



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

Arun Rijal

## Research

### 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).

Together with the recognition of the importance of indigenous knowledge of plant use, serious concern about the

loss of such knowledge has recently been expressed (Benz *et al.* 2000, Brockman *et al.* 1997, Byg & Balslev 2001, Johannes 1989, Ladio & Lozada 2000, 2003, Matavele & Habib 2002, Ruddle 2000, Twang & Kapoor 2004). Several economic and social factors are suspected of playing a part in this loss of knowledge (Amoroso & Gely 1998, Benz *et al.* 2000, Caniango & Siebert 1998, Carvalho 2004, Diaz-Betancourt *et al.* 1999, Duffield 2004, Mors 1982, Nipron 1997, Oviedo *et al.* 2004, Twarog 2004) and the causes of such loss have been of great interest to those who believe that indigenous knowledge can contribute to the resolution of sustainability problems (Benz *et al.* 2000, Byers *et al.* 2001, Phillip & Gentry 1993).

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 ethnobotanical knowledge is limited only to a few medicinal plants (Khan 1998, Manandhar 1989) and no assessment has yet been made in Nepal of

### Correspondence

Arun Rijal, GPO Box: 4326 Pasanglhamu Marg, Baudha Mahankal-6, Kathmandu, NEPAL.  
arunrijal@yahoo.com

**Ethnobotany Research & Applications 6:395-404 (2008)**

Published December 22, 2008

[www.ethnobotanyjournal.org/vol6/i1547-3465-06-395.pdf](http://www.ethnobotanyjournal.org/vol6/i1547-3465-06-395.pdf)

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:

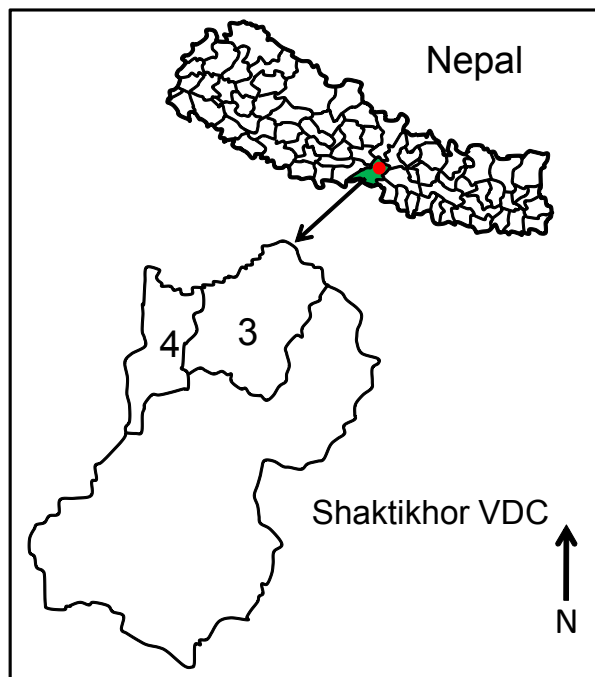
- The homogeneous ward is more knowledgeable with regard to plant use than that of the heterogeneous ward due to lack of access to road and market. Hence the population is not influenced by market and outside culture.
- The heterogeneous ward will have less knowledge due to influence of migrated people. 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 & Arn., *Lagerstroemia parviflora* Roxb., *Terminalia belerica* 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 *Diploknema 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, *Diplocyclos 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.



**Figure 1.** The study was conducted in Wards 3 and 4 of the Shaktikor VDC in the Chitwan district of Nepal.

# Rijal - A Quantitative Assessment of the Indigenous Plant Use Among Two Chepang Communities in the Central Mid-hills of Nepal 397

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 with local leaders, traditional healers and other key informants as well as community-wide meetings introducing 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 ( $n = 2 \times 5 \times 12 \times 2 = 240$ ) 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 ( $\leq 30$  and  $\geq 31$  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  $\pm$  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.

