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An Assessment of Human-Wildlife Conflict in Basanta Corridor: a Case Study from Kailari Rural Municipality, Nepal

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ABSTRACT

The human-wildlife conflict (HWC) has always been a subject of concern for conservationists and people living in the proximity of forests. Nepal has witnessed increasing incidents of HWC at an alarming rate in the last few years. The study was carried out to understand the causes and trends of HWC in Kailari Rural Municipality and the perception of people towards wildlife conservation. The major tools used for the data collection were key informant interviews and questionnaire surveys. The data collected from the field was analyzed using descriptive and inferential statistics. This study showed that crop plundering, human injuries & death, livestock injuries, and killing by wildlife was the common form of HWC and the animals with high incidents of conflict were a monkey, wild boar, elephant, tiger, blue bull, deer, and rabbit in recent years. The main crops damaged in the area were wheat, paddy, maize, peanuts, mustard, etc. The problematic animals were found to be monkeys, rabbits, and wild boars. The study concluded that tigers and elephants attack were the major problems in the areas near Dudhwa National Park (India). None of the respondents have got compensation for the loss of crops, livestock, and even in case of human casualties. Most of the respondents believed that animals come to the cropland due to farmland nearer to forest areas and lack of food for the animals.

INTRODUCTION

The forest cover change over the last few decades shows that humans have a significant impact on the landscape, with every ecosystem on the planet being subject to anthropogenic intrusion (Attia et al., 2018). Human interference and subsequent disturbance have a great impact on the natural environment. With the human population continuously growing, the need for settlement, agriculture, and other resources has greatly increased in the last few years. The expansion of agriculture and settlement area at the expense of forest areas has led to an increase in HWC in the buffer area. The International Union for Conservation of Nature (IUCN 2005) defined the term HWC as the conflict between humans and wildlife usually that occurs when the basic needs of wildlife and humans overlap, resulting in negative consequences for both humans and wildlife afterward interaction. HWC usually emerges once a physical or psychological disturbance occurs to humans or wildlife by their mutual requirement and interaction (Osei-Owusu and Bakker, 2008).

HWC in the conservation field is a global issue and a major obstacle to sustainable development (Hodgson et al., 2020). Locating and protecting wildlife corridors is an important mechanism for the continuity of landscape connectivity (Abrahms et al., 2017). Human-wildlife conflicts arise when a common natural resource like space, food, etc. has to be shared (Ghimire, 2019). HWC results from the diminishing forest cover and habitat by anthropogenic disturbances which may be primarily for agricultural purposes, construction projects, and infrastructure development (Fernando et al., 2015). Nelson et al. (2003) give credit to the limited land use as planning behind the major reason for HWC. Human-wildlife conflict has many negative effects,

the major being loss of lives, financial losses, limited food production, and reduced livelihood options for farmers due to livestock and crop loss (Pant and Hockings, 2013). In the regions where there are incidents of HWCs or their proximity, the battle between the people and wildlife for resources is generally high and the residing human settlements are very sensitive (Distefano, 2005). HWC may be crop plundering, human and livestock injuries & death caused by wildlife, or it may be illegal logging, illegal grazing, and fodder collection resulting in habitat destruction, injuring wildlife, or poaching by the people (Carter et al., 2012).

HWC in the global context is a serious issue in the conservation sector and generally results when local communities have no longer access to the resources that they have been using historically (Lamsal 2012; Timsina and Ranjitkar, 2014). Protected areas are now increasingly becoming habitat islands encircled by an ocean of urbanization and anthropogenic activities (Lopoukhine et al., 2012). The history of wildlife conservation in Nepal dates back to the 1960s. The concerned body for wildlife & biodiversity conservation and management in Nepal DNPWC has actively been working in the country to promote in-situ and ex-situ conservation. The country has 12 National Parks, 6 Conservation Areas, 1 Wildlife Reserve, 1 Hunting Reserve, and 13 Buffer Zones as protected areas that aid in in-situ conservation which cover 23.39% of the total area of the country (DNPWC, 2015). A wildlife corridor is a connecting link between two patches of wildlife habitat, generally native vegetation. Wildlife corridors differ in shape, size, length, and formation from each other (Burkart et al., 2016). Protected areas have a significant part in sustainable forest management, biodiversity conservation, and livelihood improvement. The government of Nepal has declared four transboundary corridors as protected forest areas, i.e. Barandabhar, Khata, Basanta, and Laljhadi-Mohana Corridor (MoFSC, 2015).

