strengthen civil society support for biodiversity conservation in eastern Nepal.

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Call for proposals – Save the Tiger Fund

The National Fish and Wildlife Foundation (NFWF) based in Washington D.C., U.S.A, requests the submission of proposals to the Save The Tiger Fund (STF). STF sponsors effective efforts to enable wild tigers to recover and flourish, while empowering local people to live in balance with natural resources and receive tangible benefits from conservation practices whenever possible.

STF is seeking projects in specific tiger conservation landscapes including the Terai Arc Landscape in India and Nepal. Successful proposals will consist of grants ranging from $20,000 to $150,000 operating on 1-3 year timeframes that have measurable outcomes related to stabilizing or increasing tiger populations in the targeted landscapes.

To apply, please fill out the on-line pre-proposal application form found at https://collective.nfwf.org/pre-proposal/Preproposal.php. The deadline for submission of pre-proposals is November 5th, 2007. Full proposals will be invited for on-line submission upon successful selection of pre-proposals by December 4th, 2007. The deadline for full proposals for STF projects is January 21st, 2008. The Foundation will inform applicants of their status in April 2008.

For more information
www.savethetigerfund.org

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Role of the national advisory committees

To ensure that the CEPF portfolios in Nepal, India and Bhutan are transparent and strategic, and that the CEPF investment reaches its target audiences, national advisory committees were created as a first step to selecting grantees.

National advisory committees review and approve letters of inquiry submitted by NGOs and Community-Based Organizations (CBO), in accordance with established criteria and procedures of CEPF, and provide necessary recommendations for technical review of pre-proposals and project proposals. The committees also participate in annual project reviews and when possible in the mid-term and final evaluations of projects. One of their roles is to co-ordinate conservation actions among organizations to prevent duplication.

Advisory committees are comprised of representatives from the government, NGOs and scientific institutions. Membership is by invitation from the Country Representative of WWF in co-ordination with the CEPF Regional Co-ordinator, and each member stays in office for 4 years. Members of the advisory committee serve on a voluntary basis and without financial compensation.

Second plant collection expedition in eastern Nepal

Saussurea gossypina

The Ethnobotanical Society of Nepal (ESON), on a recent 7-week expedition in the Panchthar district of Nepal, inventoried and collected over 600 plant samples. Plants from altitudes ranging from 1600 metres to 4400 metres were inventoried, and the team often worked in rough terrain and inclement weather. The team also held meetings with the local communities where villagers shared their knowledge about the uses of plants.

ESON has been awarded a one-year grant for indentifying plant biodiversity hotspots in eastern Nepal.

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How to apply for grants

To apply for a CEPF grant, all applicants must submit a Letter of Inquiry (LOI). Calls for LOIs are advertised on the websites www.panda.org/easternhimalayas/cepf and www.cepf.net, as well as in major national newspapers. Guidelines and format for developing LOIs are available on www.cepf.net.

Based on the letters of inquiry, decisions and awards of less than USD 20,000 will be made directly by the Regional Implementation Team in Bhutan, India and Nepal. For grants of more than USD 20,000, national advisory committees made up of experts in each of the three countries, along with the regional team and the grant review committee based at the CEPF Secretariat and WWF-US, will evaluate letters of inquiry. Organizations submitting promising projects will be invited to develop full proposals. These will be further evaluated to make final funding decisions.

The LOIs for potential projects should be based on the strategic directions and investment priorities as stated in the Ecosystem Profile of the Eastern Himalayas. This document can be downloaded from the Where We Work and Publications sections of www.cepf.net.

The Critical Ecosystem Partnership Fund (CEPF) is a global program that provides grants to nongovernmental organizations and other private sector partners to protect critical ecosystems. It is a joint program of Conservation International, l'Agence Française de Développement, the Global Environment Facility, the Government of Japan, the John D. and Catherine T. MacArthur Foundation, and the World Bank.

In the Eastern Himalayas region, WWF leads the regional team responsible for facilitating, coordinating and monitoring grants for CEPF-supported conservation projects.

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ESON Newsletter

ओषधिर्नामरुपाभ्यां जानते हाजपा वने । अविपाश्चैव गोपाश्च ये चान्ये वनवासिन ॥

(चरक संहिता सुत्रस्थान १-१२०, १०००-५०० ई. पू.)

Vol. **7**. No.**1** December 2007

Editorial

Since its inception, ESON is initiating to enhance public awareness on different issues related to indigenous knowledge, and trying to mobilise scientific knowledge and technology in the development of indigenous knowledge and economically important plants. With this objective and support from different funding agents, 2007 has been a very fruitful year for ESON.

ESON has successfully completed a project under the Allachy Award in Rasuwa district, which was granted by Plantlife International UK. This one-year long program was carried out in collaboration with two local community- based organisations. It mainly focused on the baseline research for *in situ* conservation of the threatened and endangered medicinal plants of the area. Similarly, capacity building of the local people through training and awareness programmes was the key activities.

ESON was also selected to carry out a project in the Kanchenjunga-Singalila Ridge of Ilam and Panchthar districts. The project was funded by the Critical Ecosystem Partnership Fund/WWF Nepal Program. The objectives of the project were to inventory and document the plant biodiversity and their associated habitats, identify and assess the rare, threatened, endemic and archaic plant species and their key habitats, and develop conservation strategies of the species and habitats through participatory and scientific approaches.

Both these projects have supported two M. Sc. students each for their dissertation. Several meetings and workshops, at the village and district level, field-based training to the field assistants and local communities have been carried out in both the projects. The projects have also strengthened the ESON documentation centre at ESON office, which is now a centre of learning for Nepali and foreign students.

We are thankful to all the sponsors, collaborators, local communities as well as governmental and non-governmental organizations for their commendable support and encouragement. At the same time we are anticipating support as well as feedback and suggestions from the like-minded experts, well-wishers and concerned organizations for achieving the national goals of biodiversity documentation and conservation involving local communities and organizations.

Editors: K K Shrestha, S Rajbhandary, and R M Kunwar

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ESON Forthcoming Events

District level ESON-CEPF workshops in February 20-22, 2008 (Falgun 8-10, 2064), Ilam and Panchthar.

National workshop, **"Identification and Conservation Strategies for the Rare and Threatened Plants of Kanchenjungha-Singalila Complex, Eastern Nepal"** in March 18, 2007 (Chaitra 5, 2064), Kathmandu, Nepal.

ESON Publications

1. Ethnobotany for Conservation and Community Development - KK Shrestha, PK Jha, P Shengji, A Rastogi, S Rajbhandary, M Joshi, 1998.
2. Ethnobotany of Nepal - KR Rajbhandari, 2001.
3. ESON Newsletter, Issue 1 (July 2001).
4. ESON Newsletter, Issue 1I (July 2002).
5. ESON Newsletter, Issue I1I (December 2003).
6. ESON Newsletter, Issue IV (December, 2004).
7. ESON Newsletter, Issue V (December, 2005).
8. ESON Newsletter, Issue VI (July, 2006).
9. Herbal drug and Pharmacognosy– S Rajbhandary and S Ranjitkar, 2006.
10. ESON Newsletter, Issue VII (December, 2007).

ESON Activities

Regional Workshop: "Identification and Conservation of Important Plant Areas for Medicinal Plants in the Himalayas".

A Regional Workshop was convened on 19-22nd September 2006, in Kathmandu which was jointly organised by the Ethnobotanical Society of Nepal (ESON) and Plantlife International, UK. The workshop was supported by Rufford Foundation, UK. Prof. Mangal Siddhi Manandhar (Honourable Minister, MoES) was the Chief Guest and Late Dr. Damodar P Parajuli, Act. Joint Secretary, MoFSC chaired the inaugural session. A book on "Herbal Drugs and Pharmacognosy: Monographs on Commercially Important Medicinal Plants of Nepal", authored by Ms. Sangeeta Rajbhandary and Mr. Sailesh Ranjitkar published by ESON was released. About 35 participants attended the workshop representing different organization. Two staff Ms. Elizabeth Radford (IPA Programme Manager) and Dr. Alan Hamilton (Manager, Plant Conservation and Livelihoods Programme) from Plantlife International, UK, participated in the program.

Inception Meeting in the District Headquarter Rasuwa (6th November 2006) and Informal Community Meeting at Chilime VDC (7th November 2006).

ESON with its collaborating partners Manekor Society Nepal (MSN), and Federation of Community Forest User Groups Nepal (FECOFUN) Rasuwa based organization, organised a one day inception meeting on "**Conservation and Sustainable Utilization of the Medicinal Plants of Rasuwa District**" at the district headquarter, Rasuwa. The meeting was participated by more than 35 persons representing 20 organizations including leading government and NGO/institutions of the district. Mr. Bharat Luitel, Act. Chief District Officer was the Chief Guest and the program was conducted under the chairmanship of Dr. Krishna K. Shrestha (President, ESON).

ESON organised an informal community meeting at Chilime VDC on 7th November 2007. The meeting was participated by 18 male and 17 female representing all the 16 Community Forest User Groups of Chilime VDC. The meeting was basically focused to develop one year plan to conduct under the Allachy Project at Rasuwa.

Critical Ecosystem Partnership Fund (CEPF) Project Inception Workshop in Ilam (18th March 2007).

Dr. Krishna K Shrestha (President ESON), Mr. Ram C Poudel (Executive member ESON) and Mr. Ripu M Kunwar participated in the CEPF Project inception workshops on 18th March 2007 organised by WWF Nepal at Ilam. Inception workshop and rapid field assessments were conducted in each district. The selection of two local collaborating community-based organizations: Shree High Altitude Herb Growers Group, Ilam and Deep Jyoti Youth Club, Panchthar was made. Two social mobilizers, one from each organization were recruited for field level work during the inception workshop.

