CHAPTER-I

1. INTRODUCTION

1.1 General Background

Wild boar (*Sus scrofa*) is one of the well known animals. It is famous in most of the protected areas of Nepal for its destructive nature of land and crop depredation near about the forest. It has distinctive sparse coat full crest or mane of black bristles reaching from the nape down the back. The colour of this animal is black mixed with grey, rusty, brown and white hairs. The youngs are brown with light or black stripes. The tusks are well developed in the male. Both the lower and upper tusks curve outwards and project from the mouth. A full grown male stands 36 inches (90 cm) high at the shoulder and its weight may be exceeding 230 kg (Shrestha 1997).

The Wild boars are widely distributed in the world. They are found in all types of forests. They are found densely in Europe and Asia and also found in north east part of Australia. In Asia, they are found in India, Burma, Thailand and Ceylon. The Wild boars are also found in the northern part of Africa along with the Nile River as well as in a few regions of North and South America. They are extremely absent in dry desert and alpine zone (Heinen and Yonzon 1994). Wild boars are widespread with a surprisingly wide altitudinal range (Shrestha 1997).

In Nepal, Wild boars are found both in terai forest and in the higher semi deciduous and temperate forests of Himalayas. It is reported from Annapurna Conservation Area, Shey-Phoksundo National Park, Makalu-Barun National Park, Langtang National Park, Rara National Park, Khaptad National Park and Shivapuri Nagarjun National Park in Mountain region. Bardia national park, Chitwan National park, Shukla Phanta Wildlife Reserve, Parsa Wildlife Reserve, Koshi Tappu Wildlife Reserve and Dhorpatan Hunting Reserve are among terai protected areas, where Wild boars are found (Baral 1998). Besides these protected areas, Wild boars are also present in the semi deciduous and temperate forest of Nepal but these are in reduced number (Heinen and Yonzon 1994). The high reproducing capacity and short lifespan, the population of Wild boar at a place is variable and difficult to find the exact population but they are found in large number at a particular place (Baral 1998).

Wild boars are omnivorous, eating on crops, roots, tubers, insects, snakes, offal and carrion. They feed in the early morning and late in the evening. No animal is more destructive to crops than Wild boar in cultivated areas. It is difficult to make a plea for its protection (Shrestha 1997). Versatile with respect to habitat, avoiding only very arid areas, woody grassland, forest and dense bush are preferred habitats and they build shelter of grasses, reeds or bushes.

Wild boars display great intelligence. Their sense of smell is acute. The eyesight and hearing are moderate. Wild boars are prolific breeders. They apparently breed at all seasons. Two male fight each other occasionally for the possession of a harem. They use their powerful tusks for fighting. During fighting, the boars stand muzzle to muzzle and by sudden jerks of their heads upward dart forward to cut deep into one another face, throat and shoulders. The quick butts are repeated six to seven times in a minute. Most important factor in the hunting is the fact that boars are allured by the scent of kerosene oil (Baral 1998).

Wild boars live in herds of up to 170 individuals. After breeding the big boar lives alone or in company with another of equal size or with one to two sows. When a juvenile boar becomes mature, it leaves the herd and leads a solitary life. In most cases, an adolescent boar is driven out of herd. Wild boars breed at all seasons but the majority of youngs are born at two periods, shortly before and after the monsoon. The gestation period is said to be four months, four to six youngs are born at a time (Shrestha 1997).

Wild life conservation has been quite successful from the view point of habitats of several threatened species (Mishra 1992). Active conservation of habitat has increased the population of wildlife within the protected areas, which results the depredation of livestock and crops outside the park. The relation between park and people becomes crooked when the park animals damage the outer peripheral area and disturb the adjacent settlements. Damage of agricultural crop, human harassment, injuries and death and livestock depredations are the common unbalanced relationship (Jnawali 1998, Studsord and Wegge 1995, Shrestha 1994 and Kasu 1996).

The local people, who once were enjoying free access to areas henceforth covered by protected areas and were able to meet their needs from inside resources, now no longer, have legal access. Local people have seen the protected areas as an attempt by the government to curtail their access to their traditional rights of resources use. However, the protected areas and buffer zones have become a very good resource for villagers to fulfill their resources needs through venturing into illegal activities like poaching, logging and hunting, all of which are directly conflicting with the park's objectives (Mishra 1982, Milton and Binney 1980).

It is very difficult for villagers to understand why wildlife is allowed to damage their crops, whereas they cannot kill any wild animals in return. They are not convinced of the rationale of protecting forest and wildlife, which they have been utilizing for many years.

Depredation of crops by Wild boars occurs to varying extend throughout their distributed range of Nepal, wherever cultivation encroaches the Wild boar habitat. By different factors the Wild boars harm the cultivated areas. However in ultimate terms

crop raiding can be thought of as an extension of their natural optimum foraging strategy (Sukumar 1990).

It is not unusual to see why animals of the protected areas are attracted to areas with grain or other crops. Cultivated crops are rich in protein and carbohydrates as well as some mineral nutrients than most of the wild plants and animals available in adjacent forests (Sukumar 1990). Unlike forest plants and animal species, many of which grow in isolated stands or scattered throughout the forest, agricultural crops and cultivated animals occur in relatively large, concentrated stands. Thus, the animals of the protected areas to have such items do not have to expend as much energy searching for food.

Many other animals like bear, deer, porcupine etc. also play the main role for crop depredation in the agricultural farm near to the park. For searching food and for other purposes they damage the crops.

1.2 Objectives

Wild boars are distributed in the Shivapuri Nagarjun National Park. Wild boars and other wildlife have affected the local people of Thanapati VDC either by crop depredation or killing the livestock. The main objective of this study was to collect detailed information on the impact of Wild boar as well as other wildlife at Thanapati VDC. Following specific objectives have been set to estimate the actual crop loss caused by wild animals:

1. to identify the causes of Park People conflict in ShNNP
2. to identify the actual crop loss
3. to identify livestock and avian stock depredation in Thanapati VDC and
4. to identify the total economic loss

1.3 Limitation of the study

Park people conflict has its origin in multidimensional factors that render it more complexes than it looks at first and all such causes of conflicts can not be studied at the same time. Thus, this study concentrated itself on only of them. It is the conflict between people and Wild boar. For a trend analysis of this type of problem, it takes long time study or information is needed. This study however will be based on the data available from the village in different seasons of a year.

This study was entirely based on data collected from interviews applying schedule surveys for crop depredation and human harassment by Wild boar and others. There are 9 wards in Thanapati VDC and the whole VDC was the study area, which was seriously affected by wildlife. During the study period, the actual crop damaged fields were visited with the local farmers during crop growing season. Different semi-

structured questions were asked to local people. Victims who had encountered Wild boar attacks were formally interviewed in order to identify actual crop damage.

The study was continued starting from the southern part of VDC that was visited twice during the crops raiding period. Financial constrain, lack of sufficient equipments and security problem also limited the study.

1.4 Rationale of the study

This study has provided data on crop depredation in Thanapati VDC for 2009/2010. It has also given information on human harassment and impact on local people due to Wild boar and other wild animals. The human wildlife conflicts have created tussle between the government and local people and which in turn has become problematic in management of wildlife. This scenario is felt all over the country and especially in adjacent VDCs of Shivapuri Nagarjun National Park. The present study aims at analyzing the complex issues of park-people's interference by focusing day to day problems faced by local people in the boundary of Shivapuri Nagarjun National Park.

CHAPTER-II

2. STUDY AREA

2.1 Description of the study Area

Shivapuri Nagarjun National Park is located on the northern fringes of Kathmandu valley. It is surrounded by 23 VDCs of three districts, Kathmandu, Nuwakot and Sindhupalchowk (DNPWC 2002). It lies between 27^0 45' – 27^0 52' N latitude and 85^0 15' – 85^0 30'E longitude (SWW 1999). It covers 144 km^2 stretching approximately 9 km from north to south and 20 km from east to west (DNPWC 2002).

Thanapati VDC is one of the adjacent VDCs of Shivapuri Nagarjun National Park, which was the study area and it is located between $27^0$50'N - $27^0$53'N altitude and $85^0$16'E – $85^0$19'E latitude (SWWR 1999). It is located on the northern fringes of Kathmandu Valley, 22 km far from Kathmandu Valley.

2.2 Climate

Shivapuri lies in the transition zone between subtropical and temperate climates. The data obtained from the Kakani station showed that the maximum temperature was on May and minimum temperature was on January for the year 2007/08. Likewise maximum rainfall was on August and minimum was on November. Maximum humidity was on July and minimum humidity was on November for the year 2007/08. (GovN 2008)

2.3 Geology and soil

Geologically, Shivapuri area occupies the inner Himalaya region. The dominant rocks are gneiss and magmatite with mica schistand pegmatic granite. The soils of the area range from loamy and sand on the northern side to sandy loam on the southern slope.

Entire area is characterized by its steep topography. More than 50% of the area has greater than 30% slopes. In several spots soil erosion is a serious problem. Erosion hazard is very high in the northern slope. Landslides, gullies and stream bank erosion, both natural and man induced are found all over the area (SWWR 1999).

2.4 Flora and Fauna

The vegetation in ShNNP consists of variety of natural forest types, depending on altitude and aspect, including pine, oak, rhododendron, and so on. In general, forests in Shivapuri Nagarjun National Park can be categorized by four types. They are (a) lower mixed hardwood forests of *Schima* and *Castonopsis* (b) Chirpine forests

dominated by *Pinus roxberghii* (c) Upper mixed hardwood forests of *Rhododendron, Aesculus* and *Betula* etc.

The establishment of protected area has led to an important increase in forest cover and standing stock. This and the greatly reduced levels of disturbance have resulted in a considerable improvement in wildlife habitats and an increase in forest dependent species. Recorded species in the Shivapuri area include: eight threatened mammal species, such as leopard (*Panthera pardus*), leopard cat (*Prionailurus bengalensis*) and clouded leopard (*Pardofelis nebulosa*), 177 species of birds, including at least 9 threatened species, such as the orange-billed leaf bird (*Chloropsis hardwickii*), 102 species of butterflies, including a number of rare and endangered species, such as the Kaiser-I-Hind (*Teinopalpus imperalis*) and 129 species of mushroom. It is also one of the view sites where the rare relict Himalayan dragonfly (*Epiophlebia laidlaw*) is found (SWWR 1999).

2.5 Land Use in Thanapati VDC

The total area of Thanapati VDC is 24148.23 ropani. The composition of land of Thanapati VDC is being covered in the following patterns. Where, 20581.53 ropani is agricultural land (khet and bari), 2050.18 ropani is bushy land, 883.82 ropani is forest land, 350.14 ropani is grassy land and 282.53 ropani is sandy land. (Topo Sheet/ government of Nepal 2008)

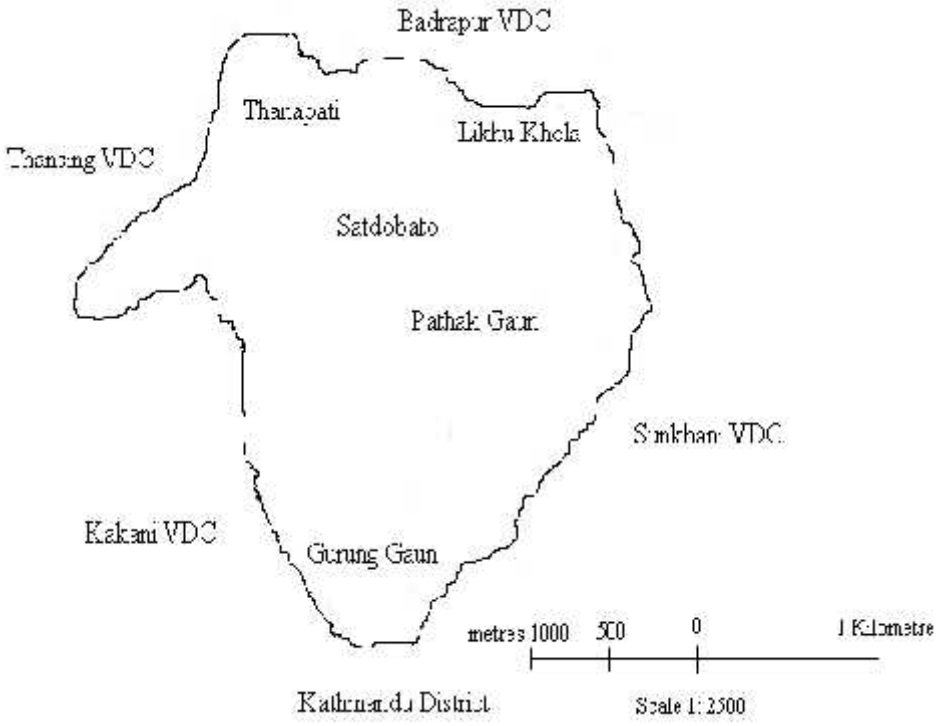

Fig 1: Thanapati VDC

2.6 Social economic status

Thanapati VDC constitutes of people of different castes. The Brahmin, Chhetri, Gurung, Lama, Pariyar, Sunar, Bishwokarma and Magar constitute the population of the VDC. The Brahmin constitutes the largest population of the VDC. Agriculture is the main source of income in the VDC. A good number of populations are engaged in army, police, teacher and other government offices.

2.7 Animal husbandry

Animal husbandry forms an integral part of the economy. People mostly keep cow (*Bos indicus*), Buffalo (*Bubalus* sps.), Goat (*Capra hircus*) and Pig (*Sus* sps.). Male buffaloes and oxen are used for hauling and transportation. Goat husbandry is the major source of income.

2.8 Farming system

Paddy and Maize are the major crops in the study area which are grown in the rain-fed lowlands, millet and wheat are also grown. Farming system is primitive. The work is mainly done manually by draft animals. Compost manure is used as bio-fertilizer. Some farmers use chemical fertilizer and pesticides to increase the yield of crops. Most farmers practice kitchen garden and plant vegetables, fruits, potato, tomato, cauliflower, sweet potato etc. Vegetable farming is one of the major cash crops in the study area. They sell their surplus food grains in the nearby market.

CHAPTER-III

LITERATURE REVIEW

Protected areas are the forefront of efforts to conserve biological diversity in developing countries like Nepal along with rest of the world. But many protected areas in Nepal are in crisis due to the increasing human activities and sometimes, wild animals interference in the crop fields. The management of the protected areas requires people's participation for its sustainability.

Milton and Binney (1980) carried out a survey on resolving resource conflicts between wildlife conservation and agricultural land use in Padampur VDC, Chitwan district. They showed that crop loss inflicted by wildlife was the main problem of the inhabitants of the area adjoining to park. The study in Chitwan identified three zones of crop damage by wildlife. The zone of highest damage suffered from 50% to 100% loss. A large number of people from such zones either wished to resettle or were deeply concerned that government took other effective actions such as fencing or loss compensation.

