A Quantitative Assessment of Indigenous Plant Uses Among Two Chepang Communities in the Central Mid-hills of Nepal

Arun Rijal

Abstract

This study analyzes the indigenous knowledge of plant use among the Chepang communities of two wards of the Shaktikhor Village Development Committee in the central mid-hills of Nepal. A total of 12 key informants and 240 men and women of different ages, were interviewed and the results were analyzed using mixed linear regressions. Though there was a significant difference in knowledge between men and women due to gender specific activities, it is difficult to draw a general conclusion about knowledge and sex, as men were in general more knowledgeable than women in the homogeneous ward while women were more knowledgeable than men in the heterogeneous ward. We also found that older people were more knowledgeable than young ones. Furthermore, the knowledge was higher in a homogeneous Chepang community than in a heterogeneous one. The knowledge transmission to the young generation was investigated and it is concluded that there is an issue with knowledge transmission to the younger generation.

Introduction

Many indigenous peoples and local communities have developed a perception and use of their natural environment that plays an important role in the conservation of resources (Benz et al. 1996, Gerritsen 1998). The sustainable practices build upon knowledge of plant use has been acquired over a very long time and are based on social, economic, environmental, spiritual and political considerations. The importance of documenting such knowledge is recognized in the Convention on Biological Diversity, Article 8j (CBD 1992) and the subsequent Global Strategy for Plant Conservation and Economic Development (Twang & Kapoor 2004).


Despite many studies on various uses of plants in Nepal, the traditional uses of a large number of plants still await proper documentation (Chaudary 1998). For instance, among the Chepangs, an indigenous hill tribe people, documentation of ethnombotanical knowledge is limited only to a few medicinal plants (Khan 1998, Manandhar 1989) and no assessment has yet been made in Nepal of...
the loss of indigenous knowledge and the factors behind such loss.

Chepang are indigenous people of Mahabharat hills of Central part of Nepal. They are highly dependent on forest resources and their knowledge of plant use helped them to survive in the infertile upper slopes of the Mahabharat hills (Bhattarai 1995, Chhetri et al. 1997). However, there is little information on Chepangs’ use of natural resources (Bhattarai 1995, Bhattarai et al. 1995, Rai & Chaudary 1975, Thapa 1979). The Chepang livelihood has been affected by in-migration of non-Chepangs (Gurung 1995) but it is unknown if there has been an impact on their indigenous plant use knowledge. However, according to the theory of ‘cultural trauma and loss’ (Stamm et al. 2004), this migration could threaten the existence of Chepang communities as they are reluctant to adopt alternative life styles (Thapa 2003). A loss of indigenous knowledge could threaten the balance between the Chepangs’ use and the conservation of the natural environment. Moreover, the area is of global significance as it forms a bottleneck of the Eastern Himalayan Eco-region, connecting Annapurna and Manaslu Conservation Areas of the high Himalayas with the Royal Chitwan National Park and the Parsa Wildlife Reserve of Nepal and the Balmiki Tiger Reserve of India in the lowland. The area also falls within the proposed Terai Arc Conservation domain.

This study makes comparative studies of knowledge in a homogenous and a heterogeneous (mixed Chepang and non-Chepang) communities (wards) to investigate the effect of in-migration. Three hypotheses are tested here:

- The homogeneous ward is more knowledgeable with regard to plant use than that of the heterogeneous ward due to lack of access to road and market. Hence the population is not influenced by market and outside culture.
- The heterogeneous ward will have less knowledge due to influence of migrated people. Women are more knowledgeable since they interact more with different useful plants than men.
- The younger generation has limited knowledge of plant use due to transmission of such knowledge being negatively affected by education, market access, culture of in-migrated people, and local scarcity of useful plant species.

