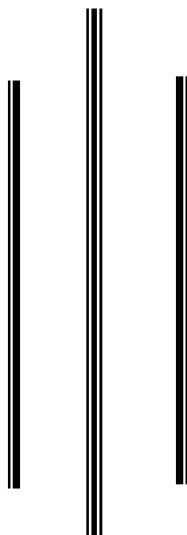# Park and People Conflict:

A Case Study from Dibyapuri Buffer Zone of Chitwan National Park

A DISSERTATION

Submitted to Tribhuvan University, Faculty of Humanities and Social

Sciences in Partial fulfillment of the requirements for the

Master's Degree of Arts in Sociology

Submited by

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LETTER OF RECOMMENDATION

It is certified that Mr. Amit Karki has completed his dissertation entitled "**Park-People Conflict: A Case Study from Dibypuri Buffer Zone of Chitwan National Park"** under my guidance and supervision. I am satisfied with his work and hereby I recommend this dissertation for final approval and acceptance.

....

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LETTER OF ACCEPTANCE

This dissertation entitled " Park-People Conflict: A case study from Dibypuri Buffer Zone of Chitwan National Park, Nepal" has been accepted to be a partial fulfillment of the requirements for the degree of master of Arts in Sociology.

APPROVED BY

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EXTERNAL EXAMINER

December 2010

iii

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ABSTRACT

The study of park people conflict was conducted focusing in Dibyapuri VDC of Nawalparasi district, located adjacent to the north - western side of park. The survey was done in 88 households by questionnaire method to assess crop and livestock depredation by wildlife for the year 2010. The main crop raiding animals are Rhino, Wild Boar and Deer. These animals cause of losses 45211.08 kg of agricultural crops in the 88 households of study area. Paddy was the most affected crop by wild animals causing 30865.13 Kg of total crop loss followed by potato and vegetables 4735 kg , maize 4994.54 kg, lentil 2413.16 kg, mustard 1282.79 kg, wheat 735.29kg and linseed 185.17kg . Monetarily, the total loss of 88 surveyed households of the year 2010 was Rs. 996933.64. Among this, the loss of paddy was worth Rs. 617302.60 followed by potato and vegetables Rs. 94700, lentils Rs. 108592.20, maize Rs. 89901.72, mustard Rs. 61573.92, wheat Rs. 18382.25 and linseed Rs. 6480.95.Thus the estimated loss was Rs. 11328.64 per household on an average.

The total economic loss of livestock was estimated Rs. 192100 in BZ of Dibyapuri VDC and average loss was Rs. 2182.95 per household. The main livestock raiding animals were Tiger, Leopard, Jackel, Wild cat etc. Rhinoceros and Tiger have killed two person and several people have injured so far.

Park animals, visit cropland due to inadequate amount of food in the protected area, taste of agricultural crops, lack of effective physical barrier, introduction to exotic species and succession inside the park. Although, affected people do not get compensation or not enough according to their loss. Park is affected by the visit of people, allowing livestock to graze, herb and thatch grass collection, timber and firewood collection, fishing and fish poisoning. Park authorities are also not running enough programs to divert the people occupation along with the awareness programs. These are the main causes of conflict.

Machan guarding, chasing with fire, shouting, drumming and fencing are preventive methods used by local people and those are partially effective.

Keywords: Park, People, Wildlife, Casualties, Conflict, Damages, Depredation

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ACCRONYMS

BZ   Buffer Zone

BZDC   Buffer Zone Development Office

CNP   Chitwan National Park

GoN   Government of Nepal

DNPWC   Department of National Park and Wildlife Conservation

HHs   Households

INGOs   International Non Governmental Organizations

IUCN   International Union for the Conservation of Nature and Natural Resources

LNP   Lantang National Park

MFSC   Ministry of Forest and Soil Conservation

NGOs   Non Governmental Organization

NPWC   National Park and Wildlife Conservation

NTB   Nepal Tourism Board

SPNP   Shey Phoksundo National Park

UNESCO   United Nations Educational, Scientific, and Cultural Organization

VDC   Village Development Committee

WHS   World Heritage Site

Chapter One

INTRODUCTION

1.1   Introduction

Wildlife human interaction, such as crop and livestock depredation, human toll by wildlife and resource utilization by local people, in and around the protected area is one of the main issues of protected area management. Numerous national parks in developing countries are surrounded by agricultural lands and the people living in and around such parks have interacted with them in multifarious ways (Nepal and Weber 1993). Chitwan National Park is one of main area of such experiences. The intimate interception of people in protected areas results in conflicts between wildlife and human (Rodgers 1989). Most definition of national parks, including that of the World Conservation Union (IUCN 1982) excluded human habituation and significant human impact. The local people were often considered as an obstacle to, rather than a means towards, conservation objectives (UNESCO 1974).

The concept of national park and protected area was developed in U.S.A. (Zebu and Bush 1990) and has been adopted in many countries, including Nepal (GON 1973, GON/IUCN 1988, Kharel 1997). Wildlife conservation after the establishment of National Park and Wildlife Conservation (NPWC) Act 1973 has been quite successful from the viewpoint of habitat conservation of several threatened species (Mishra et al. 1992) and steadily increasing population of wildlife in national parks and protected areas (Upreti 1991). However, the establishment of national parks has had severe adverse impacts on local traditions and beliefs or cultures as such, in some instances resulting in disastrous side effects (Nepal and Weber 1993) and the park is more the source of wildlife nuisance than a source of benefits for the local peoples (Mishra 1984).

There is always cost of leaving with wildlife both direct costs such as the effect of marauding crops and animals, and opportunity cost of limited access to land set aside as wildlife which might otherwise generate income from agriculture, livestock, logging, etc, (Kiss 1990). Crop raiding is the main issue due to which conflict arises between wildlife and human. Similarly, livestock depredation can cause substantial economic losses, and makes the very idea of wildlife conservation unpopular among local residents (Bhatnagar et al. 1999). Wildlife

human conflicts are acute when the species involved is highly imperiled while its pressure in an area possesses a serious threat to human welfare (Saberwal et al. 1994). Besides, human encounters with wild animals around the park were common (Jackson 1990), which is also a cause of wildlife human conflict.

The local people, who once were enjoying free access to areas henceforth covered by parks and were able to meet their needs from "inside" resources, now no longer, have legal access. Local people have seen the park as an attempt of the government to curtail access to their traditional rights of resource use. As a result, illegal activities such as hunting and poaching have intensified, and there are many cases of confrontation between park official and local people (Nepal and Weber 1993). Conflicts often arise when conservation regulations are imposed roughly to avoid natural resources usage, such as grazing land, firewood collection, fodder, medicinal plants and land for hunting without alternatives being provided (Lewis 1997).

This study explores to identify the causes of conflict and its impact on the economic life of the people at Buffer zone area of Dibyapuri VDC of Nawalparasi district on the north-western boundary of Chitwan National Park. Moreover this study also examines the relationship between park and people and tries to understand existing preventive measure applied by the local people and park in the study area.

1.2   Statement of the Problem

Chitwan National Park is the first National park in Nepal and it is categorized as world   heritage site which is situated to cover the larger biodiversity areas. Along with the establishment of the national park local people who depend upon the park were deprived from their everyday life ways. Since the establishment of the park, local people were dissatisfied from the park which is the major cause of the conflict. Along with the establishment of the National Park, the number of wild animals has been increasing. As a result, these animals raid the farm fields of the local people in search of proper food and shelter which create conflict. To save wild animal as well as bring local people in management mainstreaming, park started to work with the people in the name of collaborative management system but the targeted people still deprived from the park management system moreover the poverty of local people remain same.

Ecosystem management also recognizes that humans cannot be divorced from the ecosystem but, rather, are an integral part of it. (Wright 1996). By seeing conservation issues as development issues, we locate people very firmly in the conservation equation. Wright had pointed out some threats to protected areas which are identified as follows:

- ❖ Conflicts with local people
- ❖ Lack of policy commitment at nation state level to adequately protect systems
- ❖ Ineffective management by trained staff of individual protected areas
- ❖ Funding is insufficient or unsure.
- ❖ Inadequate public support (ibid).

It is equally important to note that participation does not equal local development, nor does local development equal participation. They are mutually dependent. For participation to be meaningful, local involvement and consultation must mean a partnership of equals. If local people are consulted and action based on mutual cooperation and a better understanding of the variety of issues involved is the result, then meaningful participation is achieved. (Furge et al, as cited in Regmi 2009). It is evident that there are several reasons for conflicts to take place among park authority and people residing within or outside the park boundary. These reasons could be:

- ❖ Neglecting the core as well as outward sphere of culture.
- ❖ Difficulties faced by local people because of inability to adjust with frequently changing government rule, red-tapes and other kind of bureaucratic systems.
- ❖ Attitude and behavior of the park staff and local people to each other.
- ❖ Differences in the understanding the need of park by people and park staffs.
- ❖ Lack of people participation in planning and implementation of park management activities (too often wild lanes are treated as 'wastelands' and wild lives as 'free goods ' to be exploited at little or no costs by the people) (ibid).

Based on these reasons, pointed out by previous studies this study will especially be focused to seek the following answer;

) What are the main causes of the conflict?
) How do the local communities depend upon present National Park's forest resources?

⟩ What is the general attitude of the local population towards the park?

⟩ Do local people get benefit from park or not?

⟩ What kind of benefit do they get from park?

⟩ What kind of loss do they bear after the establishment of NP in the study area?

2.1 Specific Objectives:

This study aims to examine the current situation of park -people conflicts and its impact on economic condition of the people living around Chitwan National Park area.

The specific objectives of this study are:

1. To examine the impact of the park on economic life of the people.
2. To identify the relationship between Park and People.
3. To understand the existing preventive measures developed by the local people and the park authorities and analyze its effectiveness.

2.2 Importance of the Study:

The main objective of this study is to find out the relationship between the park and people; park's impact on the economic life of the people and to identify the existing preventive measures from wild animals' depredation and checking its effectiveness.

Hence this study tries to show the causes of conflict existing in the Chitwan Natioanl Park, particularly in the area of Divyapur Buffer zone. This study will also helps to show why Chitwan national park regularly bears the problem from the local people. Similarly it helps to give the ideas of conflict resolution mechanism to park authority and to create awareness to local people about the system of park management activities. Meanwhile, this study will also helpful for the different types of policy level for park management committee and buffer zone management council. Moreover, this study would be beneficial for the students of sociology and to the individuals who have an interest related with this kind of research.

2.3   Organization of the Study:

I have divided the whole thesis into seven chapters. Chapter one includes the introduction which contains the brief introduction about park-people conflict along with statement of problem, objectives of the study, importance of the study, conceptual framework of the study and organization of the study itself. Chapter two contains literature review in which different related articles about park-people conflict, causes of conflict like crop depredation, livestock depredation, attacks to human are concise and included along with the park-people conflict historical perspectives. Methodology is included in chapter three in which rationale of research site selection, types of sources of data, ways of data collection and data analysis & presentation are included. In chapter four, general introduction of the study area and its physical attributes along with the map of study area, local people's socio-economic aspects and the phenomenon of crop raiding and depredation by wild animals are included. In chapter five & six the analysis of the collected data are presented which represent the sources of conflict & preventive measures with its effectiveness. Finally, the seven chapter describes the summary and conclusion.