Visit of Dr. Alan Hamilton and Mrs. Hamilton at ESON Office, and field visit to Rasuwa project site

Plantlife International Program Manager Dr. Alan Hamilton and Mrs. Hamilton visited ESON office as well as the field site (Rasuwa) for Allachy Grant from May 2-13, 2007. Dr. Alan Hamiton and his wife were accompanied by Allachy project Team Leader Dr. Krishna K Shrestha, Project Coordinator Mr. Ram C Poudel, MSN President Mr. Kaisang Tamang and FECOFUN District President Mr. Binod Poudel and two M. Sc. students Ms. Saroj Yadav and Mr. Kamal Humagain. During their visit, a half day workshop was organized in Syafrubesi on 10th May 2007 with the representatives of buffer zone management council of Langtang National Park. The workshop was participated by altogether 25 participants including the team members.

First CEPF Project fieldtrip in Ilam and Panchthar

First field trip for the CEPF project was carried out in June 4-21, 2007. Team members: KK Shrestha (Team Leader), RM Kunwar (Field Coordinator), NB Khatri, J Pandey (M. Sc. Students), K Humagain (Research Assistant), RK Rai (S. M., Panchthar), YR Poudel (S. M., Ilam); RC Poudel, B Adhikari, S Rajbhandary (Research Associates), participated the expedition carried out in seven VDCs along the Kanchenjunga-Singalila Ridge of Ilam and Panchthar districts. About 250 plant species and their voucher specimens were collected and managed. Total 14 permanent ecological research & monitoring plots were established and monthly data recording and monitoring mechanism was managed at community level.

ESON Health Camp at Gosainkunda Fair, (August 2007).

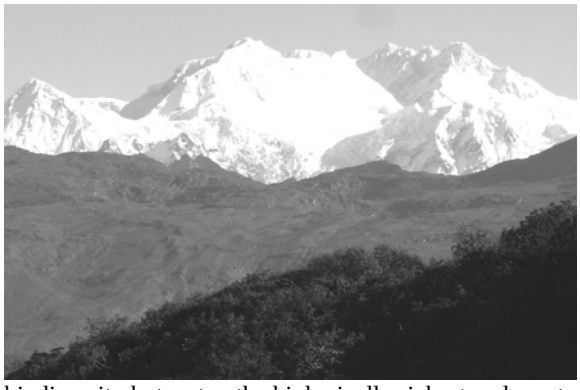
ESON organised "**Free Herbal Health Care Camp and Awareness Raising Campaign**" in August 25-29, 2007 during Gosainkunda Fair. Two free herbal health camps were conducted at the height of 3500m in Cholangpati and 4400m in Gosaikunda near the holy lake. Project Coordinator Mr. Ram C Poudel, Ms. Saroj Yadav, Mr. Kamal Humagain along with Ayurvedic doctors, Dr. Nalin N Tiwari, Kabiraj Ramesh Paneru, and Manekor members fully participated in the campaign. About 1000 pilgrims were served during the fair.

Second CEPF Project Fieldtrip in Ilam and Panchthar

Team members: Dr. KK Shrestha (Team Leader), RM Kunwar (Field Coordinator), NB Khatri, J Pandey (M. Sc. Students), MK Dhamala, K Humagain (Research Assistants), RK Rai (S.M., Panchthar), YR Poudel (S.M., Ilam); carried second field trip to the project site for 48 days (August/September). About 1200 plant specimens and their voucher specimens were collected and managed. A total of 122 primary/macro quadrate (plots) (50 in Ilam and 72 in Panchthar district), were laid within elevation 1900-4327m in all nine VDCs representing different resource management systems for ecological assessments of the site.

The Critical Ecosystem Partnership Fund (CEPF)

The Critical Ecosystem Partnership Fund (CEPF) was set up to provide strategic assistance to nongovernmental organizations, community groups and other civil society partners to help safeguard



biodiversity hotspots - the biologically richest and most threatened areas on Earth.

This is a joint initiative of Conservation International (CI), l'Agence Française de Développement, the Global Environment Facility (GEF), the Government of Japan, the MacArthur Foundation and the World Bank. A fundamental goal of the programme is ensure civil society is engaged in conserving the hotspots.

The Eastern Himalayas region

The Eastern Himalayas region spreading over Bhutan, northeastern India, and southern, central, and eastern Nepal, is home to 175 known terrestrial mammal species and over 500 bird species. This area is threatened by excessive collection of forest products, over-harvesting of trees for fuel, fodder and timber, and conversion of forests to agricultural land leading to habitat loss.

CEPF in the Eastern Himalayas

In partnership with WWF, CEPF aims to strengthen the role of nongovernmental groups, local communities and other sectors of civil society in biodiversity conservation and landscape restoration in the region. To achieve this aim, land management techniques to link existing protected areas and create reserve networks will be encouraged.

CEPF's strategy in the region is underpinned by conservation outcomes—targets against which the success of investment can be measured. These targets are defined at three levels: species (extinctions avoided), sites (areas protected), and landscapes (biodiversity conservation corridors created). As a result, CEPF investments in the Eastern Himalayas Region focus on 76 globally threatened species mostly found in 60 sites within five conservation landscapes.

How to apply for grants

To apply for a CEPF grant, all applicants must submit a Letter of Inquiry (LOI). Calls for LOIs are advertised on the websites www.panda.org/easternhimalayas/cepf and www.cepf.net, as well as in major national newspapers. Guidelines and format for developing LOIs are available on www.cepf.net. Based on the letters of inquiry, decisions and awards of less than USD 20,000 will be made directly by the Regional Implementation Team in Bhutan, India and Nepal. For grants of more than USD 20,000, national advisory committees made up of experts in each of the three countries, along with the regional team and the grant review committee based at the CEPF Secretariat and WWF-US, will evaluate letters of inquiry. Organizations submitting promising projects will be invited to develop full proposals. These will be further evaluated to make final funding decisions.

The LOIs for potential projects should be based on the strategic directions and investment priorities as stated in the Ecosystem Profile of the Eastern Himalayas. This document can be downloaded from the Where We Work and Publications sections of www.cepf.net.

Grantees in Nepal

USD 315,000 has so far been given out in grants to five NGOs working in eastern Nepal. The Ilam Co-operation Council's (ICC) project to strengthen civil society on corridor management, the Namsaling Community Development Centre's (NCDC) project on livelihood development, and the Ethnobotanical Society of Nepal's (ESON) inventory of plant biodiversity and development of conservation strategies for threatened species and habitats are funded by CEPF. The other two projects which have received CEPF grants are Bird Conservation Nepal's (BCN) work to develop civil society networks to conserve key avian biodiversity areas, and NGO Environmental Camps for Conservation Awareness' (ECCA) initiative to build partnerships at the grassroots level to incorporate conservation perspectives in managing forests outside protected areas.

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Ongoing Research Projects

Plant Biodiversity Inventory, Identification of Hotspots, and Conservation Strategies for Threatened Species and Habitats in Kanchenjunga-Singalila Ridge, Eastern Nepal

Project duration: 1st April, 2007 – 31st March, 2008

Sponsor: Critical Ecosystem Partnership Fund (CEPF), USA / WWF Nepal Program

Executant: ESON

Collaborators: Shree High Altitude Herb Growers Group, Ilam and Deep Jyoti Youth Club, Panchthar

Team members: KK Shrestha (Team Leader), RM Kunwar (Field Coordinator), NB Khatri, J Pandey (M. Sc. Students), MK Dhamala, K Humagain (Research Assistants), RK Rai (S.M., Panchthar), YR Poudel (S. M., Ilam); RC Poudel, B Adhikari, S Rajbhandary (Research Associates).

The Eastern Himalaya has been included among the Earth's biodiversity hotspots and it includes several centres for plant diversity. Kanchenjunga-Singalila Complex, one of the five prioritized landscapes of the Eastern Himalayas, possesses globally significant populations of landscape species. It is designed as one of the WWF 'Global 2000' eco-regions and is declared as a 'Gift to the Earth'. The complex stretches from Kanchenjunga Conservation Area (KCA) in Nepal, which is contiguous with Khanchendzonga Biosphere Reserve in Sikkim, India, to the forest patches in south and southwest of KCA in Ilam, Panchthar and Jhapa districts.

KCA along with its lowlands Panchthar, Ilam and Jhapa districts is floristically rich with over 2000 species of flowering plants of which, several are found to be endemic to the Himalayas. KCA, Upper Mai Valley Forest and Lower Mai Valley Forests are noteworthy for their species and diverse habitats. The lush biodiversity in combination with the indigenous knowledge and traditional practices of the areas provide a great scope of research and development at the site. However, the biodiversity and knowledge have been put into excessive pressure beyond their resilience limits.

In this regard, present project was attained to compile a comprehensive list of flowering plants and habitats, their conservation status and develop conservation strategies through participatory and scientific approaches. The project was feasible with due support from CEPF for inventorying the plant biodiversity, identifying the conservation status of the species and habitats and developing the participatory-scientific conservation strategies to manage the prioritized species and habitats. The objectives of the project were to inventory and document of plant biodiversity and their associated habitats, identify and assess the rare, threatened, endemic and archaic plant species and key habitats, and develop conservation strategies of the species and habitats through participatory and scientific approaches.

Study area: Falaincha, Chyangthapu, Memeng, Prangbung and Sidin VDCs of Panchthar district and Maimajhuwa, Mabu, Jogmai and Jamuna VDCs of Ilam district.

Methods: Literature/specimen review, two pre and post monsoon plant collection expeditions, species identification and herbarium management, etc. were means for inventorying. Community consultations, rapid field appraisals, and ecological quadrat samplings were used for diversity and species richness study. Capacity building trainings, conservation strategy workshops and expert consultation meetings were taken as tools for strategy development. Participatory biodiversity monitoring mechanism was designed for identifying the direct and underlying threats of the biodiversity.

Findings: Inception workshops and participatory resource mapping were done on 18th March 2007. Two social mobilizers, one from each collaborating organization were recruited for field level work during inception. Two pre and post monsoon expeditions (pre four weeks long and post seven weeks long) were carried out respectively in June and August-September, 2007.