Study area

The study was carried out in Wards 3 and 4 of Shaktikor VDC in Chitwan District (Figure 1). The study area extends from 300 to 2500 meters in altitude. The climate is tropical to subtropical, and three overall forest types are present: 1) Shorea robusta Gaertn. forest with associated species Terminalia tomentosa Wight & Am., Lagerstroemia parviflora Roxb., Terminalia bellerica Roxb., Cleistocalyx operculatus (Roxb.) Merr. & L.M. Perry, Dillenia pentagyna Roxb., 2) mixed broad-leaved forest of mainly Mallotus philippensis (Lam.) Müll. Arg., Schima wallichii Choisy, S. robusta Gaertn., Bombax ceiba L., Betula alnoides Buch.-Ham. ex D. Don, and Diploloma butyracea (Roxb.) H.J. Lam and 3) pine forest dominated by Pinus roxburghii Sarg. Vegetation classification based on HMGN (1994). The forests of Ward 3 generally contain more commercially valuable species, such as Asparagus racemosus Willd., Valeriana jatamansi Jones, Diploloma palmatus (L.) C. Jeffrey and Rauvolfia serpentina (L.) Benth. ex Kurz (Rijal & Meilby in press).

The average population density in Chitwan District is 213 inhabitants per square kilometer. The climate here is favorable to agriculture. The infrastructure is relatively good and development is better than average in Nepal according to the higher than average adult literacy rate (65%) and economic indicators such as proportion of household with access to institutional credit (52%) and proportion of labour force employed in non-agricultural jobs (38%) (Rimal & Rimal 2006).

Ward 3 has Chepang inhabitants only, while in Ward 4 there are both Chepangs and non-Chepangs. The population density in these wards is roughly estimated at about 70 per square kilometer (Chhetri et al. 1997). Apart from Supar village in Ward 3 and Gairibari village in Ward 4, other settlements are scattered.
A road reaches up to the relatively flat land area with mixed population, while the hilly Chepang area lies at 3-4 hours walking distance from the road. The Chepang in the mixed population area have left traces of their traditional habits in terms of food, clothing, and cultivation practices. The traditional staple of yam (Dioscorea spp.) is partly replaced by maize and rice, loincloths by pants, and shifting cultivation to some degree by permanent agriculture.

**Chepangs**

A census conducted in 2000 showed that there were approximately 52,000 Chepangs (CBS 2001) and they inhabit the Mahabharat range in Chitwan, Dhading, Gorkha and Makwanpur districts of central Nepal (Bhattarai 1995). Being hunter-gatherers until about 80 years ago (Chhetri et al. 1997), the Chepang are considered among the most primitive indigenous peoples of Nepal. They practice shifting cultivation (slash and burn cultivation) and evidence suggests that they are highly forest-dependent (Bhattarai 1995, Chhetri et al. 1997, Gautam et al. 2003, Manandhar 1989, Pandit 2001) as well as among the poorest in Nepal (Bhattarai 1995). The forest is used as an important source of food, fiber, medicine, housing materials, fuel and fodder. Products are collected for own consumption, barter and sale. They are generally considered to be shy and easily dominated by other ethnic groups (Bista 2004), who have been migrating from the mountains to the lowlands for the last 40-50 years (Chhetri et al. 1997).

**Methods**

Semi-structured interviews were conducted with key informants who were traditional healers using medicinal plants, and elder people and women using edible and other useful plants. This helped to develop a check list of plants of various uses. Initial visits included discussions regarding the research activity and its purpose. This helped to identify key informants (2 traditional healers both male and 10 elders of which 4 were female and 6 were male all above 60 years old). The ‘artifact/interview’ approach (Martin 1995) was used to gather information about the use of plants for different purposes and identifying these different plant species. During forest visits, queries were made on plants not mentioned in the interviews to trap the knowledge of forgotten species. Since Chepangs are very shy, a trained local assistant was used to facilitate the interviews. The author has been working in this region for more than 18 years and is familiar with most of the plants of the region. In case of confusing species, herbarium specimen was prepared following the standard botanical procedures and were confirmed by tallying with the herbarium at the National Herbarium and Plant Research Department, Godawari, Nepal.

