

# PHYTO-GEOGRAPHY OF NEPAL HIMALAYA

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## INTRODUCTION

The Himalaya chain consists of a complex system of nearly parallel range of tertiary mountains, which is about 40 million years old and is the youngest mountain in the world. It stretches over nearly 3,000 Km. almost from the border of Afghanistan in the West to the North of Burma in the East. The Himalayas are usually divided into four geographical divisions: 1. Assam Himalaya, 2. Nepal Himalaya, 3. Kumaon-Garhwal Himalaya 4. Punjab- Kashmir Himalaya. The Nepal Himalaya is about 900 Km. long from the River Kali in the west to the Tista river in the east (Mani; 1984:85). It is roughly a rectangular piece of land occupying one third of the Central Himalaya. It has 8 peaks above 8,000 m. in the altitude. The world's highest peak Mt. Everest also lies in the Nepal Himalaya.

Nepal, a small kingdom in the heart of the Asia, lies in the central sector of the Himalaya and has a rich flora within its boundaries which are about 150 Km. in breadth and 900 Km. in length. Some 6,500 species of seed plants are known to occur. The country extends from  $80^{\circ}15'$  to  $80^{\circ}10'$  E longitude and  $26^{\circ}20'$  and  $30^{\circ}10'$  N latitude. It lies on the "cross-road" of various bio-climatic regions of the Asia and it has been a "meeting place" for a number of floristic provinces, such as the Sino-Japanese, the Irano-Turanian, the Central Asiatic and South-East Asian and Indo-Malayan regions (Appendix 3, Fig 1). The topographical feature of Nepal with altitudinal variations from 60 m. at southern Terai to over 8000 m. towards the third pole of the Himalayas has a wide range of habitat which has more than 10 different bio-climatic zones (Dobremez; 1972). So its various sort of environmental factors have provided diverse habitat for beautiful and rich flora which is rather of a mix of two different floras of humid Eastern Himalaya and drier Western Himalayas. It is a paradise for naturalists. Thus Nepal is very rich in terms of biological species as compared to relatively small of 147,181 sq.Km.

## VEGETATION

The vegetation of Nepal has been divided by many workers into various phyto-geographical divisions. For the botanical purposes three divisions of Nepal has been proposed by Stearn (1960) and Banarjii (1963) corresponding to three big rivers systems; Karnali, Gandaki and Koshi. Swan and Laviton (1962) identified seven floristic zones based on moist habitats. Stainton (1972) described the vegetation of Nepal on the ground of ecology and vegetation composition under seven divisions

(Fig. 2). The vegetation of different sectors of Nepal has also been studied in detail by various workers, such as by Dobremez (1972) who divided the Nepal into 4 divisions, Bio-climatically he has identified twenty regions from humid tropical climate to the alpine and arid zone (Fig 3). Dobremez and Shakya (1975) studied the vegetation of East Nepal, Joshi et. al. (1975) in the Central Nepal and Dobremez and Shrestha (1976) in Western Nepal. In the same manner Japanese botanists Hara (1966, 71, 78, 79, & 82) Ohashi (1975) Ohba (1982, 86) etc. studied the detail floristic composition of East Nepal. A small country Nepal has almost all types of world vegetation squeezed in the peculiar topography of the country representing on the basis of altitude and with different types of climate.

A General picture of Nepalese flora and vegetation is out-lined as following.

### TROPICAL REGION

Terai, Bhabar, Dun valley and Outer foot hills lies below 1000 m. altitude and come under the tropical zone. It is their lower most regions of the country which is running parallel to the southern border with India. This region is hot during the summer with maximum temperature 45°C and minimum 0°C during the winter and annual average rainfall is 700-1000 mm. Natural vegetation consists of tropical semi-evergreen monsoon forest. It consists of many kinds of deciduous trees pre-dominant one being the "Sal" tree, *Shorea robusta*. The other species associated with Sal forest are *Adina cordifolia* (Karma), *Dillenia pentagyna* (Tatari), *Terminalia bellirica* (Barro), *T. chebula*, *T. myriocarpa* (Panisaj), *T. alata* (Asna), *Anogeissus latifolius* (Banki), *Lagerstroemia parviflora* (Hade), *Syzygium cumini* (Jamuna), *Schleichera oleosa* (Kumsum), *Lannea coromandelica* (Bara, dabdabi), *Bombax ceiba* (Simal), *Ehretia laevis* (Datingal), *Mallotus philippensis* (Sindhure), *Duabanga grandiflora* (Lampate), *Toona ciliata* (Toona), *Xylosma longifolium*, *Bauhinia malabarica*, *Careya arborea*, *Holarrhena pubescens*, (Indrajaw), etc. While *Dalbergia sissoo* (Sissom) and *Acacia catechu* (Khayer), pre-dominate the new alluvial and gravel terraces along rivers. Riverain forest includes *Albizia julibrissin* (Padke siris), *Cassia fistula* (Rajbrilshya), *Schleichera oleosa*, *Trewia nudiflora* (Gamari), etc. Some common shrubs and herbs of this zone are *Justicia adhatoda* (Asuro), *Butea minor* (Bhuletro), *Caesalpinia decapetata* (Arilekanda), *Clerodendrum viscosum* (Rajbali), *Colebrookea oppositifolia* (Dhusure), *Mimosa rubicaulis* (Boksighans), *Zizyphus mauritiana* etc. Some South Asiatic flora like *Cyathea spinulosa* (Chhatare unue), *Cycas pectinata* (Thakal), *Gnetum montanum*, *Podocarpous neriifolius* (Gunsi), etc are found in the Eastern part of the region and these species go on decreasing towards Western Nepal up to Central Nepal (Pokhara). These are becoming threatened and endangered from Nepal.

