

# CHAPTER-I

## 1. INTRODUCTION

### 1.1 Background

Forest is an integral part of the agriculture and livelihood of the people in Nepal. The forests provide timber for housing, fuel wood, and fodder for stock and leaf litter for composting among many other things. As a result of massive deforestation, Nepal's forest management issues have received considerable attention. After the 1990 political change, the Government of Nepal (GON) introduced the Forest Act of 1993, which categorizes forests into two main classes, viz. National forests and Private forests along with five sub-categories of national forests: Government Managed Forests, Leasehold Forests, Religious Forests, Protected Forests, and Community Forests (MFSC/HMG, 2002).

Community forests are the national forests handed over to a user group for development, conservation and utilization for the collective benefit of the community. Nepali people have been managing the forests for long time through various systems such as Guthi. In 1960s, all the forests were nationalized by the government. Later it was realized that the problems associated with diminishing forest resources are too large for personnel of government to tackle alone. Management of local forests by the local people who use them is now regarded as a practical way to ensure sustainable use of forests to meet subsistence needs. This approach not only reduces deforestation but may also help by planting enough trees to satisfy the local and environmental needs (Rajbhandari, 1995).

Nepal has demonstrated that community forestry is a viable strategy for the rehabilitation of abandoned and degraded lands through plantations and by promotion the return of a diversity of species. Community forestry has also contributed to an increase in natural regeneration. However, the improvement in forest cover near villages has resulted in an increase in numbers of wild animals, and attacks on domestic animals have been reported (HMGN/MFSC, 2002).

Animal populations are characteristically dynamic over time and it is based on the habitat available for them. Due to the development of community forestry program, it is obviously known that the habitat for wild animal is improved. Several research

works are carried out on wildlife in protected areas. However, there is a lack of research work about wildlife in the community forests so one can not say how the community forestry helps to conserve the faunal diversity, how peoples are surviving with the increasing number of wild animals and is there any loss of initial fauna or not, although we all know that community forests contribute for the improvement of wildlife habitats and faunal diversity. Thus, the community forests have been selected as study site to understand and evaluate wildlife dynamics. The study will help to identify or fulfill such research gap for the further management of community forests and wildlife found on there and aims to understand and evaluate the role of community forests in faunal diversity conservation efforts.

## **1.2 Rationale of the study**

The protected areas, by themselves are not enough to support viable wildlife populations in Nepal. Additionally, forests and wild areas, outside the parks, are often not administered and managed for wildlife conservation (MFSC/DNPWC, 1999). Therefore, it is important to shift management from protected areas to ecosystem or landscape management, so that entire wildlife populations are treated as a single management unit. The Terai Arc Landscape (TAL)-Nepal is a first landscape level conservation initiative of Government of Nepal (MFSC, 2006). Community Forestry is one of the important parts of the Terai Arc Landscape (TAL) Program for the development of corridor for free movement of wildlife, and conservation of biodiversity. In the early stages of the TAL, most habitat management has focused on community forestry (Shrestha, 2004). The improvement in forest cover near villages has resulted in an increase in numbers of wild animals, and attacks on domestic animals have been reported (HMG/N/MFSC, 2002). It is now time to use information on forest cover and condition and wildlife abundance and conflict with people to improve the quality and connectivity of wildlife habitat. At this perspective, the study will provide information about vegetation type, abundance of faunal diversity, and conflict of wildlife with local people in community forests located at Lamahi bottleneck area of TAL-program which will help for the further management of not only community forestry but landscape as a whole and its fauna.

This study will also give appropriate answers to the following questions: What is the faunal species diversity of the community forests? Which faunal species are new

visitor to the community forest and which are disappeared from the area? Whether faunal diversity has increased in the area after being established as a community forests? What is the status of overall wildlife species in the community forests? Are the existing fauna instigated a conflict with the local inhabitants in the area? What are the conflicts instigated by the local people to the fauna? What are the vegetation types of the community forests? How much crop is damaged by the wild animals?

### **1.3 Study Area**

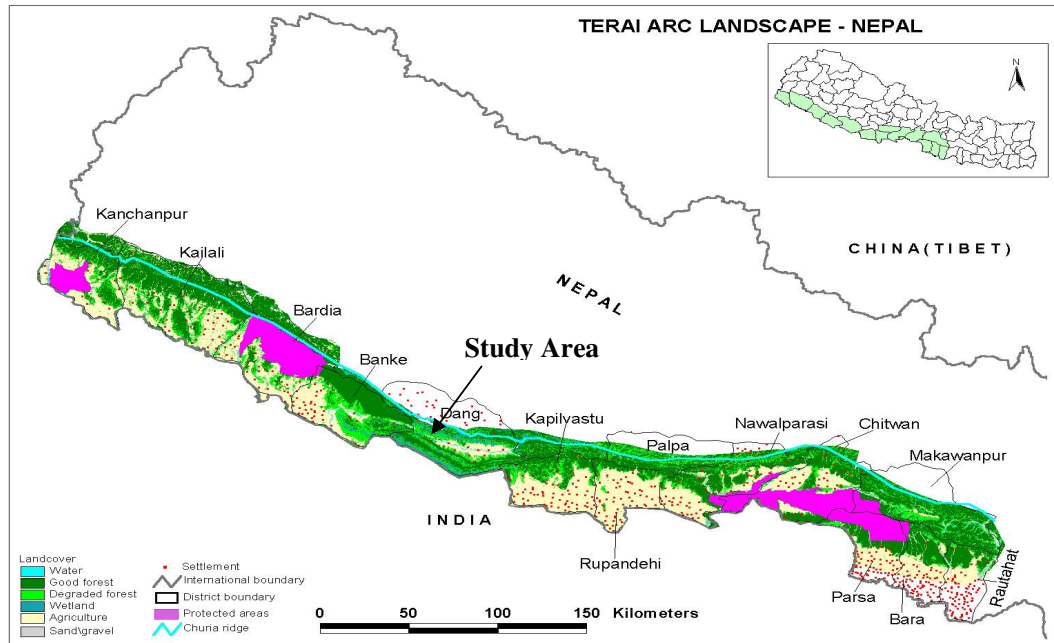
The study area, Dang is located at the Mid-Western region of the country and falls under Rapti zone. Geographically, it is located at both sides of the Churiya hills between 27<sup>0</sup>37' and 28<sup>0</sup>29'N latitude, and between 82<sup>0</sup>02' and 82<sup>0</sup>54'E longitude. The whole Dang District covers 285,552 ha of land area. The average east-west length of the District is 90 km and average north-south length is 72 km. The lowest altitude measured within the district is 213m and the highest altitude is 2058m from the sea level. The highest temperature recorded is 39.09 °C and lowest temperature recorded is 1.5°C. And the district lies on sub-tropical to sub temperate region with average annual rainfall of 170.6 mm.

The Dang district covers three valleys among them two Dang and Deukhuri are larger and remaining Tuhikhola is smaller. Among the two larger valleys Deukhuri is selected as the study site where sub-tropical climate is found. The forest of Deukhuri Valley is divided under five range posts. Among these five range posts, community forests under Satbaria range post are selected as study area. Forests area of Satbaria range post is located at the western part of the Arjun Khola and eastern part of the Shiva Khola. And south to north is extended from Rapti River to the boundary of Dharna, Phulbari and Goltakuri Village Development Committees (VDC) of Dang Valley lying on both sides of the east-west Highway. Lamahi area of Deukhuri Valley is one of the bottleneck areas among the three bottleneck areas in the Nepal side of TAL-Program. Community Forestry in this area is one of the important parts of TAL-Program for the development of corridor for free movement of wildlife, and conservation of biodiversity.

The study area is connected to the extension area of Bardia National Park in west (figure 1). This also includes a proposed area for tiger conservation which lies Level

III of Tiger conservation Landscape (TCL) (DNPWC/MFSC, 2006). And the area is supposed to be a good habitat for the viable population of Karnali tiger (WWF, 1998).

Satbariya Range Post includes total 22 community forests among which Arjun Mahila Community forest and Hasnapur Mahila community forest contains totally planted forest. The study area i.e. the area of 22 community forest covers about 105.84 Km<sup>2</sup>. It is linked with the capital, Kathmandu by about 400 km surface road.



**Figure 1:** The study area

Source: DNPWC

### 1.4 Literature review

Spears (1988) mentioned about annual loss of some 1.8 million hectares of forest area to agriculture in most of the Asian countries. It was predicted that in some countries of the region, such as Nepal and Bangladesh, virtually all the natural forest will disappear before year 2000 unless swift remedial action is taken. Bartlett (1991) mentioned about the adoption of Community forestry program by His Majesty's Government of Nepal (HMGN) in the master plan for the forestry sector, as the major strategy by which most of the country's forests can be managed in sustainable way.

Very limited information are available on the role of community forests in the conservation of faunal diversity. Bartlett (1991) mentioned that the increase in forest cover and plant species diversity associated with community forestry also has

associated benefits in providing increased wildlife habitat. Paudyal (1999) mentioned about the occurrence of various types of wild animals in Kumroj, Baghmara, and Chitrasen community forests of Chitwan District. Baghmara community forest for example, has 13 one horned rhinoceros and one tiger. Similarly, three tiger live in the Kumroj community forest and other common wild animals found are leopard, dears, hares, crocodiles, snakes etc. And some wild animals are in better condition in the community forests than at Royal Chitwan National Park which has been working for the conservation since 25 years. Similarly, Yadav (2004) recorded different types of endangered species such as tiger, hyena and four horned antelope in the buffer zone community forests of Royal Bardiya National Park. Gurung et. al. (2006) explored about the occurrence of 35 tracks and 19 killings of domestic animals by tiger during the period of 1999 to 2003 in the community forest areas of the Satbariya range post, Dang.

HMGN/MFSC (2002) mentioned about an increase in numbers of wild animals, and attacks on domestic animals due to improvement in forest cover near villages. Gautam (2003) raised the issue that the local people started to conserve the forest by making users group based on the concept of community forests but if they have to suffer from wildlife continuously, the positive attitude towards the forest and wildlife conservation will be changed. Ghimire (1999) talked about influence on distribution and availability of wildlife due to change in habitat composition before and after the establishment of community forests. For example, in Laxmi Maliha community forests of Gorkha district, porcupine is disappeared due to lack of bushy forest and leopard, jackal, monkey etc are increased.

According to Grosen (2000), the Government's ninth plan (1997-2002) emphasizes increased commercialization of community forests to include non-timber forests products (NTFP). Although NTFPs include wildlife and medicinal plants, legal authority over these resources is unclear: the land in community forest is legally National Forest and many species of plants and animals are protected under the National Park and Wildlife Conservation Act of 1973 (Chetri & Pokhrel, 2000 cited at Knowler, 2004). Bhattarai and Khanal (2005) suggested that excluding wildlife conservation from the scope of community forest activities is incongruent with conservation goals, as forests and wildlife are inseparable components of the forest

ecosystem. The lack of provisions in the work plan regarding compensations for users and other affected people for wildlife damage is a serious weakness of the community forestry program. However, management expanded by the Community Forest User Groups (CFUGs) to forests has resulted in recovery of vegetation to form reasonable forests in the hills. Due to which local extinction of species has been prevented, habitat corridors created and successive stages of forests developed (Thapa, 2007).

### **1.5 Objectives**

General objective of the study is to understand the faunal richness and dynamics found in various community forests practiced in Lamahi bottleneck area of Terai Arc Landscape in Dang district, Nepal. The specific objectives of the study are:

- To enumerate the faunal diversity in the community forests and compare this with the previously found faunal diversity of the area when it was not established as community forests
- To determine the abundance and distribution pattern of prominent wildlife species found in the community forests
- To study the relationship between the forest types and abundance of wildlife in the community forests
- To discuss and document the conflict between wild animals and people residing nearby the community forests and to make recommendations to minimize the conflicts

### **1.6 Limitations**

Information on the faunal diversity of the area, before its inclusion as the community forest was not available; therefore, comparison on their increasing or decreasing status is solely based on the questionnaire survey. Detail study on birds and herpetofaunas was not possible due to time frame. Most of the data on these are based on the information given by local people.

The study was carried out within only one season. So, it is not possible to find the signs of some wildlife species which visit the area in other seasons. Due to this, presence and absence of some wildlife in the community forests are also analyzed based on information given by local people which may not represent the actual situation of wildlife in the community forests.

## **CHAPTER-II**

### **2. METHODOLOGY**

#### **2.1 Field Methods**

##### **2.1.1 Preliminary survey**

A preliminary survey of the study area was carried out before actual field survey and general information was collected. Based on these information, sampling techniques and questionnaire were developed.

##### **2.1.2 General questionnaire survey**

The earliest settlers and members of community forestry user groups were identified and interviewed to collect information on the previously found wild animals and current faunal diversity and to know the impacts of these wild animals on the local livestock, agriculture and human settlements. The questionnaire survey also provides information on abundance of animals, frequency of encounters, sighting time and location of sightings and date of the last sightings.

##### **2.1.3 Group discussion and key informant survey**

Group discussions were done by gathering the local people, members of user groups etc; and key informant surveys were done by questionnaire and discussions with the concerned and knowledgeable people, forest watchers, members of user groups, members of District Forest Office, local leaders etc. for getting further information about wildlife in the community forests.

##### **2.1.4 Faunal survey**

The faunal survey was done by walking along the transect lines. For this, map of the study area was taken and 10 transect lines from south to north were drawn having 3km distance between each transect. At first coordinate system of the starting point and ending point were identified from the map, and by using GPS the starting point was identified in to the field and then started to walk in straight lines following constant easting as much as possible according to the feasibility of topography. During this, besides direct observation of the species, their foot prints, scats and other indirect signs were observed. Wildlife movement was also observed. Wildlife signs of 5m left and 5m right was observed and recorded.

Observation of wildlife damage sites were also conducted which was helpful in cross-checking the logic of the local villagers' claim regarding information on crop and livestock depredation by the wild animals. A checklist of the fauna was prepared which is used in the field to record sightings, frequencies and habitats. GPS was used to record the position of the prominent wildlife species and their signs, and the points were also located on map. Human settlement were generally located in the southern part of the study area so, walking on transect was started after the ending of settlement by taking GPS reading. However, there are also small scattered villages on the highway areas and even inside the core forest areas.

### **2.1.5 Identification of wildlife signs**

The indirect methods that were adopted during the identification of the wildlife were as follows:

1. **Identification of pugmarks or tracks:** By observing pugmarks and tracks, different animals were identified. The tracing and measuring of pugmark was carried out for the purpose of further confirmation of the species. Photography was used for the identification of animals. The tracks or footprints of ungulates were also identified on the basis of different signs associated with footprints such as pellet and scratches.
2. **Identification of faeces:** Faeces were collected in plastic bags and each sample collected was labeled. The collected faeces were distinguished by different size, shape, odor, color and signs associated with faeces such as scratches and footprints. The collected faeces were tallied with the samples of faeces obtained from the Central Zoo for further confirmation of the species.
3. **Identification of scrapes and scratches:** By this method, animals such as common leopard, wild boars, porcupines, sloth bears and spotted deer were identified.
4. **Identification by other materials:** By this method identification of species was done by feeding signs (e.g. materials left after feeding), shelters, and calls.

### **2.1.6 Vegetation survey**

A general vegetation survey was carried out to understand the forest types. The vegetation type, canopy coverage etc. in the study area was identified. When new



species of plant is seen then its local name was identified by asking local people and the scientific name was identified based on this local name and showing the sample with plant expert.

## **2.2 Data Analysis**

All the collected information were categorized and tabulated according to the objective of the study using Microsoft Excel, SPSS and data was processed and analyzed in descriptive way as well as by statistical measure.