On average, about 1430 plant specimens of flowering plants were collected and managed. Since the field spot identification, identification at ESON office and identification in National Herbarium (KATH), Godawari and Tribhuvan University Central Herbarium (TUCH), 786 specimens were identified. Further taxonomic identification

process is going on in Royal Botanical Garden Edinburgh, UK. To date, ten species of *Rubus*, six species of *Berberis*, six species of *Begonia* and five species of *Michelia* and *Magnolia* were identified. Endemic species *Ericoulon trisectiodes, Heracleum lallii, Tripterospermum nigrobaccatum*,etc.; threatened species: *Paris polyphylla, Rheum nobile*, etc were also identified. Of total specimens collected, 560 specimens have been submitted to KATH, Godawari, Nepal, 550 specimens to RBGE, UK and 400 specimens to TUCH, Tribhuvan University.

Species richness and diversity of the plants and habitats and soil of associated habitats were analysed. Rapid appraisal and quadrat method (transect method) were adopted along the trail for assessment. A total of 122 primary/macro quadrate (plots) (50 in Ilam and 72 in Panchthar district), 244 secondary/meso plots and 366 tertiary/micro plots were laid within elevation 1900-4327m in all nine VDCs representing different resource management systems. Two permanent plots in each VDC were set for participatory biodiversity monitoring. The monitoring was monthly scheduled and operated by social mobilizers. Week long training was made for mobilizers in Kathmandu to train them about taxonomy and harbarium. Two M. Sc. students were trained for taxonomic and inventorying study.

Plant biodiversity management trainings and community level plant biodiversity conservation strategy workshops were organized on 7-8 August, 2007 in Hangetham, Ilam and on 3-4 September, 2007 in Prangbung, Panchthar. A total of 90 participants were participated in the events. Each workshop incepted the 10 most important plant species, and sites, threats for plant biodiversity and management strategies.

One school level essay competition was organized in Memeng Lower Secondary School, Memeng on 1st Sept, 2007 with highlighting the importance of endemic, threatened and rare species. Two community forest user groups (Mahadev Kange CFUG, Jogmai -7, Ilam and Kanya Devi CFUG, Sidin-1, Panchthar) were selected for improvement of their operational plans. Based on the community level conservation strategy, threats, conservation priority of different organizations, and field observations, key 20 plant species were identified (Table 1).

Articles of the project were published in CEPF Eastern Himalayas Bulletin Dec. 10, 2007 www.cepf.net, in Nepali Times News Jan 05, 2008. www.nepalitimes.com and an article of the flora Kanchanjungha-Singalila Ridge is pipeline to publish in Nepal Journal of Plant Science Volume 2.

Challenges and lessons learned: Poaching, trapping, hunting and irrational exploitation were accounts due to free access, low level of community conservation awareness and absence of government inferences in the site. The traditional forest and land use system viz. KIPAT is a great challenge for conservation initiatives. Trans-boundary conflict was also a impediment to conservation initiatives. Decade long conflict over the resource utilization aggravated the resource management capacity of indigenous communities and institutions.

The area is a repository of biological resources specifically plant biodiversity along with diversity with respect to culture and indigenous knowledge. Some places viz. Timbu Pokhari, Chhintapu, Hangetham areas are exceptionally rich in rare, endangered, endemic and archaic floral species. *Sassurea species, Rheum nobile, Neopicrorhiza scrophulariiflora, Rhododendron anthopogon*, etc are flourishing around. These species and verdant areas are placed under added stress by anthropogenic activities importantly intense grazing by large herds of domestic livestock. Rampant collection and unsustainable harvesting of forest products including timber and non-timber forest products (NTFPs) are the chronic threats that contribute to the degradation of these sensitive ecosystems. The area is heavily doused and strong wind is common at the site. On the flip side, civil societies particularly the community forest user groups and some community based organizations have convincingly rich knowledge on biodiversity, conservation of important plant areas and they have successfully managed some sites enriched with medicinal and archaic plant species.

The needs of the locals must be addressed thereby respecting traditional rights over resources and resource use system. To guarantee their success, long term impact-oriented inclusive programs should be lunched in comprehensive and coordinated fashion.

Table1. Conservation priority plant species of Kanchenjunga-Singalila Ridge, Eastern Nepal

SN	Name of Species	Local name	IUCN 1994	CITES 1973	GoN 2001	CAMP 2001	IPA 2007	Locally threatened	Local priority	Observation, consultation & analysis	Priority score	Distribution
1.	*Neopicrorhiza scrophulariiflora* (Scrophulariaceae)	Kutki	V	+	+	V	+	+		+	7	3500-4800m, WCE
2.	*Taxus wallichiana* (Taxaceae)	Lot Salla		+	+	En	+	+	+	+	7	2300-3400m, WCE
3.	*Dactylorhiza hatagirea* (Orchidaceae)	Panchaunle		+	+	En	+	+		+	6	2800-3960m, WCE
4.	*Michelia* spp. (Magnoliaceae)	Rani Chap	E		+	Cr		+	+	+	6	2000-2500m, CE
5.	*Nardostachys grandiflora* (Valerianaceae)	Jatamansi	R		+	V	+	+		+	6	3200-5000m, WCE
6.	*Swertia chirayita* (Gentianaceae)	Chiraita, Tite	V			V	+	+	+	+	6	1500-2500m, CE
7.	*Aconitum spicatum* (Ranunculaceae)	Bikhma	Ct			V	+	+	+		5	1800-4200m, WCE
8.	*Paris polyphylla* (Liliaceae)	Satuwa, Lalgedi	V			V	+	+		+	5	1800-3300m, CE
9.	*Aconitum ferox* (Ranunculaceae)	Bikh	V			DD	+			+	4	2100-3800m, CE
10.	*Corydalis megacalyx* (Papaveraceae)	Bhutkeshi				En		+		+	4	3600-5500m, CE
11.	*Dioscorea deltoidea* and other species (Dioscoreaceae)	Bhyakur, Githa	T	+		En				+	4	450-3100m, WCE
12.	*Oroxylum indicum* (Bignoniaceae)	Tatelo	V			En	+	+			4	400-1400m, WCE
13.	*Rheum nobile, R. australe* (Polygonaceae)	Kyanjo	R			V	+	+		+	4	3200-4300m, E
14.	*Tetracentron sinense* (Tetracentraceae)	Kimbuk	R	+				+		+	4	2800-3200m, E
15.	*Castanopsis hystrix* (Fagaceae)	Patale Katus						+	+	+	4	1000-2500m, E
16.	*Asparagus racemosus* (Liliaceae)	Kurilo				V	+			+	3	600-2100m, CE
17.	*Rhododendron* spp. (Ericaceae)	Sunpati,Chimal						+	+	+	3	1500-5100m, WCE
18.	*Podophyllum hexandrum* (Berberidaceae)	Laghu Patra	V	+		V					3	3000-4500m, WCE
19.	*Rubia manjith* (Rubiaceae)	Majitho				V	+			+	3	1200-2100m, CE
20.	*Valeriana jatamansii* (Valerianaceae)	Sugandhawal			+	V	+				3	1500-3300m, WCE

Community-based Conservation and Sustainable Utilization of Potential Medicinal Plants in Rasuwa, Nepal Himalaya

Sponsor: Plantlife International, UK

Collabrators: Manekor Society Nepal (MSN), Rasuwa and Federation of Community Forest User Groups Nepal (FECOFUN), Rasuwa

Executant: ESON

Project Duration: September 1st, 2006 – August 31st, 2007.

Team members: KK Shrestha (Team Leader), RC Poudel (Project Coordinator), K Humagain and S Yadav (M. Sc. students), KS Tamang and B Poudel (Field Associates, Rasuwa), K Lama (Field Assistant); NN Tiwari, S Rajbhandary, I Shrestha (Research Associates)

ESON conducted a project on community based *in situ* conservation of medicinal plants in the Rasuwa district of Nepal Himalaya. This project is entirely a Community Participatory Action oriented program. For better effectiveness of the project activities, ESON selected two local organizations MSN and FECOFUN having tendency to work with the remote communities and strong community favour, relationships and sound prestige among local people. Each project activities were conducted in close collaboration with local authorities and related stakeholders of the project area with specific objectives:

- To find out the priority medicinal plants of local communities and understand local conservation efforts if any, along with their availability, distribution, regeneration, local use, trade and livelihood of the local people.
- Raise awareness among local communities on sustainable use and management of medicinal plants and encourage them to institutionalize their activities from a single common team (committee) for better communication, coordination and exchange of learning's on sustainable utilization, management and growing of medicinal herbs.
- Formation of medicinal plant management and monitoring team in the village.
- Building capacity of Community Forest User Groups in inventory and assessment of medicinal plants to develop habitat monitoring and annual sustainable harvesting plan.
- Based on the resolution of this first phase of study, develop community based *Action plan* for follow up project mainly *in situ* and *ex situ* conservation of medicinal plants.

From the beginning, the project was leaded by the communities of Chilime Village Development Committee (VDC) outside the National Park and Thulo syafru, inside Langtang National Park, so achievement so far made by the project is entirely the dedication of the field staffs and the local communities.

The first activity was by organizing the Inception meeting (6th November 2006) at the District headquarter on "Conservation and Sustainable utilization of the medicinal Plants of Rasuwa district". The meeting was participated by more than 35 persons representing 20 organizations including leading government and non government organizations/institutions of the district. Mr. Bharat Luitel, Act. Chief District Officer was the Chief Guest of the program and the program was conducted under the chairmanship of Dr. Krishna K Shrestha (President, ESON). The meeting concentrated on the following issues. 1. Identification and assessment of medicinal plants; 2.Ways of sustainable utilization of the medicinal plants; 3. Need and importance of participatory conservation of medicinal plants; and 4. Identify and minimize the challenges seen in the medicinal plant sector.

This was followed by more infomal community meeting organized at Chilime VDC. This meeting was participated by all the sixteen community forest representatives of Chilime VDC. In this meeting, they exchanged their

medicinal plants management practices and disscussed the challenges they were facing in the sustainable management and utilization of MAPs and at the end resource mapping of their respective community forest user groups was done.

