

**HUMAN-WILDLIFE CONFLICT IN PARSHURAM MUNICIPALITY  
AREA OF DADELDHURA DISTRICT, FAR-WESTERN PROVINCE,  
NEPAL**



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**Submitted to**  
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Institute of science and technology  
Tribhuvan University  
Kirtipur, Kathmandu  
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September, 2019

## DECLARATION

I hereby declare that the work presented in this thesis entitled "**Human-Wildlife Conflict in Parshuram Municipality Area of Dadeldhura District, Far-Western Province, Nepal**" has been done by myself, and has not been submitted elsewhere for the award of any other degree. All the sources of the information have been specifically acknowledged by references to the author(s) or institution(s).

Date: September 08, 2019

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## CERTIFICATE OF ACCEPTANCE

This thesis submitted by Ms. Jharna Kumari Pandey entitled "**Human-Wildlife Conflict in Parshuram Municipality Area of Dadeldhura District, Far-Western Province, Nepal**" has been approved as a partial fulfillment of the requirements of Master's Degree of Science in Zoology with special paper "Ecology and Environment".

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## LIST OF ABBRIVIATIONS

ACAP	Annapurna Conservation Area Project
BNP	Bardia National Park
BZUC	Buffer Zone User Committee
CF	Community Forest
CNP	Chitwan National Park
GIS	Geographic Information System
GPS	Global Positioning System
DNPWC	Department of National Parks and Wildlife Conservation
GCA	Gaurishankar Conservation Area
GON	Government of Nepal
HHs	Household Survey
HWC	Human-Wildlife Conflict
IUCN	International Union for Conservation of Nature and Natural Resources
KTWR	Koshi Tappu Wildlife Reserve
MCA	Manaslu Conservation Area
NRs.	Nepali Rupees
NTNC	National Trust for Nature Conservation
PAs	Protected Area
PWR	Parsa Wildlife Reserve
SNP	Shuklaphanta National Park
SWR	Shuklaphanta Wildlife Reserve
US\$	United States Dollars
WHO	World Health Organization
WWF	World Wide Fund for nature

## ABSTRACT

Human-wildlife conflict (HWC) is closely associated with the economics and social well-being of the local people. Parshuram Municipality of Far-Western Nepal; one of the main hotspot for the HWC. Field survey were conducted from August 2018 to May 2019. Questionnaire survey in 150 households was conducted at ward no. 3 and 4 of more effected villages of Parshuram Municipality: Katal, Ratamati, Lopa and Todina. Study was also designed to find out the status of Leopard, Monkey and Wild boar. In the 12 transects total of 48 signs of Leopard, Wild boar and Monkey were recorded, which indicated the presence of the species in study area. The average annual economic loss of crop was found to be NRs. 549105 (4859.579 US\$). Katal had highest crop loss and Maize was the most frequent crop loss. Similarly, the average annual economic loss of livestock was found to be NRs. 257100 (2275.335 US\$). Lopa had the highest average annual loss of livestock. Goat was the major livestock depredation by Leopard and Chicken was the major avian stock depredation contributed by Jackal. Total 33 wild animals were killed by farmers in last two years; among them Wild boar (26) was highest. Perception relative to wildlife conservation was found to be negative. Construction of fence, habitat conservation, change in crop plantation, awareness program for local people and regular monitoring of wild animal might help to reduce HWC.

# 1. INTRODUCTION

## 1.1 Background

Interaction between people and wildlife has recently become one of the fundamental aspect for wildlife management. HWC is common phenomenon (Wang and Macdonald 2005) and global problem (Deodatus 2000, Dickman 2010) from past and is becoming critical threat to the survival of the many species in recent years. HWC is the confrontation between humans and wild animals, resulting crop and livestock depredation, property damages, human injuries, and retaliatory killing or capturing of wildlife (Elliot et al. 2008). The direct contact with wildlife occurs in both urban and rural areas, but it is generally more common inside and around protected areas. HWC occurs when wildlife requirements overlap with human population, creating costs to residents and wild animals (World Park Congress 2003). HWC arises mainly because of the loss, degradation and fragmentation of habitats through human activities such as, logging, animal husbandry, agricultural expansion, and developmental projects (Fernando et al. 2005).

HWC has rapidly become a critical threat to the survival of many globally endangered species, particularly to large and rare mammals (Distefano et al. 2005). When both human and wildlife population increases, people occupy new land ultimately increasing the level of conflict. This unresolved human-wildlife conflict is creating negative attitudes towards both the government and newly proposed wildlife development projects (Dunhum et al. 2010).

In Europe, several wildlife species such as Red deer (*Cervus elaphus*), Bears (*Ursus arctos*), Wolf (*Canis lupus*) etc. are responsible for creating conflict (Lamarque et al. 2009). In Africa, several large herbivores and large mammalian carnivores are responsible for creating majority of conflict whereas in Asia, large predators are the principle sources of conflicts (Lamarque et al. 2009). In Chitwan National Park, human loss has increased significantly due to human Tiger conflict (Gurung et al. 2008) whereas in Langtang National Park crop raiding by wildlife has increased the conflict (Regmi et al. 2013).

In Nepal, HWC is a major problem in most protected areas and community forest. However, the frequency and intensity of park–people conflict mostly arise from crop and livestock depredation, human injuries caused by wildlife, illegal logging, grazing and

fodder collection, poaching, and poor relations between local people and protection units (Shrestha et al. 2007; Timalsina and Ranjitkar 2014). In some part of the world, increasing conflict is consequences of the habitat extension due to lack of better management and the conservation of buffer zone forests adjacent to the park and reserve. Increasing wildlife population, shrink habitat, wildlife natural preference for agricultural crops, inefficient protection measures and degradation of community forest are the driving force behind the human-wildlife conflict. One of the main reasons of conflict is increasing human population and continued loss of natural habitat.

Several studies have been carried out related to park- people issues and conservation implications in several protected areas of Nepal. But the significant problem is not known for community forest in our country as the study is confined inside the protected area. In recent years, rise in human –wildlife conflict in various part of Nepal has resulted negative public sentiment towards the wildlife especially in problematic area. Lack of scientific study in the problematic animals seems to be a serious problem. Formulation of effective mitigation guideline about HWC and its documentation is needed.

The costs of HWC included decreased food security, changes to workload, decreased physical and psychological wellbeing, economic hardship, and at times an increase in illegal or dangerous activities (Ogra 2008). Sometimes people lost their patience and tried to kill the wild animals as a final resort to get rid of HWC. Thompson and Barton (1994) developed scale to measure eco centric and anthropocentric attitudes towards environment. Hence a psychological test was developed to study the people's perception about HWC because perception is a psychological object. Perception of peoples towards HWC is affected by socio-cultural impact, economic impact, reasons for conflict, and efforts of villagers after HWC, eco-centrism, anthropocentrism and environmental apathy (Senthilkumar et al. 2017).

This study aimed exploring the human-wildlife conflict in term of crop damage, livestock depredation and human causality. Further, it has assessed the cause, compensation, perception and tolerance level of the local people towards losses caused by wild animal. The role of different stakeholders in wild animal's conservations through mitigating human-wildlife conflict was also assessed. The main reason of conflict between local people and wildlife is improper management of CF and issues regarding its utilization.



Many people in the Parshuram Municipality mainly depends upon the agriculture activities in addition to rearing livestock. The loss of crop and livestock depredation are the major problem in the Parshuram Municipality area. Therefore, detailed study was carried out to identify the extent of HWC and people's perception towards wildlife to make effective recommendation for reduction and mitigation of HWC in the study area.

## **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 conflict takes many forms ranging from loss of crop, livestock and human casualties. Understanding the HWC is important in many countries where solution to escalating conflict are urgently required. Knowledge about spatial and temporal pattern of conflict can help government and civil organization to design more effective mitigation plans. Developing effective prevention and mitigation plans for human-wildlife conflict is a top conservation priority in many areas of the world.

Osborn and Parker (2003) divides defensive measures into two broad categories: passive and active. Passive methods are designed to prevent the movement of wildlife into agricultural land through the use of barriers such as different types of fences and digging trenches (Nyhus et al. 2000). While on the other hand, active methods include chasing away wildlife by making noise through shouting, banging tins and patrolling fields (Hill 2000). Similarly, mitigation of human-wildlife conflict is also divided into direct and indirect methods (Treves 2007). Direct method reduces the frequency of wildlife damage. It includes barriers (fences, trenches, walls, buffer zones etc.), guarding, changing the type (timing or location of human activities), repellents, removal of wildlife and indirect method raise people's tolerance for conflict with wildlife and it includes compensation, participation, research and environmental education. Thapa (2010) classifies measures to protect crops into: modern means and traditional means. Modern means includes watchtower, barbed wire fence, trench and scaring devices (such as loud speakers) while traditional means include bio-fencing, scarecrow and tin hitting.

Effectiveness of defensive tactics depends upon a number of factors as the types of measure, nature of damaging animal and levels of efforts applied (Bailey 2011). So, it is important to note that no single method is enough for damage control but a combination of

measures depending upon the invading wildlife, crop patterns and household economic condition should be used. Mitigation measures may not be universal because of differences in socio-political, cultural, economic and geographic situations between the localities (Bhattarai 2009).

### **1.3 Objectives of the Study**

#### ***1.3.1 General Objective***

The main objective of this study is to investigate human-wildlife conflict in Parshuram Municipality.

#### ***1.3.2 Specific Objectives***

- To explore the livestock depredation, crop and property damage by wild animal.
- To investigate the causes of human-wildlife conflict and its impact on wildlife.
- To understand the perception of local people towards human-wildlife conflict.

### **1.4. Rationale of the Study**

Human-wildlife conflict (HWC) has both direct and indirect costs for human beings. It is rapidly becoming a critical threat to the survival of many globally endangered species particularly large and rare mammals. Conflicts poses serious challenges to conservation of biodiversity around the protected areas. People wildlife conflict is one of the main threats to the continued survival of many wildlife species. Destruction and loss of food crops, livestock depredation and human harassment are direct costs of HWC. Conflict that result from the crop loss, livestock depredation and property damage are serious management issue in most conservation area in recent year.

Parshuram Municipality is one of the renowned Municipality in Dadeldhura considering the impact to the livelihood of local people possibilities of human-wildlife conflict. Different studies were undertaken in different protected areas of Nepal on HWC but no similar studies have been undertaken in the vicinity of community in Dadeldhura district. Therefore, it is realized to carryout study in the community forest. Lack of scientific study in the culprit animals seems to be the serious problem ultimately delaying the formulation of effective mitigation plans in the study area. The baseline information available during this research will help to develop management plan for long term conservation of flora and fauna through harmonious relation between community forest and local people. Therefore,

outcomes of this study is useful for reducing HWC around the Parshuram Municipality by implementing the proper management plans.

### **1.5 Limitation of the Study**

- Few villages of Parshuram Municipality were studied because of time and financial constraints.
- Unable to analyze behavioral pattern of the wild animals.
- Lack of sophisticated scientific materials for detailed scientific study.

## 2. LITERATURE REVIEW

### 2.1 Livestock Depredation, Crop and Property Damage

Mishra (1997) conducted 18 months' study in Kibber Wildlife Sanctuary, India concluding the depredation of livestock is caused by large carnivores such as Common Leopard, Wolf etc. Study conducted in three villages attributed to total 189 (18% of total livestock holding). Three villagers have been killing the Wolf apparently but not the Common Leopard. The result showed that there was need of immediate efforts for addressing the human- wildlife conflict. A study by Hubbard and Nielson (2009) revealed that during the fawning season (May- June) of 2005- 2006, a total of 13 confirmed incidences of White-tailed deer attacking humans occurred in the campus of Southern Illinois University, Carbondale. Human casualties caused by Common Leopard in different forests of Mandi District, India for period of 20 years (1987-2007). Common Leopard caused 162 human casualties. Among them, 13 people were killed and 149 were injured. Total 4967 attacks and 8905 livestock were killed including mainly Goats, Sheep, and Cows and other were Ox, Buffalo, Claves, Horses, Mules, Donkey, and Mares (Kumar and Chauhan 2011).

Human – wildlife conflicts in Zambia during the period 2002 to 2010. A total of 347 people were killed where 49 were killed annually by five species of wildlife; Crocodile, Elephant, Hippo, Lion and Buffalo. Nile crocodile killed the largest number of people 185 (53%). There were fewer livestock predation incidences (305) which was 12% less than human fatalities. With regard to livestock, the largest number killed was for cattle 159 (52%) and the least was Dog, 8 (2.62%). Lion was responsible for 157 (51%) of all livestock predation and the least was Python 1 (0.32%). Overall, Crocodile was responsible for the greatest number of human fatalities and livestock predation combined, 273 (42%) while Elephant was responsible for the largest number of crop damage incidences 1,799 (42%) (Chombal et al. 2012). Likewise Common Leopard (*Panthera pardus*) conflict in Annapurna Conservation Area, Nepal, in 2009 and 2010. The results showed that Common Leopard killed more livestock than any other predator. The highest losses to Common Leopard were suffered in winter, and in grazing land, with Goats being the major victim. The highest financial impact was associated with predation on Goats, with Common Leopard accounting for 95% of total monetary loss to predators over the two-year study period. The majority of the local people expressed strongly negative views towards conservation of the Common Leopard (Koirala et al. 2012) and livestock depredation by Common Leopard in

Binjar wildlife sanctuary for 14 years' time period. The result of this study showed the loss of 1 human, 1763 Livestock depredation and 9 other injuries and emerging conflicts between Common Leopard and human due to scarcity of prey and habitat destruction (Kala and Kothari 2013).

In North- Eastern, India from January 2009 to March 2016. A total of 171 Common Leopards attacks were on humans most of which occurred within the tea- gardens. None of the attack was fatal and significant spatial clustering of locations of Common Leopard attack on the humans (Kshetry et al. 2017). In Bandhavgarh Tiger Reserve (BTR), Madhya Pradesh, India from 2001 to 2011. A total of 27 human casualties were recorded, of which 40.75% were lethal (death) and 59.25% were injuries. A total of 1,603 livestock killing were recorded by Tiger, which consists of 76.54% (1227) Cattle (Cow/Ox), 22.52% (361) Buffaloes and 0.93% (15) Goats (Chouksey and Singh 2018). A study in Bardia National Park, Nepal explored that 12 people were killed and four injured by Tiger attacks between 1994 and 2007 and four Tiger were killed due to the human Tiger conflict in between 1989 to 2009 (Bhattarai and Fischer 2014). Tamang and Baral (2008) reported livestock depredation by large carnivore was a serious issue and the major source of park- people conflicts in BNP during 6 years' period (1993- 1998). Total 442 of different animals were lost, out of which cattle were the highest contributing to 52.9% with economic loss contributing to 47.9%, incurring the total economic loss of US\$11,709.53. In Chitwan 36 Tigers killed 88 people during the 22 years' time period. The trend of human loss increased significantly in Chitwan. As a consequence, ten-fold increase in human casualties due to Tiger has been reported in the buffer zone (Gurung 2008).