### **2.2.1 Abundance and distribution pattern of wildlife**

The abundance of wildlife was determined on the basis of indirect signs, encounter rate, visual field observation and questionnaire survey. And the distribution pattern of some prominent wildlife species such as leopard, barking deer, wild boar and sloth bear were also determined by analyzing the data on direct observations as well as by indirect evidences.

The distribution pattern was calculated by variance ( $S^2$ ) to mean ( $\bar{X}$ ) ratio (Odum, 1996) which is based on the fact that in Poisson distribution, the variance ( $S^2$ ) is equal to mean.

**If  $S^2 / \bar{X} < 1$ , distribution is uniform**

**If  $S^2 / \bar{X} = 1$ , distribution is random**

**If  $S^2 / \bar{X} > 1$ , distribution is clumped**

A chi-square test was performed by setting hypothesis that the species were uniformly distributed in all habitat types in the study area. The hypothesis was tested at 5% level of significance. Under null hypothesis ( $H_0$ ), the test statistic is given by:

$$\text{Chi-square } (\chi^2) = \sum \frac{(O - E)^2}{E} \sim (n-1) \text{ df}$$

Where,

O= Observed frequency, and

E= Expected frequency

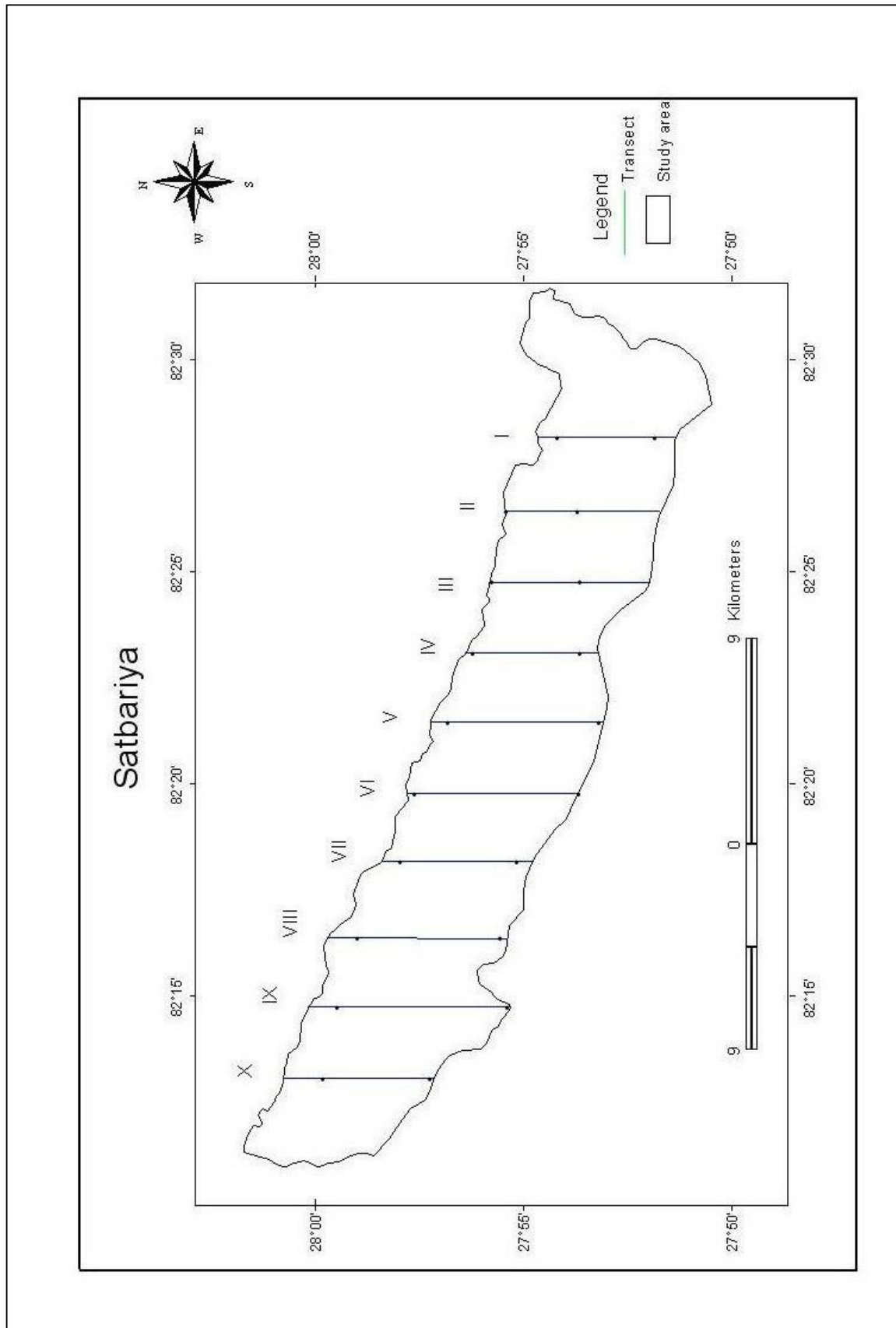


Fig 2: Transect lines drawn for the faunal survey in the study area

Note: Point placed at southern part of each transect indicates the point from which forest starts and point at northern part indicates the end point of traveling during study

**Table 1: Information on transect lines in the study area**

Transects	GPS reading	Community Forests included	Forest type	Disturbances seen
I	Forest start: 82°28.191' E, 27°51.818'N End transect: 82°28.211'E 27°54.155'N Altitudinal range=221m-411m Length= 4.33 km	Nawasanti, Hasnapur, Karri banghusri	Sal forest, Mixed forest	Tree cutting, grazing
II	Forest start: 82°24.767' E, 27°53.657'N End transect: 82°24.767'E 27°55.739'N Altitudinal range=246m-475m Length= 3.15 km	Uchanimbu, Shivsakti Bhakhara Bikas	Mixed forest, Riverine forest	Tree cutting, grazing
III	Forest start: 82°24.767' E, 27°53.657'N End transect: 82°24.767'E 27°55.739'N Altitudinal range=230m-497.43m Length= 3.91km	Laxmi Mahila, Upakar	Mixed forest, Riverine forest	Grazing
IV	Forest start: 82°24.767' E, 27°53.637'N End transect: 82°23.079'E 27°56.193'N Altitudinal range=221m-486m Length= 4.80 km	Bhattarkunda	Sal forest, Mixed forest, Riverine forest	Killing of common monitor by local people, foot trail
V	Forest start: 82°21.461' E, 27°53.676'N End transect: 82°21.465'E 27°56.843'N Altitudinal range =232m-387m Length= 6.80 km	Bhattarkunda, Bagarbaba	Sal forest, Mixed forest, Riverine forest	Grazing, tree- cutting
VI	Forest start: 82°19.767' E, 27°53.984'N End transect: 82°19.773'E 27°57.793'N Altitudinal range =227m-373m Length= 7.42 km	Jurpani, Teliya, Bagarbaba	Sal forest, Mixed forest, Riverine forest	Grazing, tree- cutting
VII	Forest start: 82°18.152' E, 27°55.109'N End transect: 82°18.162'E 27°57.982'N Altitudinal range=243m-382m Length= 5.19 km	Teliya, Mulkhola	Sal forest, Mixed forest, Riverine forest	Grazing, forest fire
VIII	Forest start: 82°16.384' E, 27°55.575'N End transect: 82°16.386'E 27°58.986'N Altitudinal range=221m-338m Length= 6.32 km	Biraha, Gupti	Mixed forest Riverine forest	Poaching, forest encroachment, grazing, tree- cutting
IX	Forest start: 82°14.767' E, 27°55.351'N End transect: 82°14.762'E, 27°59.426'N Altitudinal range=199m-386m Length= 7.52 km	Bhimbandh, Kalikhola	Riverine forest Sal forest and Mixed forest	Grazing, tree- cutting, foot trail, forest fire
X	Forest start: 82°13.076' E, 27°57.247'N End transect: 82°13.071'E, 27°59.798'N Altitudinal range=211m-351m Length= 4.76 km	Ameliya kunta Mahila, Ameliya	Sal forest, Mixed forest	Poaching, grazing, tree-cutting and forest fire

## CHAPTER-III

### 3. Results and Discussion

#### 3.1 Faunal Diversity

Based on the questionnaire survey, the major mammalian species found in the area are; tiger (*Panthera tigris*), common leopard (*Panthera pardus*), barking deer (*Muntiacus muntjac*), wild boar (*Sus scrofa*), spotted deer (*Axis axis*), four horned antelope (*Tetracerus quadricornis*), sambar deer (*Cervus unicolor*), leopard cat (*Felis bengalensis*), jungle cat (*Felis chaus*), sloth bear (*Melursus ursinus*), striped hyaena (*Hyaena hyaena*), jackal (*Canis aureus*), hare (*Lepus nigricollis*), flying squirrel (*Petaurista petaurista*), palm squirrel (*Funambulus pennati*) and porcupine (*Hystria indica*) (Appendix IV). The result in figure 3 shows the present occurrence of major wildlife species. According to respondents, most frequently observed animals are wild boar (97.9%), barking deer and sloth bear (91.7%), striped hyaena (90.5%), common leopard, (87.5%), spotted deer (71.9%) and less frequently observed animals are four horned antelope (55.8%) and sambar deer (59.4%). But tiger is rarer among them.

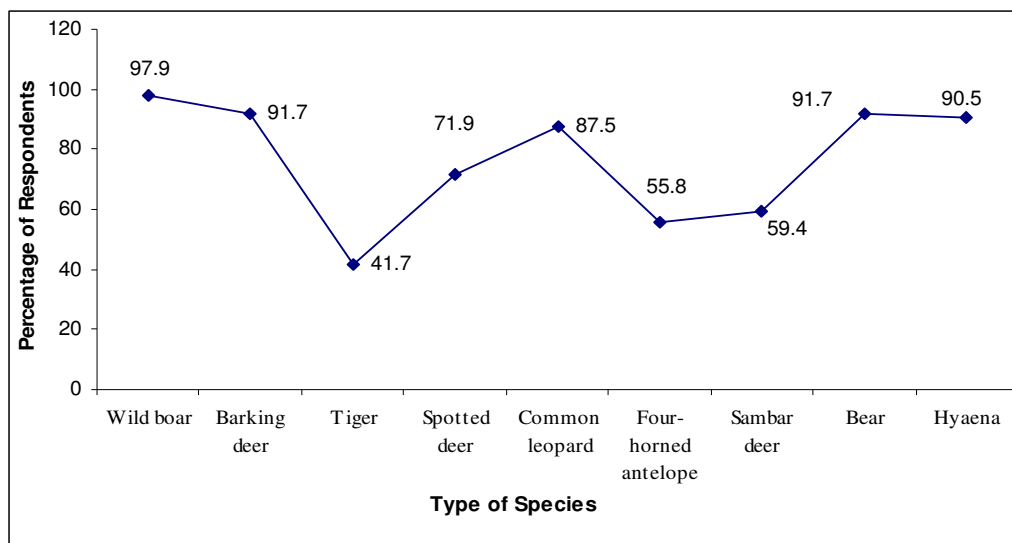


Fig 3: Frequency of occurrence of major wildlife species

Wildlife survey was also done to enumerate the different wildlife species in the area. During this survey all above mentioned wildlife species are recorded by indirect sign and direct observation method except tiger. Based on the questionnaire survey and wildlife survey altogether 25 mammalian species, 16 herpetofauna and 163 birds are recorded in the study area.

According to the local people tiger comes seasonally, especially in the winter season in the area. A total of 35 tracks and 19 killings of domestic animals by tiger was recorded by 'Bagh Heralu' hired by Bhim Gurung's research team during the period of 1999 to 2003 (Gurung et al, 2006). There has been a case of tiger being killed by local people in March, 2003 by poisoning the dead body of a domestic animal which was killed by the tiger (Aita Ram Baral, Pers. Comm.).

Aita Ram Baral is a resident of Nayabasti of Satbariya Village Development Committee. He is 75 years old. He is working as a forest watcher in Uchanimbu community forest. I hired him for the help during this field study period. He has also experience of working as a 'Bagh Heralu' with Bhim Gurungs' research team. According to him, he and another one 'Bagh Heralu' recorded several tracks and killing made by tigers in the area (from Shiva Khola to Arjun Khola) which is verified by Bhim Gurung and his technicians also. He told that tigers do come up to Arjun Khola from Bardiya national Park.

He and another 'Bagh Heralu', Bala Ram Pun also recorded a tiger killed by local people in March, 2003 near the highway close to Hardawa village. He told that a cow was killed by the tiger on 13th March 2003, then villagers poisoned the cow carcass and tiger died after eating the poisoned cow carcass. Skin was removed and taken away by the villager. When "Bagh Heralu" Bala Ram Pun found this out, then he and Aita Baral along with the forest ranger from Lamahi went to the kill site. The forest ranger took the skull and paws of the tiger and rest of the backbones with ribs were kept by the side of the hole. After one month the site was also visited by Bhim Gurung and according to him he was able to see the tiger bones.

Box 1: A case of tiger killing by local people

Cobra (*Naja naja*), Common krait (*Bungarus caeruleus*), Asiatic rat-snake (*Ptyas mucosus*), Common monitor (*Varanus bengalensis*), Golden monitor (*Varanus flavescens*) etc are common reptiles found in the area (Appendix V). Rock python (*Python molurus*) is also found in the area. It can be seen in rainy season. Gharial crocodile (*Gavialis gangeticus*) and Mugger crocodile (*Crocodylus palustris*) both are found in the Rapti River. There are many cases of encounters and even attacks by the crocodiles to

the local people especially to the fishermen. Turtles are found in Rapti Rivers and also in forest areas during rainy season. Hill turtles (*Indotestudo elongata*) are found in forest areas.

Major bird species found are; Indian Peafowl (*Pavo cristatus*), Kalij Pheasant (*Lophura leucomelanos*), Red jungle fowl (*Gallus gallus*), and other common birds (Appendix VI). Indian Grey hornbill (*Ocyrceros birostris*) and Oriental Pied hornbill (*Anthracoceros albirostris*) are frequently found besides, some people also told about the occurrence of great hornbill (*Buceros bicornis*) in the area.

### 3.2 Comparison with Previous Faunal Diversity

No record of faunal diversity of the area before its inclusion as community forest was available therefore, based on the questionnaire survey and discussion with earliest settlers and members of the community forest users group some analysis is made during this study. According to the respondents, 93.8% told that wildlife is increasing after the establishment of community forests and only 6.3% told that wildlife is not increasing.

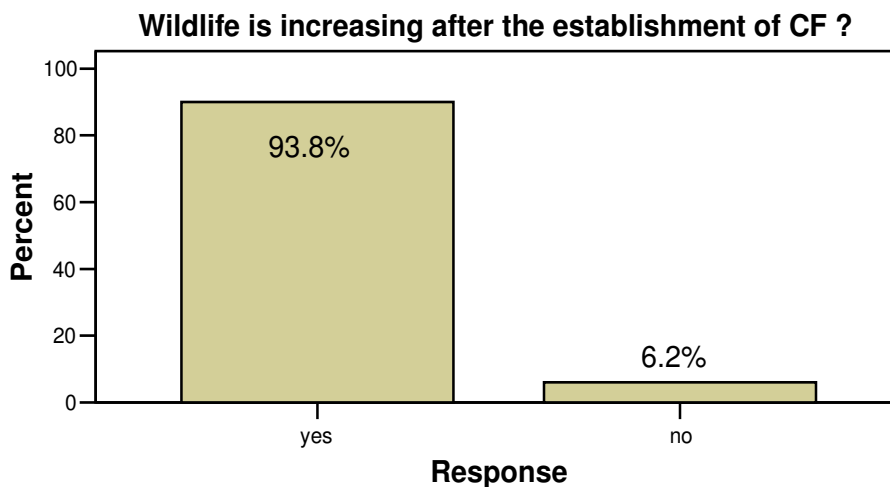


Fig 4: Wildlife status after the establishment of the community forest

Appearance of new wildlife species are also occurred after the establishment of community forest in the area, 99% respondents agree with the appearance of wild elephant (*Elephas maximus*) in their community forest, 18.8% agree with spotted deer, 14.6% agree with blue bull (*Boselaphus tragocamelus*), 11.5% agree with wild boar and

7.5% agree with the tiger appearance after the establishment of community forest in the area.