After about three month long gap due to snow fall in the villages, one day, village level workshop was done in the Mangtang Village on 2nd February 2007, which provided very good opportunities for the forest users to decide what was to be done in future. The workshop was attended by more than 40 community forest users representing six community forests of Brapche, Mangtang, Tetangche,

Tatopani, Gongau and Paragaun villages. The workshop was also participated by local NGOs working in different sector of social services.

Langtang National Park is not only rich in biodiversity and high quality medicinal plant but also a unique assemblage of natural beauty, with many small glacier lakes above 4000m. Gosaikunda is one main lake having religious value which is visited annually by more than 50,000 Hindu and Buddhist pilgrims during the month of August in the full moon, and several species are in high threats from these pilgrims. Along the route of lake, collection of herbs during the fair time by the pilgrims is very common. Due to irrational collection most of the herbs are hardly seen along

the route. To raise awarness among the pilgrims and make the people more responsible for developing guardianship of the resources, "Free Herbal Health Care Camp and Awareness Raising Campaign" was organised in August 25-29, 2007.

"Two free herbal health camps" were conducted at the height of 3500m in Cholangpati and 4400m in Gosaikunda near the holy lake. Pilgrims having problems like altitude sickness, headache, leg pains were checked by the herbal doctors and prescribed herbal medicines. About 1000 pilgrims were served during the fair. The campaign was organized in close collaboration with Gosaikunda Management Committee, Nepal Army of Dhunche, Scout of Dhunche, and Nepal Red Cross Society, Dhunche. During this program, pamphlets with many useful information about altitude sickness and importance of biodiversity and herbs, were distributed to the pilgrims and attractive posters/banners were sticked/hangged along the route.

Apart from these activities, the research team of the project coducted series of ethnobotanical and ecological studies to assess the local uses and trade value of medicinal plants, their population dynamics and distribution pattern in the study areas. Each study was done based on widely used methodologies, the data were analysed and the result acquired was fitted to the successive activities of the project.

The field research was accomplished by a group of botanists including the Project Coordinator Mr. Ram C Poudel and two M. Sc. students namely, Mr. Kamal Humagain and Ms. Saroj Yadav for their partial fulfillment of Master degree course in the form of M. Sc. dissertation. During the survey the research team also encountered high trade of medicinal herbs in the Northern VDCs of Rasuwa district, harvested from the community forests as well as

illegal harvesting done from the national park. In this regard, series of meeting have been conducted by ESON with the national park authorities and have also supported the medicinal plants growers too. To address this issue, a half day workshop was organized in Syafrubesi on 10th May 2007 with the representatives of buffer zone management council of Langtang National Park. The workshop was participated by altoghether 25 participants including Plantlife International Program Manager Dr.

Alan Hamilton, ESON-Allachy project Team Leader Dr. Krishna K. Shrestha, Project Coordinator Mr. Ram C Poudel, MSN President Mr. Kaisang Tamang and FECOFUN District President Mr. Binod Poudel.

A monitoring team has also been formed within the 5 CFs of Mangtang, Tetangche, Simbu, Tatopani and Paragaun villages. In the meetings they updated the situation of medicinal plants in their CFs and worked for the existing problems following simple scientific tactices, a half day meeting on 10th May 2007 and one week (12-18 May, 2007) long field based training in the Kaltache Community Forest was conducted. In week long duration, community were trained in the major methods of inventory, handling simple measuring tools, herbarium preparation, plant identification, and developing annual harvesting plan.

ETHNOBOTANICAL SOCIETY OF NEPAL (ESON)

Ethnobotanical Society of Nepal (ESON) is a government registered, action oriented, non-political, non-religious, non-profit making, and non-governmental organization, committed to safeguard traditional knowledge regarding plant use, conservation and sustainable utilization through the co-ordination, promotion, and research activities.

ACTIVITIES

With an overall objective of documenting indigenous knowledge, ESON aims to achieve its objectives by:

- Promoting research activities through information exchange among plant scientists and institutions at national and international levels;
- Increasing public awareness on different issues related to indigenous knowledge and ensure Intellectual Property Rights;
- Organizing seminars, conferences, trainings, workshops, and exhibitions on issues related to economically important plants of Nepal;
- Publishing books, newsletter, and journal related to Ethnobotany;
- Mobilising scientific knowledge and technology especially for the development of indigenous knowledge, and economically important plants;
- Networking and co-ordination with NGOs/ Government organisations working at the grass roots level and other regional NGOs and INGOs at the international levels.

MEMBERSHIP

Honorary member: This is awarded to renowned scientists contributing in the field of ethnobotany during his/her career of not less than 20 years.

Ordinary member: An ordinary member is eligible if he/she holds a Master's degree in botany or an allied subject related to ethnobotany (*Registration fee*: NRs.100, and *Annual Fee*: NRs.100).

Life member: Any ordinary member is eligible to become a life member if he/she donates NRs. 2,000/- (Two thousands) to the society.

Associate member: Institutes, NGOs, societies, or other interested persons who deals directly with ethnobotany are entitled to become Associate members (*Fee*: NRs. 1,000).

Corporate member: Foreign institutions (including INGOs), international societies or foreign nationals dealing with ethnobotany are entitled to become Corporate members.

a. Student/ Researcher: US$ 50.
b. Professional: US$ 100.

SOCIETY'S FUND

The Society raises its funds from membership fees, donations and through the sale of the society's publications. Society could also raise fund from different national and international organisations for its various activities.

A discount of 40% in all publications of ESON will be given to Life members, and 20% to Corporate, Associate and Ordinary members of ESON.

Corresponding Address

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Annex 12.5 Swertia chirayita (Roxb. ex Fleming) Karsten

Scientific Name Swertia chirayita (Roxb. ex Fleming) Karsten
[Syn. Swertia chirata (Wall.) C.B. Clarke; Gentiana chirayita Roxb. ex Flem.]

Family Name Gentianaceae

English Name Chiretta

Vernacular Names Chirayita, Tite, (Nepali); Kirata tikta, Bhuinimba (Sanskrit); Chirayata (Hindi); Tento (Gurung); Sungkhingba (Limbu); Rauka (Magar); Timda (Tamang); Tig ta (Tibetan); Khalu (Newari)

Introduction

Swertia is known since centuries from historical epoch. It is often found to flourish well in the areas with high humidity, long monsoon period, well drained fertile humus sandy silty loam soil with ph 4.7 to 5.8. It is an erect annual/biannual herb, 60-125 cm tall with robust branching. Leaves simple, opposite, subsessile, about 10 cm long, 3 nerved broadly lanceolate, tip pointed. Flowers pale green tinged with purple in large panicles, each petal lobe having a pair of green glands. Fruits capsule 6 mm and ovoid. Whole plant is biter in taste.

Distribution and habitat

In Nepal, 30 species of Swertia have been reported (Press et al 2000) and among them some 13 species have one or more uses and 9 species are traded as a single brand name Chiraito. Most of the species are called Chiraito in Nepali. Among traded species of Swertia in Nepal, S chirayita accounts for 80% of the total trade volume and remaining 20% is covered by rest other species. Swertia is distributed in moist and forest opening areas in subtropical to temperate bio-climates between 1500 – 2500 m altitudes and common in eastern and central Nepal.

Flowering and fruiting

It starts flowering in July and flowering continues up to September.

Harvesting

Entire plant is useful in trade. Harvesting can be done after complete fruiting and seed dispersal.

Parts used

Whole plant parts are used for various purposes.

Indigenous use

The plant is tonic, stomachic, febrifuge, and laxative. A paste of the plant is applied to treat skin diseases such as eczema and pimples. It is also used in diarrhea and level problem.

Scientific use

It is an excellent drug for intermittent fever, skin diseases, intestinal worms, and bronchial asthma. It is prescribed in dyspepsia and debility of convalescence.

Chemical constituents

The following are the chemical constituents obtained in rhizomes, leaves, inflorescence and stems of Chirayita:

1) Chiratol, 2) Bellidifolin, 3) Methylswertinin, 4) Magniferin, 5) Swertianin, 6) Chiratinin, 7) Swettenol, 8) Episwertenol, 9) Kairatenol, 10) Gentiopicroside, 11) Gentianin, 12) Enicoflavine, 13) Amarogentin, 14) Ophelic acid, 15) Decussatin, 16) Friedelin, 17) Chiratogenin, etc.

Marketing information

Swertia is one of the traded species traded in large volume in India and abroad from Nepal as semi processed or raw forms. About 50 tons of Chiraito per annum is traded from Mechi zone.

Conservation status

- Ministry of Forests and Soil Conservation, Department of Plant Resources, Thapathali, Kathmandu has listed Chiraita under the national priority herb species for cultivation and conservation.
- Dabur Nepal has prioritized 19 medicinal plants for cultivation and it is one of those.
- IUCN Nepal and CAMP Nepal both listed Swertia under Vulnerable category for conservation.

Government royalty

According to the Forest Regulation 1995 Appendix 3, the royalty rate of Chiraita parts is NRs 3/kg.

Species specific conservation strategies of *Swertia chirayita*

- Generally it is collected from natural stocks. For collection from national forests, permission should be obtained from district forest office. The collection from community forests should be managed through community forest user groups (CFUGs) collection grant.
- Harvesting of plant parts is preferred to collect only after yellowing the plant and dispersal of seeds during the month of October to December.
- Conserving 20% of the field as a protected plot is important for seeding purpose.
- Possible farming particularly the commercial one alternative should be scoped. Farmers and private sectors industries should be promoted in farming through providing extensive extension materials and update information.
- It is imperative to do selective harvesting or rotational harvesting.
- Management of species through forest user groups should be preceded by including the species in CFUG operational plan. Collection grant should be given on the basis of species distribution and availability.
- Further research and studies should be initiated by governmental, non governmental and private sector organizations for promotion and commercial production.

Cultivation

Chiraito can be farming both in natural forest lands and agricultural lands. It can be farmed in lands by seed methods. Life cycle of Chiraito is about 2 years in general bit in the higher altitude it may take 2-5 years t mature. In August/September, when the plant begins to mature, the leaves become yellow and the seeds start to mature. For cultivation purpose, the mature seed should be collected during October/November.