Thapa (2014) examined Common Leopard death reports during 2006-2013 in order to estimate cause-specific mortality, identify conservation issues related to Common Leopard mortality and provide recommendations for reducing human-caused mortality in Nepal. Data revealed that the Common Leopards in the human dominated landscape are susceptible to variation in survival caused by human induced mortality (65%), with retaliation (31%) and lethal control (20%) of declared problem Common Leopard as a significant part. Elevated human induced mortality can cause large scale stochasticity influencing population dynamics of Common Leopard. In Baitadi district of Far- Western Region of Nepal incident of conflict by Common Leopard in recent two years, 18 humans were killed and 3 injured by Common Leopard during (June 2011- February 2014) 27

month within 7 VDC (Karki and Rawat 2014). The patterns of human injury and death caused by large mammals using data collected from a national survey over five years (2010–2014) and results showed that Asiatic Elephants and Common Leopards are most commonly involved in attacks on people in terms of attack frequency and fatalities. Although One-horned rhinoceros and Bears had a higher frequency of attacks than Bengal Tigers, Tigers caused more fatalities than each of these two species (Acharya et al. 2016). European countries suffered by Wild boars (*Sus scrofa*) for crop damage. During 10 years' period in Laxembourg area (Schley et al. 2008). In Jigme Singye Wangchuk National Park, Central Bhutan reported major financial loss annually due to crop damage by Wild pigs (*Sus scrofa*), Barking Deer (*Muntiacus muntjak*), Macaques (*Macaca mulatta*), and Sambars (*Cervus unicolor*). Among them, the highest rate of damage was caused by Wild Pigs (97%) whereas the damage by Macaque increased only after the establishment of the park (Wang et al. 2006). Human-Elephant conflict in the fringe villages around Manas National Park, Assam during 2005-2006. Conflict was intense in the months of July-August and was mostly concentrated along the forest boundary areas, decreasing with distance from the Park. Crop damage occurred during two seasons; Paddy (the major crop) suffered the most due to raiding (Nath et al. 2009). Similarly, Rohini et al. (2016) documented human-elephant conflict and associated ecological and demographic factors in Nilambur, Western Ghats of Kerala, southern India from June 2014 to May 2015, by visiting farms and households of 17 selected forest fringe villages. A total of 277 incidents of crop depredation, 12 incidents of property damage, three human injuries, and one human death due to conflict were recorded during this period. Crop raiding was highest during post monsoon season and it was low during pre-monsoon and monsoon seasons.

According to Shrestha (2007) concluded crop raiding by Elephants as the major issue in the three sectors with Bardia and Jhapa reporting higher frequency of incidences compared to Shukla. Total economic value of crop loss per household per year accounted for NRs, 12,253, NRs. 10108, and NRs. 3391 in Jhapa, Bardia, and Shukla, respectively. Considering the income from crop production, a household in Bardia (27%) and Jhapa (25%) lost about a quarter of the total income which is double the amount that a household in Shukla (13%) had lost over the span of five years from 2002 to 2007. Temporally, little over 50% increase in the loss of Paddy was observed in Shukla during the period between 1999 and 2002 and same in Jhapa 30%. Crop raiding of crop by wild animals during 2007-2008 in Kabresthali and Sangla VDCs near Shivpuri Nagarjun National Park. A total of

1623kg of crop loss per annum, Maize (8928.5kg) followed by Paddy (2955kg), Wheat (2859.5kg) and Millet (1491Kg) was recorded (Bajhracharya 2009). In the Arkhale and Nayagaun VDCs in Gulmi district found 64% raiding of crop with variation in the extent of crop damage in the studied VDCs. Maize was highest preferences (53%), followed by Wheat (23%), Paddy (16%) and others (8%) by the Monkey. The monetary loss of Maize occurred highest than other crops (Aryal and Chalise 2013). Similarly, Pandey et al. (2016) investigated crop damage due to wildlife in Thanapati Village adjacent to Shivapuri Nagarjun National Park, Nepal during March 2009 and April 2010 to quantify the actual area damaged by crop-raiding wildlife and the associated economic loss. Seven wildlife groups were evaluated in which Wild boar was the primary crop raider. Approximately US\$24,000 were lost to wildlife damage annually, with 0.28 km<sup>2</sup> (8 % of the farmlands) of crops damaged.

Crop raiding and livestock depredation by wildlife in Lamabagar, Khare, Orang, Landhuk and Bulung VDCs in the Gaurishankar Conservation Area, Nepal. A total of Rs. 20, 70, 806 (US\$ 21,422.5) crop loss and Rs.13, 20, 495 (US\$ 13,659.8) livestock loss due to wildlife in one-year period. Four human were injured by Himalayan Black Bear attacks from 2010 to 2014. Major wildlife agents responsible for crop damage were Wild boar, Porcupine, Blue Bill, Hare, Jackal and Spotted Deer. Similarly, livestock loss was caused by Common Leopard followed by Grey wolf, Jackal, Himalayan yellow throated martin and Jungle Cat (Awasthi 2014). Similarly, Pant (2018) recorded crop loss and livestock loss in Haripur and Sripur VDCs near Sukhalaphata National Park during February 2016 to February 2017. A total crop loss Rs.28,63,252 (US\$ 26,510.8). Paddy and Wheat suffered maximum damage contributing to 55.86% and 18.72% of the total loss. Major culprits were Wild boar, Porcupine, Blue bull, Hare, Jackal and Spotted deer. Total annual loss of livestock was about NRs. 33,000 (US\$ 305.55).

Mohammed et al. (2017) investigate intensity of domestic damage caused by wild animals around Yegof National Forest Priority area, South Wollo, Amhara Region, Ethiopia from November 2013 to May 2014. The Anubis baboon (*Papio anubis*) and Grivet Monkey (*Chlorocebus aethiops*) were identified as major crop pests and Maize crop was more vulnerable than other crops. Conflict between human and Rhesus macaque at Pumdivumdi/Tallokodi in Pokhara valley in March, 2016 found majority of the respondents (58.3%) agreed that the damage of crops caused by Monkeys was severe. There was a loss

of more than NRs. 20,000 in 2015 in 32% of the total households surveyed. Maize was the most raided crop (31%) followed by Potato (30%) (Sharma and Acharya 2017). The issues of human wild mammal conflict in and around the Panchase area in Chitwan Annapurna Landscape of Nepal from March 2017 to April 2018. Crop raiding, property damage, livestock depredation and human casualties was the most common forms of conflict. Monkey, Muntjac Deer, Porcupine and Hare were the main crop raider that resulted in total economic loss of US\$ 29.56 per household (HH). Overall economic loss by livestock depredation was estimated US\$ 11254.54 (US\$ 112.54/HH). Common Leopard contributed to the highest cases of livestock depredation. A total of five human attack cases were recorded including one fatal and four injuries. Himalayan black bear contributed to 80 % of the total attacks and 20 % was by Common Leopard (Adhikari et al. 2018).

Ghimire and Chalise (2019) reported crop raiding by Assamese Monkeys (*Macaca assamensis*) in Kaligandaki river basin at Ramdi of Palpa and Syangja districts of western Nepal from February 2015 to January 2016 spending 1804 hours to explore the ecology and feeding behavior. A total of 24 individuals of Assamese Monkeys were counted towards Palpa district and 18 individuals were counted towards Syangja district. Crop raiding status was examined each year and it was found that Maize (47.14 %) was the highest raided among the crops, followed by Fruits (16.43 %), Wheat (11.13 %), Millet (5.72 %), Rice (4.58 %), Potato (4.27 %), Lentil (4.07 %), Mustard (1.26 %), Pumpkin (1.14 %), Bread (0.96 %), Brown lentil (0.81 %), Broad beans (0.80 %), Sesame (0.60 %), Black pulses (0.35 %), Dal (0.20 %), Cauliflower (0.14 %), Tomato (0.1 %), Egg (0.1 %), Samosa (0.1 %) and Gram (0.1%).

## **2.2 Causes of Conflict**

In Paschim Kusaha VDC, adjoining area of Koshi Tappu Wildlife Reserve from Jan.1997 to Jan.1998 to identify the major conflict issues existing between reserve authorities and villagers. Crop depredation and human harassment by wild animals were a major problem to the villagers. Illegal activities of people in reserve area were the main problem for the management of reserve (Limbu and Karki 2003).The main species causing problems includes the Wild Elephants in Africa and Asia, the Deer in North America and most of the large and median sized carnivores worldwide. The factors causing human and large mammals conflicts include the human population increases, wildlife habitat losses, change of land use pattern and wildlife population growth after effective implementation of



conservation measures (Cai and Jiang 2006). Similarly, Lamarque et al. (2009) documented conflicts between humans and wildlife have occurred since the dawn of humanity in Africa. The conflicts have become more frequent and severe over recent decades as a result of human population growth, extension of transport routes and expansion of agricultural and industrial activities which together have led to increased human encroachment on previously wild and uninhabited areas.

Human-wildlife conflicts are increasing throughout the world, principally due to combination of human population growth, increased pressure on land and natural resources and climate change. Conflict can be exacerbated by an incomplete understanding of their cause and inappropriate intervention measures. Many traditional forms of intervention are also subject to increasing scrutiny and criticism from society (White and Ward 2011). Likewise, crop raiding by wildlife was higher as compared to physical property damage, livestock killing, and human injuries during January 2012- November 2012 in Shuklaphanta Wildlife Reserve Kanchanpur, Nepal. Altogether eight pest species created conflict. Among them the most frequent crop raiders in each buffer community were Chital, Wild boar and Elephant and three livestock predators including Tiger, Common Leopard and Jackal. Wheat damage accounted the highest among the crops. Food deficiency, lack of fencing, increase in wildlife populations and deforestation were the major causes of conflict (Banjade 2014).

# 1. MATERIALS AND METHODS

## 3.1 Study Area

### 3.1.1 Parshuram Municipality Area

Parashuram municipality is located in the Dadeldhura District, of Far-western Nepal. It was established in 2071 B.S. and is divided into 12 wards. It is geographically mountainous (Bhitri Medhesh) and occupies a total area of 426.87 Sq. KM. It is surrounded by Aalital Rural Municipality in the east, Mahakali River in the west, Bhageshwor Rural Municipality in north and Kanchanpur district in the south. Parashuram municipality has a total population of 43,942 and is situated at 29.3°N latitude, 80.58°E longitude and 157 m. to 2439 m. elevation(CBS 2011).

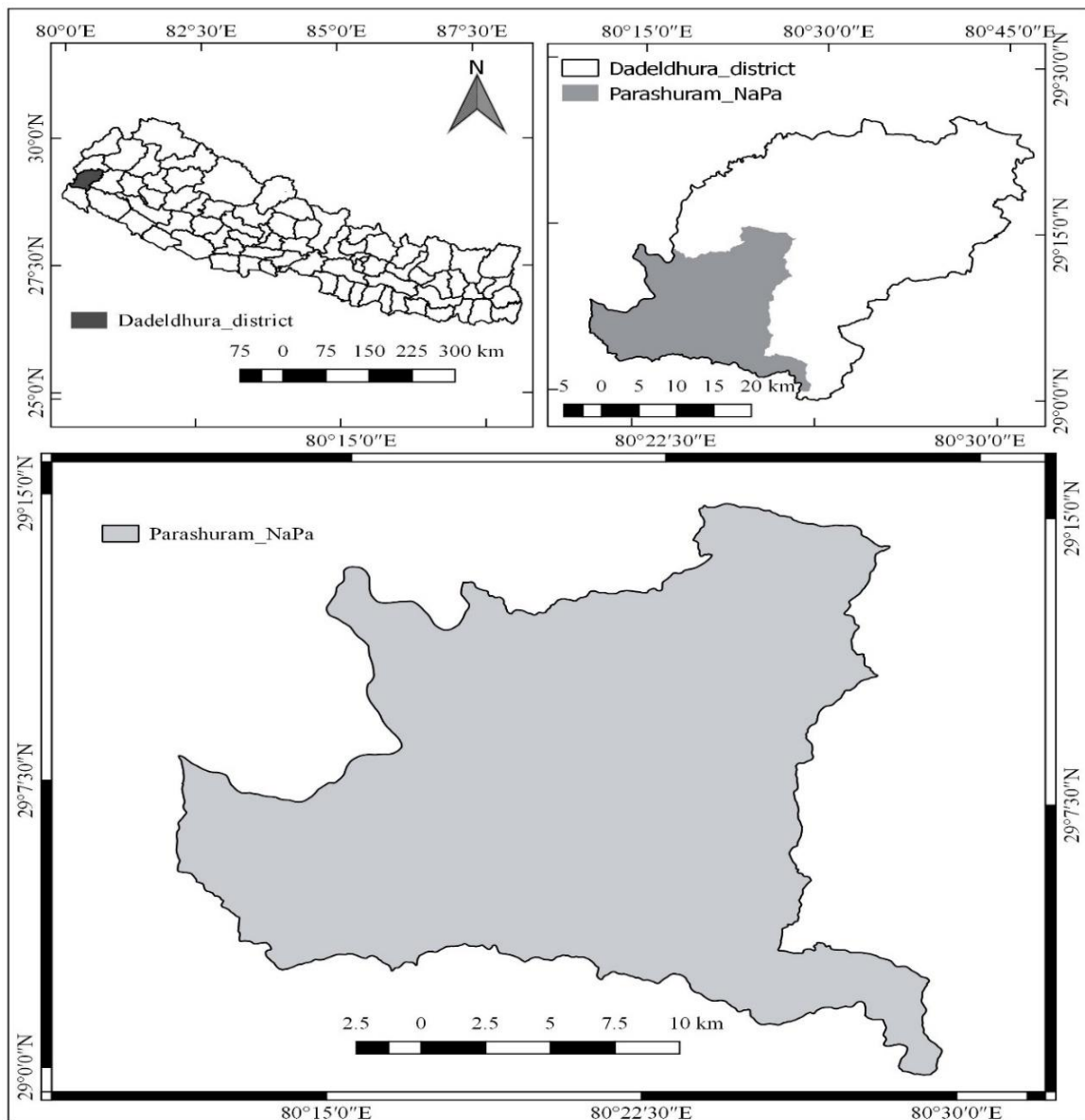


Figure 1: Map of the study area

Parshuram Municipality has total of 89 community forest and all these community forests occupies total of 13945.13 hector area, 7641 households and 46951 benefited populations from community forest (Annual progress booklet 2071/072). The study site encompasses mainly four affected village Parshuram-4; Katal, Parshuram-4; Ratamati, Parshuram-3; Lopa and Parshuram-3; Todina that includes Durgadevi Community Forest, Bhageshwor Community Forest (A), Latadeu Community Forest and Bhageshwor Community Forest (B) respectively. Most of people of Katal, Ratamati, Lopa and Todina mainly depend upon agriculture and livestock rearing and has house near the community forest. Different cast of peoples were living in this area mainly Brahamin, Kshetri and Dalit.

