Conflict for Food:

A Sociological Study of Human-Monkey Conflict

in Sikre VDC, Nuwakot

(A thesis submitted to the Faculties of Humanities and Social Sciences for the

partial fulfillment for the Masters of Arts in Sociology/Anthropology)

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Submitted by

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DECLARATION

I hereby declare that the work entitled "Conflict for Food: A Sociological Study of Human Monkey Conflict in Sikre VDC, Nuwakot" is my personal project carried out for the partial fulfillment of the requirement for master's degree in sociology/anthropology at Tribhuvan University, University Campus, Kirtipur. This work is done under the supervision of Prof. Dr. Sambhu Prasad Kattel.

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LETTER OF RECOMMENDATION

This is to certify that this thesis entitled "Conflict for Food: A Sociological Study of Human Monkey Conflict in Sikre VDC, Nuwakot" has been prepared by Mr. Bishnu Prasad Pandey under my supervision. As to my knowledge, this work has not been previously submitted for any other degree. Hence, I recommend this thesis to be accepted for the partial fulfillment of Masters of Arts, Faculties of Humanities and Social Sciences for the evaluation and to carry out further formalities.

I wish him all the best.

Dr. Sambhu Prasad Kattel

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LETTER OF APPROVAL

The thesis submitted by Mr. Bishnu Prasad Pandey entitled "Conflict for Food: A Sociological Study of Human Monkey Conflict in Sikre VDC, Nuwakot" has been accepted as a partial fulfillment of the requirement for the Masters of Arts, Faculties of Humanities and Social Sciences.

Examination Panel

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ACKNOWLEDGEMENT

ABSTRACT

Human-monkey interactions are descended from the human civilization. Some generalist and most adaptive species of wildlife can adapt in, or nearby human settlement or farmland, where they are using easily accessible food materials. Primates are the frequent crop-raiders in Nepal and Assamese monkey has no exception.

This study was carried out in proposed buffer zone of Shivapuri Nagarjun National Park and targeted to access the human and primate interaction. Particularly, assessment of the crop preference, quantity of crop loss and costs of crop damage were the main objectives. Samples were drawn randomly by lottery method and field observation, structured and un-structured interview with 12.8 % household was made. Simple mathematical tools were used to analyze the data and results were presented by texts, tables, and figures.

The study reveals that there is a mosaic of ethnicity and fairly uniform religious belief. Majority of households (80%) are headed by male and diversification of occupation was observed. On an average each households have 5.8 members with standard deviation of 2.15. 30% populations are illiterate while 30% have only primary education and 40 % secondary education. It was found that each house hold has 8.85 *Ropanies* of farm land. Shifting of occupation could be boosted by low agricultural productivity and frequent crop raids in areas of close to the national park.

The distance between farmland and forest has a negative co-relation values (r = -0.5, -0.6, and -0.7) while the distance between farmers' house and farmland has positive relations (r = 0.07, 0.1, and 0.14) on *Doyam, Sim,* and *Chahar* land respectively. It was found that maize was the top favored crop followed by millet, *Skhush,* beans, pumpkin, and rice while wheat was heavily damaged during winter followed by radish, potato, and mustard. Uprooting by infants and juveniles for curiosity and play is common. Maize was highly damaged by 77 kgs, millet 56 kgs in summer while wheat was top raided by 38 kgs, radish 24 kgs, and potato 13 kgs per family in winter. Banana was frequently raided (12 kgs). The mean cost paid by local farmer for crop damage was NRs 5933 per family while cost of crop protection tolls NRs 6602. The area of land and cost of crop raid has highly correlated (r value: 0.8) in study area.

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CHAPTER 1: INTRODUCTION

1.1 Background of the study

Human-monkey association is as old as man's history. The human perception of nonhuman primates is often one of contradiction, typified by extreme cases. In some cultures and contexts (e.g., Hindus of Bhutan, India, Nepal) primates are viewed as sacred (Campbell-Smith, et al., 2010), in others such as China or Japan, they are mythical creatures of cunning and deviousness (Fuentes, 2006), while for most of the world's subsistence farmers living in close proximity to monkeys and apes, they represent a significant crop pest (Chalise & Johnson, 2001). In many cultures these two views overlap resulting in both a love and loathing of the creatures (Hill, 2004) such that they may be worshipped at a temple and killed on the farm next door.

The Hindu and Buddhist cultures have a closer relationship with primates. The interaction and coexistence of human and primates are visualized from the 'God *Rama's* Epic'. There were some primates governed states in the forests e.g. the state managed by *Bali* (Byasha, Undated). Primates have supported god *Rama* and taken part in religious war during *Rama's* dynasty. Majestic primate like *Hanumana* and *Sugriva* and their shoulders were used to construct a *Ramasetu,* taken part in war to defeat *Ravana,* the king of the *Lanka* states, and exploration of medicinal herbs to cure injured shoulders including *Laxman* (Byasha, Undated). From the time of the *Rama's* dynasty, primates are worshiping as the sign of god and statues of *Hanumana* were constructed along with god *Rama, Sita,* and *Laxman* throughout the Hindu society. Moreover, recognition of primates can be observed in Hindu zodiac. The humans are grouped to many *Gana* including that of *Bandar Gana* counted

horoscopically from the time of birth (Tripathi, et al., 2069 VS). The Buddhist calendar has a 'monkey year' rounding for 12 years.

Current capitalist society is the product of continuous change from hunting and gathering society through agrarian and feudal society. Human has started cultivating crops and livestock rearing thereby the trend of food storage and livestock rearing became common living strategy. Parallel to the cultivation and livestock rearing, human have close affinity to the jungle for varied forest products like wood, fodder, fiber, medicinal herbs, wildlife hunt and many more. Biologically, human and primates have common ancestors and their habit, habitat, and home range are common. The dependence on seed crops by both human and primate has created a ground to have frequent human primate interaction in nature. It is common in the wild that food materials are sparsely distributed and have limited nutritional value. The food snatching from the farmland and from house is thus a common strategy for the primates (Chalise, 2008).