The collected seeds can be directly sown in nursery beds or stored in cloth bags and sown as per necessary. It is very necessary to chill the seeds in water before sowing to the nursery or poly bags to increase the percentage of germination. One kg Chiraito contains about 35-40 thousands seeds. Seed germination starts from 16th day of seed sowing. .

Table 1. General conservation strategies of *Swertia chirayita*

SN	Conservation strategies	Short-term	Mid-term	Long-term
1	**Bottom-up approach planning**			
	• Develop conservation goal, vision and plan at multiple scales and time.	√		
	• Identify gap in knowledge of status and distribution of biodiversity and resources and activities.	√		
	• Identify the resource constraints and requirements that are needed to effectively implement the conservation actions.	√	√	
2	**Awareness /capacity building programs for cattle herders/community forest users focusing on sustainable harvesting**			
	• Refresh visits	√	√	
	• Trainings/workshops and human resource development to build capacity to undertake conservation actions.	√	√	
3	**Controlled grazing and resource management**			
	• Gradual removal of cow sheds with providing alternative means of livelihood		√	√
	• Introduction of productive livestock and improvement of indigenous varieties	√	√	√
	• Local anti poaching unit development/security force set up		√	√
	• Promote local level cooperation among stakeholders and producers/collectors		√	√
4	***In- situ* conservation (Natural site conservation)**			
	• Identify the critical linkages for conservation and define conservation area boundaries and site reservation using land use maps for species conservation with designing buffer zone to reduce pressures.		√	√
	• Restoration & rehabilitation of critical habitats and linkages through peoples participation		√	√
	• Promote natural regeneration and enrichment planting and propagation		√	√
	• Identify and promote land use options to provide habitat connectivity that will let the species dispersal even at transboundary levels.	√	√	√
	• Protect and acknowledge indigenous traditional knowledge and implement		√	√
	• Empower and promote local communities in conservation programs		√	√
	• Identify the specific threats of the priority species and landscapes	√	√	
	• Control irrational exploitation and emphasis given to rotational harvesting systems	√	√	
	• Control alien species and fire		√	√
5	***Ex situ* conservation**			
	• Cultivation in community forests and common pool resources	√	√	
	• Nursery development & private farming	√	√	
	• Scientific plantation, afforestation & reforestation	√	√	
	• Seed banking & demonstration plots		√	√
	• Information centers		√	√
6	**Livelihood upliftment**			
	• Alternative income generation activities		√	√
	• Agro and community based tourism and ecotourism		√	√
7	**Research & Development**			
	• Develop and implement inventory programs and protocols including open access databases.	√	√	
	• Participatory action research		√	√
	• A comprehensive database is essential to monitor the status of biological diversity and livelihood of local people		√	√
	• Publication and dissemination		√	√
8	**Introduction/promotion of alternative energy technology**			
	• Minimize fuel wood pressure by providing alternative energy sources (solar panel, improved cooking stoves, bio briquettes etc)		√	√
	• Transfer scientific technologies at farmer level for sustainable management and production			√
9	**Institution building, networking, coordination, cooperation and mobilization**			
	• Gradual handover the resources to the local communities for wise use and conservation.		√	√
	• Strengthen existing organizations that can undertake and direct conservation efforts		√	√
	• Institutionalization and good governance mechanisms (accountable, responsible, transparent, participatory, equitable, record keeping etc.)		√	√
	• Proper delineate the community forest lands and handover to local community.	√	√	
	• Liaise government and line agencies to have collaborative projects on sustainable biodiversity management and livelihood well being.			√
	• Networking and regular communication among staketakers and holders.		√	√
	• Transboundary cooperation and provide fora to discuss transboundary issues.			√
	• Set up national committees, regional and international commissions for trans-boundary conflict resolution		√	√
10	**Market linkage and entrepreneurship**			
	• Value addition and processing opportunities		√	√
	• Develop market linkage and entrepreneurship		√	√
	• Institutionalization and cooperative mechanism		√	√
	• Organic products and certification		√	√
11	**Community based participatory biodiversity monitoring**			
	• Biodiversity/ecosystem monitoring at multiple scales and time.		√	√
12	**Policy enactment, revision and advocacy**			
	• Formulate/amend policies and legislation for equitable benefit sharing, taxation, resource access, empowerment and good governance.			√
	• Agree on national, regional and international legislations on transboundary scales.			√
13	**Project leveraging and post management**			
	• Secure sustainable funding mechanism and collaborative efforts		√	√
	• Prepare a comprehensive exit and long term sustainability strategy in full consultation with concerned stakeholders and devise interventions to facilitate the transitional projects			√
	• Design project for post management of the project			√

Annex 12.6 Taxus wallichiana Zuccarini

Scientific Name	Taxus wallichiana Zuccarini
Family Name	Taxaceae
English Name	Common Yew
Vernacular Names	Loth salla, Bunge salla, Barma salla, Dhyangre salla, Jhirmisi, Kisim, Pate salla, Silangi, Thuner, Talispatra, Kando loto, Kangraito (Nepali); Salin (Gurung); La swan (Newari); Chyangsing (Sherpa); Sigi (Tamang); Talis parta (Hindi); Madhuparni, Talis (Sanskrit)

Introduction

It is evergreen much branched coniferous tree about 12-30 m height. Bark reddish brown, rough, exfoliating in irregular papery scales. Leaves short stalked, linear, flat curved, spine tipped, leathery and dark glossy green, 2-3.5 cm long and 3 mm broad. Fruits red fleshy, 8 mm in diameter. Seeds olive green and encircled by a fleshy red aril.

Distribution and habitat

Taxus is distributed in temperate Himalayas between 2200 – 3400 m altitudes. It prefers growing on exposed slopes In Nepal, it is distributed throughout the country i.e. from east to west Nepal. Its distribution is concentrated mainly in northern Himalaya around India, Nepal, and China. It has been reported from Humla, Jumla, Dolpa, Mugu, Taplejung, Tehrathum, Panchthar districts, etc. at above 2200 m altitude.

Flowering and fruiting

May – August

Parts used

Bark, leaves, wood

Indigenous use

The red and fleshy cup shaped aril that surrounds the seed is eaten by villagers. Juice of the leaves is given for cough and asthma. Leaves are sold in the trade as a cancer cure.

Scientific use

Taxol extracted from bark and leaves of this plant is used as anti-tumor agent and also to cure breast and uterine cancers. It is also used in asthma and bronchitis.

Chemical constituents

Baccatin, cephalomannine, taxol, hydroxybaccatin, taxinine, etc.

Conservation status

- Nepal Government, Ministry of Forests and Soil Conservation notification (2001) lets the collection of Taxus leaves and processing inside the country and allows exporting with processing.
- MoFSC, Department of Plant Resources, Thapathali, Kathmandu has listed the plant under the national priority species of medicinal herbs for cultivation and conservation.
- It is locally threatened.
- IUCN Nepal and CAMP (Conservation Assessment and Management Plan) Nepal have listed the plant under Endangered and Vulnerable respectively. CITES appendix II and Important Plant Area (IPA) have also prioritized the plant for conservation.
- Government taxes 25 Rs /kg for Taxus leaves trade.

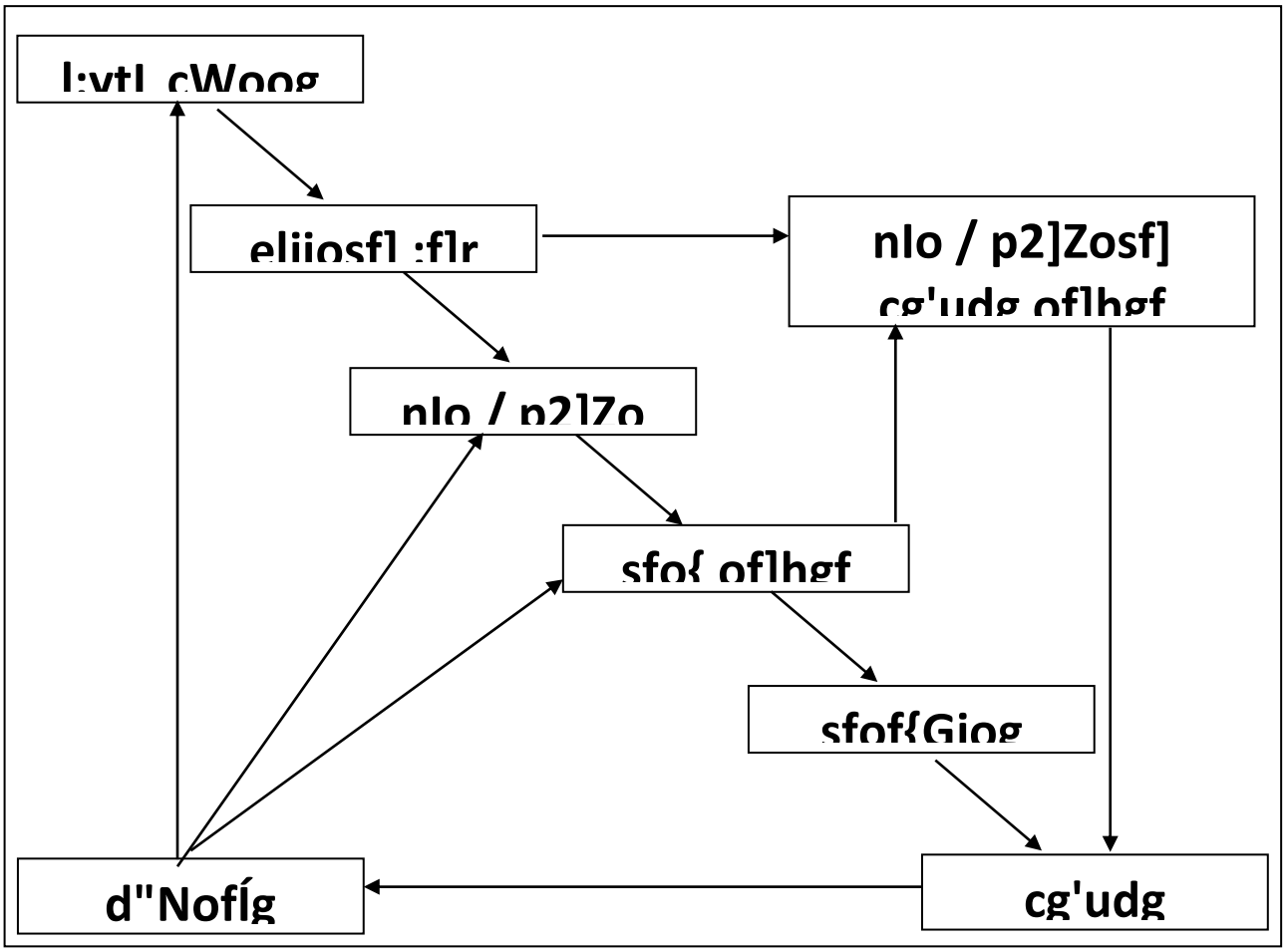
Species specific conservation strategies of *Taxus wallichiana*