Chapter Two

LITERATURE REVIEW

2.1 People-Park Conflict:

There many reasons behind People-Park conflict. These reasons can be breaking, the rules and regulation of National Park' Act, as it bans grazing, collection of fuel wood, timber, hunting, etc. Invasion of people's farm field (Agricultural land), killing/vandalizing domesticated animals and local people by the wild animals of the park or either due to differences in the understanding between local and park authorities.

"With the establishment of protected areas many traditional subsistence uses of natural resources became illegal land punishable by fines and jail terms. Tesions quickly developed in several protected areas, including Chitwan National Park (CNP) , over such issues as fuel wood gathering, wild grass cutting for fodder use, & the killing of wildlife in defense of people, livestock and crops" (Stevens 1997). The protected area regulations reduce the access of people with the park resources which can be elucidated by "For many local people, consumptive uses are essential to their welfare & conflicts arise when their access to such resources is limited by protected area regulation" (ibid). Further more people also start illicit felling of valuable species of trees and livestock grazing "Illegal grazing is also reported in Parsa & Sukla Phata Wildlife Reserves & Chitwan National Park & Khaptad NP. In Parsa wildlife reserve, valuable sal (shorea robusta) trees are being felled for illegal export to india" (Heinen & Kattel in d: 5). People and the park authorities can have the different understanding and goals for the conservation of the natural resources as "Differences in conservation concepts & goals may easily lead to resource use & management dispute, despite the best intentions" (ibid),

2.1.1 Historical Perspective

Human impacts on the vegetation and wildlife of the dun in Chitwan Valley dates far back in time (Seidensticker, 1976:183-210). With man's recent increasingly expanding pressure on land threatening the survival of large mammals, it is easy to ignore his earlier role in creating and maintaining environmental situations which were especially favorable for many species of wild ungulates (ibid). Man has long been as important component in the environment of Chitwan Valley through letting livestock graze, cultivating crops and utilizing natural resources ranging

from collecting thatch grass, gathering firewood and fishing to collecting wild fruits, edible stalks and tubers. The dominance of human population began as early as intensive development projects that were launched 30 years ago. Just how long the native Tharu and other less known groups have lived there is unknown, but could well have been for thousands of years (ibid).

Prior to the malaria eradication programme in Chitwan Valley, the ruling Rana of Nepal had protected the habitat and utilized Chitwan Valley as a hunting reserve (Milton and Binney, 1980:5). The toll on wildlife was often heavy. Massive hunts were organized such as that held for King George V of Great Britain, when 39 tigers, 18 rhinoceros and great numbers of smaller game were killed (Milton and Binney, 1980:5). The biggest toll recorded this century during the 1937/38 season included 38 rhinoceros and 120 tigers (Smythies, 1942 as cited in Lauries, 1978:15). After the fall of the Rana and the launching of the malaria eradication program, the massive population migration into this pristine area resulted in large-scale devastation of wildlife habitat by opening it up for agricultural land and subsequent intensification of poaching. Aside from crop cultivation, traditional modes of extraction of natural resources by villagers continued. These included livestock grazing and collecting fodder; burning grasslands to facilitate thatch collection and improve grazing; utilization of forest to fulfill various household needs such as for beams, poles, fences and other building materials; for firewood, wild edibles, tubers, oats, medicinal herbs, and honey; and for game and fish. The contemporary ecosystem represents the cumulative effect of all these activities which greatly modified succession patterns of vegetation and directly as well as indirectly changed the patterns and densities of wildlife species likewise. In 1927, out of the total area of Chitwan District (148,062.5 hectares), 126,621.5 hectares or 86 percent were under forest cover, which in 1977 was reduced to 64.964 hectares or 44 percent of the total area. There was an absolute decrease by 61,657 hectares or 49 percent of forest from the original forest coverage (Gurung, 1984:232). Similarly, the wildlife habitat was destroyed extensively, which resulted in the rapid decline of the wildlife population. The rhinoceros population dwindled from 1,000 in 1951 to 90 in 1969, a relative decrease by 91 percent. The population of tigers was reduced to 25 heads. Wildlife species such as water buffaloes and swamp deer became extinct.

2.1.2 Crop Depredation

Since the establishment of National Parks and Reserve, conflict has been observed between local people and park. Crop depredation by wildlife is very common in neighboring villages of protected areas in Nepal and other countries. It is one of the main causes of wildlife human conflict both in mountain and terai parks of Nepal.

In Chitwan National Park, wild ungulates such as rhinoceros (*Rhinoceros unicornis*), boar (*Sus scrofa*), and spotted deer (*Axis axis)* are chief crop depredators of rice, maize and mustard (Mishra and Margaret 1991). According to Nepal and Weber (1993), crop raiding by wild ungulates continued from May to March in any cropping cycle. Uprety (1995) found rhinoceros as a number one crop raider followed by spotted deer, wild boar and parakeet. Bhattarai and Basnet (2004) estimated Rhinoceros caused 70 percent damage and the lowest 0.2 percent by barking deer (*Muntiacus muntjak*). Wild boar, and Elephant (*Elephas maximus*), Rhinoceros, Blue bull (*Josephus tragocamelus*), Monkey (*Macaca mulatta*) and spotted deer were crop raiders in Bardia National Park (Jnawali 2002). The depredators raid varieties of crops, such as rice, maize, wheat, lentil and vegetables grown in kitchen   garden (Jnawali 2002).

In Koshi Tappu Wildlife Reserve, wild buffalo (*Bubalus arnee*) and wild boar raided paddy, wheat, and jute (Adhikari 2000).

Spotted deer, wild boar, elephant, blue bull, monkey, porcupine (*Hystrix indica*) and peacock were identified as pests in Suklaphanta Wildlife Reserve (Pande 2000).

In Shivapuri and Gokarna wild boar, monkey, porcupine, and bird species were identified as crop pests (Gurung 1997) that affected crops like maize, millet, rooted crops, rice and wheat.

In high mountain region the identified crop pests were two species of monkey (*Macaca mulatta* and *Simmnopithucus entellus*), barking deer and porcupine at Shankhuwa Valley, Makulu Barun National park (Chalise 1998). In addition to these pests, Kharel (1997) identified wild boar as the major pest in Langtang National Park. Monkeys, bears (*Selenartis thibetanus*), musk deer (*Moschus chrystogaster*), blue sheep (*Pseudois nayaur*) at Langtang National Park (Chalise et al. 2001) as well as Porcupine, and rodents were identified as major crop wildlife pest in Shey

Phoksundo National Park (Basnet 1998), and Himalayan tahr (*Hemitragus jemlahicus*) at Sagarmatha National Park (Shrestha 2004).

2.1.3 Livestock Depredation

Livestock depredation by wildlife is another issue of the protected area management. Conflict between livestock owners and predators dates back 9,000 years to the time when animals were first domesticated by human it is not recent phenomenon caused by the establishment of protected areas or wildlife protection laws as commonly believed (Jackson 1998). Tiger (*Panthera tigris*), and leopard (*Panthera pardus*) were identified as livestock depredators in Chitwan National Park (Mishra and Margaret 1991) and in Bardia National Park (Jnawali 2002). Jackel (*Canis aureus)*, Indian fox *(Vulpes vulpes)*, common mongoose *(Herpestes* spp.) and jungle cat *(Felis chaus)* have been reported as livestock lifter around the CNP (Uprety 1995). Livestock depredation has led to wildlife human conflict in Dhorpatan (Kharel 1993). Leopard, jackel, jungle cat and mongoose were identified as livestock depredating wildlife at Gokarna (Gurung 1997). Snow leopard was identified as livestock depredator in LNP (Kharel 1997), leopard, jackel, wild dog (*Cuon alpinus)* and grey wolf *(Canis lupas)* in Makalu Barun Conservation Area (Jackson 1990 and Chalise 1998), Tibetan wolf, snow leopard (*Uncia uncia)*, common leopard, wild dog, jackel and the fox in SPNP (Basnet 1998).

According to Bhadauria and Singh (1994) the frequency of domestic livestock being killed by tiger increases during the rainy season because grasses and number of bushes increase which act as a good ambush cover for the tigers. The large livestock depredators such as lion (Srivastav 1997), snow leopard (*Uncia uncia*), wolf resulted a human wildlife conflict and hindered conservation efforts of these predators. Jackson (1991) estimated an average loss of US $ 25 per household at Qomolangma Nature Reserve due to livestock depredation by wildlife and calves were the most frequent targets of wolf depredation at Wisconsin, United States (Treves et al. 2002). Frequency of attacks to livestock increased by 22.9 percent in Spain from 1991 to 1999 (Blanco 2003).

2.1.4 Attacks to Human Life

The encounters with wild animals around the park were common (Nepal and Weber 1993). This included an encounter with rhinoceros in Chitwan National Park (Jnawali 1989) and human

injury and loss of property by elephant in Suklaphanta Wildlife Reserve (Pande 2000). A total of 78 accidents were recorded in a period of 10 years from 1978 to 1988 (Jnawali 1989). Srivastav (1997) recorded 164 man-leopard encounters at Gir, and Mukherjee (2003) recorded tiger – human conflict in Sundarban Tiger Reserve. Human casualties in protected areas, loss of human life in wildlife related incident is one of the most painful experiences faced by park managers and conservationists (GON/ MFSC 2001). Old age, injuries, displacement and lack of prey species sometimes turn tigers and leopards in problem animals and they attack human beings (Mukherjee 2003 and GON/MFSC 2001). Intrusion of people into habitat of wildlife was causes of attack to human life for instance honey collectors and fisherman were victim in Sundarban Tiger Reserve (Mukherjee 2003).

Many studies of wildlife human interaction have been conducted. It should be conducted in every affected area because the interaction issue and its solution differ significantly depending on places. Regular recording of the crop and livestock depredation is necessary for better management of protected areas.

2.2   Conceptual Framework:

Interest of Chitwan National Park   **Interest of Local People**

Conservation of Flora and Fauna	Land Use and Intensive Cultivation
Increase in Wildlife	Expansion of Cultivation/Settlements
Ban on Forest Resources Use/Collection	Demand of Forest Resources;- Firewood, Fodder, Timber, Grazing.
Discourage Cultivation/Settlements	Crops and Livestock Loss Caused by Wild Animals

Figure 1 Conceptual Framework of conflict

The main objective/interest of the Chitwan National Park is to conserve flora and fauna which helps to in the number of wildlife in the park. The park authorities ban on forest resources use/collection and discourage cultivation and settlements. While the interest of local people is to

use land with intensive cultivation, expansion of settlements, increase in agricultural land, collection of firewood, fodder, timber, grazing etc. The increased wild animals also cause crops and livestock loss to the people. This kind of differences in the interest of two bodies creates conflict.

Chapter Three

METHODOLOGY

3.1   Rationale of the Research Site Selection

Before the CNP establishment, local people used forest resources and managed forest based on their cultural practices. In the long run, the ratio of resources utilization was high due to the increase in the human population. There was big depredation in the flora and fauna and created problem in the ecosystem. Thus, the Chitwan National Park (CNP) was established in 1973 which is Nepal's first National park. On the basis of its management objectives, it falls in IUCN's category II which has strict protection against consumptive human activities. Since then the conflict between the park and people started. Resolution of the conflict is a great challenge of the nation. Therefore, the area was suitable to find out the causes of the conflict and its economic impact on local people.