### **3.1.2 Climate**

Climatic condition of this region is subtropical monsoon with mean annual rainfall of 1579 mm that occur from June 10 to September and is higher in August. The winter month of December and January are cold with day temperature ranging from (7-23) °C. From February temperature rises up to 25 ° C in March and reaches 37 ° C by end of April (Department of Hydrology and Meteorology 2019).

### **3.1.3 Flora**

Community forest of Parshuram Municipality is one of the biodiversity rich area. This community forest is mainly covered by Sal forest, Khair-Sisso forest and mixed forest. The Forest comprises climber, herb, shrub and tree plants (Annual progress booklet 2071/072).

Sal Forest: Sal (*Shorea robusta*) is dominant tree species in this area. Sal forest is predominant mixed with *Terminalia alata*, *Bombax ceiba*.

Khair-Sisso forest: Khair (*Acacia catechu*) and Sisso (*Dalbergia sissoo*) are dominant along the river side area.

### **3.1.4 Fauna**

This community forest provides the important habitat for variety of wildlife. But till now no any scientific research has been done in this area. This forest is habitat for many mammalian species like Deer species, Wild boar (*Sus scrofa*), Common Leopard (*Panthera pardus*), Rhesus Monkey (*Macaca mulata*), Hanuman Langur (*Semnopithecus sp.*). Among bird's Grass Owl, Fly Catchers, Crane are found including reptiles like Cobra, Python,

Monitor Lizard. Some rodent's species are also habituated here (Annual progress booklet 2071/072).

### ***3.1.5 Geology and Soil***

Common soil type is sandy loam, clay silt loam and silt loam. Khair, Sisso forest associated soil is sandy mixture with small gravel and stone whereas in predominantly Sal forest area soil vary from loam to sandy loam (Annual progress booklet 2071/072).

## **3.2 Materials**

1. Camera (Samsung J1)
2. GPS (Canon)
3. Measuring tape
4. Questionnaire sheet & other stationary

## **3.3 Research Methods**

### ***3.3.1 Reconnaissance Survey***

The reconnaissance survey was conducted in August 2018. During this survey period, a key informant discussion was made to identify the core conflict area around Parshuram Municipality with the help of community forest member and local people recommendation. Further necessary information related to human-wildlife conflict were collected.

### ***3.3.2 Data Collection***

Final data is based on primary data. Primary data were collected through household questionnaire survey, focus group discussion, key interview survey & direct observation with local people, community forest staff, local leader, teacher & other.

## **A. Primary Data Collection**

### **1. Wildlife survey**

Problematic wildlife species in the study area were Leopard, Wild boar and Monkey. The wildlife sign survey was carried out in the community forest of Parshuram Municipality, conducted in the May 2019. Total 12 transects were conducted in four different community forest. The data on presence/absence and abundance of these wildlife species were collected by visual encounter survey and sign survey. Both surveys were conducted along transects. Parshuram Municipality lies in hilly geography, so it was not feasible to mark and monitor

straight line transects. Therefore, abundance of Leopard, Wild boar and Monkey was estimated by walking on forest trails and grassland.

### **Status of Common Leopard, Wild boar and Monkey**

The locations where the marks obtained were noted with Global Positioning System (GPS). The sizes of every marks were noted in each site where the marks were detected. For footprints, soft grounds such as near water, muddy ridge was used to detect the presence of the species (Mooty and Karns 1984). This gives estimation about the number of individuals that exist in the study site only.

### **Transect Design**

For designing transects, the resource map of the area was consulted. To remove the biasness, transects were designed in such a way so that transects represent every land use types and thus represent different habitats. Total 12 transects were drawn in four CF: Four transects in Durgadevi CF, three transects in Bhageshwor CF (A), two transects in Latadeu CF and three transects in Bhageshwor CF (B).

According to (WWF Nepal 2001), short transects were better therefore such transects were established in the forests nearby conflict areas. Each transect lengthens 250m horizontally. Local trails were used as transects. Different direct and indirect signs were recorded: visual encounter and sign survey i.e. scats, dungs, scrapes, pugmarks, foot print etc. The locations where the marks are found were noted with GPS. The starting and end points of transects were also noted with GPS. Similarly, Sign encounter rate of wild animals were calculated by use of following formula:

$$\text{Sign encounter rate of wild animals} = \frac{\text{Sign of wild animals (Leopard/ Monkey/Wild boar)}}{\text{average length of transect}}$$

## **2. Household questionnaire survey**

Two set of question were prepared, one for local people and the other for community forest officials. The questionnaire contains both close and open ended questions and majority of questions were in multiple choice form. Questions were verified by Supervisor to make them suitable for the field situation. The questionnaire survey was conducted to investigate human-wildlife conflict in the study area, crop damage and livestock depredation, cause of conflict and perception of users on the community forest management activities,

availability status of natural resources to the local community and awareness towards biodiversity conservation.

Altogether 150 households were interviewed using systematic random sampling method in four mainly affected Village namely Parshuram-4, Katal, Parshuram-4, Ratamati, Parshuram-3, Lopa and Parshuram-3, Todina. The research tools designed for this research take into an account the ability of respondents to complete questionnaires and their level of literacy. The household number were obtained from Community forest staff. Household questionnaires survey were conducted to collect information about human-wildlife conflict in the Parshuram Municipality during the time of field survey.

### **3. Focus group discussion**

During the field survey focus group discussion were organized forming two focus group at Katal. One group was formed by involving members of community forest staff and another group included class 10 interested students (Shiv-Pārbati Secondary School, Katal). This method was used to investigate varieties of information regarding the status of human-wildlife conflict, cause of conflict, management of conflict and people's role in conflict management.

### **4. Direct observation**

Crop damage and livestock depredation were assessed through direct observation and household survey. Coping strategies adopted by local people towards HWC were also assessed through household survey and direct observation.

### **5. Key informant survey**

Key person interviews were conducted exclusively with those available during the household survey. The interview were conducted to know the status of human-wildlife conflict. Questionnaire regarding the status of conflict, causes of conflict, attitudes towards wildlife and their role in conflict management especially for elderly people school teachers and local leaders.

#### ***3.3.3 Sampling of Household Survey***

Then most effected villages of Parshuram Municipality were selected for research i.e. Katal, Ratamati, Lopa and Todina. Total of 750 HHs were found in the study area.

Approximately 20% (150 HHs) of total household were chosen by using a random number table in each villages. The lists of each household were achieved from the community forest staffs (Appendix II).

### **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 Microsoft Excel. Simple statistics such as percentage and frequency of count were used to analyze the data gathered from the household survey. For wildlife sign survey, the locations where the marks are found were noted with Global Positioning Systems (GPS) along transect and these points were interpreted in map by use of QGIS software. The economic values of livestock and crop loss was calculated on the basis of the local market rate of the crops and livestock. To understand the problem from wildlife, perception of people towards wild animals in term of occupation, age group, gender and education were calculated applying Pearson Chi-square test (two tailed). Similarly, compensation scheme of people in term of occupation, gender and education were calculated by using Pearson Chi-square test. Pearson Chi-square test (two tailed) was calculated by using Past software. The result was presented in descriptive form as well as suitable bar diagram, pie chart and tabular form.

#### **Crop loss calculation:**

To find per household crop loss in kg

$$\text{Crop loss (kg per household)} = \frac{\text{total loss of crop in Kg}}{\text{total number of surveyed household}}$$

$$\text{Economic loss (NRs. per household)} = \frac{\text{total loss of crop in NRs}}{\text{total number of surveyed household}}$$

Total crop loss (NRs.) = price of crop (NRs.) × total crop loss (kg).

#### **Livestock loss calculation:**

$$\text{Livestock loss (Per household)} = \frac{\text{total number of livestock}}{\text{total number of surveyed household}}$$

## 4. RESULTS

### 4.1 Distribution of Wildlife Sign in the Study Area

In the study area total of 48 signs of wild animals were recorded in the 12 transects. In case of Leopard: out of 12 transects; six transects did not account any sign of the Leopard and remaining six transects accounted eight signs i.e., scat, pugmark and scrapes. The scats of Leopard were recorded abundantly i.e.6. Similarly, in case of Wild boar: out of 12; one transects did not account any sign of the Wild boar and remaining 11 transects accounted 26 signs i.e., dung, scrapes and direct observed. The scrapes of Wild boar were obtained most abundantly i.e.16. Likewise in case of Monkey: out of 12; two transects did not account any sign of the Monkey and remaining 10 transects accounted 14 signs i.e., scrape and direct observed. Monkey were observed by direct visual encounter (Appendix II, Figure 2).

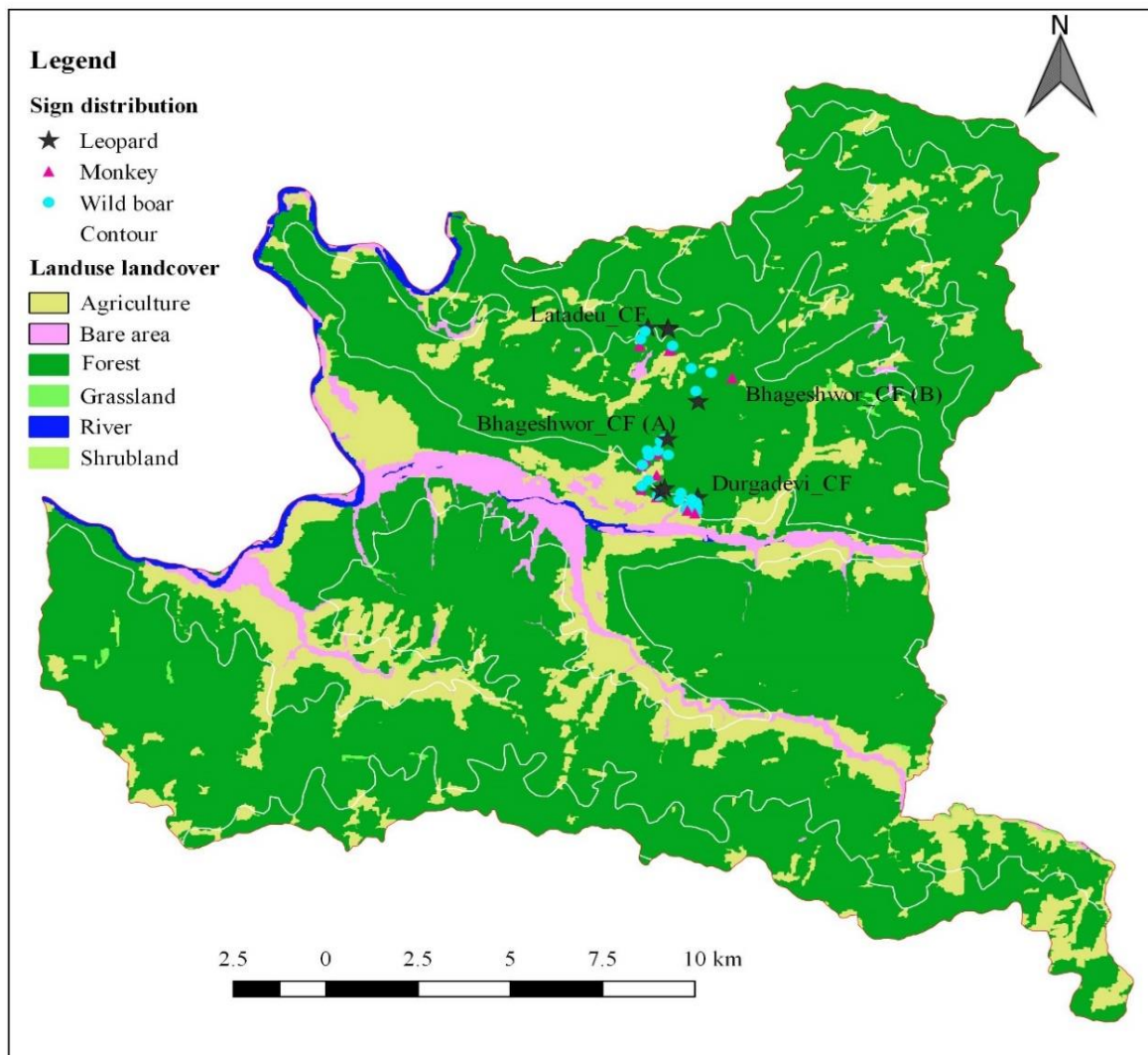


Figure 2: Map of the distribution of wildlife sign



A total of 12 transects were laid with an average length of 2km and at least 250m apart from each other. These all evidence of wild animals clearly indicated that there was presence of Leopard, Wild boar and Monkey. Maximum signs of Wild boar and Monkey were recorded near the boundary of CF while signs of Leopard were reported far from boundary. The density of signs was 4 signs per transect. The sign encounter rate of Leopard, Wild boar and Monkey were found to be 4 signs/km, 13 signs/km and 7 sign/km respectively.

## 4.2 Current Situation of Human-wildlife conflict in Parshuram Municipality

### 4.2.1 Socio-Economic Characters of Respondents

Total 150 households interviewed, 70 (46%) were male and 80 (54%) female respondents. They include 73% Kshetri, 12% Brahmin and 15% Dalit. These four study sites had total of 750 households among them 150 households were selected. Total agricultural land of those families was 3042 ropani. Among them highest 77 families were marginal farmer (below 7.5 ropani land), 54 families were small farmer (8-15 ropani land), 10 families were middle farmer (16- 30 ropani land) and least 9 families were rich farmer (more than 30 ropani land) and no any families were landless. The average agricultural land per household was 20.28 ropani and all respondents had their own land.

### 4.2.2 Problem from wild animals

Among 150 households nearly 99% of HHs faced crop damage and 27% HHs suffered livestock depredation problem from wild animals. The main responsible animals for crop damage were Wild boar, Monkey, Fox, Parrot etc. and Leopard and Jackal found involved in livestock depredation. The relation between crop loss and livestock depredation with respondent's opinion was found to be statistically significant ( $\chi^2= 166.19$ ,  $df= 1$ ,  $p\text{-value}= 0.001$ ) (Table 1).

Table 1: Problem from wild animals

	Yes	No	Total
Crop damage (N=150)	99% (148)	1% (2)	100%
Livestock and Avian stock depredation (N=150)	27% (40)	73% (110)	100%
Human Casualties	2 persons were injured due to Wild boar attack		

### 4.2.3 Level of conflict

The study showed that among 150 respondents, 108 (72%) of respondents answered that the status of human-wildlife conflict problem was high, 23 (15%) respondents said that the conflict problem was moderate, 16 (11%) respondents said that the conflict problem was general and three (2%) of respondents did not know about conflict problem (Figure 3).