Ward	Sex	Med	Edi	Tim	Fir	Cra	Cer	Spi	Mis	Fod	Env	Con
3	M	130.9 $\pm$ 64.7	61.6 $\pm$ 13.3	19.4 $\pm$ 1.2	86.1 $\pm$ 1.6	22.3 $\pm$ 4.1	19.8 $\pm$ 5.3	12.1 $\pm$ 2.6	26.6 $\pm$ 6.1	183.1 $\pm$ 10.6	7.7 $\pm$ 3.4	5.6 $\pm$ 2.1
3	F	96.6 $\pm$ 63.6	67.7 $\pm$ 8.7	19 $\pm$ 1.5	86.6 $\pm$ 1.0	22.2 $\pm$ 2.1	20.5 $\pm$ 4.9	13.3 $\pm$ 2.3	23.7 $\pm$ 5.4	184 $\pm$ 9.0	6.7 $\pm$ 3.7	5.3 $\pm$ 1.7
4	M	111 $\pm$ 59.1	58.2 $\pm$ 4.0	19.4 $\pm$ 1.1	86 $\pm$ 1.7	22 $\pm$ 4.9	18.7 $\pm$ 6.6	11.1 $\pm$ 3.1	26.7 $\pm$ 5.9	168.5 $\pm$ 29.6	7.6 $\pm$ 3.2	5.7 $\pm$ 2.1
4	F	117.2 $\pm$ 66.6	67.2 $\pm$ 9.1	18.4 $\pm$ 2.4	86.3 $\pm$ 1.3	22.2 $\pm$ 2.9	19.8 $\pm$ 4.9	12.8 $\pm$ 2.7	23.4 $\pm$ 7.3	177.2 $\pm$ 16.1	7 $\pm$ 3.1	5.9 $\pm$ 1.6

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' or 'swidden cultivation'.

## Results

### Model and hypothesis testing

Two models were developed.

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

$$Y_i = \mu_0 + \alpha \cdot \text{age}_j + \beta \cdot \text{ward}_k + \gamma \cdot \text{sex}_l + \psi \cdot \text{sex}_l(\text{age}_j) + \pi \cdot \text{sex}_l(\text{ward}_k) + \omega \cdot \text{age}_j(\text{ward}_k) + \varepsilon_i$$

where  $i=1, 2, \dots, 240$ ;  $j=1, 2$ ;  $k=1, 2$ ;  $l=1, 2$  and  $Y$ =plant use knowledge.  $\mu_0$ ,  $\alpha \cdot \text{age}_j$ ,  $\beta \cdot \text{ward}_k$ ,  $\gamma \cdot \text{sex}_l$ ,  $\psi \cdot \text{sex}_l(\text{age}_j)$ ,  $\pi \cdot \text{sex}_l(\text{ward}_k)$ , and  $\omega \cdot \text{age}_j(\text{ward}_k)$  are model parameters and  $\varepsilon_i$  is the residual term ( $\varepsilon_i \sim N(0, \sigma^2)$ ).

(ii) Model of young ( $\leq 30$  years) and old ( $\geq 31$  years) age groups of both sexes from two wards:

$$Y_i = \mu_0 + \alpha \cdot \text{age}_j + \beta \cdot \text{ward}_k + \gamma \cdot \text{sex}_l(\text{age}_j) + \pi \cdot \text{sex}_l(\text{ward}_k) + \varepsilon_i$$

where  $i=1, 2, \dots, 240$ ;  $j=1..2$ ;  $k=1..2$ ;  $l=1..2$  and  $Y$ =plant use knowledge.  $\mu_0$ ,  $\alpha \cdot \text{age}_j$ ,  $\beta \cdot \text{ward}_k$  and  $\gamma \cdot \text{sex}_l$  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 ( $\leq 30$  years) are less knowledgeable than old people ( $\geq 31$  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 knowledgeable 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