Some of the medicinal plants of this region are *Rauwolfia serpentina* (Sarpaganda), *Buxus orelana* (Sindhur), *Papaver somniferum* (Aphium), *Cyamopsis*

Some of the shrubs and herbs of this region are *Arisaema speciosum* (Sarpa ko makai), *Camellia kissi* (Chya pate), *Cassia mimosoides* *Justicia procumbens* (Phulphar), *Sarcococca coriacea* (Phitphiya), *Viburnum erubescens* (Bajrang), etc. Medicinal plants are *Mahonia napaulensis* (Jamane mandro), *Dioscorea bulbifera* (Gittha) *D. deltoidea* (Vyakur), *D. belophylla* (Tarul), *Sapindus mukorossi* (Rittha), *Datura stramonium* (Datura) *Justicia adhatoda* (Asuro), *Achyranthus aspera* (Apamarge), *Lyonia ovalifolia* (Angeri), *Holarrhena pubescens* (Indrajow), *Gelina arborea* (Kuamari) *Martynia annua* (Gridhankki), *Equisetum debile* (Kukure ghans), *Cinnamomum tamala* (Tejpat), *C.zeylanicum* (Dalchini), *Elaeocarpus sphaericus* (Rudrakshya), *Jatropha curcas* (Sajibani), *Sida rhombifolia* (Sano chillya) *Breynia retusa* (Sano nundhiki), *Piper longum* (pipla), *Viscum articulatum* (Hadchur), *Dendrophthoe falcata* (Ajeru), *Euodia fraxinifolia* (Kanukpa) etc.

In this region the Bamboos are the principle component of the grass land such as *Dendrocalamus hamiltonii* (Tama bans), *Eulaliopsis binata* (Babiyo), *Pennisetum polystachion* (Dina nath ghans), *Saccharum bengalense* (Munj), *S.spontaneum* (Kans) etc.

In Western Nepal, the sub-tropical zone is not so extensive nor is the so rich in the flora. Here the upper limit of the zone is at about 1400 m. The top canopy of the forest is composed exclusively of *Pinus roxburghii* with poor representation of ground vegetation. However some shrubs and herbs are *Inula cappa* (Kanpate), *Phyllanthus amarus*, *Wendlandia coriacea* (Dhaiyaro), are scarcely found. In the deep galleys in the pine forest a few *Quercus semecarpifolia* (Kharsu) trees with certain quantities of *Rhododendron*, *Lyonia ovalifolia* (Anjir), usually occur. Other shrubs and herbs species associated are *Buddleja paniculata*, *Gaultheria fragrantissima* (Dhasingare), *Jasminum officinale* (Lahare jai), *Reinwardtia indica* (Pyauli) etc.

### **TEMPERATE REGION**

Above the Sub-tropical zone lies the temperate zone, which extends upwards to tree-line. The altitude of the tree-line is much influenced by various aspects such as rainfall and the hand of man. This zone includes principally the Mahabharat range which lies almost parallel and north to south hills from east to west. This region falls at an altitude of 2000-3000 m. and represented by a cool and humid climate. Summer is moderately hot and winter very cold with average annual rainfall 1500-2700 mm. and snow fall is comparatively more. The lower part of temperate zone is largely under cultivation, but higher up there are extensive forest of evergreen oak, *Rhododendrons*, and Laurels are common in the Eastern and Central Nepal, where as Western Nepal is dominated by evergreen coniferous and deciduous mixed forest. It is this zone a heavy interaction between man, mountains and vegetation is under a heavy going. Human habitation and cultivation of crops usually stops at 2000 m. on the south of the main

*tetragondoba* (Gaur gum), *Acorus calamus* (Bojho), *Catharanthus roseus* (Barhamase), *Solanum diffusum* (Kantakari), *Semecarpus anacardium* (Bhalaya), *Hemidesmus indicus* (Ananta mul), *Clitoria ternatea* (Aparajita), *Calotropis gigantea* (Ank), *Vetiveria zizanioides* (Khas), *Tinospora cordifolia* (Gurjo), *Operculina turpethum* (Nishotha), *Azadirachta indica* (Neem) *Butea monosperma*, *Mussaenda frondosa* (Asari), *Mucuna nigricans* (Kauso) *Eulophia campestris* (Halti paile) *Antidesma bunius* (Himal cheri) *Commelina benghalensis* (Ban kane), *Curcuma angustifolia* (Barkhe sarro), *Leea macrophylla* (Bulevettra), *Argyreia nervosa* (Sumundra phool), *Acacia rugata* (Sikakai), *Floscopa hamiltonii* (Sim kane ghans), *Utricularia bifida* (Sim ghans), *Cassia fistula* (Rajbrikshya) etc.

Although most of the land has come under cultivation in this region cash crops cultivated are *Saccharum officinarum* (Ukhu), *Nicotiana tabacum* (Surti), *Corchorus capsularis* (Jute) *Thea sinesis* (Chiya).

### SUBTROPICAL REGION

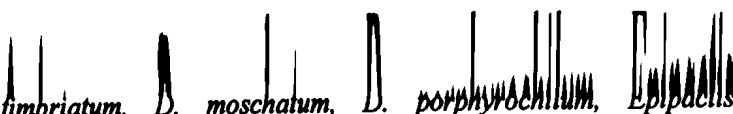
The midlands of Nepal lying between the crest of the Himalayas and the Mahabharat range consist of hills and mountains with valleys, gorges and terraces. Before malaria was eradicated from the tropical region, the midlands were the main homeland for nepalese people. Most of the midlands comes under sub-tropical and temperate zone. The altitudinal range for sub-tropical zone lies between 1000 m. and 2100 m. and having hot summer of maximum temperature 27°C and moderately cold winter. The average annual rainfall is 1000-2000 mm. In this region the leafless forest is most prominent in the spring. The dominant trees is *Schima -Castanopsis* (Chilaune-Katush) forest are *Schima wallichii* (Chilaune), *Castanopsis indica* (Katush), in the lower belt while *C.tribuloides* (Musure Katus) replace *C.indica* in the upper belts in the Central and Eastern Nepal. While in the Western Nepal this zone is characterized by the occurrence of *Pinus roxburghii* (Chir pine) forest. Other trees species associated with this zone are *Alnus nepalensis* (Utis), *Anthocephalus chinensis* (Kadam), *Toona ciliata* (Tooni), *Engelhardia spicata* (Mauwa), *Erythrina arborescens* (Theki Kath), *Juglans regia* (Okhar), *Ficus semicordifolia*, *Ilex excelsa* (Puwale), *Lithocarpus elegans* (Arkaule), *Macaranga denticulata*, *Michelia champaca* (Champ), *Rhododendron arborium* (Lali guras), *Saurauia napaulensis* (Gogan), etc. To-day the sub-tropical region of Nepal is perhaps a unique site for demonstrating example of deforestation, land slides, a and soil erosion. A large number of valuable plants are already threatened to extinction and many more are facing a precarious existence some of the finest plants like *Michelia champaca*, *M. velutina* (Sunachamp), *Talauma hodgsonii*, *Prunus carmesina*, are and number of epiphytic and terrestrial orchids and ferns have already become very rare.