The research work was conducted in two adjoining clusters (i.e. villages nearby the national park boundary VBNPB , 0-1 KM & Villages not nearby the national park boundary VBNNPB 1-2 KM) inhabited by the people in ward no. 1, 2, 3 and 7 of the Dibyapuri VDC in the Buffer zone of the CNP. The main reason to select the two areas as one VBNPB and VBNNPB to cross examine the impact of park wildlife to nearby and far distant areas.

3.2   Nature and Sources of data

This study is entirely based on both primary and secondary data. The primary data includes information collected from the study area. The schedule was used to collect the information such as land holding, agricultural type, economic condition, resource need, conservation attitude and impact of wildlife.

Secondary data include records and reports from different sources and office on different aspects of the study. Secondary data were collected from BZ office, VDC, central library Kirtipur, park headquarters, DNPWC, INGOs, NGOs etc. Other sources were articles, dissertation works on related fields.

3.3 Sampling Design

Stratified random sampling was done to collect the socio-economic data. At first, the study area was differentiated into two strata i.e. villages bordering the National Park boundary (0-1 km from CNP) and villages not bordering the National Park boundary (1-2 km from CNP).The village is divided into two parts to know whether the distance from the park boundary affects the movement of wildlife and which village faces the more problem. 18.92percent HHs were selected from total HHs from each stratum. The details of these two strata are as follows.

Table 1 Sampling Design for the Study Areas of Dibyapuri BZ

Strata	Total HH	Surveyed HH	Percentage
VBNPB	223	44	19.73
VNNPB	242	44	18.18
Total	465	88	18.92

Note: VBNPB: Villages bordering the NP boundary.
        VNNPB: Villages not bordering the NP boundary.

3.4 Data Collection Technique

The data for the study were collected by using the following techniques:

a) Household Survey

The household survey was used to collect the information about crop damage, livestock depredation, and other socio-economic data that direct affect the national park. A sample Schedule is given (Annex I).

A total number of 88 households were selected for household survey. A household survey of the households was accomplished during the months of April 2010 to June 2010.

b) Key Informant Interview

The loss of crops/livestock made by wild animals and local people's attitude towards the national park and wildlife conservation along with local existing preventive measures from wildlife destruction was also collected. The loss of crops were estimated in local scale e.g. *pathi*, *muri* and quintal which was converted into kilogram/quintal by weighing "a *pathi*" of different crops for three times and the average weight were considered as a standard value (Annex II). Rate of

different crops were obtained from local businessman of Dibyapuri VDC (Annex III). The average value was considered for estimation of the economic loss.

c) Observation

A structured Schedule cannot cover all aspects of the reality. Therefore, an observation was done in the study area in the time of growing and ripening of the paddy crops. Damage area was visited- area of fencing, "Machan guarding", through these observation the idea of the nature of damage and preventive measures were accumulated.

Focus Group Discussion

Focus group discussions were conducted among the local people in two different groups. These discussions helped to understand the collective views of the local communities, about the causes of conflict between the park and the local people along with its economic impact on local people and different kinds of preventive measures and their effectiveness to reduce the conflict. It also provided an important opportunity to understand the collective reaction of the villagers towards the effect of National Park and the frequency and abundance of pest species in and around CNP. The frequency of wildlife visit was categorized into three types such as very frequent for wildlife visiting every day or night during crop season, frequent for wildlife visiting once or twice a month; and Rare for wildlife visiting once or twice a year for fewer times.

3.5 Data Analysis and presentation

Simple data analysis technique was done for this study. After conducting Schedule survey mean crop loss per household is calculated as:

$$\text{Mean Crop loss per household} = \frac{\text{Total Crop loss (kg)}}{\text{Total no. of household}}$$

By multiplying mean crop loss and total household of the village, the total crop loss of the village was calculated.

Therefore, total crop loss of the village = mean crop loss x total household of the village in (kg)

The price of the crop was multiplied by total crop loss. So the total economic loss of the village was calculated.

Therefore, total economic loss of the village = price of crop x total crop loss of the village

I used χ^2 - test to test the association between the crop loss and study sites setting null hypothesis.

Ho = There is no relation between crop loss and different studied sites.

$$\chi^2 - \text{Test} = \frac{(O - E)^2}{E}$$

Where,

O = Observed Value

E = Expected value.

Expected value of contingency table (two way table) can be calculated by;

Expected frequency = $\dfrac{\text{RT x CT}}{\text{N}}$

Where,

RT = Row total

CT = Column total

N = Total

3.6   Limitation of the Study

The present study was mainly based on the household survey, field observation and focus group discussion. Therefore, it may not have succeeded to capture some ground realities. The study has been carried out on a small geographical area- focused only on around Chitwan National Park. The results may not be extrapolated for other protected areas of the country.

Chapter Four

Description of the study Area

4.1   General

Chitwan National Park (IUCN category II Protected Area) was established in 1973 as the first national park of Nepal to conserve the wildlife habitat of many endangered wildlife species and biodiversity richness. Chitwan National Park (CNP), one of the World Heritage Site (WHS), stretches mostly across the Churia region and has been accommodating the Rapti valley, lowlands and wetlands of Terai. It contains wetland habitat key to the survival of a globally endangered *Rhinoceros unicorni*s and many other endangered species (NTB, 2001).

CNP spread over an area 932 sq. km is known for its Sal (*Shorea robusta*), riverine forest and grassland. The parks hosts 570 species of flowering plants, 56 species of mammals, 525 birds species, 47 reptiles and 68 fish species (DNPWC, 2004). Recognizing its unique ecosystem of international significance, UNESCO declared CNP a World Heritage Site in 1984 (NTB, 2001).

In 1996, an area of 750 km^2 surrounding the park was declared as a buffer zone which consists of forest and private lands. The park and local people jointly initiated community development activities and manage natural resources in the buffer zone. The declaration of buffer zone and its management with the active participation of local communities has been effecting in easing pressure on the national park (MOPE, 2004 as cited in A.K.P). Natural resource management, community development, tourism infrastructure development are some of the key activities of the Buffer Zone (BZ) management. The map of CNP and its buffer zone is given in the figure 2.

Figure 2: Map of Chitwan NP and its buffer zone

4.2   Physical Attributes of the Study Area

Divyapur Buffer zone area is located between 27^0 29.23' to 27^0 40.85' North latitude and 84^0 12.04' to 84^0 13.45' East longitude which is 170 km south west of Kathmandu valley and 25 km. from Bharatpur, at an altitude of about 140m-165m above the sea level. It is situated in the northern fringe of the Chitwan valley (inner tarai) on the southern lap of Mahabharat Range. The boundary of this study area is Rajahar VDC at the east, Pragatinagar VDC at the West, mahendra Highway (BZ boundary) on the north and Narayani River (i.e. CNP) on the south (Office: BZ Office of Dibyapuri VDC, 2010).

The area of the Nawalpur belt (where Dibyapuri VDC is also situated) with heavy forest's resource was cleared for settlement about 50/55 years ago. The bordering Narayanghat-Butwal highway (i.e. East-west highway) was constructed in 1978/79. A migration of hilly people was spurred due to the eradication of Malaria in Chitwan valley, government's resettlement programme, fertile agricultural land and the new economic opportunities (Office: BZ Office of Dibyapuri VDC, 2010).

4.2.1   Wet Lands in the BZ

The aquatic habitat of the BZ of Dibyapuri VDC includes Kakarda Khola, Mukunde Khola, Baulaha Khola, Chuwadi of Dumkauli, Devi Tal, Shanishchar Tal, patchy forest of Soraha and Gainda Tal. The main river of the southeastern side of the BZ of Dibyapuri VDC is Narayani River. These wetlands harbour several species of fish, amphibians, reptiles and mammals. The wetlands are utilized for various purposes by local communities e.g. irrigation, fishing, animal grazing and many of them may be significant in terms of biodiversity.

The wetland of the Dibyapuri BZ are somewhat threatened from exploitation of resources, invasion of exotic plant species, chemicals used by fisher men and human disturbances. Major problem for wetlands are invasion of water hyacinth and debris deposition. The total wetland area recorded in Dibyapuri BZ is 8 Ha.

Figure 3 : Map of the study area
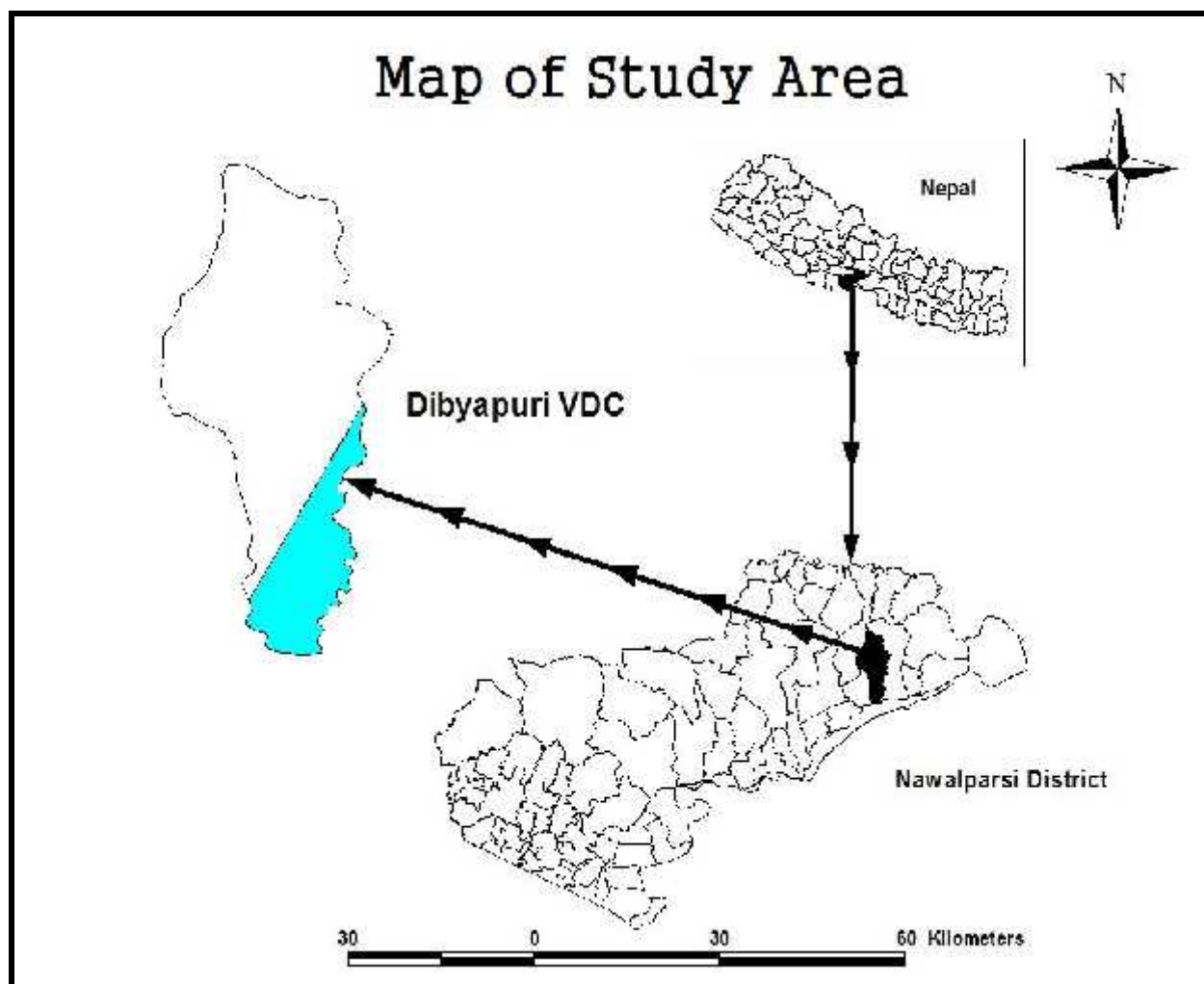
4.3   Land Use Pattern of Dibyapuri Buffer Zone (BZ)

Table 2 : Land Use in Dibyapuri BZ in ha.