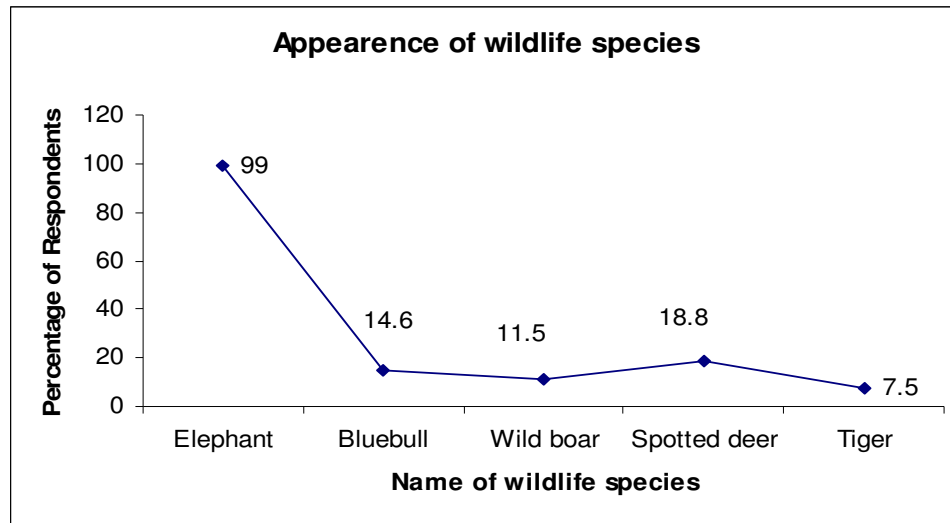


Fig 5: Showing the appearance of new wildlife species in the area

Most of the respondents told that wild elephant is new visitor in the area. It comes on one season of the year generally in the month of September to December during harvesting period of maize and paddy. Blue bull also comes in the area but it is reported only in the western part of the study area i.e. Ameliya and Jalkundi area which is close to the extension area of Bardia National Park. However, one blue bull was killed by the local people among the three sighted in the area. And other animals such as spotted deer and wild boar were seen before the establishment of community forest. However, these are also appeared in the newly established, completely planted community forests, Hasnapur Mahila community forest and Arjun Mahila community forest. Some people also told about the increase of wild boar and spotted deer in the area. Tiger was also seen before the establishment of community forests but according to the some people it is also appeared as a new animal in some community forests. Seasonal visit of wild elephant and blue bull to the area are some positive sign of development of suitable habitat for wildlife as they are not seen before the establishment of the community forest.

### 3.3 Abundance and Distribution pattern

During this study altogether 251 signs (by direct observation and indirect encounter of sign) of wild fauna were encountered in ten transect taken in the 22 community

forests of Satbariya range post. Among these signs, the highest signs encountered in the area are 75 which is of barking deer, 72 of wild boar, 23 of sloth bear, 14 of common leopard, 9 of hyaena, 6 of spotted deer, 5 of four horned antelope, 4 of sambar deer along with the signs of common monitor, common langur, porcupine, jungle cat, small civet, hare, oriental pied hornbill etc.

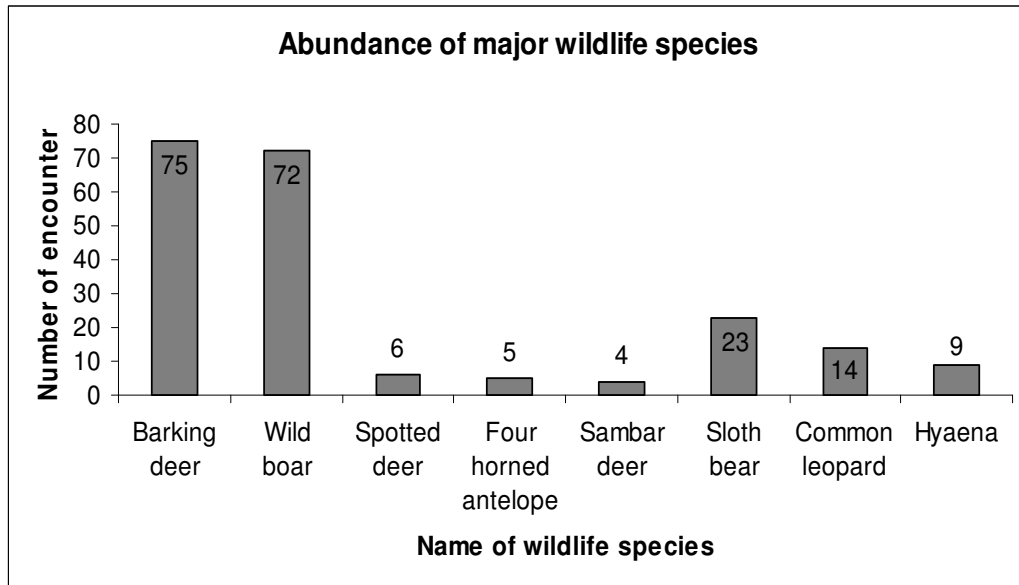


Fig 6: Abundance of wildlife species in the area based on the various encounter rates

Based on the questionnaire survey 93.6% of respondents told about the high abundance of wild boar, 65.9% told about the barking deer, 62.5% told about the sloth bear, 34.8% told about the spotted deer, 3.4% told about four horned antelope and 1.2% told about the high abundance of leopard and hyaena.

The results of wildlife and questionnaire surveys show a little difference in the abundance of wildlife species. This is mainly due to unequal distribution of wildlife in the areas. During the study it is found that spotted deer are distributed mainly eastern part of the study area i.e. Karri Chailahi, Karri Banghusri, Sorgadwari Hariyali, Uchanimbu and Nabasanti community forests and barking deer are distributed mainly in the western part of the area such as Upakar, Bhattarkunda, Bagarbaba, Chitrakot, Jurpani, Teliya Hariyali, Gupti, Kalikhola, Bhimbandh and Ameliya community forests which has relatively rough terrain. However, other animals like leopard, wild boar and sloth bear are distributed in all the areas.



Thus, it is proved that the most abundant herbivore wildlife species found in these community forests are wild boar, barking deer, sloth bear, and spotted deer and among the carnivores species found in the area are jungle cat, common leopard, and hyaena. Among these abundant herbivores species wild boar, barking deer and spotted deer are the important prey species for predators like tigers and leopards. However, several studies show that the barking deer is not preferred as prey by tigers (Schaller 1967, Stoen 1994 and Stoen and Wegge 1996). But, according to the Karanth and Sunquist (1995) it is important in the diet of leopard.

The distribution pattern of four prominent wildlife species was also calculated in these community forests. And result shows that the distribution pattern of three prominent species found in the area such as barking deer, wild boar and sloth bear is clumped type distribution while the distribution pattern of leopard is uniform.

For barking deer,  $s^2 / \bar{X} = 1.95 > 1$ , means the distribution is clumped and the calculated value of  $\chi^2 = 19.53$  which is greater than tabulated value 16.91 at 5% significance level. So,  $H_0$  is rejected. For wild boar,  $s^2 / \bar{X} = 1.8 > 1$ , means the distribution is clumped type and the calculated value of  $\chi^2 = 18$ , which is greater than the tabulated value 16.91 at 5% significance level. So,  $H_0$  is rejected. And for sloth bear,  $s^2 / \bar{X} = 1.83 > 1$ , means the distribution is clumped type and the calculated value of  $\chi^2 = 18.3$ , which is greater than the tabulated value 16.91 at 5% significance level. Here also,  $H_0$  is rejected. The rejection of  $H_0$  further confirms that the distribution is uneven type. While for the common leopard,  $s^2 / \bar{X} = 0.885 < 1$ , means the distribution pattern is uniform type and calculated value of  $\chi^2 = 8.85$ , which is less than tabulated value 16.19 at 5% significance level. So,  $H_0$  is accepted which further confirms that the distribution pattern is uniform type.

Pokhrel (2005) also found the clumped type of distribution pattern of ungulates including barking deer and wild boar in his research in Suklaphanta Wildlife Reserve and Nagarkoti (2006) also found the clumped type of distribution of barking deer in Nagarjun forest. Shrestha (2004) also reported similar type of ungulate distribution in TAL areas. The clumped pattern of distribution of biological populations is common in natural habitat (Odum, 1996). In this study area and in other natural habitats

resources such as food, water and cover are not distributed uniformly leading to the uneven distribution of the species.

Distribution pattern of the common leopard shows the uniform distribution. Uniform distribution occurs where competition between individuals is severe or where there is positive antagonism which promotes even spacing (Odum, 1996). Random distribution is relatively rare in nature and occurs where the environment is very uniform.

### **3.4 Vegetation type**

Major vegetation found in the area are; *Shorea robusta*, *Acacia catechu*, *Dalbergia latifolia*, *Anogeissus latifolius*, *Adina cordifolia*, *Terminalia alata*, *Mallotus philippensis*, *Bauhinia vahlii*, *Phoenix sylvestris*, *Berberis sps* etc. (Appendix VII). *Pinus roxburghii* is seen in some areas especially in the areas of higher elevation and south facing slopes. However, the number of tree is less and countable. The vegetation of the area can be classified in to mainly three forest types based on general observation and grassland is not found in the area.

1. Sal forest ( dominated by *Shorea robusta*)
2. Mixed forest (*Anogeissus latifolius*, *Adina cordifolia*, *Terminalia alata*, *Mallotus philippensis* etc)
3. Riverine forest (*Acacia catechu*, *Bombax ceiba*, *Syzygium cumini*, *Adina cordifolia*)

During the study it is found that barking deer are distributed mainly western part of the area which has relatively rough terrain and Mixed forest type. Pokhrel (2005) and Thapa (2003) recorded high abundance of barking deer in Sal dominated forest in Suklaphanta Wildlife Reserve (SWR) and Barandabhar Corridor Forest (BCF) respectively. But, I have found more signs of barking deer in Mixed forest. Heggdal (1999) in his radio collared study also found that the Sal forest is less used and Mixed forest was used more than would be expected. Similarly, four horned antelope are also found in this type of habitat. Spotted deer are distributed mainly eastern part of the study area where Sal forest is dominated. Pokhrel (2005) and Thapa (2003) also recorded the higher abundance of spotted deer in Sal forest of SWR and BCF. Sambar deer are distributed mainly in higher elevation and hilly terrain where Mixed forest

type is found. According to WII (2004) and Shrestha (2004), sambar deer also prefers the higher elevation with rugged terrain than lower elevation and it shows sensitivity towards human disturbances (Thapa, 2003).

Other animals like leopard, wild boar and sloth bear are distributed in all the areas. Study made by Santiapillai et al. (1992) and Maan et al. (2000) also mentioned about the occurrence of leopard in variety of habitats. It has no preference for a particular habitat and unlike tiger the leopard is more tolerant of the sun and so can inhabit much drier habitats including treeless savannah type ecosystem. Thapa (2003) and Pokhrel (2005) found wild boar in almost all types of forest in BCF and SWR respectively. The wild boar is a typical generalist species in habitat use and specifically more frequent in the fragmented parts than in the continuous forest (Thapa, 2003). Fragmentation may provide optimum condition for generalist species owing to increased food abundance and transition (Murica, 1995) or a reduction in predation by habitat specialist predators (Soule et al, 1988). According to Chhangani (2002), the sloth bear is an opportunistic feeder. It eats whatever is available in different seasons, including natural, cultivated, insects or carrion.

### 3.5 Wildlife-People Conflict

Wildlife-people conflict was studied on the basis of questionnaire survey. Altogether 96 individual representing male (79.2%) and female (20.8%) were interviewed. Based on the questionnaire survey 81.25% of respondents told that wildlife visit their agriculture land and 18.75% respondents told wildlife does not visit their agriculture land.

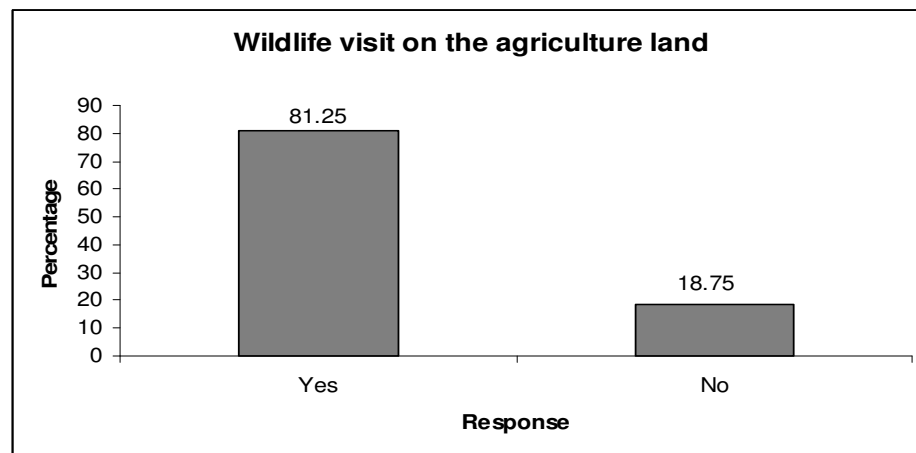


Fig 7: Percentage of Wildlife visit on agricultural land

Among the people suffered from the wildlife, Table 2 shows the frequency of wild animals recorded as threats to agricultural crop. Based on the Table 2, wild boar is the animal having highest threat to local people followed by elephant, porcupine and others.

SN	Name of Wild animal	Percent
1	Wild boar	23.06
2	Elephant	17.37
3	Porcupine	13.83
4	Hare	12.78
5	Spotted deer	8.51
6	Barking deer	7.46
7	Bear	4.60
8	Hyaena	4.60
9	Jackal	4.25
10	Parrot	3.54

Table 2: Percentage of the wild animals recorded as threats to agricultural crop

Regarding this, 90.9 % respondent told that the wildlife visit their agricultural land during night and only 9.1% told that wildlife visit their agricultural land during evening and no respondent told about the wildlife visit during morning and day time. DNPWC/PCP (2006) also recorded that the most of the crop damage occurs during night in buffer zone areas of Parsa Wildlife Reserve.

### 3.5.1 Crop Damage

Maize is severely damaged crop in the area. According to the respondents, three crops are severely damaged among which maize occupies 69.73%, paddy 22.36% and wheat 7.89%. Besides, 71.06% respondent told that wildlife visit on agriculture land is frequent and 28.94% told that the visit is sometime.