Human population growth and activities like deforestation, agriculture, and urbanization lead to an ever-increasing encroachment of wildlife habitats. Reduction of wild animals' natural habitats altered into small marginal patches. In contrast, species with a high degree of flexibility (a generalist species) can adapt to living in, or near, areas inhabited by man, where in some cases they end up using easily accessible food resources, like human cultivations and garbage. The common animals interacting with humans include primates, coyotes, birds and small mammals, hooded crows, (Vuorisalo et al. 2003 cited by(Chhangani and Mohnot 2004)). While other confront, resulting in conflicts like when non-human primates raid crops(Chalise 2010).

Sillero-Zubiri and Switzer, 2001 define crop raiding as "wild animals moving from their natural habitat onto agricultural land to feed on the produce that humans grow for their own consumption". Across the globe, primates are the most frequently identified crop-raiding animals. From Africa to the Arabian Peninsula to South Asia, primates come into conflict with humans due to the renowned crop raiding behavior of many species (Sillero-Zubiri & Switzer, 2001). Survival and reproduction of individuals depend on their ability to locate and harvest sufficient food to meet their nutritional needs (Chhangani & Mohnot, 2004).All primate species interact with a variety of food distributed in their home range, which is within their reach. Their ability to learn things very quickly and change in the behavior accordingly, makes them very successful and potential crop raiders. Primates (monkeys) are reportedly cause considerable loss in various crops especially near the forests and conservation areas (Chalise, 2003) as a response of interaction with resources on their home range (Chhangani & Mohnot, 2004) either crop or wild foods.

They are often killed for crop pest control measures and have been included on the list of endangered species in this region and protected species of Nepal. The crop losses due to the monkey species were heavy to the maize fields, potatoes (tubers also), rice, fruits and millets (Chalise, 2010).To protect crop fields and orchards from primates, farmers use many methods like patrolling and guarding (Nyinondi 2008 cited in (Upadhyay, n.d.), scarecrows, tin-box, stones and catapults, keeping dogs, fencing with thorny twigs, Cultivate of non-attractive crops as buffer zone (Upadhyay, n.d.).

The study focuses on multiple aspects of human monkey interaction especially focused on the conflicts for foods in Sikre VDC of Nuwakot district, Nepal. The aim of this study therefore was to assess the prospects and constraints of protecting globally threatened primate species

from sociological angle. This comprehensive work included describing people's perception on monkeys, nature and extent of interaction as well as benefits and costs of human monkey interaction. To sum up the study was to satisfy following research questions.

1.2   Research Questions

➢ Are local people aware of human monkey interaction?

➢ What is the perception of local people towards wildlife especially with monkeys?

➢ Is the interaction between human and monkey goes in hostile mode?

➢ How can local people be benefited from wildlife especially that with monkeys?

➢ Is the interaction beneficial to either side?

➢ How much the interaction between human and monkey costs on either side?

1.3   Objectives of the study

• To describe the understanding of local people about human-monkey relationship.

• To identify the types of human monkey relationship in the study area.

• To access the cost and benefit of human monkey conflict in the study area.

CHAPTER 2: LITERATURE REVIEW

Human are part of the ecosystem as they could define the extent of nature. Humans have developed different adaptive strategies depending on the surrounding environment. Different resource exhaustion strategies are defined by the inhabiting society and their cultural attributes. Humans have developed identical tools and technologies according to the challenges posed by the nature. Thus it can be inferred that modern societies are the product of human nature relations

Human beings were hunters and gatherers in the past. Innovations of pointed weapons of quartz and animals parts were the milestone for successful living strategy at that time. The next stage of development of human civilization was that of human's ability to tame wild animals and invention of plough thereby giving rise to the agrarian society. Human started permanent settlement and they have direct and indirect relationship with the wild animals which were otherwise using the new settlement areas. Human and monkey being closer relatives, they have multiple overlapping niches against the nature. Like the human beings, seeds are the staple food for monkeys. Monkeys therefore hang around the crop field for patches of food crops which are easily available and rather nutritious.

2.1   Human-monkey interactions

Monkeys have frequent interaction with humans. Examining the interaction pattern between human and monkey in cultural, demographic, and contextual interaction pattern has its vital importance in managing human and primate habitats. The interface between human and primates is the core component and emerging anthropological discourses (Fuentes,

2006).Inclusion of local people in conservation and their participation in conservation planning and management of wildlife has its own importance (Chauhan & Pirta, 2010).

Being evolutionarily closer relatives and interactions being represented by various mythological, diets, and scientific paradigms, study of human and monkey interaction is justified (Fuentes, 2006). Reverence as gods, loathed as evil spirits, a source of bush meat, and killing for sports (Hill & Webber, 2010) are common perceptions and activities done by humans against primates. Monkeys create their niches in proximity areas of human settlements due to combined effect of religious beliefs and dietary similarities (Chauhan & Pirta, 2010). As humans live in proximity to primates and the competition for the shared resources is obvious throughout the evolutionary history of humans and primates from centuries, millennium, or even longer (Sponsel et al, 2002 cited in (Riley, 2007)).

Human and non-human primates associations could be viewed from two schools of thoughts e.g. culturally and biologically. The interconnections between human and non-human primates could be examined by measuring human perceptions and attitude towards primates culturally and their relevance for mutual existence (Hill & Webber, 2010). Detailed understanding on the context and patterns of interaction play an important role in mitigating human macaque conflicts (Fuentes, 2006). Clear understanding of peoples' perception towards monkeys as 'pest animals' is vital for sustained survival of threatened animals for sound environmental management in conflict zones (Paterson & Wallis, 2005 cited in Hill et al., 2010).

The relevancy of studying multifarious interactions of human and non-human primates is justified in current ecological and cultural dynamic conditions (Fuentes, 2006).

Understanding multifaceted aspects of human monkey interactions are essential to create a valid database on behavioral, epidemiological, and cultural context (Fuentes, 2006). A concept of a buffer zone crops are recommended by (Riley, 2007) to ameliorate human macaque conflict.

2.2   Assamese monkey

Assamese monkey *Macaca assamensis* is locally known as *Pahare Bandar* (Chapagain & Dhakal, 2002) as well as Assami Bandar in Nepal, Bandor in Assam, Assamia Bandar in Hindi (Menon, 2003). It resembles to the Rhesus monkey having a brownish-grey to yellowish-grey coat, which is uniform in pelage, lacks a pinkish face and absence of red bottoms (Baral & Shah, 2008). In Nepal, it is reported to cover wider geographical ranges, rather patchily, distributed along rivers in the tropical and subtropical areas, from Kankai valley of Illam, Arun Valley (Wada, 2005). Its' range further extends to Api range through Langtang National Park (Chalise, 2003) (Regmi & Kandel, 2008), Shivapuri Nagarjun National Park (Wada, 2005) (Pandey, 2012), Ramdi Palpa, Makwanpur, Melamchi, and Achham district (Chalise, 2003).