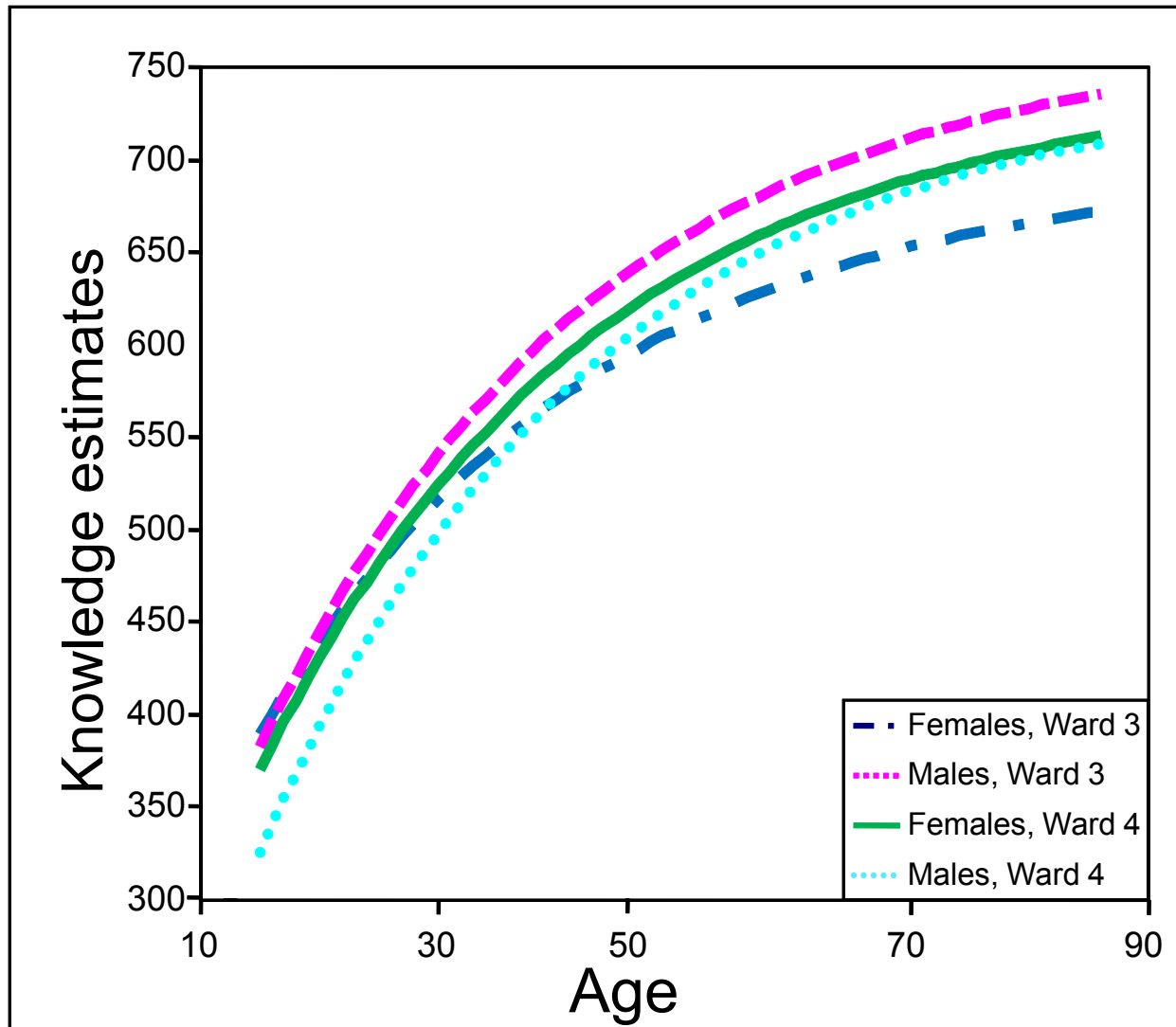


Figure 2. Knowledge estimates for different age and sex groups from Wards 3 and 4 in the Chitwan District of Nepal.

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 in-

troduced 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, co-operation and communication was good in Chepang communities (Gurung 1995). Men would meet, in their Khorias 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.