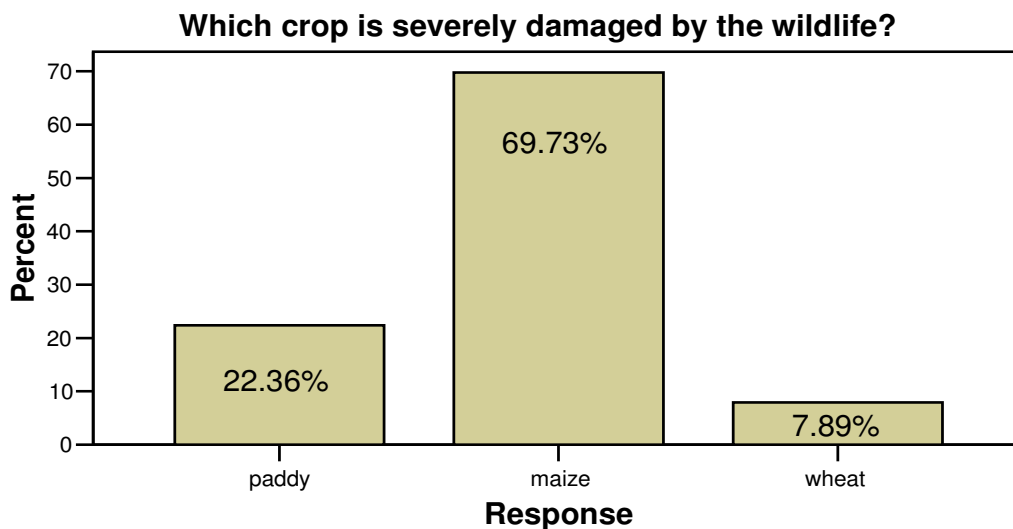


Fig 8: Percentage of severely damaged crop by the wildlife

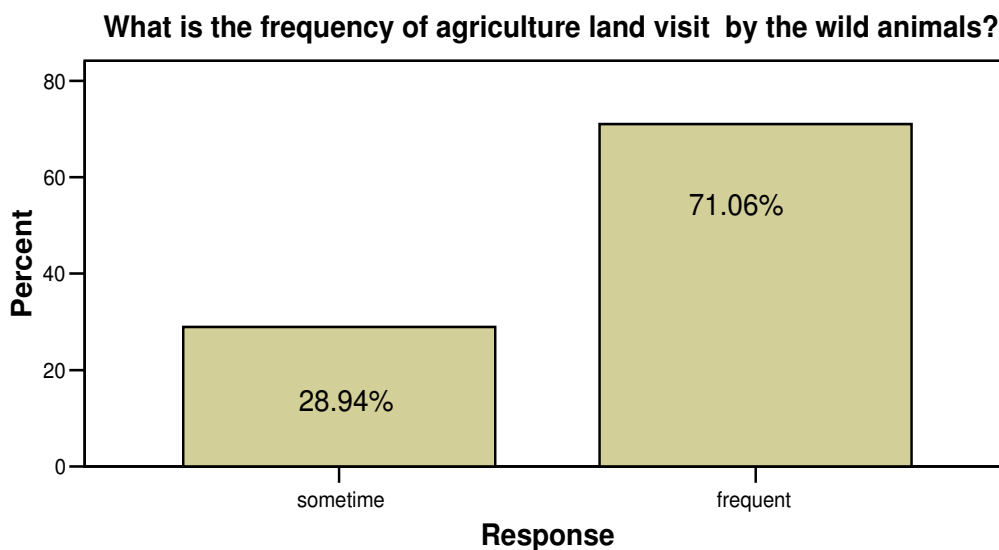


Fig 9: Frequency of agriculture land visit by the wild animals

Frequency of the crop damage based on the questionnaire survey shows that maize is highly damaged crop followed by wheat, rice and potato. Table 3, shows the percentage of crop damage and name of wild animals which is responsible for the damage.

Crop type	Percentage of damage	Wild animals responsible for the damage
Maize	29.13	Wild boar, Elephant, Bear, Hyaena, Porcupine
Wheat	20.45	Hare, Spotted deer, Barking deer
Rice	19.57	Elephant, Wild boar
Potato	15.65	Porcupine, Wild boar
Mustard	8.26	Spotted deer, Barking deer
Lentil	3.47	Spotted deer, Barking deer
Gram	3.47	Spotted deer, Hare, Parrot

Table 3: Percentage of the crop damage by the wildlife

### 3.5.2 Livestock Depredation

Among the total respondents, 89.2 % told that their livestock are killed by wild animals and 10.8% told they have no livestock damage.

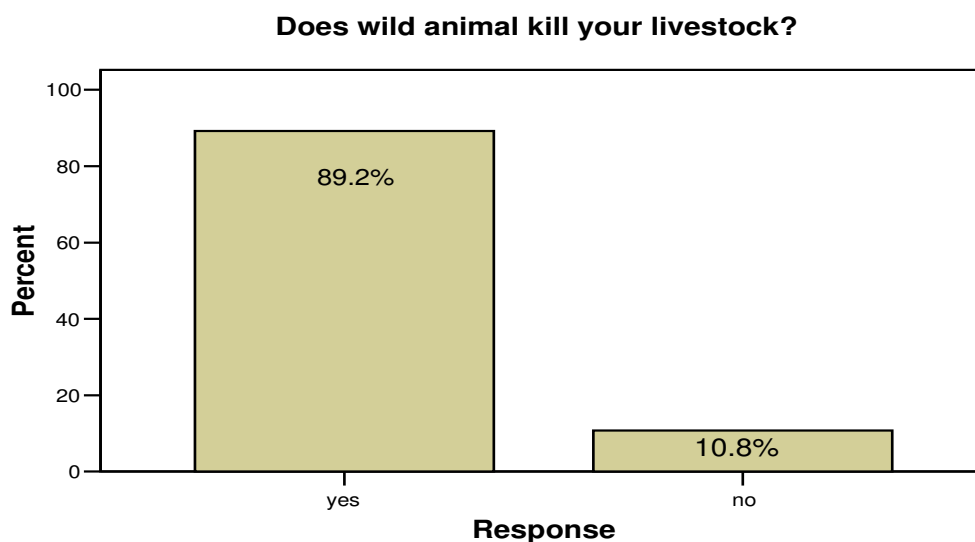


Fig 10: Respondents response to livestock depredation by the wild animal

Table 3 shows that percentage of livestock depredation based on the questionnaire survey. Data shows highly affected animal in the area are hen (33.82%) and goat (33.82%) followed by cattle (19.56%), pig (8.68%), buffalo (2.72%) and sheep (1.36%). Study made by Upreti (1995) in Patihani and Jagatpur area near the Chitwan

National Park also shows that the domestic animal killed by the wildlife are mostly hen followed by goat and cattle. Jackal, jungle cat, and leopard are the common wildlife which causes the livestock depredation. Hen is most vulnerable to predation by jackal and jungle cat and goat and cattle vulnerable to predation by leopard. Tiger sometime kills the cattle and buffalo.

Type of animal	Killed based on frequency (%)	Highly responsible predators
Hen	33.82	Jackal, Jungle cat
Goat	33.82	Leopard
Cattle	19.56	Leopard, Tiger
Pig	8.68	Leopard
Buffalo	2.76	Tiger, Leopard
Sheep	1.36	Leopard

Table 4: Percentage of livestock depredation by the wildlife

Livestock depredation mostly occurs in the community forests during the grazing period. Depredation within the settlement or animal shed occurs rarely. However, depredation of hen from the settlement by small carnivores such as jungle cat and jackal is common in the area. Livestock are the local people's assets in the area as most of the people in the area have agricultural occupation and there is no alternative. They have to graze their livestock in the forest area by making them vulnerable to predation and causing economic loss.

### 3.5.3 Risk to Human Life

So far no human beings have been killed by the wild animals in the study area. There were some cases of injury when people were swarming in the forest during collection of fuel wood and other forest resources. According to the local people interviewed, 21.9% knows about the cases of wildlife injured to human and 78.1% do not know about the human killed and injured by wild animals.

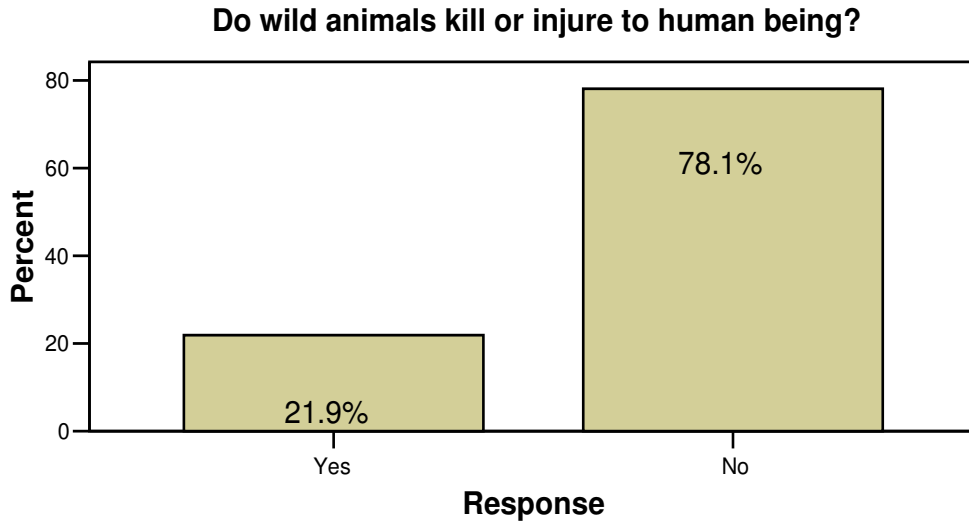


Fig 11: Respondents response to killing or injuring the human being

The main wild animal causing the human injury is sloth bear. Among the injury cases 85.7% is due to sloth bear, 9.5% is due to crocodile and 4.8% is due to leopard. Crocodile makes human injury mainly during fishing and bathing in the Rapti River. Yogananda et. al. (2000) in their study from 1996 to 2000 at Panna National Park, India, also identify that the sloth bear is the major wildlife which causes more human injures and thus considered more danger than that of tigers or leopards.

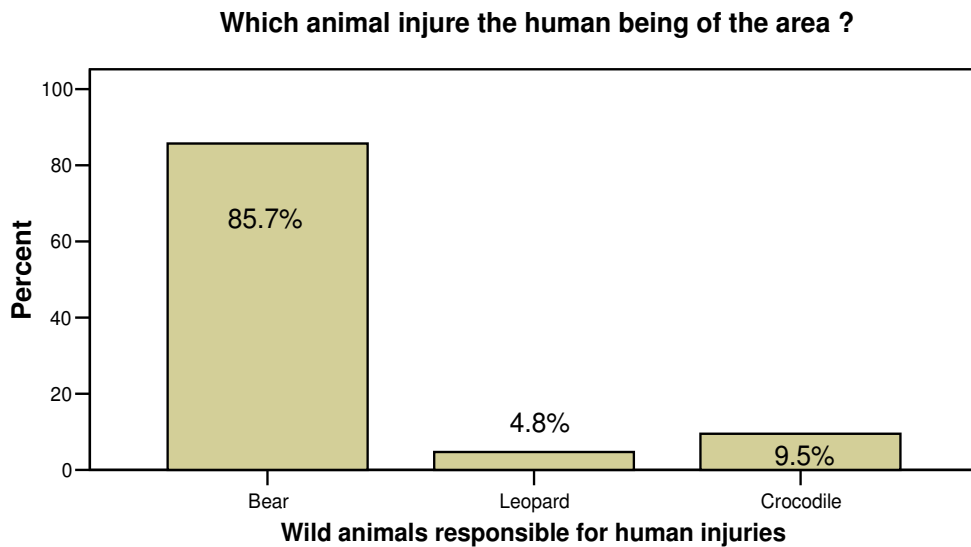


Fig 12: Cases of human injured by the wild animals



The people who visit the forest frequently are at higher risk of wildlife attack. During the field study, a case of completely damaging one eye of a girl before three years by sloth bear is found in Uchanimbu community forest. And a case of attack by a crocodile before ten years to Tek Bahadur Ramijal, a resident of Tarule Gaun during fishing period in Rapti River has been reported. The wound inflicted by the crocodile still can be seen on his thigh.

Some peoples suffer from the increasing number of wildlife in the community forest as the wild animal damages their crops and kill their livestock. Wild boar, spotted deer, barking deer, leopard, and sloth bear are the major animals due to which conflict occurs in the community. Elephants make seasonal visit but they also inflict large scale damage. The extent of people wildlife conflict is comparatively higher especially within the settlements located near the forest area.

### 3.5.4 Compensation

Among the local people, 88.5% told that provision of compensation to the affected people should be important and 11.5% opined compensation is not necessary to them.

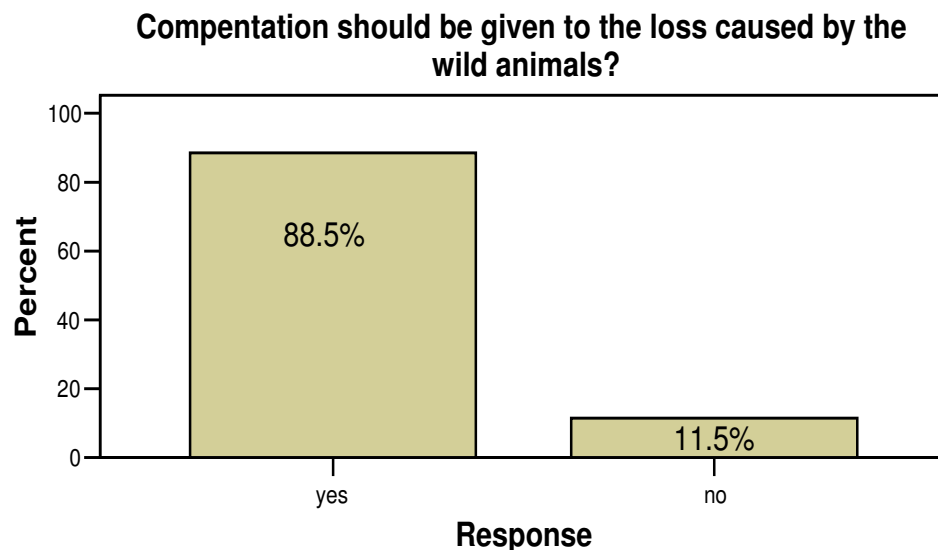


Fig 13: Needs of compensation to the loss caused by the wild animals

Some people claimed that human encroachment to the wildlife habitat for cropping and settlement is the key factor that encourages the human wildlife conflicts. That is

why compensation should not be given to the people. According Bhattarai and Khanal (2005), the lack of provisions in the work plan regarding compensations for users and other affected people for wildlife damage is a serious weakness of the community forestry program.

### 3.5.5 Crop Protection Measures

According to the local people, 55.7% do general care or guarding, 7.6% make noises, 3.8% make Machan, and 2.5% make fire for the crop protection and 30.4% do nothing.

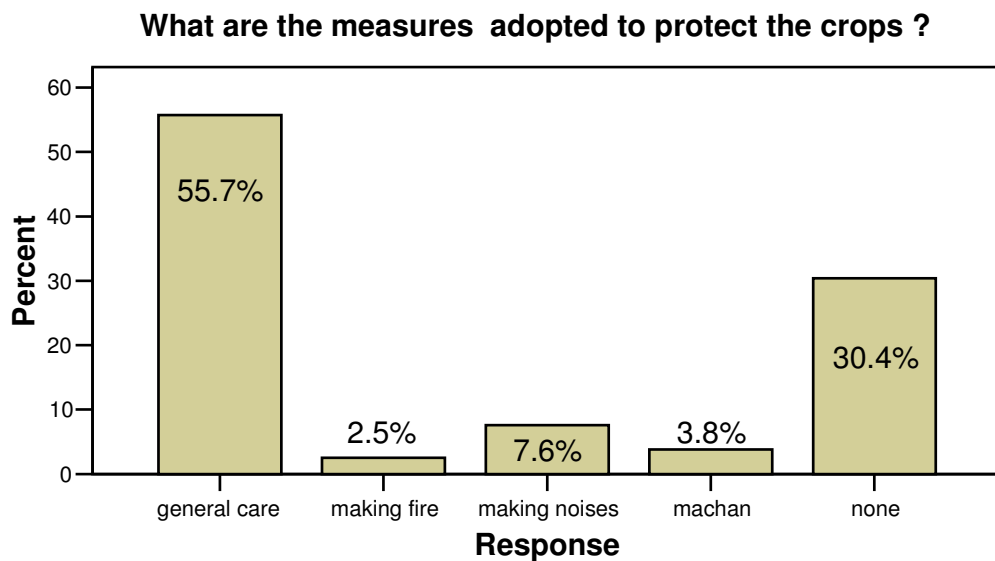


Fig 14: Different measures used to protect crop by local people

Crop protection measures adopted by the farmers in the area are guarding the field, making noises by shouting, hand clapping and beating containers. In some areas 'Machans' are also made to safeguard the crops. These measures are mostly primitive and labor intensive in nature.