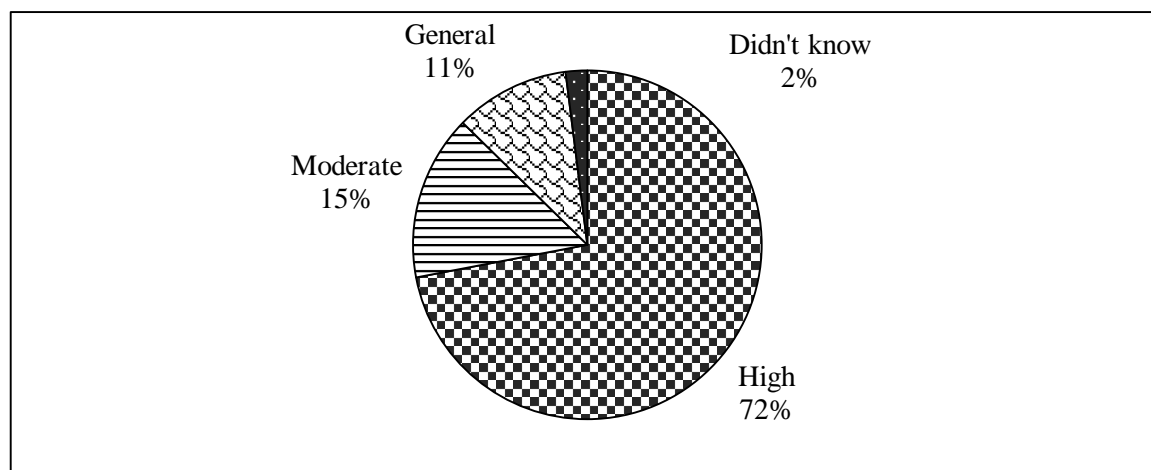


Figure 3: Level of human-wildlife conflict (N=150)

### 4.2.4 Resource collection

Questionnaire survey was done to know the dependency of local people in the community forest. Among 150 respondents, for livestock fodder collection; 40% collected from CF & own land and 20% collected from others land. Similarly, for fuel wood collection; 57% collected from CF, 18% collected from own land and 25% collected from others land. Likewise, in case of medicine collection; 54% collected from CF, 26% from own land and 20% from others land (Table 2).

Table 2: Resource collection by local people in different places

Resource Collection From	Livestock Fodder (N=150)	Fuel Wood (N=150)	Medicine (N=150)
Community Forest	40%	57%	54%
Own Land	40%	18%	26%
Other Forests	20%	25%	20%
Total	100%	100%	100%

### 4.3 Crop Damage

In the study area people cultivated different species of crops such as Maize, Paddy, Wheat, Mustard, Millet, Pulses, Barley, Potato and many other. From questionnaire survey it was found that there were two growing seasons; monsoon and winter season. Monsoon season crop included from (June to September) and winter season from (October to March) months. The summer crop includes Maize, Paddy, Millet, Potato and vegetables (Cabbage, Cauliflower). Similarly, winter crop includes Wheat, Barley, Mustard, Beans and Vegetables. From questionnaire survey it was found that wild animal damaged crops in both seasons mainly in maturing stage. Crop damage was identified quantitatively because damage varied between year to year and crop to crop.

#### 4.3.1 Types of Crops Damage

The major pest wildlife were Wild boar, Monkey, Porcupine, Hare and Birds. Wild boar and Monkey the major pest animals reported in the study area (Table 3).

Table 3: Crop wise major pest animals

Name of the Crops	Damage Responsible Wild Animals
Maize	Wild boar, Porcupine, Birds etc.
Paddy	Wild boar, Hare etc.
Wheat	Wild boar, Monkey, Birds
Mustard	Monkey etc.
Millet	Wild boar, Monkey etc.
Potato	Wild boar, Monkey, Porcupine etc.
Pulses	Monkey etc.
Others	Wild boar, Monkey etc.

#### 4.3.2 Quantitative description of the crop damage in different study sites

Table 4: Average crop damage in kg and monetary value of damage per year

S. N.	Name of the Crop	Land Cover in (Ropani)	Harvested (Kg)	Damage (Kg.)	Damage (NRs.)	Damage (US\$)	% of Crop Damage
1	Maize	576	42900	14060	275080	2434.458	50
2	Paddy	791	81275	2425	60375	534.319	11
3	Wheat	1220	98450	2400	85970	760.8345	16
4	Mustard	117	7370	150	15800	139.83	3
5	Millet	63	7050	2246	59300	524.805	10
6	Potato	84	7695	1077	32130	284.3505	6
7	Others	191	8710	485	20450	180.9825	4
<b>Total</b>		3042	253450	22843	549105	4859.579	100

The average annual loss of crop in the study area was found to be NRs. 5, 49,105 (4859.579 US\$). The highest crop loss was found to be Maize which was equal to NRs. 2, 75, 080 (2434.458 US\$). Similarly, Paddy, Wheat, Mustard, Millet, Potato and others crops were depreciated by wildlife in significant amount (Table 4).

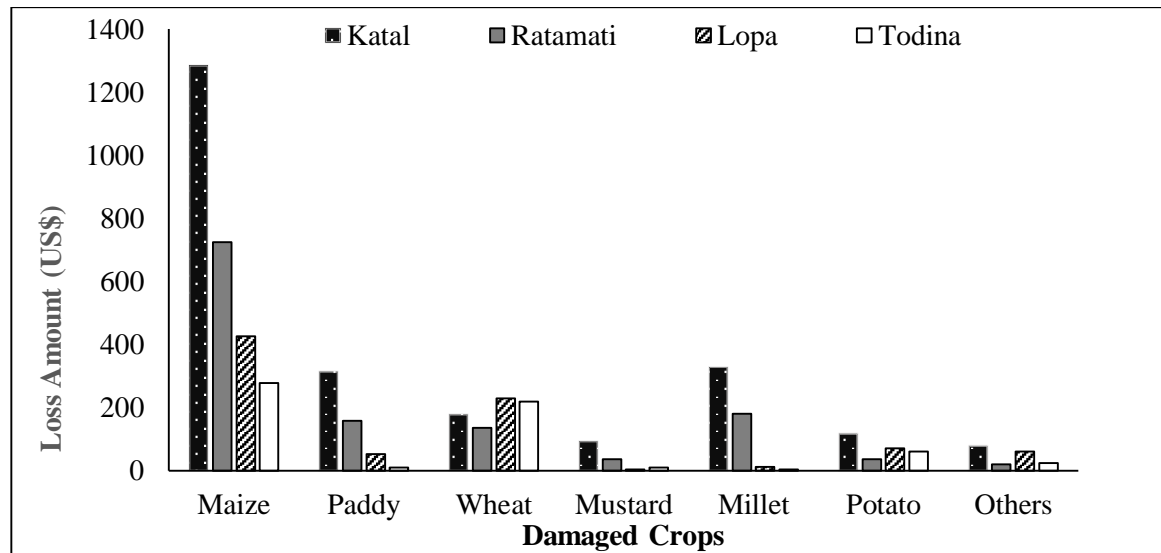


Figure 4: Comparative economic loss in Katal, Ratamati, Lopa and Todina

Katal area was more affected by wildlife than other three sites; Ratamati, Lopa and Todina. Total economic loss in Katal, Ratamati, Lopa and Todina was NRs. 270220 (US\$ 2391.447), NRs. 145615 (US\$ 1288.69275), NRs. 96285 (US\$ 852.12225) and NRs. 68225 (US\$ 603.79125) respectively (Appendix III). Among different crops damaged Maize was the most prominent crop than other (Figure 4).

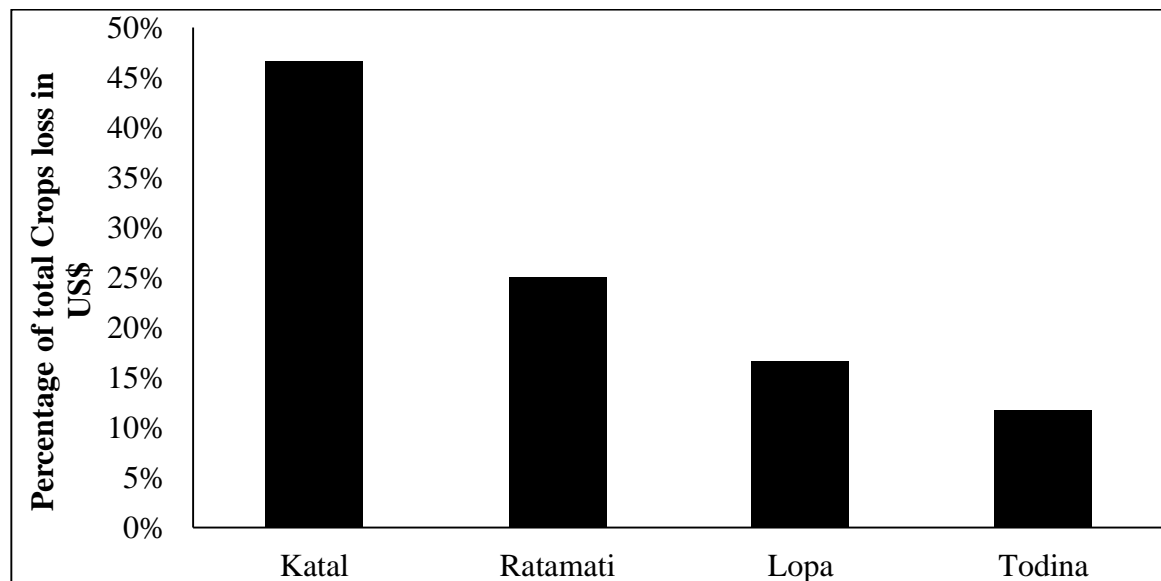


Figure 5: Monetary value (in US\$) of different crops loss in different sites

Similarly, the study sites Katal had the higher monetary loss of crops of NRs. 270220 (2391.447 US\$) whereas, the study site Todina had the lowest crop damage of NRs. 68225 (US\$ 603.79125) (Figure 5, Appendix III).

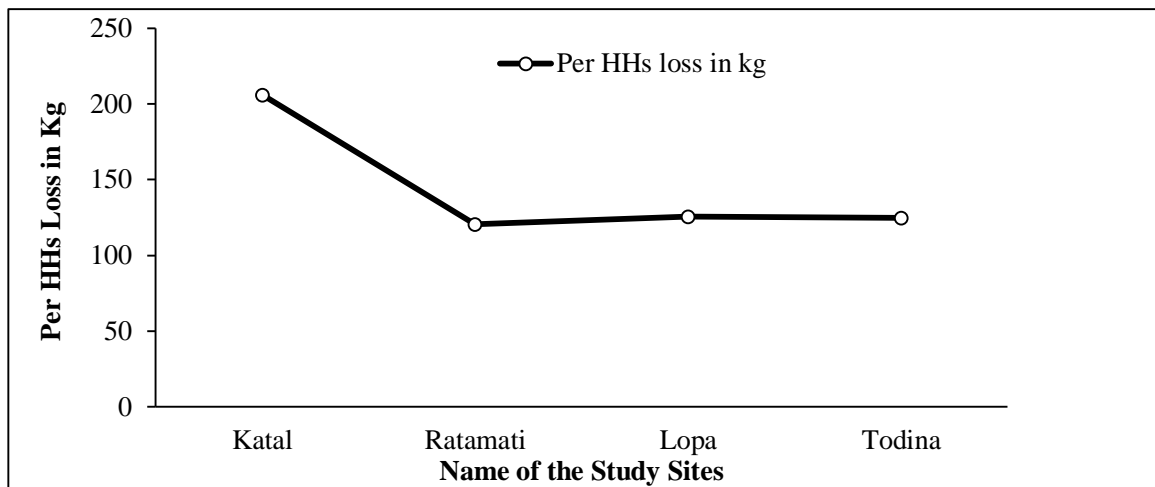


Figure 6: Per HHs crop loss in the study area

The average monetary loss of different crop varieties per household per annum in the study area was NRs.3868.97 (34.24 US\$). Similarly, in Katal had highest per household loss of different crops which was 205.79 Kg and study sites; Ratamati, Lopa and Todina had comparatively similar per household loss of different crops which were 120.62 Kg, 125.8 Kg and 124.84 Kg respectively (Figure 6).

#### 4.3.3 Seasonal intensity of crop damaged

Season wise incidents of crop damaged showed that maximum of the incidents occurred in summer season (33%) followed by spring season (29%), autumn season (24%) and least of incidents occurred in winter season (14%) (Figure 7).

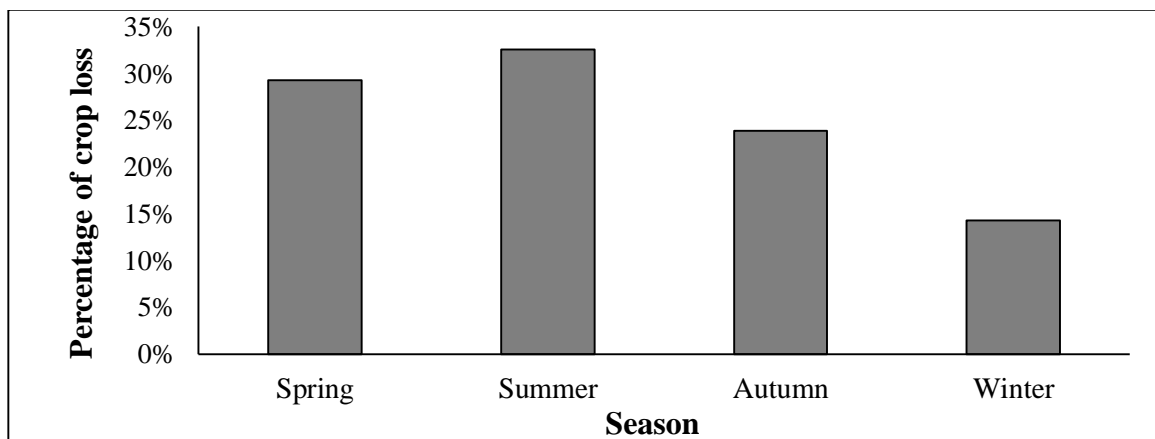


Figure 7: Season-wise frequency of crop damaged

#### 4.4 Livestock Depredation

The major carnivore species in this area are Leopard, Leopard Cat, Jungle Cat, Golden Jackal and Fox. The local people in the Parshuram Municipality mainly depends upon the agriculture and livestock rearing. The livestock depredation occurs mostly in the spring and summer season (March to August) because different crops were cultivated in this season and forest was also dense allowing easy access for hindrances by the predators. But loss of chicken was found in all of the seasons.