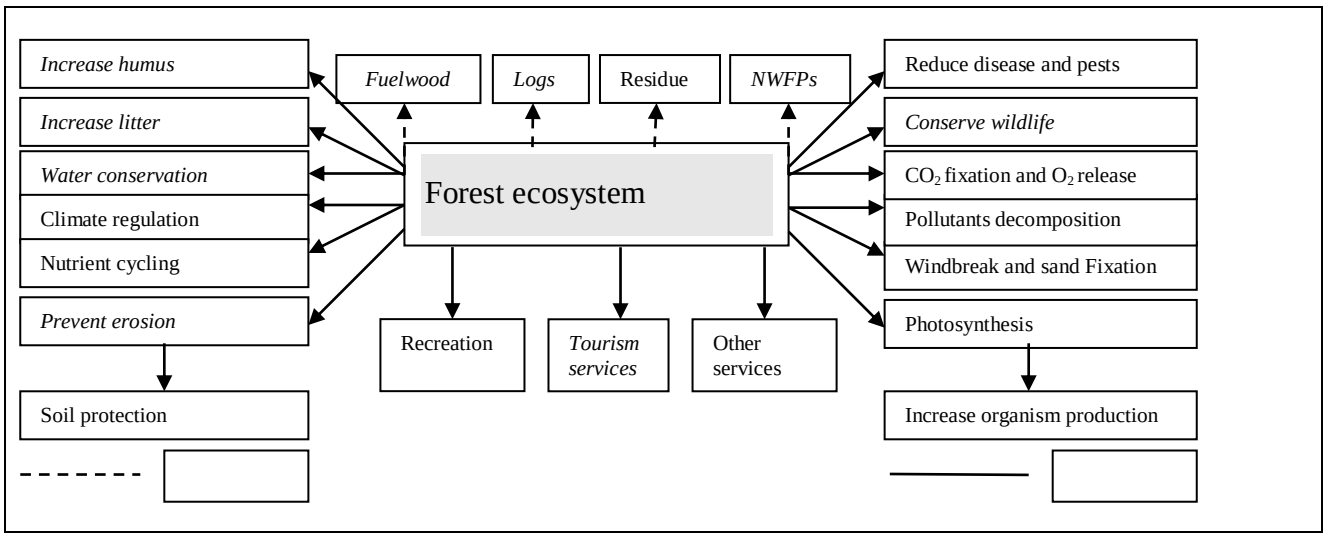
- Ex situ conservation can be done by seed and stem cutting.
- For cultivation purpose, seed collection can be done in November.
- Stem measuring 10 cm long and 2-3 cm round can be collected from matured plants before leaf budding in May June.
- Leaf collection is allowed at 2 years interval for sustainable production. So rotational leaf collection is one of the methods of sustainable management. It is permissible to collect from the matured trees of 20 cm or more in diameter and the lower one third crown leaves collection sis sustainable.
- Collection should be prohibited in rainy season and it is unsustainable to pluck the leaves from stem twigs i.e. the collection should control and prohibit from the 6.5 or more cm round branches.
- About 25% mature and old trees can be reserved as parent trees for regeneration and reproduction.
- It is slow growing tree 0.2 mm radius/year and its seed germination rate is very low 8% therefore special protection should be managed for this plant.

Table 1. General conservation strategies of *Taxus wallichina*

SN	Conservation strategies	Short-term	Mid-term	Long-term
1	**Bottom-up approach planning**			
	• Develop conservation goal, vision and plan at multiple scales and time.	√		
	• Identify gap in knowledge of status and distribution of biodiversity and resources and activities.	√		
	• Identify the resource constraints and requirements that are needed to effectively implement the conservation actions.	√	√	
2	**Awareness /capacity building programs for cattle herders/community forest users focusing on sustainable harvesting**			
	• Refresh visits	√	√	
	• Trainings/workshops and human resource development to build capacity to undertake conservation actions.	√	√	
3	**Controlled grazing and resource management**			
	• Gradual removal of cow sheds with providing alternative means of livelihood		√	
	• Local anti poaching unit development/security force set up		√	
	• Promote local level cooperation among stakeholders and producers/collectors		√	√
4	***In- situ* conservation (Natural site conservation)**			
	• Identify the critical linkages for conservation and define conservation area boundaries and site reservation using land use maps for species conservation with designing buffer zone to reduce pressures.		√	√
	• Restoration & rehabilitation of critical habitats and linkages through peoples participation		√	√
	• Promote natural regeneration and enrichment planting and propagation		√	√
	• Identify and promote land use options to provide habitat connectivity that will let the species dispersal even at transboundary levels.		√	√
	• Protect and acknowledge indigenous traditional knowledge and implement		√	√
	• Empower and promote local communities in biodiversity management programs		√	√
	• Identify the specific threats of the priority species and landscapes	√	√	√
	• Control irrational exploitation and emphasis given to rotational harvesting systems	√	√	√
	• Control alien species and fire	√	√	
5	***Ex situ* conservation**			
	• Cultivation in community forests and common pool resources	√	√	
	• Nursery development & private farming	√	√	
	• Scientific plantation, afforestation & reforestation		√	
	• Seed banking & demonstration plots			√
	• Information centers			√
6	**Livelihood upliftment**			
	• Alternative income generation activities		√	√
	• Agro and community based tourism and ecotourism		√	√
7	**Research & Development**			
	• Develop and implement inventory programs and protocols including open access databases.	√	√	
	• Participatory action research		√	√
	• A comprehensive database is essential to monitor the status of biological diversity and livelihood of local people	√	√	
	• Publication and dissemination		√	√
8	**Introduction/promotion of alternative energy technology**			
	• Minimize fuel wood pressure by providing alternative energy sources (solar panel, improved cooking stoves, bio briquettes etc)		√	√
	• Alternative source of Timber		√	√
	• Transfer scientific technologies at farmer level for sustainable management and production		√	√
9	**Institution building, networking, coordination, cooperation and mobilization**			
	• Gradual handover the resources to the local communities for wise use and conservation.		√	√
	• Strengthen existing organizations that can undertake and direct conservation efforts		√	√
	• Institutionalization and good governance mechanisms (accountable, responsible, transparent, participatory, equitable, record keeping etc.)		√	√
	• Proper delineate the community forest lands and handover to local community.	√	√	√
	• Liaise government and line agencies to have collaborative projects on sustainable biodiversity management and livelihood well being.			√
	• Networking and regular communication among staketakers and holders.		√	√
	• Transboundary cooperation and provide fora to discuss transboundary issues.			√
	• Set up national committees, regional and international commissions for trans-boundary conflict resolution		√	√
10	**Market linkage and entrepreneurship**			
	• Value addition and processing opportunities		√	√
	• Develop market linkage and entrepreneurship			√
	• Institutionalization and cooperative mechanism		√	√
	• Organic products and certification		√	√
11	**Community based participatory biodiversity monitoring**			
	• Biodiversity/ecosystem monitoring at multiple scales and time.		√	√
12	**Policy enactment, revision and advocacy**			
	• Formulate/amend policies and legislation for equitable benefit sharing, taxation, resource access, empowerment and good governance.			√
	• Agree on national, regional and international legislations on transboundary scales.		√	√
13	**Project leveraging and post management**			
	• Secure sustainable funding mechanism and collaborative efforts		√	√
	• Prepare a comprehensive exit and long term sustainability strategy in full consultation with concerned stakeholders and devise interventions to facilitate the transitional projects			√
	• Design project for post management of the project			√

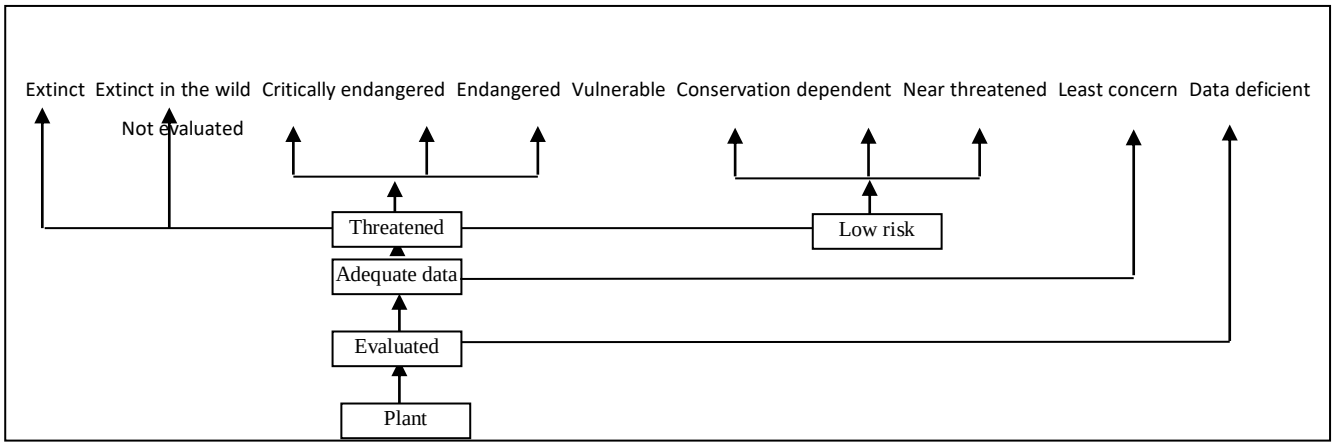
Annex 13. Training materials (selected)