### 3.6 Level of Awareness

According to the local people, 91.7% told that they have not received any information about the wildlife conservation by any institution or organization. And 8.3% told that they do have knowledge about the importance of wildlife conservation.

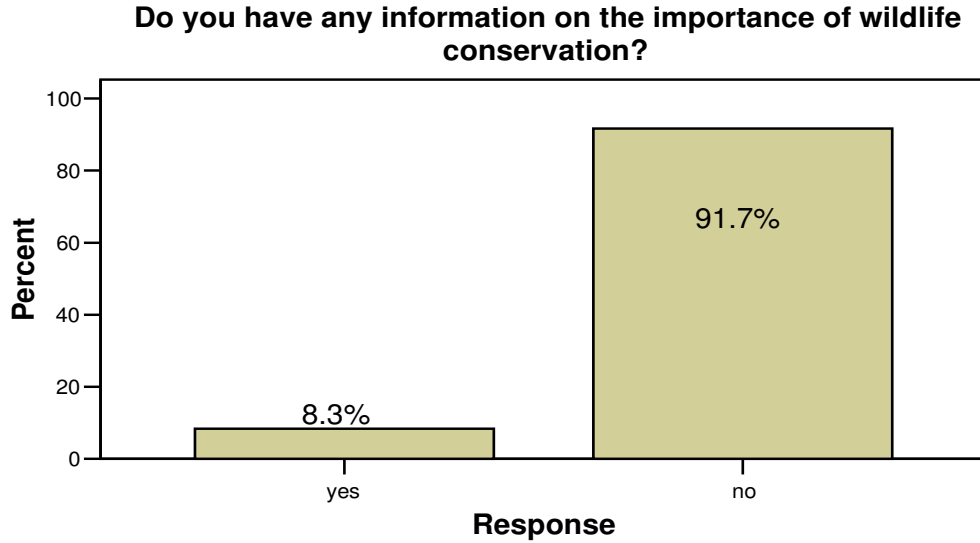


Fig 15: Awareness level to the importance of wildlife conservation

Among the respondents, 77.1% told that the wildlife should be protected and 22.9% told wildlife should not be protected because they harm crop and livestock.

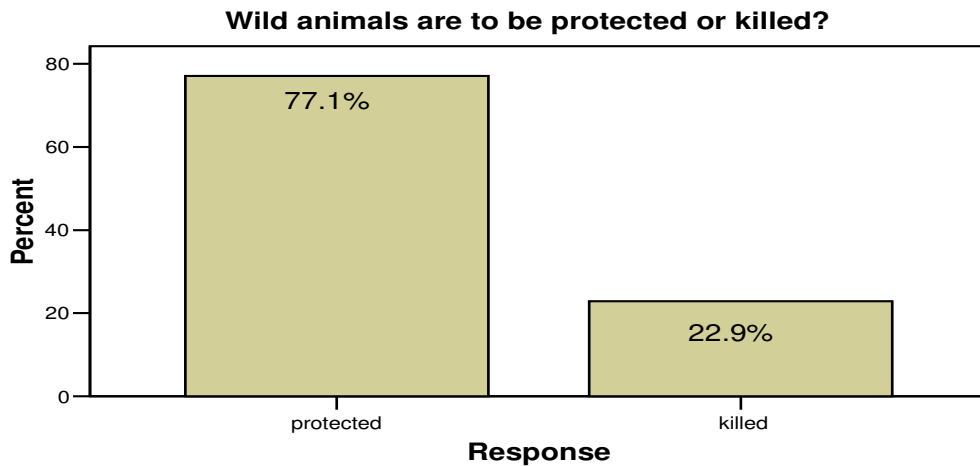


Fig 16: Views of local people towards protection and killing of the Wildlife

The respondents who are in the favor of protection were asked for why and how wildlife should be protected, 78.4 % of respondent told it should be protected for forest beauty, 17.6% told to balance nature, 2.7% told for future generation and 1.4% told they do not know about it and 54.1% told wildlife can be protected by protecting their habitat, 40.5% told by controlling poaching and 5.4% told that wildlife can be protected in the area by declaring it as a national park.

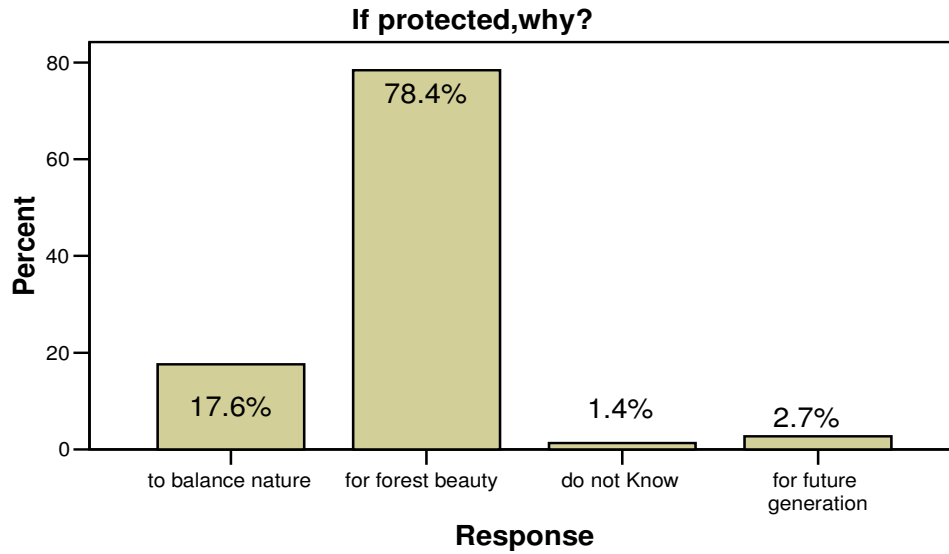


Fig 17: Views of local people about why wildlife should be protected

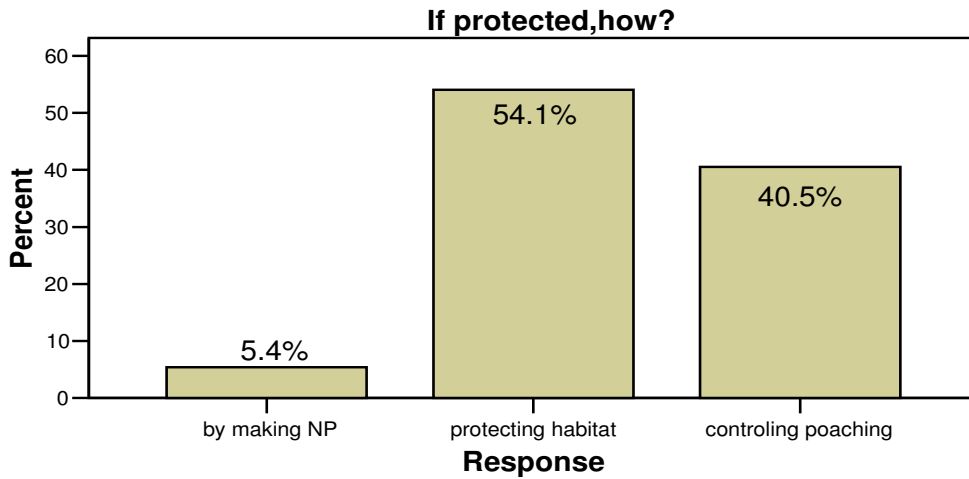


Fig 18: Views of local people about how wildlife should be protected

Awareness level in the area is not very low. However, some people including some chairperson of the community forest told that the wild animal should be killed to protect crop and livestock and they have no value for the people and community. Some people are unsatisfied with community forest management process. They told wildlife can not be protected by this process and for the protection of wildlife it is necessary to declare the area as a national park.

### 3.7 Poaching

According to the respondents, 72.9% agree with the poaching occurs in their community forests and only 27.1% disagree with the poaching. Among the respondents who agree with poaching or illegal hunting, 81.4% told it is done for both food and trade, 11.4% told for food and 7.1% told it is done for trade purpose only.

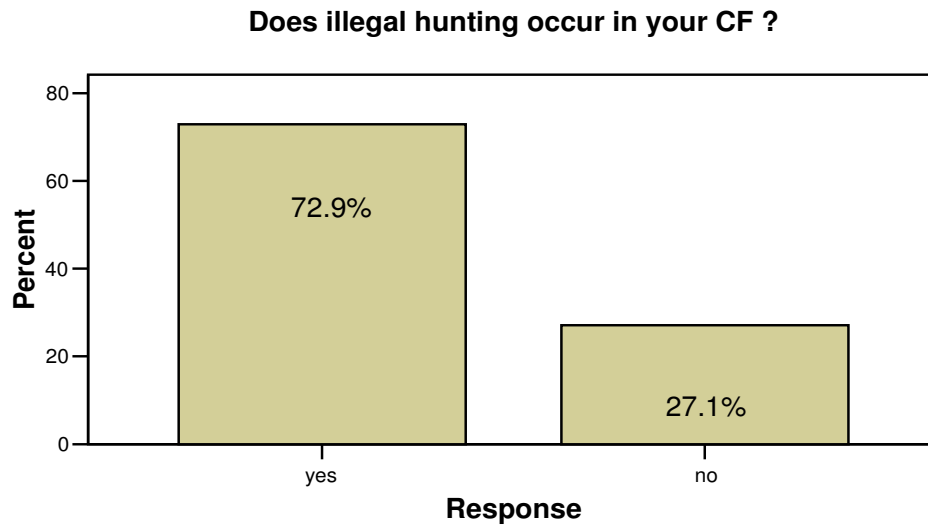


Fig 19: Status of illegal hunting in the area

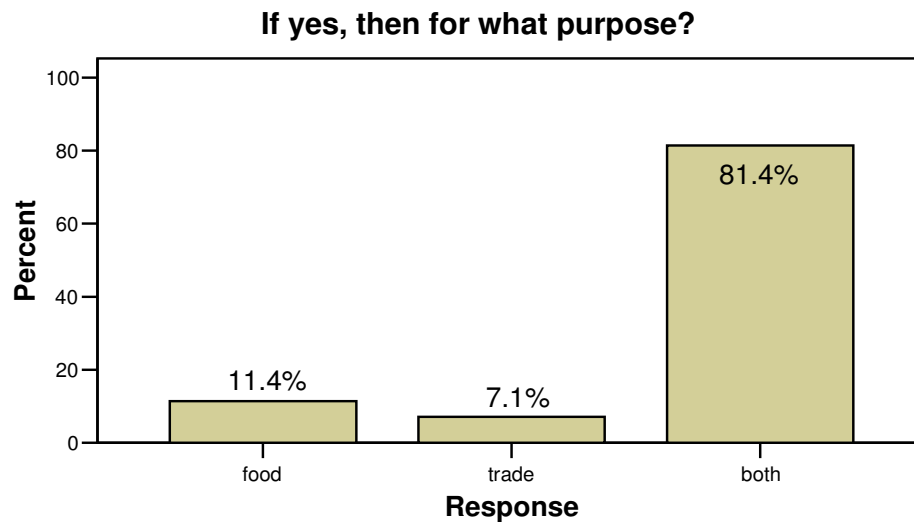


Fig 20: Purpose for illegal hunting

Poaching is high in these community forests. Four groups of poachers were encountered within the forest with gun and other weapons during this study period. In some area people's life is totally depends on illegal hunting. Poaching was high in

west part of the study area i.e. periphery of the Amelia region. Dry and fresh meat of wild herbivores is openly sold in Amelia bazaar. Decrease in prey species due to poaching may affect the predator's population for instance tiger and leopard.

Common langur and Rhesus monkey are being disappeared from the community forest due to poaching. Their dried meat is sold in the market through their fake identity. During this field study there is no any encounter with monkey except one killed by a poacher. Some people also told about the disappearance of other animals like squirrel, spotted deer and sambar deer in some pockets of areas due to high poaching activities.

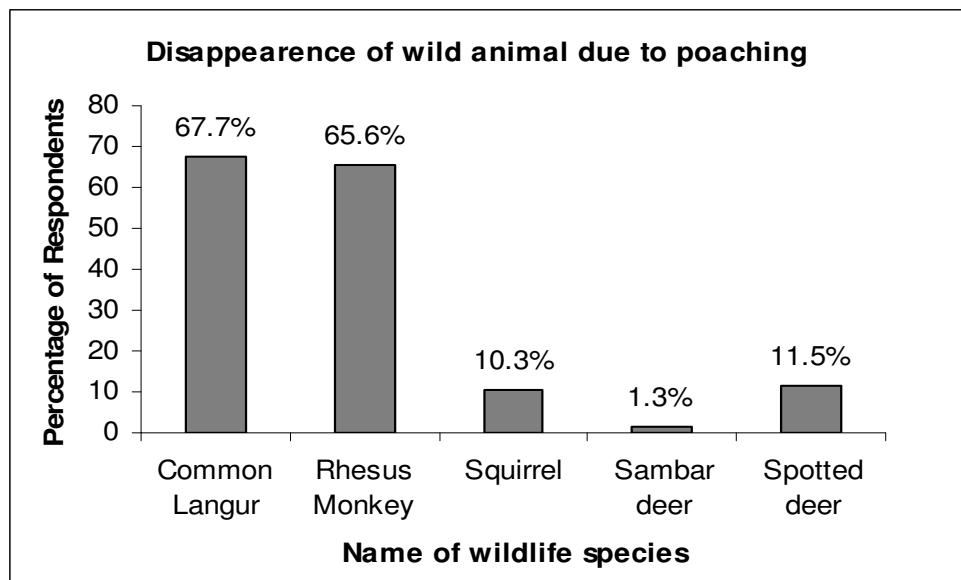


Fig 21: People agree with the disappearance of wildlife due to poaching

According to the local people, 67.7% are agreed with the disappearance of common langur, 65.6% are with rhesus monkey, 10.3% with squirrel, 11.5% with spotted deer and 1.3% are agreed with the disappearance of sambar deer. They have not seen these animals since long back. Squirrels are disappearing around the Tharu community because they kill it for food purpose. Spotted deer and sambar deer are disappearing from the territory of Ameliya and Kalikhola community forests due to illegal hunting. Monkeys are disappeared from all the community forest area. When I asked the authorized person of community forest about the high poaching prone area, it is found that the member of community forests have not taken any responsibility. Some person simply gave sympathy to the poachers as they have no other alternatives to sustain

their life .Some opined it is the job of District Forest Office and other related institution for controlling poaching of wildlife.

During this field study four groups of poacher were encountered, one is so heart feeling which I can not forget till date. When I and my assistant were walking along the transect number ten in Ameliya community forest, we encountered a poacher carrying a common langur killed by him. Every part of the body of poacher was soaking by blood coming from the langurs' body. We had seen the gun on his shoulder and a large knife (khukuri) in his bag. When he saw us in the core area of the forest first, he became worried. We went close to him and asked for the photographs at first he rejected our request but at last we were success to agree him to take photos of only that monkey (Appendix I). We were not able to take photos of poacher and his weapons. He was highly reluctant in this matter.