HWC is a global issue that differs in geography, land use practices, livelihood activities of humans, and animal behavior within the species (WWF, 2005), and each year, many people, as well as wild animals lose their lives in various tragic incidents of HWC (Treves, 2007). The objective of this study is to assess the HWC incidents, study the major harm due to wildlife and understand people's perception of HWC in the Basanta Corridor. Basanta Protection Forest is the largest patch of forest located in the Kailali district covering more than 25% of the district with an area of about 69001 hectares. It acts as an important wildlife corridor connecting Bardiya National Park to Suklaphanta National Park through the foothills of Siwalik and also connects the Chure region to Dudhwa National Park. This study will help the wildlife managers, and local and central level officials manage the HWC existing in the area and this study will be a baseline.

MATERIALS AND METHODS

Study Area

The study was done in the Kailari Rural Municipality of the Kailali district of Sudurpaschim Province, Nepal which covers an area of 234.69 sq. km. According to the preliminary report of CBS (2021), the population of Kailari Rural Municipality is 50,457, among them 24,485 are male whereas 25,972 are female. Some portion (Area=168.30 sq. km) of the Basanta corridor lies inside the Kailari Rural Municipality. This corridor lies in the Kailali district that connects the Chure region of Nepal to Dudhwa National Park of India (Dangaura et al., 2020) and covers a total area of 652.36 sq. km. Basanta protected forest, which is the largest protected forest of Nepal covers an area of 68836.53 ha including 3 municipalities as Bhajani, Ghodaghodi, and Gauriganga, and 4 rural municipalities as Kailari, Bardagoriya, Joshipur, and Mohanyal.

Wildlife species like tigers, rhinoceros, wild elephants, foxes, deer, monkeys, etc. have dispersal habitats. There are 381 bird species from 78 different families in the Basanta protected forest (Dangaura et al., 2020). Also, rare species of trees such as Bijaya Sal (*Pterocarpus marsupium*) and Satisal (*Dalbergia latifolia*) are found here. Ghodaghodi Lake is adjacent to the Basanta corridor which is the Ramsar site of Nepal and the river system around the corridor is the home of Dolphins and 43 species of fish (Kafle, 2017). This corridor is rich in biodiversity as it extends from Terai to the Churia hills of Nepal. Many important and valuable tree species such as Sal, Satisal (*Dalbergia latifolia*), Bijaya Sal (*Pterocarpus*

marsupium), Asna (*Terminalia elliptica)*, Harro (*Terminalia chebula*), Barro (*Terminalia bellirica*), etc are found in this forest. There are 88 community forests in Basanta Protected Forest.

Research Methods and Data Collection

Information like socio-economic status, problematic animals, crop loss, season and time of conflict, practices and their effectiveness to mitigate the HWC, and people's awareness level of HWC mitigation were collected through both primary and secondary methods of data collection. The primary methods include field observation, a key informant interview (n=3), focus group discussion (n=5), and household surveys (n=75). The secondary data were assembled and analyzed from numerous reports, articles, books, journals, and the periodic reports of concerned organizations and websites.

Data Analysis

The data analysis was done by both qualitative and quantitative methods. All the information was assembled in semi-structured forms, photographs, and interviews. The data collected from the field were verified and fixed as per objectives. After data categorization and data entry, further analysis was done by using MS Excel 2019 and SPSS 28.0.1. The information is shown using charts and graphs.