Jnawali (1989) reported on human harassment and crop damage by greater one horned rhinoceros (*Rhinoceros unicornis*) in Sauraha adjacent to CNP. The loss was found Rs. 172000 of which 68.6% occurred within a distance of 500m. The highest economic loss 27.6% occurred to paddy.

Sharma (1991) found that the main cause of conflict was due to crop and livestock depredation in CNP. In 1991, he calculated crop damage by two methods, interview and Net Area Damage (NAD). He also reported that real crop damage was five times less by NAD method than interviewed. He also reported that paddy was severely damaged followed by wheat, maize, oil seeds, lentils, vegetables and miscellaneous.

Kattel (1993) reported that 87% people had perceived about increasing number of Wild boar (*Sus scrofa*) and it was one of the raiding animals in the neighboring villages of Shivapuri. He found that Wild boar was present from 1000-2700 m. in altitude of Shivapuri Nagarjun National Park.

Kharel (1993) identified Wild boar (*Sus scrofa*), Himalayan black bear (*Selenarctos thibetanus*), monkey (*Macaca milatta*) and deer (*Muntiacus muntjak*) species were major crop raiders in Langtang National Park.

Khatri (1993) found that crop damage by Nilgai (*Boselaphus tragocamelus*) averaged 8.3% of the total crop loss caused by wild animals in BNP.

Nepal and Weber (1993), reported that rhinoceros (Rhinoceros unicornis), chital (Axis axis) and Wild boar (Sus scrofa) were the principal crop pests in CNP. They

calculated rhino, Wild boar and chital destroyed 60%, 27% and 12.9% of the total crop damage respectively.

Heinen and Yonzon (1994) have reported that the Wild boar was not only present in all Nepal's protected areas but also found in reduced numbers in most forested areas. They rooted for tubers, as they turn the soil over in large areas.

Shrestha (1994) and Upreti (1995) found park regulation, crop damage, livestock depredation and loss of human life as sources of conflict in CNP. They also found rhino (*Rhinoceros unicornis*) as a principal crop pest in Chitwan National Park.

Poudyal (1995) found that, on an average, each affected household lost around Rs. 3132 annually due to crop loss by wild animals in Shivapuri Nagarjun National Park.

Sharma (1995) found that wild buffalo (*Bubalus bubalis*) and Wild boar (*Sus scrofa*) were important crop raiders in Koshi Tappu Wildlife Reserve.

Soti (1995) found Wild boar (*Sus Scrofa*) as a main crop raider in Shivapuri Nagarjun National Park. He found that Wild boar destroyed maize, wheat, millet and paddy by 80%, 45%, 90% and 40% respectively.

Kasu (1996) found two types of problems that created conflict in Parsa Wildlife Reserve that were: (a) problems created due to reserve and (b) problems created due to local people. He found that wild elephant, Wild boar and chital were the pest animals. He reported paddy damage was 77.52% followed by wheat and maize. The average economic loss of each household due to crop damage by wild animals was Rs. 3191.48

SIWDP (1996) had given the report of Wild boar in Shivapuri Nagarjun National Park. The report showed that in three months (April, May and June 1995), 352 Wild boars were seen in the survey spots of Shivapuri Nagarjun National Park.

Limbu (1998) found a total 117517 kg crop loss consisting 65240kg paddy, 37967kg of wheat and 14310kg potato in P. Kusaha VDC, area adjacent to Koshi Tappu Wildlife Reserve. The study found the economic loss of Rs. Rs. 831966. The highest economic loss in paddy (54.89%) followed by wheat (36.51%) and potato (8.60%).

Regmi (1998) reported that the relation between park and people was more critical when the local inhabitants use park resources illegally. Cutting down trees, firewood and fodder, livestock grazing, poaching of animals and fishing were the common activities done by local inhabitants inside the park. Park-people conflict was thus emerging as a burning issue of protected areas in Nepal. Livestock grazing was the main problem of the local people around the national park. Due to lack of grazing land in their farm, local people were forced to graze their animals inside the parks or

reserves. Livestock grazing can exert strong influences on grassland vegetation, forest structure and wild life.

Acharya (1999) has found that besides protected areas, Wild boar also presented in other semi-deciduous and temperate forests of Nepal.

Baral (1999) surveyed on Wild boar-man interaction in BNP. He found an economic loss of Rs. 20, 95,346 of which 52.73% occurred in Thakurdwara and 47.27% in Shivpura. He found that the highest economic loss (15.40%) occurred to paddy crop, followed by potato (15.40%), maize (15.21%), wheat (13.80%), mussuro (12.42%) and yam (7.57%).

Gautam (1999) gave a report on the crop damage by wild animals in proposed buffer zone of SWR. He found highest economic loss 74.28% to paddy crop followed by wheat (17.08%) and maize (8.62%). He found that among the wild animals, highest economic loss 43.29% by wild elephant, followed by Wild boar (28.67%), chital (24.09%) and bluebull (3.92%). He reported that loss of crop to wild animals ranged from 61.62kg to 162.33 kg per household.

Gurung (2002) reported on Wild boar distribution and park-people conflict in Shivapuri Nagarjun National Park. He found the sources of conflict. He also studied about the crop damage near the village of Shivapuri Nagarjun National Park.

Gaire (2007) found that Wild boar was the main crop pest in Bardia National Park. Dalits, who lived near the park, were more affected than any other ethnic group. As they had a few lands for cultivation and it is also damaged by wild animals.

Khatiwada (2008) found that Wild boars were also found in the high altitude forests of Kangchanjunga Conservation Area. He also said that it was a crop raider to surrounding farm of the conservation area.

Kurkait and Chalise (2010) also reported that there was a great loss in the surrounding villages of Shivapuri Nagarjun National Park. There was a total loss of Rs. 587618.74 of a small village.

Shova Thapa (2010) found that Wild boars were the main crop pests in Bardia National Park. The animal was found in the rooted food field mostly and said that its main food in the farm was rooted food.

Uttam Raj Regmi (2010) found that Wild boars were also found in Bardia National Park. It was also a main crop pest to the surrounding villages of the park.

CHAPTER-IV

4. MATERIALS AND METHODS

4.1 Reconnaissance survey

The reconnaissance survey of the proposed study areas was carried out in first week of May 2009. During that time conflicted areas and land use pattern were identified. The survey also included field observation and interaction with local people. Sites for Wild boar distribution in Shivapuri Nagarjun National Park were selected. Then whole wards were selected in Thanapati VDC, where Wild boars and other wild animals were frequented.

4.2 Data collection.

This study was totally based on primary and secondary data. Primary data were collected from the field observation and questionnaire survey.

4.2.1 Questionnaire survey

A total of 121 households (with the head of the family and in some cases the person above 21 yrs) were interviewed using the semi-structured questionnaires. The interview focused on family composition, economic condition of the respondents, ethinicity, land, occupation and conflict issues such as crop damage and human harassment. Altogether twenty two questions were asked to the respondents from a set of a questionnaire named as household questionnaire and another set of questionnaire containing six questions were asked to VDC authorities and leaders. There were two more other sets of questionnaire for respondents about Wild boar and for park staffs about park-people conflict. The questionnaire set is given in Appendix (1-2).

4.2.2 Secondary data collection

Secondary data were collected from records and reports from different sources of VDC. Other secondary sources were from journals, books and unpublished dissertation works. The secondary data was also collected from the office of Shivapuri Nagarjun National Park.

4.3 Sampling

At first, Thanapati VDC was selected for the study area. The latest household number and population were available from the VDC office. On the basis of number of households in each ward, the sample size for the study was determined. For the study, simple random sampling was adopted. Information was taken from key informants such as village headman, local leaders, park authorities and army men.

There are altogether 504 households in the study area but only 121 households are taken as sample for the present study due to time constraint. The sampled households constitute 24.70% of total households.

4.4 Field Observation and Net Area Damage Measurement

This field observation was done for one year round. The seasonal crops were recorded during growing to harvesting period. Therefore, field survey was conducted several times within a year (from May 2009 to May 2010). A single visit included seven days.

The damaged area was measured with the help of measuring tape. For the measurement of damaged area, topographical map was also used for the verification of the damaged area. The actual affected area was assessed with seasonal photographs taken on the spot.

Extend of damage in crop fields was measured as follows:

1. Damaged plots were outlined and marked with ropes and ribbon flags.
2. The damaged plots were then subdivided by parallel transects with the help of ropes and straight bamboo sticks.
3. The following formula was used to measure the size of damaged area.

$$A = \Sigma L \times d$$

Where, A = Area of damaged irregular plot

L = Length of transects

D = distance between transects

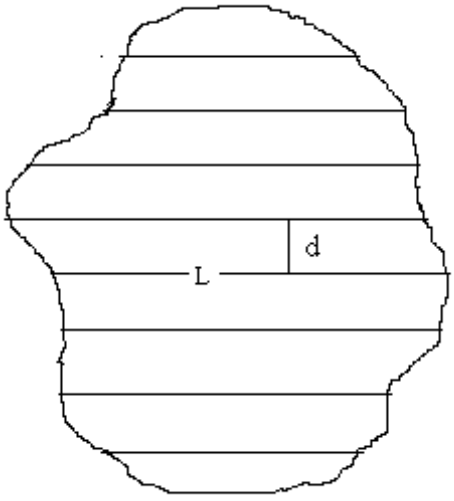

Fig 2: A damaged plot

At harvesting time, 3-5 control plots, each measuring 2×2m were laid out randomly around the damaged plots in a distance of 2-5m. The crop was harvested at maturity. Yields from the damaged plots and control plots were sun dried and weighed to determine the percentage lost due to damage. The percentage lost by damage was measured from early green stage to mature stage. Local techniques were used to harvest, winnowing and drying. The yield was measured in local units. Grains and crops reduces were given back to the farmers after the work was finished.

4.4.1 Evaluation by Net Area Damage Method

In the study area, there was considerably real damage by wildlife. The Net Area Damaged (NAD) by wildlife is considered the real damage. Most of the farmers exaggerated the damage, which may be attributed to the compensation. Net Area Damage was calculated adopting Sharma's (1991) and Jnawali's (1989) methods. The NAD is a fraction of Gross Area Damaged, where the wildlife actually ate or otherwise damaged crops. Extend of damage is somewhat dependent in the growth stages of crops. The damage estimation is adjusted by multiplying the area by a factor of 0.25 for the beginning stage of any crop (prior to the flowering stage). The rationale for this adjustment is that farmers can replant the damaged parts because of their early stages, and regenerate new shoots to flower recovering most of the damage. But another factor is taken as 1 for the crop damaged or eaten during milky stage to harvestable period. This multiplication is adopted because of the fact that the farmers can not replant the crop during the harvestable period and the damaged parts of the crops after the flowering period would not re-grow or regenerate the new shoots and could not cover the damage portion of the crops. Thus it is multiplied here by the stage factor 1 for the crop damaged in the harvestable period.

The NAD is summation of area-damaged × factor for the percentage loss of crop × factor for the stage of crop. The factor for the percentage loss is estimated in the field for each individual case and damaged was recorded.

NAD = Σ [Area Damaged × % Loss of crop × Stage of crop]

4.5 Data Analysis

To find per household / ropani, total loss of each crop was estimated in NC / ropani and it was divided by the total sampled households

Mathematically,

$$Per\ household\ loss/Ropani = \frac{Total\ loss\ NC/Ropani}{Total\ sampled\ households}$$

The total loss in rupees was estimated by multiplying with the market price of the crops during that period and the estimated loss / ropani was taken in Kg.

The following formulae are used to calculate the loss per unit area.

$$xLy = \frac{xE - xA}{xLc}$$

Where, x = Specific crop: if Paddy, then (P) is used, if Maize (M) is used similarly

xLy = the loss in yield of the crop x per unit area of land

xE = expected production of crop x.

xA = actual production of crop x.

xLc = total land coverage under crop x.

xl = xE – xA

Where, x = Specific crop

L = Total loss

E = Expected production of crop x.

A = Actual production of crop x.

The crop loss was the difference between expected and actual production of different crops.

Besides, these statistical inferences (χ^2 test) various tables and bar diagrams have been used to simplify the presentation of data.

χ^2 Test was calculated by the following formula

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

Where, O = Observed Value

E = Expected or Estimated value

CHAPTER-V

5. RESULTS

5.1 Effects on park by local people

Among the 24 respondents of park staffs, the main cause of effects were shown in the following result, figure 3, where 13 on fodder cutting followed by 6 on livestock grazing, 3 on timber and firewood cutting and 2 on hunting and poaching wildlife. Description of data is in table 8 of appendix 12.

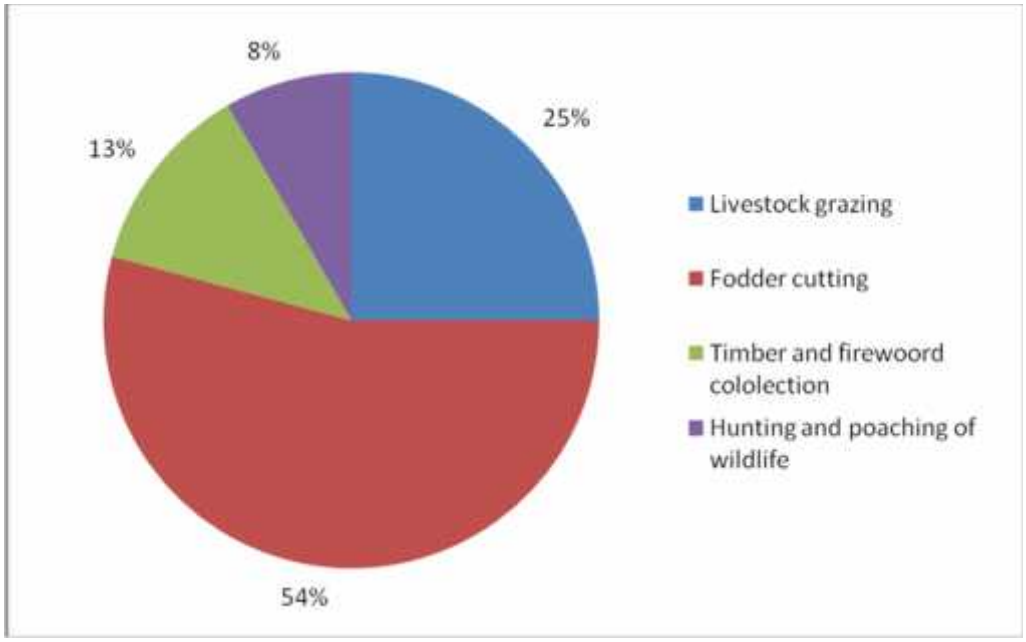

Figure 3: Effects on park by local people

5.2 Crop depredation

5.2.1 Frequency of wildlife's visit to different crops

Figure 4 showed the frequency of wildlife visits in the crop land that was not the same through out the year. There were 845 reported cases of Wild boar in sample areas, which is followed by porcupines, rats, birds, monkeys, deer and bears visited for 807, 774, 745, 655, 450 and 135 times respectively. Within all these animals, the most visited crop field was maize for 1156 times, which is followed by 959 times for paddy, 726 times for wheat, 563 times for millet, 530 times for potato and 477 times for mustard was recorded. The total visit of wildlife was 4411. Description of data is in table 9 of appendix 12.