##### 4.4.1 Livestock holding

All the respondents living in the Parshuram Municipality had different types of livestock. Respondents in the study sites katal had total 821 livestock among them 119 Cow/Ox (*Bos taurus*), 70 Buffalos (*Bos bubailis*), 190 Goats (*Capra hircus*), 381 Chicken (*Gallus domesticus*), 40 Dog (*Canis lupus familiaris*) and 21 others like Cat, Hare etc. Respondents in the Ratamati had total 603 livestock among them 103 Cow/Ox (*Bos taurus*), 39 Buffalos (*Bos bubailis*), 123 Goats (*Capra hircus*), 284 Chicken (*Gallus domesticus*), 34 Dog (*Canis lupus familiaris*) and 20 others like Cat, Hare etc. Respondents in the Lopa had total 491 livestock among them 96 Cow/Ox (*Bos taurus*), 48 Buffalos (*Bos bubailis*), 317 Goats (*Capra hircus*), 24 Dog (*Canis lupus familiaris*) and six others like Cat, Hare etc. Similarly, respondents in the Todina had total 313 livestock among them 69 Cow/Ox (*Bos taurus*), 25 Buffalos (*Bos bubailis*), 203 Goats (*Capra hircus*), 13 Dog (*Canis lupus familiaris*) and three others like Cat, Hare etc. Respondent in The Lopa and Todina had no poultry.

##### 4.4.2 Types of livestock losses

Among 150 respondents, 27% respondent said that their livestock and avian stock were killed by predator especially by Leopard, Jackal & unknown species and 73% had no effect from predators (Table 5).

Table 5: Most responsible wildlife for livestock and avian stock depredation

Livestock/ Avian stock	Predator
Cow/Ox	Leopard
Buffalo	Leopard
Goat	Leopard and Jackal
Dog	Leopard and Jackal
Chicken	Jackal

The total of 147 livestock and avian stock were killed during last two years. In 2017; 40% Goat, 5% Cow, 3% Buffalo, 9% Dog and 43% avian stock were killed. Similarly, in 2018; 34% Goat, 2% Cow, 2% Buffalo, 4% Dog and 58% avian stock were killed.

#### **4.4.3 Economic value of livestock loss**

Average annual economic loss from livestock and avian stock was found to be NRs. 257100 (2275.335US\$) (Table 6). The average per household loss was NRs.1714 (15.1689US\$). Lopa had highest average per household loss of livestock was NRs. 576.67 and Ratamati had least average per household loss NRs. 190. Similarly, in the study site Katal had average annual per household loss of avian stock was NRs. 109.901 and Ratamati had average annual loss NRs. 73.27. In study sites Lopa and Todina poultry farming was band due to religious norms.

Table 6: Estimating economic loss for livestock depredation (Average per year)

	<b>Livestock/ Avian stock</b>	<b>No. of Killed</b>	<b>Total loss in NRs.</b>	<b>Total Loss In US\$</b>	<b>Remarks</b>
Livestock	Cow/Ox	3	20,000	177	The rate of the livestock and avian stock were calculated based on the local people information during field visit time in the study area
	Buffalo	2	40,000	354	
	Goat	28	177000	1566.45	
Pet animal	Dog	5	5500	48.675	
Avian Stock	Chicken	35	14600	129.21	
Total		73	257,100	2275.335	

In the study area found that, Livestock loss in descending order in different study sites: Parshuram-3 Lopa > Parshuram-4 Katal > Parshuram-3 Todina > Parshuram-4 Ratamati (Figure 8).

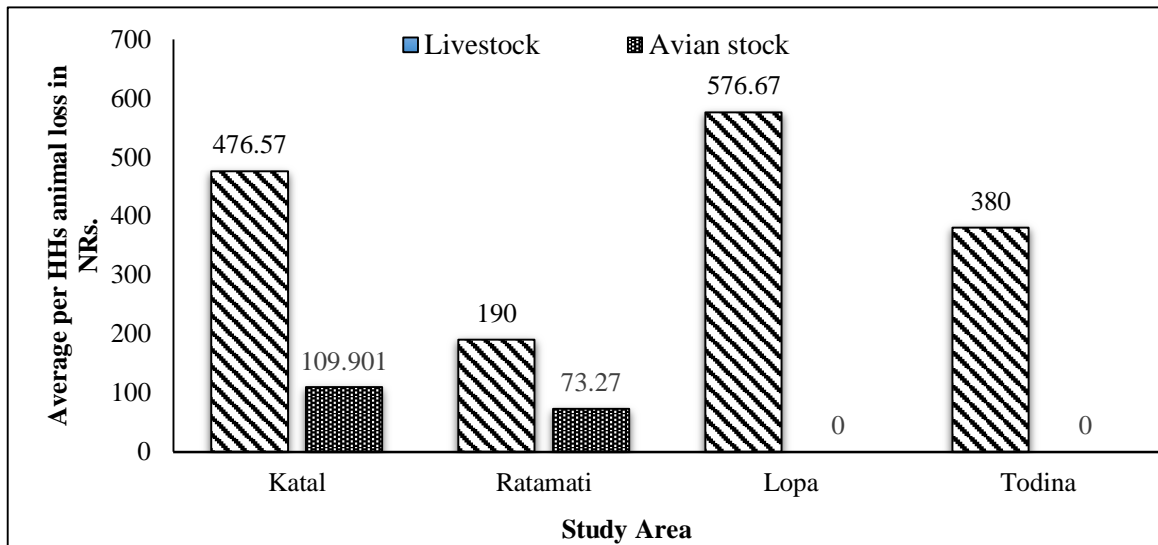


Figure 8: Per HHs annual loss of livestock and avian stock depredation

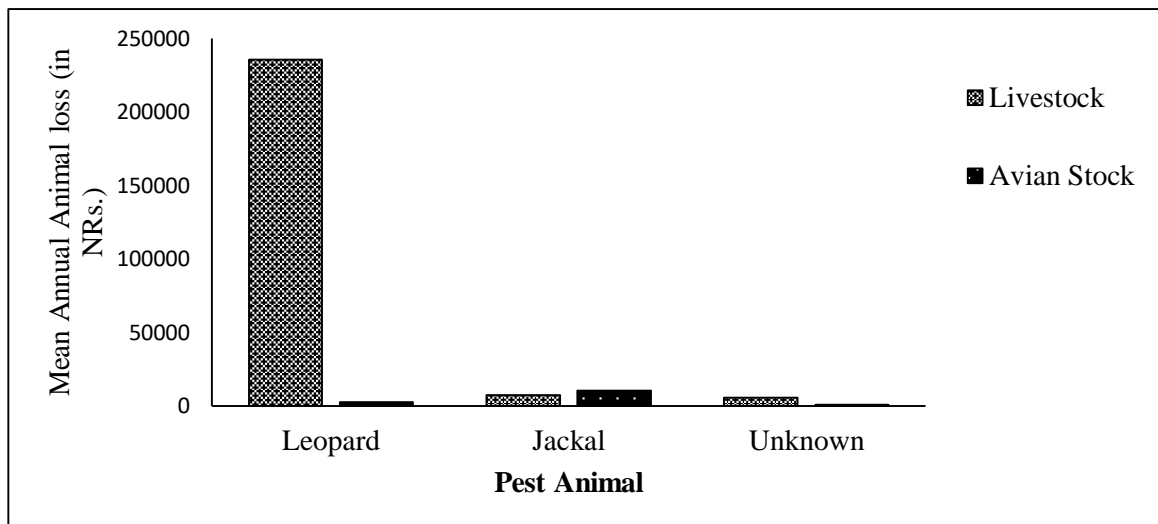


Figure 9: Mean annual animal loss (Livestock/ Avian Stock) (in NRs.) contributed by different pest animal

Leopard contributed to the highest amount of NRs. 235500 (2084.175 US\$) economic loss of livestock depredation whereas Jackal contributed to the highest amount of NRs. 10200 (90.27 US\$) economic loss of avian stock depredation (Figure 9, Table 7).

Table 7: Average annual animal loss loss (Livestock/ Avian Stock) (in NRs.) contributed by different pest animal

	Leopard (NRs.)	Jackal (NRs.)	Unknown (NRs.)
Livestock	235500	7500	5500
Avian Stock	2500	10200	800



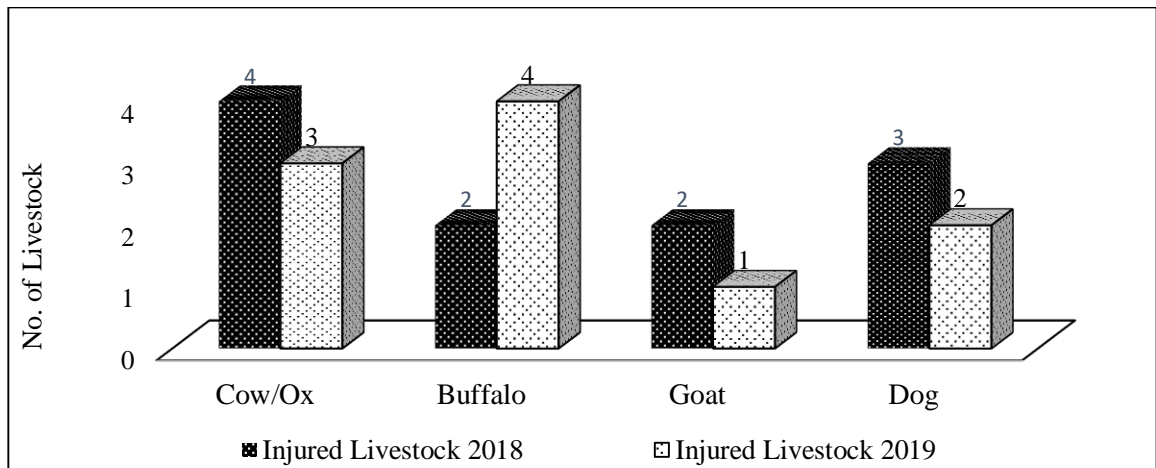


Figure 10: Number of livestock injured by wildlife during last two years

#### 4.4.4 Seasonal intensity of livestock depredation

Season wise incidents of livestock depredation showed that maximum of the incidents occurred in summer season (51%) and least was in spring season (9%) (Figure 11). Similarly, most of the incidents (80%) of livestock depredation occurred during the day time and least (20%) at night time.

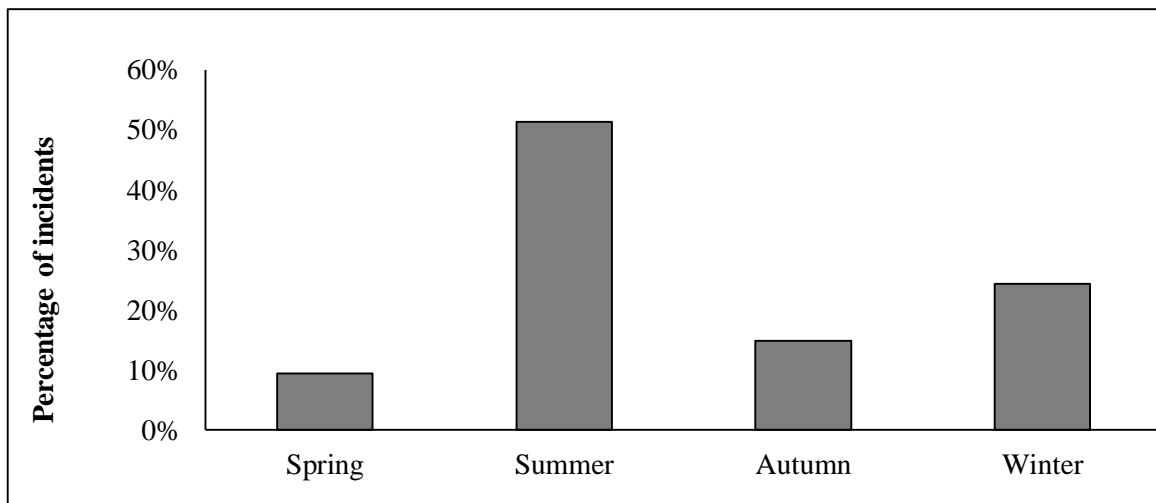


Figure 11: Season-wise frequency of livestock depredation

#### 4.5 Mitigation Measures for Wildlife against Crop & Livestock Depredation

In the study area local people had adopted different protective measures to divert wild animals. For crop protection they use guarding, scarecrow (Mukunda), making loud noise, fire, fencing etc. But all these methods adopted by local people were not significant. Similarly, in case of livestock majority of respondents (61%) didn't adopt any preventive measures and only 26% respondents apply dog watch, 9% fencing and 4% making shed against livestock depredation (Figure12,13).

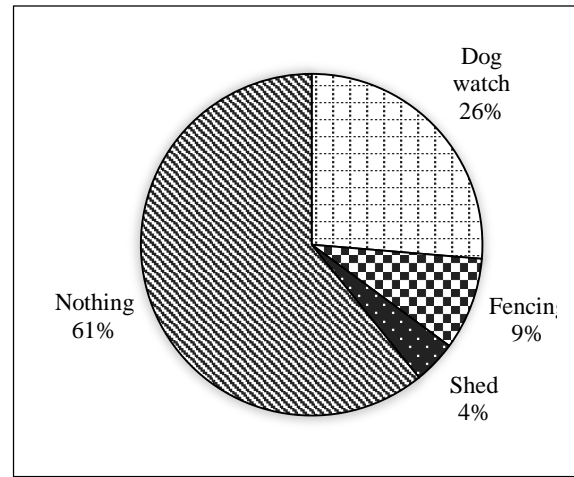
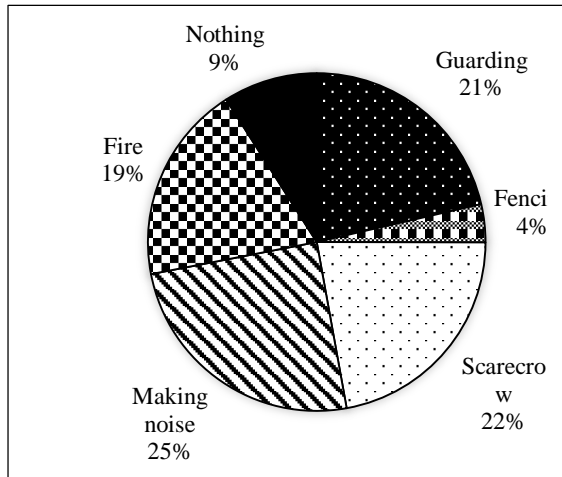


Figure 12: Preventive measure against crop damage Figure 13: Preventive measures against livestock depredation

#### 4.6 Human Casualties

In last two years, two human casualties had taken place, in which one was male and other female. Data was obtained through key-person interview with community forest staffs. Among the injured two persons one was from Lopa and one was from Katal (Table 8).