Himalayan range. Thus virgin forest with large number of indigenous plants are to be seen only beyond 2400 m.. It is the zone of distinct evergreen coniferous forest and deciduous mixed forest. Laurels and evergreen oak forest are found in the lower parts of this zone. Which is associated with *Acer oblongum* (Phiphire), *Alnus nepaulensis* (Utis), *Betula alnoides* (Paiya), *Castanopsis tribuloides*, *C. hystrix*, *Cinnamomum tamala*, *Daphniphyllum himalense* (Rakchan), *Ilex dipyrena*, *Lindera bifaia*, *Litsea oblonga* (Pahenli), *Persea duthiei*, *Michelia kisopa*, *Phoebe lanceolata* etc.

Mixed broad-leaved deciduous forest in the upper temperate zone has *Acer campbellii* (Yaarla), *Corylus ferox*, *Magnolia campbellii* (Ranichamp), *Osmanthus suavis* (Siling) etc and are they the typical species of this zone growing mostly on the north and west facing slopes of the Himalaya range. The other trees of this zone are *Acer thomsonii*, *Betula alnoides*, *Euonymus tingens* (Kasuri), *Lidiera pulcherrima* (Phusure), *Litsea doshia*, *Populus ciliata* (Bange kath) and *Prunus cornuta* (Arupate), *Tsuga dumosa* and *Quercus lamellosa* (Phalat) also often present in this forest. The broad-leaved forest region also shows the pre-dominance of *Rhododendron falconeri* (Koringa), *R. fulgens*, *R. grande* (Patukorlinga), *R. hodgsonii* are distributed in the Eastern side in Nepal. Similarly Western Himalaya elements like *Cedrus deodara* (Deodar), *Pinus wallichiana* (Gobre salla), are an importance constituent and succeeds in the above region by *Cupressus torulosa* (Raj sallo), *Picea smithiana* (Thule sallo), *Juglans regia*, *Aesculus indica* (Karu), are common in the western side of the country. The other associated trees are *Abies pindrow*, *Acer cappadocicum*, *Corylus jacquemontii*, *Morus serrata*, and *Quercus floribunda*, *Ulmus wallichiana* which is one of the endangered species of Nepal.

The common shrubs and herbs associated with the Laurels evergreen oak and mixed broad-leaved deciduous forest are *Berberis aristata* (Chutro), *Boehmeria macrophylla*, *Daphne papyracea* (Bhulu), *Holboellia latifolia* (Guphala) *Lyonia ovalifolia* (Anjir), *Mohania napaulensis*, *Piptanthus nepalensis*, *Schisandra grandiflora* (Singato) and *Arundinaria aristata* (Malingo). They come up whenever the forest is opened out. In the Western Nepal the ground vegetation has a very poor growth of shrubs and herbs due to the presence of evergreen coniferous forest. Some of the shrubs and herbs like *Berberis chitria*, *Clematis montana*, *Deutzia compacta*, *Leycesteria formosa*, *Rosa sericea*, *Sorbaria tomentosa*, etc are found in Western Nepal.

The temperate region of Nepal Himalayas is the home land of orchids. There are more than 300 species, which is both epiphytic and terrestrial habits are *Aerides multiflora*, *Arundina graminifolia*, *Bulbophyllum dyerianum*, *B. hookeri*, *B. leopardinum*, *B. otogiossum*, *B. viridiflorum*, *Calanthe alpina*, *C. brevicornu*, *C. mannii*, *C. masuca*, *C. plantaginea*, *C. tricarinata*, *Coelogyne corymbosa*, *C. cristata*, *C. ochracea*, *Cymbidium iridiodes*, *Cephalanthera longifolia*, *Coeloglossum viride*, *Cryptochillus luteus*, *C. longifolium*, *Cypripedium cordigerum*, *Dendrobium amoenum*,



*D. densiflorum*, *D. fimbriatum*, *D. moschatum*, *D. porphyrochitum*, *Epipactis helleborine*, *Eria coronaria*, *E. excavata*, *E. amica*, *E. flava*, *E. paniculata*, *E. biflora*, *Kingidium taenialis*, *Pleione hookeriana*, *P. proecox*, *Rhyachostylis retusa*, *Satyrium nepalense*, *Vanda cristata*, *V. terres* etc.

Many medicinal plants are found in this region such as *Valeriana jatamansii* (Sugandhawal), *Nardostachys grandiflora* (jatamansi), *Bergenia ligulata* (Pakhanbed), *Dictylorhiza hatagirea* (Panch aungule), *Picrorhiza scrophulariiflora* (Kutki), *Asparagus racemosus* (Satabari), *Swetia angustifolia* (Chiraito), *Aconitum spicatum* (Bikh), *Dryopteris filix* (Unue), *cotoneaster affinis* (Kause phool), *Podophyllum hexandrum* (Laghu patre), *Rhododendron campanulatum* (Nilo chimal), *Lobelia pyramidalis* (Eklebir), *Lycopodium clavatum* (Nagbali), *Persicaria chinensis* (Kukur thotne), *Gnaphalium luteo-album* (Jyapughans), *Smailex macrophylla* (Kukurdaino), *Potentilla fulgens* (Bajradanti), *Valeriana hardwickii* (Nakali jatamansi), *Blainvillea acemella* (Lato ghans), *Symplocos paniculata* (Lodh), *Paris polyphylla* (Satuwa), *Zanthoxylum oxyphyllum* (Siltimur), *Picris hieracioides* (Ban dudhe), *Rubia cordifolia* (Manjitho) etc.