The common langur killed was adult male and according to hunter it was alone in the forest. The hunter told that he came to the forest to hunt sambar deer and he also saw three sambar deer in the forest but he was not successful in killing them. Then he killed common langur which he saw later. According to the poacher the killed langur would be sold by making dry meat and giving fake identity (called dry meat of sambar deer). And meat would be sold at the rate of NRs 400 per kg.

Box 2: Case of poaching encountered in the area

### **3.8 Other Human Impacts**

Various types of human impacts such as grazing, forest fire, tree cutting, forest encroachment etc were recorded in the area. Grazing is common even in the core area of the forest. Mainly cattle and goat grazing were seen frequently in the core area of the community forest. Sometimes buffalo grazing was also seen in the low elevation areas. Extensive grazing may affect the wildlife and its habitat in many ways. Grazing may cause modification of natural succession, invasion of weed and exotic species, reduction of palatable tree, shrubs and perennial species, increased competition with native herbivores, vegetation unacceptable to native species due to excretion of dung and urine, spreading diseases and parasites, disturbance to native animal species and reduction in nutrient pool (IUCN/UNEP, 1986).

Forest fire was seen another problem in the area. During the study period I have seen fresh (i.e. burning) forest fire in two transects and cases of old forest fire were seen in various places. According to the local people most of the forest fires were due to human, mainly by herder of domestic animal and poachers. Document on Terai Arc Landscape- Nepal Strategic Plan (HMGN/MFSC, 2004) also identify that the majority of the uncontrolled fires in the Terai are induced by people. Sometime forest fire is also made for the purpose of forest management by the member of community forest users group. Forest fire may cause local breakdown of ecological balance between species, progressive reduction of species' diversity and increase in uniformity with fewer ecosystem and specialized niches, migration and concentration of herbivores, loss of biomass and trapping and killing of wildlife (IUCN/UNEP, 1986).

Tree cutting was seen everywhere in the area. According to the local people these tree cutting were done by users group of community forest. During the study period cutting of large amount of Khayer (*Acacia catechu*), Sal (*Shorea robusta*) and Saj (*Termenalia alata*) were seen in the area. Larger trees of Sal (*Shorea robusta*) and Saj (*Termenalia alata*) are considered good for nesting and brooding of vulture. So, cutting of large tree is one of the major causes to decrease the number of vulture. Harvesting of other forest resources such as fuel wood, Tata collection (seed of *Bauhinia vahlii*) and Thakal collection (fruit of *Phoenix sylvestris*) etc are common there. Any bulk harvesting of the forest resources will have permanent effects on the continued productivity of the forest (IUCN/UNEP, 1986).

Forest encroachment is also common in the area and it is ongoing. Encroachment is mainly done by landless people. Various scattered settlements with few households are found even in the core area of the forest. According to the local people most of such types of settlements are unregistered land, Goyeli, Dhabari etc are such type of settlements seen in the area. This type of settlement may influence wildlife habitat and also increases poaching activities.



## CHAPTER-IV

### 4. Conclusion and Recommendations

#### 4.1 Conclusion

Nepal has demonstrated that community forestry is a viable strategy for the rehabilitation of abandoned and degraded lands through plantations. This in return is also contributing in revival of the plant and animal species. Community forestry plays a direct role in augmenting natural regeneration, which in turn increase in forest cover and wildlife habitats. The study area has been included in Terai Arc Landscape Program. Thus, the community forests of this area have important role in the Terai Arc Landscape Program for the development of corridor for free movement of wildlife and conservation of biodiversity. Based on the results of the study, following conclusions are made about the fauna found in the community forests and other issues related to them.

The major mammalian species found are; wild boar (*Sus scrofa*), barking deer (*Muntiacus muntjac*), spotted deer (*Axis axis*), four horned antelope (*Tetracerus quadricornis*), sambar deer (*Cervus unicolor*), common leopard (*Panthera pardus*), leopard cat (*Felis bengalensis*), jungle cat (*Felis chaus*), sloth bear (*Melursus ursinus*), striped hyaena (*Hyaena hyaena*) and jackal (*Canis aureus*). Tiger (*Panthera tigris*) comes seasonally specially in the winter season in the area. Numerous footprints and killing of domestic animals by tiger were recorded by 'Bagh Heralu' hired by Bhim Gurung's research team during the period of 1999 to 2003. There has been a case of tiger killed by local people 4 years before by poisoning the dead body of domestic animal which was killed by the tiger. Among these animals the abundance of wild boar, barking deer, common leopard and sloth bear are high based on questionnaire survey and signs encountered in the area. During study, 75 signs of barking deer, 72 of wild boar, 23 of sloth bear, and 14 of common leopard were recorded.

The number of wildlife species has been increased after the establishment of community forest. Among the respondents, 93.8% agreed with the increase in wildlife in the area. Wild animals such as wild boar, spotted deer also seen in totally planted community forests, Hasnapur Mahila community forest and Arjun Mahila community

forest. Due to restoration of degraded habitats through community forestry program land base for wild animals are increasing in the area.

During the study it is found that spotted deer are distributed mainly eastern part of the study area where Sal forest is dominated. Barking deer and four horned antelope are distributed mainly western part of the area which has relatively rough terrain and Mixed forest type. However other animals like leopard, wild boar and sloth bear are distributed in all the areas.

Seasonal visit of wild elephant (*Elephas maximus*) and blue bull (*Boselaphus tragocamelus*) to the area is some positive sign of development of suitable habitat for wildlife as they are not seen before the establishment of the community forest. Among the respondents, 99% agree with the appearance of wild elephant in their community forest and only 14.6% agree with blue bull. Appearance of wild elephant is reported from entire study area however, blue bull is reported only in the western part of the study area i.e. Ameliya and Jalkundi area which is close to the extension area of Bardia National Park.

Major bird species found are; Indian Peafowl (*Pavo cristatus*), Kalij Pheasant (*Lophura leucomelanos*), Red jungle fowl (*Gallus gallus*), and other common birds. Indian Grey hornbill (*Ocyceros birostris*) and Oriental Pied hornbill (*Anthracoceros albirostris*) are frequently found besides, some people also told about the occurrence of great hornbill (*Buceros bicornis*) in the area. Among the birds, vultures are disappearing nowadays. It is mainly due to two reasons first is poison, used in dead body of domestic animal due to lack of awareness and the second is felling down of large and tall trees by forest user groups which are very essential for the vultures for roosting and nesting.

Cobra (*Naja naja*), Common krait (*Bungarus caeruleus*), Asiatic rat-snake (*Ptyas mucosus*), Common monitor (*Varanus bengalensis*), Golden monitor (*Varanus flavescens*) etc are common reptiles found in the area. Rock python (*Python molurus*) is also found in the area. It can be seen in rainy season. Gharial crocodile (*Gavialis gangeticus*) and Mugger crocodile (*Crocodylus palustris*) both are found in the Rapti River. They were encountered several times and even attacks of the crocodiles to the

local people especially fisherman were also recorded. Turtles are found in Rapti Rivers and also in forest areas during rainy season. Hill turtles (*Indotestudo elongata*) are found in forest areas.

Major vegetation found in the area are; *Shorea robusta*, *Acacia catechu*, *Dalbergia latifolia*, *Anogeissus latifolius*, *Adina cordifolia*, *Terminalia alata*, *Mallotus philippensis*, *Phoenix sylvestris*, *Berberis sps* etc. And based on the general observation three forest types such as Sal forest, Mixed forest and Riverine forest are recorded in the area.

Some people have definitely suffered from the increasing number of wildlife in the community forest as the wild animal damages their crops and kill their livestock. Wild boar, wild elephant, spotted deer, barking deer, leopard, and sloth bear are the major animals due to which conflict rises in the community. Elephant comes seasonally but made large scale damage. The extent of people wildlife conflict is comparatively higher especially within the settlements located near the forest area.

Awareness level in the area is not very low. However, some people including some chairperson of the community forest told that the wild animal should be killed to protect crop and livestock and they have no value for the people and community.

Poaching is high in these community forests. Among the respondents, 72.9% are agreed with poaching that occurs in the area. Four groups of poachers were encountered within the forest with gun and other weapons. In some area people's life is totally depended on illegal hunting. Poaching is high in west part of the study area i.e. periphery of the Amelia region. Dry and fresh meat of wild herbivores is openly sold in Amelia bazaar. Common langur and Rhesus monkey are disappeared from the community forest due to poaching. Their dried meat is sold in the market through their fake identity.

It is obvious that the community forest plays an important role for development of suitable habitat and thereby conservation of the faunal diversity in the Satbariya Range Post area. Several endangered species such as tiger, hyaena, four-horned antelope, rock python, gharial crocodile etc are recorded in the community forests and

appearance of new wildlife such as wild elephant is also occurs in the area. But, conservation issues such as poaching, grazing, tree cutting, forest fire and human-wildlife conflicts are common in the area. So, relentless handling of these conservation issues is necessary for the conservation of these fauna in the community forest.

## **4.2 Recommendations**

Based on this study following recommendations are suggested, and it is hoped that this will help to conserve wildlife species and their habitat in the area.

The area is identified as a bottleneck area of the TAL- Program but, it lacks any type of programs such as awareness program, income generating activities etc. Thus, these activities must be launched in the area.

Despite the fact that forests and wildlife are inseparable components of the forest ecosystem, excluding wildlife conservation from the scope of the community forest activities seems incongruent with conservation goals. There is no clear legal provision for the conservation of wildlife in the community forests. So, appropriate legal provisions for the conservation of wildlife in the community forests and compensation to the damage should be made.

Good coordination between community forests within the area is required to control the poaching. It is found that if the wildlife is killed in one Community forest then member of another community forests shows ignorance although they have seen live the case and also told it is not related to them. Regarding to this, District Forest Office also has to play important role to control poaching.

Tiger comes in the area but due to lack of awareness, sometime its life is threatened by local people. So, awareness program especially based on such flagship species is important in the area. However, protection of prey species of tiger in the area is also a must.

After the establishment of community forests wildlife are increasing in the area and due to which wildlife-people conflict is also increasing. So, programs to mitigate wildlife people conflict are necessary in the area.

Important wildlife species such as tiger, leopard, hyaena, four-horned antelope, rock python, crocodile (both Gharial and Mugger) are found in the area but no research work are carried out on these in the area. So, detail research on these wildlife and other related issues to them in these community forests area are necessary.

Forest encroachment is continuous in the area so, illegal agriculture and settlement in the forest area should be stopped very early before the problem grows out of hand. For these if the settlement and agriculture are clearly a matter of survival for needy, landless people, they must be translocated elsewhere. And if the settlement is greed motivated land speculation, then proceed quickly to eject people and rehabilitate the cleared land is necessary in the area.

Several squatter settlements are found in the area and to develop the area as good wildlife habitat appropriate solution on this matter is important. For this, it is better to persuade squatter to move out of the forest area voluntarily rather than force them out. But if the settlement is of long standing such as in Goyeli, Dhabari finding them alternative legal land holding or some other incentives are important. However, it may need large amount of money.

Poaching is high and is mostly done by the local people who can not afford basic needs by other activities and who have no knowledge about importance of wildlife. So, income generating activities which increase the livelihood status and awareness program based on the importance of wildlife conservation is required in the area.

Forest fire is seen common in the area and it is mainly human induced. So, herdsmen and fuel wood collectors should not be allowed to make fires in the forest area.

Areas for the fuel wood collection and grazing is to be previously determined in the community forests. Grazing in the core area should not be permitted which may disturb and displace the wildlife.

### **Some special recommendations to minimize the human-wildlife conflict**

Livestock grazing is seen even in the core area of the forest but no herdsmen were seen with livestock and study also shows that the most of livestock killing occurs within the community forests. So, careful guarding of livestock is necessary to decrease the livestock depredation.

Careful caring of crop is also recommended to protect crop from wild animals such as deer, wild boar, parakeet, hare etc. Collective guarding of fields during night time is appropriate because study shows that large scale damage of crop occurs at night time.

Damage due to wild animals such as wild boar can be minimized planting the crops which are not eaten by wild boar near forest areas where it makes large scale damage. For example, chilly is not eaten by the wild boar (Upreti, 1995).

Damage due to elephant can be minimized by slightly changing the cropping season as it comes only one season in the area and makes large scale damage. It is better to plant maize and paddy so that they can be harvested just before elephant reach in the area. This practice has been already adopted by some people in the area also.

## Reference

- Bartlett, A.G. 1991. *Community Forestry: A Viable Strategy for Meeting Forest Development and Conservation Objectives in Nepal*. Nepal-Australia Forestry Project, Kathmandu.
- Bhattra, A.M. and D.R. Khanal. 2005. *Communities, Forests and Law of Nepal: Present State and Challenges*. Pro-Public and FECOFUN, Kathmandu, Nepal.
- Chhangani, A. K. 2002. *Food and Feeding of Sloth Bear in Aravalli Hills of Rajasthan, India*. Pp 1-6 in J. Naewboonnien (Ed). Tigerpaper. Vol. XXIX, No. 2.
- DNPWC/MFSC. 2006. *Tiger Action Plan for Nepal*. Kathmandu: Government of Nepal, Ministry of Forests and Soil Conservation, Department of National Parks and Wildlife Conservation; National Trust for Nature Conservation; and WWF Nepal Program (Unpublished).
- DNPWC/PCP. 2006. Management Plan of Parsa Wildlife Reserve and Its Buffer Zone. Department of National Parks and Wildlife Conservation and Participatory Conservation Programme, Kathmandu, Nepal.
- Gautam, J.R. 2003. *Ban Badhyo, Banyajantule Dukha Dina Thale*. pp 7 in Samudaik Ban. Vol-1, No-2 (2003). NEFEJ, Kathmandu, Nepal.
- Ghimire, K. 1999. *The Status and Prospectus of Biodiversity Conservation in Community Forest: A Case Study of Laxmi Maliha Community Forests, Gorkha, Nepal*. Tribhuvan University, Institute of Forestry, Pokhara, Nepal.
- Grosen, J. 2000. *Policy and Legal Framework Issues*. Issue paper presented to the workshop on Joint Technical Review of Community Based Forestry. Godavari, Nepal.
- Gurung, B., M. Shrestha and J. L. David Smith. 2006. *Using a Bagh Heralu Network to Map the Metapopulation Structures of Tigers in Nepal*, pp 214 -231 in J.A. Mcneely, T. McCarthy, A. Smith, L.O. Whittaker and E.D. Wikramanayake (Ed.). Conservation Biology in Asia. Society for Conservation Biology Asia Section and Resources Himalaya Foundation, Kathmandu, Nepal.
- Heggdal, P. O. 1999. *Spatial Organization, Habitat Preferences and activity of Barking Deer during the Dry Season in Royal Bardiya National Park, Lowland Nepal*. A thesis submitted in partial fulfillment of the requirements for the M Sc degree in Wildlife Ecology.