Table 8: Human casualties caused by wildlife during last two years (2017-2018)

S.N.	Name	Age	Activity of Victim	Where	Remarks
1	Maya Chand	60	Collecting Livestock fodder	In Jungle	Injured (by Wild boar)
2	Mansingh Bagal	40	Working at crop field	Crop field	Injured (by Wild boar)

#### 4.7 Poaching and Killing of Wildlife

In the study area, large number of Wild boar (26) were killed by farmer in last two years because Wild boar was the regular pest of crop & destroy the all crop field. Similarly, Leopard also injured by local farmer in Parigaon (Table 9).

Table 9: Wild animals killed by local people during last two years

Wild Animal	2017 Poaching/Killing	2018 Poaching/Killing
Wild boar	16	10
Hanuman Languor	1	1
Porcupine	3	0
Hare	1	1
Leopard	1 (Injured)-2016	

#### 4.8 Causes of Increasing Conflict

There were several causes of conflict in the study area. Maximum of the respondents believed that food deficiency & deforestation was the main causes of conflict. (Figure 14).

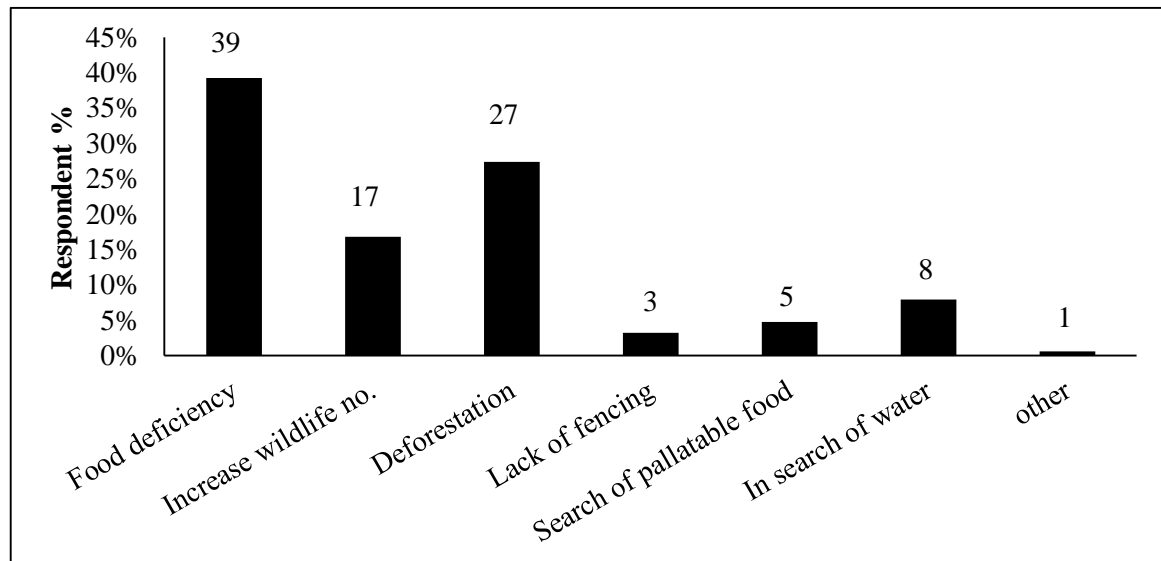


Figure 14: Respondents opinion towards causes of conflict

#### 4.9 Perception of Local People towards Wildlife and Wildlife Conservation

Respondents perceived negative thinking towards conservation of wildlife. Among 150 respondents, 89 respondents did not like wild animals and wanted to eradicate them, while 61 respondents like wild animals. It means that they were negative towards wild animal conservation (Figure 15). Perception towards wildlife conservation in term of age group, gender wise and occupation showed that no significant differences: for age group Pearson Chi-square  $\chi^2=2.535$ ,  $df=3$ ,  $p=0.469$ , for gender  $\chi^2=0.140$ ,  $df=1$ ,  $p=0.708$  and occupation  $\chi^2=4.186$ ,  $df=4$ ,  $p=0.381$ .

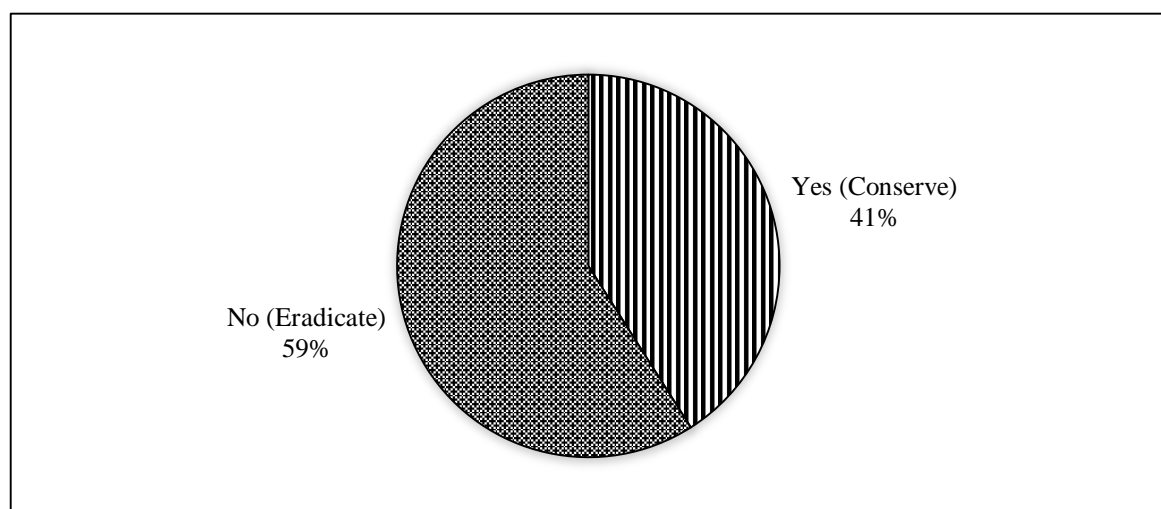


Figure 15: Wild animal liked/ dislike

#### 4.10 Compensation Schemes

In the study area large number of people were unaware about the benefit of present governmental schemes. Among 150 respondents only 62 respondents were known about compensation and majority of respondents 88 were unknown (Figure 16). The knowledge about compensation for age group, gender and education were not of significant differences (Pearson Chi-square Age wise  $\chi^2=10.062$ ,  $df=3$  and  $p=0.018$ , Gender wise  $\chi^2=0.607$ ,  $df=1$  and  $p=0.436$  and Education wise  $\chi^2=50.731$ ,  $df=4$  and  $p=2.541$ ).

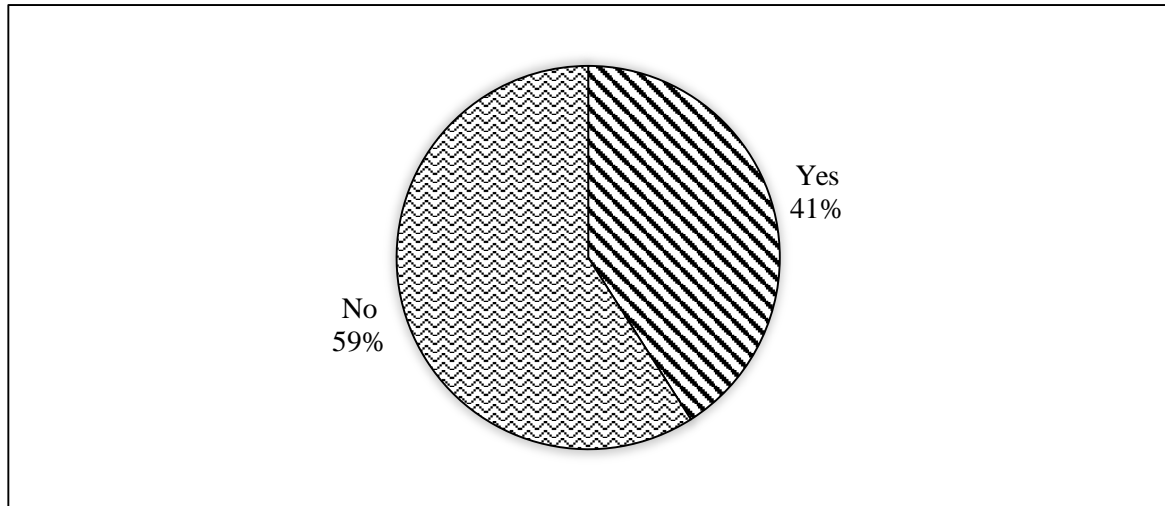


Figure 16: Local people knowing about compensation

## 5. DISCUSSION

### 5.1 Distribution of Wildlife Sign in the Study Area

Agricultural land, forest, bushes areas are occupied by the Leopard, Wild boar and Monkey which are predicted as suitable habitat for wild animals. The Leopard prefers to that habitat type where agricultural land, bush and forest areas have greater affinity towards prey base that serves as food for them. Total of 48 signs of Leopard, Wild boar and Monkey were reported in 12 transects of four different CF in the Parshuram Municipality. This results clearly indicated that there is presence of Leopard, Wild boar and Monkey. Similarly, in Kunjo VDC of Mustang district (Ghimirey 2006) conducted 8 transects out of which 4 transects did not account for any signs of the Common Leopard but the remaining four accounted for 19 signs which gave sample evidences of Common Leopard's presence in the study area.

The encounter rate of Leopard, Wild boar and Monkey were found to be 4 signs/km, 13 signs/km and 7 signs/km respectively. Similarly, in Chhekampar VDC, Manaslu Conservation Area encounter rate of Snow Leopard signs were 3.57/km on an average, indicating low abundance, whereas prey species such as Blue Sheep and Himalayan Tahr had 3.8 and 1.8 animals/ km<sup>2</sup>, respectively (Devkota 2017).

### 5.2 Human-wildlife conflict in Parshuram Municipality

Comparatively higher number of incidents related to human-wildlife conflict were observed in the study area. From questionnaires survey it was found that the number of wildlife had been increased after established of community forest and most of the respondents said that the status of HWC was higher. Similar results were found number of wildlife species had been increased and higher number of conflict were created by wildlife after establishment of community forest in Dang (Pokarel and Shah 2008). Similarly, in Gaurishankar Conservation Area (GCA) the number of wildlife had been increased after establishment of conservation area and create more conflict (Awasthi 2014).

Overall, 99% HHs was documented experiencing some kind of conflict incident with wildlife. Similarly, 84.1% HHs around GCA were faced from conflict incident with wildlife (Awasthi 2014). In the study area majority of people were depending upon the community forest for resource collection such as livestock fodder, fuel wood, medicine and furniture.

The local people have high dependency on a CF which is also prime habitat of wild animals, which makes activity very conflict prone. It has seen other conservation area that when need of people overlaps the need of wild animals and it creates conflict (Graham et al. 2005, Schwerdtner and Gruber 2007).

### **5.3 Crop Damage**

About 99% of respondents reported that they faced crop damage problem due to the invasion of wildlife in their agricultural field. Similar things were found from other studies (Pokhrel and Shah 2008). But in GCA 81.25% of the respondent documented that they faced crop damage problem due to wildlife in their agricultural land (Awasthi 2014). The possible reasons were the livelihood pattern of local people. Most of the people in the study area are mainly depends upon agriculture practices and livestock farming that makes vulnerable to the conflict with wildlife from the forest area.

In the study area, it was found that wild animals like Wild boar, Monkey, Fox and Bird (Parrot) were the major pest for crop damage & damage all types of crops on both seasons. Wild animals damage in all stage of crop mainly in fruiting period. Crop depredation by wild animals varies depending upon the types of crops that might be due to the palatability of the crop varieties (Paudel 2007). Among various wild animals, Wild boar and Monkey were the major crop raider. Wild boar was the regular pest of crop causes highest crop damage. Limbu (1988) reported that most notorious animal to damage the crop was Wild boar and Wild Buffalo in KTWR. Similarly, (Regmi et al. 2013) reported Monkey was the major crop raider supported throughout the Asia. Monkey, Muntjac Deer, Porcupine and Hare were the main crop raider in Panchase area (Adhikari et al. 2018). Nepal and Weber (1993) reported that Rhinoceros, Chital and Wild boar as principle crop raider in CNP. Adhikari (2005) identified *Rhinoceros*, Deer and other as a major pest species on the Buffer Zone of CNP. Awasthi (2014) reported that Monkey, Porcupine, Barking Deer, Himalayan Goral, Jackal and Himalayan black bear were the major pest for crop damage in GCA. Wild boar was the principle crop raider in SNNP (Kharel 1993, Paudel 2007, Pandey et al. 2015).

The average annual loss of crop in the study area was found to be NRs. 5, 49,105 (4859.579 US\$). The highest crop loss was found Maize. Similarly, in the study sites Katal which suffered from highest monetary loss of crops & least was found in Todina. Study site Katal

is located near the CF and Maize was the principle crop cultivated by farmer so that it provides great palatability to main crop raider (Wild boar) & farmers did not effectively follow any preventive measures for crop loss so wild animals came easily on crop field. Farm lands were sloppy and rocky type in Todina and they follow mixed cropping. The main pest animals; Wild boar and Monkey did not enjoy this crop variety so least crop damage was found in the Todina. The un-palatability of mixed crop like Pulses, Mustard and Paddy by Wild boar seem to be interesting behavior of which need to be verified with detailed study in the future.

Sharma (1995) reported that Wild boar destroyed potato, Paddy and Wheat by 67.76%, 21.17% and 11.07% respectively in Kusaha VDC adjacent to KTWR. Maize was the maximum damage crops followed by Millet, Potato and Wheat in GCA (Awasthi 2014) which was similar to this study. In the study area found total crop loss 22843 Kg consisting 14060 Kg Maize, 2425 Kg Paddy, 2400 Kg Wheat, 150 Kg Mustard, 2246 Kg Millet, 1077 Kg Potato and 485 Kg other. Similar types of results was found in Sunkhani VDC of SHNP by (Gurung 2002). Similarly, in Mahendranager, Municipality adjacent to SNP highest economic loss 74.28% was estimated to Paddy followed by Wheat (17.08%) and Maize (8.62%) and highest economic loss was contributed by Elephants (43.29%) followed by Wild boar and Chital (Gautam 1999). Likewise, Monkey, Muntjac deer, Porcupine and Hare were the main crop raider that resulted in total economic loss of US\$ 29.56 per household (HH) in Panchase area Chitwan (Adhikari 2018).

Season wise incidents of crop damaged was shows that maximum of the incidents occurred in summer season followed by spring autumn and least of incidents occurred in winter. The reason behind this may be low availability of protein contained food in natural forest. Wildlife go out from CF to eat more palatable food which was abundant in crop field, change their test. This result was also supported by (Sukumar 2003, Neupane et al. 2014, Shrestha 2007).

#### **5.4 Livestock Depredation**

About 27% of house hold in the study area faced from livestock depredation. Goat suffered the highest level of predation because most people leave goats for grazing in forest without any herder and people bring them back to home at the late evening so it was easier to attack

on prey for wild animals. As compared to other study, most of the attack occurred in the grazing land (Koirala et al. 2012, Shah 2018).

