

1. INTRODUCTION

1.1. Background

Human-wildlife conflict (HWC) is defined as any interaction between humans and wildlife that results in negative impacts on human social, economic or cultural life, on the conservation of wildlife populations, or on the environment. Globally, Human-wildlife conflict (HWC) is a growing problem for communities located at the borders of protected areas (Orga, 2008). HWC takes many forms including crop or property damage, livestock predation and animal attacks on people (Awasthi, 2014; Ogra and Badola, 2008). HWC arises due to crops damage by wildlife, livestock depredation, property losses, human casualty and poaching of wildlife by the people (Ayadi, 2010). Human-wildlife conflict (HWC) is defined as any interaction between humans and wildlife that results in negative impacts on human social, economic or cultural life, on the conservation of wildlife populations, or on the environment. Human-Wildlife Conflict (HWC) or negative interaction between people and wildlife has recently become one of the fundamental aspects of wildlife management as it represents the most widespread and complex challenge currently being faced by the conservationist around the world (Ayadhi, 2010; Awasthi, 2014).

When people occupied or approached to the place/resources, because of the loss, degradation and fragmentation of habitats through human activities such as, logging, animal husbandry, agricultural expansion, and developmental projects, then human-wildlife conflict arises (Fernando *et al.*, 2005). People lose their crops, livestock, property and sometimes their lives on the other hand animals, which are already endangered or threatened, are often killed by the people (Bhatta, 2003). As habitat gets fragmented, the length of 'edge' for the interface between humans and wildlife increases, while the animal populations become compressed in insular refuges (Ayadi, 2010).

Consequently, it leads to greater contact and conflict with humans as wild animals seek to fulfill their nutritional, ecological and behavioral needs (Sukumar, 1990). The rural communities with limited livelihood opportunities are often hardest hit by conflicts with wildlife. The conflict problem is hence a cause for concern that urges managers to shift their conventional policy from that of managing wildlife populations to enhancing their societal values. As such understanding the ecological and socio-economical context of the HWC is a prerequisite to bring about an efficient

and long-term management of wildlife and its habitats. Crop damage caused by raiding wildlife is a prevalent form of human-wildlife conflict along protected area boundaries (Naughton-Treves, 1998).

Conflicts between humans and wildlife are escalating due to increasing human population, loss of natural habitats, and, in some regions, increasing wildlife population as a result of successful conservation programs. Livestock, due to their reduced escape abilities compared to wild herbivores, become especially vulnerable to predation (Nowell and Jackson, 1996). Some species are rapidly losing their habitat and prey species so then they come in the interaction with human and livestock in search of food.

The rural communities with limited livelihood opportunities are often hardest hit by conflicts with wildlife. So, advocating enhancing policy that social value seems to more important along with that of conventional policies (Awasthi, 2014) Interaction between people and wildlife has recently become one of the fundamental aspects of wildlife management as it represents the most widespread and complex challenge currently being faced by the conservationist around the world. As such understanding the ecological and socio-economical context of the HWC is managing wildlife population for addressing conflict problem. Prerequisite to bring about an efficient and long-term management of wildlife and its habitats. If protected area authorities fail to address the needs of the local people or to work with them to address such conflict, the conflict intensifies, becoming not only conflict between humans and wildlife, but also between humans about wildlife (Madden, 2004; Awasthi, 2014).

Human wildlife conflict is a serious challenge undermining the integrity of protected areas in developing countries. Protected areas and such issues as loss of livestock and competition between wildlife and livestock cannot be avoided. People reside within nearly all conservation strategies have been deployed to limit these impact but often assessed (Shapkota *et al.*, 2014). Human wildlife conflict is one of the biggest conservation challenge throughout the world. Human wildlife conflict generated mainly by crop and livestock depredation by wildlife species have always remained a matter of dissatisfaction for the local people (Bajracharya.*et al.*, 2006).

Conflict between human and animals are major problem in many part of Nepal. The damage and destruction caused by a variety of animals to human property and sometimes human life is a real and significant danger to many human communities with the animals often killed, captured or otherwise harmed in relation those conflict

are one of the main threats to the continued survival of many species. One of the main reasons for the conflict is increasing human population and continued loss of natural habitat. Crop damage is very common along the periphery of the parks and reserves in the Terai. In Chitwan National Park, human loss has increased significantly due to human tiger conflict. As a consequence a ten folds increase in human casualties due to the tiger has been reported in the buffer zone since 1988 and similar rise in livestock depredation and financial loss due to the poor people can be expected (Gurung, 2008).

It is very difficult for villagers to understand why wildlife may damage their crops, while they must not kill any wild animals in return they are not convinced of the rationale of protecting forest and wildlife, which they have been utilizing thousands of years (Gautam, 1999).

This study aimed at exploring the human-wildlife conflict in terms of crop damage, livestock depredation and human casualties. Further, it has assessed the compensation perception and tolerance level of the local people to losses caused by wild animal and the roles of different stakeholders in wild animals' conservation through mitigating human-wildlife conflict. The main reason of conflicts arises was seems that between the local people and the reserve area authorities is that government laws restrict access to the park are resources in an attempt to halt natural resource utilization. Many people in the surrounding villages of the SNP depend on agricultural activities in addition to rearing livestock. The losses in the yield of crops and livestock depredation are the problems observed in the study area. Therefore, in order to identify the extent of HWC, People's attitudes towards the wild predator animals in the SNP and to make effective recommendation for reducing and mitigating HWC in study area, a detail study was carried out.

1.2 Human wildlife conflict mitigation in Nepal

Human-wildlife conflict has direct, indirect and opportunity costs. The mitigation of HWC is an important issue in the management of biodiversity and protected area. The management techniques of wild animals are of two types; one of them is the traditional technique followed due to stopping and minimizing the conflict by controlling animal population in different ways and modern methods understanding of ecological and ethological understanding of the wildlife and environment to prevent

or minimize conflict (Awasthi, 2014). Developing effective prevention and mitigation plans for human wildlife conflicts is a top conservation priority in many areas of the world. Understanding human-wildlife conflict (HWC) is important in many countries where solutions to escalating conflicts are urgently required. In particular, knowledge of the spatial and temporal patterns of conflict can help governments and civil organizations to design more effective mitigation plans, based on reliable forecasts and maps of conflict risks.

Practical mitigation of human-wildlife conflict is critical to the success of conservation in protected area and wildlife conservation in Nepal in general. Dozens of mechanisms and strategies have been initiated in an effort to reduce and manage human-wildlife conflicts and provide long-term solution to the prevalent resource use conflicts around and within SNP (Gautam, 1999) However, there has been an increase in the human-wildlife interface problem, with serious consequences for sustainable conservation practice.

A rather different approach to dealing with conflicts between local communities, wildlife and conservation authorities involves changing the attitudes of affected communities to wildlife and the conservation institutions (Western, 1989; Adams and Hulme, 2001; Mackinnon, 2001; Muruthi, 2005).

Potential solution to minimize conflict include electric fencing, land use planning, community based natural resource management, compensation, environmental services, ecotourism, wildlife friendly product, or in field solutions. Meanwhile, the Government has recently promulgated the Revised Guideline 2069 (2012/13) which tries to make clearer for some issues. The Revised Guideline has made a provision of a fund at the Park where immediate relief could be provided and reimbursed from the Ministry of Finance through DNPWC.

1.3. Objectives of the Study

1.3.1. General Objective

The general objectives of the study was to examine the human-wildlife conflict (Piperiya, Bankatti and Nimbhukheda three wards of Bheemdatta Municipality) in Shukla Phanta National Park.

1.3.2. Specific Objectives.

- i) To find out the current situation of human wildlife conflict in Shukla Phanta National Park.
- ii) To assess the amount of crop damage and livestock depredation.
- iii) To explore the methods and techniques adopted by local people to reduce HWC and adaptation of a suitable compensation scheme.

1.4. Statement of the Problem

Human-wildlife conflict has both direct and indirect costs for human beings. It is fast becoming a critical threat to the survival of many globally endangered species. , in particular to large and rare mammals. The numerous cases from buffer villages of National parks and conservation areas all over the Nepal demonstrate the severity of human-wildlife conflict and in depth analysis is essential to understand the problem. Direct contact with wildlife occurs in both urban and rural areas, but it is generally more common inside and around protected areas, where wildlife population density is higher and animals often stray into adjacent cultivated fields or grazing areas And, if solution to the conflicts are not adequate, local support for conservation declines (Ayadi, 2010).And support the conservation prospects of threatened and potentially endangered species. Human-wildlife conflict is one of the main threats to the continued survival of many wildlife- species. Due to the conflicts, result from the predation on livestock and sometimes killing of human in the Sukla Phanta National Park area. Therefore, assessing the loss of human and wildlife is necessary to minimize the human wildlife conflict around National Park area.

1.5. Rationale of the Study

Human wildlife conflict is one of the major focusing parts of management issue in most of the conservation areas in recent years, unless we reduce such conflicts, effective protected area management will not be possible and thus biodiversity may not be effectively conserved. Almost all research findings conducted in Pas of Nepal confirmed that HWC is one of the major problems. There are many research findings available illustrating human wildlife conflict which is one of the major factors creating biodiversity loss due to in harmonium relationship between park area and local people it seems in major protected areas of Nepal. The lack of scientific studies of the conflict animals seems to be a serious problem in formulating effective conflict

mitigation guideline in Nepal (Awasthi, 2014). The SNP is an established protected area in Nepal but exact data on the HWC in this Park was not explored. The consequence of these results will make delay on the formulation of management plan which is lacking in the SNP. The baseline data available during this research will help to develop management plan in SNP for long-term conservation of flora and fauna through harmonious relation between park and local people. Thus this study will come up with major human wildlife issues in the study area so that concerned authorities like, Sukla Phanta National Park will value this major concern of conservation agenda. Human wildlife conflict is a major focus of management issue in most of the conservation areas in recent years, because unless we reduce such conflicts effective management of park areas is not possible and thus biodiversity may not be effectively conserved. Thus this study will come up with major human wild animal issues in the study area.

1.6. Limitation of the Study

This research has been conducted for the requirement of Master's degree and has its time boundary. Every study needs sufficient time to explore and find ground reality relating to the specific field. Some limitations faced during this study were given below;

- Behavior pattern of the wild animals could not be collected.
- Night observation could not be done.
- Financial Constriction

2. LITERATURE REVIEW

2.1 In global context

Siddiqui and Chaudhary (1987) analyzed the forest department data and found 554 human casualties in Bangladesh for a period of 28 years between from 1956-1983.

Sangay and Verne (2008) revealed that tiger (*Panthera tigris*), common leopard (*Panthera pardus*) snow leopard (*Uncia uncia*) and Himayan black bear (*Ursus thibetanus*) killed 1375 variety of domestic animals (cattle horse, shep yak) where only leopard killing significantly 70% total killed in two year period (2003-2005) in Bhutan.

Mishra (1997) conducted a study in Kibber Wildlife Sanctuary, India showed livestock depredation by large carnivores such as Snow Leopard, Wolf etc. The study conducted in three villages (80 household) attributed to total of 189 (18% of total livestock holding) livestock depredation during 18 months. There villagers have been killing the Wolf though apparently not the Snow Leopard. The result showed that there was a need of immediate efforts for addressing the human-wildlife conflict.

Geisser and Reyer (2004) reported that Wild Boar populations and damages were increasing throughout Europe. Since, 1980, populations of Wild Boar (*Sus scrofa*) had increased over the species entire European range. This increase has led to conflicts because Wild Boars cause crop damage amounting to several million U.S. dollars every year.

Schley *et al.* (2008) mentioned that in many European countries suffered by Wild Boars (*Sus scrofa*) for crop damage. During the 10 year period in Luxembourg an area of 2586 square km in western part of Europe 13,276 cases of agriculture damage by Wild Boar was reported.

Dickman (2010) addressed the issue of human-wildlife conflict, which was one of the most critical threats facing many wildlife species, and now days the topic is receiving increasing attention from conservation biologists. Direct wildlife damage is commonly cited as the main driver of conflict, and many tools exist for reducing such damage.

Hafeez *et al.* (2011) studied that in the Pakistan, *Hystrix indica* had been identified as a serious pest of traditional as well as non-traditional crops, fruit orchards, vegetables, flowering plants and grass. Crops of economic importance such as wheat, maize, sugar cane, groundnut and melon were severely damaged in the irrigated plains and

rain-feed pothohar belt. Among the vegetables, okara, pumpkin, bitter ground and onions were badly damaged. Porcupine damage was found in 41 fields wheat crops out of 105 fields.

Musiane *et al.*, 2013. Human–wildlife conflicts occur within the context of a complex social–ecological system influenced by a wide variety of social, economic and political forces. Management responses to human–wildlife conflict are based on certain assumptions and perceptions that form the mental models of this system.

Kala and Kothari (2013) studied the livestock depredation by common leopard in Binjar wildlife sanctuary for 14 year period. The study revealed that loss of one human 1763 livestock predation and nine injuries by common leopard. The conflict between human and leopard due to scarcity of prey and habitat destruction.