Land type	Area (ha)	Percent
Tall tree forest (old riverine natural forest)	89.0 ha	23.73
Grass Land Area	16.0 ha	4.27
Simsar Area (Ghol+Tal)	8.0 ha	2.13
Plantation area	7.0 ha	1.87
Grazing Land	5.0 ha	1.33
Agriculture/Settlements	250.0 ha	66.67
Total area	375 ha	100.0

Source: (Office: BZ Office of Dibyapuri VDC, 2010)

The land used system of Dibyapuri BZ shown in table. The total land area of Dibyapuri BZ is about 375 ha. Community forest land comprising 125 hectare (ha).Among 125 ha of forest land, tall trees occupy 89 ha, grass land occupy 16 ha, simsar occupy 8 ha, plantation area occupy 7 ha and grazing land occupy 5 ha.Where as settlement & cultivated land is about 250 ha. The land used pattern of Dibyapuri BZ as shown in table 2.

4.4   Social Aspects

According to respondents, the population growth has leaped fast due to hill migrant and is continuous. Traditionally, local people of Dibyapuri VDC depend upon agriculture and livestock rearing. But some people like Bote and Musahar depend upon forest resources and fishing into the Narayani River for their subsidence economy. People who live near the park used both timber and non-timber forest product such as thatch grasses and seeds, tree fodder, fibers, wild vegetables, driftwood, medicinal herbs and fruits.

Figure 4 : Ethnic Composition of BZ of Dibyapuri VDC (N = 465)
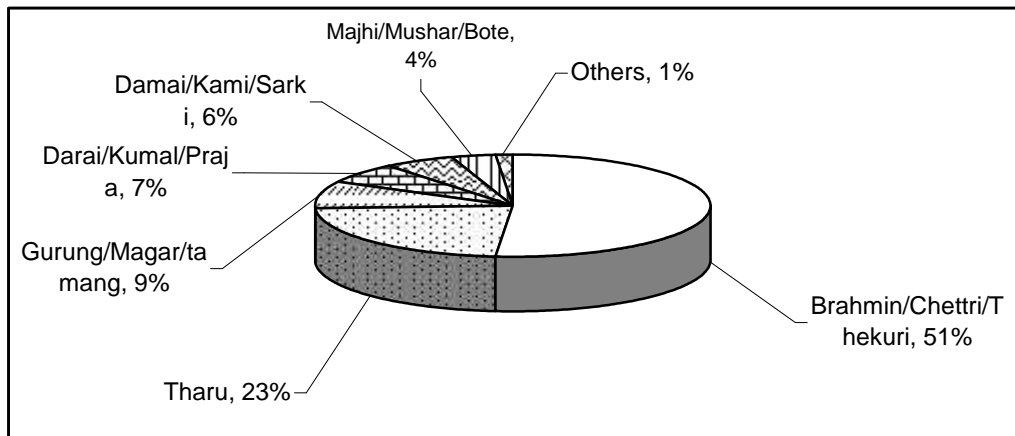
Source: BZ Office of Dibyapuri VDC 2010

The figure 4 presents the caste/ethnic composition in the study area. Brahman/Chhetri is 51 percent and Tharu are 23 percent which is higher proportion in compare with others. Other ethnic people comprise Gurung/Magar/Tamang 9percent , Kumal/Darai/Praja 7 percent , Dalit (Kami, Sarki and Damai) 6 percent , Bote-Majhi-Mushar 4 percent , and others 1 percent . The proportion of Brahman/Chettri seems to be higher in the study as most of them have migrated from the hills after the eradication of malaria.

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4.5   Economic Aspects

Agriculture is the main source of income in this village and livestock rearing is another important source. 1 percent of the members of this study area are also engaged in corporate job. Fishing is another important source of income for ethnic groups like Majhi, Bote and Musahar. They also collect seasonally the wild vegetables (e.g."*Niuro*") and get income by selling it at the town.

4.5.1   Farming System

Paddy and wheat were the major crops in the study area. According to the villagers, since 7/8 years, cultivation of wheat has been decreased and ultimately the wheat cultivation has been going to stop due to depredation of wheat crops completely by wild animals.

Paddy and Maize have become the major crops in the study area, in which paddy is grown rain fed low lands while maize is mostly cultivated on the uplands area (i.e. in *Tandi*). Non cereals crops such as legumes, oil seeds, potatoes, pulse and variety of vegetables are also cultivated by most of the households but in low proportion. Kitchen plants like tomato, radish, cauliflower, cabbage, onion, garlic, chilly etc. are also grown in their vegetable garden. People sell their surplus food grains and vegetables in nearby village market.

The cropping pattern in the area consists mostly of either sequential or mixed cropping. Sequential cropping or the cropping cycle depends upon the quality of land, irrigation facilities, ability of the farm holders to invest, credit facilities and extension services. However, in general practice, the cropping cycle in this area is paddy-oil seeds-fallow, paddy - fallow-maize, paddy-pulses-fallow and paddy only in a year.

Paddy is generally planted in late June to mid-August and harvested in October-November and after then pulses or oil seeds are sown in different quality of land as their suitability. In the low lands a local variety of rice called "*Sabitri*" or "*Mota Dhan*", which has a short life cycle are usually planted in late May and harvested in late August. Such fields are then used to cultivate either oil seeds or pulses. Maize is generally sown in late February or March and harvested in late June to July (Table 3).

Table 3 : Growing Season for Different Crops in Study Area

Months												
Crops	J	F	M	A	M	J	J	A	S	O	N	D
Paddy							◄	─	─	─	►	
Maize		◄	─	─	─	►						
Mustard	◄	►									◄	►
Lentil	◄	►								◄	─	►
Rajma	◄	─	►								◄	►
Linseed	◄	─	►								◄	►
Phaper	◄	►								◄	►	
Potato	◄	─	►								◄	►
Vegetables	◄	─	─	─	─	─	─	─	─	─	►	

J: January, F: February, M: March, A: April, J: June, J: July, A: August, S: September, O: October, N: November, D: December

The table 3 shows that the specific cycle of crop production within the month of a year which is designated by the arrow headed line, such as paddy from July to November, Maize February to June and so on.

4.5.2 Land Holding

To determine land holding, questions were asked to 88 households of study area of Dibyapuri VDC. According to their response, the status of the land holding is presented in table 4.

Table 4 : Land holding size by household

Land holding size in *bigha*	No. of Household	Percentage
Land less	1	1.14
Blow 0.5	25	28.41
(0.5-1.0)	32	36.36
(1.0-2.0)	20	22.73
Above 2.0	10	11.36
Total	88	100.00

Source: Field Survey 2010.

There was 1.14 percent landless household, 28.41 percent have below 0.5 *Bigha* land, 36.36 percent have 0.5-1.0 *Bigha* land, 22.73 percent have 1-2 *Bigha* and 11.36 percent have above 2

Bigha land as shown in Table 4. Those families who have got land below 0.5 Bigha can have food for 5 months, 0.5-1.0 *Bigha* can have food for 10 months. Similarly those families who have got land in between 1-2 *Bigha* and above it can have surplus amount of food.

Those families who can't grow enough food from their farm field, they were engaged in different kinds of jobs like drivers, either subsistence kind of job or self employed in small shops. One Dalit was found landless during the survey. Especially Brahman/Chettri/Thakuri and Tharu has got more land than other ethnic people.

Land holding in between the two strata was calculated to find out differences in the rate of crops depredation and /or causes of conflict. As when the cultivation rate is higher near by the park boundary, it helps to attract the wildlife in the cultivated land.

Table 5 : Total Land Quantity and Land Holding /HH in Surveyed HH (in *Bigha*)

Area	Total No. of HHs	No. of HHs	Total Calculated land in HHs	Land Holding per HHs
VBNPB (0-1km)	223	44	43.56	0.99 *Bigha*
VNNPB (1-2 km)	242	44	40.04	0.91 *Bigha*
Total	465	88	83.60	0.95 *Bigha*

Source: Field Survey 2010

Table 5 shows that the total cultivated land owned by the sampled household in BZ of Dibyapuri VDC was 83.60 *Bigha*. Table 5 shows that cultivated land and land holding per family is higher in villages bordering the National Park (NP) boundary (0-1 km from NP) i.e. 43.56 *Bigha* and 0.99 *Bigha* respectively and lower in villages not bordering the NP boundary (1-2 km) of which total cultivated land and land holding per family is 40.04 *Bigha* and 0.91 *Bigha* respectively.

4.6 Crop Raiding and Depredation

However several crops were damaged by wild animals, four major crops paddy, maize, lentil and oilseed were included in this study. Crop raiding was mainly associated with three principal wild ungulates of the park; those are rhinoceros, wild pig and *chittal*. Crop raiding by wild ungulates is a common phenomenon in the vicinity of CNP. Feeding in the fields by these wild animals could only be hindered by human interference. During the cropping seasons, the farmers built elevated pole platforms *(Machan)* on which they sat out at night to guard their crops. If detected, they simply scared the animals off their fields into fallow land, or someone else's crop field and sought the neighboring guards to their attention. Wherever they failed to be on guard, they suffered crop damage. The respondents said that during misty or cloudy nights, and during the

dark periods of the lunar cycle, crop raiding was more. Crop raiding by the wild ungulates continued throughout from May to March in any one cropping cycle.

Table 6 : Wild Pests of Different Crops and Livestock and Their Raiding Time

Species of Wildlife	Raid Crops/ Livestock	Preferred Crops/ Livestock	Time of Raiding	Unpreferred Crops
Rhinoceros	Wheat, Paddy, Maize, Lentil, Potato, Barley, Buck wheat, Garden Vegetables	Wheat, Paddy, Lentil, Potato	Night	Mentha,, Linseed, Rajma, Tora, Jhuse Til
Wild Boar	Maize, Wheat, Arum, Potato, Yam	Maize, Arum, Potato, Paddy	Night	Chilli, Ginger
Spotted Deer	Mustard, Lentil	Mustard	Early Night	Potato
Bear	Honey, Termite	Honey	Night	Paddy
Rabbit	Paddy, Wheat, Mustard, Barley	Paddy, Wheat	Night	Tall plant
Tiger	Goat, Sheep, calf	Goat, sheep	Night	Crops
Leopard	Goat, Sheep, Calf	Goat, sheep	Night	Crops
Wild cat	Chickens	Chickens	Day/ Night	Crops
Jackel	Chickens, Ducks, Maize	Chickens	Day/ Night	Oilseed
Python	Chickens	Chickens	Day/ Night	Crops

Source: Field Survey 2010

Table 6 shows that the pests of different crops and livestock and their raiding time along with their preferred and unpreferred crops. Such as rhino especially raids wheat, paddy, maize, lentil, barley etc. but likes wheat, paddy, lentil, and potato and unlike mentha, linseed, rajma, jhuse til etc and the raiding time is at night. Similarly, other wild animals do the same kind of thing as shown in table 6.