Annually 38 livestock and 35 avian stock were killed by wild animals in the study area. Total cost of livestock and avian stock depredation was NRs. 257100 (2275.335 US\$). Livestock depredation prevalence around study area was not uniform. Some study sites had higher economic loss than other study sites. Leopard had been found the major predator for livestock depredation in the study area. Similar types of results also carried out in different places. Common Leopard to be the main predator of livestock in Bhutan and Pakistan (Wang and Macdahl 2006) and in Nepal (Gurung 2002, Ghimire 2006, Awasthi 2014,) reported Common Leopard was the primary predator for livestock. Further Jackal being the main predator for avian stock depredation causes high economic loss. These results were supported by (Koirala et al. 2012) and in Satbariya range of Dang district, Nepal, Chicken was most vulnerable to predation by Jackal (Pokharel and Shah 2008).

Season wise incidents showed that maximum of the incidents occurred monsoon season. This results were supported by (Kshetry et al. 2015) in North- Eastern India. The reason may be in monsoon there was the dense vegetation and it makes easy to hide predator inside vegetation and easily captured livestock. Our results found most incidents (80%) of livestock and avian stock depredation occurred during the day time. In Mandi district, India, highest number of killing (74.5%) occurred at night time. Also (Kumar 2011, Awasthi 2014) reported that livestock depredation pattern (60.16%) occurred at night time. This finding was completely different from our results. It was because in study area livestock was stall-feeding. Peoples graze livestock in day time only and return home at evening. Livestock was kept in stall and there were no chances of killing livestock by predators.

### **5.5 Mitigation Measures for Wildlife against Crop & Livestock Depredation**

There are various techniques for crop protection and its effectiveness varies based upon the method and pest animal focused. During the study, it was found that farmers used traditional method such as hunting, making loud noise 'Ho-Ho', making scarecrow in the crop field and other popular method was day night guarding on wooden platforms "chhapro" were effective method in chasing wild animals. This results were also supported by (Paudel 2007, Bhandari 2008, Shrestha 2012, Awasthi 2014). Chalise (2011) reported



farmer suffering from crop damage in the eastern part of Nepal by Monkey, where the farmer planted alternative crops which was unfavorable for Monkey.

Most of respondents in the study area didn't adopted any precautionary measures towards the wild animal for prevent livestock depredation. It was compared to the study in Kunjo VDCs Mustang where most of people didn't fallow any preventive measures against livestock depredation (Ghimirey, 2006) and similar result was also documented around GCA (Awasthi, 2014).

### **5.6 Human Casualities**

In the study period two people were injured due to Wild boar attacks. Similar types of things were made by (Chetri 1013, Awasthi 2014) documented six human casualities by Black Bear in Manaslu Conservation Area and four human injury was created by attack of Himalayan Black Bear in GCA.

### **5.7 Poaching and Killing of Wildlife**

The poaching and killing of wild animal were common practices in Parshuram Municipality. A total of 33 wild animals were killed by local people. Majority of Wild boar (26) were killed in last two years. Similarly, Leopard also injured by local farmer in Parigaon. A Leopard was trapped in a snare laid to catch Wild boars and other animals, accidently Leopard was trapped and become injured. Similarly, in Kunjo VDC Mustang district, Common Leopard was killed before the area was included in ACAP (Ghimere 2006) and the poaching and killing of wild animals were common practices before GCA include in conservation area and SNP (Awasthi 2014, Shah 2018).

### **5.8 Causes of Increasing Conflict**

Maximum respondents said that the wild animals came out of the forest because of food deficiency, deforestation and fragmentation of wild life habitat. It means natural forest could not full fill their requirements so that wild animals entered to the crop field. Grazing larger number of livestock in the forest area reduce the quality and quantity of forests, which influence the conflict in the study area. HWC arises mainly because of the loss, degradation and fragmentation of habitats through human activities such as, logging, animal husbandry, agricultural expansion, and developmental projects (Fernando et al. 2005). Similarly, fragmentation of huge proportion of forest area thereby reducing the

habitat for the Wild Elephant and causes conflict (Sukumar 1994). Graham (2004) reported that the frequency of conflict has grown largely because of the increase in human population and resultant expansion of human activities. Food deficiency, increase in number of wildlife, search of palatable food and water were the causes of conflict in Banke National Park (Ayadi 2011) which was similar to my finding. Limbu and Karki (2003) also observed lack of sufficient food in the reserve, palatability of field crops and lack of fences in the boundary were the causes of conflict in KTWR. Crop depredation, grazing and scarcity of fodder and fire wood collection were the cause of negative interaction between peoples (Paudel 2007, Sharma 1991, Karanth et al. 2012). Therefore, necessary alternative way is needed at time to minimize this problem.

### **5.9 Perception of Local People towards Wildlife and Wildlife Conservation**

The goal of this research was to understand the importance of wild animals measured as intrinsic value and perception of local people toward the wild animal conservation. Majority of the respondents had negative attitude towards wild animals. The possible reason includes the overlapping of local people and wild animals need. The respondents demonstrated negative thinking about conservation of wildlife. It means that they were negative towards wild animal conservation. Most of the respondents believed that wildlife population had increased significantly as a result of restriction; the perception was derived from an increases frequency and intensity of damage to crop and livestock compared to the Jigme Singye Wangchuk National Park, Bhutan (Wang et al. 2006). Similarly, Barandabhar corridor forest, Chitwan crop damage was the serious issue that has developed negative attitude towards wildlife protection (Bhattarai and Basnet 2004).

### **5.10 Compensation Schemes**

In the Parshuram Municipality majority of households are experienced problems created by wild animals such as crop damage and livestock depredation. A large number of people were unaware about the benefit of present governmental schemes. Till now no any local people received any relief fund from government. This was due to lack of appropriate education and lack of information flow from the concerning authority. Similarly, lack of communication about the actual policy, language, internet and scope combined with villagers depending sense of victimization exacerbates the more broadly defined problem of Park- people conflict that characterize countless PA community around the world (Orga and Badola 2008).

## 6. CONCLUSION AND RECOMMENDATIONS

### 6.1 Conclusion

Crop damage, livestock depredation and human injuries were the major types of damage. All respondents said that the problem of crop damage and livestock depredation increased day by day. Majority of local people did not like wild animals because they faced crop damage and livestock depredation, also victim family did not get any compensation from government authority. Total of 48 signs were recorded in 12 transects of four different CF, which indicate the presence of the species (Leopard, Wild boar and Monkey) in the study area. Different wildlife was responsible for crop damage but Wild boar and Monkey were the major crop raider. Leopard and Jackal were responsible for livestock and avian stock depredation. Human casualties also noticed during this study period, two people were injured by Wild boar attack. Poaching and killing of wild animals were high in the study area. Total of 33 wild animals were killed by local people in last two years, among them Wild boar number was high.

The average annual economic loss of different crop was found to be NRs. 549105 (4859.579 US\$) and per household economic loss NRs.3660.7 (32.397 US\$). Parshuram-4 Katal had the highest crop loss and Maize was the most frequent crop loss than other. Similarly, the average annual economic loss of livestock was found to be NRs. 257100 (2275.335 US\$). The average loss per household was NRs. 1714 (15.1689 US\$). Parshuram- Lopa had highest average annual loss of livestock. Goat and cow, calf of buffalo, dog was the main target of Leopard.

Local people were participating direct method such as guarding, making loud noise, fencing, fire to control the depredation but these methods were partially effective to chase wildlife. It is concluded that HWC in the study area was increasing in order, majority of respondents were unknown about the compensation. It was necessary to know about compensation and needed compensation towards loss.

This study focused on the major issues and status of HWC in Parshuram Municipality area. The survey has revealed crop damage and livestock depredation by different wildlife which constitute a major point of HWC in study area so it is an urgently priority to develop management practices, conflict mitigation measures and public awareness programs that help to minimize the conflict.

## 6.2 Recommendation

- **Detailed study of human-wildlife conflict (HWC) is necessary:** This research can't cover all villages of Parshuram Municipality so that there is also necessarily needed to conducted scientific researches related to HWC in Parshuram Municipality area. This will provide detailed information on crop damage and livestock depredation by wild animals.
- **Awareness for the wildlife conservation:** Integrating program combining conservation education, compensation for livestock or human loss and local people participation in resource management is recommended. Conservation education must also be provided to the villagers about the role of the species wild animal in balancing the ecosystem. Seminar, rally, public advocacy program should be organized regularly.
- **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 peoples should be encouraged to grow unpalatable, less preamble crops like Mustard.
- **Effective physical barriers:** Good effective strong wall with wire fencing on it should be constructed around community forest areas to prevent wildlife entering into the human settlement.
- **Behavioral study:** The behavioral study of most conflict creating species should be done in order to confine them within the community forest by protecting their habitat, food and creating water sources, which are lacking inside the forest.
- **Compensation:** Proper compensation for all types of losses/damages should be provided to help people in making the positive attitude towards the conservation of wildlife.
- **Illegal poaching and killing:** People who are engaged in illegal logging, poaching and hunting should be strictly punished.
- **Insurance policy:** Crop, livestock and human insurance policy should be opened for the people to make positive attitude towards the wildlife.

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## APPENDIX- I

### Appendix I- 1: Household Questionnaire

HH No: ..... GPS: N..... E.....

Elevation: .....

Name: Occupation: Date:

Address: Education: Age:

#### Land holding Capacity:

Landless= Marginal Farmer (Below 7.5

Ropani) = Small Farmer (8-15 Ropani) = Middle Farmer

(16-30 Ropani) =

Rich Farmer (More than 30 Ropani) =

Amount/Type	Grass	Tree grass	Thatch grass	Fuel wood	Medicinal herbs	Others
KG/Day						
Bhari/Day						

1. Collection of forest product:

2. Do you have livestock/ avian stock? If yes, how many and which types of livestock do you have?

Types	Cow/Ox	Buffalo	Goat	Dog	Poultry	Other
Male						
Female						
Calves						

3. Do you graze your livestock inside the forest? If yes, which area do you mostly graze your livestock?

.....

4. Do you know, which wildlife are present in this area?

Common Leopard      Monkeys      Wild boar      Wolf/ Jackal      Chital/ Goral

Deer sps.      Hanuman Languor      Porcupine      Hare      Squirrel

Other...

5. What type of crop do you plant in growing season?

Season

Crop types

(a).....

.....

(b).....

.....

(c).....

.....

(d).....

.....

6. Does wildlife damage your crops? If yes which wildlife?

Common Leopard      Monkeys      Wild boar      Wolf/ Jackal      Chital/ Goral

Deer sps.      Hanuman Languor      Porcupine      Hare      Squirrel

Other...

7. Among them which wildlife mostly damages your crops and how often do they enter the field?

Rate/Animals	Wild boar	Monkey	Jackal/wolf	Porcupine	Hare	Birds	Others
Once a day							
Twice a day							
Thrice a day							
Day time							
Evening time							
Night time							
Regular pest of crops							

8. How much crop did wild animals destroy in this year?

Season	Crop type	Production (kg)	Damage (kg)	Amount in NRs

9. What type of crops wild animal prefer? If yes which animal.....

Maize/Paddy/Wheat/ Mustard/Lentil /Millet/Potato/Others.....

10. How many distance far-off your land from your community forest? a) 0-500 m

b) 500-1000 m

c) 1000-1500 m

d) above 1500m

11. Do the Animals come alone or they come in group?

a) Single

b) Group

12. In which season wild animal come most?

a) Spring

b) Summer

c) Autumn

d) Winter

13. Have you applied any techniques for the protection of crop and property damage?

a) Yes

b) No

14. What are the techniques do you applying to protect crop damage by wild animals?

a) Guarding overnight

b) Fencing around the village/cultivable field

c) Scare-crow

d) Making noise

e) Fire

15. What are the livestock that are killed / injured by wildlife in last two years?

Animals	Total	Killed	wounded	Time of killing	Season	Predator identification sighting sign	Name of predator	Cost of livestock killed
Goat								
Cow/Ox								
Buffalo								
Dog								
Chicken								
Others								





## Appendix I- 2: Stakeholder Questionnaire

SH Q. No: ..... GPS: N..... E.....

Elevation: .....

Name: Occupation: Date:

Address: Education: Age:

1. From how long you been working in this field?

.....

2. What have you done in this field till now?

.....

3. What do you think what are the main reason for the conflict?

.....

4. If there you get the reason for the conflict, did you apply any effort to overcome from this problem?

a) Yes b) No

5. If yes what did you apply?

.....

6. Does it was effective what did you apply?

.....