Assamese monkey is a diurnal animal and arboreal (Menon, 2003) and feed on vegetables, cereals, twigs, and invertebrates (Chapagain & Dhakal, 2002) (Menon, 2003) therefore hang around the crop field. Given its restricted extent of occurrence, increasing threats to the individuals and habitat, and decreasing numbers in fragmented patches, the Nepal Assamese macaques is categorized as '*Near Threatened*' in the *2013 IUCN Red List of Threatened Animal*s (IUCN, 2011)and fully protected in Nepal under National Parks and Wildlife Conservation Act 1973 of Nepal (GoN, 1973). The national red list of Nepal categorize this

specie's status is given as a *vulnerable* (Jnawali, et al., 2011) and considered as a crop-raiding pest in Nepal (Chalise & Johnson, 2001) and survival of this species is under peril. Examining human-macaque conflict within the people's social, economic, and cultural context is justified (Hill, 2004) and essential on the scenario that primate population are under decreasing trend and conflicts between local people are on the rise. Given the decreases in natural habitat and population numbers along with increasing threats due to retaliation for crop raiding, there was a critical need to assess the degree of crop raiding problem and generate solutions to deal effectively with the human–macaque conflict

CHAPTER 3: METHODOLOGY

Different methods used for sociological studies were replicated in this study. Basically exploratory methods of informal nature were favored to find the answers of research questions. The study area was in the vicinity of capital city and easily accessible for study. Details of methods adopted were discussed in following paragraphs.

3.1 Study Area

Alche Gaun, *Bhandare Gaun*, and *Pune Gaun* of Sikre VDC, Nuwakot were selected for the study to study the human monkey relations. It a proposed buffer zone of this Shivapuri Nagarjun national park and contagious to the park boundary where two troops of Assamese monkey inhabits. Human and park interaction is common in terms of peoples movement to the park for their subsistence and wildlife movement to the farms and livestock sheds for their alternative food. The park authority has found the area is the ideal site for study of human wildlife interaction particularly to that of Assamese monkey thus the investigator was intended to understand the human monkey interaction, people's perception towards monkeys, and to quantify the extent of crop damage by monkeys.

Moreover, the study area is the mosaic of cultures viz. Hindu and Buddhist culture. People have multiple living strategy and occupation including farming, trade, service, foreign labor and domestic laboring. The *Sikre* VDC is not only closer to the capital city but its serene beauty and wilderness areas allured the investigator to understand the human-monkey interaction. It is an interesting site for anthropological and biological studies.

3.2   The Universe and Sampling Procedures

There are 78 households within three settlements of *Sikre* VDC namely the *Alche Gaun, Pune Gaun,* and *Bhandare Gaun.*The list of households was available from the village development committee office and each household were provided with nominal numbers e.g. 1, 2, 3 etc. 10 households (12.84 %) of 78 households were randomly drawn and visited. The randomly selected households were visited to understand the people's perception on human monkey interaction, identify the types of interaction, and the benefit and cost of such interactions.

3.3   Nature and sources of data

Both qualitative and quantitative data were generated from the study area. The perceptions of local people towards human monkey interaction and the type of interaction were measured by subjective methods while benefits and costs of interaction were measured quantitatively. The study was depending on primary data generated from study area while literatures were reviewed for discussions.

3.4   Data collection techniques

Key informant interview

Key informant interview was made to understand the general scenario of the study area. Finding randomly selected households was easy with key informant interview. The history of the village, human and nature relations and general understanding of people's perception regarding human wildlife relation was made with key informants. The local shop keepers, village leaders, park authorities were the key informants for this study.

Observation

The damage made by the monkey and protection measured were observed during study period. Complete follow up of the troops of Assamese monkey was made for examining daily activities of monkeys. A scanning method was used to observe the daily routine.

Interview

Informal interviews with respondents were made with 12.82% households of three villages (*Alche, Bhandare,* and *Pune* Gaun). The interview was targeted to probe answers for all chosen question. A checklist of questions was accompanied with the interviewer for general references.

Local villager (Chalise, 2003) will make the extent and frequency of raiding and error will be minimized triangulation with other respondents. To investigate the interplay of factors that explain attitudes toward crop-raiding (Campbell-Smith, et al., 2010) by Assamese monkey, settlements adjacent to the crop field (i.e. *focal group*) were key area selected for interview.

3.5   Data Analysis and Presentation

The presence or absence of crop raiding were made by scoring the response as zero for absence and one for presence by simple mathematical tool (percentage %). Data were analyzed both qualitatively and quantitatively; simple statistical tools were used for data analysis and interpretation. Statistical tools such as mean, median, mode, and standard deviation were used for quantitative analysis. Charts, figures and tables are used to present the data.

CHAPTER 4: THE SETTING

Sikre Village Development Committee lies northwards of Shivapuri Nagarjun national park which is the closest of all protected area from capital city. To the student and novice researchers it is the good site to consider where multiple aspects of human society and culture as well as various ecological studies could be launched. The interaction between humans and two troops of Assamese monkeys (Pandey, 2012) was thus chosen for this study.

4.1 Geography

The *Sikre gaun* lies north to Shivapuri Nagarjun National Park. Geographically this area is located in 0635465 UTM latitude and 3079208 UTM longitude and lies atop around 1700 meters north faced slope (Pandey, 2012). Their altitudes range from 1600 meters to 2000 meters above sea level.

4.2 Climate

Distinct winter, summer and monsoon season are characteristic of SNNP and surrounding area. During summer, temperature fluctuates between 19°C, which may rise up to 30°C during May and June. The minimum temperature varies from 2–17 °C during the winter season. The annual precipitation of about 1,400 mm (55 in) falls mostly from May to September, with 80% during monsoon.