2.2 In National Context

A) Crop damage

Milton and Binney (1980) the main reason that arise conflicts between the local people and the park authorities is that government laws restricted access to the park resources in an attempt to halt natural resource utilization (Sharma and Shaw, 1993). However, the park has become a very good sources for villagers to fulfill their resources needs through veneering into illegal poaching, logging and hunting which directly conflict with the park objectives.

Jnawali (1989) studies the case of human harassment and crop damage by greater one horned rhinoceros in Sauraha Area adjacent to CNP. The economics loss was reported Rs. 1,72,000 of which 68.6% accrued within distance of 500m. Highest economic loss 27.6% accrued to rice.

Gautam (1999) reported heavy economic loss of Rs. 9,47,470.19 was estimated due to damage of agricultural crop by wild animal in the buffor zone area of Shukla Phanta National Park. Among the wild animal, wild elephant (*Elephas maximum*) was found to be economically serious part spas (43.29%) followed by wild bear (*sur scrofa*) which contributed loss of 28.075% and Chital (*axis axis*) cause loss of (24.05%). Among farmer suffering wild animal damage the economic loss was estimated from Rs. 731.20 to Rs. 1,346.85 her house hold.

Baral (1999) studied wild boar main conflict in BNP estimated a heavy economics loss Rs. 2095, 341 of which 52.73% occurred in Thakurdwara and 47.27% in

Shivapuri. Highest economic loss (28.32%) occurred to paddy crops followed by potato (15.4%) maize (15.2%) wheat (19.80%), mustard (12.42%) and yam(7.57%).

B) Livestocks depredation

Tamang and Baral (2008) studied livestock depredation by large carnivore was a serious issue and a major source of park–people conflicts in BNP during 6 year period (1993-1998). A total 442 of different animals were lost out of which Cattle were the highest contributing to 52.9% with economic loss was contributed to 47.9%, incurring the total economic loss of US\$11,709.53.

Awasthi (2014) reported that in the Gaurishankar Conservation Area, Nepal local people suffered from economic loss due to the livestock depredation, crop damage. The projected total value of crop yield losses and livestock loss due to wildlife damage in study area is about Rs. 20,70,806 (US\$ 21,422.5) and Rs. 13,20,495 (US\$ 13,659.8) respectively during one year period. Four human were injured by Himalayan Black Bear attacks between 2010 and 2014. The main predator for livestock loss was leopard followed by Grey wolf, Jackal, Himalayan yellow throated martin, and Jungle cat and crop damage was monkey followed by porcupine, Goral, Barking deer, Jackal and Bear.

C) Park people relation

Sharma (1991) mentioned that following issues were responsible for conflict between Chitwan National Park (RCNP) and local peoples in the research: Fire wood shortage, scarcity of fodder, shortage of grazing land, crop damage and livestock depredation by wild animals.

Adhikari (2000) reported the conflict accrued between local people and park authority. When donot get co-operation against loss of crops, property and human casualties. Many problems created due to reserves are such as crop damage, human harassment and penalty.

Allendorf (2007) stated that understanding people's beliefs and attitudes towards protected areas was a key factor to developing successful management plans for long-term conservation of those areas. Peoples negative perception about protected area were the results of various factors such as economic, social and other factors include prohibition in extraction of wood, fodder and thatch, crop damage, livestock

depredation, lack of grazing facilities for animal; and inability to kill animals when they entered the croplands.

Regmi *et al.* (2013) reported that it was obvious the purposed of the park did not appear to be an area of conflict between the park administration and local population but the degree of commitment to their purpose was less strongly held by local people towards park management was negative due to mainly to the negative impacts of wildlife damage and lack of compensation. There is still a long standing conflict situation prevailing between resettles and reserve authority.

D) Human casualties

Gurung (2008) reported that thirty six tigers killed 88 people during the 28 year period. The trends of human loss increased significantly. As a consequence, ten- folds increase in human casualties due to tiger has been reported in the buffer zone since 1998 and similar rise in livestock depredation and financial loss to the poor people. People who are living near the park area tend to have lowest income.

Karki and Rawat (2014) reported several incident of human calculation by leopard in recent two year 18 human were killed and 3 injuries by leopard during (June 2011- Feb 2014) 27 month period within 7VDC The problem of human leopard conflict has researched serious level in Baitadi district of Far-western Region of Nepal.

3. MATERIALS AND METHODS

3.1 Study Area

3.1.1. Sukla Phanta National Park

Shukla Phanta National Park was established as a hunting reserve in 1969. During early day's forest and grassland areas of Western Terai region were famous hunting site for the rulers of Nepal (Bhatta and Shrestha, 1977). The reserve also had been a famous hunting area for many years and was declared as Royal Hunting Reserve with an area of 131 km² in 1969 (Yadav *et al.*, 2000). The area was then gazette as a National Park in 2017, covering an area of 305 square km, developed as the prime habitat of swamp deer. The Shukla Phanta National Park is a protected area in the Terai of the Far-Western Region, Nepal, covering 305 km²(118 sq mile). A small part of the reserve extends north of the East-West Highway to create a corridor for seasonal migration of wildlife into the Siwalik Hills. Syali River forms the eastern boundary southward to the international border with India, which demarcates the reserve's southern and western boundary. The area of 243.5 km² surrounding the park was declared as buffer zone in 2004 to interact with local people for conservation. Shukla Phanta wildlife reserve was declared as Shukla Phanta National Park in 2073/09/07.



Map of Shukla Phanta National Park, Kanchanpur, Nepal

Buffer Zone Profile

| | |
|---|---------------|
| 1. Buffer Zone declared: | 2004 A.D. |
| 2. SPWR Area | 305sq KM |
| 3. Buffer Zone Area (km ²): | 243.5 sq. K.M |
| 4. Buffer Zone Community Forest: | 32 |
| 5. Buffer Zone/VDCS: | 12 |
| 6. Buffer Zone User Group: | 501 |
| 7. Buffer Zone User Committee: | 09 |
| 8. Buffer Zone included wards: | 61 |
| 9. Buffer Zone Households: | 22,413 |
| 10. Buffer Zone Population: | 1,43,395 |

Source: BZMC, Sukla Phanta National Park, 2017.

The vegetation of the reserve is tropical and sub-tropical forest types with saal (*Shorea robusta*) forest constituting about 90% of the vegetation. Khair (*Acacia catechu*), Sisoo (*Dalberia sisoo*) etc are also found in reserve area. An estimated 665 species of flora have been recorded. The number of faunal species are 43 mammal species, 503 birds, 21 species fish numbers (Bhujju *et al.*, 2007) and 31 species of butterfly (Sah *et al.*, 1999).The soil is primarily composed of gravel and conglomerate, making at very susceptible to erosion. Park forest are also found with khair, and silk cotton tree, pine are also find. Endangered species include wild Asian Elephant, Royal Bengal tiger, sloth bear and leopard. My study area Piperiya, Bankatti and Nimbhukheda in Kanchanpur District in the Mahakali Zone of south-western Nepal. . Mainly Brahmins, kshetris mostly western community. The main Language is Doteli.

3.2 Climate:

Climate of this region is subtropical monsoon with mean 1579mm that occur from June 10 September and as higher in August. The winter month of December and January are fairly cold with day time temperature (7-10)⁰ C and from February. Onward temperature rise upto 25⁰ C in March and 42⁰ C by and as April (NTB 2016)

3.3 Flora

The reserve is comprised of mainly Sal forest the other vegetation type includes Khair Siva forest Grassland and Marsh Vegetation.

- a) Sal Forest: Sal (*Shorea robusta*) Forest in predominant mixed with *Iterminalia arata*, Bombar ceiba
- b) Khair Sisso forest: Khair (*Acacia catechs*) and sisso (*Dalbergia sissoo*) are dominant along the river side area.
- c) Grass land (Phanta): The reserve was established on account of tall grass land (locally known as phanta. The main grass species includes *Imperata cylindria* and *Heteropagon contortus* which are extensively used by local people.
- d) Marsh Vegetation: On wetland such as Ranital, Shikarital dense grasses are Karka.

3.4 Fauna:

The reserve provides important habitat for variety of wildlife. The last surviving population about 2000 individual of swamp deer around 50 wild elephants and 30 tiger, other animals spotted deer (*Axis axis*), hog deer (*Axis parnicos*) leopard (*Panthera pardus*), hispid hare (*Caprdalaeque hispidis*), wild elephant (*Elephant maxims*), Tiger (*Panthera tigris*), Barking deer (*Montiacus montjack*), Back buck (*Antelope Cervicapra*), Rhesus Monkey (*Macca mulata*). Among birds grass Owl, Fly catchers, Crane, Reptiles like Marsh mugger, Crocodile, Cobra, Indian python and Monitor lizard have recorded in the Park (NTB 2016).

3.5 Geology and soil

Common soil type are loamy sand, sandy loam and clay loam khair, sisso forest associated soil is sandy mixture with small gravel and stone with PH of 7.4 whereas the soil of miscellaneous forest around grassland is sandy-loam but slightly alkaline (Bhatta, 1988) in predominant Sal forest area soil vary from loam to sandy loam with light acidity.

3.2. Materials:

In the study period different materials were used.

1. Questionnaire
2. Camera
3. Measuring tapes

3.3. Research Methods

3.3.1. Reconnaissance Survey

Reconnaissance survey was made on the month of January 2016. During this survey period, based on the NTNC staff's recommendation a key informant discussion was made to identify the core conflicting area of Shukla Phanta National Park, further necessary secondary information related to human wildlife conflict were collected.

3.3.2 Data Collection:

The study was based upon the primary and secondary data. The primary data were collected through household questioner survey, interview with park authority and field observation.

3.3.2.1 Primary data collection:

Participatory rural appraisal (PRA) was applied for the collection of primary data as given below:

3.3.2.1.1 Household questionnaires' survey:

A set of questionnaires' were developed to collect data from local community of the selected study area. The majorities of question were in multiple choice form and were verified by the supervision to make them suitable for the field situation. The questionnaires' survey was used to collect status of human wildlife conflict in the study are, crop damage and livestock depredation the ability status of natural resources. Household questionnaires' survey were conducted to gather information about human wildlife conflict in the SNP during the time of field survey.

3.3.2.1.2 Key informant survey:

Key person interview were conducted exclusively with those who were available during household survey. The interviews were conducted to the status of human-wildlife conflict in their area, their role in mitigating the conflict and to know the causes of conflict management and their role in conflict management especially for local research, local politician interview were conducted.

3.3.2.1.3 Focus group discussion:

During the field survey focus group discussion were organized forming two focus group at ward no.13 Piperiya and ward no.15 Nimbhukheda. The main objective of the group discussion was to collect varieties of information regarding the status of conflict, causes of conflict, conflict management and their role in conflict management also for verification of the information collected from questionnaires' survey.

3.3.2.1.4 Direct observation:

Crop damage and livestock depredation were assessed through direct observation and household survey. Various livestock become incident due to wildlife damaged experienced by the local people were explored along with assessing the adopted coping strategies crisis management strategies by local people.

3.3.2.2 Secondary data collection:

The secondary data were collected through different literature and journal report and work for general information data were collected through different relevant institution like WWF, NTNC, DWPWC, CDZ and Human population data was obtained from CBS for this research different website was consulted and the important document related to human wildlife conflict were downloaded from the internet. On the research related different experts were contact and various fact human wildlife were collected and noted.

3.3.3. Sampling of Household Survey

Of the 19 wards, 3 were selected. From these 3 wards, approximately 7 % of the total households were chosen using a random selection process. These numbers were later selected using a random number table. The lists of households were achieved from the

buffer zone office at SNP. The total numbers of households selected by the random selection process in each Wards represented in the following table:

Table 1. Household sampling

| SN | Municipality | Sampled HH Number | Total HHs | Sampling intensity % |
|----|-------------------------|-------------------|-----------|----------------------|
| 1 | Ward no.13(Piperiya) | 52 | 698 | 7.44 |
| 2 | Ward no.14(Bankatti) | 52 | 744 | 6.98 |
| 3 | Ward.No.15(Nimbhukheda) | 56 | 882 | 6.34 |
| | Total | 160 | 2227 | 6.92 |

Geographically, 52 (32.5) respondents from Piperiya, 52(32.5%) from Bankatti, 56(35%) from Nimbhukheda were included.

Table 2. Age wise distribution of respondents

| Age Group | No of respondent | Percent |
|-----------|------------------|---------|
| 18-36 | 28 | 17.25 |
| 36-54 | 74 | 46.25 |
| 54-72 | 56 | 35 |
| Above 72 | 2 | 1.25 |
| Total | 160 | 100.0 |

3.3.4. Data Analysis

The quantitative data obtained from the field was first coded, then the data entry process was done using an appropriate computer package, namely “Statistical Package for Social Sciences (SPSS)”, which facilitates the process of data analysis in a more precise and appropriate way (SPSS, Version 16). Simple statistics such as percentage and frequency count were used to analyze the data gathered from the household survey. Microsoft Excel was also used. The data was presented in descriptive form as well as in suitable table, pie chart and tabular form.