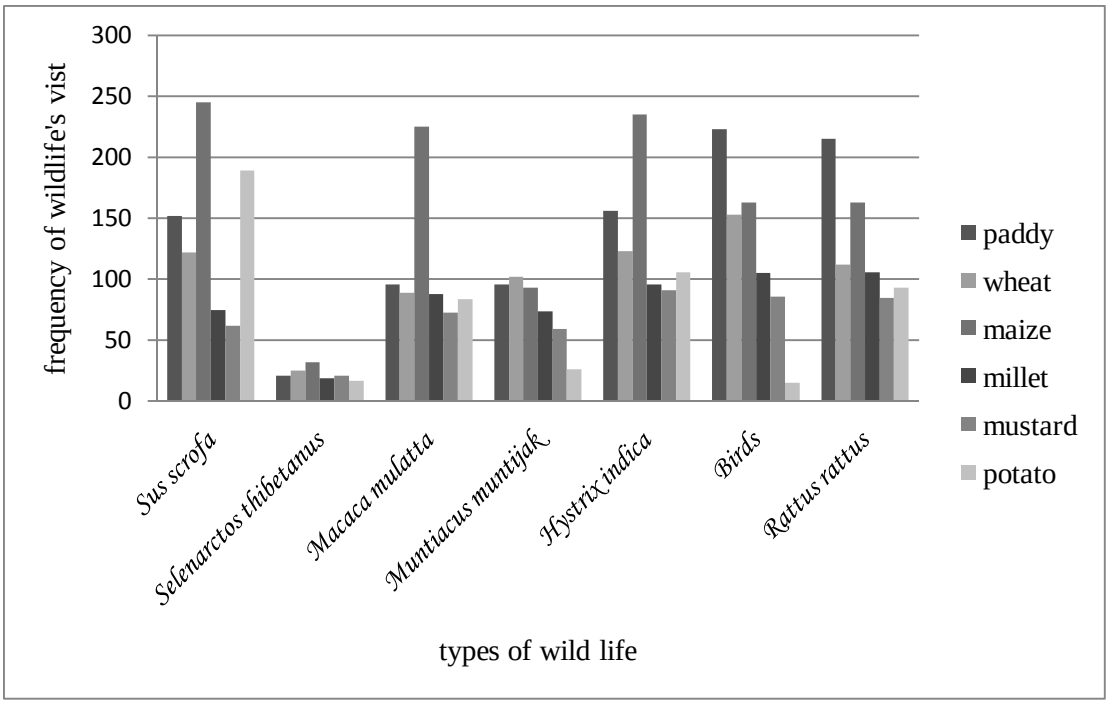

Figure 4: Frequency of wildlife's visit to different crops in the sampled area.

5.2.2 Population size of wildlife

Figure 5 showed that birds were in the largest number of group size of 50 with maximum number and 5 with minimum number, which was followed by monkey, rat, Wild boar, porcupine, deer, bear, jackal, common mongoose, leopard and wild cat. Description of data is in table 10 of appendix 12.

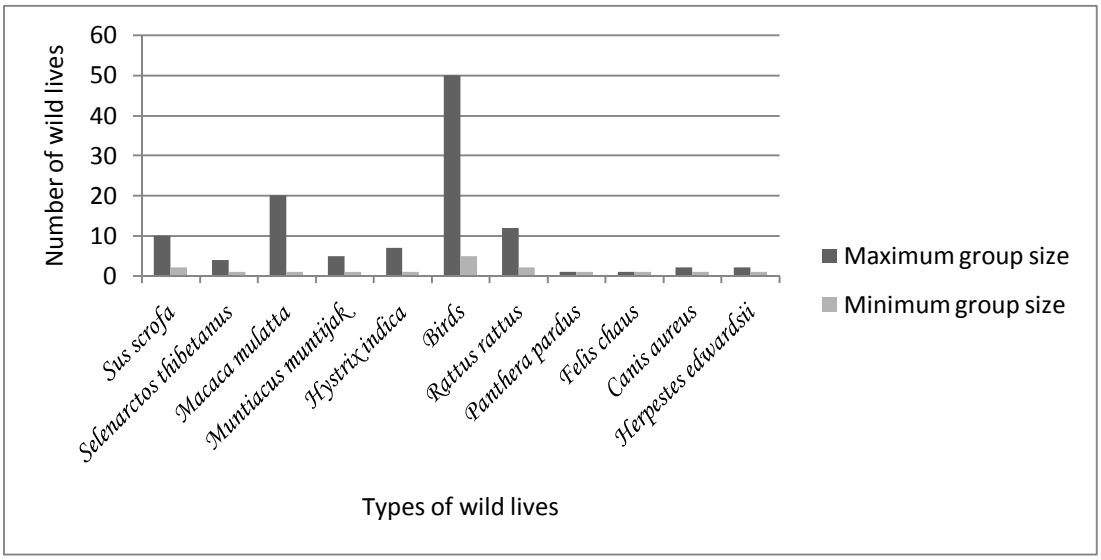

Figure 5: Number of wildlife raiding the crops and preying upon livestock and avian stock.

5.2.3 The Gross Area and Net Area damaged of crops by wildlife

Figure 6 showed that the highest total Gross Area and Net Area Damage by wildlife were indicated for paddy, the total Gross Area was 2155.6 ropani and the total Gross Area affected by wildlife was 455.50 ropani, which was 21.13 percentage of total Gross Area. The Net Area Damaged by wildlife was 107.70 ropani and its NAD percentage was 4.99. The lowest Gross Area and Net Area Damage were found for mustard, the total Gross Area was 421.50 ropani. The total Gross Area affected by wildlife was 81.60 ropani, which was 19.35 percentage of total Gross Area. The Net Area Damaged by wildlife was 32.42 ropani. NAD percentage in terms of Gross Area was 7.69. For the Net Area Damaged, $\chi^2 = 90.98$ ($\chi^2_{cal} > \chi^2_{tab}$ at p = 0.05 and 5 d.f.). Description of data is in table 11 of appendix 12.

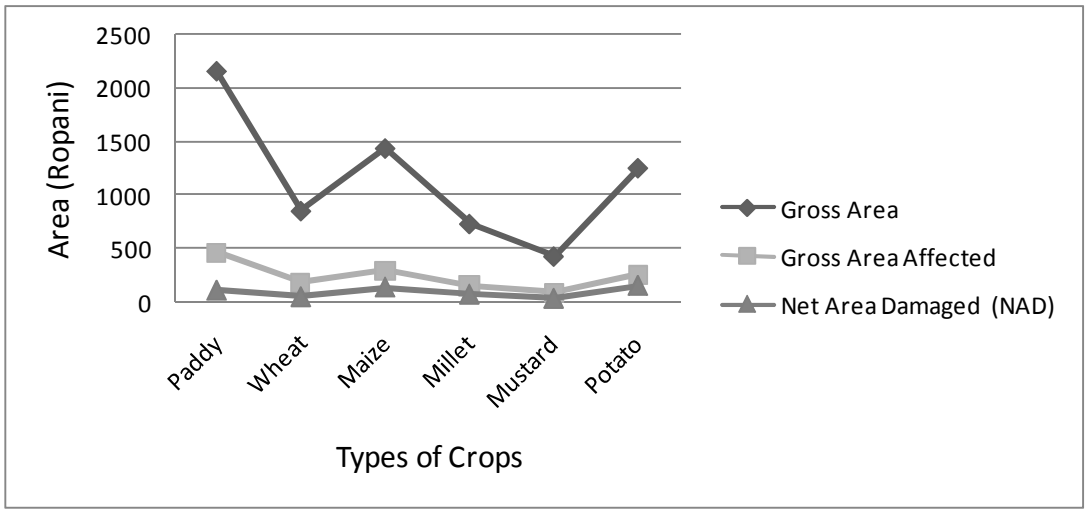

Figure 6: Total Gross Area and Net Area Damage of crops by wildlife in the sampled area (in ropani).

5.2.4 Net Area Damage (NAD) of crops by wildlife

Figure 7 showed the highest total Net Area Damage of crops done by Wild boar was 175.90 ropani, which is followed by porcupine, deer, monkey, rats, bear and birds by 95.09, 87.40, 72.83, 60.68, 27.10 and 26.90 ropani respectively. Similarly the table showed the Total Net Area Damage in paddy, wheat, maize, millet, mustard and potato were 107.77, 46.99, 136.42, 70.73, 32.42 and 151.57 ropani respectively. Total Net Area Damaged was 545.90 ropani. Description of data is in table 12 of appendix 12.

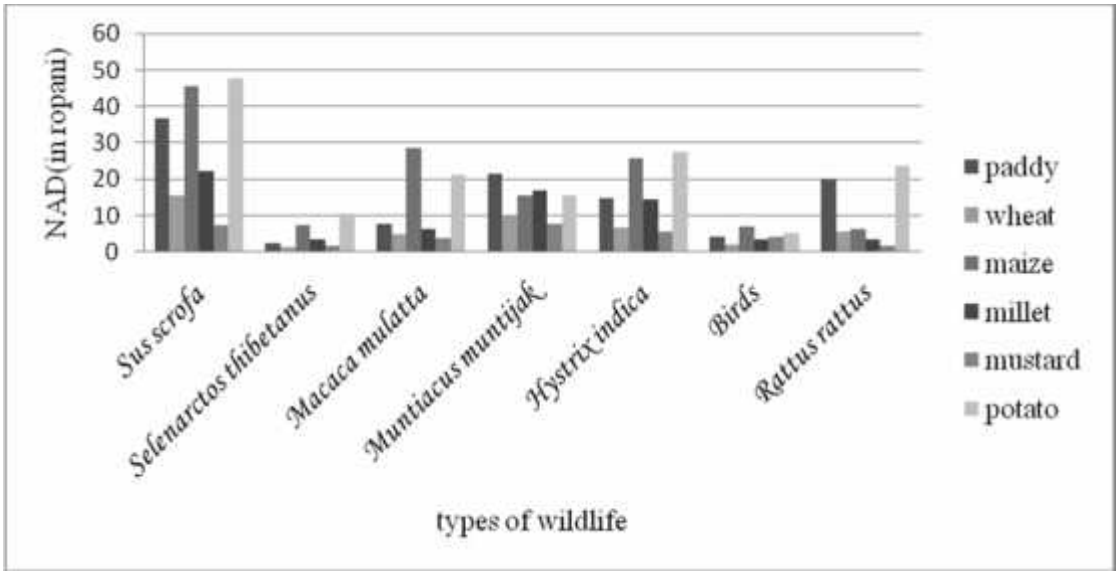

Figure 7: Net Area Damage (NAD) of different crops by different wildlife.

5.2.5 Percentage of Net Area Damage (NAD) of crops by wild lives

Figure 8 showed the highest percentage 32.05 of Net Area Damage of crops by Wild boar followed by deer, porcupines, monkeys, rats, birds and bears 18.34, 17.11, 12.18, 10.11, 5.79 and 4.42 percentages respectively. Description of data is in table 13 of appendix 12.

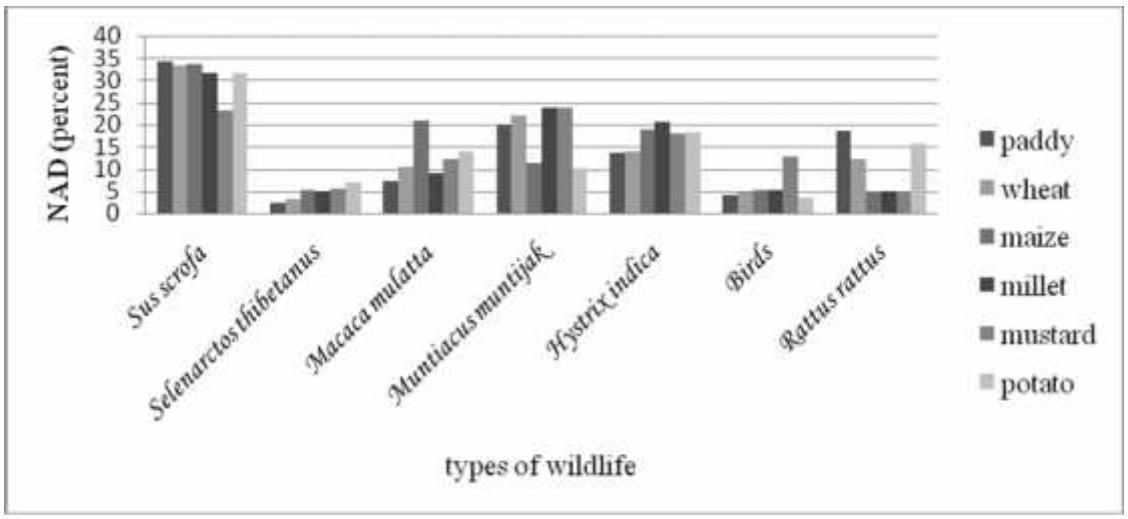

Figure 8: Percentage of Net Area Damage of different crops done by different wildlife.

5.2.6 Total Expected Yield of different crops

Figure 9 showed the highest total expected yield 551969.60 kg of potato from the sampled area 1248.80 ropani, which is followed by 284539.20 kg of paddy from 2155.60 ropani, 110302.50 kg of maize from 1432.50 ropani, 74786.40 kg of wheat from 846.00 ropani, 38462.10 kg of millet from 725.70 ropani and 19810.50 kg of mustard from 421.50 ropani. Description of data is in table 14 of appendix 12.