The Village Development Committee provided a name list of the permanent residents that was used to group them into sex and five age classes (<20, 21-30, 31-40, 41-50, >50 years) for each ward. From this list, 12 individuals were drawn randomly from each age class of both sex for each ward (n = 2 x 5 x 12 x 2 = 240) and interviewed for their knowledge of wild plant use. Total Chepang population in these two wards was 168 households with 1008 individuals in total. The sample size represent 24% of the total Chepang population. To analyze the knowledge difference between youth and elder people, the data were rearranged into two classes (≤ 30 and ≥ 31 years) because individuals until 30 years is considered youth in the Nepali society. The transmission of knowledge was analyzed through mixed linear regression analysis at 95% confidence interval of knowledge for each age class, sex and ward. The use of 95% confidence interval is justified by there being a tradition that all age groups are involved in plant use and good sharing of knowledge. For several causes affecting knowledge, justifications were obtained from elder Chepangs and relevant secondary sources. Estimates from the statistical analysis of plant use knowledge for each sex of all age groups from both wards were plotted against the age groups to explain graphically the knowledge distribution among each sex from both wards for all age groups (Figure 2). Similarly, average plant use knowledge for each use was calculated to see knowledge

**Table 1.** Average plant use knowledge (mean ± standard deviation) of different uses among male and female of Ward 3 and 4 of Shaktikhor VDC. M and F denote male and female respectively. Keys: Med = Medicine; Edi = Edible; Tim = Timber; Fir = Firewood; Cra = Craft; Cer = Ceremonial; Spi = Spices/Oil; Mis = Miscellaneous; Fod = Fodder; Env = Environmental and Con = Construction.

<table>
<thead>
<tr>
<th>Ward</th>
<th>Sex</th>
<th>Med</th>
<th>Edi</th>
<th>Tim</th>
<th>Fir</th>
<th>Cra</th>
<th>Cer</th>
<th>Spi</th>
<th>Mis</th>
<th>Fod</th>
<th>Env</th>
<th>Con</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>M</td>
<td>130.9 ± 64.7</td>
<td>61.6 ± 13.3</td>
<td>19.4 ± 1.2</td>
<td>86.1 ± 1.6</td>
<td>22.3 ± 4.1</td>
<td>19.8 ± 5.3</td>
<td>12.1 ± 2.6</td>
<td>26.6 ± 6.1</td>
<td>183.1 ± 10.6</td>
<td>7.7 ± 3.4</td>
<td>5.6 ± 2.1</td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>96.6 ± 63.6</td>
<td>67.7 ± 8.7</td>
<td>19 ± 1.5</td>
<td>86.6 ± 1.0</td>
<td>22.2 ± 2.1</td>
<td>20.5 ± 4.9</td>
<td>13.3 ± 4.9</td>
<td>23.7 ± 5.4</td>
<td>184 ± 9.0</td>
<td>6.7 ± 3.7</td>
<td>5.3 ± 1.7</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>111 ± 59.1</td>
<td>58.2 ± 4.0</td>
<td>19.4 ± 1.1</td>
<td>86 ± 1.7</td>
<td>22 ± 4.9</td>
<td>18.7 ± 6.6</td>
<td>11.1 ± 3.1</td>
<td>26.7 ± 5.9</td>
<td>168.5 ± 29.6</td>
<td>7.6 ± 3.2</td>
<td>5.7 ± 2.1</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>117.2 ± 66.9</td>
<td>67.2 ± 9.1</td>
<td>18.4 ± 2.4</td>
<td>86.3 ± 1.3</td>
<td>22.2 ± 2.9</td>
<td>19.8 ± 4.9</td>
<td>12.8 ± 2.7</td>
<td>23.4 ± 7.3</td>
<td>177.2 ± 16.1</td>
<td>7 ± 3.1</td>
<td>5.9 ± 1.6</td>
</tr>
</tbody>
</table>
difference between uses. Standard deviation of each uses for each sex was also calculated to analyze magnitude of differences within each sex of both wards (Table 1).