4.3 Natural resources

Forest and wildlife

Alche Gaun, *Bhandare Gaun*, and *Pune Gaun* lie on the subtropical zone while the forest area of park lies on subtropical and temperate zones (Pandey, 2012). The major forest type found in study area was Northern mixed hardwood forest. Major tree species found in study area were Uttis (*Alnus nepalensis*), Paiyu (*Prunus ceracoides*), Chilaune (*Schima wallichii),* Katus (*Castenopsis* sp.), Banjh (*Quercus lamelosa*), Khasru (*Quercus semecarpifolia*), Kafal (*Myrica esculanta*) and associated species (GoN, 2065/66 VS). It is obvious that the area is reach in forest resources. People are dependent on park resources but their harvesting practice is rather illegal (NLC, 2029 VS). People are planting and growing timber, fuel wood, fodder, and some multipurpose tree species around crop fields and fallow lands (GoN, 2065/66 VS).

Sikre village is proud to have some majestic wildlife aside of their village. The most elusive cats like clouded leopard (*Pardofelis nebulosa*), common leopard (*Panthera pardus*), leopard cat (*Felis bengalensis*), Jungle cat (*Felis chaos*), and civet cats (*Viveridae*) are the wealth of the park and buffer zone people (GoN, 2065/66 VS). These cats often prey upon livestock and retaliatory killing was also reported. The Tibetan black bear (*Ursus thibetanus*), Pahare Bandar (*Macaca assamensis*), porcupine (*Hystrix indica*), barking deer (*Muntiacus muntjack*), parakeets, Kalij pheasants, hares and other rodents are frequent crop raiders (Jnawali, et al., 2011).

Water Resources

Sikre khola and Poudha khola are the permanent stream channels in study area. Some small springs are also observed. The low altitude crops fields are irrigated through these two streams for a whole year while up top terraces are dependent on monsoon rains. Moreover, the dew and frost in the winter also supply trace amount of moisture in winter.

4.4   Population

The affected area comprised of 78 households of 3 small settlements. The total population of
the study area was calculated as 452 with 148 male, 172 females, and 133 children. 80%
households were headed by males while 20% by females. The average household size was
calculated to be 5.8 with standard deviation of 2.15 and range valued to 7. The range
calculated was 7 and the median family members were 6. More details can be read in table 1.

S.N.	Respondents	family size				Remarks
		total	male	female	child	
1	Respondent 1	6	2	3	1	Below 10 years are grouped as child
2	Respondent 2	7	3	2	2	
3	Respondent 3	3	1	1	1	
4	Respondent 4	5	1	1	3	
5	Respondent 5	2	0	2	0	
6	Respondent 6	9	3	3	3	
7	Respondent 7	5	2	2	1	
8	Respondent 8	6	2	2	2	
9	Respondent 9	7	2	3	2	
10	Respondent 10	8	3	3	2	
Mean family size		**5.8**	1.9	2.2	1.7	
Standard Deviation		2.15	0.99	0.79	0.95	
Data range		7	3	2	3	
Median		6	2	2	2	
Total population of study area		**452**	**148**	**171.6**	**132.6**	

Table 1: Demography of study area
Source: primary data from the field

4.5   Education

Although the settlements are in proximity to the capital the people are not well educated. 30%
populations are illiterate while 30% are of only primary education. Fortunately, 40 % people
have secondary education. No college level studies were reported from study area.
The major occupation of the affected area was agriculture. 90% populations are involved in
agriculture followed by foreign labor 40%, domestic labor 40%, local business 20%, and
government/non-government service 20%.

Caste, Ethnicity, and Religion

The study area is a heterogeneous society. Various castes and religious groups are settling in mixture. 80 % populations are related to Hinduism and 20% are Buddhist. 40 % populations are Brahmins and Chetries while 50% ethnic groups and 10% disadvantaged groups.

Economy

Land holding

The average land holding of the affected area was recorded on local land area classification system i.e. *Abbal, Doyam, Sim,* and *Chahar.* Average land holding of the respondents was 8.85 *Ropanies* with standard deviation of 4.49. The median land area of the respondents is 9 while the range of the land area is 16.5. Additionally, the 3 *Ropanies* of land are found irrigated while 6 *Ropanies* land is un-irrigated. Details of land holding record is given in table 2.

	land holding of respondent (ropanies)					type of land	
Respondents	*Abbal*	*Doyam*	*Sim*	*Chahar*	Total	irrigated	un-irrigated
1	0	1	2	4	7	2	4.5
2	0	2	2	2.5	6.5	2	3.5
3	0	2	2	1.5	5.5	3	5
4	1	2	2	3	8	0	0.5
5	0	0	0	0.5	0.5	3	7
6	0	3	4	3	10	5	12
7	0	5	6	6	17	5	8
8	2	3	7	1	13	3	7
9	0	3	5	2	10	5	6
10	0	5	3	3	11	2.9	5.95
Mean	0.30	2.60	3.30	2.65	8.85	3.09	5.95
Standard Deviation	0.67	1.58	2.16	1.58	4.49	1.60	3.01
Median	0	2.5	2.5	2.75	9	3	5.97
Range	2	5	7	5	16.5	3	11.5

Table 2: Land holding detail
Source: primary data from the field

4.6   Occupation

Agriculture is the major occupation in the study area where 90 % population is involving in agriculture. 20 % people are involving in seasonal and year round trade/business while similar case was observed for government/non-government services. The civil servants were found to be confined up to assistant level at office. Labor migration is the key to sustain livelihood and 80% households are involving in domestic or foreign labor. The proportion of domestic and foreign laboring has similar figure i.e. 40%. Only 10% women are involving in labor migration and confined to household duty. Equal proportion in government and non-governmental job was observed between high caste households and ethnic groups.

CHAPTER 5: PERCEPTION OF PEOPLE ABOUT HUMAN PRIMATE RELATIONS

Resources are those things which can satisfy ones' demand for its subsistence. Anything that is out of use for a particular person could never be a resource for them. Grains, vegetables, fruits, spices from the farmland serve as a life sustaining resource for people. Snatching their crucial resources by wild animals often lead to antagonistic relations and state of conflict arises. Much wildlife is considered as crop or livestock pest whose intensity depends upon the distance from the forest, type of crop grown, and the length of growing season. The Assamese monkey is no exception and frequently raid the crop thereby creating a negative attitude of people towards them.