### SUBALPINE REGION

The slopes of the Himalayan region above 3000 m. to tree-line of about 4000 m. comes under the sub-alpine zone. This zone includes Inner and Outer Himalayas and Trans-Himalayan land in the North part of the country. The climate is extensively cold, dry, and windy. In this region is the most limiting factor for the growth of plants. This zone is perhaps the best ground for plant hunters and nature lovers. This zone is characterized by coniferous forest of *Abies spectabilis* at lower level and tree-line vegetation however consists of *Betula utilis* (Bhojpatra) and *Rhododendron cowanianum*, *R. grande*, *R. falconari* etc. The number of *Rhododendron* species is maximum up to 32 in the Eastern Nepal and their number goes on falling towards Central and Western Nepal. In the Western Nepal, midland *Acer acuminatum*, *Prunus cornuta*, *P. rufa*, *Picea smithiana*, *Sobrus cuspidata*, and *Taxus baccata* var *wallichii* (Dengre sallo) are associated. In this zone a large number of genera belonging to European flora are found. Some of the well known ones are *Aconitum*, *Anaphalis*, *Androsace*, *Corydalis*, *Gentiana*, *Meconopsis*, *Polygonum*, *Potentilla*, *Primula*, *Sassurea*, *Saxifraga* and so on. Among the shrubs and herbs most important ones are *Clematis barbellata*, *Cotoneaster acuminatus*, *Daphne bholua* (Kagat pate), *Euonymus porphyreus*, *Lonicera webbiana*, *Primula denticulata*, *Rhododendron barbatum* (Guras), *R. campanulatum*, *Ribes himalense*, *Rosa sericea*, *Salix bhutanensis*, *S. daltoniana*, *S. sikkimensis* etc.

In the Central and Western mid-land *Betula* forest lies at upper level of this zone and *Rhododendron campanulatum* is most associated with it. The other associated

species are *Acer pectinatum*, *Juniperus recurva*, *Lyonia villosa*, *Potentilla fruticosa* (Chiniya phool), *Rhododendron lepidotum* (Bhale sunpate), *Sobrus foliosa* etc. In the Western Nepal, this zone has a predominance of *Quercus semecarpifolia* on dry south facing slopes which is contrast to its paucity in Eastern Nepal.

Some of the medicinal plants of this zone are *Aconitum heterophyllum* (Atis), *A.bafourii* (Gobari), *Ephedra gerardiana* (Somlata), *Selium tenuifolium* (Bhutkesh) *Potentilla fruticosa* *Delphinium denudatum* (Nilo Bisk), *Anemone rivularis* (Ratanjot), *Rheum emodi* etc.

Some of the orchid flora is also distributed in sub-alpine region such as *Coeloglossum viride*, *Corallorhiza trifida*, *Cyperipedium elgans*, *C.himalaicum*, *Epipogium aphyllum*, and *Habenaria* species.

### ALPINE REGION

Between the tree-line (4000 m.) and snow-line (5000 m.) the mountainous country of Nepal comes under alpine zone. The alpine zone is represented by moist alpine scrub and dry alpine scrub. In this area winter is severe and summer relatively short and cold. Precipitation is minimum in the form of snow and rain is scanty. There is lacking of timber and vegetation covers consists mainly of grasses, herbs and dwarf shrubs. Most of the plants are hairy and colored. This zone is particularly rich in the number of species, Shrestha (1982) has listed 16 woody species and 143 herbaceous species of plants from this zone in the Karnali region. Where as Ohba (1988) has listed 1227 species of plants of which 6 species are gymnosperm, 192 monocotyledons and 1029 dicotyledons from the whole alpine Himalaya of Nepal . Some species reach to areas near the snow line and are therefore sub-nival vegetation. The total number of Alpine flora of Nepal Himalaya with 29 genera is nearly half of the total number of alpine flora, which is common and diversified in both arctic and temperate region of Northern Hemisphere. (Appendix I) .

The highest altitudinal recording reporting of flowering plant in the world is to be found in Nepal. Shipton's collection of *Saussurea gnaphaloides* at about 6400 m. altitude during his 1935 expedition to Mt. Everest is perhaps the most remarkable record of flowering plants in the world. In the alpine region in the moist alpine scrub, shrubberies rhododendrons are *Rhododendron compylocarpum*, *R.fulgens*, *R.wightii*, while are characteristic features in the Eastern midland. Besides these *R.anthopogon* (Guras), *R.lepidotum*, *R.pumilum*, *R.setosum*, *Juniperus recurva*, *Lonicera obovata*, *Salix sikkemensis* etc. form dense carpet in some place. In Central and Western midlands of this zone is *Betula utilis*, as the main component is associated with the least frequent *Juniperus indica*, *Lonacera obovata*, *Potentilla fructose* shrubby rhododendrons etc. Some of beautiful plants of this belts now cultivated in the Western

Countries are of *Anemone obtusiloba*, *Campanula aristata*, *Corydalis meifolia*, *C. ramosa*, *Delphinium dictycarpum*, *D. vertitum*, *Epilobium conspernum*, *Fritillaria cirrhosa*, *Gentiana depressa*, *G. prolata*, *G. venusta*, *Meconopsis horridula*, *M. simplicifolia*, *Primula calderina*, *P. capitata*, *Rhododendron nivale*: the smallest bushy rhododendron, *Saussurea gossypiphora* (Kapase phool), *S. obvallata*, *Saxifraga aristulata*, *S. brunonis*, *S. grandifera*, *S. mallae* etc.

Dry alpine scrub vegetation are found in the inner valleys, such as *Juniperus recurva* which are found in the lower belt and *J. indica*, *J. squamata* in the upper belt in the Eastern and Central region of this zone. The increasing dry condition at upper level are marked by the occurrence of *Ephedra gerardiana*, *Hippophae tibetiana*, *Myricaria germanica*, on riverside terraces. In this zone the shrub do not grow over 1.25 m. in height, so that in this region *Caragana gerardiana*, *Ephedra gerardiana*, *E. intermedia* and *Sophera moerostiana* etc grow in abundance.

The alpine meadows are subjected to grazing in summer and rainy season. They are covered by herbs like *Cortia depressa*, *Kobresia hookerii*, *K. trinervis*, and other species of *Agrostis munroana*, *Carex atrofusca*, *C. cordiolepis*, *C. segitera*, *Caltha palustris*, *Geranium polyanthes*, *Potentilla peduncularis*, *Primula obliqua* etc.

## CONCLUSION

The vegetation described above is typical representation in the different region of Nepal. The variety in the vegetation of Nepal thus range from the tropical to alpine species and from east to west region owing to variation of aspect, altitude, geography etc. The Himalayas is the "meeting place" of different floristic elements entering from different directions. Thus, Nepalese flora is not only represented by a mix of the differing Eastern Himalayan humid flora with that of the drier Western one on the Southern slopes of Himalayas, but also a mix of high and dry plateau flora of Tibet with that of the humid monsoon region of Indian Sub-continental plains floras. Besides it has a rich heritage of endemic and monogeneric plants (Appendix II and III) as well.