Crop loss calculation:

To find per household crop loss in Kg;

$$\text{Per household loss in Kg} = \frac{\text{Total loss of crop in Kg}}{\text{Total number of surveyed household}}$$

$$\text{Per household loss in NRs} = \frac{\text{Total loss of crop in NRs}}{\text{Total number of surveyed household}}$$

Livestock loss calculation:

$$\text{Total livestock holdings} = \frac{\text{Total number of livestock}}{\text{Total number of surveyed household}}$$

$$\text{Per household livestock loss} = \frac{\text{Total number of livestock loss}}{\text{Total number of surveyed household}}$$

The economic values of livestock were calculated on the basis of the local market rate of the crops and livestock. To understand the relationship between the in the wildlife conservation to wise and occupation and people's knowledge in compensation to their occupational and genders was applied. Results were presented in bar diagrams, frequency tables and pie charts.

4. RESULTS

4.1 Current situation of Human wildlife conflict in SNP

4.1.1 Character of Respondents

Out of total 160 household heads interviewed, 60.62 % were male and 39.38% female. They included (36.87%) of Kshetri, 25.62% of Brahmin, 20.63% Janajati, and 16.88% of Dalit. The total population was 933, the males were 507 and females were 426. The total agricultural land of those families were 685 Katta. The average agricultural land per HHs was 4.28 Katta.

4.1.2 Problems from wild animals

Among 160 household 144(90%) faced crop damage and livestock depredation problems from wild animals. The main responsible animals of crop damage were wildboar chital, elephant, monkey etc. Tigers, Jackal found involved in livestock depredation.

Table 3: Problem from wild animals

| | Yes | No | Total |
|------------------------------------|---|-------------|-------|
| Problem from park animal N=160 | 90% (144) | 10% (16) | 100% |
| Cattle loss due to carnivore N=160 | 51.25%(82) | 48.75% (78) | 100% |
| Crop damage N=160 | 84.37(135) | 15.63%(25) | 100% |
| Human Casualties | 1 died and 4 person injured due to wild boar attack | | |

4.1.3 Level of Conflict

The study revealed that among 160 respondents 86(53.75%) of respondents answered that the status of human wildlife conflict in this area was high, 42(26.25%) of respondents answered that the conflict was moderate 30(18.75%) of respondent answered that the problem was general and 2(0.6%) did not reply for those questions.

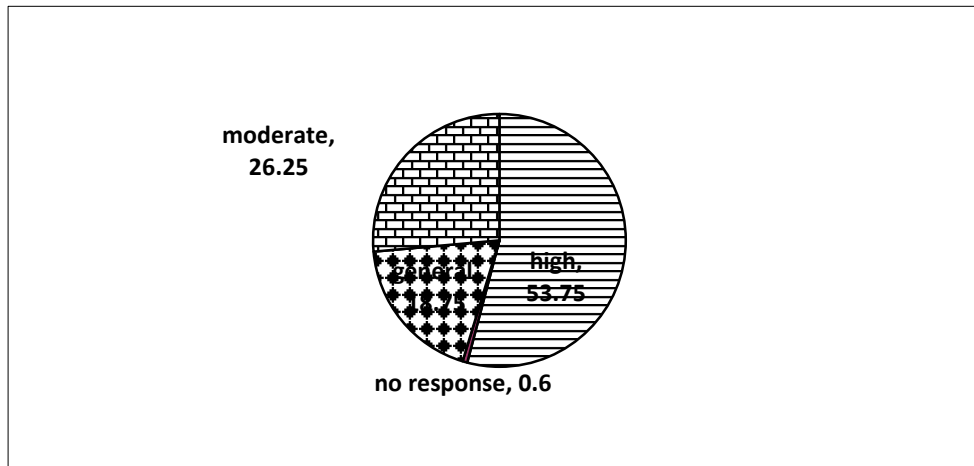


Figure 1: Level of human wildlife conflict (n=160)

4.1.4 Conflicting zone

The result showed that among 160 respondent 146 (91.2%) of respondent answered that conflict was high inside the SNP while 9(5.6%) of respondent expressed that the conflict was more in boarder of SNP and rent respondent 5(3.2%) were unknown where the conflict was high. The data attacking human showed that cases accrued inside the SNP.

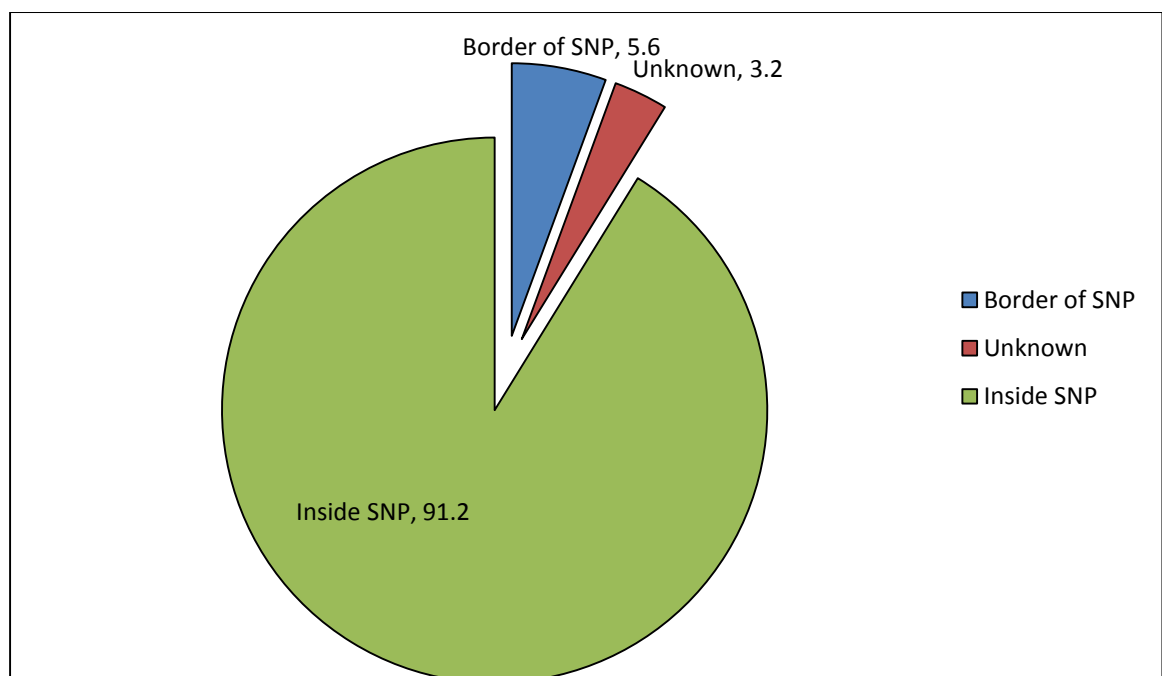


Figure 2: Human wildlife conflicting zone (N=160)

4.1.5 Crop damage:

The major part wild animals were wild boar, monkey, elephant, barking deer and hispid hare crop wise major part animal are given follow:

| Name of crop | Damage responsible animals |
|--------------|---|
| Wheat | Wild boar, elephant, barking deer. |
| Paddy | Wild boar, mouse, elephant, barking deer. |
| Maize | Monkey, Jackal, wild birds etc. |
| Potato | Monkey, wild boar |
| Others | Monkey, Jackal, Mouse, hares etc. |

4.2 Amount of crop damage and livestock depredation

4.2.1 Quantitative description of the crop damage in different wards

According to the table maximum crop damage found of the paddy that was equal to approximately NRs 4,09,600 quantity per annum. Whereas average annual loss of total crops in the study area is high similarly potato, maize other crops depredated by wild life in monetary value has been illustrated in the table below:

Table 4: Average crop damage in kg and monetary value of damage per year in the study area.

| S.NO. | Name of crop | Harvested kg | Damage kg | Damage Rs. | Damage in US\$ | % of crop damage |
|-------|--------------|--------------|-----------|------------|----------------|------------------|
| 1 | Paddy | 96000kg | 32,640 | 718080 | 6587.88 | 34% |
| 2 | Wheat | 128000kg | 30,720 | 860160 | 7891.37 | 24% |
| 3 | Maize | 27486.4 | 5057.5 | 101150 | 927.98 | 18.4% |
| 4 | Potato | 14000kg | 1764 | 44100 | 404.58 | 12.6% |
| 5 | Other | 13,775 | 1515.25 | 31875 | 292.43 | 11% |
| Total | | 2,79,261.4 | 71,696.75 | 17,55,365 | 16104.24 | 100% |

Source: Field study 2016

Among different crop damaged by wild animal paddy has become the prominent crop in 3 wards of the study area. It is Piperiya ward no. 13, which suffer from both paddy and wheat damage of 13732kg per annum and 12372kg per annum respectively.

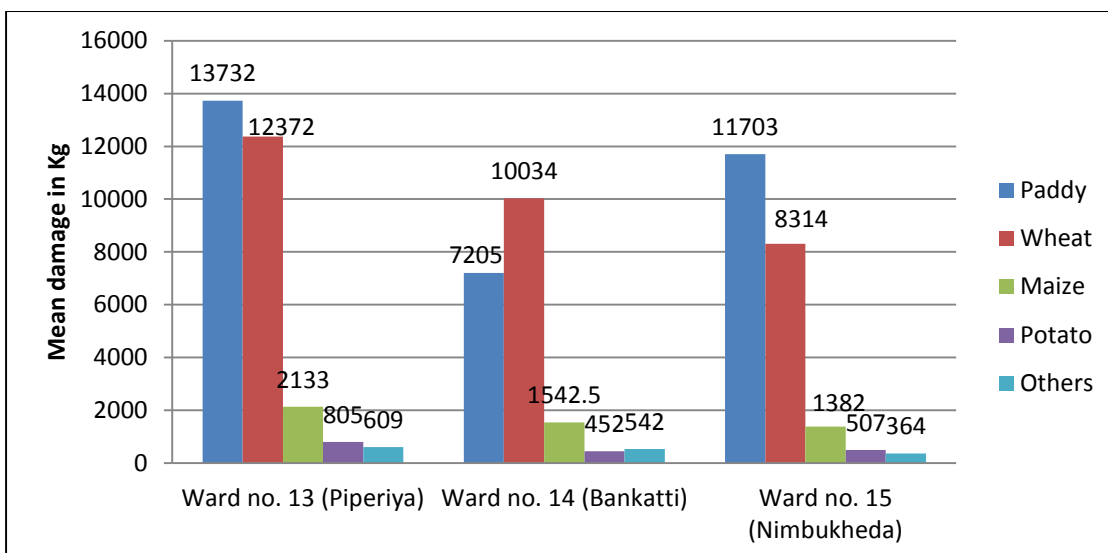


Figure 3: Comparison mean damage of different crop (in kg) in different ward.

Similarly the Piperiya of ward no. 13 had the highest monetary loss of crop of NRs 842,969 (7,71,4.55US\$) Whereas ward no. 14 of Bankatti had the lowest crop damage of NRs 4,84,005(4,429.44US\$) in the study area. The average monetary loss of different crop varieties per household per annum in the study area NRs. 11,648.83 (106.60 US\$)

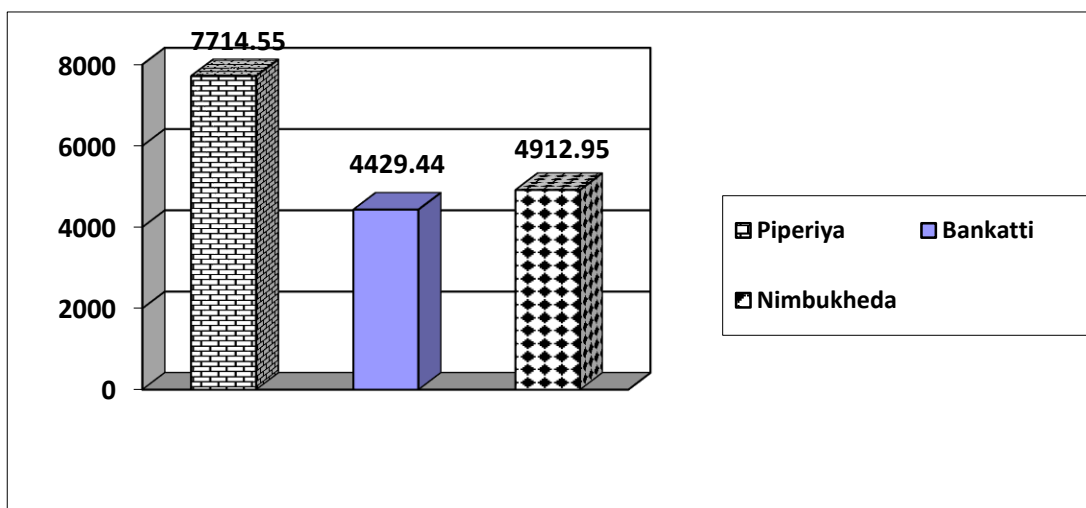


Figure 4: Monetary value in (USD) of different crops loss in different wards.

The Piperiya ward no.13 had higher per HHS loss of different crop per annum (549.09kg) followed by Nimbukheda of ward no.15, of 428.28kg per annum per household ward no. 14 of Bankatti had lowest per HHs loss of 340.56kg per annum.