5.1   Human monkey relations

Crop raiding is an active phenomenon that it is likely to be started from the stage when human beings started agricultural production (Sillero-Zubiri & Switzer, 2001). Significant impact on local people livelihood by wildlife, there by primates, is experienced worldwide (Hill, 2004). Human-wildlife conflicts are challenging conservation of wildlife and their disappearing habitat thus needs to explore new methods to meet conservation needs (Sillero-Zubiri & Switzer, 2001). Crop raiding is very common throughout Indian protected areas (Chhangani & Mohnot, 2004) and so is the case around Nepalese protected areas (Chalise, 2008).

Human monkey relations with respect to caste are clearly observed in study area. It is the general setting that Brahmins and Chettries inhabits to the land which are far from the forest

areas. As there exist a significant relation between crop raiding and distance from the forests Brahmins and Chettries are receiving less antagonistic relations. Although some of the high caste families are receiving larger amount of crop damage this is happening because of the proportionate land areas. It is the most serious case to ethnic groups (the Tamangs) that they usually clear the land and starts cultivation on newly constructed terraces near to the forest receives larger amount of antagonistic relations with primates. In some cases land abandonment and shifting of occupation is common to the people immediate to the park boundary.

The location of farmland plays an important role in crop raiding (Sillero-Zubiri & Switzer, 2001). Among the three species of non-human primates of Nepal, all are crop raiders (Chalise & Johnson, 2001) and they live in vicinity of human settlement. Human primate conflicts are obvious and the extent of it varies by sites. The distance between forest (resting habitat) and the farmland play a significant role in defining extent of crop raids. Moreover, distance from the house can affect the level of crop raids. The level of crop raids was categorized as 0 for no crop raids, 1 for few instances, 2 for frequent raids and 3 for severe raiding instances. All the categories are based on subjective judgments.

The *Abbal* land which was located far away from the forests (10 km) is receiving no crop raids. On the contrast the *Chahar* lands are severely damaged by crop raids not only by primates but also by wild boar, porcupine, bear, barking deer, hare, and birds. On an average this type of land is situated in vicinity to the park is 1.8 Km (SD of 0.79). On the other hand the *Chahar* lands are situated far away from the house 2.5 Km (SD of 0.8). Following the *Chahar* land, the *Sim* land and *Dwayam* lands are receiving relatively lower crop raids. There is negative correlation between distances from the forests to the farmland and positive

correlation between distances from house to farmland. Detail information on distance

relationship is available in table 3.

	Distance from forest (km)				Distance from house (km)				Level of crop raiding*			
S.N.	*Abbal*	*Doyam*	*Sim*	*Chahar*	*Abbal*	*Doyam*	*Sim*	*Chahar*	*Abbal*	*Doyam*	*Sim*	*Chahar*
1		4	2	1		1	1	2		1	2	4
2		7	3	1		1	3	4		1	2	3
3		7	3	2		0	2	3		0	1	2
4	10	8	4	1	3	2	0	3	0	1	2	3
5		0	0	2				1				2
6		8	6	2		1	1	2		1	1	2
7		6	3	3		1	2	0		0	1	2
8		5	2	1		1	2	2		1	2	2
9		3	2	2		1	2	2		2	2	3
10		7	4	3		2	1	3		0	1	1
Mean		5.50	2.90	1.80		1.11	1.56	2.20		0.78	1.56	2.40
Standard Deviation		2.55	1.60	0.79		0.60	0.88	1.14		0.67	0.53	0.84
Median		6.5	3	2		1	2	2		1	2	2
Range		11.5	4	2		3	2	3				
Correlation co-efficient	Distance from forest vs Crop raid									-0.51	-0.6	-0.702
	Distance from house vs Crop raid									0.07	0.1	0.1393
(*0 for none, 4 for intensive), distances are estimated by respondents themselves												

Table 3: Distance from farmland and crop raiding
Source: primary data from the field

5.2   Assamese monkey and crop preference

Sillero-Zubiri et al, 2001 concluded that maize seemed to be targeted and damaged

throughout its life cycle. Similar is the case for Shivapuri Nagarjun National Park buffer

zone. The Assamese monkey in Shivapuri Nagarjun National Park spends 46% time in

foraging (Pandey, 2012) there by increasing the cost of crop security.

Crop preference was accessed by a matrix ranking method. The seasonal crops were

separately scored and analyzed. Maize was the top preferred crop by Assamese monkey with

5.7 scores out of 6. Following maize millet secured second choice with 5.3 (6) and *Skush*

covering third, beans in fourth, pumpkin fifth and rice at last with 2.55, 1.9, 1.75, and 1.6

scores respectively. On the winter crop side wheat is the top raided crop with overall score of 5.75 followed by radish with 4.2 score, potato 3.55 scores, mustard 2.65, garlic 0.4 and onion with 0.35 scores. Similarly among the raided crops from multi-season *Lapsi* was severely damaged (score of 1.55 out of 3) followed by banana 1.5 and ginger/turmeric 0.65. Fore detail information see annex 3 and chart 1.
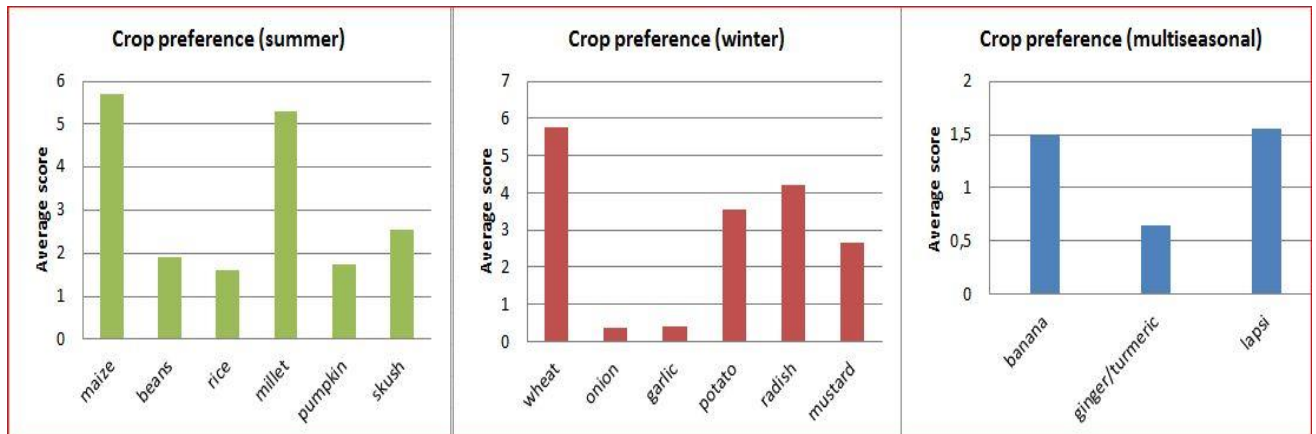