RESULTS AND DISCUSSION

Socioeconomic Characteristics

Out of all, most of the respondents were male (68%) whereas females were 32%. The age groups of 18-40 years (48%) and above 40 years (52%) were involved in the study. Many of the respondents had primary level education status (40%), followed by secondary level (28%) and only 8% had secondary level education. Also, 24% of the respondents were uneducated. While looking at the income source, agriculture was the main source of income for 76% of respondents, and Business (8%), Office work (8%) and others (8%) were minor income sources. The socio-economic status and profiles of the respondents are illustrated below:

Table 1. Socio-economic status and profiles of the respondents

Sex		Age structure		Education level				Income source			
Male	Female	18-40 years	Above 40 years	Illiterate	Primary level	Secondary level	Above secondary	Agriculture	Business	Office work	Others
68%	32%	48%	52%	24%	40%	28%	8%	76%	8%	8%	8%

Impacts of Human-Wildlife Conflict

The various types of wildlife encounters were occurring in the study area. The majority of the people (64%) believed that crop loss was an alarming problem followed by livestock loss (48%), property damage (32%), and threats to humans (12%). Few of the respondents had different views than others. They believed that there is no loss and damage by wildlife.

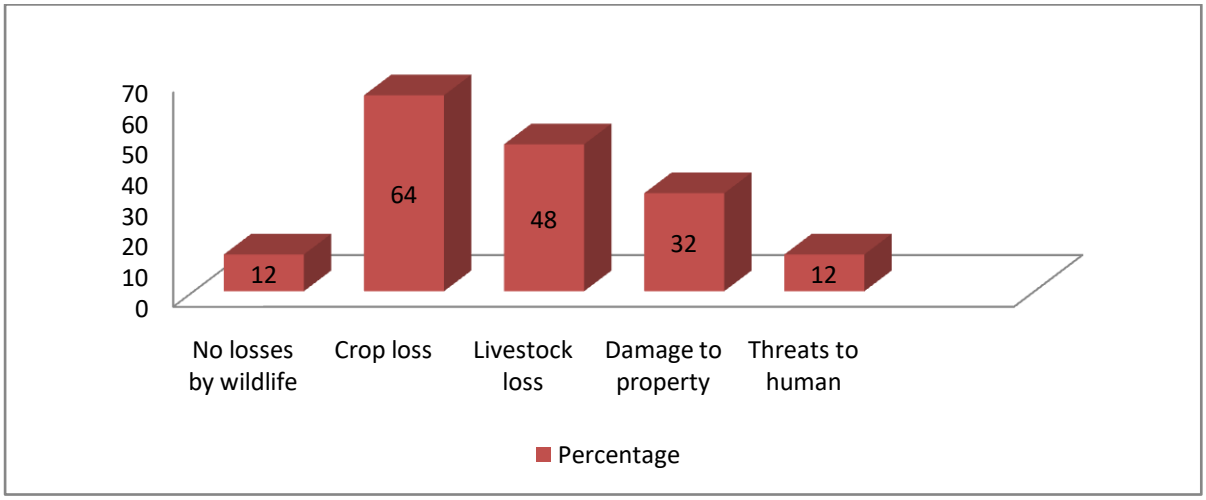

Figure 1. Loss due to wildlife

Encountered Wild animals and Crops

Table 2. Encountered wild animals and crops

Rank	Wild animal	Rank	Most damaged crops
1	Monkey	1	Wheat
2	Wild boar	2	Rice
3	Hare	3	Wheat
4	Elephant	4	Masuro
5	Blue bull	5	Mustard
6	Spotted deer	6	Peanuts
7	Tiger	7	Sugarcane
8	Fox		

Among nine different animals encountered, Monkeys were seen most in the area and the most damaged crop is wheat.

Respondents' View on the Crop-Wise Damage

According to the respondents, Wheat (68%) and paddy (65%) were the most damaged crops by the wildlife. The other crops damaged by wildlife were maize (42%), mustard (50%), peanuts (25%), pulses (35%), and vegetables (20%).

