Effectiveness of Predator Proof Enclosures to Reduce Livestock Depredation

Submitted to:
Hariyo Ban Pogram
World Wildlife Fund (WWF NEPAL)
Baluwatar, Kathmandu, Nepal

Submitted by:
Jayan Joshi

Date of Submission
December 2019

Hariyo Ban Program

USAID FROM THE AMERICAN PEOPLE WWF care FECOFUN NTNC

ACKNOWLEDGEMENT

USAID funded Hariyo Ban Program- a five-year program implemented in two important landscapes of Nepal – Terai Arc Landscape (TAL) and Chitwan Annapurna Landscape (CHAL), initiated a program and supported 186 families of three districts Kanchanpur, Bardiya and Banke residing near the corridors and buffer zone of protected areas to build predator proof enclosures(targeted to small livestock goats/sheep/pigs). The present report embodies the result of survey carried out to understand and address the "**Effectiveness of predator proof enclosures to reduce livestock depredation**".

The completion of this survey has been supported by many people who in more than one way offered me their time, thoughts and advice. First, I would like to express my sincere gratitude to Hariyo Ban Program- WWF for providing this opportunity to evaluate the status of the effectiveness of Modern predator proof enclosures.

My sincere gratitude and deep respectgoes to Mr. Kapil Khanal and Mrs. Anita Adhikari, for their trust, frequent feedback and suggestion to accomplish this task; without their steady support and guidance, it would be impossible to carry out this work. I express my heartfelt thanks to them.

Likewise, I personally want to thank the respondents from , Buffer zone committee, User committee and other committees from all three districts, for their valuable time and information. Also, I would like to thank local people who helped us during my stay and those random strangers who made sure I didn't miss my path while travelling. I want to thank them for surprising us with their kindness and generosity.

I cannot thank enough Mr. Puran Prasad Chaudhary, for helping us a lot during the field work, by contacting key persons and also for guiding me and for being a good friend towards us.

At last, I would like to thank Mr. Fatte Thapa, Mr. Narayan Poudel, Mr. Ganesh Thapa, Mr. Ganesh Joshi, Mr. Santosh Raj Bhatt and Mr. Chetan Joshi for helping me out in every way possible during this research. I am forever grateful for this.

- Jayan Joshi

ABSTRACT

Human-Wildlife Conflict (HWC) occurs when wildlife requirements encroach on those of the human population. The conflict has been in existence for many years, both in developing and developed countries. HWC in Nepal, Particularly livestock predation can result in great economic losses to communities as well as decline in carnivore's species. The human-wildlife conflict has been intensified by loss of wildlife habitats, negative community attitudes, and reduction in wild prey base due to the rapid demographic developments.

The threats and vulnerability assessment conducted in 2016 suggests that Human Wildlife Conflict (HWC) is critical to biodiversity conservation. This issue is burgeoning in the corridors and buffer zones of Protected Areas. To overcome this in Nepal, Hariyo Ban Program has been working significantly in implementation of various curative and preventive measures. Preventive measures against the Human Wildlife conflict implemented under the program included: Power fence, plantation of unpalatable crops, predator proof coral distribution and early warning system. These measures help to deter wildlife from the possible conflicts between human and wildlife. Among all, predator proof corral (enclosure) support is one of the major interventions to deter Human Wildlife Conflict (HWC) for the reduction of livestock depredation by wildlife.

The research entitled "**Effectiveness of Predator Proof Enclosure**" is a study carried out in 182 households in twenty buffer zone community of three districts Kanchanpur, Bardiya and Banke. This study intends to document the effectiveness of predator proof enclosure/pen to prevent livestock from wild predator's attacks (targeted to small livestock as goats/sheep/pigs) and prepare report on effectiveness of predator proof enclosures for reduction of livestock depredation by wildlife and in mitigating human-predator conflict in corridors and buffer zones of protected Areas i.e. in Sukhlaphanta NP(Kanchanpur), Bardiya NP (Bardiya) and Banke NP (Banke). The required information was collected through Individual household survey (IHS), Key Informant Survey (KIS) and Focus Group Discussion (FGD). Collected data from the field were analyzed qualitatively. Final report was prepared based on the findings of the study and suggestion from advisors.

From the study findings, it was found that the Modern Predator Proof Pen are highly effective to prevent livestock from wild predator attack and also making positive impact on enhancing economic status of people residing in buffer zone area. People are found grateful towards Hariyo Ban support and contribution which is helping them in many ways. Support of modern predator seemed to be an excellent initiative to prevent livestock from wild predators attack and is also playing role in conservation as it is reducing Human Wildlife Conflict (HWC).