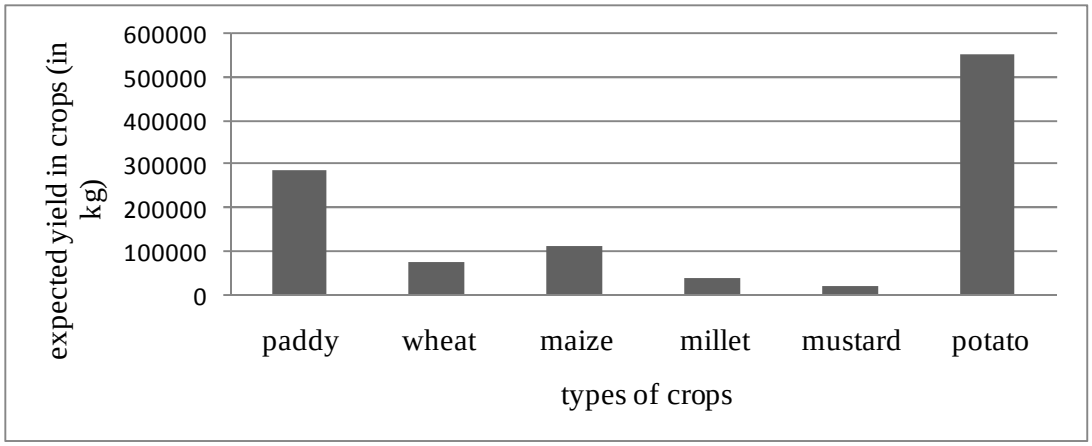

Figure 9: Total Expected Yield of different crops in the sampled area.

5.2.7 Loss of crops by wildlife

Figure 10 showed the highest total loss of potato is 66994.47 kg that is 12.13 percentage of expected production, which is followed by paddy, maize, wheat, millet and mustard were 14226.32 kg (4.99%), 10504.85 kg (9.52%), 4154.63 kg (5.55%), 3748.86 kg (9.74%) and 1523.81 kg (7.69%) respectively. For loss of crops $\chi^2 = 16858.79$ ($\chi^2_{cal} > \chi^2_{tab}$ at p = 0.05 and 5 d.f.). Description of data is in table 15 of appendix 12.

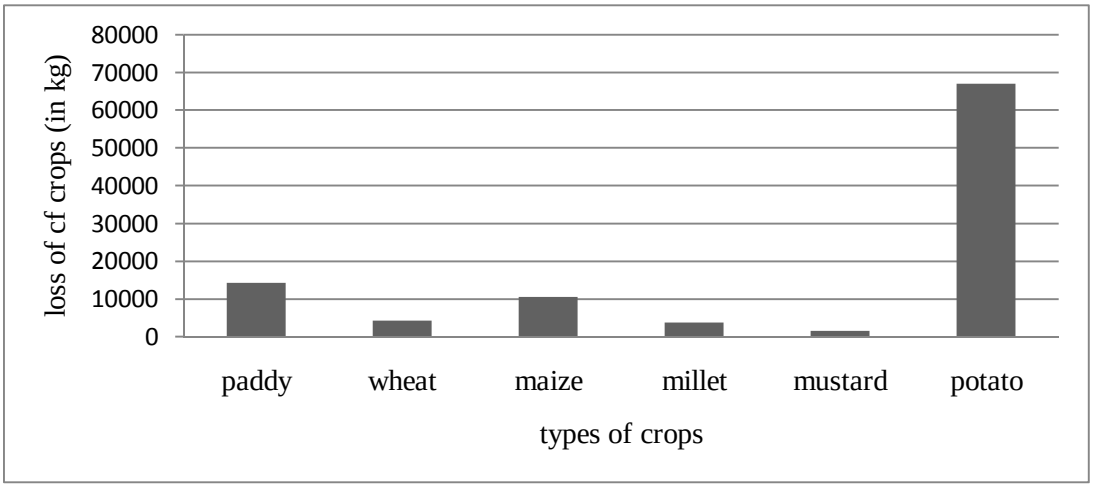

Figure 10: Loss of crops by NAD method in the sampled areas.

5.2.8 Loss of crops by different wild lives

Figure 11 showed the highest total loss of crops by Wild boar was 32432.1 kg; which is followed by porcupine, rats, monkeys, deer, bears and birds were 17763.21 kg, 14314.15 kg, 13568.5 kg, 13046.41 kg, 5935.92 kg and 4092.46 kg respectively. Total loss was 101152.75 kg. Description of data is in table 16 of appendix 12.

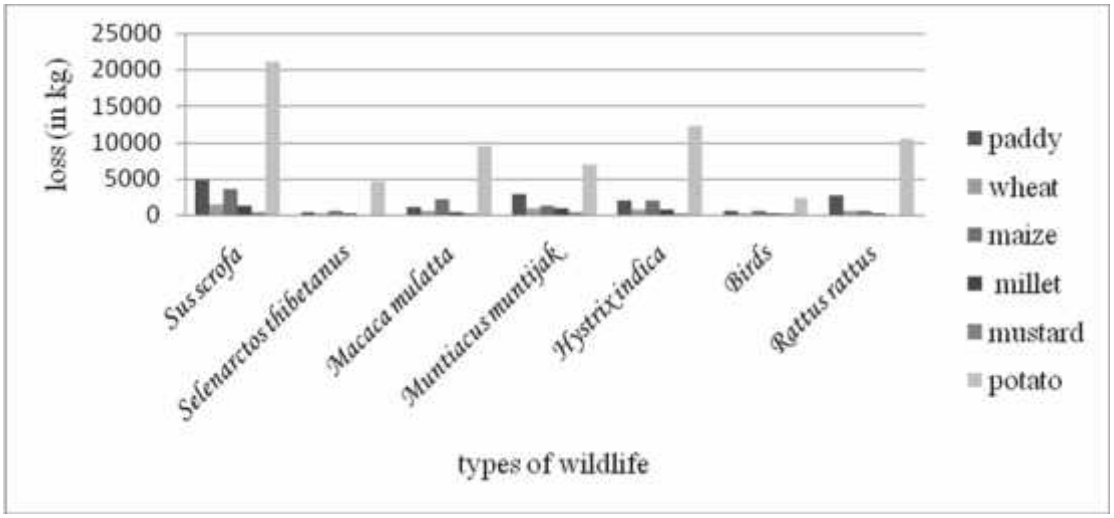

Figure 11: Loss of different crops by different wildlife in the sampled area (in kg).

5.2.9 Economic loss of different crops

Figure 12 showed the total loss of crops in monetary value, which was Rs. 1803982.68. The loss in different crops like paddy, wheat, maize, millet, mustard and potato were Rs. 199168.48, 62315.4, 367669.75, 93721.5, 76190.5 and 1004917.05 respectively. For Economic loss of crops $\chi^2 = 300663.78$ ($\chi^2_{cal} > \chi^2_{tab}$ at p = 0.05 and 5 d.f.). The rate of crops was calculated based on the villagers' information during field study in 2010 A.D. Description of data is in table 17 of appendix 12.

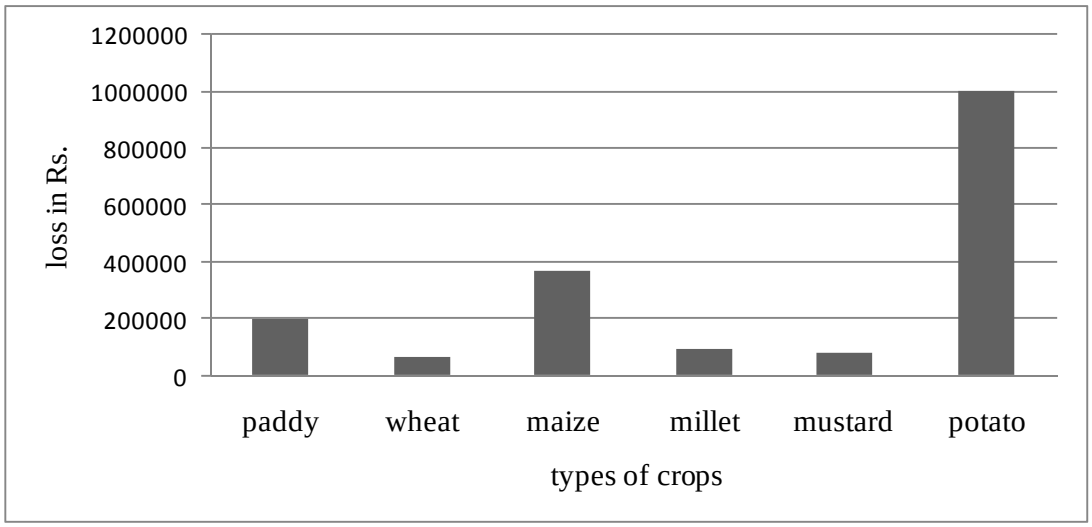

Figure 12: Total economic loss of different crops (NPR)

5.2.10 Total Economic loss of different crops by different wildlife (in NC)

Figure 13 showed the highest loss of crops by Wild boar (Rs. 576212.4), which is followed by porcupine (Rs. 321454.55), monkey (Rs. 256289.06), deer (Rs. 238365.85), rats (Rs. 226262.81), bear (Rs. 104770.25) and birds (Rs. 80619.85). Description of data is in table 18 of appendix 12.

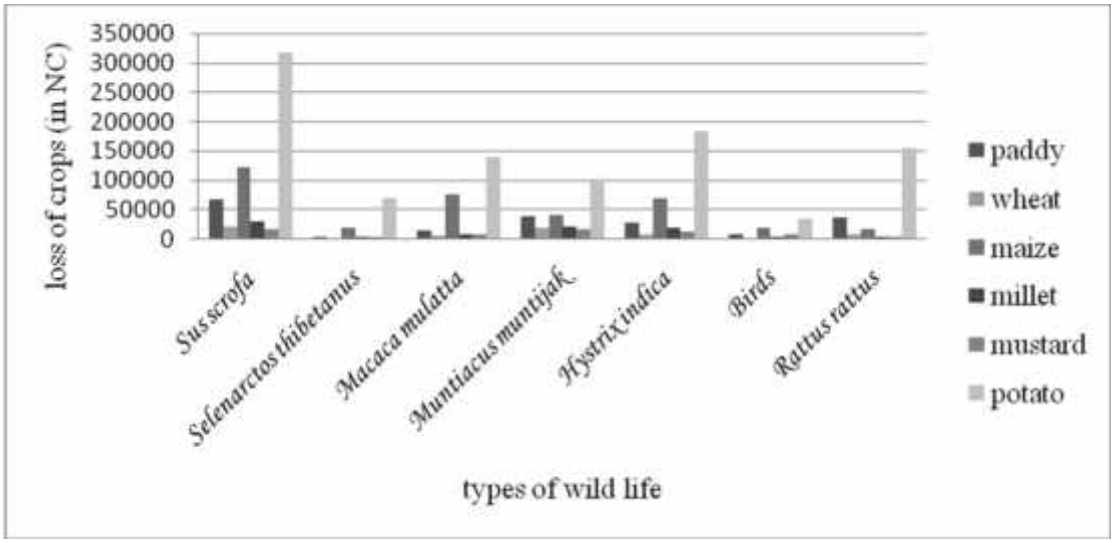

Figure 13: Economic loss of different types crops by different wild animals (NPR)

5.2.11 Ranking of wildlife in crop damage

Figure 14 indicated the loss of crop from Wild boar which was the highest amount of 32432.1 kg. It was in the first position of ranking of crop damage. Similarly, Porcupine in second position which destroyed 17763.21 kg of crop, rats in third position with 14314.15 kg crop damage. On the descending order of crop damage were monkey (13568.5 kg), deer (13046.41 kg), bear (5935.92 kg) and birds (4092.46 kg).

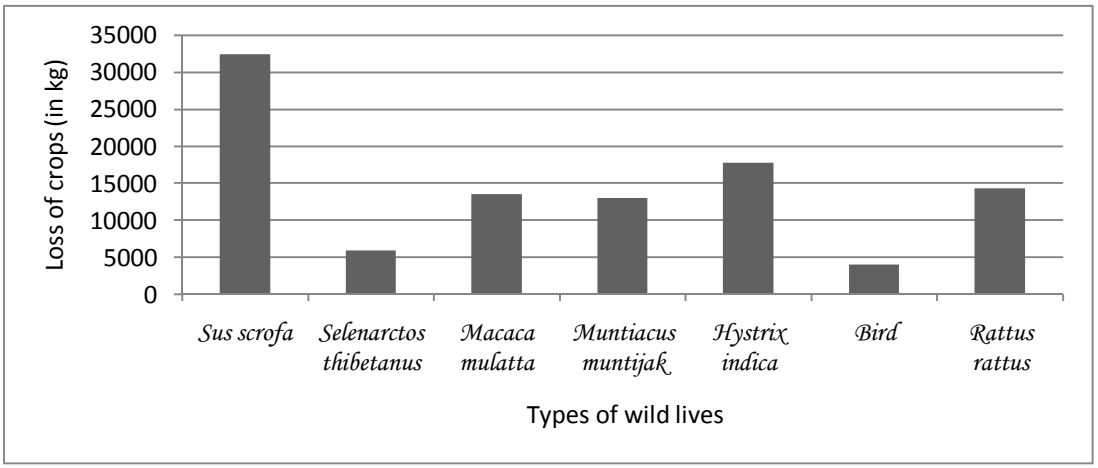

Fig. 14: Ranking of wildlife in crop damage.

5.3 Total number of livestock reared by the sampled households

Figure 15 showed that chicken was the highest number by 910, which was followed by goat (335), buffalo (277), bull (100), cow (86), pig (13), pigeon (100) and duck (10). Description of data is in table 19 of appendix 12.

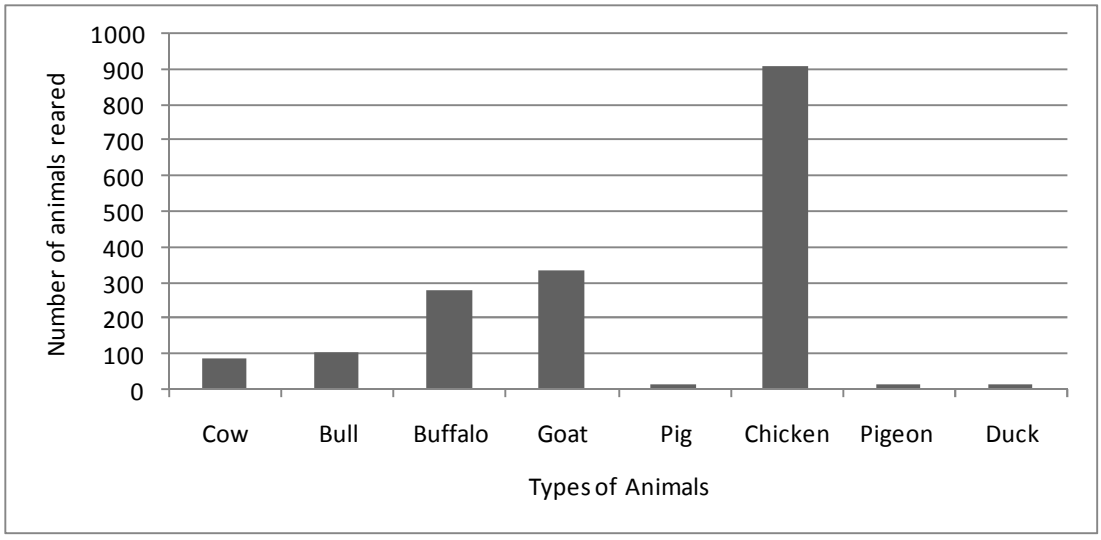

Figure 15: Total number of animals reared in the study area

5.3.1 Livestock depredation by wildlife

The park animals had been the cause of loss of livestock and avian stock in Thanapati VDC. The livestock like goats, cows, bulls, buffaloes, pigs etc and avian stocks like chicken, duck etc were killed by the park animals. The most important predators were Leopard (*Panthera pardus*), Wild cat (*Felis chaus*), Jackal (*Canis aureus*), Common Mongoose (*Herpestes edwardsii*). Jackal was found in the highest number (55) throughout the year.