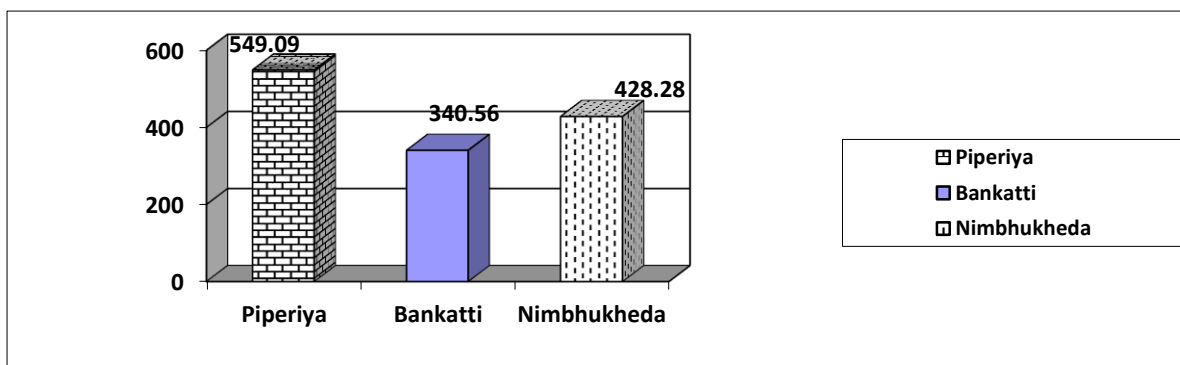


Figure 5: Crop damage per household

4.2.2 Reason of wildlife visit to the crop field

This study revealed that out of 160 respondents 87(54.4%) respondents said that wild animals visited crop field because the forest could not fulfill their requirement 37(23.1%) respondent said that wildlife entered crop field because animal liked field crop, remaining 18(11.2%) respondent other cause (chasing by wild animal lack of appropriate boundary wall etc.) and 11(6.9%) respondents replied that they come to change the taste and 7(4.4%) respondent said that they were unknown for the causes of wildlife visit to the crop field.

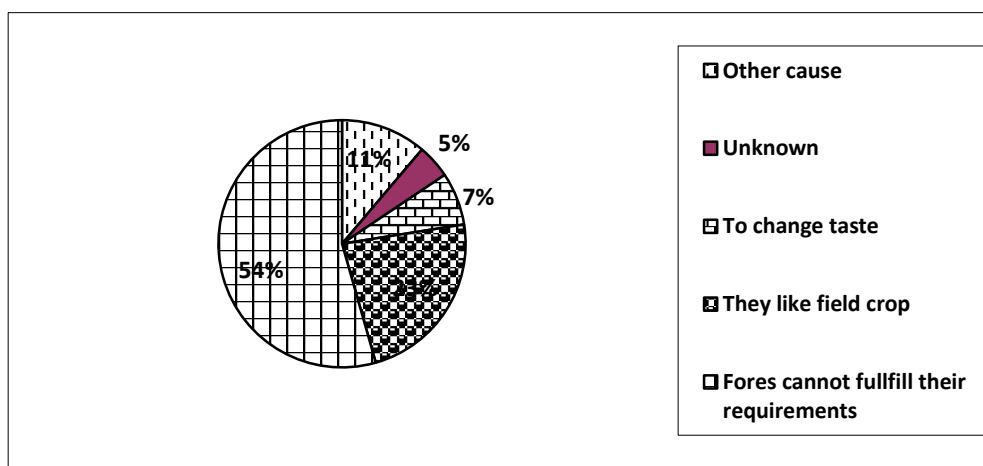


Figure 6: Reason of wild animal visit in crop field (N = 160)

4.2.3 Preventive measures

Preventive measures adopted by local people for crop protection and effectiveness:
 The local people had adopted different protective measures to divert wild animals feeding on crop and drive away to reduce the crop damage. Pest wise protective

measures for different animal were made as, wild boar: guarding making loud sound threatening etc.

(ii) Elephant guarding making loud sound etc.

(iii) Monkey making false human structure Mukunda ,guarding, threatening etc.

(iv) Deer, Guarding, threatening, making loud sound but it wasn't significantly effective because of preventive techniques used by local people to prevent wild animals visits to crop field. So, the local's had to guard overnight on the wood constructed platform. If the farmer knew that if the wild animal were visiting to their crop field at this time they make noise to drive them away. One of the popular method of scaring wild animal was making scare crow (Mukunda) in the cropped field scare crow is of figure resembling a person that dressed in old cloth. It is easy to make buy few sticks and old cloths 50(25%) of the respondent made in their crop field. Similarly, making loud noise 'Ho-Ho, Ho-Ho' is an effective method in chasing wild animals.

The study revealed that out of 160 respondents 44(27.5%) Said that they adopted day night guarding method crop damage 36(22.5%) respondent said that they adopted scaring malaria, 33(20.7%) respondents adopted throw and threatening, 20(12.5%) respondents adopted noise making and remaining 27(16.8%) respondents adopted nothing against crop damage.

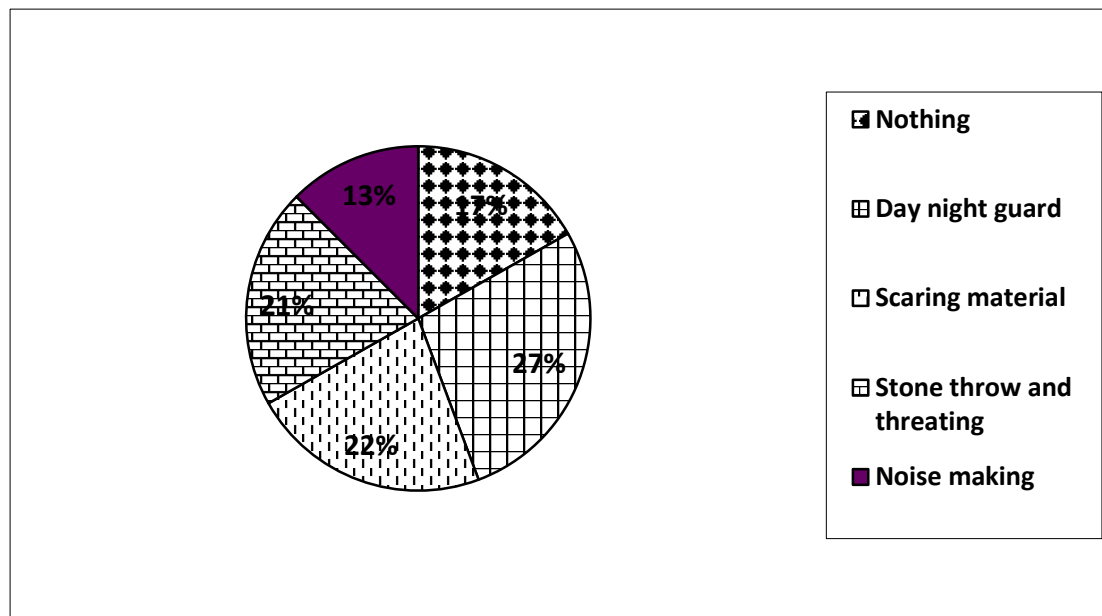


Figure 7: Method adopted by local people against crop damage (N=160)

4.2.4 Livestock Depredation

The farmer in the study area mainly depends upon the agriculture and season labour works. Among them many households keep cows, 3 goat and (3-5) chickens and a pair of ox for plowing. The livestock depredation occur most in the spring and summer season (Chaitra to Asoj). And different crop were cultivated in this season, but loss of chicken was found in all of the season. From questionnaire's survey it was found that most of the predation by wild animal found in the rainy/summer season, various type of predator were responsible for depredation of livestock and avian stock tiger (*Panthera tigris*), Jackal (*Canis aureus*).

4.2.5 Livestock holding

Among the respondent, 153 householders (95.6% held different type of livestock were buffalo (*Bos bubailis*), cow/ox (*Bos Taurus*), Goat (*Capra hircus*), Pig (*Sus domesticus*), chicken (*Gallus domesticus*), cat (*Felis catus*), Dog (*canis lupus familiaris*). Only 7(4.4%) respondents had no livestock (figures 8).

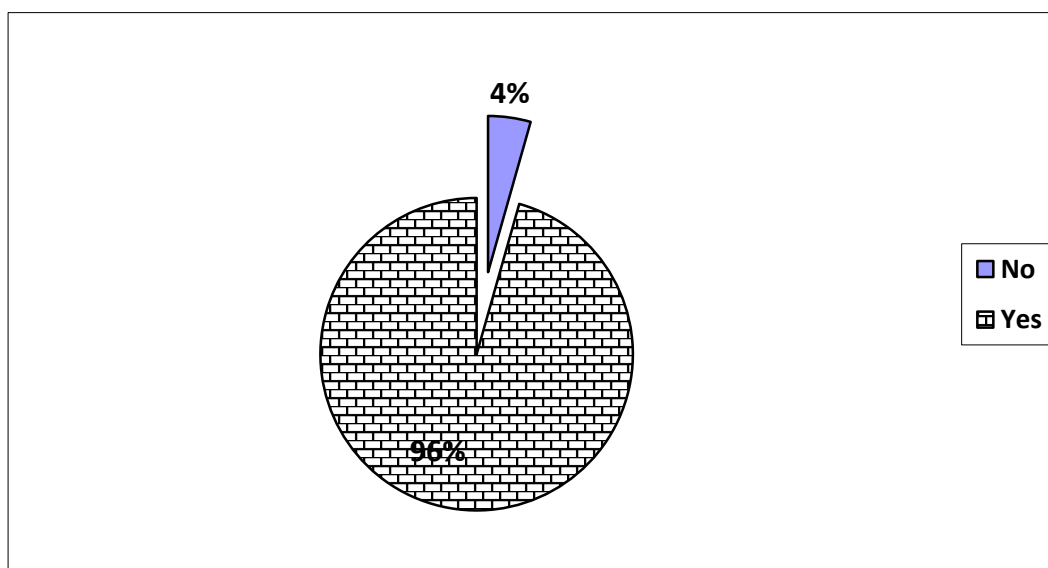


Figure 8: Livestock holding in the study area (N=160)

4.2.6 Types of livestock losses

The wildlife had the hardest hit for livestock depredation in the study area which included livestock like cows, buffalo, ox, goat, dog and avian stock like chicken. The total 503 livestock and avian stocks were killed during last 2 year (13 Livestock and

255 avian stock) 193 Chickens and 38 were goats, 2 cow/ox 2 dogs. Leopard and jackal are responsible for livestock depredation.

| | |
|------------|----------------|
| Cow and Ox | Leopard/ Tiger |
| Goat | leopard/Jackal |
| Chicken | Leopard |
| | Jackal |

4.2.7 Economic Value of Livestock loss

Average annual economic loss from livestock depredation was found to be NRs 8,30,000 (7614.67US). The average loss per household was NRs. 5,187.5 (41.59 US). Livestock depredation prevalence around SNP wasn't uniform. Some ward had higher economic loss than other from figure Piperiya ward no. 13 has highest average loss of livestock per household NRs 7,592.6 and ward no. 15 Nimbhukheda had lowest average loss of per household was NRs 3,750 (34.40US). Same as Piperiya ward no.13 had highest average loss or avian stock per household NRs. 1,365.3 (US 12.49)

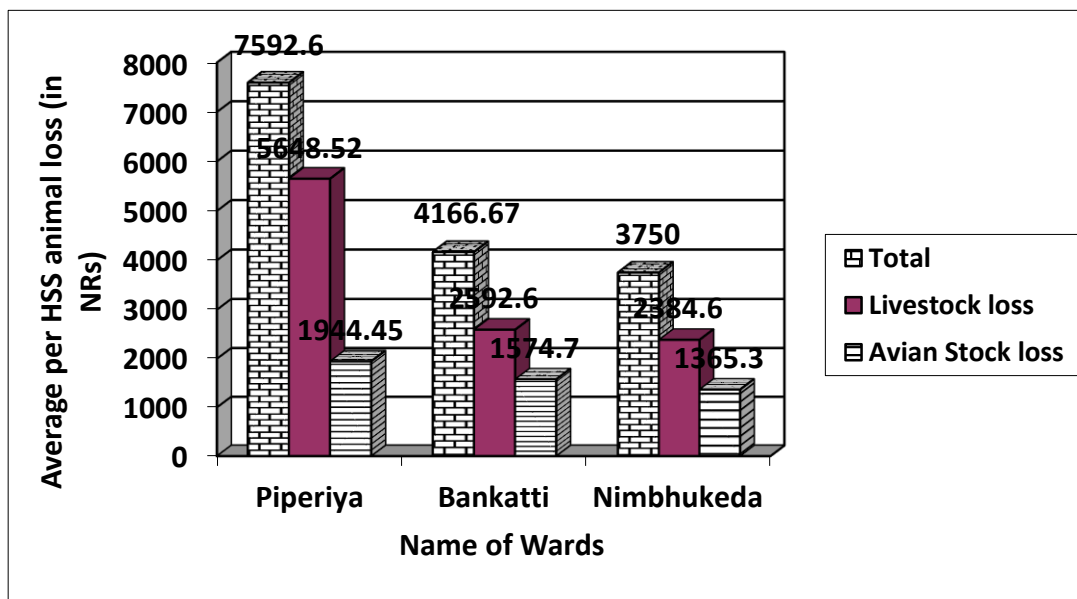


Figure 9: Average annual loss (In NRs) for domestic animal (Livestocks/Avian Stock) per HHs for different wards

Livestock loss in descending order in different wards: Piperiya (Ward no.13) > Bankatti (Ward no.14) > Nimbhukheda (Ward no.15).

