Commercially important medicinal and aromatic plants of Nepal and their distribution pattern and conservation measure along the elevation gradient of the Himalayas

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This study aims to assess and evaluate the number of commercially important medicinal and aromatic plants (MAPs) found in the trade and explore their distribution pattern and conservation measures along the Himalayan elevation gradient of Nepal. The species data for this study are based on primary as well as secondary sources, where as elevation range data are based only on secondary sources. The number of MAPs species and number of conservation sites present in each 100 m elevation band is estimated by interpolation. The assessed numbers of commercial MAPs are assigned in to different life forms group to find the life form spectrum of commercial species. The number of MAPs species and conservation sites present in each 100 m elevation band are evaluated as a response variable where as elevation gradient is the predictor. The relationship between them is elucidated by scatter plot as well as generalised liner models.

In this study, we have assessed 143 species as commercial MAPs. The variation of MAPs species is found related to elevation. The MAPs species richness increases with increasing the elevation up to 1000 m then decrease with further increasing the elevation thus unimodal type of pattern is observed. The maximum numbers of MAPs are found at 1000 m but maximum numbers of conservation sites are found above this elevation range. We did not find the significant pattern between conservation sites and MAPs species richness along the elevation gradient of the Himalayas. The conservation sites of Nepal are less concentrated where MAPs species diversity is rich.

Key words: Medicinal and aromatic plants, elevation gradient, species richness, generalised linear model

Nepal contains diverse physiographic and climatic variation along the elevation gradient and harbours different ecosystems with valuable floral wealth. Nepal is ranked 9th among the Asian countries for its floral wealth as more than 9,000 species of flowering plants are estimated. Among total floral wealth of Nepal, about 10 % of species are reported with medicinal and aromatic properties. Various parts of these annuals, biennials and perennial plants have been used as medicines, perfumes, and food. Pandey (1961) for the first time reported 73 medicinal and aromatic plants (MAPs). Then, Department of Medicinal Plants (DMP, 1970) reported 483 species; Malla and Shyaka (1984) reported 690 species of MAPs in Nepal. Manandhar (2002) has reported ethno-botanical information of 1,500 plant species, majority of them have medicinal value. Before implementation of master plan for the forestry sector (1988), this group of plants have been termed as minor forest products and these were relatively neglected from the state. Later, due to their high volume and commercial value in no way is described as minor. They were recognised as important because of their diverse uses and high commercial value. Every year thousands of collectors and gatherers of hilly region sustain their livelihood from the collection and sales of MAPs. The sustainable collection of MAPs can provide valuable cash for rural people therefore government should focus to this sector for research and conservation to bring out it in to competitive world.

Although, the collection and trade of MAPs have been a source of income for rural people of Nepal, the literatures concerning assessment of commercial species, distribution pattern and their conservation measures are not well addressed. There is lacking on quantitative assessment of their natural population

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and testing their pattern along the climatic elevation gradient. Natural forests are decreasing due to ever increasing human population in the Himalayan region so diversity pattern should be examined before their clearance (Bhattarai, 2005). Many species of MAPs are already threatened from collection pressure (Ghimire *et al.* 2005). The natural populations of commercially important MAPs might have disappeared or might be under the serious risk of extinction, so it is urgent to explore their patterns and find out factors controlling upon the patterns, so that effective conservation measures can be implemented.

Different methods and approaches have been applied to describe the variation in vascular plants species diversity and composition along elevation gradients in different floristic areas of the world (Shmida and Wilson, 1985; Oland and Birks, 1999; Vetaas and Grytnes, 2002; Bhattarai and Vetaas, 2003, 2006) but study in the medicinal and aromatic plants along the elevation gradient has not been done so far. These plants are belonging to wide range of families so it might represent all life forms as well as taxonomic groups. Although, this sector contributes significant amount in the Nepalese economy documentation has not been done how many of those commercially important medicinal and aromatics plants are belong to different life forms groups like trees, shrubs, climbers and herbs.

Factors causing variation in species diversity may differ between life forms of plants, which may provide the finer resolution on how patterns are exist and what are the underlying factors behind the distribution mechanism (Bhattarai and Vetaas, 2003). Thus, this study will ask the following three major questions: (1) which species of MAPs are in the trade and commercially important for Nepal? (2) how is the distribution pattern of these commercially important MAPs along the elevation gradient of the Himalayas; Nepal? and, (3) is there any trend between conservation measures and MAPs diversity along the elevation gradient?