Therefore, the glory of Nepal could well be established comforted on the basis of its typical natural vegetation, but on the face of present situation, it is evident that this will not last long, if immediate effective measures of preservation are not taken. The depletion of vegetation in the tropical and sub-tropical regions have already threatened a large number of plants from extinction. It is a time to take care of these vegetation by conservation of the forest So that our natural heritage of Nepalese flora has a global importance and it is our national responsibility to preserve them not only to highlight natural heritage but also to safeguard their genetic values which has not yet been explored for the development.



## APPENDIX: I

Genus	No. of sp. Nepal	No. of sp. in world	Type species	Endemic sp.	List Ohba Himal
<i>Saxifraga</i>	76	370	22	14	74
<i>Pedicularis</i>	63	500	29	11	55
<i>Primula</i>	62	500	11	5	48
<i>Carex</i>	61	2000	5	-	23
<i>Gentiana</i>	44	400	7	3	31
<i>Impatiens</i>	40	700	13	12	-
<i>Saussurea</i>	36	400	10	5	29
<i>Aconitum</i>	36	300	16	12	18
<i>Ficus</i>	33	800	2	-	-
<i>Rubus</i>	32	250	12	2	-
<i>Cotoneaster</i>	32	50	11	6	-
<i>Berberis</i>	30	450	5	-	12
<i>Rhododendron</i>	30	600	7	2	-
<i>Salix</i>	30	500	5	3	17
<i>Juncus</i>	30	300	3	-	17
<i>Poa</i>	29	300	7	5	18
<i>Astragalus</i>	29	2000	2	1	12
<i>Corydalis</i>	28	320	9	7	27
<i>Swertia</i>	28	100	9	2	15
<i>Persicaria</i>	27	150	8	-	-
<i>Cyprus</i>	27	550	2	-	-
<i>Potentilla</i>	25	500	7	-	17
<i>Silene</i>	24	500	9	6	15
<i>Senecio</i>	24	2-3000	14	3	-
<i>Kobresia</i>	24	50	5	5	16
<i>Clematis</i>	23	250	9	3	-
<i>Euphorbia</i>	22	2000	3	-	-
<i>Lonicera</i>	22	200	6	-	11
<i>Deplphinium</i>	20	250	5	2	12
<i>Ranunculus</i>	20	400	2	2	11
<i>Thalictrum</i>	20	150	5	2	-
<i>Rhodiola</i>	20	50	6	4	19
<i>Arenaria</i>	19	250	4	2	17
<i>Begonia</i>	18	900	10	4	-
<i>Crotalaria</i>	17	550	3	1	-
<i>Epilobium</i>	17	215	6	-	-

Genus	No. of sp. Nepal	No. of sp. in world	Type species	Endemic sp.	List Ohba Himal
<i>Anaphalis</i>	17	35	1	-	-
<i>Aster</i>	17	500	2	-	12
<i>Androsace</i>	17	100	3	-	10
<i>Arisaema</i>	17	150	6	3	1
<i>Habenaria</i>	16	600	2	-	-
<i>Anaphalis</i>	17	35	1	-	-
<i>Aster</i>	17	500	2	-	12
<i>Androsace</i>	17	100	3	-	10
<i>Arisaema</i>	17	150	8	3	1
<i>Habenaria</i>	16	600	2	-	-
<i>Stellaria</i>	16	120	4	3	-
<i>Sedum</i>	16	600	2	1	-
<i>Solanum</i>	16	1700	1	-	-
<i>Artemisia</i>	15	400	1	1	-
<i>Veronica</i>	15	300	3	1	-
<i>Draba</i>	15	300	2	2	12
<i>Hypericum</i>	15	300	5	-	-
<i>Prunus</i>	15	400	5	2	-
<i>Smilax</i>	15	430	2	-	-
<i>Meconopsis</i>	14	350	4	4	12
<i>Geranium</i>	14	42	3	-	-
<i>Viola</i>	14	400	-	-	-
<i>Taraxacum</i>	14	500	6	4	-
<i>Jasminum</i>	14	60	2	1	-
<i>Pilea</i>	14	300	4	2	-
<i>Elatostema</i>	13	400	4	-	-
<i>Lindernia</i>	13	200	2	-	-
<i>Cremanthodium</i>	13	80	2	-	12
<i>Acer</i>	13	55	5	-	-
<i>Anemone</i>	13	200	7	1	11
<i>Oxytropis</i>	13	150	7	7	12
<i>Eriocaulon</i>	13	300	6	5	-
<i>Dioscorea</i>	13	400	1	-	-
<i>Hedychium</i>	12	600	7	-	-
<i>Blumea</i>	12	50	1	-	-
<i>Codonopsis</i>	12	50	4	1	-
<i>Didymocarpus</i>	12	30-40	6	-	-
<i>Litsea</i>	12	120	4	-	-

Genus	No. of sp. Nepal	No. of sp. in world	Type species	Endemic sp.	List Ohba Himal
<i>Rabdosia</i>	11	400	4	2	-
<i>Nepata</i>	11	250	2	-	-
<i>Gentianella</i>	11	125	1	-	-
<i>Elymus</i>	11	70	2	2	-
<i>Oberonia</i>	14	330	2	-	-
<i>Cardamine</i>	10	160	1	-	-
<i>Euonymus</i>	10	176	7	-	-
<i>Caragana</i>	10	80	1	1	-
<i>Rosa</i>	10	250	3	-	-
<i>Ga;oi,</i>	10	400	3	-	-
<i>Elsholtzia</i>	10	35	2	-	-
<i>Phyllanthus</i>	10	600	2	-	-
<i>Lomatogonium</i>	9	18	2	-	-
<i>Cyananthus</i>	9	30	2	1	-
<i>Symplocos</i>	9	350	3	-	-
<i>Polygala</i>	9	5-6000	2	-	-
<i>Ilex</i>	9	400	3	-	-
<i>Indigofera</i>	9	700	1	-	-
<i>Chrysosplenium</i>	9	55	1	-	-
<i>Polygonatum</i>	9	50	3	-	-
<i>Herminium</i>	9	30	2	-	-
<i>Cymbidium</i>	9	40	2	-	-
<i>Goodyear</i>	8	40	1	-	-
<i>Peristylus</i>	8	60	3	-	-
<i>Eleocharis</i>	8	200	1	-	-
<i>Cymbopogon</i>	8	60	2	-	-
<i>Stipa</i>	8	300	1	1	-
<i>Viburnum</i>	8	200	5	-	-
<i>Pleurospermum</i>	8	80	6	-	-
<i>Ribes</i>	8	150	1	-	-
<i>Dalbergia</i>	8	300	1	-	-
<i>Zizyphus</i>	8	100	1	-	-
<i>Inula</i>	8	200	2	-	-
<i>Leontopodium</i>	8	30	1	1	-
<i>Lobelia</i>	8	2	-	-	-
<i>Scrophularia</i>	8	300	3	2	-
<i>Bistorta</i>	8	50	2	-	-