- HMGN/MFSC. 2002. *Nepal Biodiversity Strategy*, 170 pages
- HMGN/MFSC. 2004. *Terai Arc Landscape-Nepal Strategic Plan (2004-2014), Broad Strategy Document*. Government of Nepal, Ministry of Forests and Soil Conservation, Kathmandu, Nepal.
- IUCN/UNEP. 1986. *Managing Protected Areas in the Tropics*. International Union for Conservation of Nature and Natural Resources and United Nation Environment Program.
- Karanth, K. U. and M. E. Sunquist. 1995. Prey Selection by Tiger, Leopard and Dhole in Tropical Forests. *Journal of Animal Ecology* 64: 439-450.
- Knowler, D. 2004. *Assessing the Prospects for Community Management of Wildlife in Sagarmatha (Mt. Everest) National Park, Nepal*. School of Resource and Environmental Management, Simon Fraser University, Canada.
- Maan, M. A. and A. A. Chaudhary. 2000. *Common Leopard: our endangered heritage needs special conservation*. Pp 14-16 in J. Naewboonnien (Ed). Tigerpaper. Vol. XXVII, No. 4.
- MFSC/DNPWC. 1999. *Tiger Conservation Action Plan for the Kingdom of Nepal*.
- MFSC. 2006. *Terai Arc Landscape-Nepal Annual Progress Report*
- Murica, C. 1995. *Edge effects in fragmented forests: implications for conservation*. *Trends in Ecology and evolution* 10:58-62.
- Nagarkoti, A. 2006. *Distribution Pattern, Habitat Preference and Food Habitats of Barking deer in Nagarjun Royal Forest*. M Sc Thesis Submitted to Central Department of Zoology, Tribhuvan University, Kathmandu, Nepal.
- Odum, E. P. 1996. *Fundamentals of Ecology*. W. B. Sanders Company, USA.
- Paudyal, B. 1999. *Samudaik Banma Banyajantu Sanrakshan*. pp 117-120 in K. Shrestha (Ed.), Jaibik Bibidhata. NEFEJ, Kathmandu, Nepal.
- Pokhrel, S. 2005. *Distribution and Abundance of Wild Ungulates in Royal Suklaphanta Wildlife Reserve*. M Sc Thesis Submitted to Central Department of Zoology, Tribhuvan University, Kathmandu, Nepal.



- Rajbhandari, R. 1995. *Biodiversity and Conservation*. pp 203-227 in Environmental Education Source Book, IUCN-Nepal.
- Santiapillai, C. and W. S. Ramono. 1992. *Status of the Leopard in Java, Indonesia*. Pp 1-5 in J. Naewboonnien (Ed). Tigerpaper. Vol. XIX, No: 2
- Schaller, G. B. 1967. *The deer and the tiger. A study of wildlife in India*. 370 pp. The University of Chicago Press.
- Shrestha, T.K. 2003. *Wildlife of Nepal*. B. Shrestha, Kathmandu, Nepal.
- Shrestha, B. 2005. *Distribution and Diversity of Mammals with Reference to Disturbance at Shivapuri National Park*. MSc Thesis, Tribhuvan University, Kathmandu, Nepal.
- Shrestha, M.K. 2004. *Relative Ungulate Abundance in a Fragmented Landscape: Implications for Tiger Conservation*. PhD Thesis, University of Minnesota, USA.
- Soule, M. E., D. T. Bolger, A. C. Alberts, J. Wright, M. Sorice, and S. Hill. 1988. *Reconstructed dynamics of rapid extinctions of Chaparral requiring birds in urban habitat islands*. Conservation Biology, 2: 75-92.
- Spears, J. 1988. *Preserving Biological Diversity in the Tropical Forests of the Asian Region*. pp 393-402 in E.O. Wilson (Ed.). Biodiversity. National Academy Press, Washington D.C., USA.
- Støen, O. G. 1994. *The Status and Food habits of the Tiger Population in the Karnali flood plain of Royal Bardiya National Park, Nepal*. M. Sc. Thesis. Agricultural University of Norway (NLH).
- Støen, O. G. and P. Wegge. 1996. *Prey Selection and Prey Removal by Tiger during the Dry Season in Lowland Nepal*. Mammalia, 60(3): 363-373.
- Thapa, V. 2003. *Habitat Heterogeneity and Distribution of some Ungulate Prey species in Barandabhar Forest, Chitawan, Nepal*. A Thesis submitted to Agriculture University of Norway (NLH).
- Thapa, I. 2007. *Community Forestry: Ideal for Participatory Biodiversity Conservation*. Pp18-20 in C. Inskipp (Ed). Danphe. Vol-16, No.1, Bird Conservation Nepal (BCN), Kathmandu, Nepal.

- Upreti, H.K. 1995. *An Assessment of Agriculture and Livestock Depredation through Wild Animals at Patihani and Jagatpur Area near the Royal Chitwan National Park*. MSc Thesis Submitted to the Central Department of Zoology, Tribhuvan University, Kathmandu, Nepal.
- WII. 2004. *Conservation Status of Tiger and associated species in the Terai Arc Landscape, India*. Wildlife Institute of India.
- WWF. 1998. *Year for the Tiger*. WWF Nepal Program, Kathmandu.
- Yadav, B. R. 2004. *Participatory Biodiversity Monitoring in the Buffer Zone Community Forests of Royal Bardiya National Park*.
- Yogananda, K., A. J. T. Johnsingh and G. R. Clifford. 2000. *The Sloth Bear in India: Ecology, Behavior, and Conservation*. Sloth\_bear\_page.htm

**Appendix I**  
**Plates**



Plate 1: Getting information through discussion in the field



Plate 2: Getting information through questionnaire survey



Plate 3: Matching the scat samples collected from the field in the Central Zoo



Plate 4: Tracing footprint of leopard in the field

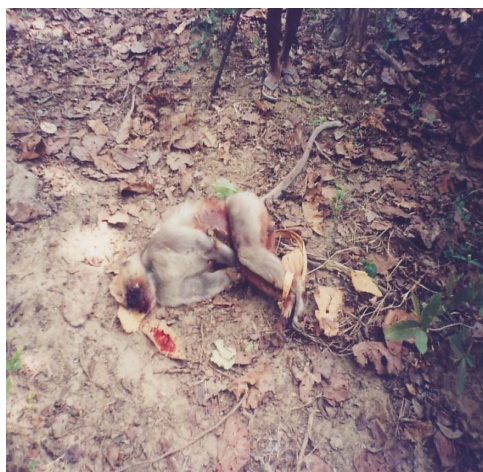


Plate 5: A male Common Langur killed by a poacher



Plate 6: A young wild boar captured by a local villager





Plate 7: A spotted deer fawn captured by a local villager



Plate 8: Common Monitor killed by local people in the community forest



Plate 9: Forest fire encountered in the area



Plate 10: 'Machan' used by local people to protect crop from wildlife



Plate 11: Pellets of barking deer observed in the area



Plate 12: Dry pellets of barking deer collected from the area





Plate 13: Digging made by wild boar in the area



Plate 14: Droppings of wild boar collected from the area



Plate 15: Footprint of the common leopard found in the area



Plate 16: Dry scat of the common leopard collected from the area



Plate 17: Dry pellets of four-horned antelope collected from the area



Plate 18: Dry pellets of sambar deer collected from the area

## Appendix II

### Individual Questionnaire Survey

Name: ..... VDC: ..... Ward No..... Education: .....

Occupation: ..... Sex: ..... Age: .... Name of C.F.: .....

1. Does the wildlife visit your agricultural land? (a) Yes (b) No
2. If yes, which animals do come? (Write names).....
3. Which time do they come? (a) Morning (b) Evening (c) Day time (d) Night
4. During which cropping time, do they come? .....
5. Which crop is severely damaged by the wild animals? .....
6. What is the frequency of visit your agricultural land by wild animals?  
(a) Rare (b) Sometime (c) Frequent
7. How much is the annual approximate damage of your crop?

Crop type	Wild Animal	Annual damage(Approx)
Paddy		
Wheat		
Maize		
Mustard		
Vegetables		
Fruits		
Others		

8. Are all the wild animals come from the community forest? (a) Yes (b) No
9. Is there any crop or livestock damage before the establishment of CF? (a) Yes  
(b) No. If yes, then by which animal?  
.....

10. Does wild animal kill your livestock? (a) Yes (b) No, If yes

Name of livestock	Annual no. of livestock killed inside the CF	Annual no. of livestock killed at house
Cow		
Buffalo (He / She)		
Goat		
Sheep		
Pig		
Hen / Duck		
Others		

CF= Community Forest

11. Do wild animals kill/injured the human? If yes, then when and where?  
.....
12. What are the measures that you have adopted to protect your crop? .....
13. What do you think, these wild animals are to be protected or killed? If protected, why and how? .....
14. Do you think that compensation should be given to the loss by wild animals?  
(a) Yes (b) No
15. Do you have received any information/education on the importance of wildlife conservation? (a) Yes (b) No
16. Do you believe that wild animals are increasing after the establishment of CF?  
(a) Yes (b) No
17. Do you want to harvest the wild animals which are increasing on your community forest? (a) Yes (b) No, if yes for what? .....

18. Which wild animals have you seen in your CF?

Wild animals	Frequency of encounter	Abundance	Location	Time	Date of last sightings
Elephant (Hathi)					
Bluebull (Nil gai)					
Spotted deer(Chital)					
4 horned (Chauka)					
Wild boar (Bandel)					
Barking deer(Ratuwa)					
Sambar (Jarayo)					
Common Langur					
Rhesus(Rato Bander)					
Leopard (Chituwa)					
Leo-cat (Chari Bagh)					
Jungle Cat(Ban Biralo)					
Tiger (Bagh)					
Sloth bear					
Hyaena (Hundar)					
Jackal (Sayal)					
Wild dog (Ban Kukur)					
Squirrel (Lokharke)					
Mongoose (Nyauri)					
Others					

Code; Abundance: L= Low, M= Medium, H= High

Frequency: R= Rare, S= Sometime, F= Frequent

19. Which wild animals have you seen before the establishment of CF?

Wild animals	Frequency of encounter	Location	Time	Date of last sightings

Code; Frequency: R= Rare, S= Sometime, F= Frequent

20. Is there any wild animal which has been found before the establishment of CF but disappeared now days? (a) Yes (b) No

21. If yes, which animal was found? .....

22. Is there any wild animal which is appeared after the establishment of CF? If yes,

Name of the animal	Location	Time	Date of last sightings

23. Does illegal hunting of wild animals occur in your CF? (a) Yes (b) No

24. If yes, then for what purpose? .....

25. What is the major bird species found in your CF?

Name of birds	Frequency of encounter	Abundance	Location	Time	Date of last sightings
White Stork(Seto garud)					
Black Stork(kalo garud)					
Lesser Florican(Sano kharmujur)					
Bengal Flo.(Kharmujur)					
Hornbill(Raj,Kalo,Sano)					
Vulture					

Code; Frequency: R= Rare, S= Sometime, F= Frequent

26. What are the major amphibian & Reptile species found in your CF?

Name of the Species	Frequency of encounter	Abundance	Location	Time	Date of last sightings
Common toad					
Stream frog					
Turtle					
Gharial Crocodile					
Mugger Crocodile					
Python (Ajingar)					
Cobra					
Common Krait					

27. If there is other information, Please write.....

.....  
 .....  
 .....  
 .....  
 .....



### Appendix III

#### Field Observation Sheet for Wildlife

Transect no: ..... Location: ..... Length.....Date: .....

Start time: ..... End time: .....

Records

SN	Sign type	Animal sps	GPS	Habitat type	Elevation/Aspect	Remarks
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Sign code: Fe=Feces (dropping/pellet/scat), Ft=Footprint (pugmark/track), Sc=Scrapes, Sh=Scratches, Br=Burrow, V=Visual observation, C=Calls, R=Root lings, Rb=Rubbings

**Habitat type:** Vegetation type, Canopy coverage

**Major Disturbances** (e.g. livestock grazing and other human impact):

.....  
 .....  
 .....

**Measurement of pugmarks/footprints:**

Total length (TL): ..... Pad length (PL): .....

Total width (TW): ..... Pad width (PW): .....

**Transect summary:**

Total sign of each species: ..... (a)

Total length of transect: ..... (b)

Sign encounter rate (Sign per km.)=a/b

## Appendix IV

### Mammals Found in the Community Forests of Satbariya Range Post

Scientific names	Common names	Local Names	Status	Remarks
<i>Canis aureus</i>	Jackal	Sayal	C	-
<i>Cuon alpinus</i>	Wild Dog	Ban Kukur	R	Occurs sometime only
<i>Felis bengalensis</i>	Leopard Cat	Chari Bagh	E/P	
<i>Felis chaus</i>	Jungle Cat	Ban Biralo	C	
<i>Herpestes auropunctatus</i>	Common Mongoose	Nauri	C	
<i>Hyaena hyaena</i>	Striped Hyeana	Hundar	E/P	
<i>Melursus ursinus</i>	Sloth Bear	Bhalu	E	
<i>Panthera pardus</i>	Leopard	Chituwa	E	
<i>Panthera tigris</i>	Tiger	Bagh	E/P	Seasonal Occurrence only
<i>Viverra indica</i>	Small Civet	-	C	
<i>Elephus maximus</i>	Elephant	Hathi	E/P	Seasonal Occurrence only
<i>Axis axis</i>	Spotted Deer	Chital	C	
<i>Boselaphus tragocamelus</i>	Bluebull	Nilgai	C	Seasonal Occurrence only
<i>Cervus unicolor</i>	Sambar	Jarao	C	
<i>Muntiacus muntjac</i>	Barking Deer	Ratuwa	C	
<i>Sus scrofa</i>	Wild Boar	Bandel	C	
<i>Tetracerus quadricornis</i>	Four-horned Antelope	Chauka	E/P	
<i>Macaca mulatta</i>	Rhesus Macaque	Rato Bander	C	Disappearing nowadays
<i>Presbytis entellus</i>	Langur	Langur Bander	C	Disappearing nowadays
<i>Lepus nigricollis</i>	Hare	Kharayo	C	
<i>Funambulus pennati</i>	Palm Squirrel	Lokharke	C	
<i>Hystrix indica</i>	Porcupine	Dumsi	C	
<i>Petaurista petaurista</i>	Flying Squirrel	Koirala	C	
<i>Rattus rattus</i>	House Rat	Muso	C	
<i>Cynopterus sps</i>	Bat	Chamero		

Status: C= Common & intermediate, R= Rare, E= Endangered, P= Protected in Nepal

## Appendix V

### Amphibians and Reptiles Found in the Community Forests of Satbariya Range Post

Scientific names	Common names	Local Names	Status	Remarks
<b>Amphibians</b>				
<i>Bufo melanostictus</i>	Common toad	Kharse Bhaguto	C	
<i>Euphlyctis cyanophlyctis</i>	Stream frog	Bhyaguto	C	
<b>Reptiles</b>				
<i>Gavialis gangeticus</i>	Gharial Crocodile	Gohi	E/P	In Rapti River
<i>Crocodylus palustris</i>	Mugger Crocodile	Nakata Gohi	E	In Rapti River
<i>Indotestudo elongata</i>	Hill Turtle	Thotari	E	
<i>Melanochelys trisuga</i>	River Turtle	-		
<i>Calotes versicolor</i>	Garden lizard	Chheparo	C	
<i>Varanus bengalensis</i>	Common Monitor lizard	Kalo Gohoro	C	
<i>Varanus flavescens</i>	Golden Monitor lizard	Sun Gohoro	E/P	
<i>Python molurus ssp.</i>	Python	Ajingar	E/P	
<i>Bungarus caeruleus</i>	Common krait	Graich, Karet	C	
<i>Naja naja</i>	Binocellate Cobra	Goman Sarpa	C	
<i>Ptyas mucosus</i>	Asiatic rat-snake	Dhaman	C	
<i>Dendrelaphis tristis</i>	Tree snake	Sirisesanp	C	
<i>Xenochrophis piscator</i>	Water snake	Dhodesanp	C	
<i>Amphiesma stolata</i>	Striped Keel back	Harhara	C	