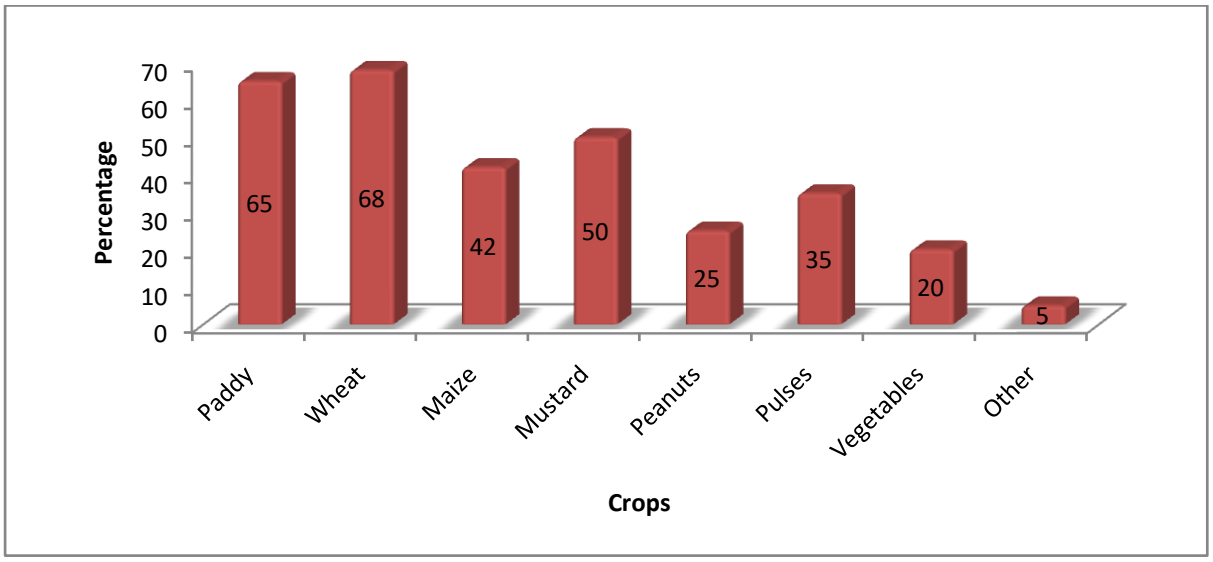

Figure 2. Respondents' view on the crop-wise damage

Livestock Damage by Wild Animals

The incidence of livestock damage by a wild animal was very less compared to crop damage. Tigers and leopards from adjoining Dudhwa National Park, India, occasionally attack livestock near the forest. The foxes usually attack chickens in the area. In the last 5 years, about 15 goats were killed by wildlife, which is the highest among other livestock. The other livestock killed were the Pig (12), Buffalo (7), and Cow (4).