Chapter Five

Impact of wild life on the economy of people

This chapter describes the economic impact of park on local people. The chapter especially deals with economic loss by crops depredation and livestock loss due to wildlife in the study area.

5.1 Economic Loss by Crop Depredation

Crop depredation is very common in BZ of CNP. Most of the respondents reported crop depredation in their field. The data of collected crop yield and crop depredation are the assumed crop yield and crop depredation given by the respondents. The table 7 shows the crop depredation in the study area.

Table 7 : Total Yield if not Loss by WL, Average Yield and Crop Loss by WL in Surveyed Households

Crops	Yield if not loss due to WL		Average yield		Crop depredation		Losspercent in each crops
	In Kg	In NRs	In Kg	In NRs	In Kg	In NRs	
Paddy	166601.97	3332039.4	135736.84	2714736.00	30865.13	617302.60	18.52
Wheat	1717.43	42935.75	982.14	24553.50	735.29	18382.25	42.81
Maize	24546.26	441832.68	19551.72	351930.96	4994.54	89901.72	20.34
Mustard	6582.79	315973.92	5300.00	254400.00	1282.79	61573.92	19.49
Lentils	7763.16	349342.20	5350.00	240750.00	2413.16	108592.2	31.08
Pot+veg	18585.00	371700.00	13850.00	277000.00	4735.00	94700.00	25.48
Linseed	1496.23	52368.05	1311.06	45887.10	185.17	6480.95	12.37
Total	217983.68	4906192.00	176731.76	3909257.56	45211.08	996933.64	20.74

Source: Field Survey 2010

The following calculation based on table seven

$$\text{Mean crop loss/HH (in kg)} = \frac{\text{Total crop loss in surveyed HH (in kg)}}{\text{No. of surveyed HH}}$$

$$= \frac{45211.08\,kg}{88} \text{X} 513.76\,kg\,crops/HH$$

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Mean crop loss/HH (in Rs.) $= \dfrac{\text{Total crop loss in surveyed HH (in Rs.)}}{\text{No. of surveyed HH}}$

$$= \frac{Rs.996933.64}{88} \times Rs.11328.79$$

Total Eco. loss of the village = Mean Crop loss/HH x Total

No. of household in study area

= Rs. 11,328.79 x 465

= Rs. 5,267,887.35

On the basis of their total yield if not loss due to wildlife, their actual loss percentage of each crop as shown in table 7 was paddy (18.52 percent), wheat (42.81 percent), maize (20.34 percent), mustard (19.49 percent), lentil (31.08 percent), potato and vegetables (25.48percent) and linseed (12.37percent) in the study area of CNP.

Table 8 : Loss of Agricultural Crops Due to Depredation by Wildlife

S.N.	Name of Crops	VBNPB		VNNPB		Total loss of wt. in kg. (each crop)	Total Eco loss of each crop (NRs.)	Loss percent
		Loss of wt in kg.	Economic loss (Rs)	Loss of wt. in kg.	Eco Loss Rs.			
1	Paddy	20345.18	406903.6	10519.95	210399.00	30865.13	617302.60	61.92
2	Wheat	735.29	18382.25	-	-	735.29	18382.25	1.84
3	Maize	3270.70	58872.60	1723.84	31029.12	4994.54	89901.72	9.02
4	Mustard	708.8	34022.40	573.99	27551.52	1282.79	61573.92	6.18
5	Lentils	1502.29	67603.05	910.87	40989.15	2413.16	108592.2	10.89
6	Pot + Veg	2879.01	57580.20	1855.99	37119.80	4735.00	94700.00	9.50
7	Linseed	144.33	5051.55	40.84	1429.40	185.17	6480.95	0.65
Total	Total	29585.60	648415.65	15625.48	348517.99	45211.08	996933.64	100.0

Source: Field Survey 2010

Table 8 shows that economically, paddy (61.92 percent), wheat (1.84 percent), maize (9.02 percent), mustard (6.18 percent), lentils (10.89 percent), potato and vegetables (9.5 percent) and linseed (0.65 percent) were the most raided crops which are mostly affected during their mature stage. The depredation was not only by eating the crops but also by roaming and wallowing on the crop fields by rhinoceros and other wild animals. According to the field survey, it was estimated the total economic loss of Rs. 996,933.64 per annum and Rs. 11,328.79 per household based on 88 households survey (Table 8). The maximum economic loss was for paddy followed by lentils, potato and vegetables, maize, mustard, wheat and linseeds in Dibyapuri BZ of CNP. Table 8 also shows that the crop depredation rate is higher in the area which is 0-1km far from the park boundary than the area which is 1-2km far from the park boundary. According to the respondents, the cultivated land in 0-1km far from the park boundary is higher as the land owned is higher in that area. The land in that area is also more fertile with good irrigation facilities.

The χ^2 analysis to test the association between the crop loss per household with d.f. = 6 and Level of significance 5percent , as shown in Table 9.

Table 9 : Result of χ^2 Analysis to Show Relation Between Crop Loss and Study Area

Relation	Observed Value (0)	Expected value E = $\dfrac{RT \ x \ CT}{N}$	$\dfrac{(O \ Z \ E)^2}{E}$
Paddy x (0-1 km)	91.23	90.61	0.00
Paddy x (1-2 km)	43.47	14.23	60.10
Wheat x (0-1 km)	3.30	2.22	0.53
Maize x (0-1 km)	14.67	14.66	0.00
Maize x (1-2 km)	7.12	7.13	0.00
Mustard x (0-1 km)	3.18	3.73	0.08
Mustard x (1-2 km)	2.37	1.82	0.17
Lentils (0-1 km)	6.74	7.06	0.01
Mauro (1-2 km)	3.76	3.44	0.03
Pot + veg. x (0-1 km)	12.91	13.84	0.06
Pot + veg. x (1-2 km)	7.67	6.74	0.13
Linseed x (0-1 km)	0.65	0.55	0.02
Linseed x (1-2 km)	0.17	0.27	0.04
			Total χ^2 value =61.17

Source: Field Survey 2010

The tabulated value of Chi Square(t^2) with d.f 6 at 5percent level of significance is 1.64 but the calculated value of t^2 is 61.17.Hence the calculated value is greater than the tabulated value which means null hypothesis is rejected and it proves that there is more affect of wild animals in village bordering the national park.

Table 10 : Comparison of Crop Loss Percent in Two Different Strata

Crops	VBNPB			VNNPB		
	Total Yield in *muri* if not loss due to wildlife	Loss due to wild life in *muri*	Loss percent	Total yield if not loss due to wild life in *muri*	Loss due to wild life in *muri*	loss percent
Paddy	1647.02	386.79	23.48	1520.32	200	13.16
Maize	184.84	47.54	25.72	171.93	25.06	14.58
Mustard	56.49	11.70	20.71	52.14	9.47	18.16
Lentil	59.72	22.22	37.21	55.12	13.47	24.44
Linseed	17.52	3.25	18.55	16.17	0.92	5.69
Wheat	30.67	13.13	42.81			

Source: Field Survey 2010

The table 10 shows the comparative crop loss in two different settlements in the study area. From table 10, on the VBNPB, the crude data on wheat loss percent showed high (42.81percent) damage followed by lentils (37.21percent) potato and vegetables (29.79percent) maize (25.72percent), paddy (23.48percent), mustard (20.71percent), and linseed (18.55percent) whereas on the VNNPB, the crop loss percent was lentils (24.44percent), potato and vegetable (20.80percent), mustard (18.16percent), maize (14.58percent), paddy (13.16percent) and linseed (5.69percent)

The analysis shows that the crop loss varied in the different areas, depending on the intrusion by wild ungulates responsible for crop damage. While the rhinoceros was mainly responsible for paddy and wheat losses, wild boar caused heavy loss to maize and chital to oil seed. The crop loss declined as the distance from the park increased.

The volume of crop loss increased as the size of landholding and frequency of crop raid increased. Distance and crop loss had an inverse relationship, i.e. the shorter the distance from the park, the higher was the loss.

Figure 5 : Economic Losses in Two Strata Due to Crop Depredation
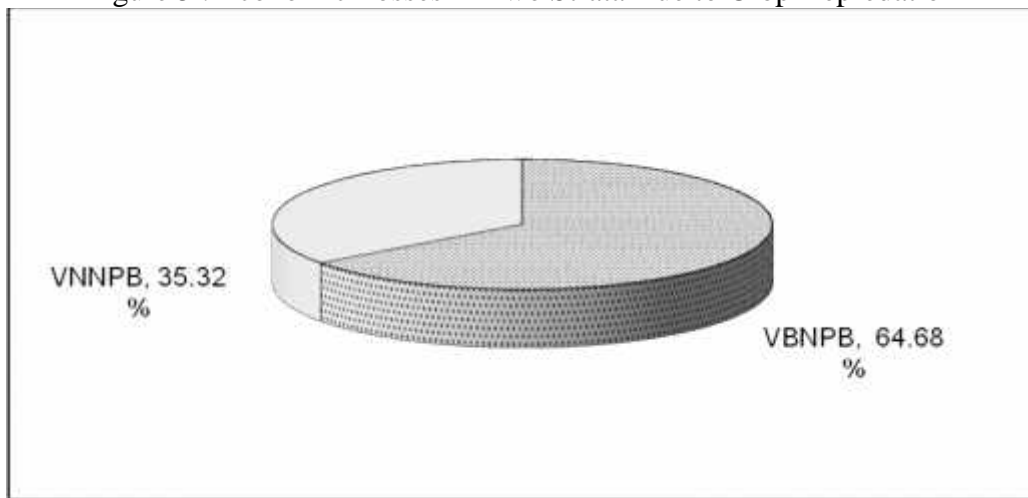
Source: Field Survey 2010

Figure   7 shows that loss due to crop depredation was unequal in two strata. Comparison of the crude economic loss in bordering area (0-1km) Rs. 6,48,415.65 which is 64.68 percent and non bordering area (1-2km) Rs.3,48,517.99 which is 35.32 percent of the total loss.

5.2 Livestock Loss by Wildlife

Livestock depredation is another problem after crop damage. The tiger, leopard, bear, Wild boar etc. killed the domestic animals on the edge of the forest and on the Shed (*khor)* at night time. According to Tamang (1982) domestic cattle constitute 30 percent killed by the Tiger in areas near park boundaries. According to the record of CNP in 2009, the rate of depredation of goat by leopard is maximum than other in the study area that was registered for compensation. This is the number however represents only those cattle which were killed or attacked while they were shed. This result shows that the number of cases of depredation finally high than it is reported to CNP office. (i.e.BZDC).

Figure 6 : Cattle grazing in buffer zone area

Figure 8 shows cattle in buffer zone are where they could be a victim of wild predators. This kind of grazing also reduces the food resources of wild animals due to which wild animal raids the farming field in search of food.