Materials and methods

Location of study area and its elevation gradient

The study considers the whole central Himalayas, Nepal, (26º 22' to 30º 27' N and 80º 4' to 88º 12' E), an area 800 km east west by 150-200 km north south. There is the Indo-Gangetic plain in the south, hills and valleys in the middle and ice-carved mountains in the north. In the northern part of the Indo-Gangetic plain there is a flat plain about 30-40 km wide from east to west, which is called Terai in Nepal. After a 30-40 km north-south extension of this flatland, the Siwalik hills rise abruptly to an average elevation of 1300 m. The Himalayan elevation gradient extends from ca. 60 to more than 8,000 m within 150-200 km and includes compressed tropical/subtropical, temperate, sub-alpine, and alpine climatic zones.

Data sources and interpolation

We have collected data from the primary as well as secondary sources. The elevation range data for MAPs are collected from DPR (2001); Press *et al.* (2001), ANSAB and SNV (2003). The functional group data were based upon Press *et al.* (2001) that is a most reliable and up-to-date source about the flora of Nepal as is based on extensive field studies, reviews of published literature, and examinations of herbaria. To examine the relationship between species richness and elevation, the total elevation gradient between 100 and 5500 m was divided into 55 100-m elevation intervals (vertical elevation band). The number of species presences in each elevation band is estimated by the interpolation (Bhattarai and Vetaas, 2006). A species was defined as being present in every 100-m interval between its upper and lower elevation limits. For example, *Swertia chirayita* with its elevation limit between 1500 and 3000 m, was assumed to be present in each elevation band of 1500, 1600, 1700, 1800 and so on up to 3000 m (Rahbek, 1997; Vetaas and Grytnes, 2002). The term species richness is defined as the total number of MAPs species found in each 100 m elevation band (Grytnes and Vetaas, 2002). The MAPs species were assessed as commercially important based on extensive visits of the trade centres and interviewing of traders from Kathmandu, Dolakha, Trisuli, Pokhara, Butwal, Pyuthan, Nepalgunj, Hetaunda between 1996-1998, and secondary sources (Malla *et al.* 1993; Edwards 1996; Bhattarai and Acharya, 1996a; Bhattarai and Acharya, 1996b; ANSAB and SNV, 2003; DOF, 2002; HNCC, 2005). The samples of MAPs sent by different District Forest Offices to National Herbarium and Plant Laboratories for identification also contributed to make a decision whether these species are in trade or not.

To find the number of conservation activities occurring per 100 m elevation band along the elevation gradient of Nepal, the altitudinal range of each conservation area, National Park, Wild life Reserve and Hunting Reserve of Nepal are taken from Biodiversity Profile Project (1995). The interpolated elevation range is converted in to dummy variable by considering 1 for presence and 0 for absence and number of conservation sites per 100 m elevation is estimated (Crawley, 2002; see Table 2).

Numerical analysis

To examine the relationships between species richness and elevation we have used Generalized Linear Models (GLM; McCullagh & Nelder, 1989; Dobson, 1990) (see Table 1). The response variable, species richness, is a discrete data type (counts) and may follow a Poisson error distribution (McCullagh & Nelder, 1989), which requires a logarithmic link. The models were checked with up to third-order polynomial regressions. We used a F-test to check the significance of models, as this is more robust (Crawley, 2002). We used S-plus (version 4.5) for all the regression analyses and graphical representations.

Results

Lifeforms spectrum of commercial MAPs

Neither all species reported in the different literature as medicinal and aromatic plants are found in the trade, nor all species found in the trade are reported as medicinal and aromatic plants. A total of 143 species are assessed as commercial MAPs in Nepal. These commercial MAPs are belonging to different life forms such as tree, shrub, climber and herbaceous groups (Fig. 1).

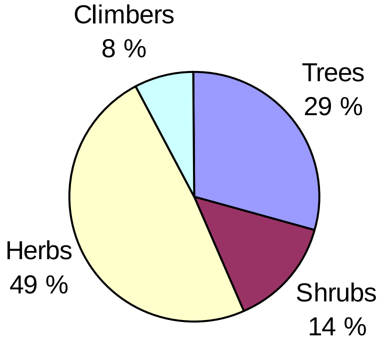

Fig. 1 : Diagramme shows composition of commercial MAPs species richness belong to each life form.

Distribution of MAPs along the elevation gradient

The MAPs are found growing between 100 m to 5500 m along the elevation gradient in Nepal. The uppermost range of distribution is different for different life forms groups. The variation in species richness of MAPs belonging to each life forms group is shown in Table 1 and Fig. 2. The MAPs belonging to trees life form group are found up to 4400 m a.s.l. but the the MAPs species belong to shrub life forms group are found up to 5100 m a.s.l. Similarly climbers are found up to 3200 m a.s.l. and herbaceous MAPs are found up to 5500 m a.s.l. All life form groups when regressed separately and in combination against elevation significant trend was observed in the second order term in the GLM and confirm the hump shaped relationship along the elevation gradient of Himalayas (Table 1). Thus, the pattern of distribution along the elevation gradient is almost similar for all life forms groups.