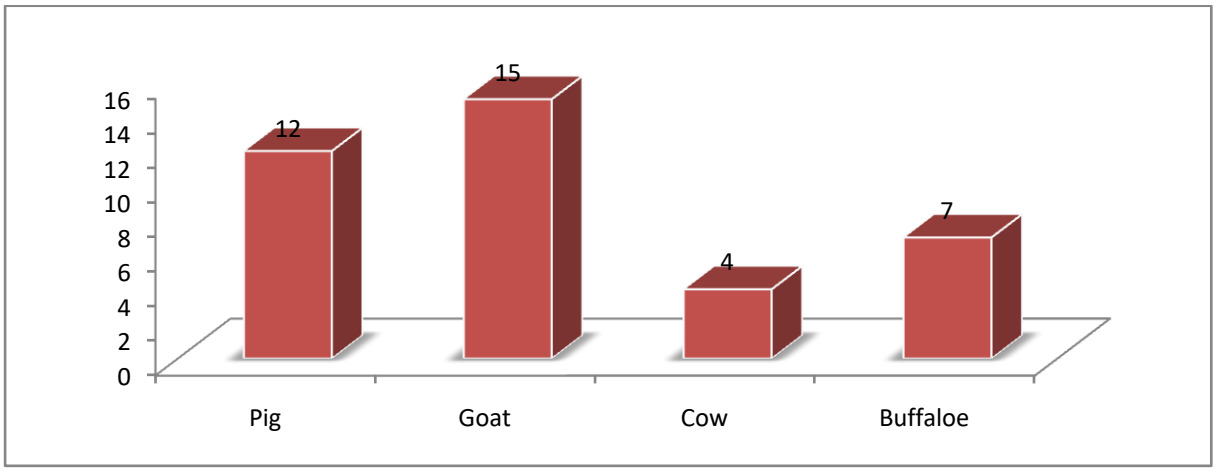

Figure 3. Livestock killed by a wild animal in the last five years

Livestock Rearing Trend in Study Area

The trend of livestock rearing is decreasing in the study area. 82% of people believed that the livestock rearing trend is decreasing whereas 18% believed that it is increasing. Normally livestock, such as Ox and male Buffalo (Bull) are kept mainly kept for agriculture purposes. With the development of technology and machines, ox and male buffaloes are on decreasing trend. But still, animals such as goats, pigs, and chickens are kept for agro-business purposes and are in increasing trend.

Property Damage by Wildlife

Physical, livestock and financial losses were a few of the major reasons for HWC in the area. The elephant was the main threat to human property. The majority of the respondents (28%) were having an issue with house damage and stored food damage (20%), whereas 60% of respondents were not having any damage from wildlife.