Chart 1: Crop preference by Assamese monkey
Source: primary data from the field

CHAPTER 6: HUMAN MONKEY RELATION IN SIKRE VILLAGE

Local people are benefited from monkeys by identifying the food plants which are not toxic to humans. People collect all species of mushrooms which are eaten by monkeys in wild. A local herbs processor collects some of their medicinal plants that monkeys are using. Local herb collector Mr. Man Bahadur was informed from his father that their medicinal plants were discovered with the help of monkeys in the past and it is a common belief that people can consume all wild fruits, shoots, and any other forest products without any doubt.

The local livestock herders are pleased to browse their livestock on the site where monkeys are foraging their food. It is the common belief that monkey identifies the presence of carnivores and makes a threatening call so that they can flee from the dangerous site. Herders could be benefited from monkey by their alarm calls and prepares to escape from livestock damage. Local people feel that a monkey is the incarnation of god *Hanumana* and believes that monkey are pioneer of identifying medicinal plants and are informants of possible danger by carnivores to their livestock. They are also hopeful on wildlife based tourism in near future.

Crop raiding is a common and noticeable outcome of the human and monkey relations. Since farm crops are easily available for them to pick up and nutritious to them, monkey generally prefers to hang around the farmland. Few instances of snatching the stored food during winter were also found in study area. The monkeys have different crop preference thereby creating excessive pressure during some crop season e.g. maize in summer and wheat in winter (details on later pages). Some cases of damage by infants and young for play were also observed from study area.

The monkeys hardly got frightened with lonely child, women, and small dogs. Frequent attempts of attack to children and women are a serious issue on human mental and physical health. Children who became victims of monkey attack are hard to deploy to the field for crop protection there by costing more to deploy multiple guards on the field. People are aware of potential damage by monkey bites and deploy group of children, or accompany with male guards. Moreover, the monkeys are vulnerable to disease transmission from human food stuffs which are generally snatched by monkeys.

Monkeys on the other hand are receiving harassment by human and the patrolling dogs. The chase with pebbles has some physical damage which is sometimes serious to monkeys. The use of *Guleli* by local people is really problematic to monkeys. The throwing of stones and boulders from uphill is really hard to escape from. The separation of mother and infant is obvious during fleeing.

CHAPTER 7: ASSESSMENT OF COST AND BENEFIT OF HUMAN MONKEY CONFLICTS

There is very little observable benefit of human monkey interactions while a large sum of cost should be paid by human due to this relationship. On the other hand, the monkeys have a direct benefit of getting food while chasing, harassment, and injuries are the cost to be paid by monkeys. The study was focused primarily to assess the costs that are paid by local people due to such relations. Cost of crop loss was assessed through local market rates while cost of crop protection was made by opportunity cost of local laboring i.e. farm laboring. Cost of dog rearing was calculated as the food cost otherwise bought from the shop. The cost of dog purchase was omitted provided that puppies are freely available in villages. Assessing benefits of the relationship, listing of observed and prospective benefits was made. No mathematical calculations as well as valuation were made in this study.

7.1 Quantity of crop loss by Assamese monkey

Assamese monkey is an adaptive animal feeding both upon natural and cultivated lands. It forages on variety of cultivated crops viz. maize, millet, rice, beans, pumpkin, *Skush,* wheat, potato, radish, mustard, banana, *Lapsi,* etc. while it uproots onion, garlic, ginger, and turmeric.

Quantifying amount of crop loss in terms of actual yield and economic term is difficult (Sillero-Zubiri & Switzer, 2001). Respondents were asked to make a rough estimate of crop damage. It was found that maize is the top damaged crop followed by millet by monkeys

during summer and in winter wheat was top damaged followed by radish and potato. Similar to the situation was found by Sillero-Zubiri et al, 2001 and calculated that 19% of maize was raided by wildlife (range 7.7-53%) (Sillero-Zubiri & Switzer, 2001) in Tanzania.

Simple mathematical calculation reveals that 6007 kilograms of maize was raided within three settlements. Millet was raided up to 4414 kilograms followed by *Skush,874* kilograms, rice 749 kilograms, beans 713 kilograms, and pumpkin 647 kilograms. Among the winter crops wheat was raided heavily i.e. 2974 kilograms followed by radish 1925 kilograms, potato 981 kilograms, mustard 542 kilograms, garlic 11 kilograms, and onion 7 kilograms. Among multi-season crops banana was heavily damaged with 917 kilograms and *Lapsi* 168 kilograms. Ginger and turmeric is least damaged (26 kilograms). Details of crop damage is presented in Annex 4

7.2 Costs

Cost of crop loss

Local people are paying a considerable amount of money in terms of crop raiding by monkeys. People are losing NRs 1414 per family for millet followed by maize NRs 1153, beans NRs 914 while cost on rice, pumpkin, *Skush* comparatively low. Among the winter crop loss by crop raiding is higher for wheat with NRs 762, mustard 347, potato NRs 314, and radish NRs 123 while other crops has negligible financial loss. More details are given in Annex 5.

Cost of crop protection

Common crop protection methods recorded are sentinels by men alone, men with dog, and sometimes dogs alone. The total cost of sentry was never calculated by local people either by men or dog. It was asked the respondent to have tentative cost in terms of opportunity cost of sentry and found that protection cost by men is averaged to NRs 5325 with 2120 standard deviation and that of dog is NRs 1277 with standard deviation 882 per family. Details are given in table 4.

protection method		cost on patrolling		total
human sentinel days	dog patrol	human sentinel	dog patrol	
20	0	7500	0	7500
15	1	5625	1825	7450
15	1	5625	1825	7450
10	0	3750	0	3750
2	1	750	1825	2575
10	1	3750	1825	5575
20	1	7500	1825	9325
20	1	7500	1825	9325
15	0	5625	0	5625
15	1	5625	1825	7450

Table 4: Crop protection methods used by local community
Source: primary data from the field

Chasing and harassing is the major cost paid by monkeys in study area. Sometimes domestic dogs kill the monkeys but in negligible amount. Culturally, the monkeys are considered as the descendants of god *Hanuman* killing of primate is very rare in study area.