Figure 16 showed that chicken were lost in the highest number by wildlife by 86, which was followed by goats (34), bulls (12), cows (11), pigs (5), buffaloes (2) and pigeons (2). Description of data is in table 20 of appendix 12.

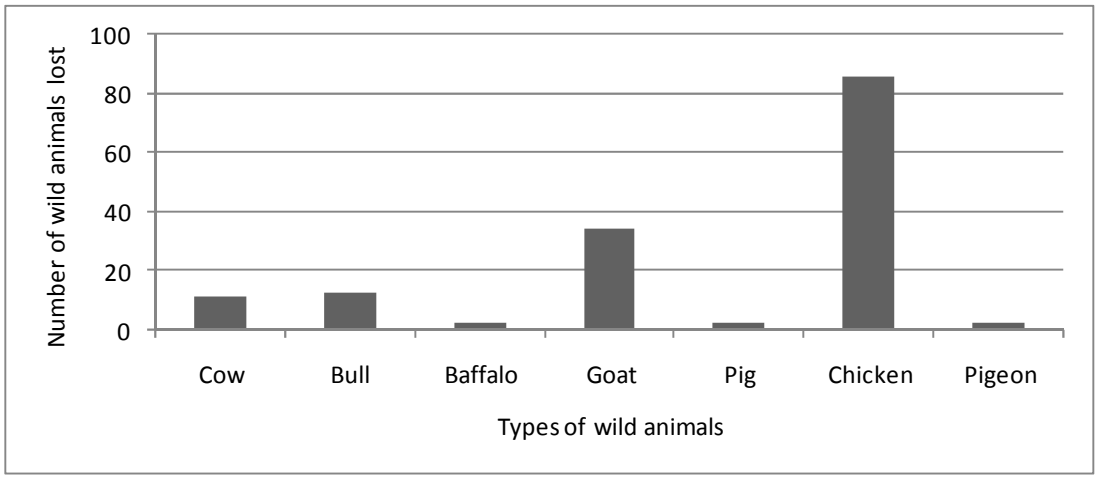

Figure 16: Number of animals lost by wildlife.

5.3.2 Estimated economic loss by livestock depredation in the study area

Figure 17 showed that the highest loss in monetary value was for goat by Rs. 85000, which was followed by cow (Rs. 66000), bull (Rs. 60000), buffalo (Rs. 44000), chicken (Rs. 30100), pig (Rs. 8000) and pigeon (Rs. 300). The total loss was Rs.

293400. The rate of livestock and avian stock were calculated based on the villagers' information during field study in 2010 A.D. Description of data is in table 21 of appendix 12.

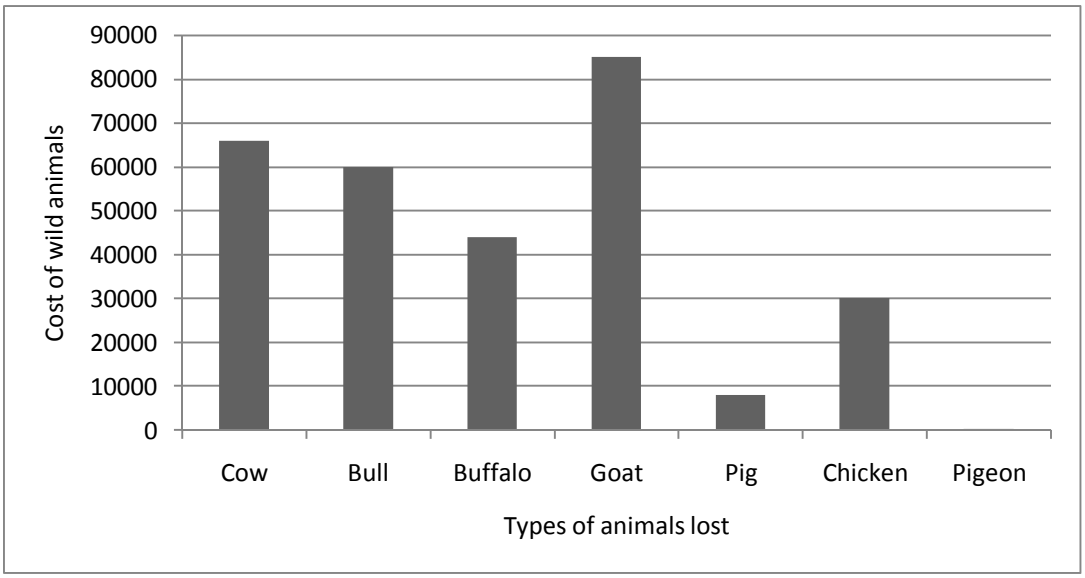

Figure 17: Estimated monetary value of livestock and avian stock in the study area

CHAPTER-VI

DISCUSSION

The present study conducted in Thanapati VDC of Nuwakot District which has been facing the serious problems of Wild boars and many other wild animals from ShNNP for many years. Park-people conflict in ShNNP was due to problem created from Park and also from local people of the adjacent areas. 72% people during the survey said that presence of Park resulted in loss of their crop and livestock from wildlife. Similarly, park had been a source of irritation for local people who did not follow rule and regulation for livestock grazing (6), fodder (13), timber and firewood collection (3) and poaching of wildlife (2) among 24 respondents from park staffs. Park and local people realized that conflict between these two groups arose due to four major sources and these were fuel wood and fodder, crop damage, livestock grazing and human harassment. This is due to the presence of park near by the VDC, the illegal use of park by local people for their requirement and the visiting of wild life for the food.

Similar types of conflicts exist as also pointed out from Upreti (1985), were crop damage, encounter between man and wildlife, loss of livestock by predators, fishing and hunting, antipathy towards parks and reserves and tourism. Sharma (1991) found causes of conflict in Royal Chitwan National Park where crop and livestock damage, loss of human life by wild animals nearest to the park due to habitat encroachments from local people.

This study also showed that the total Net Area Damaged (NAD) was 545.90 ropani. Out of which the highest was by Wild boar 32.22%, which was followed by porcupines 17.42%, deer 16.02%, monkeys 13.34%, rats 11.12%, bears 4.96% and birds 4.92%. Similarly, the highest Net Area Damaged was found in potato field 27.76%, which was followed by maize 24.98%, paddy 19.74%, millet 12.95%, wheat 8.62% and mustard 5.93%. The Wild boar was the main crop raider so it ploughed the field, ate tuber of potato at that time it damaged most of the areas and it had made the highest damage in potato field. Wild boars mostly visited in the season when the potato was planted or in the ripen stage. Wild boar and other animals raided the crops just before the harvesting time. Some animals like monkey, porcupine raided on the milky stage but deer raided on small grown plants and they grazed on them. In NAD, Chi square equaled to 90.98 with 5 degrees of freedom. The right-tailed value equaled 11.070 at 5% of significance level, so $\chi^2_{cal} > \chi^2_{tab}$ and null hypothesis was rejected. Here we could conclude that the crop damage was not equal. By conventional criteria, this difference was considered to be statistically significant. A small p value was the evidence that the data were not sampled from the distribution we had expected.

Similar type of result was pointed by Gurung (2002), who found total NAD was 466.93 in Sunkhani VDC in Nuwakot district. The highest NAD was by Wild boar in 38.53%, which was followed by porcupine 20.83%, monkey 20.09%, deer 8.72%, bear 9.12% and birds 2.68%.

In this study, Wild boar (*Sus scrofa*) was found as main crop raider in Thanapati VDC, adjacent to Shivapuri Nagarjun National Park. Other crop raiders were porcupine (*Hystrix indica*), monkey (*Macaca mulatta*), bear (*Selenarctos thibetanus*), deer (*Muntiacus muntijak*), rats (*Rattus rattus*) and different birds. Due to the lack of food inside the park at the time of seasonal changes, intra and inter specific competitions, temperature changes in winter and summer seasons and population of the wildlife, the wildlife came out of the park and they entered to the cultivated area and raided. In the study, Wild boar was found most visited wild animals in the cultivated land by 845 times. Wild boar was found mostly raiding in tuber like potato, sweet potato etc. Other wildlife like bear, porcupine, rat, monkey and deer were also found raiding in all types of plants. They raided the crops according to the taste and season of plants.

Similarly Kharel (1993) identified Wild boar (*Sus scrofa*), Himalayan black bear (*Selenaectos thibetanus*), monkey (*Macaca mulatta*) and deer (*Muntiacus muntjak*) species as major crop raiders in Langtang National Park. Nepal and Weber (1993) reported rhinoceros (*Rhinoceros unicornis*), chital (*Axis axis*) and Wild boar (*Sus scrofa*) as principal crop raiders in CNP. Sharma (1995) found wild buffalo (*Babulus babulis arnee*) and Wild boar (Sus scrofa) as main crop raider in KTWR. Previous study of Soti (1995), Poudel (1995), Gurung (2002) and Kurkait (2010) found Wild boar (*Sus scrofa*) as a principal crop raider in ShNNP. Gautam (1999) identified wild elephant (*Elephas maximus*), Wild boar (*Sus scrofa*) and chital (*Axis axis*) as main crop raider in Suklaphanta Wildlife reserve. Gaire (2007), Thapa (1008) and Regmi (2010) identified Wild boar (*Sus scrofa*) as a main crop raider in Bardia National Park. Khatiwada (2008) found Wild boar (*Sus scrofa*) as a main crop pest in Kangchenjanga Conservation area. In all these studies, Wild boar (*Sus scrofa*) seemed to be one of the main crop raiders in most of the parks and reserves of Nepal.

In this study, crop damage of 101152.94 kg was found due to wildlife depredation. Out of total damage, highest loss was found in potato (66.25%), this was followed by paddy (14.08%), maize (10.38%), wheat (4.10%), millet (3.70%) and mustard (1.50%). As Wild boar is the main pest and most visited wild life in the cultivated land and this may be due to the taste of tuber like plants results the highest loss in potato. Crop damage depends on various factors like nature of crop and preventive measures used by farmers, the number of wildlife and distance from jungle boundary. The main reasons for this damage may be the lack of sufficient food in the jungle followed by liking of taste of crop. In crop damage, Chi square equaled to 16858.79 with 5 degrees of freedom. The right-tailed value equaled to 11.070 at 5% of significance level, so $\chi^2_{cal} > \chi^2_{tab}$ and null hypothesis was rejected. Here we could conclude that the crop damage was not equal. By conventional criteria, this difference was considered to be statistically significant. A small p value was the evidence that the data were not sampled from the distribution we had expected.

Similarly, Shrestha (1994) found Bodreni as a most affected area with annual loss of 38.5% in its total production in CNP. The loss was 50.88% of maize, 25.50% of paddy and 6.60% of mustard respectively. The highly affected area was Padampur where 22.56% of total production was estimated as crop loss. The loss was 25% of maize, 24% of paddy and 5.33% of mustard. Poudel (1995) calculated that loss of paddy was 2.06% of total production in Sundarijal VDC adjacent to Shivapuri Nagarjun National Park. Similarly, total loss of wheat, maize and millet were 30.41%, 35.21% and 47.36% of expected production respectively. He calculated that Wild boar (*Sus scrofa*) destroyed maize, wheat and millet by 85%, 70% and 90% of total loss respectively Soti (1995) in Kakani VDC adjacent to Shivapuri Nagarjun National Park calculated the loss of maize as 999.88 quintal. Likewise, the total loss of millet, wheat and paddy were 55.57, 23.65 and 23.06 quintal respectively. He found the Wild boar as the main crop raider. He found Wild boar destroyed maize, wheat, millet and paddy by 80%, 45%, 90% and 40% respectively. Sharma (1995) found that Wild boar destroyed potato, paddy and wheat by 67.76%, 21.17% and 11.07% of total loss respectively in P. Kusaha VDC adjacent to KTWR. Similarly in Shripur VDC, potato wheat and paddy were 49.27%, 33.83% and 16.89% of total damage respectively. Kasu (1996) in Parsa Wildlife Reserve, found the loss of 23857 kg of paddy which was 77.52% of the total paddy damage. Likewise, total loss of wheat and maize were 4896 kg or 15.91% and 2022 kg or 6.57% respectively. He found that deer, boar and elephant destroyed 52.2%, 32.61% and 15.19% respectively of the total crop damage. Limbu (1998) found that a total 117517 kg crop loss consisting 65240 kg of paddy, 37967 kg of wheat and 14310 kg of potato were damaged in P. Kusaha VDC, adjacent to KTWR. Gurung (2002) found crop damage of 46872.40 kg in Sunkhani VDC adjacent to ShNNP. He found highest loss in paddy of 12085.83 kg followed by maize of 11531.46 kg, potato of 11281.50 kg, wheat of 6421.85 kg, millet of 5119.01 kg and mustard of 432.75 kg.

The study estimated economic loss of crop was Rs. 1803982.68 of which 11.05% to paddy, 3.45% to wheat, 20.38% to maize, 5.20% to millet, 4.22% to mustard and 55.70% to potato. The reported economic loss was Rs. 14908.94 per household on an average. The highest loss was in potato. According to market price, the highest was mustard that cost Rs. 50 per kg and lowest was paddy Rs. 14 per kg. In economic loss, Chi square equaled to 300663.78 with 5 degrees of freedom. The right-tailed value equaled to 11.070 at 5% of significance level, so $\chi^2_{cal} > \chi^2_{tab}$ and null hypothesis was rejected. Hence, it was concluded that the crop damage was not equal. By conventional criteria, this difference was considered to be statistically significant. A small p value was the evidence that the data were not sampled from the distribution we had expected.