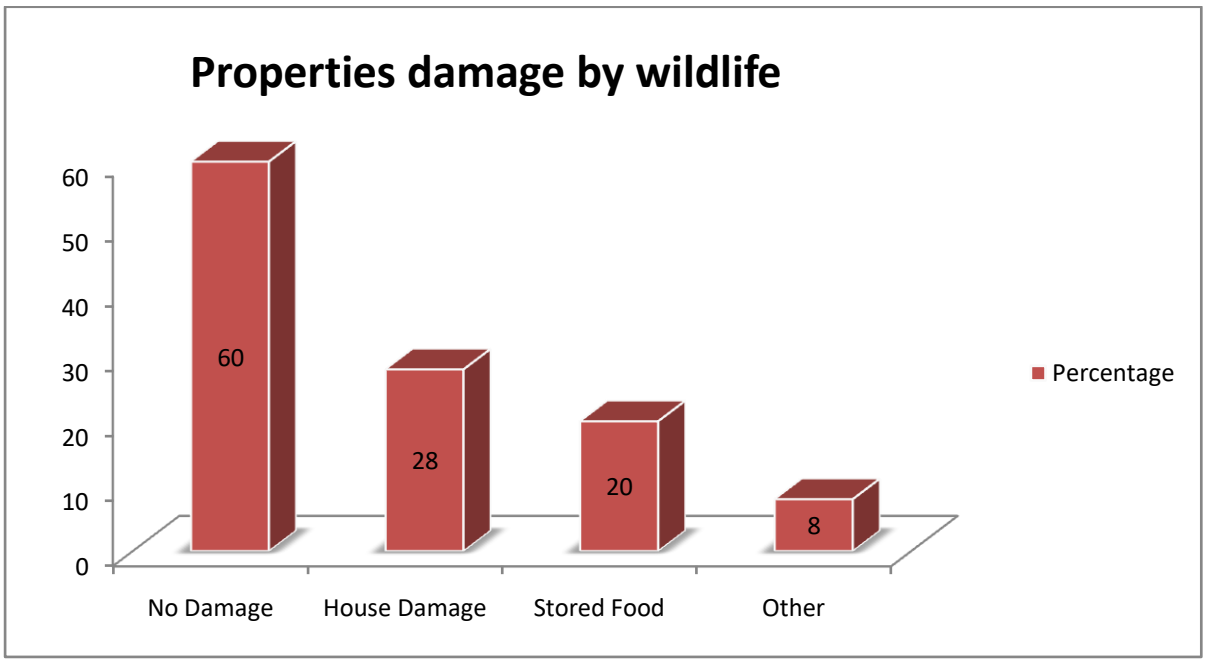

Figure 4. Property damage by wildlife

Human Casualties

The incidence of human casualties was very less in the study area. The death of 3 people was reported in the last 10 years in the Kailari Rural Municipality. Elephants and wild boar were the animals behind the death of the people. The 6 persons that were injured were attacked by the wild boar. The table below shows, the incidents, the animal responsible, the place, and the year of the incident.

Table 3. Human casualties

S.N.	Incident	Wildlife	Place	Year (A.D)
1	1 Death	Elephant	Sapana Sibir	2009
2	1 Death, 3 Injured	Wild Boar	Bishanpur	2011
3	1 Death, 3 Injured	Wild Boar	Kharuwa Khera	2018

Perception of People

1. Trends of HWC

According to the respondents, the HWC is increasing in the area. Mainly the conflicts are by monkeys, elephants, and Boar. The main cause of increasing HWC according to the people is human habitat being near to the wildlife habitat. The other causes are food scarcity in the forest, habitat fragmentation, lack of support from concerned authorities, community forestry protection, nearby Dudhwa National Park, and encroachment. Though the HWC is increasing, the majority of people believe the importance of wildlife and awareness of wildlife conservation is increasing.

2. Drivers of Human-wildlife conflict

The reason for increasing HWC in the study is mainly due to the study area being nearer to the wildlife habitat. Lack of food in the habitat and habitat fragmentation was the secondary causes of HWC. The other minor causes were less support from the concerned authority, community forestry protection encroachment, and nearby Dudhwa National Park.