Leopard contributed to the highest amount of NRs 4,50,000 (4128.44US) economic loss of livestock depredation where wolf contributed to the lowest amount of NRs.

14,000(128.44US) economic value depreciation of livestock. Similarly, Jackal contributed to the highest amount of NRs. 2,43,000(2229.35US) economics value deprecation of avian stock and the unknown species contributed to the lowest amount of NRs. 18000(165.13US) economics value deprecation of avian stock (figure 10)

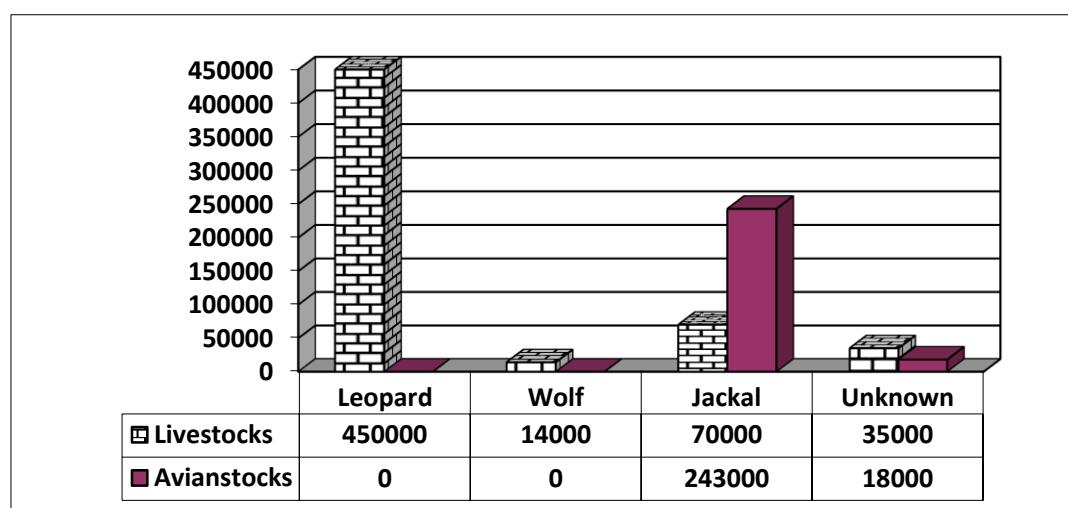


Figure 10: Mean animal loss (Livestock/avian stock) (In NRs) contributed by different pest animal in study area.

Table 5: Estimating economic loss for livestock deprecation in the study area (Average per year)

| | Livestock/A vian stock | No. of Killed | Total loss in NRs. | Total Loss in US\$ | Remarks |
|-------------|---------------------------|------------------|-----------------------|-----------------------|--|
| Livestock | Cow | 3 | 60000 | 550.45 | The rate of line stock and avian stock calculated based upon the villagers information during field visit time in the study area |
| | Ox | 2 | 30000 | 275.22 | |
| | Buffalo | 2 | 100000 | 917.43 | |
| | Goat | 52 | 364000 | 3339.44 | |
| | Dog | 3 | 15000 | 137.61 | |
| Avian Stock | Chicken | 240 | 26100 | 239.44 | |
| Total | | 302 | 830000 | 7614.67 | |

The average annually total 302 livestock and avian stock were killed by wild animal in the study area. Total cost of the animal was NRs. 8,30,000 (7614.67US\$).

4.3 Preventive Measure for wild animal against livestock depredation.

The results showed that most of the respondents in the study area had not adopted any preventive method against the livestock depredation. Out of 153 HHS 133 (86.9%) respondents had not adopted any precautionary measures towards the wild animal, the rest respondents were following different preventive measures, 9(5.9%). Dog watching, 4(2.6%) keeping cowherds for preventive measures against the livestock depredation by wild animals (Figure 11)

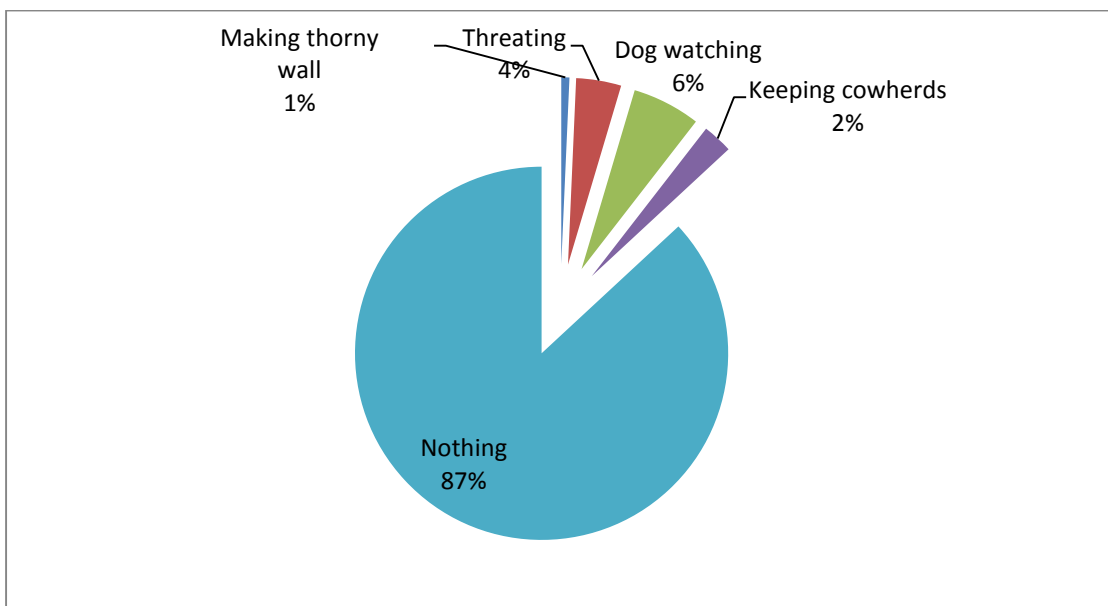


Figure 11: Preventive measure against wildlife damage (N = 153)

4.3.1 Benefit from wild animal

Among 160 respondents, 43(26.9%) of total respondents answered that there were not any benefit from wild animal conservation, rest of the respondents answered benefit from wild animals, 57(35.6%) said the support for tourism, 29(18.11%) said biodiversity balance 11(6.8%) did not know about the benefit from wild animals and 7(4.3%) respondent did not give any answer of this questions (Figure12)

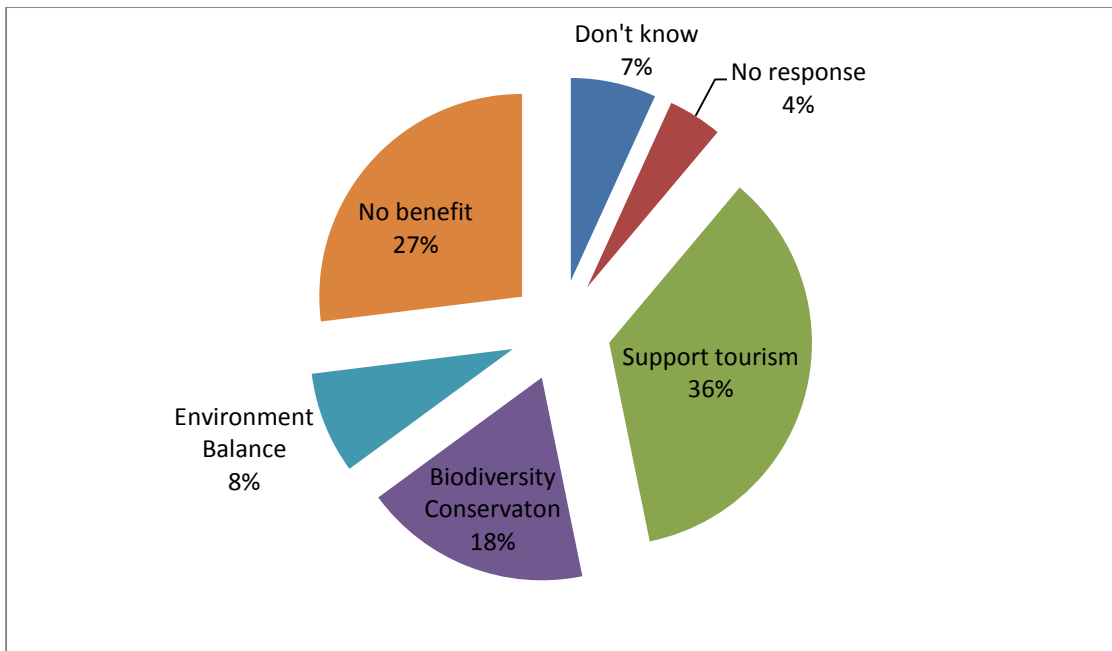


Figure 12: Benefit from conserving wild animals (N=160)

4.3.2 Compensation Schemes

More than 90% of households around the SNP area experienced crop damage and livestock depredation and were not receiving any compensation for their losses. A large number of people were unaware about benefit of present governmental compensation schemes. Among 160 respondent 87(54.87%) respondent know about compensation and remaining 73(45.63%) respondent unaware about compensation only 11(12.65% n=87) respondent received some relief fund from the office of SNP and 76(87.35% n=87) not received any amount of compensation other animals like deer, monkey were common and damage by those animals couldn't be included in compensation

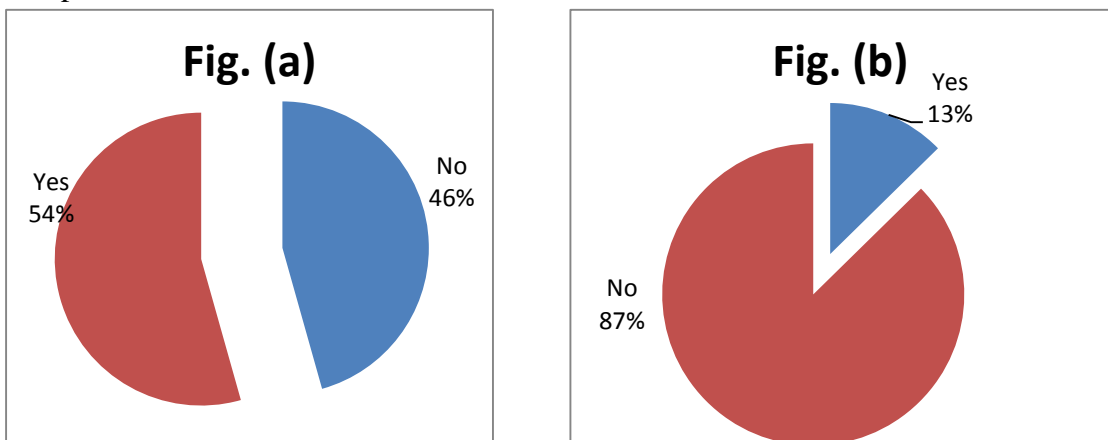


Figure 13. (a) Local people knowing compensation (N=160) (b) Receiving compensation (N=87)

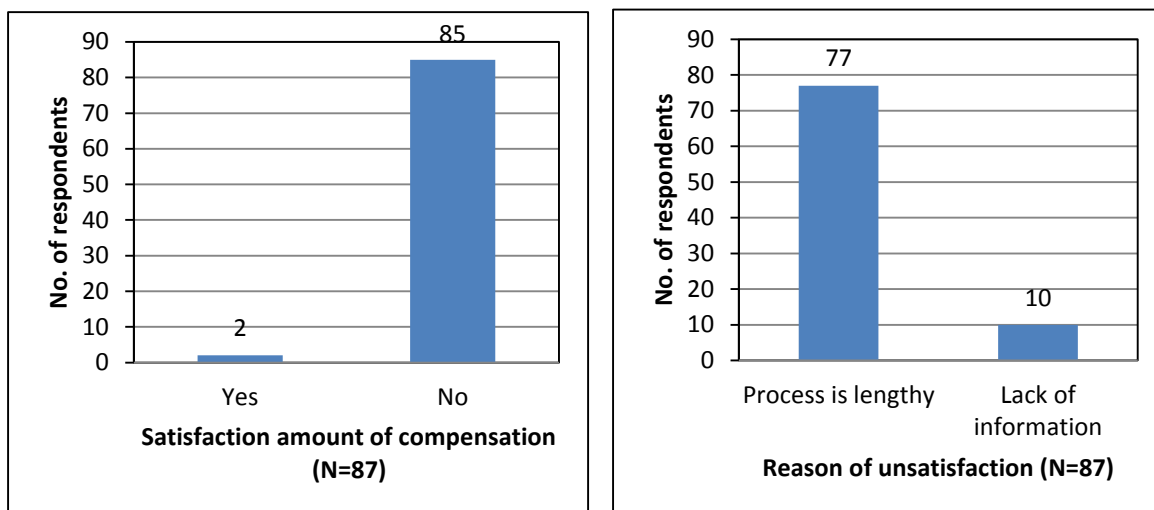


Figure 14: Satisfaction amount of Compensation Fig (a) Reason of unsatisfaction
 Among 87 respondents almost all of the people 85(97.7%) weren't satisfied with present compensation process. The reason of dissatisfaction among 87 respondents. 77(88.5%) was lengthy compensation process and 10(11.5%) due to lack of information from office of Shukla Phanta National Park.