Similarly, Limbu (1998) found the economic loss of Rs. 831966. Highest economic loss 54.89% was estimated to paddy followed by wheat (36.51%) and potato (8.60%) in P. Kusaha VDC, adjacent to KTWR. Baral (1999) found the loss of Rs. 2095346 of

which 52.73% in Thakurdwara and 47.27% in Shivapur VDC. Highest loss (28.32%) occurred to paddy, followed by potato (15.40%), maize (15.21%), wheat (13.80%), mussuro (12.42%) and yam (7.57%). Gautam (1999) found the loss of Rs. 947470 in ward no. 19, 13, 18, 15 and 14 of Mahendranagar Municipality adjacent to Suklaphanta Wildlife Reserve. Higher economic loss of 74.28% was estimated to paddy crop followed by wheat (14.08%) and maize (8.62%). Among the wild animals, highest economic loss of 43.29% was estimated by wild elephant followed by Wild boar (28.67%), chital (24.09%) and bluebull (3.29%). Gurung (2002) estimated economic loss of Rs. 554989.31 of which 33.24% to maize, 10.14% to millet, 17.35% to wheat, 19.59% to paddy, 3.39% to mustard and 16.26% to potato.

Similarly, livestock depredation took in the park due to presence of carnivore. Highest loss of livestock in the ward no. 1 and 2 is due to the location at the adjacent to the forest which was easy to attack by carnivore. The total economic loss was less than from crop depredation by herbivore and omnivore but the possibility of higher loss in livestock was greater. The main predators for livestock and avian stock depredation were leopard (*Panthera pardus*), wild cat (*Felis chaus*), Wild boar (*Sus scrofa*), jackal (*Canis aereus*) and common mongoose (*Herpestes erdwardsii*).

Similar result was reported by Gurung (2002), he found that 280 livestock were killed by wildlife in his study area, Sunkhani VDC, Nuwakot district. The total economic loss was Rs. 48355.

Besides the crop and livestock damage there was also harassment of people from wildlife. They were in dilemma for their cultivation planning in the future. The leopard (*Panthera pardus*) and Wild boar (*Sus scrofa*) were found to become main cause of human harassment in the study area. There were not any losses of human being.

For this, they had adopted different kinds of preventive measures. For instance, spending night in watch towers and machan, use of noise making tools, beating tins and boxes, chasing with stones, guarding by dogs to deter the Wild boars and other wild animals etc. Shouting and chasing with fires, beating tins and boxes, spending whole night in watch towers and machan were more popular methods.

According to the villagers, spending whole nights in watch towers and machans had an adverse effect on the people's health as well as on the efficiency of villagers' work. They become irritated from park because they lose their valuable time for chasing the wildlife and guarding their crops and livestock. Extra loss of money for keeping dog,

Similarly, local people were unknown about all rule and regulations of park, and at the time of chasing wildlife and other illegal activities created unknowingly or from poachers, they get burden from park. Local people's act of collecting fodder, felling

and looping trees, grazing inside the park, moving inside the park without permission especially in the hot spot and breeding season for particular species developed conflict towards park. The main reason of agricultural loss and harassment to the local people occurred due to lack of complete physical barriers between cultivated areas and forest. Lack of planning, lacking of alternative practices for agriculture, ignoring people's needs were responsible for today's problem in Thanapati VDC. So, the problems are growing more serious than ever.

CHAPTER-VII

7. CONCLUSION AND RECOMMENDATIONS

7.1 Conclusion

The study of park-people conflict was conducted in Thanapati VDC of Nuwakot district, located adjacent to the northwestern side of Shivapuri Nagarjun National Park. The main objectives of this study were to quantify the amount of crop and livestock depredation, source of conflict between park and local people and to find out possible solution to problems. The survey was done in 121 households by both questionnaire and NAD method to access the crop and livestock depredation. Park staffs and village leaders were also interviewed to know the causes of park-people conflict and its preventive measures. Present study indicates that the poor socio-economic condition creates conflicts between local people and park. The main causes of conflict are breaking the rules and regulations of the park; crop and livestock depredation and human harassment due to wildlife, livestock grazing, hunting and poaching and fodder, timber and firewood cutting by local people inside the park.

Crop damage amounting 101152.94 kg was found due to wildlife in the study area for the year 2009-2010. Out of this total damage, potato came to be first with 66994.47 kg followed by paddy (14226.32 kg), maize (10504.85 kg), wheat (4154.36 kg), millet (3748.86kg) and mustard (1523.81 kg). The study estimated loss of crops was Rs. 1803982.68 of which 11.05% to paddy, 3.45% to wheat, 20.38% to maize, 5.20% to millet, 4.22% to mustard and 55.70% to potato.

Among the wildlife, Wild boar is serious pest species of crop, 32.07% followed by porcupine (17.56%), rats (14.15%), monkey (13.42%), deer (12.89%), bear (5.87%) and birds (4.04%). The main causes of crop damage in Thanapati VDC were (1) Lack of effective physical barrier (2) Lack of sufficient food inside the park (3) taste of agricultural crops (4) high density of wildlife.

The study found the loss of 11 cows, 12 bulls, 2 buffaloes, 34 goats, 2 pigs, 86 chicken and 2 pigeons by wildlife recently in the study area. There is no loss in duck in the study area.

The economic loss of livestock and avian stock was Rs. 293400 and average loss was Rs.2424.79 per household. The main predators were leopard (*Panthera pardus*), wild cat (*Felis chaus*), Wild boar (*Sus scrofa*), jackal (*Canis aereus*) and common mongoose (*Herpestes erdwardsii*). The leopard (*Panthera pardus*) and Wild boar (*Sus scrofa*) were found to become main cause of human harassment. There were not any losses of human being. Leopards were found to visit house to house. Villagers even feel insecure to work in the field and walk through the jungle alone.

Traditional preventive measures include machan, fence and various type of scaring devices, which are partially successful to control the damages.

7.2 Recommendations

Following measures are suggested to mitigate the problem.

1. Crop depredation by wildlife also depends upon the taste of crop plants. The food habit of the wildlife should be thoroughly studied and local villagers should be encouraged to grow unpalatable, less preferable crops.

2. Most of people living around the park are illiterate and do not have knowledge about the issue of environmental degradation and its overall impact. They do not know the importance of protected wild animals and forest resources. They do not have better understanding of the role of the park. If education on the importance of park and conservation of natural resources was given to them time to time, they can realize the importance of such park for present and future generation and can enjoy the nature, feel the importance of the wildlife, feel it as their own and for their benefits.

3. Park authorities should make walls and fences around the park.

4. Affected area by wildlife should be regularly monitored. In such area, park should provide preventive measures including the effective noise producing equipments and other scaring devices. Park also has to provide wood for making machan (raised platforms) and should encourage farmers to unite watching the fields.

5. Instead of putting their traditional emphasis on agriculture, the farmers should be encouraged to adopt other occupations such as small cottage industries, poultry farming, tourism and other means of livelihood. They can utilize their own land for this purpose. Government should provide loans to local people to start such works.

6. People living adjacent to the park boundary (word no. 1 and 2 in Thanapati VDC) are heavily affected. Similarly, presence of people very close to the wildlife habitat causes a certain annoyance to the animals. For the sake of both of them, it is better not to permit human habitation very close to such areas. Therefore, those who live at the proximity of the core area should be shifted to other suitable places.

7. Local people should use modern preventive measures leaving traditional preventive measures.

8. Park office or government should provide compensation.

PLATES

Plate 1: Main gate to enter the national park

Plate 2: Dense forest near the Shivapuri Peak

Plate 3: Adjacent forest from the study area, Thanapati VDC

Plate 4: After a questionnaire survey with villagers

Plate 5: Damage made in paddy field by wild animals

Plate 6: North view from the study area, Thanapati VDC

Plate 7: Rootling made by Wild boar

Plate 8: Maize farm destroyed by Wild boar

Plate 9: Foot print of Wild boar

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APPENDIX 1

QUESTIONNAIRE SURVEY
About the Wild boar

Name: …… Village/VDC:……
Ward no: …… Occupation: ……

1. How do you see the Wild boar around here?
   ……
   ……
2. How do you notice the presence of Wild boar around here?
   Sighting …… footprint…….. scratches ……. Faecal mater ……..
   nest …… other……
3. Can you tell me where the Wild boar was present?
   Site 1…… site 2 ……site3 ……Site4……
   Site5……. Site6……
   Site7…… Site8……. Site9…….. Site10……..
   Site11……..
   Site12……. Site13…… Site14……
4. In which months do you notice the presence of Wild boar?
   Jan ……..Feb……. Mar…… Apr……
   May…… June ……..
   Jul…… Aug…… Sept…… Oct……
   Nov……. Dec……..
5. Did you observe the Wild boar in herds or solitary?
   Solitary ……..Herds…….
6. What are the favourite foods of Wild boar in the forest?
   ……
   ……
7. What are the favourite foods of Wild boar in cultivated land?
   Maize…… Paddy…….. Millet……..
   Wheat……
   Mustard……. Potato……..
   Other……..
8. In which stage the Wild boar raids the crop?
   Young stage…… Milky stage……..
   Ripen stage…….

APPENDIX 2

About the issues of Human Conflict in SNP
Household Questionnarie

Name:……..
Village/VDC:……..
Ward No.: ……
Occupation:……..

1. How many members are there in your family?
   ……
   ……
2. Do you have livestock/avainstock?
   Yes…… No……..
   If yes how many do you have?
   Cattle……Buffalo
   ……Goat……Pig……..
   Chicken……Duck……Pigeon……
   …….Parrot…….
   Other……
3. How many livestock/avainstock were lost due to wild animal?

	Cattle	Buffalo	Goat	pig	Chicken	Duck	Pigeon	parrot	Other
By Leopard									
By Jackal									
By wild cat									
By Common mongoose									
By Bird									
By others									

4. How much land do you have?
   …… Ropani
5. How much khet and how much bari?
   Khet……ropani, bari …… ropani
6. In how many ropani of land do you grow following crops?
   Paddy…… Wheat…….. Maize…….
   Millet……..
   Mustard……. Potato…….. Radish…….
   Other……

7. Do you practise mixed cropping system?
   Yes…….. No…….
   If yes, which crop do you plant together?
   ……
   ……
8. What is the average yield of crops?(Kg/ropani)
   Paddy……. Wheat……. Maize……
   Millet……..
   Mustard…….. Potato……. Radish……..
   Other……..
9. What is the total production of these crops?(In Kg)
   …….
10. Do wild animals attack on your crops?
    Yes……..
    No……
    If yes, which are the main wild animals?
    Wild boar…… Bear…… Deer…….
    Porcupine……
    Monkey…… Bird……. Other…….
11. Which animals attack crops?

	Paddy	Maize	Millet	Wheat	Mustard	Potato	Other
Wild boar							
Bear							
Deer							
Porcupine							
Monkey							
Birds							
Other							

12. What is the frequency of their visit on crops?
    Wild boar……. Bear……..
    Deer……
    Porcupine…… Monkey……..
13. What is the total loss of crops?(In Kg)
    Paddy……. Maize……. Wheat…….
    Millet…….. Mustard…… Patato…….
14. What is the total lost of crops by wild animals? (In Kg)

	Paddy	Maize	Millet	Wheat	Mustard	Potato	Other
Wild boar							
Bear							
Deer							
Porcupine							
Monkey							
Birds							
Other							

15. If there was no such wildlife damage problem,what would have been the total production? (in Kg)
    Paddy…… Wheat…….. Maize…….
    Millet……..
    Mustard……. Potato…….. Radish…….
    Other……
16. Any crop you dodn't grow because ofd the fear of wild animals?
    Paddy…… Wheat…….. Maize…….
    Millet……..
    Mustard……. Potato…….. Radish…….
    Other……
17. Do you apply any techniques to protect your crop from wild animals? If yes, mention
    a) …… b) ……. c) …….
    d) …….
18. Because of such wildlife damage problem. Are you thinking of leaving this place and going somewhere else?
    Yes……. No……
19. Any other kind of injuries of harassment?
    Yes……. No……
20. Have you received any compensation?
    Yes……. No……
21. What are the sources of human conflict in ShNNP?
    ……
    ……..
22. What would be the best controlling measures? Any idea or recommendation do you have?
    ……
    ……..

Questionnnarie for park staffs

1. What are the main causes that conflict between the park authorities and local people?
    a) Livestock grazing…… b) Hunting and poaching…… c) Fodder cutting…….
    d) Crop damage…….. e) Loss of live stock and avianstock……. f) Human harassment…….. g) Other……..
2. In your opinion, why do animals come out of the park and do the damage?
    a) Lack of foods insie the park……. b) Crop preference……..
    b) Lack of proper fence…… d) Other……..
3. Are the local people aware of the importance of National park and its rule and regulations?
    ……
    ……..

4. Have you adopted any measures to control the wild animals to come outside the park?
   ……
   ……
5. What is the better and permanent solution to minimize the conflict between the park authorities and the local people?
   ……
   ……

Questionnarie for Community Leader

1. What is your perception about the wild animals and national park?
   ……
   …….
2. Would you like to tell your suggestion for the management of the park and maintaining of its balance?
   ……
   …….
3. Are there any complaints from public sector?
   a) Yes…… b) ……
4. Have you ever visited park dfficer about public complaints for solving the problems?
   ……
   ……
5. What are your suggestions for managing the p-ark using its resources for the local people?
   ……
   …….
6. In your opinion, have you found any differences between past and current park management approach?
   a) Yes…….. b)……
   If yes, what are the differences.
   ……
   ……..

बदेल सम्बन्धि प्रश्नावली

नाम..... गाउ/गा.बि.स.....
वडा नं..... पेशा.....

(१) तपाईले यता वरिपरि बदेल लेख्नुभयो ?

.....

(२) बदेल यस ठाउमा आएको कसरी पत्ता लगाउनुभयो ?

(क) बदेल देखेर..... (ख) खुट्टाको डाम..... (ग) खोस्रेको ठाउ.....

(घ) दिशा गोबर..... (ङ) गुँड .....(च) अन्य.....

(३) बदेल आएको ठाउ तपाईले भन्न सक्नुहुन्छ ?

स्थान १..... स्थान २..... स्थान ३..... स्थान ४.....
स्थान ५..... स्थान ६..... स्थान ७..... स्थान ८.....
स्थान ९..... स्थान १०.....स्थान ११.....
स्थान १२..... स्थान १३..... स्थान १४.....

(४) कुन महिनामा तपाईले बदेल देख्नुभयो ?

(क) पुष.....(ख) माघ.....(ग) फागुन.....(घ) चैत्र..... (ङ) बैशाख.....

(च) जेठ.....(छ) असार.....(ज) साउन..... (झ) भदौ..... (ञ) असोज.....

(ट) कार्तिक..... (ठ) मंसिर.....

(५) तपाईले बदेल एक्लै वा हुलमा देख्नुभयो ?

(क) एक्लै..... (ख) हुल .....

(६) तपाईको बिचारमा बदेलले रुचाउने बनका मुख्य आहारहरु के के हुन् ?

.....

(७) खेती गरिने क्षेत्रमा बदेलले रुचाउने मुख्य बालीहरु के के हुन् ?

(क) मकै..... (ख) धान .....(ग) कोदो .....(घ) गहूँ .....
(ङ) तोरी .....(च) आलु..... (छ) अन्य.....