7. In which season wild animals come most?

a) Spring b) Summer c) Autumn d) Winter

8. Do the affected people come to complain about the damaged?

a) Yes b) No

9. Has any controlling measures or protection been adopted by government authorities?

a) Yes b) No

10. If yes, what types of control measures have been adopted?

11. How can conflict between human and wild animals be solved?

## Appendix –II Sampling of Household Survey

**Table 1: Household sampling**

S.N.	Municipality	Sampled HHs	Total HHs	Sampling intensity %
1	Parshuram-4 Katal	53	265	20
2	Parshuram-4 Ratamati	48	240	20
3	Parshuram-3 Lopa	30	150	20
4	Parshuram-3 Todina	19	95	20
Total		150	750	

**Table 2: Age wise distribution of respondents**

Age class	Male	Male (%)	Female	Female (%)
0-19	3	2%	12	8%
20-40	37	25%	42	28%
41-60	19	13%	23	15%
Above 60	11	7%	3	2%
Total	70	46%	80	54%

## APPENDIX-III

**Table 1: Position of the transects conducted in the study area  
a. Durgadevi Community Forest - Katal**

Transects Number	Position on GPS (Degree Decimal)	
	Initial Point	End point
1	N: 29.138092 E:80.3672264 Elevation: 578m	N: 29.142776 E:80.368662 Elevation: 583m
2	N: 29.138473 E:80.365071 Elevation: 482m	N: 29.144108 E:80.367661 Elevation: 619m
3	N: 29.140119 E:80.362915 Elevation: 481m	N: 29.148661 E:80.367487 Elevation: 633m
4	N: 29.141955 E:80.356808 Elevation: 472m	N: 29.146541 E:80.360071 Elevation: 623m

**b. Bhageshwor Community Forest (A) - Ratamati**

Transects Number	Position on GPS (Degree Decimal)	
	Initial Point	End Point
1	N: 29.144034 E:80.352021 Elevation: 481m	N: 29.153719 E:80.360627 Elevation: 685m
2	N: 29.153301 E:80.356522 Elevation: 599m	N: 29.158336 E:80.360758 Elevation: 728m
3	N: 29.148773 E:80.350129 Elevation: 498m	N: 29.15642 E:80.353699 Elevation: 655m

**c. Latadeu Community Forest - Lopa**

Transects Number	Position on GPS (Degree Decimal)	
	Initial Point	End Point
1	N: 29.180145 E:80.357782 Elevation: 742m	N: 29.188605 E:80.358198 Elevation: 1216m
2	N: 29.182728 E:80.350482 Elevation: 834m	N: 29.188343 E:80.353214 Elevation: 1126m

**d. Bhageshwor Community Forest (B) - Todina**

Transects Number	Position on GPS (Degree Decimal)	
	Initial Point	End Point
1	N: 29.174728 E:80.365592 Elevation: 810m	N: 29.165140 E:80.367829 Elevation: 1076m
2	N: 29.180397 E:80.370241 Elevation: 788m	N: 29.171742 E:80.371503 Elevation: 1141m
3	N: 29.178561 E:80.372923 Elevation: 950m	N: 29.174968 E:80.376632 Elevation: 859m

**Table 2: Distribution of Wildlife Sign in the Study Area**

**a. Durgadevi Community Forest- Katal**

Transect Number	Wild animal sign	Name of Wild animal	GPS Point (Degree Decimal)		
			Latitude	Longitude	Elevation (m)
1	Scat	Leopard	29.142263	80.36828	572
	Scrape	Wild boar	29.138574	80.368134	493
	Dung	Wild boar	29.140083	80.368088	521
	Visual Encounter	Monkey	29.138109	80.367594	479

	Visual Encounter	Wild boar	29.14092	80.367912	543
2	Dung	Wild boar	29.138941	80.365077	504
	Scrape	Wild boar	29.13971	80.365588	534
	Scrape	Wild boar	29.141818	80.366555	569
	Visual Encounter	Monkey	29.138805	80.136549	502
	Absent	Leopard			
3	Visual Encounter	Monkey	29.141984	80.362808	491
	Scrape	Wild boar	29.141467	80.363016	486
	Scrape	Wild boar	29.143366	80.363518	506
	Absent	Leopard			
4	Visual Encounter	Monkey	29.142105	80.356753	474
	Visual Encounter	Monkey	29.143874	80.358033	523
	Scrape	Wild boar	29.14253	80.357036	448
	Visual Encounter	Wild boar	29.143084	80.357439	479
	Dung	Wild boar	29.143819	80.358024	527
	Scat	Leopard	29.143556	80.357837	513
	Pugmark	Leopard	29.144361	80.358932	548

### b. Bhageshwor Community Forest (A) - Ratamati

Transect Number	Wild Animals Sign	Name of Wild animals	GPS Point (Degree Decimal)		
			Latitude	Longitude	Elevation (m)
1	Visual Encounter	Monkey	29.14398	80.3525	481
	Scrape	Monkey	29.14792	80.35661	548
	Scrape	Wild boar	29.1449	80.35254	491
	Dung	Wild boar	29.14651	80.35429	506
	Scrape	Wild boar	29.15761	80.3582	601
	Scrape	Wild boar	29.15339	80.35964	658
	Absent	Leopard			
2	Scrape	Monkey	29.15361	80.35651	608
	Dung	Wild boar	29.15448	80.35671	628
	Scrape	Wild boar	29.15702	80.35737	605
	Scat	Leopard	29.1575	80.35926	701
3	Visual Encounter	Monkey	29.15028	80.35225	523
	Visual Encounter	Monkey	29.1519	80.35351	553
	Dung	Wild boar	29.15055	80.35252	527

	Scrape	Wild boar	29.1530 8	80.35423	554
	Scrape	Wild boar	29.1543 6	80.35383	608
	Absent	Leopard			

### c. Latadeu Community Forest - Lopa

Transect Number	Wild animal Sign	Name of Wild animal	GPS Point (Degree Decimal)		
			Latitude	Longitude	Elevation (m)
1	Visual Encounter	Monkey	29.18113	80.35891	752
	Visual Encounter	Monkey	29.18152	80.35927	765
	Scrape	Wild boar	29.1824	80.35983	799
	Scat	Leopard	29.18699	80.35838	1091
	Scrape	Leopard	29.18662	80.35854	1064
2	Scat	Leopard	29.18697	80.35278	1014
	Visual Encounter	Monkey	29.18221	80.35067	824
	Scrape	Wild boar	29.18393	80.35086	878
	Scrape	Wild boar	29.18606	80.35201	963

### d. Bhageshwor Community Forest (B) - Todina

Transect Number	Wild animal Sign	Name of Wild animal	GPS Point (Degree Decimal)		
			Latitude	Longitude	Elevation (m)
1	Scat	Leopard	29.167749	80.367509	1064
	Dung	Wild boar	29.170568	80.366749	959
	Absent	Monkey			
	Visual Encounter	Wild boar	29.176574	80.36527	741
2	Absent	Monkey			
	Absent	Leopard			
	Scrape	Wild boar	29.175629	80.370828	1023
3	Visual Encounter	Monkey	29.174332	80.376705	858
	Absent	Wild boar			
	Absent	Leopard			

## APPENDIX-IV: UNIT CONVERSION

(Maize, Paddy, Wheat) 1 Mann = 40 kg

1 Bigh = 20 kattha

13 Ropani = 1 Bigh

1 Ropani = 1.54 Kattha

1 Kattha= 20 Dhur

According to the Crop Production in Field

Maize in 1 Ropani = 300 kg

Paddy in 1 Ropani = 300 kg

Wheat in 1 Ropani = 180 kg

Wheat in 1 Kattha = 3 Mann

Paddy in 1 Kattha = 5 Man

## APPENDIX – V

**Table 1: Local market price of different crops**

Crop Name	Market Rate per Kg. (NRs.)
Maize	22
Paddy	25
Wheat	32
Mustard	70
Millet	30
Potato	30
Others	50

**Table 2: Local market price of livestock deprecation**

Domesticated Animal	Market Rate Per Animal (NRs)
Livestock: 1)Young Cow	5,000
2)Milked Cow	15,000
3) Ox	10,000
4) Young Buffalo	20,000
5) Milked Buffalo	50,000
6) Male Buffalo	30,000
7) Goat	7,000
8) Male Goat	10,000
9) Kid	2,000
Pet Animal: 1) Dog	1,000
Avian stock: 1) Chicken	1,000
2) Chick	200

## APPENDIX –VI

NRs. = 0.00885 US\$

**Table 1: Average crop production and damage in Katal**

S.N.	Name of the Crop	Actual yields (kg)	Damage (Kg)	Damage NRs.	Damage US\$
1	Maize	19350	6650	145200	1285.02
2	Paddy	35500	1430	35,500	314.175
3	Wheat	40400	615	20,020	177.177
4	Mustard	3850	80	10400	92.04
5	Millet	2865	1487	37130	328.6005
6	Potato	3195	460	13220	116.997
7	Other	4750	185	8750	77.4375
	<b>Total</b>	109910	10907	270220	2391.447

**Table 2: Average crop production and damage in Ratamati**

S.N.	Name of the Crop	Actual yields (kg)	Damage (Kg)	Damage NRs.	Damage US\$
1	Maize	10950	3720	81840	724.284
2	Paddy	22275	715	17875	158.19375
3	Wheat	28150	385	15200	134.52
4	Mustard	2200	50	4000	35.4
5	Millet	1795	700	20400	180.54
6	Potato	2390	130	4100	36.285
7	Other	2430	90	2200	19.47
	<b>Total</b>	70190	5790	145615	1288.69275

**Table 3: Average Crop Production and Damage in Lopa**

S.N.	Name of the Crop	Actual yields (kg)	Damage (Kg)	Damage NRs.	Damage US\$
1	Maize	8450	2270	48040	425.154
2	Paddy	14750	235	5875	51.99375
3	Wheat	19200	805	25950	229.6575
4	Mustard	950	5	350	3.0975
5	Millet	580	44	1320	11.682
6	Potato	2060	260	8000	70.8
7	Other	1020	155	6750	59.7375
	<b>Total</b>	47010	3774	96285	852.12225

**Table 4: Average Crop Production and Damage in Todina**

S.N.	Name of the Crop	Actual yields (kg)	Damage (Kg)	Damage NRs.	Damage US\$
1	Maize	4150	1420	31240	276.474
2	Paddy	8750	45	1125	9.95625
3	Wheat	10700	595	24800	219.48



4	Mustard	370	15	1050	9.2925
5	Millet	330	15	450	3.9825
6	Potato	1090	227	6810	60.2685
7	Other	510	55	2750	24.3375
	<b>Total</b>	25900	2372	68225	603.79125

**Table 5: Total number of Livestock, Avian Stock and Pet Animals holding**

Name of the study site	Cow/Ox	Buffalo	Goat	Poultry	Dog	Other	Total
Katal	119	70	190	381	40	21	821
Ratamati	103	39	123	284	34	20	603
Lopa	96	48	317	0	24	6	491
Todina	69	25	203	0	13	3	313
<b>Total</b>	387	182	833	665	111	50	2,228

**Table 6: Estimating number of livestock killed by wildlife (2017)**

Animals	Number of Livestock Killed					
		Katal	Ratamati	Lopa	Todina	Total
Livestock	Young Cow	1	0	2	0	3
	Milked Cow	0	0	0	0	0
	Ox	0	0	1	1	2
	Young Buffalo	2	1	0	0	3
	Milked Buffalo	0	0	0	0	0
	Male Buffalo	0	0	0	0	0
	Goat	5	2	9	8	24
	Male Goat	3	0	4	3	10
	Kid	2	1	1	0	4
Avian stock	Dog (Pet animal)	4	4	0	0	8
	Chicken	6	5	0	0	11
	Chick	18	11	0	0	29
<b>Total</b>		41	24	15	11	94

**Table 7: Estimating number of livestock killed by wildlife in the study area (2018)**

Animals	Number of Livestock Killed					
		Katal	Ratamati	Lopa	Todina	Total
Livestock	Young Cow	1	0	0	0	1
	Milked Cow	0	0	0	0	0
	Ox	0	0	0	0	0
	Young Buffalo	0	0	1	0	1
	Milked Buffalo	0	0	0	0	0
	Male Buffalo	0	0	0	0	0

	Goat	5	1	7	2	15
	Male Goat	0	1	0	1	2
	Kid	0	0	0	1	1
	Dog (Pet animal)	1	0	1	0	2
Avian stock	Chicken	4	6	0	0	10
	Chick	13	8	0	0	21
<b>Total</b>		24	16	8	4	53

**Table 8: Estimating total economic loss for livestock depredation (2017)**

Animals		Economic loss (NRs.)				
		Katal	Ratamati	Lopa	Todina	Total
Livestock	Young Cow	5000	0	10000	0	15000
	Milked Cow	0	0	0	0	0
	Ox	0	0	10,000	10,000	20000
	Young Buffalo	40,000	20,000	0	0	60,000
	Milked Buffalo	0	0	0	0	0
	Male Buffalo	0	0	0	0	0
	Goat	28,000	14,000	63000	56000	161000
	Male Goat	20,000	0	30000	22000	72000
	Kid	4,000	2000	4000	0	10000
	Dog (Pet animal)	5,000	4000	0	0	9000
Avian stock	Chicken	5,000	5000	0	0	10000
	Chick	3,000	2200	0	0	5200
<b>Total</b>	<b>Total</b>	110000	47200	102000	78000	362,200

**Table 9: Estimating total economic loss for livestock depredation (2018)**

Animals		Economic loss (NRs.)				
		Katal	Ratamati	Lopa	Todina	Total
Livestock	Young Cow	5000	0	0	0	5000
	Milked Cow	0	0	0	0	0
	Ox	0	0	0	0	0
	Young Buffalo	0	0	20000	0	20000
	Milked Buffalo	0	0	0	0	0
	Male Buffalo	0	0	0	0	0
	Goat	35000	7000	35000	14000	91000
	Male Goat	0	10000	0	10000	20000
	Kid	0	0	0	2000	2000
	Dog (Pet animal)	1000	0	1000	0	2000
Avian stock	Chicken	6000	6000	0	0	12000
	Chick	8200	1600	0	0	9800
<b>Total</b>		55200	24600	56000	26000	161,800

## PHOTO PLATES



Photograph 1: Wheat field damaged by Parrot.



Photograph 2: Maize damaged by Wild boar.



Photograph 3: Maize field damaged by wild boar.



Photograph 4: Maize damaged by Wild boar.

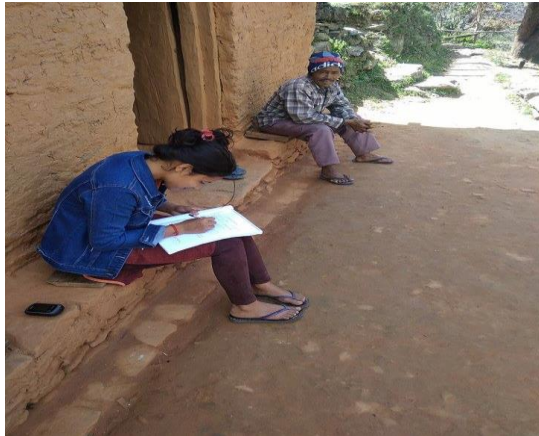


Photograph 5: Young Wild boar kept by local people.



Photograph 6: Leopard killed by local people.





Photograph 7: Interview and focus group discussion with local people.





Photograph 8: Scats of leopard in the study area.



Photograph 9: Spine of Porcupine.



Photograph 10: Fecal matter of Wild boar.

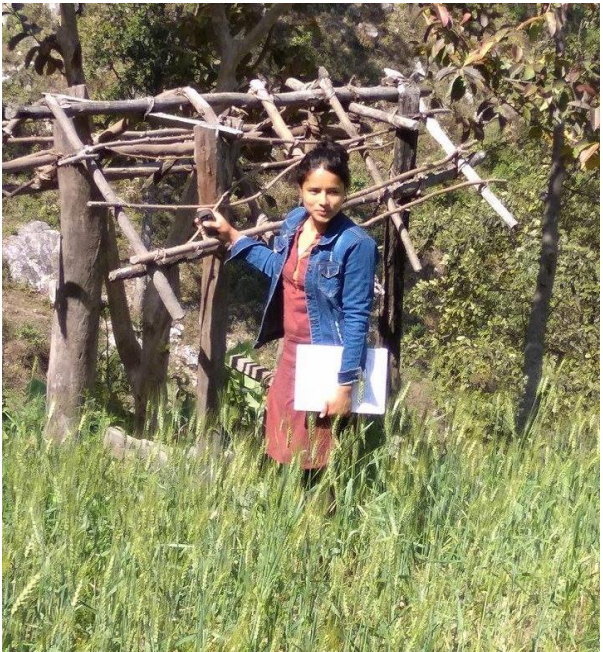


Photograph 11: Fire wood collection from CF



Photograph 12: Grazing livestock near the forest





Photograph 13: Preventive measures against crop and livestock damage.