Table 11 : Quantative and economic description of livestock depredation for last 5 years

Killed site	Year	Species	No of killed	Killed by(Predator)			Place	Amount of Compensation	Real price
				Tiger	Leopard	Jackal/Jungle cat/Python			
VBNPB	062/63	Goat	11	*			Shed	6200	24800
			1		*		Shed	500	2000
		Cow	2	*			Shed	5000	20000
		Buffalo	2	*			Meadow	7000	28000
	063/64	Goat	10	*			Meadow	5000	10000
			5		*		Jungle	10000	20000
		Buffalo	4	*			Shed	16250	32500
	064/65	Goat	4		*		Shed	7550	15100
	065/66	Ox	2	*			Shed	6000	12000
		Chicken	27			*	Trap/Cage	2125	4050
	066/67	Goat	2		*		Shed	2500	5000
Sub-Total			70					68125	173450
VBNNPB	062/63	Goat	4		*		Shed	2925	11700
		Buffalo	1	*			Shed	525	2100
	063/64	Goat	1		*		Meadow	1000	2000
		Buffalo	3	*			Shed	2000	4000
			2		*		Shed	1250	2500
	064/65	Goat	5		*		Meadow	8700	17400
	066/67	Goat	2		*		Shed	2000	4000
Sub-Total			18					18400	43700
Total			88					73900	192100

Source: BZ Office of Dibyapuri VDC & Field Survey 2010

Up to a year 062/63 the BZDC give compensation only the 25 percent of the total valuation, if the livestock is killed by wild life. The rate of compensation is increased to 50 percent from 063/64. From the data of field survey 2010 as shown in table 11, altogether 88 livestock killed (35from tiger, 26 from leopard) during the period of five years (from fiscal year 062/63-066/67). Among them 70 livestock from VBNPB and 18 from the VBNNPB .The field survey revealed that Tiger caused maximum economic loss (Rs 133400) being goats, cows, buffaloes as a chief domestic prey. The village area mostly affected near by the park boundary (i.e VBNPB) than that not the area near by the park boundary(VBNNPB) as the economic loss made by wild animals near by the park boundary is Rs 173,450 and not near the park boundary is Rs 43,700 only.

Chapter Six

Causes of Conflict

This chapter describes the causes of conflict in between the park and people and the relationship in between them along with the efficiency of local crop preventive measures.

Sources of Conflicts

Protection of natural environment through the establishment of parks and reserves are of great importance to mankind. But establishment of NP and reserves become a matter of conflict in developing countries as well as in most developed countries. National parks and wildlife reserves of Nepal are no exception to this (Adhikari 2000). Like other protected areas, CNP is also facing this problem with local people. The park has affected their life in both direct and indirect way. Thus conflict is due to problem arises between reserve and local people. There are two types of problems.

6.1   Human impact on Park

6.1.1   Demand and Use of Fodder, Timber and Firewood Cutting

People living around the park fulfill their fodder requirement from their land but it is not sufficient to feed their livestock. They can get various species of fodder plants for their livestock from the park. So people enter the park to lop off green branches of the trees, bushes and grasses for fodder. Local people are also involved in timber cutting to build house and furniture. Kerosene is rarely used by villagers and firewood is insufficient in the VDC, so they enter the park for firewood. Due to all these reasons, conflict arises between local people and the park. Cutting of timber and fodder destroy wildlife habitat greatly during dry season. It has a great effect on wildlife.

Basically, people residing there; get forest products from National Park (NP), Buffer zone community Forest (BZCF) and Private Lands (PL) which are differentiated as follows with the extraction percentage from those areas.

Figure 7 : Resource utilization Pattern
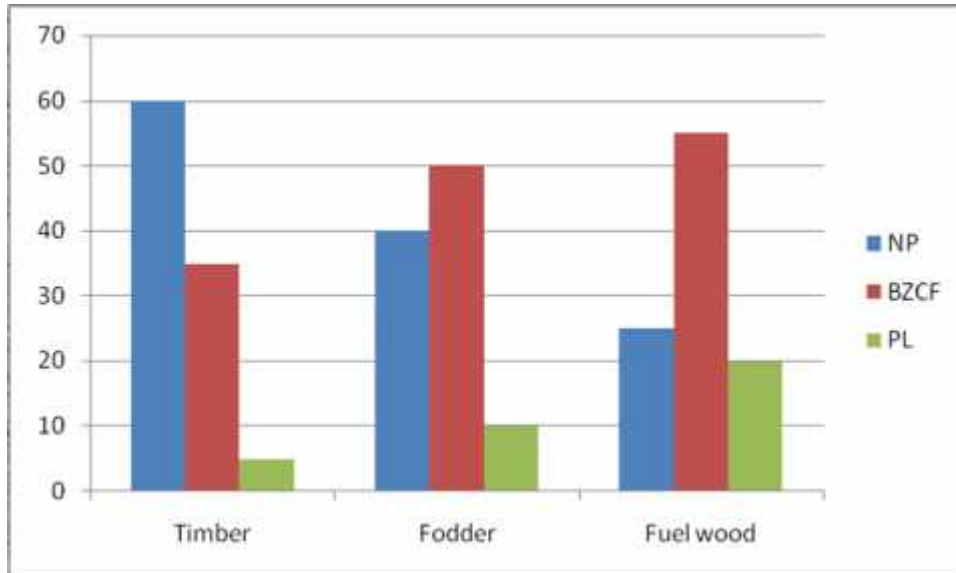
Field survey 2010

Buffer Zone community forest, private land and National park are the major sources of fodder in the study area that as shown in the figure 9 and the explanation is mentioned below.

a. Timber: Timber is used for the construction and maintenance of houses and agricultural implements. Indicating local people the trend of using timber is gradually decrease due to practices of modern infrastructure. In the study area 35 percent respondent fulfilled the timber from BZCF and 60 percent from National Parks and 5 percent from the private lands.

b. Fuel wood: In the study area there are three major sources of fuel wood namely national Park, Buffer zone community forest and Private land. Local people collected maximum fuel wood in the period of *Khar- Khadari* as it is allowed once a year inside the National Park.

About 55 percent of the respondents reported that their fuel wood requirement is fulfilled from BZCF, 25 percent from National park, 20 percent from private lands (PL).

c. Fodder: In the study area 55 percent of the respondents reported that their fodder is fulfilled from the BZCF, 25 percent from the National Park and 20 percent from the private land.

According to the respondents, basically National Park does not allow people to collect forest resource throughout the year as it opens for 15 days in a year, generally in January- February and it does not provide as per the demand of the local people.

People holding more private land and who have higher income from other sources (agricultural farming) use less timber, fodder and fuel wood while those having low income and less private land, use more timber, fodder and fuel wood from buffer zone. But around 1percent of them found to be using more timber and fuel wood for business purposes.

6.1.2 Total Land Coverage by Major Crops

In this study area there are various types of soil structure noted. The main crops are paddy and maize. Almost all farmers grow these crops. Besides these crops mustard, lentils, vegetables and potato, linseed and fruits are also cultivated in small quantity. Total land area and coverage by major crops in the surveyed household in two strata of VDC are given in the Table 12.

Table 12 : Land Coverage by Major Crops in Dibyapuri BZ (Comparative Studies of Two Strata)

	Land covered	Paddy		Maize		Mustard		Lentil		Veg.+Pot		Linseed	
		Land	percent	Land	percent	Land	percent	Land	percent	Land	percent	Land	percent
VBNPB	43.56	33.12	76.10	13.46	30.89	2.58	5.93	3.06	7.02	2.40	5.52	0.88	2.03
VNNPB	40.04	28.44	71.03	13.02	32.52	2.70	6.74	2.59	6.46	2.76	6.89	0.63	1.59
Total Area	83.60	61.56	73.69	26.48	31.66	5.28	6.32	5.65	6.75	5.10	6.17	1.51	1.82

Source: Field Survey 2010

The table 12 shows that out of 43.56 *Bigha*, in villages bordering the national park boundary, paddy grown land was 33.12 *Bigha*, which was 76.10 percent of total cultivated land. Similarly maize grown land was 13.46 *Bigha* (30.89 percent), mustard grown land was 2.58 *Bigha* (5.93 percent), lentil grown land was 3.06 *Bigha* (7.02 percent), vegetables and potato grown land was 2.40 *Bigha* (5.52 percent) and linseed grown land was 0.88 *Bigha* (2.03 percent).

In case of villages not bordering in the national park boundary, total cultivated land was 40.04 *Bigha*. Paddy grown land of this site was 28.44 *Bigha* (71.03 percent), maize grown land was 13.02 *Bigha* (32.52 percent), mustard grown land was 2.70 *Bigha* (6.74 percent), lentil grown land was 2.59 *Bigha* (6.46 percent), potato plus vegetables grown land was 2.76 *Bigha* (6.89 percent) and linseed grown land was 0.63 *Bigha* (1.59 percent).

This coverage of land by the crops attracts the wild animals of the park which causes loss to the people.

6.1.3 Poaching

Poaching of wild animals is a reality in CNP. Hunting in Chitwan has been a practice since historical times. Rhinoceros is heavily poached for its highly valued horn. According to "Rhino Count 2005" the total Rhinoceros killed by poachers is 108 in CNP from May 1996 to 2005. The annual report of Department of National Parks and Wildlife Conservation 2009 depicts that among 18 casualties of Rhino 9 were killed by the poachers for its horn. So poaching has created huge conflicts between the park and the local people.

Table 13 : Wildlife Casualties in BZ of Dibyapuri VDC

Wildlife species	Sex	Date	Place	Cause of death	Remarks
Chital	Juv.	057/12/26	Field	Killed by street dog	Chaudhary Industrial area.
Rhino	Un	058/11/7	Com. forest Dibyapuri	Gunshot	Horn missing
Rhino	F	059/3/2	Com. forest Dibyapuri	Poaching	Horn missing Hooves found
Rhino (Infant)	M	059/6/9	Near Narayani River	Natural death	Horn and Hooves were found
Rhino (3yrs)	M	059/6/22	Com. Forest of Dibyapuri	Killed by Natural death	Horn and Hooves present
Rhino	F	059/6/26	Com. Forest of Dibyapuri	Gunshot poaching	Horn missing Hooves present

(Source: Annual Reports DNPWC)   M = Male; F = Female, Juv. = Juvenile, Un = Unknown

One chital and five rhinoceros were found (recorded) dead in different places of Dibyapuri BZ, which were killed by different causes. The table 13 shows the details of the wild life casualties in Dibyapuri BZ.

Along with the establishment of BZ concept, the Users' Group Committee of Dibya BZ community Forest has been taken many strong actions against the poacher and illegal dealers of wildlife products in BZ area of Dibyapuri VDC (Annex IV).

6.1.4 Fishing and River Poisoning

Another impact practiced by local people is fishing in Narayani River which is against the regulation of national park. Only 1 percent of the total population of the village is engaged for

fishing daily. Narayani River is the habitat of endangered aquatic mammals such as gangetic dolphin (*Platanista* spp.) and crocodiles, marsh mugger and gharial. The crocodiles are left in the Narayani River by the park authorities to increase their number. Some indigenous people also doing nuisance of poisoning of small Ox – Bow Lake to catch large amount of fishes impacting the aquatic flora and fauna.

6.2   Parks Impact on Local People

6.2.1   Attack to Human beings

Every year people are killed or injured by wild animal like Tiger, rhino, bear, wild elephant etc. According to Jawali (1989) a total of 125 accidents (42 killed & 83 injured) between1978 to 1997 of which 97 percent occurred outside the park. Similarly Shrestha (1994) point out the animal human casualties reach as high as 6 even 10 and cases of rhino attacking people in the park and farm are common.

Table 14 : Number of People Injured/Killed by Wildlife in BZ of Dibyapuri VDC.