Status: C= Common & intermediate, R= Rare, E= Endangered, P= Protected in Nepal

## Appendix VI

### Birds Recorded in the Community Forests of Satbariya Range Post

Status: C= Common, R= Rare, E= Endangered, P= Protected in Nepal

Scientific names	Common names	Status	Remarks
<i>Turnix suscitator</i>	Barred Buttonquail	R	
<i>Lophura leucomelanos</i>	Kalij Pheasant	-	
<i>Dicrurus macrocercus</i>	Black Drongo	C	
<i>Dicrurus leucophaeus</i>	Ashy Drongo	-	
<i>Dicrurus caerulescens</i>	White-bellied Drongo	-	
<i>Gallus gallus</i>	Red Junglefowl	R	
<i>Francolinus pondiceriancas</i>	Grey Francolin	-	
<i>Pavo cristatus</i>	Indian Peafowl	-	
<i>Tadorna ferruginea</i>	Ruddy Shelduck	R	Rapti River
<i>Anas penelope</i>	Eurasian Wigeon	-	Rapti River
<i>Mullevipicus pulverulentus</i>	Great Slaty Woodpecker	C	
<i>Celeus brachyurus</i>	Rufous Woodpecker	-	
<i>Dendrocopos nanus</i>	Brown-capped Pygmy Woodpecker	-	
<i>Dendrocopos canicapillus</i>	Grey-capped Woodpecker	C	
<i>Dendrovopos maharattensis</i>	Yellow-crowned Woodpecker	-	
<i>Picus chlorolophus</i>	Lesser Yellownape	-	
<i>Picus flavinucha</i>	Greater Yellownape	-	
<i>Picus xanthopygaus</i>	Streaked-throated Woodpecker	C	
<i>Dinopium shorii</i>	Himalayan Flameback	-	
<i>Dinopium benghalense</i>	Black-rumped Flameback	-	
<i>Chryocolaptes lucidus</i>	Greater Flameback	-	
<i>Megalaima lineate</i>	Lineated Barbet	-	
<i>Megalaima asiatica</i>	Blue-throated Barbet	-	
<i>Megalaima haemacephala</i>	Coppersmith Barbet	-	
<i>Ocyroceros birostris</i>	Indian Grey Hornbill	C	
<i>Anthracoeros albirostris</i>	Oriental Pied Hornbill	C	
<i>Harpactes erythrocephalus</i>	Red-headed Trogon	-	
<i>Coracis benghalensis</i>	Indian Roller	C	
<i>Merops philippinus</i>	Blue-tailed Bee-eater	-	
<i>Merops orientalis</i>	Green Bee-eater	-	
<i>Merops leschenaultia</i>	Chestnut-headed Bee-eater	C	
<i>Halcyon smyrnensis</i>	White-throated Kingfisher	R	
<i>Megaceryle lugubris</i>	Crested Kingfisher	-	
<i>Ceryle rudis</i>	Pied Kingfisher	R	
<i>Halcyon capensis</i>	Stroke-billed Kingfisher	-	
<i>Alcedo atthis</i>	Common Kingfisher	-	
<i>Hierococcyx varius</i>	Common Hawk Cuckoo	C	
<i>Cuculus micropterus</i>	Indian Cuckoo	R	
<i>Eudynamys scolopacea</i>	Asian Koel	-	
<i>Cacomantis passerinus</i>	Grey-bellied Cuckoo	R	

<i>Phaenicophaeus tristis</i>	Green-billed Malkoha	C	
<i>Cenropus sinensis</i>	Greater Coucal	R	
<i>Psittacula eupatria</i>	Alexandrin Parakeet	-	
<i>Psittacula krameri</i>	Rose-ringed Parakeet	-	
<i>Psittacula cyanocephala</i>	Plumped-headed Parakeed	-	
<i>Psittacula himalayana</i>	Slaty headed parakeet	-	
<i>Psittacula alexandri</i>	Red breasted Parakeet	C	
<i>Apus affinis</i>	House Swift	-	
<i>Apus pacificus</i>	Fork-tailed Swift	-	
<i>Ninox scutulata</i>	Brown Hawk Owl	C	
<i>Otus Sunia</i>	Oriental Scops Owl	-	
<i>Otus bakkamoena</i>	Collared Scops Owl	-	
<i>Bubo nipalensis</i>	Forest eagle Owl	C	
<i>Ketupa zeylonensis</i>	Brown Fish Owl	-	
<i>Glaucidium cuculoides</i>	Asian Barred Owlet	-	
<i>Glaucidium radiatum</i>	Jungle Owlet	C	
<i>Athene brama</i>	Spotted Owlet	R	
<i>Caprimulgus indicus</i>	Grey Nightjar	-	
<i>Caprimulgus macrurus</i>	Large-tailed Nightjar	C	
<i>Columba livia</i>	Rock Pigeon	-	
<i>Streptopelia orientalis</i>	Oriental Turtle Dove	C	
<i>Streptopelia chinensis</i>	Spotted Dove	-	
<i>Streptopelia tranquebarica</i>	Red Collared Dove	-	
<i>Streptopelia decaocto</i>	Eurasian Collar Dove	C	
<i>Treron phoenicoptera</i>	Yellow-footed Green Pigeon	-	
<i>Treron sphenura</i>	Wedge-tailed Green Pigeon	-	
<i>Gallinula chloropus</i>	Common Moorhen	-	
<i>Amaurornis phoenicurus</i>	White-breasted Water hen	-	
<i>Gallinago stenura</i>	Pintail Snipe	-	
<i>Gallinago gallinago</i>	Common Snipe	-	
<i>Vanellus indicu</i>	Red Watt-led Lapwing	-	
<i>Vanellus duvaucelii</i>	River Lapwing	-	
<i>Glareola lacteal</i>	Small Pratincole	-	
<i>Tringa nebularia</i>	Common Greenshank	C	
<i>Tringa ochropus</i>	Green Sandpiper	-	
<i>Actitis hypoleucos</i>	Common Sandpiper	C	
<i>Calidristemminckii</i>	Temminck's Stint	-	
<i>Burhinus oediconemus</i>	Eurasian Thick-Knee	-	
<i>Metopidius indicus</i>	Bronze-winged Jacana	-	
<i>Charadrius dubius</i>	Little Ringed Plover	C	
<i>Charadrius alexandrinus</i>	Kentish Plover	R	
<i>Sterna albifrons</i>	Little Tern	-	
<i>Sterna aurantia</i>	River Tern	-	Rapti River
<i>Sterna acuticauda</i>	Black-bellied Tern	R	
<i>Pandion haliaetus</i>	Osprey	R	

<i>Elanus caeruleus</i>	Black-shouldered Kite	-	
<i>Milvus migrans</i>	Black Kite	R	
<i>Haliastur indus</i>	Brahminy Kite	-	
<i>Gyps bengalensis</i>	White-rumped Vulture	-	
<i>Neophron percnopterus</i>	Egyptian Vulture	-	
<i>Gyps tenuirostris</i>	Slender-billed Vulture	-	
<i>Gyps fulvus</i>	Eurasian Griffon	-	
<i>Sarcogyps calvus</i>	Red-headed Vulture	-	
<i>Circaetus gallicus</i>	Short-toed Snake Eagle	-	
<i>Spilornis cheela</i>	Crested Serpent Eagle	C	
<i>Circus auruginosus</i>	Eurasian Marsh Harrier	-	
<i>Circus melanoleucos</i>	Pied Harrier	R	
<i>Circus cyaneus</i>	Hen Harrier	-	
<i>Circus macrourus</i>	Pallid Harrier	-	
<i>Accipiter nisus</i>	Eurasian Sparrowhawk	-	
<i>Accipiter vergatus</i>	Besra	-	
<i>Accipiter badius</i>	Shikra	-	
<i>Butastur teesa</i>	White-eyed Buzzard	-	
<i>Falco tinnunculus</i>	Common Kestrel	C	
<i>Falco subbuteo</i>	Eurasian Hobby	-	
<i>Egretta garzetta</i>	Little Egret	R	Rapti River
<i>Nycticorax nycticorax</i>	Black-crowned Night Heron	-	
<i>Pseudibis papillosa</i>	Black Ibis	-	
<i>Lanius cristatus</i>	Brown Shrike	C	
<i>Lanius vittatus</i>	Bay-backed Shrike	-	
<i>Lanius schach</i>	Long-tailed Shrike	C	
<i>Urocisa erythrorhyncha</i>	Red-billed Blue Magpie	-	
<i>Cissa chinensis</i>	Common Green Magpie	-	
<i>Dendrocitta vagabunda</i>	Rufous Treepie	C	
<i>Dendrocitta formosae</i>	House Crow	-	
<i>Corvus macrorhynchos</i>	Large-billed Crow	-	
<i>Oriolus xanthornus</i>	Black-hooded Oriole	-	
<i>Oriolus oriolus</i>	Golden Oriole	-	
<i>Pericrocotus cinnamomeus</i>	Small Minivet	-	
<i>Pericrocotus flammeus</i>	Scarlet Minivet	-	
<i>Rhipidura albicollis</i>	White-throated Fantail	-	
<i>Hemipus picatus</i>	Bar-winged Flycatcher-Shrike	-	
<i>Tephrodornis gularis</i>	Large Woodshrike	-	
<i>Tephrodornis pondicerianus</i>	Common Woodshrike	-	
<i>Zoothera citrine</i>	Orange-headed Thrush		
<i>Copsychus saularis</i>	Oriental Magpie Robin		
<i>Enicurus immaculatus</i>	Black-backed Forktail		
<i>Saxicola caprata</i>	Pied Bushchat	R	
<i>Saxicola ferrea</i>	Grey Bushchat	-	
<i>Acridotheres tristis</i>	Common Myna	C	

<i>Sturnus malabaricus</i>	Chestnut-tailed Starling	C	
<i>Acridotheres ginginianus</i>	Bank Myna	R	
<i>Acridotheres focus</i>	Jungle Myna	C	
<i>Tichodroma muraria</i>	Wallcreeper	C	
<i>Sitta frontails</i>	Velvet-fronted Nuthatch	-	
<i>Parus major</i>	Great Tit	C	
<i>Pycnonotus melanictus</i>	Black-crested Bulbul	R	
<i>Hypsipetes leucocephalus</i>	Black Bulbul	C	
<i>Pycnonotus cafer</i>	Red-vented Bulbul	R	
<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul	-	
<i>Hemixos flavala</i>	Ashy Bulbul	-	
<i>Prinia socialis</i>	Ashy Prinia	-	
<i>Prinia hodgsonii</i>	Grey-brested Prinia	-	
<i>Orthotomus sutorius</i>	Common Tailorbird	C	
<i>Acrocephalus dumetorum</i>	Blyth's Reed Warbler	-	
<i>Phylloscopus fuscatus</i>	Dusky Warbler	-	
<i>Seicercus burkii</i>	Golden-spectacled Warbler	-	
<i>Pellorneum ruficeps</i>	Puff-throated Babbler	-	
<i>Macronous gularis</i>	Striped Tit Babbler	-	
<i>Turdoides striatus</i>	Jungle Babbler	C	
<i>Calandrella raytal</i>	Sand Lark	-	
<i>Eremopterix grisea</i>	Ashy-crowned Sparrow Lark	-	
<i>Dicaeum erythrorhynchus</i>	Pale-billed Flowerpecker	-	
<i>Aethopyga siparaja</i>	Crimson Sundird	-	
<i>Nectarinia asiatica</i>	Purple Sunbird	C	
<i>Passer domesticus</i>	House Sparrow	-	
<i>Motacilla alba</i>	White Wagtail	C	
<i>Motacilla maderaspatensis</i>	White-browed Wagtail	-	
<i>Anthus rufulus</i>	Paddyfield Pipit	-	
<i>Anthus hodgsoni</i>	Olive-backed Pipit	-	
<i>Ploceus philippinus</i>	Baya Weaver	-	
<i>Lonchura punctulata</i>	Scaly-breasted Munia	-	
<i>Carpodacus pulcherrimus</i>	Common Rosefinch	C	

*This list is prepared by direct observation and based on the information given by Key informant*

## Appendix VII

### Plant Species Recorded from the Community forests of Satbariya Range post

SN	Scientific Name	Local Name	Remarks
1	<i>Shorea robusta</i>	Sal	Dominant sp
2	<i>Anogeissus latifolius</i>	Dhauti	Dominant sp
3	<i>Terminalia alata</i>	Saj	Dominant sp
4	<i>Acacia catechu</i>	Khayer	Dominant sp
5	<i>Bauhinia vahlii</i>	Maluko	Dominant sp
6	<i>Mallotus philippensis</i>	Rohini	Dominant sp
7	<i>Woodfordia fruticosa</i>	Dhayero	
8	<i>Ficus benghalensis</i>	Bar	
9	<i>Syzygium cumini</i>	Jamun	
10	<i>Desmodium oojeinen</i>	Sadhan	
11	<i>Picrasma javanica</i>	Teju	
12	<i>Hymenodictyon excusum</i>	Bhurkut	
13	<i>Phoenix sylvestris</i>	Thakal	
14	<i>Garuga pinnata</i>	Dabdabe	
15	<i>Grewia tiliaefolia</i>	Dhaman	
16	<i>Berberis sp</i>	Chutro	
17	<i>Mangifera indica</i>	Anp	
18	<i>Aegle marmelos</i>	Bel	
19	<i>Bauhinia variegata</i>	Koiralo	
20	<i>Terminalia bellirica</i>	Barro	
21	<i>Myrsine semiserrata</i>	Kali kath	
22	<i>Phyllanthus emblica</i>	Amala	
23	<i>Bombax ceiba</i>	Simal	
24	<i>Adina cordifolia</i>	Karam	
25	<i>Pinus roxburghii</i>	Sallo	
26	<i>Largestroemia parviflora</i>	Bot dhayero	
27	<i>Azadirachta indica</i>	Nim	
28	<i>Carthamus tinctorius</i>	Kusum	
29	<i>Grewia optiva</i>	Bhimal	
30	<i>Nyctanthes arbor-tritis</i>	Budilo	



31	<i>Buchanania latifolia</i>	Char	
32	<i>Wednlandia exserta</i>	-	
33	<i>Neolitsea umbrosa</i>	-	
34	<i>Dalbergia latifloia</i>	Satisal	
35	<i>Semecarpus anacardium</i>	Bhalayo	
36	<i>Cassia fistula</i>	Raj Briksha	
37	<i>Sapium insigne</i>	Khirro	
38	<i>Dalbergia sisso</i>	Sisau	
39	<i>Ficus semicordata</i>	Khannu	
40	<i>Ficus racemosa</i>	Dumri	
41	<i>Dillenia pentagyna</i>	Tatari	
42	<i>Artocarpu lakooch</i>	Badhar	
43	<i>Cassia tora</i>	Chakmake	
44	<i>Bridelia retusa</i>	-	
45	<i>Euphorbia hispida</i>	-	
46	<i>Murrya koenigii</i>	Mitho Nim	
47	<i>Colebrookea oppositifolia</i>	-	
48	<i>Terminalia chebula</i>	Harro	
49	<i>Albizzia lebbek</i>	Shiris	
50	<i>Smilax sp</i>	Kukur Daino	
51	<i>Mimosa rubicaulis</i>	Boksi Ghans	
52	<i>Ficus hispida</i>	Khasreto	

## Appendix VIII

### List of the Studied Community forests

SN	Name of the Community Forest	Area Occupied (ha)
1	Karri Arjun Khola	626
2	Nabasanti	266
3	Hasnapur Mahila	17
4	Sorgadwari Hariyali	137.50
5	Arjun Mahila	28.38
6	Karri Banghusri	470
7	Uchhanimbu	646
8	Shivasakti Bakharabikas	470.8
9	Chitrakot	208
10	Gupti	341
11	Jurpani	397
12	Laxmi	457
13	Upakar	234
14	Bhattarkunda	1189
15	Bagarbaba	846
16	Teliya Hariyali	1021
17	Mulkhola	269.79
18	Biraha	454
19	Kali Khola	675.1
20	Bhim Bandh	564
21	Ameliya Kunta Mahila	144
22	Ameliya	1126
Total Area		10583.57 ha