4.3.3 Human Casualties

In the SNP five human casualties had been taken place during two year period. Out of 5 victims, 2 were males and three were females because female often visit park for grass cutting so they were attacked more. Ages of victims ranged from 21 to 52 years. The data obtained from field for human casualties from the SNP were verified through key-person interviews with BZMC member personnel and Park area conservation officer. In the study period one people died and four people were injured due to wild animal (Wild boar) attacks. The died person and one injured person was attacked at Piperiya (Ward no 13) and two was at Bankatti (Ward no 14) and one was in Nimbhukheda (Ward no 15). Survey was not done for the whole park area (Table 6)

Table 6: Human casualties by wildlife attacks

| S.N | Age | Sex | Activity of victim | Where | Remarks |
|-----|-----|-----|-----------------------|------------|---------|
| 1 | 42 | M | For livestock grazing | At jungle | Died |
| 2 | 52 | M | Way to jungle | At jungle | Wounded |
| 3 | 21 | F | Grass cutting | At jungle | Wounded |
| 4 | 33 | F | Grass cutting | Crop field | Wounded |
| 5 | 27 | F | Grass cutting | At jungle | Wounded |

4.3.4 Conflict Management

Respondents showed strong dissatisfaction 155(96.88%) within problems of wildlife management. Only 2(1.25%) of household expressed satisfaction with the wildlife management 3(1.88%) of respondent didn't reply for this questions (Figure 15)

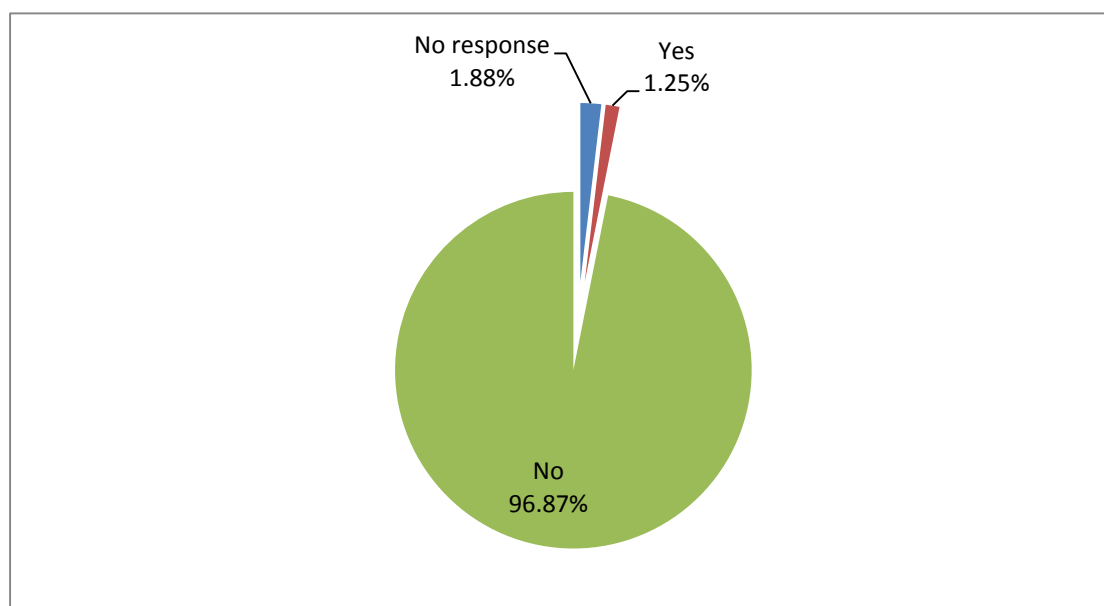


Figure 15 : Satisfaction with the problem of wildlife management (N=160)

Concerning how to manage the problem of wild animals, 74(46.25%) respondents replied that they were unknown how to manage wild animals, 61(38.13%) of respondents replied they should be killed, 10(6.25%) of respondent replied that they should be captured and kept in closer, 7(4.38%) replied the capture and release the wild animals and 8 (5%) replied that other ways should be followed for wildlife management problems (figure 16)

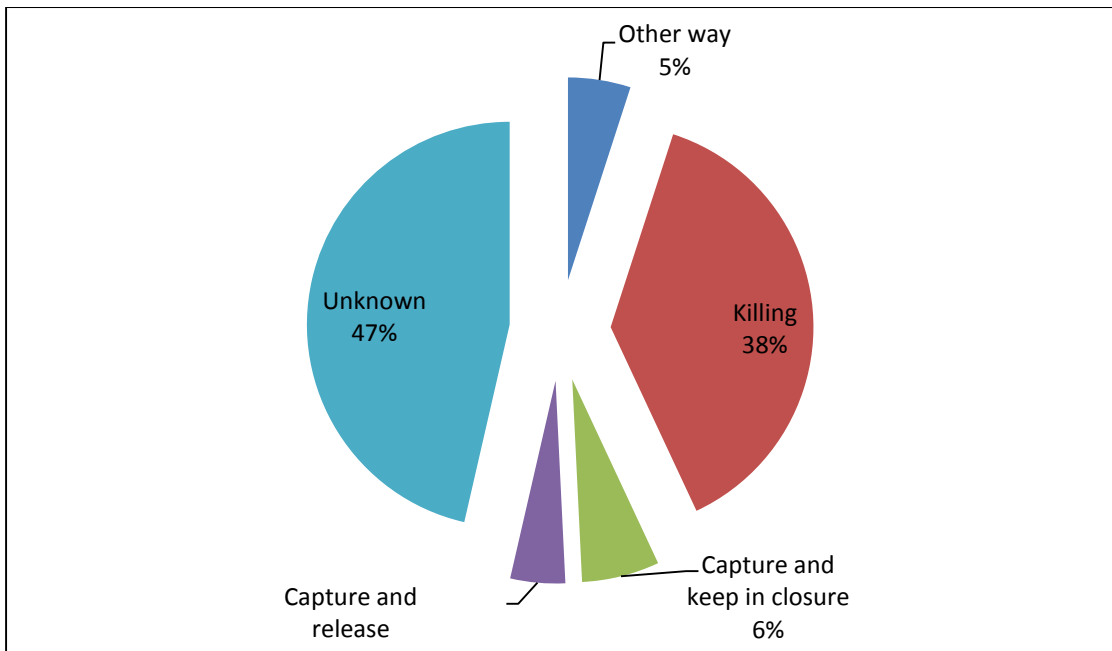


Figure 16: Management of problem of wildlife (N=160)

According to questionnaire survey, the respondents gave more than one answer. 153 (95.63%) said that proper compensation should be given to victim family, 68(42.5%) respondents conservation education should be given to educate local people about the benefit and behavior of wild animals and 59(32.5%) said the need of regular monitoring to make people aware of where the problem of wild animal was and 9(5.63%) respondents said that problem could be sold by other way (killing/kept in zoo) (figure 17)

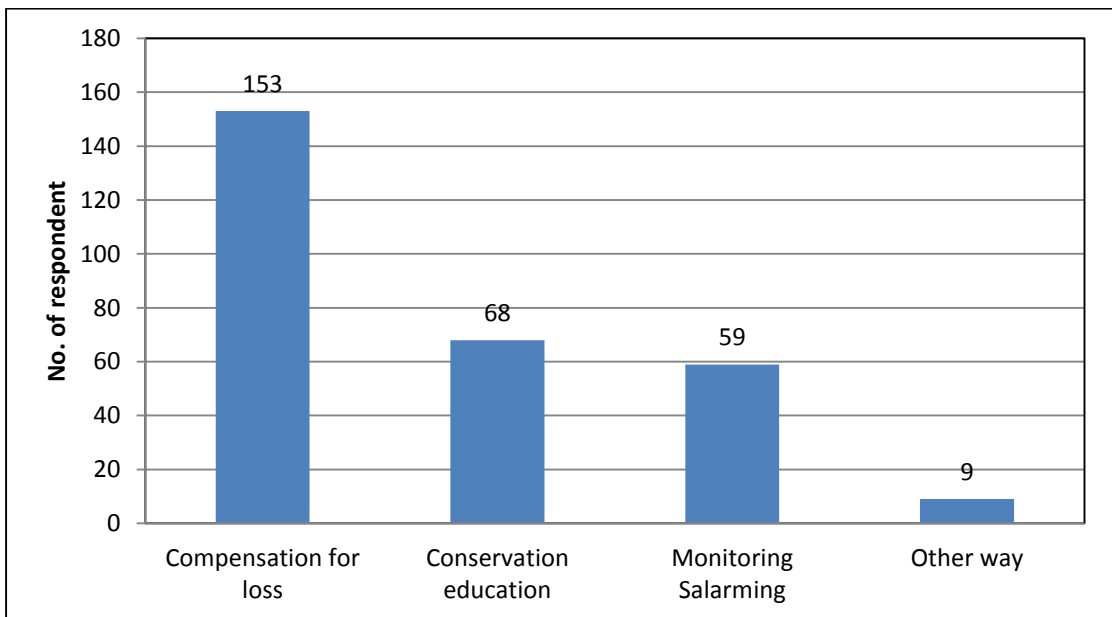


Figure 17: Way to conflict reduction (N=160) (Response were overlapped)

5. DISCUSSION

5.1 Human Wildlife Conflict in Shukla Phanta National Park

Tentatively higher number of incidents related to human wildlife were observed in the field. Out of 160 HHS observed, 29 HSS showed a recent crop damage and livestock depredation incident in which 23 HHS showed crop damages and 6 HHS showed livestock depredation events.

From the questionnaires survey it was found that the number of wildlife animals after established of SNP had been increased similar study were found the number of wildlife species had been increased after establishment of community forest in Dang (Pokharel and Shah, 2008). The poaching and killing of wild animal were common practices before the establishment of the SNP. Similarly in Kunjo VDC Mustang district, leopard were killed before the areas was included in ACAP (Ghimire, 2006) similarly the poaching and killing of wild animals were common practices before GCA include in conservation area (Awasthi, 2014).

Overall, 84.1% house hold around GCA reported experiencing some kind of conflict incident with wildlife (Awasthi, 2014). Compared the study in Nepal and India (Pokharel and Shah, 2008; Karanth *et al.*, 2012) and this was comparatively higher than other places in the world (Dickmand, 2010). It was similarly to my finding out of 160 respondent 90% respondent answered that they had problem from wild animals. However, majority of peoples were depending upon community forest for resource collection such as furniture fuel wood and grass. The local people have high dependency to the community forest in SNP which is also the prime habitat for wildlife, which makes this activity very conflict prone. It has seen in other PAS that when need of people overlap the need of wild animals, the conflict begins. Besides, crop depredation, the conflict begins, besides, crop depredation, grazing and scarcity for fodder and firewood collection were the causes for negative interaction between wild animals and local people (Poudel, 2007; Sharma 1990; Karanthal, 2012). Therefore, necessary alternative ways to address this problem is the need of this time in SNP.

According to questionnaire near border were the major conflict zone were found (Awasthi, 2014) revealed conflict were high inside the GCA. This was not similar to my finding found out of total 160 respondent 91.2% of respondent answered that conflict was high inside the SNP. So finding the major conflict zone gives up the

scope of human wildlife conflict and the area which need to be focused while addressing the problem of HWC management in SNP. This result has showed that inside the SNP the need of concerning authority like SNP project and other become more responsible for such conservation initiatives in the area. Identifying prime conflict zone gives advantage for any conservation program to be more effective (Karanth *et al.*, 2012).

5.2 Crop damage and livestock depredation by wild animals

84.37% of the respondent reported that they faced crop damage problem due to Inugasion of wildlife in their agricultural land. Similar things were also found from other studies (Pokharel and shah, 2008) But 81.25% of the respondent reported that they faced problem of crop damage due to wild animal in their agricultural land (Awasthi, 2014). The possible reason are the livelihood pattern of people, where majority of local people depend upon agriculture and livestock forming and that makes vulnerable to the conflict with wildlife from the forest area. Farmers also voiced concerns about problem of wildlife and increased crop or property damage including loss of human life states in Bhutan (Wang *et al.*, 2006). It was found that wild boar, elephant, deer, monkey, rabbit, mouse are the major pest for crop damage of the study area.

Wild animals were responsible in all stage of crop mainly paddy, wheat, maize, potato, banana on any reason when the cropping in the field. Damage also creates serve conflict and led to substantial economic loss for villagers composition of wild animal varies depending on the type of crop and other studies have shown different wild animals have different palatability of crop varieties (Poudel, 2007) Among various wild animals monkey has highest total damage of 213 cases seems to be most destructive. The research behind monkey as a major pest animals are supported by various past studies as monkey has been seen as prominent crop raider throughout as a (Regmi *et al.*, 2013). Further, Rhesus Monkey shows the most commensally character to human and crop raiding (Aryal and Chalise, 2013). Similarly, people's perception about monkey itself is the next major problematic animal, lack of arms and no pro for killing monkey (Aryal and Chalise, 2013; Regmi *et al.*, 2013) possible reason being the maize as the primary crop and provides great palatability to main crop raider monkey in the study area.