Different types or categories of people possess different kinds and amounts of knowledge, depending on their experiences (Saul 1992). Due to time limitations, the study could not include non-Chepangs, which would otherwise have given a better comparative picture of knowledge distribution. Specifically, this might have revealed whether knowledge is exchanged between Chepangs and non-Chepangs. Time also did not permit follow-up interviews with the same individuals after some years, which might have revealed interesting trends in the level of knowledge. Moreover, in-depth analysis for each genus/species might have been interesting.

Use value was calculated by adding number of uses of the species.

The growth rate of shrubs and trees is very fast in the study area. Within few years of fallow period, fallow land contain large number of shrubs and young trees or saplings which are slashed and burned before cultivation. Besides, clearing of new forest land was also taking place in the study area so to reflect their actions more properly, the term 'slash and burn cultivation' is used in the text instead of using alternative word 'shifting cultivation' of using alternative word 'swidden cultivation'.

Results

Model and hypothesis testing

Two models were developed.

(i) Model of all ages of both sexes from two wards:

\[ Y = \mu_{0} + \alpha_{\text{age}} + \beta_{\text{ward}} + \gamma_{\text{sex}} + \psi_{\text{sex}(\text{age})} + \pi \cdot \text{sex}(\text{ward})_{i} + \omega \cdot \text{age}(\text{ward})_{i} + \varepsilon_{i} \]

where \( i = 1, 2, ..., 240; j = 1, 2; k = 1, 2; l = 1, 2 \) and \( Y = \) plant use knowledge. \( \mu_{0}, \alpha_{\text{age}}, \beta_{\text{ward}}, \gamma_{\text{sex}}, \psi_{\text{sex}(\text{age})}, \pi \cdot \text{sex}(\text{ward})_{k}, \) and \( \omega \cdot \text{age}(\text{ward})_{k} \) are model parameters and \( \varepsilon_{i} \) is the residual term (\( \varepsilon_{i} \sim N(0, \sigma^{2}) \)).

(ii) Model of young (<30 years) and old (≥31 years) age groups of both sexes from two wards:

\[ Y = \mu_{0} + \alpha_{\text{age}} + \beta_{\text{ward}} + \gamma_{\text{sex}} + \psi_{\text{sex}(\text{age})} + \pi \cdot \text{sex}(\text{ward})_{k} + \varepsilon_{i} \]

where \( i = 1, 2, ..., 240; j = 1, 2; k = 1, 2; l = 1, 2 \) and \( Y = \) plant use knowledge. \( \mu_{0}, \alpha_{\text{age}}, \beta_{\text{ward}}, \gamma_{\text{sex}}, \psi_{\text{sex}(\text{age})} \) are model parameters and \( \varepsilon_{i} \) is the residual term (\( \varepsilon_{i} \sim N(0, \sigma^{2}) \)).

Figure 2 shows that men of Ward 3 are relatively more knowledgeable over the entire age spectrum, while men of Ward 4 are the least knowledgeable below 40 years of age. In Ward 4, women are generally slightly more knowledgeable than men. In Ward 3, the knowledge difference between men and women increases with age whereas it decreases in Ward 4.

The hypothesis that people of Ward 3 are more knowledgeable than those of Ward 4 is accepted (\( p<0.0001 \)), and so is the hypothesis that women are more knowledgeable than men (\( p<0.0001 \)) (Table 2A). Also the hypothesis that young people (<30 years) are less knowledgeable than old people (≥31 years) is accepted (\( p<0.0001 \)) (Table 2B).