Local people, on the other hand, are paying considerable amount of financial loss. Although the study was intended to quantify the cost of crop raiding by Assamese monkeys, the crop damage by other wildlife was found. Among the important crop raiders are wild boar, primates, porcupine, deer and birds. The marginal lands were found abandoned cultivating by local people and formation of bush land on such land. The land abandonment is forcing local people to look for alternative occupation e.g. domestic and foreign laboring. Land

abandonment became obvious as the cost of crop rising is high and no compensation to crop damage was reported.

Chasing by human alone, by dog, and combined farm protection method is adopted by local people. Respondents are asked to figure out opportunity cost of farm protection in terms of domestic labor and daily cost on dog was estimated. Although, the dogs are domesticated on food scrapes the nominal value was assigned and the annual cost was calculated. No cost on dog purchase was made since free ranging dogs are available without any cost.

Combining the cost of opportunity cost of human sentinels and cost of dog rearing, it was calculated that each family are losing NRs 12,536 by crop raiding. The cost of crop raid and land possession has a strong correlation (0.82) that people with larger area of land are paying high cost due to crop raids. The indirect cost of crop damage and shifting of profession was never understood.

CHAPTER 8: FINDINGS AND CONCLUSIONS

It is concluded from the study that there exist both harmonious and antagonistic relations between human and monkey in study area from history. High caste and distant farmers are receiving low interaction thereby creating a mild relationship with monkeys while the ethnic groups and close distant farmers have antagonistic relation with monkeys.

Several crops are damaged by Assamese monkeys like maize, millet, wheat, radish, potato, and some multi season crops. Moreover, other wild animals also raid the crops including wild boar, porcupine, deer, bear, and birds etc. There exist a negative correlation between distance from the forest to the farmland (applicable for all land types) and positive correlation between distance to the house and farmland. It can thus be inferred that farmlands with closer reach of monkeys are vulnerable to crop raiding while farmlands close to the house are more secured.

It was found that maize is the top preferred crop by Assamese monkey in summer growing season. Matrix ranking made by local people reveals that it secures 5.7 scores out of 6 possible scores. Monkeys are equally attracted to millet (score 5.3), and also allured at *Skush* (score 2.55), beans (score 1.9), pumpkin (score 1.75) and least focused on rice (1.6). During the winter season wheat was top damaged (5.75 scores out of 6 possible score) followed by radish (4.2), potato (3.55). Onion and garlic are also damaged by infants and juveniles on their play. Among the multi-season crops banana was top damaged (score of 1.5 out of 3) and *Lapsi* (0.65). Ginger and turmeric are also damaged by uprooting and trampling during child play. During summer growing season a total of 77 kilograms of maize is damaged by monkeys while millet damage tolls up to 57 kilograms. Similarly, 11 kilogram of *Skush* is damaged and rice, beans, and pumpkin toll up to 9.7, 9.1, and 8.2 kilograms respectively.

During winter on an average 38 kilograms of wheat is lost by each house hold while 24.7 kilogram of radish, 12.6 kilograms of potato was lost. Among multi-season crops banana damage has considerable loss i.e. 11.8 kg per household while *Lapsi* is lost by 2.1 kilograms each household. Few amount of damage are done against onion, garlic, ginger, mustard and turmeric.

People are paying considerable amount of cost in terms of crop damage and opportunity costs to be paid for crop protection. Crop raiding by Assamese monkey costs NRs 5933 by each family while crop protection costs NRs 6602. Neither the indirect costs nor the cost by other wildlife was calculated for this purpose.

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ANNEXES

Annex 1: Framework of the semi-structured interview.

The number of the interview, date, location (Name of the village), time at which the interview was completed and the sex of the interviewee were first recorded. The interviewee was then asked the following questions:

1. How old are you?
2. What is your ethnicity?
3. What is your religion
4. How long have you been in this village?
5. What is your position in the household?
6. How far is your agricultural land/farm from your home?
7. How far is your agricultural land/farm from national park or other forests?
8. Which type of crops do you cultivate in your farm?
9. Does anything limit your crop yields?
   - Respondents who answered "yes" to this question will then asked, "Which of kind of problems limit crop yields in your farm?" Respondents will ask to rank the problems in order of importance.
   - If respondents listed wild animals as one of the problems, they will ask, "Which animals are problematic for you?" They will ask to rank the four major species problematic to them.
   - Respondents who reported primates as causing crop damage will then be asked, "Whenthe last time was that animal damaged his/her crop? And which species of primate did you see crop raiding in your farm?
10. Which species of crop is likely the Assamese monkeys may raid? Will you rank the crops preference?
11. Do you know which species Assamese monkey usually forage in the jungle?
12. Why does Assamese macaque come to raid your crop? Expectations: 1. No food inside the forest, 2. Poor quality food inside the forest, 3. Easy to find food in farm, 4. Nutritious and tasty, and 5. others (if they like to mention).
13. How frequent this macaque raids your crop?
14. Can you estimate the loss due to crop raiding? (In local units).
15. Do you have any crop which Assamese monkeys do not like raiding?
16. Which methods do you use to protect your crop?
17. What will be the price of crop protection by deploying paid crop patroller?
18. Have you ever seen/heard someone shooting/trapping a crop raider?
   - Respondents who answer "yes" to this question will be asked, "Did this person kill the animal or injure it?"