Name of Person	Encounter Place	Date	Treatment	Killed	Predator	Compensation
Devkala Dhakal	Home	2057			Rhino	Rs 4000
Megh Nath Bastakoti	Way Home	2058			Rhino	Rs 4500
Bishnu Pangeni	BZ Jungle	2059			Rhino	Rs 5500
Mitralal Pandey	BZ Jungle	2059			Rhino	Rs 20000
Hiradevi	Farm	2060			Rhino	Rs 6700
Sailo	BZ Jungle	2061			Rhino	Rs 6000
Jogeshwar Mahato	Park	2062			Tiger	Rs 28000
Poudel Dai	Com. Forest	2063			Rhino	Rs 5800
Damber's Mother	Com. Forest	2066			Rhino	Rs 5000

Source: BZ Office of Dibyapuri VDC & Field Survey 2010

Wildfauna in Dibyapuri VDC have killed two people and seven people have injured so far (Table 14). The killing of Mitralal Pandey was happened during daytime when he was entering the community forest of his village. Similarly, Jogeswar Mahato, worker of Hattisar was killed by tiger on the day time when he was entering the park for the collection of thatch grass for elephant. During the field study a victim of rhinoceros was found. A woman of forty-five years was severely wounded by rhinoceros. Her son spent more than Rs. 20,000 for her treatment but he had got only Rs. 5,000 as compensation by BZ council, Sauraha.

6.2.2 Preferences of Crop by Rhinoceros and Crop Abandoned by Local People

Table 15 : Preference of Crops by Rhinoceros

S.N.	Preferred Crops	No. of Respondents	Respondents percent
1	Wheat	48	54.54
2	Paddy	9	10.23
3	Potato	12	13.64
4	Lentils	7	7.95
5	Radish	3	3.41
6	Vegetables	2	2.27
7	Buck wheat	3	3.41
8	Maize	3	3.41
9	Not known	1	1.14
	Total	88	100.0

Source: Field Survey 2010

According to responses collected from the household survey, it showed that the crop preference by Rhinoceros was wheat (54.54 percent), potato (13.64 percent), paddy (10.23 percent), lentils (7.95 percent) and so on as shown in Table 15. The most of the local people had completely abandoned wheat cropping in their cultivated land because of increasing crop (especially wheat) depredation by Rhinoceros and people get only 50 percent compensation of the total damage made by wild life.

6.2.3 Attitude of Local People towards Park/BZ Community Forest Conservation and its Management

Attitude of people towards the park conservation and its management were categorized into three aspects i.e. strongly positive, positive and negative towards the park conservation and its management.

Figure 8 : Attitudes of People towards Wildlife and its Management
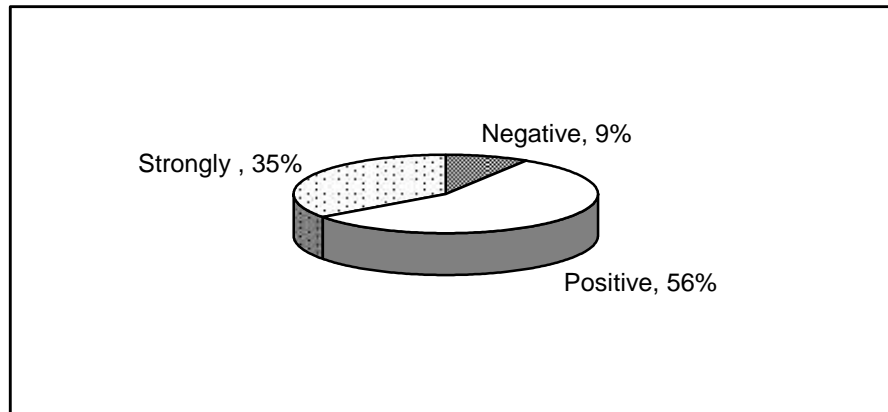
(Source: Field Survey 2010)

In the study area it was found that about 35 percent of total respondents expressed strongly positive attitude, 56 percent of total respondents expressed positive attitude and about 9 percent respondents were not in favor of park conservation and its management as shown in Figure 10. That might be due to loss of their properties by wildlife.

6.3 Cause of Wild Animals Visiting Settlements

The field study and scheduled survey revealed that most of the park animals visited the crops field due to the lack of abundance of food at the time of breeding season in the park. Details of the causes are given below.

6.3.1 Lack of Abundance Fodder

According to the respondents of the study area, the area of CNP is limited and due to effective protection the numbers of animals in the park are increasing. There is high demand of food inside the park. Food inside the park might not sufficient for subsistence, so wild animals mainly rhino have to come out of the park and damage the agricultural crops.

6.3.2 Taste of Agricultural Crops

Crops such as paddy, wheat, maize, pulses etc. cultivated around the park are rich in protein and carbohydrate as well as some minerals than most of the wild plants available in the park. Agricultural crops tender, clumped than wild mature plant species. In spring season, wild

animals come more frequently outside the park because they find nutritious food outside the park easily. Wild animals also need to spend much energy in search of qualitative food in the park as the foods are found scattered.

6.3.3   Lack of Effective Physical Barrier

Strong physical barrier is important to prevent the entering of wild animals in the settlement. In the study area, although there is large Narayani river in-between NP and study area but animals like rhino easily cross the river and raid the adjoining agricultural fields. 80 percent of the respondents suggested to get electric fence installed by the park authorities.

6.3.4   Succession

Succession is the gradual change of barren land to forest. Many ecologists suggested that due to succession, grass land of CNP is changing towards forest and the animals that live in grassland migrate outwards in the surrounding field in search of food.

6.3.5   Introduction of New Plant Species in Forest Land

Introduction of exotic species in the park causes the alteration of their habitat by wildlife. Some introduced exotic species of plants such as "*Banmara*" and "*Mile a minute*" in their new habitat allowed them to dominate in their new ecosystem and wipe out the natural food habitat of wild animals and it ultimately causes the migration of animals towards the crop fields.

Figure 9 : Attitudes of People towards the entering of Park Animals into Their Crop Fields
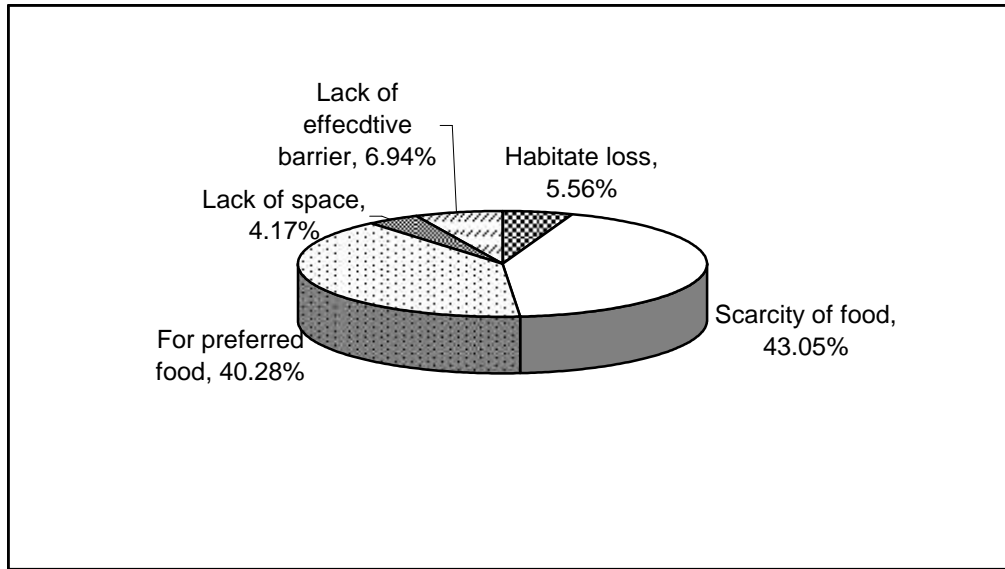
Source: Field Survey 2010

Attitude of people towards the entering to the park and wild animals into people's crop fields seems ecological imbalance in the area. According to the responses collected from the study area as shown in figure 11, the cause of raiding crops by wild animals is divided into five categories among which, the figure 11 shows that For scarcity of food is 43.05 percent , preferred food is 40.28 percent , Lack of effective barrier is 6.94 percent , Habitat loss is 5.56 percent , Lack of space is 4.17 percent .

6.4   Benefits to Local People from BZ and the Park

The people were totally restricted from the entry of park; when there was political conflict of maoist and the insurgency in the nation 11 years ago, but they were taking resource benefit and developmental support continue from the BZ community forest and fund of BZ. Except these benefits, I found that 20 percent people of the total population in my study area are benefited from skilled training and educational tour funded by BZ budget collected by the revenue of NP. The revenue collected from the park and the buffer zone were also utilized in the sector of agricultural farming improvement training, non timber forest products (NTFP) utilization for commercial use to generate income among the poor, and local developmental works such as road gravelling, biogas support, electric poles etc.

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6.5 Preventive Measures and its Effectiveness

6.5.1 Local Preventive Measures /existing preventive measures

Quite a number of different local methods are applied to reduce wildlife damage as per the respondents' response given during the field survey 2010. Machan guarding, chasing with fires, shouting, drumming, fencing etc. are most commonly used methods in Dibyapuri VDC.

Table 16 : Means Applied to Reduce Damage for Different Crops

Means guarding	Rice	Maize	Mustard	Lentil	Pot+Veg.
Machan			-	-	-
Chasing with fires					-
Shouting					
Drumming					-
Fencing	-			-	

Source: Field Survey 2010   (indicates the methods applied to reduce individual's crops)

Table 16 shows that for rice prevention Machan, chasing with fire, shouting, drumming means of guarding are applied to reduce the damage from wild animals. Machan guarding, chasing with fires, shouting, drumming, fencing means of prevention are used to protect for the maize where as for the mustard all means of guarding except Machan guarding are applied. Similarly for lentil and potato-vegetable prevention means are applied as shown in the table 16.

Table 17 : Effectiveness of Techniques Used to Protect Crops

Techniques	Rhino	Wild Boar	Deer
Machan guarding	III	III	II
Chasing with fire	III	-	-
Shouting	I	III	III
Drumming	I	II	III
Fencing	I	III	III

Source: Field survey 2010   Note: I - Very little effective, II - Little effective, III - Most effective

Methods used depend upon the type of crop and the type of animal. In the case of rhinos, they use all these methods. Machan which is installed to protect rice and maize from the pests, is the most common and useful technique. Deer and wild boars are kept away by drumming. Fencing is not very useful against huge animals like rhinos, although it does often keep wild boars and deer

away. Chasing with fires is very effective for rhinos along with shouting and drumming. Effectiveness of those local preventive techniques has found different level to chase animals (Table 17).

About 56.82 percent of people gave their view that chasing with fire is effective techniques to protect the crops from wildlife. Similarly machan guarding 29.54 percent, drumming 6.82 percent, shouting 4.55 percent and fencing 2.27 percent were the ways of method by local people for crops protection from wildlife.

Chapter Seven

Summary and Conclusion

7.1   Summary

The study of park and people conflict was conducted during year 2010 in BZ of Dibyapuri VDC of Nawalparasi district, located adjacent to the northwestern side of CNP.