Knowledge of different uses

Specific plant use knowledge indicated that in uses related to food, firewood, spices, fodder and ceremony, women were more knowledge while in medicine, timber, craft, environment, construction and miscellaneous (green manure, hedge, brewery, fish poison) men were more knowledgeable. But except medicine use knowledge difference in other uses were very insignificant (Table 1). The study also indicated that in activities like paid labour, young people (<30 years) were involved.

Households of young Chepangs (separated from the parents and living independently) used plastic ropes and artificial fiber and none of these households used traditional hand-made cloth. Especially in Ward 4, most of the households used market products rather than hand-made cloths or goods from natural fiber.

Discussion

Gender and knowledge

Knowledge is generated from observation and implementation, i.e., learning by doing. Women in rural societies worldwide are often primarily responsible for ensuring household food security, health and family continuity (Howard-Borjas 1999, Saul 1992) and due to that women are expected to be richer than men in indigenous plant use knowledge (Aguilar 2004, Latoya et al. 2003, Wayland 2001, Voeks & Leony 2004). In accordance with other findings in Nepal (Saul 1992) our analysis supports this in general (Table 2A). However, specific use knowledge analysis indicated that plant use knowledge of several uses was common among both sexes as both were involved in collection and utilization of those species while others differ due to gender specific activities (Table 1). Moreover, there is clear evidence that in the homogeneous ward, men are in general more knowledgeable than women while women are more knowledgeable than men in heterogeneous ward (Figure 2). Therefore, no general conclusions can be drawn from the analysis of difference of knowledge of specific plant uses between men and women. The study also indicated that in activities like paid labour, young people (<30 years) were involved.
and women (Table 2). The reason for men being more knowledgeable than women in homogeneous ward is due to big difference in knowledge about medicinal plant use (Table 1), and one of the reasons for this difference could be because all shaman-healers are men (Gurung 1995), while women concentrate on plants used for common and minor illnesses.

Knowledge and socio-economic environment

The quantitative comparison showed that Chepangs of the homogeneous Ward 3 were much more knowledgeable of wild plant use than those of Ward 4, indicating that socio-economic influences have led to erosion of indigenous knowledge (Table 2A). In Ward 4, Chepangs’ lifestyle is socially and economically influenced by the in-migrated non-Chepangs (Chhetri et al. 1997, Gurung 1995) and Stamm et al. (2004) holds that the influence of an introduced culture results in loss of knowledge. More than half of the population of Ward 4 is non-Chepang (CBS 1994, Chhetri et al. 1997).

Indigenous knowledge is transmitted vertically from elder to younger members of the family and also horizontally, through oral communication, imitation and participation in communal activities (Gispert & Campos 1986). Earlier, cooperation and communication was good in Chepang communities (Gurung 1995). Men would meet, in their Khoria clearing activities (slash-and-burn cultivation) and women also had mutual contact in forest products collection, water fetching and social gatherings. Like in several other rural societies (Saul 1992) sharing of knowledge used to take place at such occasions. But in Ward 4, the influence of non-Chepangs has affected such practices.
Changes in life style and socio-economic status of people are reflected in a declining use of wild plants (Uniyal et al. 2003) which ultimately affects the knowledge transfer (Ladia & Lozada 2000, 2001, 2004). The influence of non-Chepangs on the life style of Chepangs was obvious among the youth. Devaluation of traditional food and other practices by non-Chepangs has developed a prestige feeling among them, making the young Chepangs embarrassed at collecting wild plant products and follow traditional practices in general, which resulted in loss of collection skills (such as tuber and root digging) and use knowledge (Gurung 1995). Some Chepangs have married non-Chepangs and due to that changed life style and cultural practices the interaction between children of the two groups has also changed the cultural and social understanding of Chepang children (Gurung 1995).