Poudel (1995) found wild boar (*Sus scrofa*) as principal crop raider in Shivapuri National Park. Gautam (1999) identified wild elephant (*Elephas maximus*) wild boar (*Sus scrofa*) and Chital (*Axis axis*) as main crop raider in Shuklaphanta wild life research. Sharma (1995) found wild buffalo (*Bubolos bubalisarnee*) and wild boar (*Sus scrofa*) as main principal crop raider in KTWR. Nepal and weber (1993) found Rhino (*Rhinoceros Unicornos*) Chital (*Axis axis*) and wild boar (*Sus scrofa*) as principal crop raides in CNP. Adhikari (2005) identified Rhinoceros, deer and other as a major pest animal in this study on the Buffer Zone of Chiwan National Park.

Gautam (1999) identified as chital (*Axis axis*) become the first major pest followed by elephant and then wild bear in SNP.

It is the Piperiya ward no.13 which suffered from highest crop loss and Bankatti ward no.14 was lowest from crop damage. It was the Piperiya which suffered paddy and wheat of 13,732 kg and 12,372 kg per annum respectively. The possible reason are the Piperiya study area becoming near the forest area where the habitat seems to be favorable for wild animals. Wild bear, elephant and chital which are main pest of the study area.

In Bankatti, there was the lowest crop damage because as majority farm land were cultivated. It is the Ladhuk VDC which was suffered from highest crop loss and organ was lowest suffered. It is the Ladhuk VDC which suffered from both maize and potato damage of 5,459.8kg and 6,450kg per annum respectively (Awasthi, 2014).

A study an crop damage by rhinos done by (Jhawali, 1989) in Sauraha Area and other villages shows the estimated economic loss of total of Rs. 1,70,500 for 1968.98 based on 90 household surveys in 4 villages of CNP besides the deer, boars and Parakeets also can be taken as major pest animals causing crop damage.

Gurung (2002) found a total 46,872.40 kg crop loss consisting 12,085.83kg of paddy followed by 11,531.46kg of maize 11,281.50 kg of potato 6,421.85 kg of wheat 5,199.08 kg of millet and 432.75 kg of mustard in Sunkhani VDC of SHNP. The study found the economic loss of Rs. 5,54989.31 of which the loss where 33.24% of maize 19.59% of paddy 17.35% of wheat, 16.26% of potato, 10.14% of millet and 3.39% of mustard. The estimated economic loss was 4,586.68 per household on an average.

Gautam (1999) found the loss of 9,47,470.19 in ward no. 13, 14, 15, 18 and 19 of Mahendranagar municipality adjacent to Shukla Phanta wildlife reserve. Highest economic loss 74.28% was estimated to paddy crop followed by wheat (17.08%) and

maize (8.62%) among the wild animals, highest economics loss was estimated by wild animal elephants (43.29%) followed by wild animal elephants (43.29%) followed by wild boar 28.67%, chital (24.09%) The reported of economic loss was estimated from Rs. 73.20 to Rs. 1346.85 per household.

Above studies shows that there are considered loss of crop due to wildlife adjacent to the reserve and parks of Nepal. In my study also crop loss 71,696.75kg was found out of 160 household among 144 household questionnaire survey. Out of the total damage of the crop paddy come to be first with 32,640kg (34%) followed by wheat 30,720 (24%) maize 5,057.5kg (18.4%) potato 1,764kg (12.6%) and others 1515.25kg(11%) by weight.

The study shows that the total economic loss of 144 household was Rs. 17,55,365 annually out of the total loss economic loss of the paddy was 7,18,080(34%) follow by wheat 8,60,160(24%) and maize Rs. 1,01,150(18%) potato Rs. 4,41,100(12.6%) and Rs. 31,875 (11%) by others. The estimate economic loss was Rs. 1,164.83 per household on average.

Goat suffered the highest level of predation because reason for maximum killing of goat is that most of people leave goats for grazing in forest without any herder and people bring them back to homes at the late evening so there was herder with goats and thus they proved to be easier prey for wild animals. As compared to study, most of the day time attack occurred in the grazing land when the livestock were left unattended (Koirala *et al.*, 2012) As compared to the study in ACA, the highest losses to predation were incurred by chicken amounting 48.3% and 47.2% of the total loss in 2009 and 2010 respectively this was due to frequent predation by jackal (Koirala *et al.*, 2012).

The annual average income loss from livestock depredation in the SNP to be NRs. 8,30,000(7614.67US). The estimated average annual monetary loss for a household in the SNP was NRs 5187.5. The substantial economic losses due to livestock depredation by wildlife observed in the study have been reported in many studies.

While comparing livestock loss with avian stock loss, Piperiya (Ward no.13) suffered from more livestock loss and avian loss in my study.

Leopard had been found the major predator in the study area for livestock depredation similarly, 3 studies of human carnivore conflict in Bhutan and Pakistan reported Leopard to be the main predator of livestock (Wang and Macdahald, 2006: Sangay and vernes, 2008) in Nepal Ghimire(2006) reported a, trend of increasing damage by

leopard after establishment of the ACAP office in mustang with the local people ranking common leopard as the main part of livestock depredation.

(Awasthi, 2014) reported 89.8% livestock killed by leopard found the major predation in the GCA contributing NR 4,38,500 economic loss by leopard only.

Gurung (2002) reported total economic loss of livestock was Rs. 48355 and average loss was Rs. 399.02 per household. The main predator were leopard, wild cat, Jackel and common mongoose in Shivapuri National Park.

Gautam (1999) reported that two person were killed by male elephant during her field in SNP Cheetri (2013) reported that 6 human attacked by black bear from 2005 to 2012 within manaslu conservation area similarly Awasthi (2014) also reported 4 local people were injured by wild animal attack by Himalayan black bear from 2010-2014. Gurung (2002) also reported a human casualties in Sunkoshi VDC in Shivapuri National Park during his study.

In the study it was known through people and reserve staffs interview that the event of human casualty by wildlife had been increased in recent year from the study area it was found that 5 were altogether accident occurred in Piperiya, Bankati and Nimbukheda. Among them 1 man killed by wild boar and 4 were seriously injured in 2016.

5.3 Methods and Techniques adopted by local people to reduce human-wildlife conflict and compensation schemes

Among the respondents 90% of households around SNP area experience problems created by wild animals such as crop damage and livestock depredation and are not reciting any compensation for their losses majority of respondents (45.63%) were unaware about compensation. This was due to lack of appropriate education and lack of information flow from the concerning authority was one of the problem of the study area as compared to other study, lack of communication about the actual policy language intent and scope combined with villagers deepening sense of victimization exacerbates the more broadly defined problem of 'People-park' conflicts that characterize countless PA community around the world (Orga and Badula 2008).

Similarly, most of the people were not satisfied with present compensation and major reason includes the compensation process is lengthy (95.12%) out of dissatisfaction respondent similar thing found in GCA (Awasthi, 2014).

The provision of compensation included only damage by animal that are endangers other animal like monkey beer species were common and the damage by these animals has not included in the compensation schemes.

Unlike in India (Madhusudhan, 2003; Orga and Badola 2008) there is no corruption and comparatively no long bureaucratic process to endure. Three cases were rejecter for the compensation because the different reason like less amount compensation incomplete document, delay reporting to SNP people etc. as compared to the study in India (Kumar, 2011) similarly in the GCA (Awasthi, 2014).

Only a single technique is not effective to control the wild animal various types of techniques such as machan guarding, chasing with fire, shouting, drumming, fencing etc. in multiferous ways are much more effective in the study area to prevent the crop in some extent in more effective area. The local people were use five traditional means of controlling crop depredation and their effectiveness in different for different crop similar observation were revealed by (Chalise, 2001; Bhandari, 2008; Awasthi, 2014).

Local communities were highly unsatisfied with the present practice of the HWC management in SNP. Further this way supplementary with the result which showed that majority of respondents shower strong dissatisfaction (96.88%) over the wild animal management in SNP as compared to study in PWR 61% of the respondent had no opinion or held negative attitude towards the protected area (Thapa, 2014) Awasthi, 2014) reported 95.5% of the respondent are not satisfied with the wild animal management in the GCA which was similar to my study.

Further one of the popular method was making loud noise Ho, Ho, HOHO were partially effective method in chasing wild animals as compared with the study conducted (Poudel, 2007; Shrestha, 2012)

(Orga and Badola, 2008) compensation of losses is a fundamental strategy to reduce the human wildlife conflict through the increased tolerance level of the community towards wildlife. (Nghus and Titson, 2004; Gurung *et al.*, 2000; Bhattarai and Fischer, 2014; Awasthi, 2014) suggested that conservation education can charge the attitude and behavior of people and increase the tolerance of losses or as a tool to reduce human-wildlife conflict. Similarly, majority of the respondent in my study period 153(95.63%) answered that compensation for losses will reduced the conflict as followed 68(42.5%) said conservation education 59(32.5%) by monitoring alarming and 9(5.63%) by other way.

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Crop damage, livestock depredation and human injuries were the major types of damage major causes of conflict were feral cattle inside reserve, lack of fence resource collection poaching/ killing and habitat disturbance. Among 160 respondents 90% peoples tackles with wildlife problem and rest 10% or respondents have not any problem. among them 37 HHs loss their goat by wild attack followed by 3HHs cows, 3HHs Dog, 2HHs ox, 2HHs buffalo and 81HHs lost their avian stock due to wild animals. Almost all of the respondent answered that the problem of crop damage and livestock depredation increasing after establishment of SNP. The number of wild animals increased after establishment of SNP. It was good for conservation but (26.9%) of respondent said that there was not any benefit from wild animals and (35.6%) respondent said that this support the tourism.

The livestock depredation rate is high in the study area the causes of livestock depredation might be associated with grazing of livestock in the forest were wild animals are present.

Damage to crop was high in SNP by wild boar chital and elephant there were 7 as leopard, wild boar, chital, elephant, jackal monkey and hares are problematic species in SNP.

Human casualties were also noticed during my study period. Total of 5 people, among them one person was dead by wild boar attack and 4 person was injured. People centers in the forest to collect forest resources at drifting wood, cotton, grass they are heavily dependent on forest for their livelihood.

I estimated the total economic loss of crop NRs 17,55,365 and NRs. 11,648.83 per household per annum and NRs. 8,30,000 and NRs. 5,187.5 per household per annum livestock damage comparatively in Piperiya ward no.13 crop damage were higher than Bankatti and Nimbhukheda wards.

Local people were practicing direct method as noise making, drumming and stone throw and threatening day height guard to control the depredation but these methods are partially successful to chase wild animals. Many people in this area are poor and they depend upon the agriculture so monetary compensation and material support should be increased for tolerance level of local people towards the wild animal conservation. It is concluded that the problem of human and wild animal conflict in the study area

are increasing order, the livestock depredation rate and crop damage of the study area are also increased, many of respondent are unknown about compensation they all need compensation towards the loss.

The survey revealed that loss of wild boar chital and elephant were a major point of human wildlife conflict in the SNP it was an urgent priority to develop management practices that access the problem both for the sustainability of the local economy and reserve animal in the SNP.

6.2. Recommendations

1. Change Crop Plantation: Crop depredation by wildlife also depends upon the taste of crop plant. The food habit of the wildlife should be thoroughly studied and local villagers should be encouraged to grow unpalatable, less preamable crops like mustard.

2. The local people should be encouraged to follow proper methods: Inside the SNP peoples are highly encouraged to follow appropriate methods so as to save their crops and livestock from predators. Proper day guarding of the crop field and livestock herd, proper fencing of Cows, Goat, and Chicken sheds etc should be carried out.

3. Regular monitoring of human-wildlife conflict: The conflict arises between human and wildlife must be monitored regularly, if possible within short time interval period. This could help in making the concerned authorities well aware of the extent of human-wildlife conflict level and assist in making some special arrangement to reduce the conflict in the SNP

4. Habitat conservation: The habitat disturbance of wild animal in this area due to flooding of Mahakali River and human settlements that results in livestock depredation. Therefore deforestation and encroachments of the wild animals' habitat must be discouraged properly.

5. Supporting alternative cultivation: To apply biological methods in controlling the wild animals should be effective to control crop depredation. The food habitat of

the wild animal should be studied and local people be encouraged to the other varieties of crops and changed the varieties of crop so that crop damage should be decreased some extent caused by crop damage was high in this area. Monkey and Porcupine are mainly responsible for crop damage and almost people are said that those species must be killed to save cultivation.

6. Livestock insurance and basket fund for immediate relief: Compensation process the concerning authority should shorten the compensation process and also implement effective compensation mechanism for crop damage and livestock depredation. The livestock depredation record should be more accurately maintained, accurate compensation claim should be verified by an experts so responsible predator species can be identified and the payment of compensation delay and lengthy process should be avoided; the payment should be prompt by simplifying the verification process. To launch livestock insurance system in collaboration with conservation agencies, local conservation management committee would be a good method for compensation. Establishment of a basket fund for immediate relief to a victim's family would be advantageous and should be part of local and central GoN policy.