Annex 2: Schedule of the study

S.N.	Activities	June'2012	Jul	Aug	Sep	Oct	Nov	Dec	Jan'2013	Feb	Mar	Apr
1	Literature review and conceptualization											
2	Field Visit/Data collection											
3	Data Analysis											
4	Draft Preparation											
5	Report finalization and											

Annex 3: Crop preference by Assamese monkey

S.N.	maize	beans	rice	millet	pumpkin	skush	wheat	onion	garlic	potato	radish	mustard	banana	ginger/turmeric	lapsi
respondent 1	6	4	2,5	5	1	2,5	6	0	0	4	5	0	3	0	2
respondent 2	5	2	4	6	1	3	5	0	0	4	6	0	0	3	0
respondent 3	6	4	0	5	0	3	6	2	1	3	5	4	0	2,5	2,5
respondent 4	6	3	4	5	1	2	6	1,5	3	4	5	1,5	3	0	2
respondent 5	6	0	0	5	0	0	6	0	0	0	0	0	0	0	0
respondent 6	5	0	0	6	4	3	6	0	0	5	4	0	0	0	0
respondent 7	6	0	0	5	4	3	6	0	0	5	4	3	3	0	2
respondent 8	6	1	2	5	3	4	6	0	0	3	5	4	3	1	2
respondent 9	6	1	3,5	5	3,5	2	6	0	0	3	5	4	3	0	2
respondent 10	5	4	0	6	0	3	4,5	0	0	4,5	3	10	0	0	3
Average score	**5,7**	**1,9**	**1,6**	**5,3**	**1,75**	**2,55**	**5,75**	**0,35**	**0,4**	**3,55**	**4,2**	**2,65**	**1,5**	**0,65**	**1,55**

Annex 4: Crop damage by Assamese monkey

S.N.	Summer crops						Winter crops						Multiseasonal crops			Remarks
	maize	beans	rice	Millet	pumpkin	skush	wheat	onion	garlic	potato	radish	mustard	banana	ginger/turmeric	lapsi	
respondent 1	80,00	23,10	10,00	76,00	6,00	10,00	58,00	0,00	0,00	6,00	34,00	0,00	20,00	0,00	3,00	figures in kgs
respondent 2	20,25	2,10	15,00	34,50	1,00	8,00	15,38	0,00	0,00	8,00	46,00	0,00	0,00	1,30	0,00	
respondent 3	31,95	6,40	0,00	20,65	0,00	5,00	27,25	0,40	0,20	4,00	11,20	8,00	0,00	1,00	1,00	
respondent 4	82,50	28,80	34,00	40,70	7,00	16,00	48,60	0,50	1,20	5,60	31,90	0,50	24,00	0,00	6,60	
respondent 5	5,25	0,00	0,00	5,00	0,00	0,00	3,50	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	
respondent 6	44,10	0,00	0,00	55,00	7,20	4,00	28,50	0,00	0,00	13,20	7,20	0,00	0,00	0,00	0,00	
respondent 7	228,00	0,00	0,00	73,60	11,70	10,00	40,00	0,00	0,00	30,00	13,20	11,00	21,00	0,00	2,00	
respondent 8	99,00	1,50	7,00	79,20	20,00	32,00	41,10	0,00	0,00	18,00	22,10	20,00	33,60	1,00	5,00	
respondent 9	128,00	7,50	30,00	114,00	30,00	22,00	96,00	0,00	0,00	18,00	44,00	20,00	19,00	0,00	1,00	
respondent 10	51,10	22,00	0,00	67,20	0,00	5,00	23,00	0,00	0,00	23,00	37,20	10,00	0,00	0,00	3,00	
Mean	77,02	9,14	9,60	56,59	8,29	11,20	38,13	0,09	0,14	12,58	24,68	6,95	11,76	0,33	2,16	
Standard deviation	65,04	11,13	12,95	32,11	9,93	9,66	25,87	0,19	0,38	9,52	16,19	8,18	13,01	0,54	2,26	
Median	65,55	4,25	3,50	61,10	6,50	9,00	34,25	0,00	0,00	10,60	27,00	4,25	9,50	0,00	1,50	
Total crop loss	6007,17	712,92	748,80	4413,63	646,62	873,60	2974,34	7,02	10,92	981,24	1925,04	542,10	917,28	25,74	168,48	

Annex 5: Cost of crop loss

S.N.	Summer crops						Winter crops						Multi-season crops			Sub Total
	maize	rice	millet	beans	pumpkin	skush	wheat	onion	garlic	potato	radish	mustard	banana	lapsi	ginger/turmeric	
respondent 1	1200,00	150,00	1900,00	2310,00	30,00	30,00	1160,00	0,00	0,00	150,00	170,00	0,00	1000,00	60,00	0,00	8160,00
respondent 2	303,75	225,00	862,50	210,00	5,00	24,00	307,50	0,00	0,00	200,00	230,00	0,00	0,00	0,00	78,00	2445,75
respondent 3	479,25	0,00	516,25	640,00	0,00	15,00	545,00	16,00	40,00	100,00	56,00	400,00	0,00	20,00	60,00	2887,50
respondent 4	1237,50	510,00	1017,50	2880,00	35,00	48,00	972,00	20,00	240,00	140,00	159,50	25,00	1200,00	132,00	0,00	8616,50
respondent 5	78,75	0,00	125,00	0,00	0,00	0,00	70,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	273,75
respondent 6	661,50	0,00	1375,00	0,00	36,00	12,00	570,00	0,00	0,00	330,00	36,00	0,00	0,00	0,00	0,00	3020,50
respondent 7	3420,00	0,00	1840,00	0,00	58,50	30,00	800,00	0,00	0,00	750,00	66,00	550,00	1050,00	40,00	0,00	8604,50
respondent 8	1485,00	105,00	1980,00	150,00	100,00	96,00	822,00	0,00	0,00	450,00	110,50	1000,00	1680,00	100,00	60,00	8138,50
respondent 9	1920,00	450,00	2850,00	750,00	150,00	66,00	1920,00	0,00	0,00	450,00	220,00	1000,00	950,00	20,00	0,00	10746,00
respondent 10	766,50	0,00	1680,00	2200,00	0,00	15,00	460,00	0,00	0,00	575,00	186,00	500,00	0,00	60,00	0,00	6442,50
Mean	**1155,23**	**144,00**	**1414,63**	**914,00**	**41,45**	**33,60**	**762,65**	**3,60**	**28,00**	**314,50**	**123,40**	**347,50**	**588,00**	**43,20**	**19,80**	**5933,55**
Standard deviation	975,66	194,19	802,86	1113,32	49,65	28,98	517,38	7,65	75,54	238,05	80,94	409,00	650,64	45,17	32,26	3488,59
Median	983,25	52,50	1527,50	425,00	32,50	27,00	685,00	0,00	0,00	265,00	135,00	212,50	475,00	30,00	0,00	7290,50