Increased use of easily available market products implies a decline in the use of traditional plant products earlier preferred for food, fiber, utensils, and medicine (Uniyal et al. 2003). The use of various marketed products, such as agricultural products, synthetic rope and cloth, is increasing in Chepang communities and more so in Ward 4 with easy market access. This has decreased the use of wild food and traditional home-made cloths and natural fiber products, and also lost the market for several handicraft products like rope and leaf hat. Knowledge of wild edible species begins to diminish with the appearance of agriculture (Diaz-Betancourt et al. 1999). Study also indicated Chepangs learned agricultural practice from the in-migrating non-Chepangs (Gurung 1995). Agricultural practice also decrease Chepangs’ time for plant collection and substituted the use of some wild products (vegetables, fruits, oil and ceremonal products) and led to encroachment of forest with subsequent decrease in wild plant supply (Gurung 1995). Knowledge of useful plants is context specific (Saul 1992) and when the context changes such knowledge may be lost. In Chepang communities, economy played an important role in erosion of plant use knowledge. Due to lack of market for agriculture products in the homogeneous ward, contribution of income from agriculture and labour in household economy was less but contribution of income from traditional trade of forest products was high while in heterogenous ward, forest product had less economic contribution but income from agriculture products and other sources (such as labor) had more contribution in household economy (Rijal et al. in press). Due to economic role of forest products in homogenous ward, several plants remained subject of context while in heterogenous community knowledge of such plant were lost as they were not subject of context due to absence of their trade. The decrease in such species in the forest owing to unhealthy competition that was accelerated by migrated non-Chepangs was reason for decrease in trade (Rijal et al. in press).

Like in other aboriginal populations (Hill 2003) Christian missionaries made several young Chepangs stop practising traditional spiritual and cultural activities, including herbal treatment from Pande (healer) (Gurung 1995) and non-Chepangs encouraged them to use modern medicine, leading to a loss of indigenous knowledge of medicinal plants.

**Age and knowledge**

Several studies from all over the world indicate that elder people know more about plant use than younger (Benz et al. 2000, Caniago & Siebert 1998, Latoya et al. 2003, Tsuji 1996, Uniyal et al. 2003) and this corresponds to the findings of the present study (Table 2B and Figure 2). However, Saul (1992) suggests that young people (<40 years) are more knowledgeable than older people in the mid-hills of western Nepal and her argument is that knowledge is forgotten because people stop collection and utilization at old age. But in Chepang communities, wild plants remain part of old people’s context; they continue collection and preparation for utilization.

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**Table 2.** Models describing variation in plant use knowledge between two Chepang communities in Shaktivor VDC of the Chitwan district in Nepal.

<table>
<thead>
<tr>
<th>Effect</th>
<th>Estimate</th>
<th>Std error</th>
<th>Pr &gt;T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>265.02</td>
<td>15.4094</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Age</td>
<td>6.9479</td>
<td>0.3765</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Sex F</td>
<td>83.3063</td>
<td>21.1251</td>
<td>0.0001</td>
</tr>
<tr>
<td>Ward 3</td>
<td>89.7266</td>
<td>21.8588</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Age*Sex F</td>
<td>-1.6551</td>
<td>0.5107</td>
<td>0.0014</td>
</tr>
<tr>
<td>Age*Ward 3</td>
<td>-1.2802</td>
<td>0.5300</td>
<td>0.0165</td>
</tr>
<tr>
<td>Sex F*Ward 3</td>
<td>-84.1211</td>
<td>29.7765</td>
<td>0.0051</td>
</tr>
</tbody>
</table>

Changes in life style and socio-economic status of people are reflected in a declining use of wild plants (Uniyal et al. 2003) which ultimately affects the knowledge transfer (Ladia & Lozada 2000, 2001, 2004). The influence of non-Chepangs on the life style of Chepangs was obvious among the youth. Devaluation of traditional food and other practices by non-Chepangs has developed a prestige feeling among them, making the young Chepangs embarrassed at collecting wild plant products and follow traditional practices in general, which resulted in loss of collection skills (such as tuber and root digging) and use knowledge (Gurung 1995). Some Chepangs have married non-Chepangs and due to that changed life style and cultural practices the interaction between children of the two groups has also changed the cultural and social understanding of Chepang children (Gurung 1995).