7. Political commitment and local involvement: The strong political commitment required for proper management of the SNP. While formulating plans to mitigate the human-wildlife conflict, local people must be involved since they have knowledge about local condition.

8. Shifiting to suitable places: People living adjacent to the park boundary (ward no.13 in Piperiya) are heavily affected .Similarly presence of people very close to the wildlife habitat causes a certain annoyance to the animals. For the sake of both of them, it is better not to permit human habitation very close to such areas. Therefore, those who live at the proximity of the core area should be shifted to other suitable places.

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APPENDIX 1:

Questionnaires survey for households

Name of the respondent Age

Sex.....

Ward No..... Village VDC.....

Distance from SNP.....

1. How much land do you have?

.....

2. Do you have any problems from park animals?

Yes. No.....

3. If yes, what kind of problem do you have?

a. Crop damage

b. Cattle loss due to carnivores (which carnivores....)

c. Human casualties

d. House destroy

4. Do you notice that the number of wild animals has changed since (SNP) interventaion?

Increasing Decreasing Same as past..... Do Not knows.....

5. Is there any poaching/killing in your area?

Yes..... No.....

6. What about the habitat?

Disturbed Undisturbed.....

7. What might be causes of disturbances?

Poaching Killing..... Habitat degradation..... Other specific.....

8. Where does the human wildlife conflict (wildlife attacking human) occur more frequently?

a. Inside the SNP

b. Outside the SNP.

c. Boarder of SNP.

9. When do they usually visit the field?

At night..... At day time..... Any time.....

10. How often they come?

Every night..... Every week1/2 per month..... Occasionally.....

11. What are the major crop that you are cultivating? During last Year?

| Name of the crop | Damage in kg | Local rate |
|------------------|--------------|------------|
| Paddy | | |
| Wheat | | |
| Potato | | |
| Sugarcane | | |
| Banana | | |
| Pulses | | |
| Other specific | | |

12. Which animals mostly damage your crop in which season and stage?

| Name of the animal | crop | season | stage |
|--------------------|-------|--------|-------|
| | | | |
| | | | |

12. Do you think crop damage problem is increasing every year after establishment SNP?

Yes No.....

13. Why do park animals came out to the field in your opinion?

- To change the taste
- They like the field crop
- Habitat destruction
- Other specific

14. Do you have livestock?

Yes No.....

15. Where do you take to graze them?

Inside the park outside park Border of park.....

16. Where do you go for the resource collection?

From own land From WRA..... Both.....

17. What are the wild animals found in the area?

leopard.... Elephant..... Wild boar Porcupine..... Blue bull.....
Barking deer..... Spotted deer Jackal..... Fox.....

Indian Civet..... Monkey..... Jungle cat Fishing Cat
Etc.

18. Any of the people wounded/attacked or killed by wildlife in the previous year?

No..... Yes..... Name age..... when..... Where.....
Agriculture field..... village..... name of the animal.....

19. How does the animal attacked the man?

.....

20. What are the livestock that are killed/wounded by wildlife in the previous year?

Please write the number and local Price.

| Name of the animal | Wounded | Killed | Local rate |
|--------------------|---------|--------|------------|
| Cow | | | |
| Goat | | | |
| Chicken | | | |
| Pigeon | | | |
| Buffalo | | | |
| Sheep | | | |
| Others | | | |

21. What are the precautionary measures that you are adopting to minimize the wildlife damage?

Shouting..... Electric fencing..... Beating Drum.....
Firing/lighting.....

22. Have you noticed any changes after SNP intervention? If yes what are they?

23. Do you know about the compensation?

Yes..... No.....

24. Production of crop is sufficient/insufficient during the year?

Sufficient..... Insufficient.....

25. Do you receive any (relief fund) compensation or medical help from concerning authorities?

Yes..... No.....

26. Are you satisfied with the amount of compensation?

Yes No....

27. If not, why?
- It is too lengthy
 - Weak information flow
 - Only time spending.
28. Are you satisfied with problem of wild animal management?
Yes..... No.....
29. If no, what should be the problem wildlife management strategy?
- Good and effective barrier
 - Inside the park they should manage them for food
 - Other causes
30. Have you seen dead wild animal?
Yes..... No.....
31. The extent of human wildlife conflict is high in the area?
Yes..... No.....
32. How can we minimize the human wildlife conflict?
- Conservation education
 - Compensation of loss
 - monitoring
 - good and effective barrier

APPENDIX 2:

Questionnaires to the Park authorities

- What types of human wildlife conflict occurs in this area?
 - Crop damage
 - human casualties
 - house destroy
 - others.
- What is the effect of the people who live near by the reserve?
 - Cutting grass
 - stole firewood
 - Livestock Grazing
 - killing livestock. d. breaking fence
- Why do people do illegal activities inside the reserve?
 - Poor economy
 - occupation
 - Illiterate.

4. How are those conflicts minimized?
.....
5. What measures can be adopted to increase tolerance of local people to loss by wildlife?
 - a. Conservation education
 - b. Timely monetary compensation against losses
 - c. Others
6. Do you have any record of revenge killing of wild animals? please give details(no. ... where ... when.....)
.....
7. What types of punishments are given for illegal work?
 - a. Arresting and seizing
 - b. Convincing
 - c. Punishment
 - d. Others
8. How can poaching/killing inside the reserve can be controlled?
9. What steps have been taken to confine wildlife within the reserve boundaries?
10. How can the competition between wild animals and domestic livestock be lifted?
11. How can wild animals be conserved in a better way?

APPEENDIX 3:

Unit conversion

Wheat 1 maan = 40kg

Paddy 1maan = 40kg

1 Bigha = 20 kattha

1kattha = 20 Dhur

According to the crop production in field

Wheat in 1 kattha = 3 maan

Paddy in 1 kattha = 5maan

In case of Banana

1 ghor = 8/10 hatha

1 hatta = 12-16 pices.

APPENDIX 4: Local rates of different crops

| Crops | Market rate per Kg. (Rs) |
|--------|--------------------------|
| Wheat | 25 |
| Paddy | 22 |
| Maize | 26 |
| Banana | 350 per ghor |
| Potato | 27 |

APPENDIX 5:

English, Scientific and Local names of the speceis

| Scientific Name | English Name | Local Name |
|--------------------------------|---------------------|-------------|
| <i>Lepus ruficaudatus</i> | Rufous-tailed Hare | Kharayo |
| <i>Lutra perspicillata</i> | Smooth Coated Otter | Oth |
| <i>Herpestes auropunctatus</i> | Small Mongoose | Nyauri |
| <i>Felis chaus</i> | Jungle Cat | Ban Biralo |
| <i>Felis viverrina</i> | Fishing Cat | Ban Biralo |
| <i>Canis aureus</i> | Jackal | Syal |
| <i>Vulpes benglensis</i> | Indian fox | Phyauro |
| <i>Pteropus giganteus</i> | Indian Flyong Fox | Chamero |
| <i>Axis axis</i> | Spotted Deer | Chital |
| <i>Axis porcinus</i> | Hog Deer | Laguna |
| <i>Boselophus tragocamelus</i> | Blue bull | Nilgai |
| <i>Sus scrofa</i> | Wild Boar | Bandel |
| <i>Bos gaurus</i> | Bison | Gaur |
| <i>Unica unica</i> | Leopard | Chituwa |
| <i>Platanista gangetica</i> | Gangetic Dolphin | Saus |
| <i>Macaca mullata</i> | Rhesus Macaque | Rato Bandar |
| <i>Elephas maximus</i> | Asiatic Elephant | Haati |
| <i>Viverricula indica</i> | Small Indian Civet | Rasse |

Source: SNP

APPENDIX 6: Crop damage in Pipariya

| S.N. | Name of the Crop | Damage Kg | Damage Rs. | Damage U\$ |
|------|------------------|-----------|------------|------------|
| 1 | Paddy | 13732 | 439424 | 4021.45 |
| 2 | Wheat | 12372 | 309300 | 2830.60 |
| 3 | Maize | 2133 | 55458 | 507.53 |
| 4 | Potato | 805 | 21735 | 198.91 |
| 5 | Others | 609 | 17052 | 156.05 |
| | Total | | 842969 | 7714.55 |

APPENDIX 7: Crop damage in Bankatti

| S.N. | Name of the Crop | Damage Kg | Damage Rs. | Damage U\$ |
|------|------------------|-----------|------------|------------|
| 1 | Paddy | 7205 | 165715 | 1516.56 |
| 2 | Wheat | 1034 | 250850 | 2295.68 |
| 3 | Maize | 1542.5 | 40105 | 367.02 |
| 4 | Potato | 452 | 12204 | 111.68 |
| 5 | Others | 542 | 15176 | 138.88 |
| | Total | | 484005 | 4429.44 |

APPENDIX 8: Crop damage in Nimbhukheda

| S.N. | Name of the Crop | Damage Kg | Damage Rs. | Damage U\$ |
|------|------------------|-----------|------------|------------|
| 1 | Paddy | 11703 | 269169 | 2463.33 |
| 2 | Wheat | 8314 | 207850 | 1902.16 |
| 3 | Maize | 1382 | 35932 | 328.83 |
| 4 | Potato | 507 | 13689 | 125.27 |
| 5 | Others | 364.25 | 10199 | 93.33 |
| | Total | | 536839 | 4912.95 |

APPNDIX 9: Respondent characters

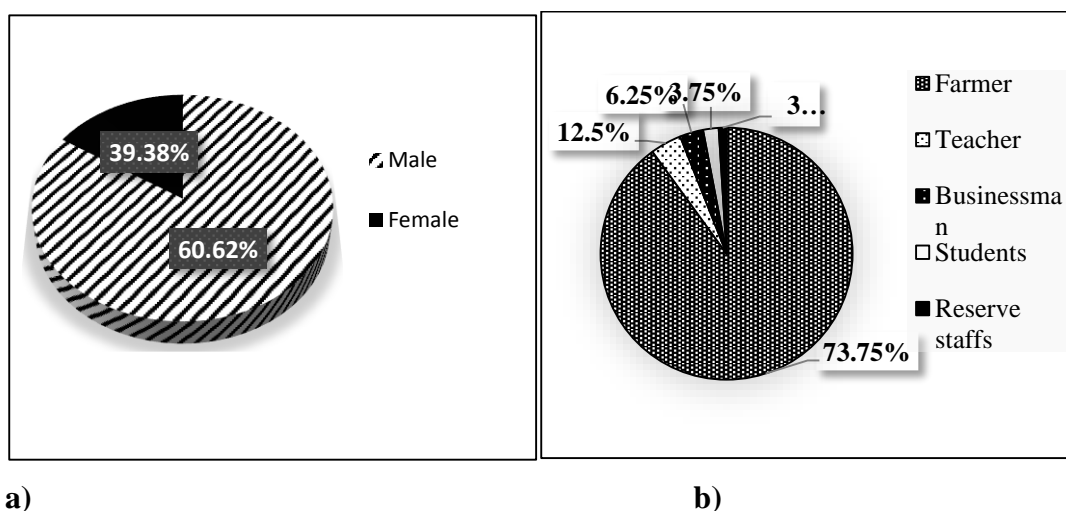


Figure: Respondent characters; a) Proportion of gender b) Occupations

Table: Age categories of respondents

| Age group | No. of respondent | Percentage |
|-----------|-------------------|------------|
| 18-36 | 28 | 17.25 |
| 36-54 | 74 | 46.16 |
| 54-74 | 56 | 35 |
| Above 72 | 2 | 1.25 |
| Total | 160 | 100% |

All respondents were age between 18 to 75 years. The highest respondents were age between 36 to 54 years while the lowest respondents were age Above 72.

Photo Plates



Photo 1: Wheat destroy by wild animals near settlements



Photo-2: Crop damage by wild elephant at Piperiya



Photo-3 : Barren field near human settlement Photo-4: Paddy destroyed by wild boar



Photo-5: Questionnaire survey with women inside SNP



Photo-6 ; Women Showing Crop damage she lost her husband due to wild boar attack

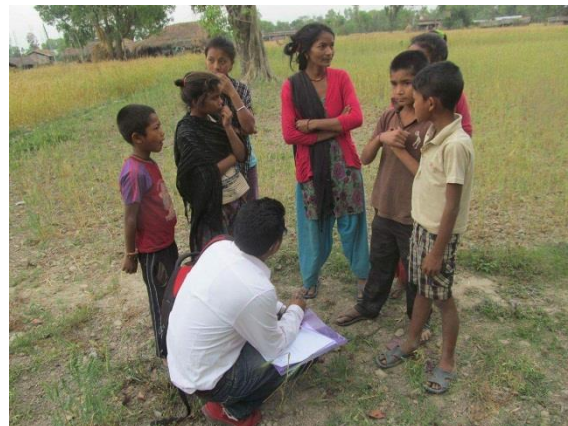


Photo-7: Old Man and women helping in questionnaire survey



Photo-8; Livestock grazing inside the park



Photo-9: office gate of SNP



Photo-10: Enjoying the elephant safari



Photo-11: No effective barrier for wild animals



Photo-12: Unsatisfactory campaigning against compensation scheme





Photo-13 Park elephant taking to graze inside Photo-14: Dead elephant in the park



Photo-15: Children participating in the questionnaire survey



Photo-16: Destruction of bananas & crops by elephants near settlement