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

<b>2A.</b> Model describing the variation of plant use knowledge among different age groups, sex and wards using least square means. N=240, $\sigma^2=2125.51$ , $\sigma=46.1$ , $df=232$ . Estimates for Sex M and Ward 4 are 0.			
Effect	Estimate	Std error	Pr >T
Intercept	265.02	15.4094	<0.0001
Age	6.9479	0.3765	<0.0001
Sex F	83.3063	21.1251	0.0001
Ward 3	89.7266	21.8588	<0.0001
Age*Sex F	-1.6551	0.5107	0.00014
Age*Ward 3	-1.2802	0.5300	0.0165
Sex F*Ward 3	-84.1211	29.7765	0.0051

<b>2B.</b> Model describing variation of plant use knowledge among young ( $\leq 30$ ) & old ( $\geq 31$ ) age groups, sex and ward using least square means. N=240, $\sigma^2 = 2323.5$ , $\sigma = 48.2$ , $df=232$ . Estimates for Age $\geq 31$ , Sex M and Ward 4 are 0.			
Effect	Estimate	Std error	Pr >T
Intercept	612.25	8.0338	<0.0001
Age 30	-212.37	12.7025	<0.0001
Sex F	13.75	11.3615	0.2274
Ward 3	34.5	11.3615	0.0027
Age $\leq 30$ *Sex F	23.2083	17.9641	0.1977
Sex F*Ward 3	-58.7222	16.0676	<0.0003

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 ceremonial 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, Caniogo & 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.

# Rijal - A Quantitative Assessment of the Indigenous Plant Use Among Two Chepang Communities in the Central Mid-hills of Nepal 401

Difference in knowledge between young and old people ( $\leq 30$  and  $\geq 31$  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 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 & Meilby, 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.

## Literature cited

Amoroso, M. & A. Gely. 1998. Uso de plantas medicinais por caboclos do baixo Amazonas, Barbarena, PA, Brasil. *Boletim do Museu Paraense Emilio Goeldi Serie Botanica* 4:47-131.

Anguilar, L. 2004. Gender and Biodiversity. <http://site-mason.vanderbilt.edu/files/iUYZ01/IUCN%20BioDiversity%20Factsheet.pdf>. (accessed April 2005)

Benz, B., J. Cevallos, E. Munoz & F. Santana. 1996. Ethnobotany serving society: A case study from the Sierra de Manantlan Biosphere Reserve. *Journal of Botanical Research Institute of Texas* 17:1-16.

Benz, B., J. Cevallos, F. Santana, & S. Graf. 2000. Losing knowledge about plant use in the Sierra de Manantlan