GENUS	No. of sp.	No. of sp.	Type	Endemic	List Ohba
	Nepal	in world	species	sp.	Himal
<i>Persea</i>	8	150	2	-	-
<i>Boehmeria</i>	8	100	1	-	-
<i>Glochidion</i>	8	300	1	1	-
<i>Lindera</i>	8	100	3	-	-
<i>Cinnamomum</i>	7	250	2	-	-
<i>Scutellaria</i>	7	300	2	-	-
<i>Limnophilia</i>	7	30	1	-	-
<i>Hoya</i>	7	200	5	-	-
<i>Gaultheria</i>	7	200	1	-	-
<i>Cirsium</i>	7	150	4	3	-
<i>Zanthoxylum</i>	7	20-30	1	1	-
<i>Rhamnus</i>	7	110	1	-	-
<i>Rhus</i>	7	250	1	1	-
<i>Sibbaldia</i>	7	20	2	1	-
<i>Osbeckia</i>	7	100	4	-	-
<i>Heracleum</i>	7	70	3	-	-
<i>Pimpinella</i>	7	150	2	-	-
<i>Wendlandia</i>	7	70	4	1	-
<i>Bromus</i>	7	50	2	2	-
<i>Eulophia</i>	7	200	2	-	-
<i>Malaxis</i>	6	300	4	1	-
<i>Iris</i>	6	300	2	1	-
<i>Allium</i>	6	450	2	1	-
<i>Lilium</i>	6	80	1	-	-
<i>Ophiorrhiza</i>	6	150	3	1	-
<i>Mussaenda</i>	6	200	3	-	-
<i>Brassaiopsis</i>	6	35	3	-	-
<i>Rotala</i>	6	50	1	-	-
<i>Parnassia</i>	6	50	2	-	-
<i>Rhynchosia</i>	6	300	2	1	-
<i>Milletia</i>	6	180	1	1	-
<i>Buddleja</i>	6	100	1	-	-
<i>Euphorbia</i>	6	200	2	-	-
<i>Rheum</i>	6	50	1	1	-
<i>Rumex</i>	6	200	2	-	-
<i>Elaeagnus</i>	5	45	5	1	-
<i>Aristolochia</i>	5	350	1	-	-
<i>Koenigia</i>	5	7	1	-	-
<i>Aconogonum</i>	5	15	2	-	-

APPENDIX: II

Family	No. of species in		Nepalese species
	World	Nepal	
<i>Azollaceae</i>	6	1	<i>Azolla imbricata</i> (Roxb.) Nakai
<i>Equisetaceae</i>	23	2	<i>Equisetum debile</i> Roxb. ex vauch. <i>E. diffusum</i> D. Don
<i>Parkeriaceae</i>	2	1	<i>Ceratopteris siliquosa</i> (L.) Copel.
<i>Plagiogyriaceae</i>	36	3	<i>Plagiogyria communis</i> Ching <i>P. euphiebia</i> (Kunze) Mett. <i>P. Picnophylla</i> (Kunze) Mett.
<i>Saviniaceae</i>	10	1	<i>Salvinia natans</i> (L.) All.
<i>Selaginellaceae</i>	700	17	<i>Selaginella biformis</i> A. Br. <i>S. bisulcata</i> Spring <i>S. bryopteris</i> (L.) Bak. <i>S. chrysocaulos</i> (Hook. et Grev.) spr. <i>S. chryorhizos</i> Spring <i>S. ciliaris</i> (Ratz.) Spring. <i>S. fulcrata</i> (Ham.) Spring. <i>S. involvens</i> (Sw.) Spring. <i>S. kurzii</i> Baker <i>S. monospora</i> Spring. <i>S. pallida</i> (Hook et Grev.) Spring. <i>S. pennata</i> (D. Don) Spring. <i>S. pubescens</i> (Wall.) Spring. <i>S. repanda</i> (Desv.) Spring. <i>S. subdiaphana</i> (Wall) Spring. <i>S. tenuifolia</i> Spring. <i>S. vaginata</i> Spring.
<b>Gymnosperms</b>			
<i>Cycadaceae</i>	20	1	<i>Cycas pectinata</i> Griff.
<i>Gnetaceae</i>	30	1	<i>Gnetum montanum</i> Markgr.
<i>Ginkgoaceae</i>	1		<i>Ginkgo biloba</i> L.
<i>Ephedraceae</i>	40	4	<i>Ephedra gerardiana</i> Wall ex Stapf <i>E. intermedia</i> Schrenk & Meyer <i>E. pachyclada</i> Boiss. <i>E. saxatilis</i> Wall ex Stapf.