(८) तपाईको बिचारमा बदेलले बालीको कुन अबस्थामा असर पार्दछ ?

(क) शिशु-सानो अबस्था..... (ख) दुधे अबस्था..... (ग) पाक्ने अबस्था.....

गाउँले र निकुञ्ज बचि बिबाद सम्बन्धि प्रश्नावली
हरेक घरधुरिमा गरेको प्रश्नावली

नाम..... गाउ/गा.बि.स.....

वडा नं..... पेशा.....

(१) तपाईको परिवारमा कति सदस्य छन् ?

.....

(२) तपाईले बस्तुभाउ पाल्नुभएको छ ?

यदि छ भने, तपाईसँग कतिवटा छन् ?

(क) गाइगोरु..... (ख) भैसी..... (ग) बाखा..... (घ) सुङ्गुर.....

(ङ) कुखुरा..... (च) हाँस..... (छ) परेवा..... (ज) सुगा.....

(झ) अन्य.....

(३) जंगली जनवारहरुले तपाईको कतिवटा बस्तुभाउ नोक्सान गरे ?

	गाईबस्तु	भैसी	बाखा	सुङ्गुर	कुखुरा	हाँस	परेवा	सुगा	अन्य
चितुवाले									
स्याललले									
जंगली बिरालोले									
न्यउरी मुसाले									
चराले									
अन्यले									

(४) तपाईको खेतीयोग्य जमीन कति छ ?

.....रोपनी

(५) तपाईको खेत र बारी कति छ ?

(क) खेत..... रोपनी (ख) बारी..... रोपनी

(६) निम्न बालीहरु तपाईले कति जग्गामा लगाउनुहुन्छ ?

मकै .....रोपनी
धान..... रोपनी
कोदो .....रोपनी
गहूँ .....रोपनी
तोरी .....रोपनी
आलु .....रोपनी
अन्य .....रोपनी

(७) तपाईले मिश्रित बाली लगाउनुहुन्छ ?

(क) लगाउछु..... (ख) लगाउदिन.....

(८) कुन कुन बालीहरु सँगै लगाउनुहुन्छ ?

.....

(९) निम्न बालीहरुको औसत उत्पादन कति छ ? (किलो/रोपनी)

आलु.....
धान .....
कोदो .....
गहूँ.....
तोरी.....
मकै.....
अन्य .....

(१०) यी बालीहरुको पूरा उत्पादन कति छ ? (किलो/रोपनी)

.....

(११) के जंगली जनवारहरुले तपाईको बालीलाई नोक्सानी गर्छन् ?

(क) गर्छन्..... (ख) गर्दैनन्.....

गर्छन् भने मुख्य जंगली जनवारहरु कुन कुन हुन् ?

(क) बदेल..... (ख) भालु..... (ग) मृग.....
(घ) दुम्सी..... (ङ) बाँदर..... (च) चरा.....
(छ) अन्य.....

(१२) कुन कुन जंगली जनवारहरुले तपाईको कुन कुन बालीलाई नोक्सान गर्छन् ?

	आलु	धान	कोदो	गहूँ	तोरी	मकै	अन्य
बदेल							
भाल							
मृग							
दुम्सी							
बाँदर							
चरा							
अन्य							

(१३) जंगली जनावरहरु कति पटक तपाईको बाली नोक्सान गर्न आउछन् ?

(क) बदेल..... (ख) भालु..... (ग) मृग.....

(घ) दुम्सी..... (ङ) बाँदर..... (च) चरा.....

(छ) अन्य.....

(१४) जम्मा कति बाली नोक्सान भयो ? (किलोमा)

आलु.....

धान .....

कोदो .....

गहूँ.....

तोरी.....

मकै.....

अन्य .....

(१५) जंगली जनावरहरुले जम्मा कति बाली नोक्सान गरे ? (किलोमा)

	आलु	धान	कोदो	गहूँ	तोरी	मकै	अन्य
बदेल							
भाल							
मृग							
दुम्सी							
बाँदर							
चरा							
अन्य							

(१६) यदि जंगली जनवारहरुले नोक्सान नगरे जम्मा कति बाली उत्पादन हुन्थ्यो ? (किलोमा)

आलु.....

धान .....

कोदो .....

गहूँ.....
तोरी.....
मकै.....
अन्य .....

(१७) जंगली जनवारहरुको नोक्सान रोक्न के के उपायहरु अपनाउनु भएको छ ?
(क)..... (ख).....
(ग)..... (घ).....

(१८) जंगली जनवारहरुको कारणले के तपाईले बस्ती सर्ने योजना बनाउनुभएको छ ?
(क) छ..... (ख) छैन.....

(१९) जंगली जनवारहरुले कुनै किसिमको हतोत्साही र चोटपटक पुऱ्याएको छ ?
(क) छ..... (ख) छैन.....

(२०) तपाईले कुनै क्षति पूर्ति पाउनुभएको छ ?
(क) छ..... (ख) छैन.....

(२१) निकुञ्जसँग विबाद हुनुको कारण के के हुन् ?
.....

(२२) निकुञ्जसँगको विबाद समाधान गर्ने कुनै उपाय र सुझब दिनुहुन्छ कि ?
.....

निकुञ्जको कर्मचारीको लागि प्रश्नावली

(१) निकुञ्ज र स्थानिय बासिन्दाबिच विबादका मुख्य कारणहरु के के हुन् ?
(क) निकुञ्जभित्र बस्तुभाउ चराउनु.....
(ख) जंगली जनावरको चोरी निकाशी र शिकार.....
(ग) निकुञ्जभित्र घाँस दाउरा गर्नु .....
(घ) जंगली जनावरबाट बाली नोक्सान हुनु.....
(ङ) जंगली जनावरबाट हतोत्साही र चोटपटक लाग्नु.....
(च) अन्य कारण.....

(२) तपाईको बिचारमा जंगली जनावरहरु निकुञ्ज बाहिर आएर किन नोक्सान गर्छन् ?
(क) निकुञ्जभित्र खानाको कमि.....
(ख) अन्नबाली मन पराउने.....
(ग) उपयुक्त छेकबारको कमि.....
(घ) अन्य कारण.....

(३) के स्थानिय मानिसहरु निकुञ्जको आबस्यकता र यसको निति नियम सम्बन्धि सचेत छन् ?

.....

(४) जंगली जनवारलाई निकुञ्ज बाहिर आउनबाट रोक्न कुनै उपायहरु अपनाउनुभएको छ ?

.....

(५) निकुञ्ज र स्थानिय बासिन्दाहरु बिच उठेका विबादलाई समाधान गर्ने राम्रो र स्थायी उपायहरु के के हुन सक्छन् ?

.....

सामूदायिक कार्यकर्ताका लागि प्रश्नावली

(१) निकुञ्ज र जंगली जनावरहरुप्रतिको तपाईको धारणा कस्तो छ ?

.....

(२) निकुञ्जलाई व्यबस्थित गर्न र निकुञ्ज र स्थानिय बिच सम्बन्ध सामन्यीकरण गर्ने कुनै सुझाबहरु दिनुहुन्छ कि ?

.....

(३) स्थानिय बासिन्दाहरुबाट कुनै गुनासाहरु छन् कि ?

(क) छ..... (ख) छैन.....

(४) स्थानिय बासिन्दाहरुको गुनासाहरुलाई लिएर तपाईले कहिल्यै निकुञ्जका सम्बन्धित व्यक्तिहरुलाई भेट्नु भएको छ ?

(क) छ..... (ख) छैन.....

(५) बिगत र अहिलेको निकुञ्जको ब्यबस्थापन सम्बन्धि तपाईले कुनै फरकपन पउनुभएको छ ?

(क) छ..... (ख) छैन.....

छ भने के फरक पाउनुभएको छ ?

.....

APPENDIX 3

Table 1: Total cultivated land of sampled area (In ropani)

Ward No.	Sampled households	Khet	Bari	Total Cultivated land
1	10	20	162.50	182.50
2	14	37.66	217.84	255.50
3	13	58.50	178.75	237.25
4	12	96	123	219
5	12	96	123	219
6	16	224	68	292
7	13	58.50	178.75	237.25
8	11	121	79.75	200.75
9	20	290	75	365
Total		1001.66	1206.59	2208.25

Khet = Irrigated or seasonal irrigated crop land

Bari = Non-irrigated crop land, where irrigation depends only on rain.

APPENDIX 4

Table 2: Productivity of different crops:

S.N.	Crops	Productivity (Metric ton/hectare)	Productivity (Kg/Ropani)
1	Paddy (Barse)	2.59	132
2	Paddy (Chaite)	2.59	132
3	Maize (Khet)	0.62	32
4	Maize (Bari)	0.88	45
5	Wheat (Khet)	0.72	37.1
6	Wheat (Bari)	1.00	51.3
7	Millet	1.04	53
8	Mustard	0.92	47
9	Radish	27.52	1400
10	Potato	8.68	442

Source : Nuwakot Agricultural Office

Equivalent
1 ropani = 0.0523076 hectare

Table 3: Local name, Common name and Scientific name of the crops grown in the study area.

Local name	Common name	Scientific name
Dhan	Paddy/rice	*Oryza sativa*
Makai	Maize	*Zea mays*
Ganhu	Wheat	*Triticum aestivum*
Kodo	Millet	*Eleusine coracana*
Tori	Mustard	*Brassica compestris*
Alu	Potato	*Solanum tubersum*

APPENDIX 5

Table 4: Cropping Calendar

Crops	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Paddy (Barse)							←	—	—	—	—	→
Paddy (Chaite)			←	—	—	—	→					
Maize (Khet)					←	—	—	—	→			
Maize (Bari)			←	—	—	—	→					
Wheat	→	→	→	→	→					←	←	←
Millet							←	—	—	—	—	→
Mustard								←	—	—	—	→
Radish	→	→							←	←	←	←
Potato (Khet)	→	→	→	→						←	←	←
Potato (Bari)	→	→	→						←	←	←	←

APPENDIX 6

Table 5: Name, area and establishment of Nepal's protected areas

Protected Areas	Area covered (sq. km)	Year of establishment
1. National Parks	**10838**	
Chitwan National Park	932	1973
Sagarmatha National Park	1148	1976
Langtang national Park	1710	1976
Rara National Park	106	1976
Shey-Phoksundo National Park	3555	1984
Khaptad National Park	225	1984
Bardia National Park	968	1988
Makalu-Barun National Park	1500	1991
Shivapuri Nagarjun National Park	144	2002
Banke National park	550	2010
2. Wildlife Reserves	**979**	
Shukla-Phanta Wildlife Reserve	305	1976
Koshi Tappu Wildlife Reserve	175	1976
Parsa Wildlife Reserve	499	1984
3. Hunting Reserve	**1325**	
Dhorpatan Hunting Reserve	1325	1987
4. Conservation Area	**12133**	
Makalu-Barun Conservation Area	7629	1991
Annapurna Conservation Area	830	1992
Kangchanjunga Conservation Area	2011	1997
Manaslu Conservation Area	1663	1998
Total Area	**25275**	
Percentage	**12%**	

APPENDIX 7

Table 6: Protected mammals, birds and reptiles in Nepal

Mammals

Scientific Name	Local Name	Common Name	Status	
			IUCN	CITES
Ailurus fulgens	Habre	Red Panda		I
Antilope cervicapra	Krishnasagar	Black Buck	V	III
Bos gaurus	Gauri Gai	Gaur	V	I
Bos mutus	Yak	Wild Yak	E	I
Bubalus arnee	Arna	Wild Water Buffalo	E	III
Canis lupus	Bwanso	Tibetan Wolf	V	I
Caprolagus hispidus	Hispid Kharayo	Hispid Hare	E	I
Cervus duvauceli	Barasingha	Swamp Deer	E	I
Elephas maximus	Hatti	Asiatic Elephant	E	I
Felis lynx	Lynx	Lynx	E	II
Hyaena hyaena	Hundar	Striped Hyaena	E	
Macaca assamensis	Asame Rato Bandar	Assamese Monkey		II
Manis pentadactyla	Salak	Chinese pangolin		II
Moschus chrysogaster	Kasturi	Himalayan Musk Deer	E	I
Ovis ammon	nayan	Great Tibetan Sheep	I	I
Panthera tigris	Bagh	Bengal Tiger	E	I
Panthera uncia	Hiun Chituwa	Snow Leopaed	E	I
Pantholops hodgsoni	Chiru	Tibetan Antelope		I
Pardofelis nebulosa	Dhwanse Chituwa	Clouded Leopard	V	I
Platanista gangetica	Sauns	Gangetic Dolphin	V	I
Prionailurus bengalensis	Chari Bagh	Leopard Cat		II
Prionodon pardicolor	Lingsang	Spotted Lingsang		I
Rhinoceros unicornis	Gainda	One Horned Rhinoceros	E	I
Sus salvanius	Sano Bandel	Pigmy Hog	E	I
Tetracerus quadricornis	Chauka	Four Horned Antilope		II
Ursus arctos	Himali Rato Bhalu	Brown Bear		I

Birds

Buceros bicornis	Thulo Dhanesh	Great Horned Hornbill		I
Catreus wallichii	Cheer	Cheer Pheasant	E	I
Ciconia ciconia	Seto Stork	White Stork		II
Ciconia nigra	Kalo Stork	Black Stork		II
Grus grus	Saras	Common Crane		
Houbaropsis bengalensis	Khar Majur	Bengal Florican	E	I
Lophophorous impejanus	Danfe	Impeyan Pheasent		I
Sypheotides indica	Sano Khar Majur	Lesser Florican		II
Tragopansatyra	Monal	Crimson Horned Pheasant		III

Reptiles

Gavialis gangeticus	Ghadial Gohi	Gharial	E	I
Python molurus	Azingar	Asiatic Rock Python	V	I
Varanus flavescens	Sun Gohoro	Golden Monitor Lizard	I	I

Source: Yonzon, P. and Heinen, J. (1997)

Appendix 8

Table 7: Meteorological data on temperature, rainfall and humidity for the year 2007/08 at Kakani station.