- Biosphere Reserve, Mexico. *Economic Botany* 54:183-191.
- Bhattarai, T.R. 1995. Chepangs: Status, Efforts and Issues: A Syo's perspective. Pp 5-11 in *Chepang Resources and Development: Collection of expressions of the Gathering of the Concerned, 7-9 February 1995 (24-26 Magh 205) Thimura, Chitwan*. Netherlands Development Organisation/School of Ecology, Agriculture and Community works, Edited by Bhattarai, T.R., Pradhan, Samita, Ghimire & Gobinda. SNV/SEACOW Kathmandu, Nepal.
- Bhattarai, R.T., Pradhan, Samita, Ghimire & Gobinda. 1995. *Chepang Resources and Development: Collection of expressions of the Gathering of the Concerned, 7-9 February 1995 (24-26 Magh 205) Thimura, Chitwan*. Netherlands Development Organisation/School of Ecology, Agriculture and Community works, Kathmandu, Nepal.
- Boesch, C. & M. Tomasello 1998. Chimpanzee and human cultures. *Current Anthropology* 39:591-614.
- Brockman, A., B. Masuzumi. & S. Augustine. 1997. *When All Peoples Have the Same Story, Humans Will Cease to Exist: Protecting and Conserving Traditional Knowledge*. A Report for the Biodiversity Convention Office. Dene Cultural Institute, Hull, Canada.
- Byers, B.A., R. N. Cunliffe. & A. T. Hudak. 2001. Linking the conservation of culture and nature: A case study of sacred forests in Zimbabwe. *Human Ecology* 29:187-218.
- Byg, A. & H. Balslev. 2001. Traditional knowledge of *Dypsis fibrosa* (Arecaceae) in Eastern Madagascar. *Economic Botany* 55: 263-275.
- Caniago, I. & S. Siebert. 1998. Medicinal plant ecology, knowledge, and conservation in Kalimantan, Indonesia. *Economic Botany* 52:229-250.
- Carvalho, A. R. 2004. Popular use, chemical composition and trade of cerrado's medicinal plants (Goias's, Brazil). *Environment, Development and Sustainability* 6:307-316.
- Central Bureau of Statistics (CBS) 1994. *Population Census 1991*. His Majesty's Government, National Planning Commission Secretariat, Kathmandu.
- Central Bureau of Statistics (CBS) 2001. *Statistical year book of Nepal*. His Majesty's Government, National Planning Commission Secretariat, Kathmandu.
- Chaudhary, R.P. 1998. *Biodiversity in Nepal-Status and Conservation*. Craftsman Press, Bangkok, Thailand.
- Chhetri, N.S., S. Ghimire, C. Gribnau, S. Pradhan & S. Rana. 1997. *Can orange trees bloom on a barren land? Identification of development potentials of Praja communities in Chitwan District*. Netherlands Development Organisation, Kathmandu.
- Convention on Biological Diversity (CBD) 1992. *Traditional Knowledge and the Convention on Biological Diversity*. [www.cbd.int/traditional/intro.shtml](http://www.cbd.int/traditional/intro.shtml).
- Cotton, C.M. 1996. *Ethnobotany: Principles and Applications*. John Wileys and Sons, London.
- Diaz-Betancourt, M.E., L. Ghermandi, A. H. Ladio, I. R. Lopez Moreno, E. Raffaele, & E. H. Rapoport 1999. Weeds as a source for human consumption. A comparison between tropical and temperate Latin America. *Revista de Biologia Tropical* 47:329-338.
- Dutfield, G. 2004. Developing and implementing National Systems for Protecting Traditional Knowledge: Experiences in Selected Developing Countries. Pp 141-154 in *Protecting and Promoting Traditional Knowledge: Systems, National Experiences and International Dimensions*. United Nations Conference on Trade and Development (UNCTAD), Edited by S.Twarog & P. Kapoor. United Nations. New York and Geneva.
- Gautam, M.K., E. H. Roberts, & B. K. Singh 2003. *Community based leasehold approach and agroforestry technology for restoring degraded hill forests and improving rural livelihoods in Nepal*. Paper presented at the International Conference on Rural Livelihoods, Forests and Biodiversity May 19-23, Bonn, Germany.
- Gerritsen, P.R.W. 1998. Community development, natural resource management and biodiversity conservation in the Sierra de Manantlan biosphere reserve, Mexico. *Community Development Journal* 33:314-324.
- Gispert, M. & A. G. A. Campos. 1986. Plantas medicinales silvestres: el proceso de adquisicion, transmission y colectivizacion del conocimiento vegetal. *Biotica* 11:113-125.
- Gurung, G.M. 1995. *Report from a Chepang Village Society, Culture and Ecology*. Ratna Pustak Bhandar, Kathmandu.
- Hill, D.M. 2003. *Traditional medicine in contemporary contexts. Protecting and respecting indigenous knowledge and medicine*. National Aboriginal Health organisation (NAHO). [www.naho.ca/english/pdf/research\\_tradition.pdf](http://www.naho.ca/english/pdf/research_tradition.pdf)
- Hill, F. 2004. *Passing on Traditional Knowledge*. Indigenous Knowledge Conference Proceedings. Pennsylvania State University, University Park, Pennsylvania. [www.ed.psu.edu/icik/2004conference\\_proceedings.html](http://www.ed.psu.edu/icik/2004conference_proceedings.html).