The MAPs species richness increases with increasing the elevation up to certain elevation range and then decreases with further increasing the elevation. Thus optimum MAPs species richness observed at the middle of the gradient. This optimum richness site is different for different life forms of MAPs. The MAPs belonging to trees and climbers life forms are found optimum at 1000 m; shrubs are found optimum at 2000 m and herbaceous are found optimum at 2500 m a.s.l. The optimum richness site is 1000 m a.s.l for these combination (total MAPs). Thus a total MAPs species richness increases up to 1000 m and decreases afterwards showing a mid-elevation peak in richness (Fig. 2, Table 1).

Relationship between conservation sites and richness of MAPs

To date, there are nine national parks, three-wildlife reserves, one hunting reserve, three conservation areas and one protected forest (Table 2). When a relationship between number of conservation sites and elevation gradient is sought, the unimodal type trend is observed (Fig. 2). These conservation sites are distributed along the elevation gradient ranging from 75 m to 8,848m, highest the peak in the world. This is a longest bio-climatic gradient in the world. The numbers of conservation sites are increased with increasing elevation up to 1400 m and decreases afterwards with further increasing elevation. Thus

Table 1 : Summary of generalised linear models (GLM) for each life forms of MAPs

Life forms	Polynomial order	Degree of freedom	Resi. deviance	%-Deviance explained	P-value
Trees MAPs	2	41	47.75	86	P = 0
Shrubs MAPs	2	47	19.66	84	P<0.001
Climbers MAPs	2	32	8.00	89	P<0.001
Herbs MAPs	2	52	30.18	91	P = 0
Total MAPs	2	52	74.56	92	P = 0

Res. Deviance = Residual deviance

maximum numbers of conservation sites are found around 1400 m a.s.l. (Fig. 2). Although, there are large numbers of conservations sites available in Nepal, unfortunately, no positive trend could be observed between commercial MAPs species diversity and number of conservation sites (r = -0.32, Fig. 3) along the elevation gradient. When these conservation sites are ordinate, the length of gradient i equal ± 05.5 in SD unit, (Fig. 5).When we took only 12 prioritise MAPs of Nepal and sough the same relationship we did not find the trend (r = 0.05), as the Generalised Additive Model (GAM) smoother also could not detect the pattern.

Discussion

Variation in MAPs species along the elevation gradient

This study found a mid-elevation peak for MAPs species richness along the elevation gradient, which is consistent with several other studies (Terborg, 1977; Grytnes & Vetaas, 2002). This study also supports the results obtained by Bhattarai and Vetaas (2003, 2006), Bhattarai *et al.* (2004) along the elevation gradient of the Himalayas.

Malla and Shakya (1984) also reported mid elevation peak richness for MAPs of Nepal. Although, MAPs