This study showed that people living adjacent to the CNP were facing crop damage, harassment and livestock depredation and Forest Resource using problem. I identified ten pest species such as rhinoceros (*Rhinoceros unicornis*), Tiger (*Panthera tigris*), common leopard (*Panthera pardus*), wild boar (*Sus scrofa*), spotted deer (*Axis axis*), Jackel (*Canis aureus*), wild cat (*Felis chaus*), Python (*Python morulus*), rabbit (*Lepus nigricollis*) and sloth bear (*Melursus ursinus*). Among them rhinoceros, deer and wild boar were very frequent pest species in and around the park. Jackal and wild cats were frequent in all study sites but the remaining pest species such as tiger, common leopard, bear, rabbit and python were occasionally visiting pest species.

Present study indicated that the poor socio-economic condition creates conflicts between local people and park. The main causes of conflict are breaking the rules and regulation of the park; crop and livestock depredation and human harassment due to wildlife; livestock grazing, hunting and poaching and fodder, timber and firewood cutting by local people inside the park.

It was estimated that the total economic loss of Rs. 9.96, 933.64 due to crop depredation by wild herbivores. The comparison of the crude economic loss at two strata showed that people near the park boundary were in heavy loss. Wheat, lentil, potato and paddy were preferred crops of rhinoceros. This forced people to partially abandon the affected crops such as wheat, potato etc in affected areas. The incidents of livestock lifting by wild predator were becoming common at the peripheral villages of CNP. The estimation of total economic loss due to livestock depredation by wild predator was equal to Rs. 192100. There were altogether nine accidents occurred in my study area. Among them two men were killed and other seven were seriously injured.

Local people were getting resource utilization (fodder, grass, firewood, timber, khar khadai, wild vegetables, medicinal plants etc) from community forest and park and developmental support (graveling, electric pole, biogas support, ham pipe, wells, building material for school, irrigation support etc) from the BZ management committee. People of BZ have also gained benefits from education tour and skilled-training co-ordinated by BZ office.

People were aware of the declaration of the national park and hunting/poaching as illegal. Only 9 percent of local people had negative attitude towards wildlife protection but the most of the people had negative feeling towards rhinoceros as the main culprit of crop loss at the study sites.

Local people were practicing direct methods such as shouting, drumming, Machan guarding, chasing with fire and fencing to control the depredation and practicing stall-feeding and open grazing with attendant as indirect methods to control livestock depredation by wild predators.

7.2   Conclusion

Discussions and data analysis in the preceding chapters about the effect of Park on people and vice versa, I conclude some of the conclusion drawn in the following ways:

1. People residing in VBNPB faces economic loss of Rs 648415.65 and people from VNNPB faces Rs 348517.99 due to the Park animals and especially those people who reside near by the park boundary face more economic loss than the people living not near by the park boundary.

2. The main causes of conflict between the Park and people conflict can be pointed out as follows:
   a) People especially residing near by the park cultivate the lands which attract wild animals towards the crop field.
   b) People do not have much alternative means of income generation rather than agriculture.
   c) People do not get enough compensation from the damages done by the park animals.
   d) Park's vegetative composition is changing so that there is not enough palatable and suitable food for the wild animals and park is not well managed.
   e) Less resources and increase in human population.

f) People are not getting enough benefits from the park and lack of awareness program etc.

3. Machan guarding, Shouting, Chasing with Fire, Drumming, and Fencing are the existing local preventive measures. Machan guarding, Chasing with fire are the most effective preventive measures for the Rhinos whereas Drumming and Shouting are most effective preventive measures for the deer and these depend with the animal type as well.

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ANNEX I

Questionnaires Sheet

Individual Questionnaire survey for wild animals and to get information about crop damage and livestock depredation in and around CNP.

Name :

Address: VDC   Ward No. :

Education :   Ethnicity :   Sex :   Age :

Occupation :   Family Member :

1.   How much land do you have ?

        Khet   _____   Bari   _____

2.   How far is your land from the Park ?

3.   Which crops do you grow in your land ? And what is their average yield ?

Name of Crops	Seasons	Average Yield	Yield if not loss due to wildlife	Loss due to wildlife	In which stage wildlife visit	Remarks
Paddy (Rice)						
Wheat (Gahun)						
Maize (Makai)						
Masuro						
Millet (kodo)						
Potato (Aalu)						
Others						

4.   Do you practice mix cropping system ?

        Yes   No

5.   If yes, which crop do you plant combine ?

6.   Do you have any problem from park animals ?

        Yes   No

7. If yes, what kinds of problems do you have ?

    a. Crop Damage   b. Harassment

    c. Livestock Depredation   d. Others

8. Do the wild life raid/damage crop in your land ?

    Yes   No   Every Year   Rarely

9. If yes

Name of Wildlife	Crop Raid/ Damage	Most preferred Crop	Time of Raiding	Un-preferred Crop	Frequency of Visit	Number at a Time
Rhinoceros						
Wild boar						
Chittal						
Elephant						
Monkey						
Bear						
Others						

10. How far is your home from the Park ?

11. Do you raise livestock

    Yes   No

    If yes

Types of Livestock	Number		How you raise them	Remarks
	M.	F.		
a. Cow				
b. Buffalo				
c. Goat				
d. Sheep				
e. Pig				
f. Chickens				

    a. Stall Feeding   b. Open grazing with attendant

    c. Open grazing without attendant   d. Dhuto/Dana/Pitho

12. Have you seen any wild mammals species graze or visit the same area where the livestock graze ?

Yes   No

13. If yes, which months ....

14. How often livestock depredation take place at your village ?

a. Most frequently   b. Frequently   c. Rarely

15. Is your livestock were killed recently, fill up the following from.

S.N.	Name of Livestock	Killed Month	Annual Injured	Lost of livestock Killed	Time morning/day /evening/ night	Name of Predator
1						
2						
3						
4						
5						

16. How did you know which predator killed the livestock ?

a. Saw predator   b. presence of pugmark c. other

17. Where did the wildlife kill your livestock ?

a. Shed b. Meadow/forest   c. Road.   d. Agricultural field

18. Did the kills dragged on the ground ?

If yes, how much meters ? ....

19. Have the wildlife attack human ?   Yes/No

If yes

S.N.	Where	Who	Date	Treatment	Death	Remarks
1						
2						
3						
4						

20. Do you remember any case you injured wildlife while saving your crop livestock life ?

Which animal   When (Month/Year)

a.

b.

21. What are the preventative methods you are using to control the damage ?

a. Shouting   b. Chasing with fires

c. Drumming   d. Fencing   e. Traps /Trench

f. Poisoning   g. Current   h. Others

i. machan guarding

22. Best preventive measure for different crops (1-3 number given) 3 for highest priority.

Methods	Effectiveness for crops						
	Paddy	Wheat	Maize	Mustard	Lentil	Linseed	Pot.+Veg.
Shouting							
Drumming							
Chasing with fires							
Traps/ Trench							
Fencing							
Machan guarding							

23. Have you noticed how many animals enter your village annually ?

Types of Pest	Number
Rhinoceros	
Tiger	
Leopards	
Wild boar	
Chital	
Elephant	
Jackal	
Wild cat	
Others	

24.   Why do you think the wildlife kill livestock and damage crop ?

a. Habitat loss   d. Lack of space   b. Encroachment

e. Other   c. Scarcity of prey 7 food.

25.   Did you get compensation from the park ?

Yes   No

How much percent you get ?

26.   Do you think these animals should be protected ?

a. Strongly positive   b. Positive   c. Negative

d. Strongly Negative   e. Others

27.   What benefit do you have from park ?

a. Resource utilization   b. Economic benefit from tourism

c. Training   d. other facility

28.   Is there any difference between conflict before and after the establishment of BZ.

29.   Have the wildlife caused any damage to human life

Yes   No

30.   Do you know about any body killed wildlife ?

If yes, who / when / Species

31.   Do you know wildlife killing is illegal ?

Yes   No

32.   Do the park management involve you in managing park ?

a. Information about hunting / poaching

b. Information about inconvenience

c. Meeting

d. Awareness program

e. Others

33.   What would be the best controlling measures ? any idea or recommendation you have ?

34. **Problem associated with resource use from the reserve.**

 Resource use pattern

Sources	Timber		Fuel wood		Fodder		Others (NTFPs)	
	Present	Past	Present	Past	Present	Past	Present	Past
CF								
Reserve								
Private land								
Others								

35. Whether the distanceof the settlements and cultivation from the park's boundary affects economic losses or not ?

    a. Yes it does   b. No it doesn't

ANNEX II

Unit Conversion

Paddy	= 1 Pathi	= 2.63 kg
Maize	= 1 Pathi	= 3.44 kg
Mustard	= 1 Pathi	= 3.03 kg
Masuro	= 1 Pathi	= 3.38 kg
Rajma	= 1 Pathi	= 3.85 kg
Alas	= 1 Pathi	= 2.22 kg
Faper	= 1 Pathi	= 2.0 kg
Wheat	= 1 Pathi	= 3.37 kg
Potato	= 1 Pathi	= 2.80 kg

ANNEX III

Local Rate of Different Crops

	Crops	Market Rate Per Kg (NRs.)
1.	Crops	Market Rate Per Kg (NRs.)
2.	Paddy	20.00
3.	Maize	18.00
1.	Mustard	48.00
2.	Masuro	45.00
3.	Rajma	58.00
4.	Alas (linseeds)	35.00
5.	Faper	44.00
6.	Wheat	25.00
7.	Potato+Veg	20.00

Source: Local Respondents.

ANNEX IV

Action taken against poachers and illegal dealers of wildlife products in Dibyapuri BZ area by BZ user group committee.

S.N.	Place	Date	Offences
1	Different Places	2054/10/30	Four people were arrested for cutting natural resources and freed them after making commitment paper.
2.	Shanishchare Tal (Wetland)	2056/4/23	Four people were arrested and made warning paper for using poison illegally in the wetland.
3.	Wetland of Jungle	2056/4/23	2 People were arrested and made free after making warning paper for using poison for fishing.
4.	Kakarda Khola	2056/5/1	2 people were arrested and made free after warning them.
5.	Bhatak Kulo (canal)	2056/5/23	4 people were arrested and made free after making warning paper for poisoning.
6.	Kakarda Khola	2056/5/28	2 people were arrested and released after making paper for using "Fhiodine Poison" for fishing.
7.	Kakarda Khola	2056/5/32	One people was arrested and fined for destroying the dam for fishing.
8.	Wetland of Jungle	2056/2/2	Six people were arrested and released after making commitment paper for illegal fishing
9.	Com.Forest	2057/1/23	One people was arrested and released after making commitment paper for harvesting natural resources illegally from the com. forest.
10.	Profected	2059 B.S.	One people was arrested by army and sent to jail for killing Rhinoceros. Now in jail.
11.	Protected area	2061/1/22	Two people were arrested and fined for cutting timber and firewood illegally.
12.	Kakarda Khola	2061/5/18	Two people were arrested and fined for using "Thiodine Poison" for fishing.
13.	BZ com. Forest	2061/6/18	One people was arrested and punished officially for using net for tripping of birds.
14.	Kakarda Khola	2062/5/1	Six people were arrasted and fined Rs. 101/- each of them for using Poison (Fidal) for fishing illegally.
15.	Protected	2062 BS.	One poacher was arrested by army man and sent to jail for paching Rhinoceros. Now in Jail.
16.	BZ com. forest	2062/9/13	One people was arrested and fixed Rs. 200/- for cutting and smuggling timber illegally.
17.	Wayto village	2063/1/28	four people were arrested timber and 3 bicycles Rs. 500 per person for timebr smuggling.