## Rijal - A Quantitative Assessment of the Indigenous Plant Use Among Two Chepang Communities in the Central Mid-hills of Nepal 403

- Hipwell, M.A.B. 1998. *Integrating local/traditional ecological knowledge into fisheries management in Canada*. Research Report. Integrated Coastal Zone Management Division, Marine Ecosystems Conservation Branch, Fisheries and Oceans. Ottawa, Canada.
- His Majesty's Government of Nepal (HMGN) 1994. *Topo sheet no. 2784 07A and 2784 03C*. Survey Department, Ministry of Land Reform, Kathmandu, Nepal.
- Howard-Borjas, P. 1999. Some implications of gender relations for plant genetic resources management. *Biotechnology and Development Monitor* 37: 2-5.
- Johannes, R.E. 1989. Fishing and traditional knowledge conservation. Pp 39-43 in *Traditional Ecological Knowledge: A collection of essays*. Edited by R.E. Johannes. IUCN Publications Services, Hertfordshire, England.
- Khan, M.H. 1998. Documentation of indigenous knowledge in the Chepang community of Shakti Khor VDC, Chitwan. Pp 96-101 in *Ethnobotany for Conservation and Community Development*. Edited by K.K. Shrestha, P.K. Jha, P. Shengji, A. Rastogi, S. Rajbhandary & M. Joshi, Ethnobotanical Society of Nepal, Kathmandu.
- Kurien, J. 1998. Traditional ecological knowledge and ecosystem sustainability: New meaning to Asian coastal proverbs. *Ecological Applications* 8(1): S2-S5.
- Ladio, A.H. & M. Lozada. 2000. Edible wild plant use in a Mapuche community of north-western Patagonia. *Human Ecology* 28:53-71.
- Ladio, A.H. & M. Lozada. 2001. Non-timber forest product use in two human populations from NW Patagonia: A quantitative approach. *Human Ecology* 29: 367-380.
- Ladio, A.H. & M. Lozada. 2003. Comparison of wild edible plant diversity and foraging strategies in two aboriginal communities of north-western Patagonia. *Biodiversity and Conservation* 12:937-951.
- Ladio, A.H. & M. Lozada. 2004. Patterns of use and knowledge of wild edible plants in distinct ecological environments: A case study of a Mapuche community from north-western Patagonia. *Biodiversity and Conservation* 13:1153-1173.
- Latoya, B., J. Bussey, Z. Donehue, T. Fischer, W. Fry, J. Lawton, C. Parham, S. Turner & J. Wheeler. 2003. *An investigation of the knowledge concerning medicinal plant use in Allegany country, MD and Somerset County, Pennsylvania*. (Unpublished)
- Manandhar, N.P. 1989. Medicinal Plants used by Chepang tribes of Makwanpur District, Nepal. *Fitoterapia* 60(1):61-68.
- Martin, G. J. 1995. *Ethnobotany: A Method Manual*. A People and Plant Conservation Manual. Chapman and Hall, London.
- Matavele, J. & M. Habib. 2002. Ethnobotany in Cabo Delgado, Mozambique: Use of medicinal plants. *Environment Development and Sustainability* 2: 227-234.
- Mors, W. 1982. Plantas medicinais. *Ciencia Hoje* 1:14-19.
- NIPRON 1997. *Plantas Mediciniais*, Passo Fundo: EDI-UPF.
- Oviedo, G., Gonzales, A. & Maffi, L. 2004. The Importance of Traditional Ecological Knowledge and Ways to Protect it. Pp 71-82 in *Protecting and Promoting Traditional Knowledge: Systems, National Experiences and International Dimensions*. United Nations Conference on Trade and Development (UNCTAD), United Nations. Edited by S. Twarog & P. Kapoor, New York and Geneva.
- Pandit, B.H. 2001. Non-timber forest products on shifting cultivation plots (*khorya*): A means of improving livelihood of Chepang Rural Hill Tribe of Nepal. *Asia-Pacific Journal of Rural Development* 11:1-14.
- Phillip, O.L. & A. H. Gentry. 1993. The useful plants of Tamborata, Peru I: Statistical hypothesis tests with new quantitative techniques. *Economic Botany* 47:15-32.
- Rai, N.K. & J. Chaudhary. 1975. A survey of the socio-economic development of the Chepangs. CEDA T.U. Kirtipur, Kathmandu.
- Rijal, A., S. C. Olsen & F. Helles (in press). Non-timber forest product dependency in the Central Himalayan foot hills. *Forest Ecology and Management*.
- Rijal, A. & H. Meilby (in press) Is the life supporting capacity of forests in the mid-hills of Nepal threatened? *Environment and Management*.
- Rimal, S. & R. Rimal. 2006. *Nepal district profile 2006*. Nepal Development Information Institute, Kathmandu, Nepal.
- Ruddle, K. 1993. *The Transmission of Traditional Ecological Knowledge*. Pp 17-31 in *Traditional Ecological Knowledge, Concept and Cases*. Edited by J. T. Inglis. International Program on Traditional Ecological Knowledge and International Development Research Centre, Ottawa, Canada, 17-31.
- Ruddle, K. 2000. Systems of knowledge: Dialogue, relationships and process. *Environment, Development and Sustainability* 2: 227-304