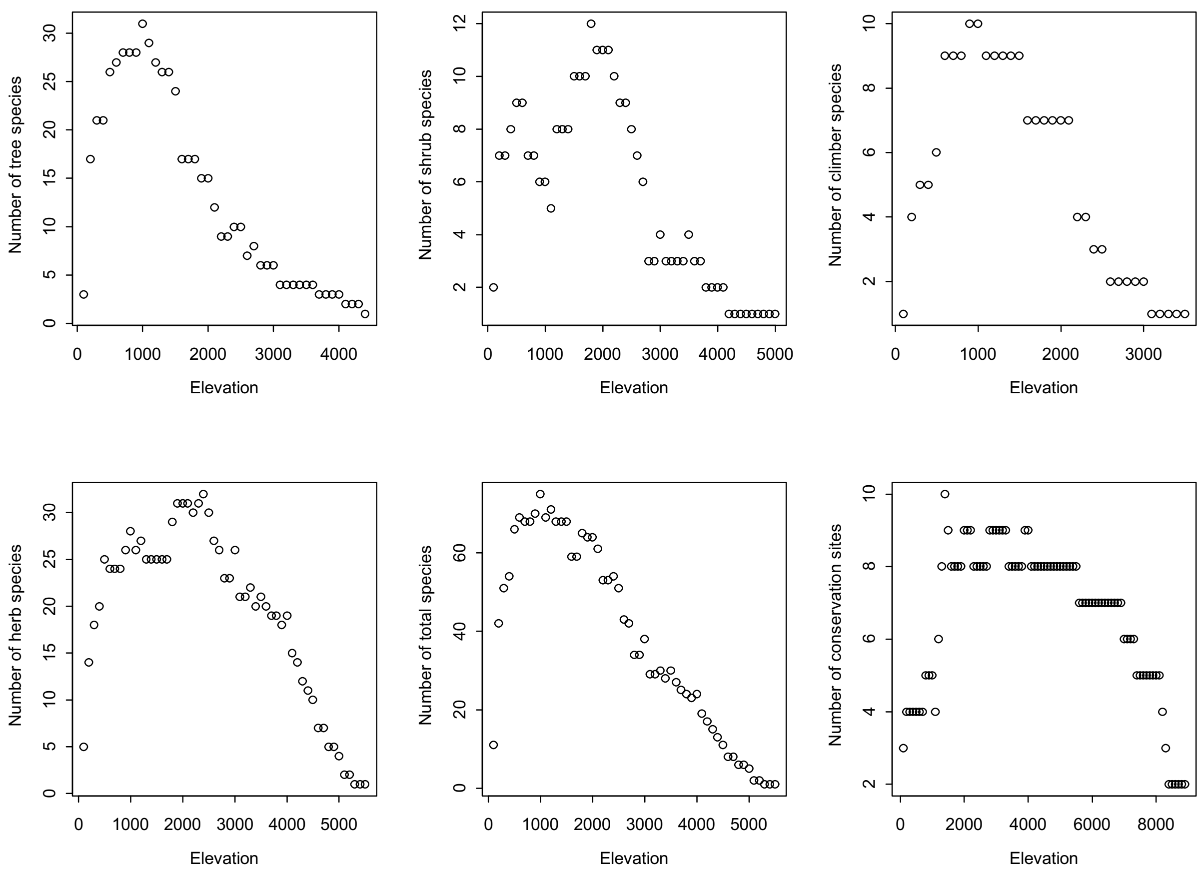

Fig. 2 : Scatter plots show the relationship between MAPs species (belongs to different life forms), conservation sites and elevation gradient. The x-axis represents the elevation in m above sea level.

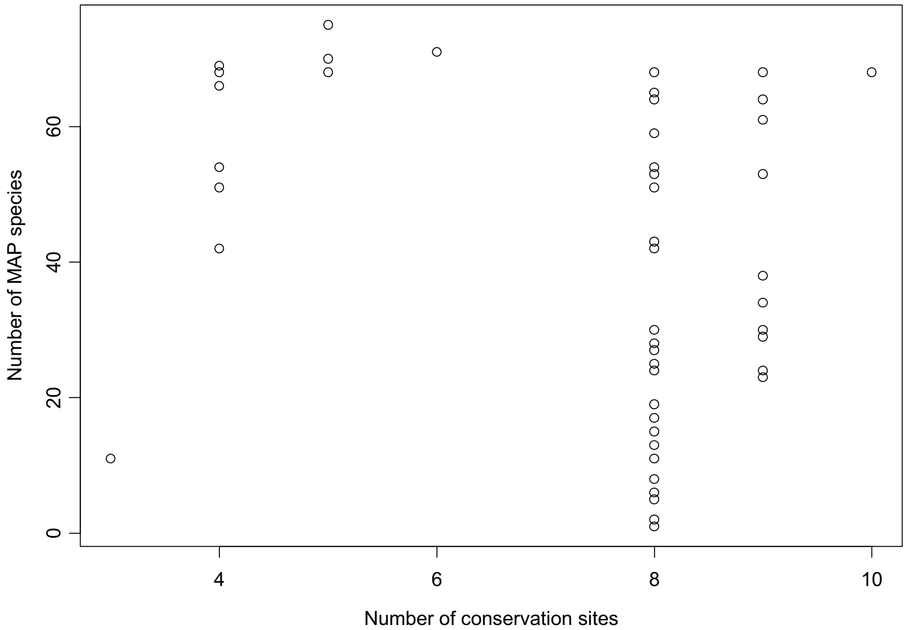

Fig. 3 : Scatter plot shows the relationship between number of conservation sites and MAPs diversity along the elevation gradient.

belong to heterogeneous group plants consisting of angiosperm, gymnosperm as well as cryptogrammic plants thus this mid-elevation peak might be true reflection of total floral diversity of Nepal. Rahbek's (1995) review concluded that the mid-elevation peak is a common pattern.

However, this study does not support monotonically decreasing species richness with increasing elevation, as suggested by Stevens (1992). He predicts that elevation range will increase with increasing elevation due to the wider climatic tolerances of high-altitude species. The location of herbaceous MAPs richness is different from the total MAPs species richness (including herbs, shrubs, climbers and trees) as observed by Bhattarai and Vetaas (2003). along the elevation gradient. This discrepancy might be associated with different limits of distribution i.e. different hard boundaries for tree species and non-tree species. Herbaceous species in the Himalayas are reported up to 6500 m (Miehe, 1989), but tree species hardly extend beyond 4300 m, i.e. the timberline.