Month	Temperature ^{0}C		Rainfall (mm)	Humidity (%)
	Mean maximum	Mean Minimum		
January	15.36	5.5	21.7	71.28
February	16.6	6.71	30.92	68.99
March	20.71	10.56	46.2	66.6
April	24.62	13.22	68.86	61.99
May	25.12	16.2	260.2	74.8
June	24.95	18.09	441.07	84.7
July	24.67	18.77	578.49	90.44
August	24.7	18.58	692.31	88.17
September	24.04	17.64	352.96	85.12
October	23.02	14.41	55.51	78.53
November	19.72	10.45	17.7	60.64
December	16.15	7.94	21.47	69.1

Appendix 9

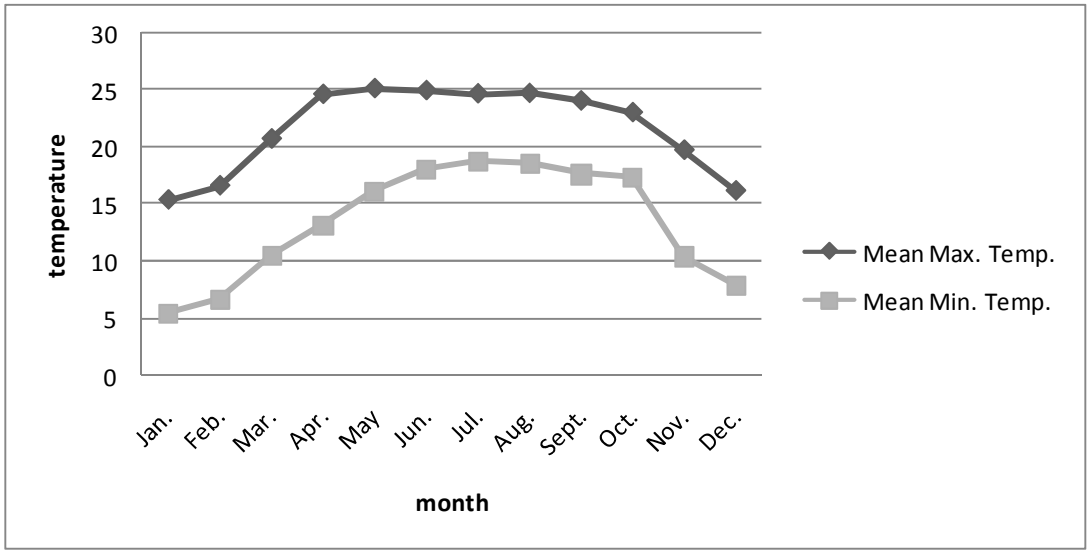

Figure 18: Monthly variation in mean maximum and mean minimum temperature for the year 2007/08 recorded at Kakani station.

Appendix 10

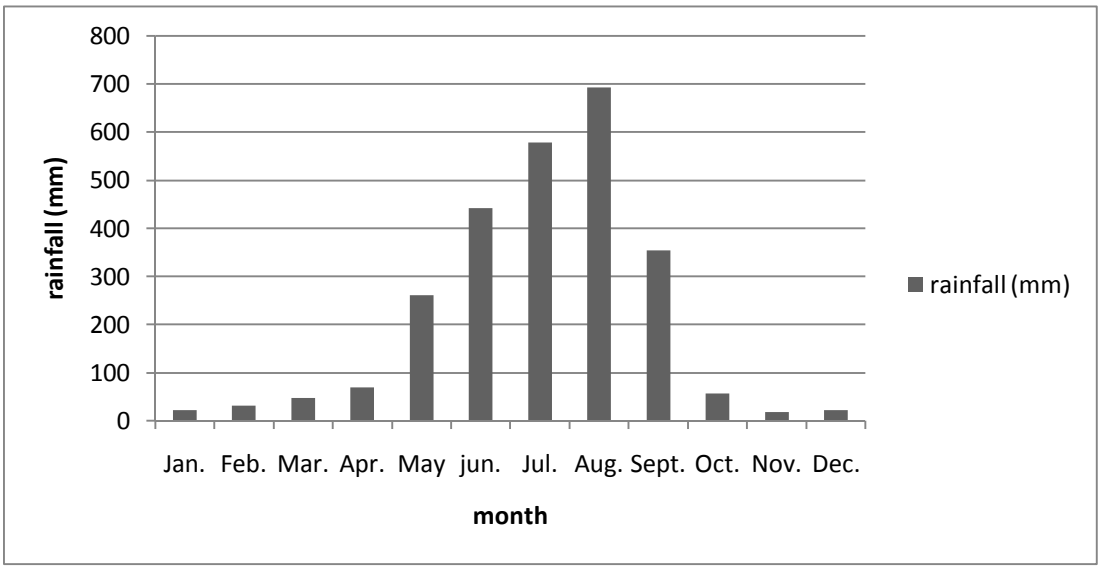

Figure 19: Monthly variation in average monthly rainfall (mm) for the year 2007/08 recorded at Kakani station.

Appendix 11

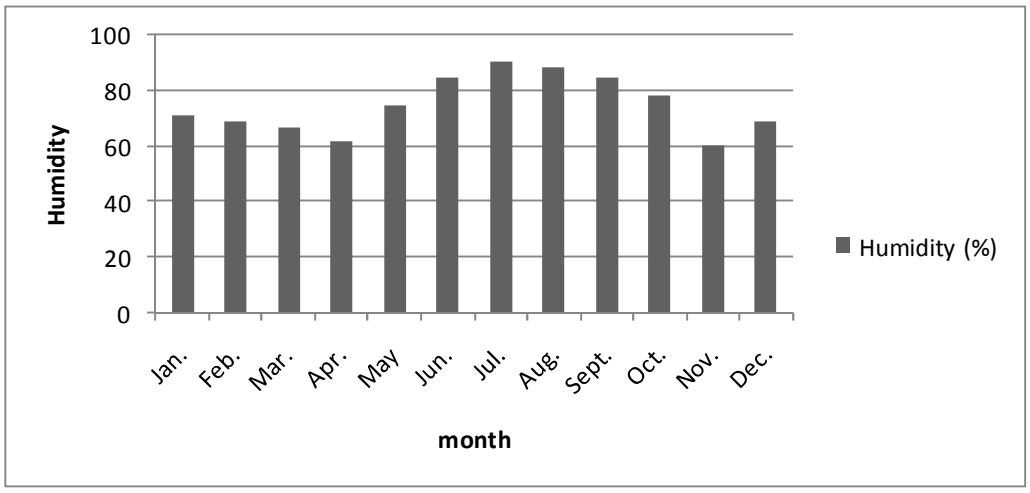

Figure 20: Monthly variation in average monthly humidity (%) for the year 2007/08 at Kakani station

Appendix 12

Table 8: Effects on park by local people

S.N.	Main causes of effect	Number of respondents
1.	Livestock grazing	6
2.	Fodder cutting	13
3.	Timber and firewood collection	3
4.	Hunting and poaching of wildlife	2

Table 9: Frequency of wildlife's visit to different crops in the sampled area.

Types of crops	Wild boar	Bear	Monkey	Deer	Porcupine	Birds	Rats	Total
Paddy	152	21	96	96	156	223	215	959
Wheat	122	25	89	102	123	153	112	726
Maize	245	32	225	93	235	163	163	1156
Millet	75	19	88	74	96	105	106	563
Mustard	62	21	73	59	91	86	85	477
Potato	189	17	84	26	106	15	93	530
Total	845	135	655	450	807	745	774	4411

Table 10: Number of wildlife raiding the crops and preying upon livestock

Wild animals	Group size (maximum)	Group size (minimum)
Wild boar (*Sus scrofa*)	10	2
Bear (*Selenarctos thibetanus*)	4	1
Monkey (*Macaca mulatta*)	20	1
Deer (*Muntiacus muntjak*)	5	1
Porcupine (*Hystrix indica*)	7	1
Birds	50	5

	Rats (*Rattus rattus*)	12	2
	Leopard (*Panthera pardus*)	1	1
	Wild cat (*Felis chaus*)	1	1
	Jackal (*Canis aureus*)	2	1
	Common Mongoose (*Herpestes edwardsii*)	2	1

Table 11: Total Gross Area and Net Area Damage of crops by wildlife in the sampled area (in ropani).

S.N.	Crops	Gross Area (Total Area Sampled)	Gross Area affected (Total Area Damaged)	Percentage of gross area affected	Net Area Damaged (NAD)	NAD percent in terms of Gross Area
1.	Paddy	2155.6	455.50	21.13	107.70	4.99
2.	Wheat	846.00	171.20	20.23	46.99	5.55
3.	Maize	1432.50	285.50	19.93	136.42	9.52
4.	Millet	725.70	143.90	19.82	70.73	9.74
5.	Mustard	421.50	81.60	19.35	32.42	7.69
6.	Potato	1248.80	242.50	11.41	151.57	12.13

Table 12: Net Area Damage (NAD) of different crops by different wildlife in the sampled area (in ropani)

Type of crops	Wild boar	Bear	Monkey	Deer	Porcupine	Birds	Rats	Total
Paddy	36.80	2.50	7.90	21.40	14.80	4.30	20.07	107.77
Wheat	15.70	1.50	4.90	10.40	6.59	2.20	5.70	46.99
Maize	45.70	7.30	28.60	15.50	25.80	7.20	6.32	136.42
Millet	22.40	3.50	6.33	16.90	14.50	3.70	3.40	70.73
Mustard	7.50	1.80	3.90	7.70	5.80	4.10	1.62	32.42
Potato	47.80	10.50	21.20	15.50	27.60	5.40	23.57	151.57
Total	175.90	27.10	72.83	87.40	95.09	26.90	60.68	545.90

Table 13: Percentage of Net Area Damage of different crops done by different wildlife in sampled area.

Type of crops	Percentage of NAD of crops by wild life							Total
	Wild boar	Bear	Monkey	Deer	Porcupine	Birds	Rats	
Paddy	34.16	2.32	7.33	19.87	13.74	4.01	18.57	100
Wheat	33.41	3.19	10.44	22.13	14.02	4.68	12.13	100
Maize	33.49	5.36	20.98	11.36	18.91	5.27	4.63	100
Millet	31.67	4.96	8.95	23.89	20.50	5.23	4.80	100
Mustard	23.13	5.56	12.03	23.76	17.89	12.64	4.99	100
Potato	31.53	6.93	13.99	10.24	18.20	3.56	15.55	100
Average	32.05	4.42	12.18	18.34	17.11	5.79	10.11	100

Table 14: Total Expected Yield of different crops in the sampled area.

S.N.	Crops	Total sampled area(in ropani)	Total expected yield(in kg)
1.	Paddy	2155.60	284539.20
2.	Wheat	846.00	74786.40
3.	Maize	1432.50	110302.50
4.	Millet	725.70	38462.10
5.	Mustard	421.50	19810.50
6.	Potato	1248.80	551969.60

Table 15: Loss of crops and their percentage of loss by NAD method in the sampled area.

S.N.	Crops	Total expected yield(in kg)	Loss of crops (in kg)	Percentage of loss
1.	Paddy	284539.20	14226.32	4.99
2.	Wheat	74786.40	4154.63	5.55
3.	Maize	110302.50	10504.85	9.52
4.	Millet	38462.10	3748.86	9.74
5.	Mustard	19810.50	1523.81	7.69
6.	Potato	551969.60	66994.47	12.13

Table 16: Loss of different crops by different wildlife in the sampled area (in kg).

Type of crops	Wild boar	Bear	Monkey	Deer	Porcupine	Birds	Rats
Paddy	4857.8	330	1043.19	2824.8	1953.6	567.6	2649.34
Wheat	1388.18	132.6	433.16	919.46	582.56	194.49	503.88
Maize	3518.9	562.15	2202.25	1193.55	1986.65	554.7	486.65
Millet	1187.2	185.5	335.49	895.7	768.6	196.17	180.2
Mustard	352.5	84.67	183.3	361.9	272.6	192.7	76.14
Potato	21127.6	4641	9370.4	6851	12199.2	2386.8	10417.94

Table 17: Total economic loss of different crops (NPR)

S.N.	Crops	Total loss (kg)	Market rate per kg(NPR)	Total loss(NPR)
1.	Paddy	14226.32	14	199168.48
2.	Wheat	4154.36	15	62315.4
3.	Maize	10504.85	35	367669.75
4.	Millet	3748.86	25	93721.5
5.	Mustard	1523.81	50	76190.5
6.	Potato	66994.47	15	1004917.05
Total				1803982.68

Table 18: Economic loss of different types crops by different wild animals (NPR)

Types of crops	Wild boar	Bear	Monkey	Deer	Porcupine	Birds	Rats
Paddy	68009.2	4620	14604.66	39547.2	27350.4	7946.4	37090.76
Wheat	20822.7	1989	6497.4	13791.9	8738.4	2917.35	7558.2
Maize	123161.5	19675.25	77078.75	41774.25	69532.75	19414.5	17032.75
Millet	29680	4637.5	8387.25	22392.5	19215	4904.25	4505
Mustard	17625	4233.5	9165	18095	13630	9635	3807
Potato	316914	69615	140556	102765	182988	35802	156269.1
Total	576212.4	104770.25	256289.06	238365.85	321454.55	80619.5	226262.81

Table 19: Number of livestock and avian stock reared in Thanapati VDC

Ward No.	Cow	Bull	Buffalo	Goat	Pig	Chicken	Pigeon	Duck
1	15	8	25	41	5	29	4	-
2	12	18	32	33	6	14	6	-
3	6	10	14	25	-	26	-	-
4	9	12	45	47	-	250	-	-
5	7	8	38	26	-	500	-	-
6	9	10	26	38	2	32	-	-
7	11	12	29	29	-	23	-	-
8	13	16	31	52	-	24	-	6
9	4	6	37	44	-	12	-	4
Total	86	100	277	335	13	910	10	10

Table 20: Loss percent and estimated monetary value of livestock and avian stock in the study area

Livestock and avian stock	Total number of animals	Number of lost animals	Percentage of loss	Rate (in NRs.)	Loss in monetary value (in NRs.)
Cow	76	11	14.47	6000	66000
Bull	100	12	12	5000	60000
Buffalo	277	2	0.72	22000	44000
Goat	335	34	10.17	2500	85000
Pig	13	2	15.38	4000	8000
Chicken	910	86	9.45	350	30100
Pigeon	10	2	20	150	300
Duck	10	0	0	250	0
Total	1731	149	10.27(average)		293400

Table 21: Number of loss of livestock and avian stock by wildlife (per year)

Ward No.	Cow	Bull	Buffalo	Goat	Pig	Chicken	Pigeon	Duck
1	3	2	1	8	1	12	1	-
2	4	3	1	6	1	10	1	-
3	1	1	-	5	-	8	-	-
4	1	1	-	5	-	13	-	-
5	1	2	-	3	-	15	-	-
6	1	1	-	1	-	6	-	-
7	-	1	-	2	-	7	-	-
8	-	1	-	2	-	9	-	-
9	-	-	-	2	-	6	-	-
Total	11	12	2	34	2	86	2	0

Table 22: Ward number, total number of households, number of sampled households and its percentage

Ward No.	Total number of households	Number of sampled households	Percentage of sampled households
1.	38	10	26.31
2.	52	14	26.92
3.	48	13	27.08
4.	44	12	27.27
5.	51	12	23.52
6.	77	16	20.77
7.	55	13	23.63
8.	42	11	26.19
9.	97	20	20.61
Total	504	121	24.70 (Average)