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Difference in knowledge between young and old people (≤30 and ≥31 years) would be expected whereas significant difference between two adjacent age classes indicates lack of knowledge transmission. Loss of species, change in social practices, influence of migrated cultures, influence of market, influence of development activities, change in life style, and policy problems are some of the important factors that potentially affect knowledge transmission (Brockman et al. 1997, Oviedo et al. 2004, Ruddle 1993, Twarog 2004). Knowledge generated by elders from historic practices (Hipwell 1998, Kurien 1998, Schultes 1989) and transmitted vertically to the younger generation is very much related to the affinity between family members (Boesch & Tomasello 1998, Ladio & Lozada 2001, Ulluwishewa 1993). Traditionally, all members of a Chepang family used to gather around the fireplace in the morning and evening, where sharing of knowledge took place. Moreover, in Chepang communities children at 12-13 years are expected to help their parents in field and forest (Gurung 1995). Learning the names and characteristics of the more common items of the biota is among the ecological knowledge transmitted earliest in life (Cotton 1996, Ruddle 2000). Childrens’ involvement from an early age in livestock grazing, collection of fodder, firewood and different non-timber forest products and assisting in their preparation helped to increase their knowledge. Multi-generational families provided ample opportunities for sharing indigenous knowledge (Hill 2004) and changes of such social structures affected knowledge transmission (Wavey 1993). In Ward 3, most of the households were still multi-generational while in Ward 4, due to influence from non-Chepangs, this was no more the case (Gurung 1995).

Government policies may also contribute to the erosion of biological knowledge (Gurung 1995). There has been a lack of national policy and commitment to protect Chepangs from socio-cultural and economic discrimination and to promote their indigenous knowledge. The government has even encouraged in-migration through offering free land, and the absence of planned action has led to uncontrolled clearing of forest. The damage to the forest is revealed in a recent study, indicating not only a decrease in forest area but also in species diversity and density (Rijal & Meiby, in press). Similarly, development work like the construction of a highway at Ward 4 has increased the pressure on forests through opening markets for forest products.

A decrease in the time spent on collecting wild plants will result in a decrease in plant knowledge (Ladio & Lozada 2003) but Chepangs mentioned that as a consequence of deforestation more time was spent on collection leading to less time being available for social events where sharing of knowledge used to take place. Extinction of plant species will lead to the disappearance of indigenous knowledge regarding their use (Brockman et al. 1997, Saul 1992) and elder Chepangs claimed that some species are now difficult to find.

Conclusion

Some plant use knowledge was common among both sexes as both were involved in collection and utilization while others differ due to gender specific work. Therefore, no general conclusions could be drawn regarding knowledge and sex. But socio-economic activities have affected transmission of knowledge to the younger generation, and this loss of knowledge may have negative effects on biodiversity as well as on the future of the Chepangs. Several medicinal species used by traditional healers and environmentally important species are known only by elder people and there is risk of loss of such knowledge.

To protect the indigenous plant use knowledge and the benefits derived from it, the state should acknowledge folklore and legitimize its role. Since loss of knowledge affect biodiversity and vice versa, traditional forest management and utilization should be included in the national policy and institutional set-ups be made on access to resources and benefit sharing.

Acknowledgement

I would like to thank Chepang community of Shaktikhor for their understanding and cooperation. I would like to thank Prof. Finn Helles and Dr. Carsten S. Olsen for their constructive comments. Dr. Eric Dinerstine always encouraged me in my studies. Thanks also goes to unknown reviewers for their constructive comments. The study was supported by Russel E. Train Education Foundation of WWF-US and Copenhagen University (then Royal Veterinary and Agricultural University) with financial assistance.

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