Table 2 : National parks, wildlife reserves, hunting reserve, conservation areas and protected forest and their altitudinal range in Nepal

S.N.	Name of the protected areas	Conservation type	Altitudinal range (m asl)
1	Rara National Park	National Park	2800-4048
2	Shey Phoksundo National Park	National Park	2000-6883
3	Langtang National Park	National Park	792-7245
4	Makalu Barun National Park and Conservation Area	National Park	435-8463
5	Sagarmatha National Park	National Park	2845-8848
6	Shiva puri National Park	National Park	1336-2732
7	Khaptad National Park	National Park	1400-3300
8	Royan Chitwan National Park	National Park	150-815
9	Royal Bardia National Park	National Park	152-1441
10	Koshi Tapu Wildlife Reserve	Wildlife Reserve	75-90
11	Royal Shuklaphanta Wildlife Reserve	Wildlife Reserve	90-270
12	Parsa Wildlife Reserve	Wildlife Reserve	100-950
13	Dhorpatan Hunting Reserve	Hunting Reserve	2850-5500
14	Annapurna Conservation Area	Conservation Area	1151-8091
15	Kanchanjunga Conservation Area	Conservation Area	1200-8586
16	Manaslu Conservation Area	Conservation Area	1360-8163
17	Nagarjun Royal Forest	Protected forest	1300-2200

Sources: Biodiversity profile project (1995)

Bhattarai & Vetaas (2003) from field sampling found maximum tree species richness around 800 m, therefore this mid-elevation peak is close to that found by Bhattarai & Vetaas (2003). The range of a species along an elevation gradient is constrained by these hard boundaries. These boundaries present at the two ends of an elevation gradient produce some degree of resistance to dispersal.

Although variation of species richness is influenced by several factors like aspects, forest types, canopy cover, slope, conservation sites, grazing, competetion etc, the influences of these factors depends upon the scale of the study. These factors influence the species richness pattern only at local scale (Bhattarai and Vetaas, 2005). This is a macro-scale study so such local factors can not influence upon the species richness pattern.

Several suggestions have been proposed to explain the mid-elevation peak in richness; in particular climatic factors have received more attention (Oland & Birks, 1999; Md. Nor, 2001; Bhattarai *et al.* 2004). Bhattarai & Vetaas (2003) found that the mid-elevation peak in richness is a function of water-energy dynamics. The maximum species richness will be found at locations with maximum rainfall and optimal energy conditions (O'Brien, 1993, 1998). We propose that the maximum MAPs species richness around 1000 m might be associated with optimum energy and maximum rainfall (Bhattarai and Vetaas, 2003).

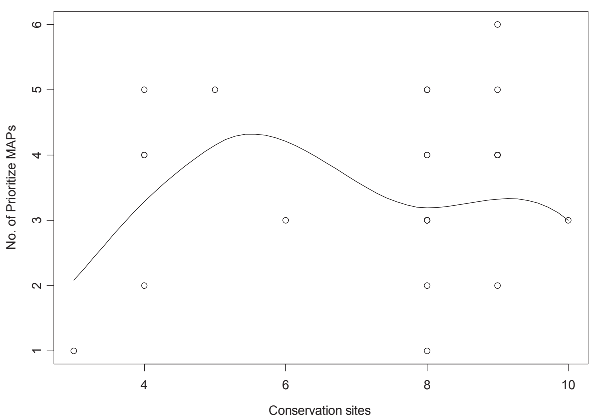

Fig. 4 : Relationship between conservation sites and number of prioritized MAPs species. The line is fitted by GAM smoother, which is fitted only to guide the reader's eye

The increase in MAPs species richness from lowland up to 1000 m is in contrast with report of decreasing tree species richness with higher elevation (Yoda, 1967). The mid-elevation peak in MAPs species richness may result from large-scale mass effects, of species from the lower elevation and the higher elevation (montane-flora) (Shmida & Wilson, 1985). The mid-elevation receive input from both directions. Thus, mass effects or source-sink dynamics may be important to influence variation in species richness within an elevation gradient (Grytnes & Vetaas, 2002).

This study did not support the claim made by Malla and Shakya (1984) as a 1000-2000 m is rich for diversity of MAPs. They did not separate the MAPs in to each life form as well as they did not make any statistical test about the distribution pattern of the MAPs. Most plant groups excluding ferns have optimum richness around 1000 m asl (Bhattarai and Vetass, 2003, 2006; Bhattarai *et al.* 2004). This is a first report that the optimum richness for MAPs is found at 1000 m asl.