Family	No. of species in		Nepalese species
	World	Nepal	
Angiosperms Monocotyledons <i>Cannaceae</i>	55	4	<i>Canna edulis</i> Ker-Gawler <i>C. indica</i> L. <i>C. chinensis</i> Willd. <i>C. speciosa</i> Sims.
<i>Najadaceae</i>	50	2	<i>Naja graminea</i> Delile <i>N. minor</i> All.
<i>Typhaceae</i>	10	2	<i>Typha angustifolia</i> L. <i>T. elephantina</i> Roxb.
Angiosperms Dicotyledons <i>Callitrichaceae</i>	25	2	<i>Callitriche palustris</i> L. <i>C. stagnalis</i> Scopoli
<i>Circaeasteraceae</i>	1		<i>Circaeaster agrestis</i> Maxim.
<i>Coriariaceae</i>	15	2	<i>Coriaria nepalensis</i> Wall <i>C. terminalis</i> Hemsl.
<i>Daphniphyllaceae</i>	10	1	<i>Daphniphyllum himalense</i> (Benth Muell- Arg.
<i>Datisceae</i>	2	1	<i>Datisca cannabina</i> L.
<i>Hippuridaceae</i>	3	1	<i>Hippuris vulgaris</i> L.
<i>Leeaceae</i>	70	7	<i>Leea aequata</i> L. <i>L. alata</i> Edgew. <i>L. compactiflora</i> Kunz <i>L. crispa</i> van Royen ex L. <i>L. guineensis</i> G. Don <i>L. macrophylla</i> Roxb. ex Hornem.
<i>Moringaceae</i>	12	1	<i>Moringa oleifera</i> Lam.
<i>Paeoniaceae</i>	33	1	<i>Paeonia emodi</i> Wall ex Royle
<i>Phrymaceae</i>	2	1	<i>Phryma leptostachya</i> L.
<i>Punicaceae</i>	2	1	<i>Punica grantum</i> L.
<i>Sphenocleaceae</i>	2	1	<i>Sphenoclea zeylanica</i> Gaertn.
<i>Stachyuraceae</i>	10	1	<i>Stachyurus himalaicus</i> Hook.f. & Thoms. ex Benth
<i>Tetracentraceae</i>	1	1	<i>Tetracentron sinense</i> Oliv.
<i>Toricelliaceae</i>	3	1	<i>Toricellia tiliifolia</i> DC.
<i>Trapaceae</i>	30	1	<i>Trapa quadrispinosa</i> Roxb.

APPENDIX III

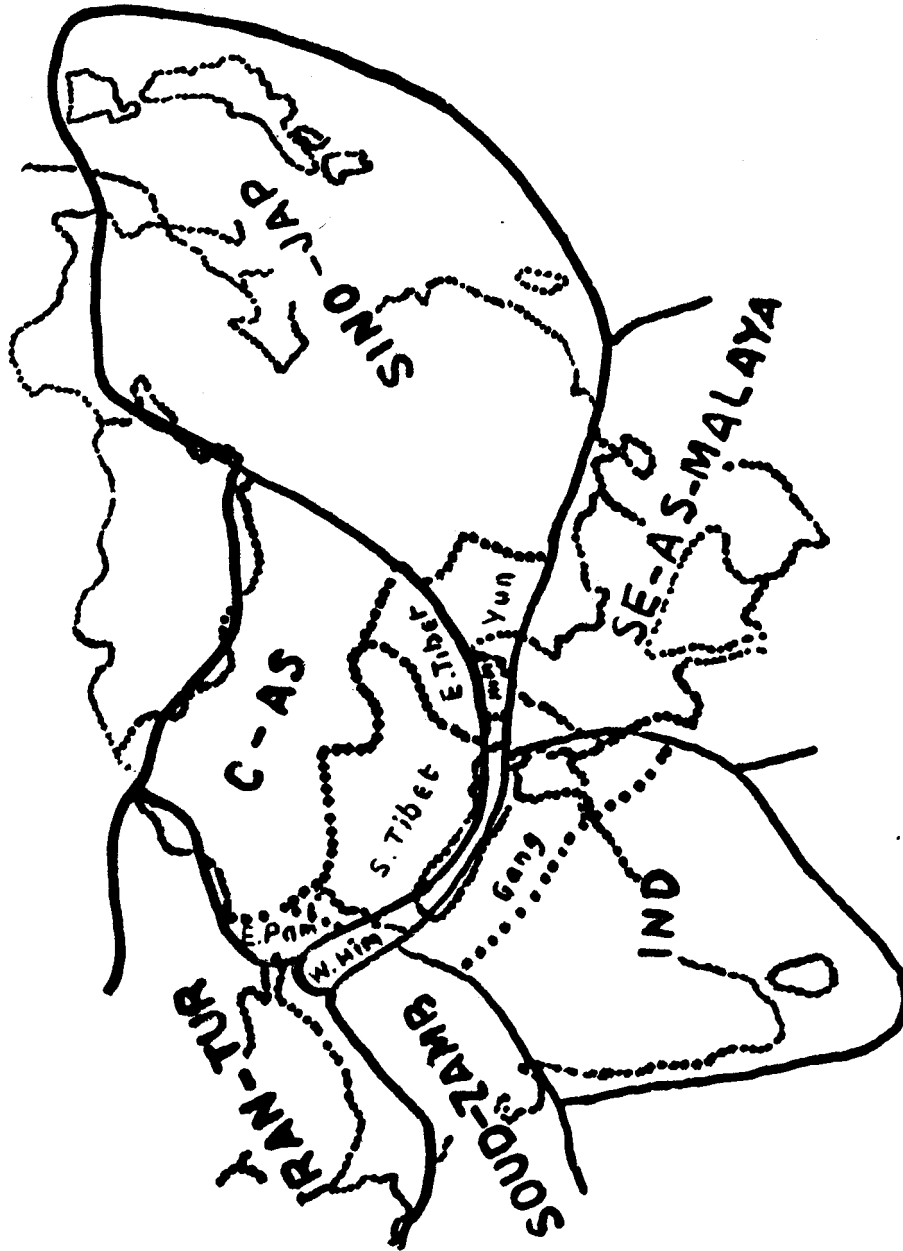


Fig. 1: Florestic composition of Asiatic region.