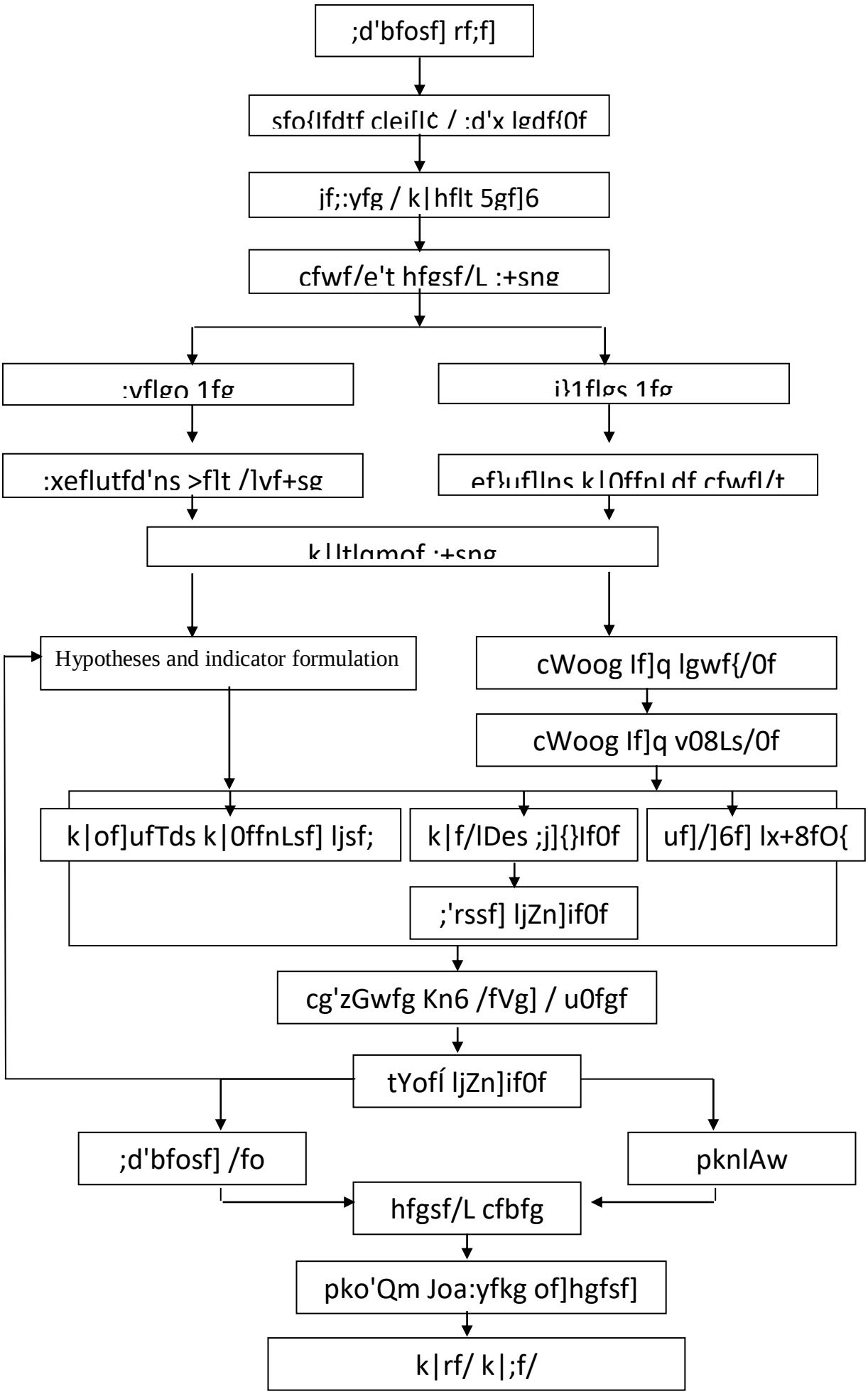




Criteria

Categories	Hotspots	IPA	ESON Priority area
Site with species richness	Site with species richness	Site with species richness	Site with species richness
Site with threatened species	Site with threatened species	Site with threatened species	Site with threatened species IUCN, CAMP, GON, CITES
Site with threatened habitat/vegetation type		Site with threatened habitat/vegetation type	Site with threatened habitat/vegetation type
Site with endemic species	Site with endemic species		Site with endemic species
			Socioeconomic and cultural importance
			Globally/Regional threatened species

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Hypotheses and indicator formulation
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Plant Biodiversity Inventory, Identification of Hotspots, and Conservation Strategies for Threatened Species and Habitats in Kanchenjunga-Singhalila Ridge, Eastern Nepal

Project duration: 1st April, 2007 – 31st March, 2008

Sponsor: Critical Ecosystem Partnership Fund (CEPF), USA / WWF Nepal Program

Executant: ESON

Collaborators: Shree High Altitude Herb Growers Group, Ilam and Deep Jyoti Youth Club, Panchthar

Team members: KK Shrestha (Team Leader), RM Kunwar (Field Coordinator), NB Khatri, J Pandey (M. Sc. Students), MK Dhamala, K Humagain (Research Assistants), RK Rai (S.M., Panchthar), YR Poudel (S. M., Ilam); RC Poudel, B Adhikari, S Rajbhandary (Research Associates)

The Eastern Himalaya has been included among the Earth's biodiversity hotspots and it includes several centres for plant diversity. Kanchenjunga-Singalila Complex, one of the five prioritized landscapes of the Eastern Himalayas, possesses globally significant populations of landscape species. It is designed as one of the WWF 'Global 2000' eco-regions and is declared as a 'Gift to the Earth'. The complex stretches from Kanchenjunga Conservation Area (KCA) in Nepal, which is contiguous with Khanchendzonga Biosphere Reserve in Sikkim, India, to the forest patches in south and southwest of KCA in Ilam, Panchthar and Jhapa districts.

KCA along with its lowlands Panchthar, Ilam and Jhapa districts is floristically rich with over 2000 species of flowering plants of which, several are found to be endemic to the Himalayas. KCA, Upper Mai Valley Forest and Lower Mai Valley Forests are noteworthy for their species and diverse habitats. The lush biodiversity in combination with the indigenous knowledge and traditional practices of the areas provide a great scope of research and development at the site. However, the biodiversity and knowledge have been put into excessive pressure beyond their resilience limits.

In this regard, present project was attained to compile a comprehensive list of flowering plants and habitats, their conservation status and develop conservation strategies through participatory and scientific approaches. The project was feasible with due support from CEPF for inventorying the plant biodiversity, identifying the conservation status of the species and habitats and developing the participatory-scientific conservation strategies to manage the prioritized species and habitats. The objectives of the project were to inventory and document of plant biodiversity and their associated habitats, identify and assess the rare, threatened, endemic and archaic plant species and key habitats, and develop conservation strategies of the species and habitats through participatory and scientific approaches.

Study area: Falaincha, Chyangthapu, Memeng, Prangbung and Sidin VDCs of Panchthar district and Maimajhuwa, Mabu, Jogmai and Jamuna VDCs of Ilam district.

Methods: Literature/specimen review, two pre and post monsoon plant collection expeditions, species identification

and herbarium management, etc. were means for inventorying. Community consultations, rapid field appraisals, and ecological quadrat samplings were used for diversity and species richness study. Capacity building trainings, conservation strategy workshops and expert consultation meetings were taken as tools for strategy development. Participatory biodiversity monitoring mechanism was designed for identifying the direct and underlying threats of the biodiversity.

Findings: Inception workshops and participatory resource mapping were done on 18th March 2007. Two social mobilizers, one from each collaborating organization were recruited for field level work during inception. Two pre and post monsoon expeditions (pre four weeks long and post seven weeks long) were carried out respectively in June and August-September, 2007.

On average, about 1430 plant specimens of flowering plants were collected and managed. Since the field spot identification, identification at ESON office and identification in National Herbarium (KATH), Godawari and Tribhuvan University Central Herbarium (TUCH), 786 species were identified from 904 specimens. Further taxonomic identification process is going on in Royal Botanical Garden Edinburgh, UK. To date, ten species of *Rubus*, six species of *Berberis*, six species of *Begonia* and five species of *Michelia* and *Magnolia* were identified. Endemic species *Ericoulon trisectiodes*, *Heracleum lallii*; threatened species: *Paris polyphylla*, *Rheum nobile*, etc were also identified.

The comprehensive list of flowering plants and their status was aimed at maintaining and updating CEPF species outcome. The inventory and ecological assessments updated the distribution and population dynamics and contributed in managing the species and habitats through providing information of conservation status. The analysis revealed that there were two new records of varieties for Nepal, 10 new records of species for Nepal and one new species to the World. The new species to the World was *Begonia* and it was collected from Prangbung, Panchthar district. New varieties were from *Asparagus* and *Carex* species and both were from Ilam district (Table 1). Of total specimens collected, 560 specimens have been submitted to KATH, Godawari, Nepal, 550 specimens to RBGE, UK and 400 specimens to TUCH, Tribhuvan University.

Species richness and diversity of the plants and habitats and soil of associated habitats were analysed. Rapid appraisal and quadrat method (transect method) were adopted along the trail for assessment. A total of 122 primary/macro quadrate (plots) (50 in Ilam and 72 in Panchthar district), 244 secondary/meso plots and 366 tertiary/micro plots were laid within elevation 1900-4327m in all nine VDCs representing different resource management systems. Two permanent plots in each VDC were set for participatory biodiversity monitoring. The monitoring was monthly scheduled and operated by social mobilizers. Week long training was made for mobilizers in Kathmandu to train them about taxonomy and harbarium. Two M. Sc. students were trained for taxonomic and inventorying study.