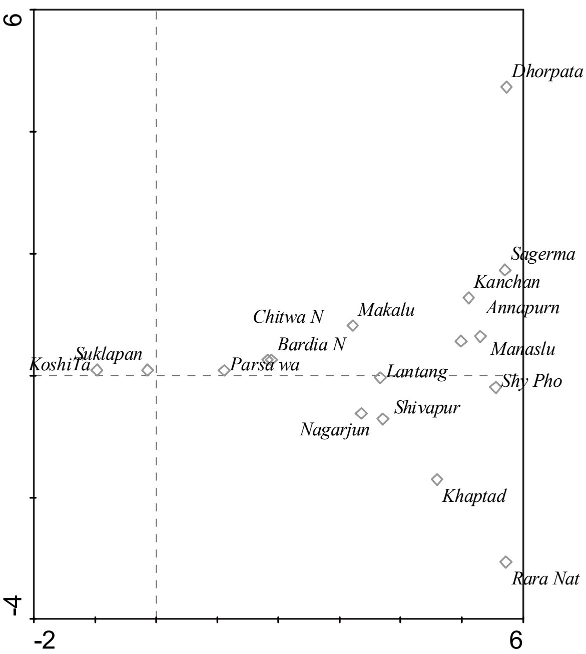

Fig. 5 : The ordination of conservation sites of Nepal. The conservation sites are distributed in the DCA diagram according to their respective elevational range from Terai to Higher Himalayas.

Commercial MAPs of Nepal

Regarding the number of MAPs species, there is no same consensus how many species are actually present. It might be due to several systems of medicine (e.g. Ayurved, Tibetan, Chinese, Sidha, & Unani) are being practiced in Nepal and, have been considered MAPs differently. If we take an account of these different systems of medicine in terms of plant use, then large number of species would fall under the MAPs' category. Thus, the number of

MAPs actually depends on system of medicine and degree of their uses.

Although, several authors have reported different numbers of MAPs in Nepal (DMP, 1970; Malla and Shakya, 1984; Malla *et al*. 1993; Manandhar, 2002; Watanabe *et al*. 2005), this paper does not emphasize upon the listing the MAPs as it has been found in most of the Nepalese literature. The important issue is to assess and evaluate how many commercial MAPs species are found in the trade, how is their diversity pattern and conservation measures in their natural habitats. Among the MAPs, only commercial species are being collected for trade. Due to their high commercial value, MAPs are threatened by large-scale exploitation for trade (Ghimire *et al*. 2005). According to Forest Regulation (third amendment 2005) there is a list of 188 NTFPs but taxonomically there are less species. These days National Herbarium and Plant Laboratories have been receiving NTFPs samples from District Forest Office for identification. These most samples are arrested due to illegal trade. About 20-25 % of the species from those samples have not been found included in the royalty list. This suggests that, there might be more than 188 species of NTFPs in the trade so several species may not have been incorporated in to royalty list. Shrestha and Shrestha (2061) have reported 101 NTFPs as major commercial species of Nepal. Similarly ANSAB and SNV (2003) reported 125 commercial species of NTFPs in the trade. Both reports could not evaluate how many commercial species are actually found in the trade. Some of the species of NTFPs, which ANSAB and SNV (2003) have reported as a commercially importance is not found in the trade at all e.g. *Sapium insigne, Dalbergia sissoo and Toona ciliata*. However, these species might have subsistence use only. We have observed some additional species of MAPs in the trade, which have not been yet reported as commercial MAPs (see appendix 1).

Our judgement upon the commercial species is largely based on volume of trade, frequency of trade occurrence, royalty rate, revenue collection, market rate, market demand, and threats status. Even though there might be more species in the trade, we have only assessed 143 MAPs species as commercially important (appendix 1). Some species, which are occasionally found in the trade with low price and low volume, are not considered as commercial species of MAPs. Although we could assess only 143 MAPs as a commercially important, it is not a final list for commercial MAPs, still there might be several species left to be incorporated. However we have not considered other Non-timber forest product (NTFPs) like Canes *(Bet)*, Babiyo etc. in this study so that number of species might be more than 150. If there were a complete list of commercial MAPs, then it would be possible to find out where these species are distributed, and what might be threats upon them.