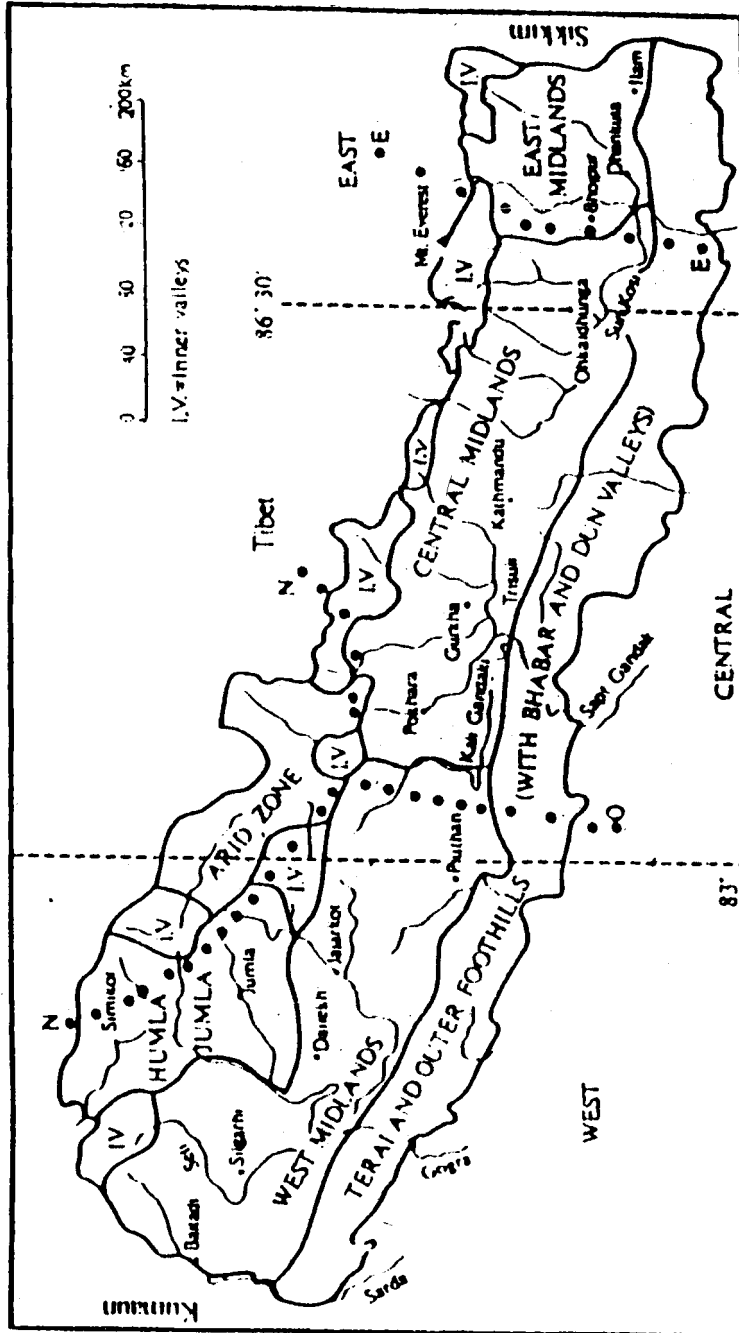
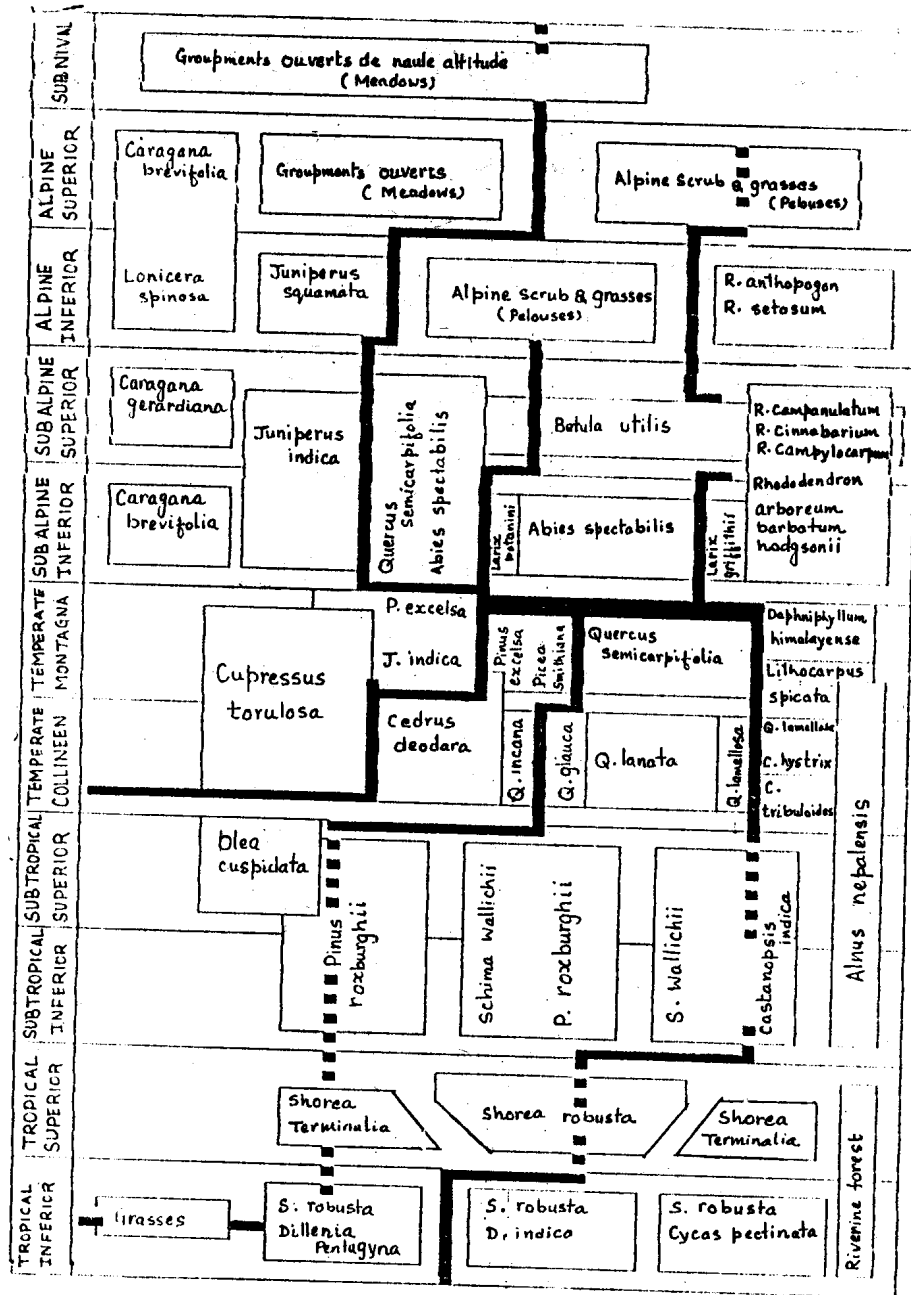


Fig. 2: Climatic and vegetational divisions of Nepal proposed by Stainton (1972) with the three major regions bounded by ---- (West, Central and East) proposed by Stearn (1960) and the four domains bounded by ooo (West of line N-O, north of line N-N, centre, between lines N-O and E-E, east of line E-E) proposed by Dobremez (1972).



Fig. 3: Vegetation division of Nepal Himalaya (Dobremez, 1972).



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