- Saul, R. 1992. Indigenous Forest Knowledge: Factors Influencing its Social Distribution. Pp 136-144 in *Anthropology of Nepal: People, Problems and Processes*. Edited by M. Allen. Mandala Book Point, Kathmandu.
- Schultes, R.E. 1989. Reasons for ethnobotanical conservation. Pp 31-37 in *Traditional Ecological Knowledge: a collection of essays*. Edited by Johannes. IUCN Publications Services, England
- Stamm, B.H., H. E. Stamm, A.C. Hudnall, & C. Higson-Smith. 2004. Considering a Theory of Cultural Trauma and Loss. Invited article for *Journal of Loss and Trauma* 9(1):89-111.
- Thapa, B.B. 1979. Chepang Jatiko Adharvut Awasyakta: A Case Study of Makaisingh Village Development Committee. Masters thesis, Tribhuvan University, Kirtipur.
- Thapa, D.S. 2003. *Odhar nai Banyo Chepang ko Ghar*. *Kantipur Daily*, December 2, 2003.
- Tsuji, L.J.S. 1996. Loss of Cree traditional ecological knowledge in the Western James Bay region of Northern Ontario, Canada: A case study of the sharp-tailed grouse, *Tympanuchus phasianellus phasianellus*. *The Canadian Journal of Native Studies* 16: 283-292.
- Twarog, S. 2004. Preserving, Protecting and Promoting Traditional Knowledge: National Actions and International Dimensions. Pp 61-70 in *Protecting and Promoting Traditional Knowledge: Systems, National Experiences and International Dimensions*. United Nations Conference on Trade and Development (UNCTAD). Edited by S. Twarog. & P. Kapoor. United Nations, New York and Geneva.
- Twarog, S. & P. Kapoor. 2004. *Protecting and Promoting Traditional Knowledge: Systems, National Experiences and International Dimensions*. United Nations Conference on Trade and Development (UNCTAD). United Nations, New York and Geneva.
- Ulluwishewa, R. 1993. Indigenous pest control methods in Sri Lanka. *Honey Bee* 4(1):3-4.
- Uniyal, S.K., A. Awasthi, & G. Rawat. 2003. Developmental Processes, Changing Lifestyle and Traditional Wisdom: Analysis from Western Himalaya. *The Environment* 23:307-312.
- Voeks, R.A. & A. Leony. 2004. Forgetting the forest: Assessing medicinal plant erosion in eastern Brazil. *Economic Botany* 58: 294-306.
- Wayland, P. 2001. Gendering local knowledge: Medicinal plant use and primary health care in the Amazon. *Medical Anthropology* 15:171-88.
- Wavey, R. 1993. International workshop on knowledge and community-based resource management: Keynote Address. Pp 11-16 in *Traditional Ecological Knowledge: Concepts and Cases*. Edited by J .T. Inglis. Canadian Museum of Nature, Ottawa, Ontario.