Conservation areas and MAPs species richness

There are 17 protected areas in Nepal (Table 2). These are distributed from terai to the highest peak in the world (8848 m). The protected areas, including six declared buffer zones cover 27,874 km^2 or, 19.21% of the total area of the country. The maximum numbers of protected areas are located between 1400 to 4500 m a.s.l. (See Fig. 2). Unfortunately, the maximum diversity of flowering plant is found below 1400 m a.s.l. (Bhattarai & Vetaas, 2003, 2004, 2006). The maximum diversity of MAPs are also found around 1000 m along the elevation gradient. Although, the main aim of these protected areas is to conserve the overall biodiversity of the region but this study did not find the trend between the diversity of MAPs and protected areas. This may indicate that Nepalese conservation activities might have focused to conserve the flagship animal species like one-horned rhinoceros, tiger, Indian elephant, snow leopard, musk deer, swamp deer and gharial rather than plant species. In Nepal there are several endangered plant species (e.g. *Ceropegia pubescens, Cyathea spinulosa, Cycas pectinata, Podophyllum hexandrum, Gnetum montanum, Talauma hodgsonii, Tetracentron sinensis*) but there are no special declared plant conservation sites for these species. It is surprising that complete checklist of flora present in protected areas of Nepal has not yet been prepared. This indicates that our conservation efforts are less focused towards plant diversity (Bhattarai, 2004). Hunter and Yunzon (1993) have made remarks that conservation activities are focused to higher elevations where diversity of plant is less.

However, there are 60 MAPs species categorised as threatened (Shrestha and Joshi, 1996; Bhattarai *et al*. 2002) in Nepal. Government of Nepal has selected 30 species of MAPs and all species of *Genus* Lichen for research and management, and 12 species of MAPs are prioritised for development of agro-technology (Sharma *et al*. 2004; and Bhattarai *et al*.

2004). There is no breeding programme for MAPs to select best genotype to adapt at the man made conditions (Bhattarai *et al*. 2004). This may indicate that sufficient attention is lacking for overall development of MAPs. Moreover, there is no special project undertaken to solve the agricultural related problem for these wildly growing plant species. However, tissue culture has been initiated in the National Herbarium and Plant Laboratories for micro propagation of *Kutki, Sughandhawal, Serpagandha, Pipla* and *Chiraito*, (Rajkarnikar *et al*. 2004), which are all belongs to commercial MAPs as well as prioritise species of the country. The *vitro* planting material developed in the laboratory generally is not brought in the field for their performance test (pers. comm. with GD Bhatt). The laboratory works alone cannot solve the domestication and other cultivation problems of wild species. Even though, MAPs is one of the prioritised sectors by Tenth Plan of the Government of Nepal, it has not received proper attention for the up-liftment of the poor rural people through the development of MAPs.

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Appendix 1 : Commercial Medicinal and aromatic plants of Nepal

Sn	Species	Local name
1	*Abies spectabilis*	Talispatra
2	*Acacia catechu*	Khayar
3	*Accacia rugata*	Sikakai
4	*Aconitum ferox*	Bisma
5	*Aconitum heterophylloides*	Nirmasi
6	*Aconitum heterophyllum*	Atish
7	*Aconitum spicatum*	Bikha
8	*Acorus calamus*	Bojho
9	*Aegle marmelos*	Bail
10	*Aesculus indica*	Lekhpangra
11	*Agave americana*	Ketuki
12	*Aloe vera*	Ghiukumari
13	*Allium hypsisturm*	Jimbu
14	*Allium wallichii*	Ban lasun
15	*Amomum subulatum*	Aalainchi
16	*Andrographis paniculata*	Kalmegh
17	*Artemisia indica*	Titepati
18	*Asparagus racemosus*	Kurilo
19	*Astilbe rivularis*	Thulookhati
20	*Atropa belladonna*	Belladona
21	*Azadirachta indica*	Neem
22	*Bassia butyracea*	Chiuri
23	*Bauhania vahlii*	Bhorlo
24	*Bauhania varigata*	Koiralo
25	*Berberis aristata*	Chutro
26	*Berberis asiatica*	Chutro
27	*Bergenia cialita*	Pakhanbet
28	*Bergenia purpurascens*	Pakhanbet
29	*Betula utilis*	Bhojpatra
30	*Bombax ceiba*	Simal
31	*Brachycorythis obcordata*	
32	*Butea monosperma*	Palanshbeej
33	*Calotropis gigantea*	Aank
34	*Cannabis sativa*	Bhanga
35	*Cassia fistula*	Rajbrksha
36	*Cedrus deodara*	Debdar
37	*Centella asitica*	Godtapre
38	*Chlorophytum borivilianum*	Setomusli
39	*Choerospondias axillaris*	Lapsi
40	*Cinnamomum camphora*	Camphor
41	*Cinnamomum tamala*	Tejpat
42	*Citrulus lanatus*	
43	*Coleus barbatus*	
44	*Cordia dichotoma*	Bonori
45	*Cordyceps sinensis*	Yarshagumba
46	*Cucuma zedoraria*	Kachur
47	*Curculigo orchioides*	Kalomusli
48	*Curcuma angustifolia*	Haledo
49	*Cymbopogon flexousus*	Lemongrass
50	*Cymbopogon jwarancusa*	
51	*Cymbopogon martini*	Pamaroja
52	*Cymbopogon winterianus*	Citronella
53	*Cyperus rotundus*	Nagemothe
54	*Dactlorhiza hatagirea*	Panchaunle
55	*Dalbergia latifolia*	Bijaya sal
56	*Datura metel*	Dhatura
57	*Delphinium denudatum*	Nirmbisi
58	*Delphinium himalayai*	Mauremulo
59	*Desmotichum fimbriatum*	
60	*Dioscorea deltoidea*	Githa
61	*Dioscorea bulbifera*	Tarul
62	*Dioscorea pentaphylla*	Bhayakur
63	*Dioscorea spp*	
64	*Diospyros melanoxylon*	Tendu
65	*Daphnephyllum himalens*	Raktachandan
66	*Embelia ribes*	Bayobidanga
67	*Elaecarpus sphaericus*	Rudrachha
68	*Ephedra gegardiana*	Somlata
69	*Eulophia dabia*	Kalodana
70	*Gaultheria fragrantissima*	Dhashingare
71	*Gentiana kurroo*	Karu
72	*Gigardiana diversifolia*	Allo
73	*Glycyrhiza glabra*	Jesthimadhu
74	*Grewia optiva*	Bhimal
75	*Guizotia abyssinica*	Jusetil
76	*Hippophae salicifolia*	Dalechuk
77	*Hippophae tibetna*	Dalechuk
78	*Holarrhena pubescens*	Indrajau
79	*Iris decora*	Padampuskar
80	*Jatropha curcas*	Sajiban
81	*Juglanus regia*	Okhar
82	*Juniperus indica*	Dhupi