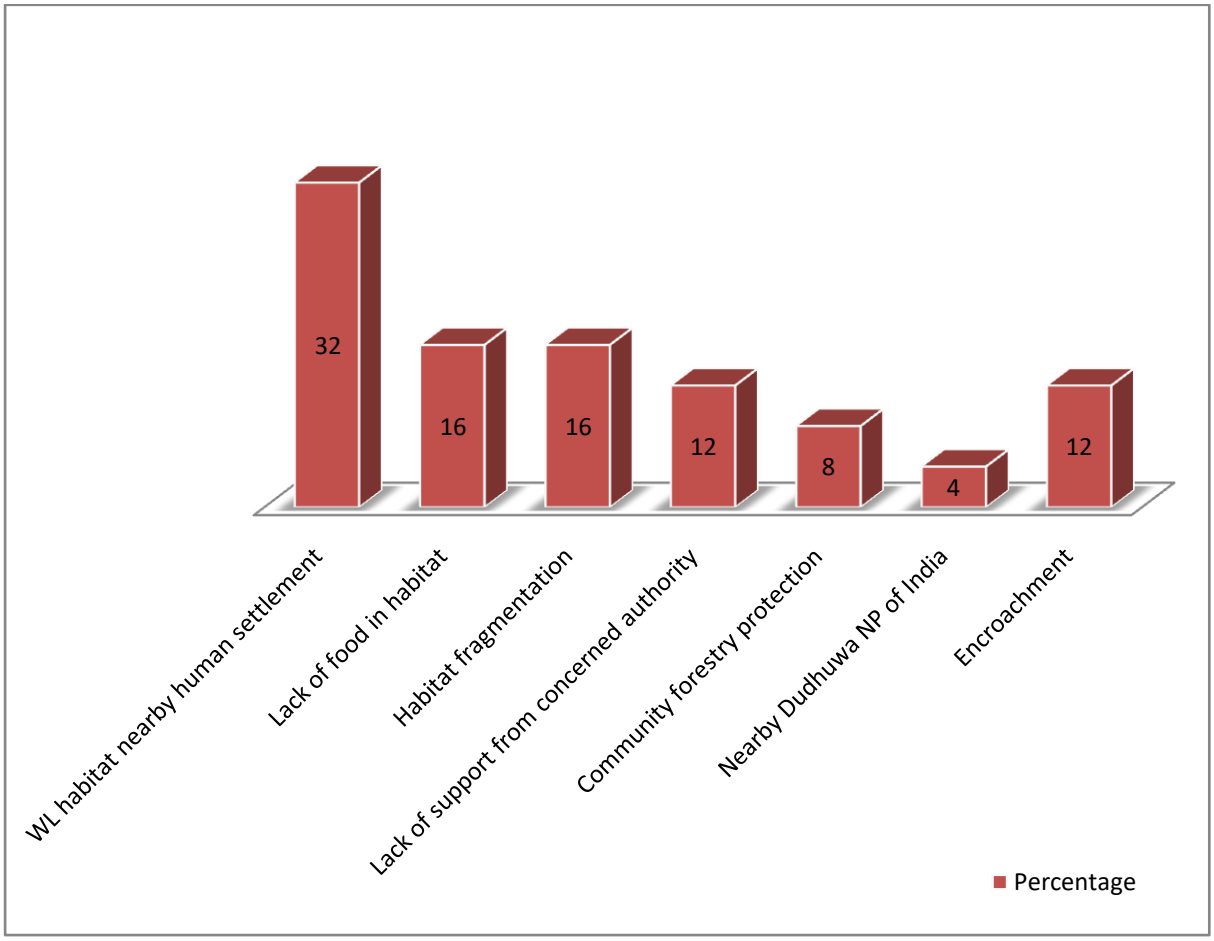

Figure 5. Respondent's perception of causes of increasing HWC

3. People's perception of the Importance of Wildlife

The majority of the respondents were positive about the importance of wildlife. People having high perceptions of wildlife importance were 56%. Only 4% of people had a low perception of wildlife importance.

4. Awareness of people about wildlife conservation

With the increasing HWC in the area, the awareness of the people about wildlife conservation is also increasing. The increasing percentage is 84% and the decreasing percentage is only 4%, whereas 12% of people have an indifferent perception

Chi-square test on the Importance of Wildlife concerning Education Level

According to the chi-square test, there is relatable and significant interdependence between the education status of respondents and their perception of the importance of wildlife. People with higher education assume that wildlife is an important component of nature, while illiterate people see wildlife as a conflicting factor rather than their importance in nature.

Table 4. Chi-square test on the Importance of wildlife concerning education level

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	20.556[a]	6	.002

Significant at 1% level degrees of freedom for $\chi 2$ test = 6

Impacts of Human-Wildlife Conflict

Awasthi & Singh (2015) in Gaurishankar Conservation Area (GCA), Subedi et al. (2020) in the Bardiya National Park buffer zone, and Sherchan and Bhandari (2017) in Kanchenjunga Conservation Area revealed that crop damage was the most critical problem which is also similar to our study. Crop damage (95%) followed by livestock depredation (23%), property damage (22%), and human injury (10%) were major conflicts (Pokharel and Aryal, 2020). According to Shrestha et al. (2007), most of the people (90%) in the research area were having wildlife problems and crop damage was the most common problem. Baral et al. (2021) in their study found that Human, livestock, and wildlife death or injury were reported more than crop losses

Crop damage

The study by Joshi et al. (2020) lines with the findings of this study. According to their study crop damage was an alarming problem and the elephant was the main conflicting animal which is similar to our findings. Pandey et al. (2016) through their study in Shivapuri Nagarjun National Park found wild boar as the major crop robber which is comparable to our findings. Baral et al., (2011) revealed that paddy (*Oryza sativa)* was the most damaged crop and other crops were maize (*Zea mays*), and millet (*Panicum miliaceum*). Bhatta and Joshi (2020) found that paddy was the major crop damaged followed by wheat and maize, but our study finds wheat (*Triticum aestivum*) is the most damaged crop followed by paddy (*Oryza sativa),* mustard (*Brassica campestris)*, maize (*Zea mays)*, pulses, peanuts (*Arachis hypogaea)*, vegetables and others. Dahal et al. (2021) concluded paddy was the most vandalized crop and the elephant was the major contributor to the overall damage.