Plant biodiversity management trainings and community level plant biodiversity conservation strategy workshops were organized on 7-8 August, 2007 in Hangetham, Ilam and on 3-4 September, 2007 in Prangbung, Panchthar. A total of 90 participants were participated in the events. Each workshop incepted the 10 most important plant species, and sites, threats for plant biodiversity and management strategies.

One school level essay competition was organized in Memeng Lower Secondary School, Memeng on 1st Sept, 2007 with highlighting the importance of endemic, threatened and rare species. Two community forest user groups (Mahadev Kange CFUG, Jogmai -7, Ilam and Kanya Devi CFUG, Sidin-1, Panchthar) were selected for improvement of their operational plans. Based on the community level conservation strategy, threats, conservation priority of different organizations, and field observations, key 26 plant species were identified (Table 2).

Articles of the project were published in CEPF Eastern Himalayas Bulletin Dec. 10, 2007 www.cepf.net, in Nepali Times News Jan 05, 2008. www.nepalitimes.com and an article of the flora Kanchanjungha-Singalila Ridge is pipeline to publish in Nepal Journal of Plant Science Volume 2.

Table 1. New Record Species to Nepal from Lower Kanchenjungha Singhalila Ridge

SN	Call No.	Family	Species Name	Coll. date	Alt. (m)	Lat	Long	Locality	Remarks
1.	D 257	Umbelliferae	*Acronema ioniostyles* Farille & Lachard	09/29	2702	27 13 21	87 57 25	Dabale Deurali, Ilam	New variety to Nepal
2.	B 155 C 201	Liliaceae	*Asparagus filicinus* Buch.-Ham. ex D.Don. var. *lycopodineus* Bake	06/07 09/06	2245 2334	27.04 27 02 44	88.00 88 00 25	Jamuna 2, Ilam Jamuna-1, Ilam	New variety to Nepal
3.	B 157 B 163	Begoniaceae	*Begonia flaviflora* H. Hara	06/07	2245 2172	27.04	88.00	Jamuna 2, Hangetham, Ilam	New species to Nepal
4.	D 357	Begoniaceae	*Begonia panchtharensis* (sp.nov.)	10/02	2248	27 10 01	87 57 17	Prangbung, Panchthar	New to the World
5.	D 130	Poaceae	*Calamogrostis lahulensis* G. Singh	09/24	4337	27 26 11	88 03 16	Timbu Falaincha-9, Panchthar	New species to Nepal
6.	C 240	Cyperaceae	*Carex cruciata* Wahlenberg var. *argocarpa* C. B. Clarke	09/12	3210	27 18 45	88 01 22	Bie-Chitre, Jogmai-2, Ilam	New variety
7.	D 200	Fagaceae	*Castanopsis longispina* (King ex Hook.f.) C.C.Huang & Y.T.Zhang	09/27	1900	27 16 04	87 57 29	Falaincha-6, Tintine, Panchthar	New species to Nepal
8.	D 012	Juncaceae	*Juncus clarkei* Buchenau	09/19	3530	27 19 29	88 03 09	Chiwabhanjyang-Major, Panchthar	New species to Nepal
9.	D 013	Juncaceae	*Juncus khasiensis* Buchenau	09/19	3910	27 23 35	88 02 16	Chiwabhanjyang-Major, Panchthar	New species to Nepal
10.	A 006	Rosaceae	*Potentialla sundaica* (Blume) Kuntze	06/07	1903	27.06	87.94	Maimajuwa 7, Upper Hatiya, Ilam	New species to Nepal
11.	D 279	Rubiaceae	*Rubia hispidicaulis* Long	09/29	2450	27 04 21	87 59 29	Narelung CF, Memeng-3, Panchthar	New species to Nepal
12.	C 191	Acanthaceae	*Strobilanthes helicta* Anderson	09/05	2656	27 04 07	87 59 37	Dobate, Hangetham, Ilam	New species to Nepal
13.	D 099	Gentianaceae	*Swertia wardii* Marquand	09/23	3910	27 23 35	88 02 16	Paharemeghu, Falaincha-9, Panchthar	New species to Nepal

Table 2. Conservation priority plant species of Kanchenjunga-Singalila Ridge, Eastern Nepal

SN	Prioritized plant species of lower Kanchenjungha Singhalila Ridge	Priority score	Distribution (horiz & vert)
1.	*Taxus wallichiana* (Taxaceae) LOTH SALLA	10	ECW; 2300-3400m
2.	*Nardostachys grandiflora* (Valerianaceae) JATAMANSI	9	ECW; 3200-5000m
3.	*Aconitum ferox, A. spicatum* (Ranunculaceae) BIKHMA	9	ECW; 1800-4200m
4.	*Neopicrorhiza scrophulariiflora* (Scrophulariaceae) KUTKI	9	ECW; 3500-4800m
5.	*Swertia chirayita* (Gentianaceae) CHIRAITO, TITE	9	EC; 1500-2500m
6.	*Michelia* and *Magnolia* species (Magnoliaceae) CHAAMP	8	EC; 2000-2700m
7.	*Dactylorhiza hatagirea* (Orchidaceae) PANCHAUNLE	8	ECW; 2800-3960m
8.	*Rheum nobile, R. australe* (Polygonaceae) KYANJO	7	E; 3200-4300m
9.	*Dioscorea deltoidea* and other species (Dioscoreaceae) GITHHA, BHYAKUR	6	ECW; 500-3100m
10.	*Paris polyphylla* (Liliaceae) SATUWA, LALGEDI	5	EC; 1800-3300m
11.	*Cinnamomum glauscescens* (Lauraceae) MALAGIRI	5	ECW; 2000-2500m
12.	*Juglans regia* (Juglandaceae) OKHAR	5	ECW; 1200-2100m
13.	*Podophyllum hexandrum* (Berberidaceae) LAGHUPATRA	5	ECW; 3000-4500m
14.	*Castanopsis hystrix* (Fagaceae) PATALE KATUSH	4	E; 1000-2500m
15.	*Oroxylum indicum* (Bignoniaceae) TATELO	4	ECW; 400-1400m
16.	*Rhododendron* species (Ericaceae) SUNPATI, CHIMAL, GURANS	4	ECW; 1500-5100m
17.	*Schefflera impressa* (Araliaceae) BHALUCHINDE	4	EC; 2000-3400m
18.	*Asparagus racemosus* (Liliaceae) KURILO	4	EC; 600-2100m
19.	*Valeriana jatamansii* (Valerianaceae) SUGANDHWAL	4	ECW; 1500-3300m
20.	*Arundinaria* species (Poaceae) MALINGO & NIGALO	3	E; 1500-2000 m
21.	*Heracleum lallii* (Umbelliferae) CHIMPHING	3	ECW; 300-4400
22.	*Tetracentron sinense* (Tetracentraceae) KIMBUK	3	E; 2800-3200m
23.	*Rubia manjith* (Rubiaceae) MAJITHO	3	EC; 1200-2100m
24.	*Bergenia purpurascens/ B. ciliata* (Saxifragaceae) PAKHANVED	2	EC; 3800-4700m
25.	*Zanthoxylum* species (Rutaceae) TIMUR	2	ECW; 1100-2500m
26.	*Cardiocrinum giganteum* (Liliaceae) CHAMELI	1	ECW; 1800-3000m

Challenges and lessons learned: Poaching, trapping, hunting and irrational exploitation were accounts due to free access, low level of community conservation awareness and absence of government inferences in the site. The traditional forest and land use system viz. KIPAT is a great challenge for conservation initiatives. Trans-boundary conflict was also a impediment to conservation initiatives. Decade long conflict over the resource utilization aggravated the resource management capacity of indigenous communities and institutions.

The area is a repository of biological resources specifically plant biodiversity along with diversity with respect to culture and indigenous knowledge. Some places viz. Timbu Pokhari, Chhintapu, Hangetham areas are exceptionally rich in rare, endangered, endemic and archaic floral species. *Sassurea species, Rheum nobile, Neopicrorhiza scrophulariiflora, Rhododendron anthopogon*, etc are flourishing around. These species and verdant areas are placed under added stress by anthropogenic activities importantly intense grazing by large herds of domestic livestock. Rampant collection and unsustainable harvesting of forest products including timber and non-timber forest products (NTFPs) are the chronic threats that contribute to the degradation of these sensitive ecosystems. The area is heavily doused and strong wind is common at the site. On the flip side, civil societies particularly the community forest user groups and some community based organizations have convincingly rich knowledge on biodiversity, conservation of important plant areas and they have successfully managed some sites enriched with medicinal and archaic plant species.

The needs of the locals must be addressed thereby respecting traditional rights over resources and resource use system. To guarantee their success, long term impact-oriented inclusive programs should be lunched in comprehensive and coordinated fashion.

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For an updated online version of Press, J.R., Shrestha, K.K. & Sutton, D.A. (2000), Annotated Checklist of the Flowering Plants of Nepal (The Natural History Museum, London)

see http://www.efloras.org

Updates include the addition of species recently recorded from Nepal and the inclusion of vernacular names.

For further information on Nepal and its plants

see http://www.floraofnepal.org

ESON Publications

Nepalese Plant Database

Nepalese Plant Database Information Service Centre (NEPDISC) is a computer-based database, specifically designed to manage data on Flowering and Non-flowering plants of Nepal.

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ESON Projects

Plant Biodiversity Inventory, Identification of Hotspots and Conservation Strategies for Threatened Species and Habitats in Kanchanjunga-Singalila Ridge, Eastern Nepal

Supported by: Critical Ecosystem Partnership Fund (CEPF), USA/WWF Nepal
Local collaborators: Deep Jyoti Youth Club, Panchthar and Shree High Altitude Herbs Growers Group (SHAGG), Ilam.

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Community-based conservation and sustainable utilization of potential medicinal plants in Rasuwa, Nepal Himalaya

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