Sn	Species	Local name	Sn	Species	Local name
83	*Jurinea dolomiaea*	Dhupjadi	114	*Pyrus pashia*	Mayal
84	*Justicia adhatoda*	Asuro	115	*Rauvolfia serpentina*	Sepagandha
85	*Leuucas cephalotes*	Dornapuspi	116	*Rheum australe*	Padamchal
86	*Lobelia pyramidalis*	Yaklebir	117	*Rhododendron anthopogon*	Sunpati
87	*Lycopodium clavatum*	Nagbeli	118	*Rhododendron arboreum*	Laligurans
88	*Madhuca longifolia*	Mauha	119	*Ricinus communis*	Ader
89	*Maesa chisia*	Bilaune	120	*Roscoea purpurea*	Phasel
90	*Mallotus philippensis*	Sindure	121	*Rubia manjith*	Manjitho
91	*Mentha arvensis*	Patena	122	*Sapindus mukorossi*	Rithaa
92	*Mesua ferrea*	Nageswori	123	*Satyrium nepalense*	Gamdol
93	*Mimosa pudica*	Lajbattijhar	124	*Saussurea lappa*	Kuth
94	*Morchella conica*	Guchhichyau	125	*Schleichera oleosa*	Kusum
95	*Morchella spp*	Guchhichyau	126	*Selenium wallichinum*	Bhutkesh
96	*Mucuna pruriens*	Kauso	127	*Semicarpus anacardium*	Bhalayodhela
97	*Nardostachys gandiflora*	Jatamasi	128	*Shorea robusta*	Sal
98	*Neopicrorhiza scrophulariiflora*	Kutki	129	*Sida cordifolia*	Balu
99	*Ocimum basilicum*	Babari	130	*Solanum virginianum*	Bini
100	*Ocimum sanctum*	Tulshi	131	*Swertia angustifolia*	Bhalechiraito
101	*Panax pseudo-ginseng*	Nepali ginseng	132	*Swertia chirayita*	Chiraito
102	*Paris polyphylla*	Satuwa	133	*Swertia multicaulis*	Sharmaguru
103	*Parmelia nepalensis*	Jhauau	134	*Taxus baccata*	Lauthsalla
104	*Parmelia spp*	Jhauau	135	*Terminalia arjuna*	Arjun
105	*Persea odoratissima*	Kaulo	136	*Terminalia bellirica*	Barro
106	*Phyllanthus emblica*	Amala	137	*Terminalia chebula*	Harro
107	*Pinus roxburghii*	Khotesalla	138	*Trichoxanthus palmata*	Indrayani
108	*Piper chaba*	Chaba	139	*Tinospora sinensis*	Gurjo
109	*Piper longum*	Pipla	140	*Trigonella foenum-graecum*	Methi
110	*Pistacia chinensis*	Kakersinga	141	*Valeriana jatamansii*	Sugandhawal
111	*Podophyllum hexandrum*	Lagupatra	142	*Woodfordia fructicosa*	Dhayaro
112	*Polypodium vulgaris*	Bisfez	143	*Zanthoxylum armatum*	Timur
113	*Prinsepia utilis*	Dhatelo			