A study by Limbu & Karki (2003) in the Koshi Tappu Wildlife Reserve (KTWR) found wild water buffalo (85.15 %) and wild boar (14.84%) as the main crop robber. As per the report by Suklaphanta National Park, wild elephants caused 33,307.42 kg of crop damage in 1998-1999. Out of that, paddy consists of 31,449.94 kg and maize 1857.49kg. There was an economic loss of 27.6% in the rice crops, 21.9% in mustard, 18.4% in lentils, 16.8% in maize, and 12.55 in kitchen garden plants as per the study by Jnawali (1989) in Chitwan National Park. Pokharel and Aryal (2020) in Sundarpur, Udayapur shows that monkeys (93%), and elephants (86%) were major problematic animals,

Livestock damage by wild animals

A study done by Baral et al. (2021) in the Kaski and Tanahun districts of Nepal shows that chicken was the most damaged livestock followed by sheep, goats, cows, pigs, and buffalo. But in our study goat was the most damaged livestock followed by pig, buffalo, and cow.

Perception of people

Bhatta and Joshi (2020) and Pokharel and Aryal (2020) revealed that the people's viewpoint towards the importance of wildlife is positive whereas our study also reveals a similar type result i.e. about 55% of the respondents have a high perception of the importance of wildlife.

Human casualties

Adhikari et al. (2018) through their study found that Himalayan black bears were responsible for 80% of total attacks and the rest 20% by Leopard. According to our study, there were 3 deaths of humans from wild animals. Wild boar contributed 66.66% and elephants contributed 33.33% to death. Acharya et al. (2016) found that the death or injury of people was mainly due to elephants (30%), leopards (21%), rhinoceros (18%), bears (12%), and tigers (10%) The other animals involved were rhinoceros, leopards, tigers, and bears.

Drivers of Human-wildlife conflict

According to Acharya et al. (2017), forest fragmentation is the severe driver of human-wildlife conflict whereas human settlement near wildlife habitats is the critical driver in our study area followed by lack of food in habitat, habitat fragmentation, lack of support from concerned authorities, encroachment, nearby Dudhwa National Park of India. Research done by Ayadi (2011) in Bardiya National Park revealed that people's migration from different areas, high dependency on the forest for firewood and fodder, housing, and fencing around cropland influence the conflict in that area. Similarly, crop damage, livestock toll, and human-wildlife encounters were the main problems incurred by the conflict (Ayadi, 2011).

CONCLUSION

Cultivated lands are easily raided by wild animals which are in proximity to the forests. Crop damage is more frequent than before. The crops like Paddy, Wheat, Maize, Mustard, and Peanuts are more damaged from the cultivated land. The Elephants damage crop more in cropping seasons whereas the monkeys, wild boars, rabbits, and Chital damage crops throughout the year. Livestock attacks and human casualties are rare cases of conflict. The target animals of tigers seem to be cows, pigs, and goats whereas foxes mainly attack chickens. Only three incidences of human deaths are reported in the last ten years in Kailari rural municipality. Free-roaming Tigers and Elephants mostly come from Dudhwa National Park in India. The chances of property damage are high in human-elephant conflicts. The habitat in many places is degrading due to anthropogenic activities, most notably forest encroachment and illegal logging. The corridor functions have been in danger due to scattered human settlements in the corridor. Infrastructure development like the Postal highway has only contributed to attracting the human population to the area. Also, the main problem in dealing with HWC is that people are not getting compensation for a loss due to wildlife. To prevent or minimize the HWC, electrification around the crop fields, plantation of unpalatable crop species near the forest, grassland improvement, water ponds, management of overpopulation of wild animals, and awareness and capacity-building programs are recommended through the study.

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