Keywords: Human-Wildlife Conflict, Predator proof enclosure, livestock depredation, Protected Areas.

ACRONYMS

BZUC: Buffer Zone User Committee

CFUG: Community Forest User Group

UC: User Community

IHS: Individual Household Survey

FGD: Focus Group Discussion

IDIs: In-Depth Interviews

KII: Key Informant Interview

PAs: Protected Areas

BaNP: Banke National Park

BNP: Bardiya National Park

ShNP: Shukhlaphanta National Park

BZ: Buffer Zone

NGO: Non-Government Organization

HWC: Human Wildlife Conflict

CHAL: Chitwan Arc Landscape

TAL: Terai Arc Landscape

WWF: World Wildlife Fund

Table of Contents

CHAPTER I

1. INTRODUCTION

1.1 Background

Nepal is included in the Oriental zoogeographical zone. This signifies the rich biodiversity and consequently animal diversity in the country. Also altitude and slope pronounces the difference in the faunal diversity (Majupuria 2006). Chitwan National Park was established in 1973 as a first national park of Nepal, after 1st declaration of the National Park and Wildlife Conservation (NPWC) Act 1972. After that a number of protected areas have been established to preserve and conserve the flora and fauna (Majupuria 2006). At present there are twelve (12) National Parks, one (1) Wildlife Reserves, one (1) Hunting Reserve and six (6) Conservation Areas and Eleven Buffer Zones. Due to increase in population and increase demand for natural resources, serious problems and conflicts arises between park and people. This is a major challenge to achieve parks objectives.

Many of the park areas in the developing countries are surrounded by the agricultural lands. The people living in and around such national parks have interacted with them in a multifarious ways. Some of them have built an ecological relationship with the park, where as in certain areas the existence of the National Park has been questioned because of the growing conflict over land use rights and practices (Nepal & Weber 1992). The protected areas are surrounded by the rural settlements and agricultural lands, especially in Terai region of country. With increasing urbanization and demand of resources, the rising serious problems, the conflicts between park and people, becomes more pronounced and thus become major obstacles in meeting the objectives of the establishment of the protected areas.

Before the establishment of the PAs, local people were free to use forest resources. With the declaration of the Parks and Reserves in such areas many people were legally restricted from utilizing their traditional rights to these resources. As a result, illegal activities such as poaching, illegal collection of fire wood have intensified. The wild animals of PAs have caused losses of crops and depredation on livestock, which has further aggravated the problems (Regmi 2006).

1.2 Human-Wildlife Conflict (HWC)

Human-Wildlife Conflict is defined as any interaction between humans and wildlife that results in negative impacts social, economic or cultural life, on the conservation of wildlife populations, or on the environment (WWF (2005). It affects both wild animal and human being and also in economy. People lose their crops, livestock, property and sometimes their lives. Animals, which are already endangered or threatened, are often killed by the people (Bhatta 2003).

Conflicts arise when the activities of wild animals coincide with those of people (Treves 2007). Human-wildlife is a universal problem and it vary according to geography, land use patterns, human behavior,

and the habitat and behavior of wildlife species or individual animals within the species (WWF 2006). The nature of HWC in Buffer Zone area and corridors of the Terai Arc is both historical and recent. What seems inevitable is that human wildlife conflicts incidences will continue to occur in the present context of wildlife habitat instability and growing human population's activity in and around the park and reserves (Shrestha & Paudyal 2007).

The studies around the world show that HWC is more intense in the developing countries where livestock holdings and agriculture are an important part of rural livelihoods. In these regions, competition between local communities and wild animals, for the use of natural resources, is particularly intense and direct and resident human populations are very vulnerable (Distefano 2010).

1.3. Causes of the human-wildlife conflict

Many wild species face increasing competition with people for space and resources. As a result, some are coming into increasing conflict with people, and this is particularly true of large mammals. Such as the African elephant Loxodonta africana , also have considerable impact on people and are in the unusual position of being simultaneously an endangered species and, in places, a pest species (Sitati et.al. 2003).

HWCs arise primarily because of competition between human and wildlife for shared, limited resources. The conflicts can be particularly controversial when the resources concerned have economic value and the wildlife involved is legally protected. The frequency of conflicts has grown in recent decades, largely because of the exponential increase in human populations and the resultant expansion of human activities (Graham 2004). HWC is a serious challenge to conservation world-wide and is spreading as human population and development increase (FAO 2007).

In the past few decades, the Terai region of Nepal experienced a massive human population growth induced by inter-regional migration and immigration. The population density is almost double than the national average. Consequently, more and more wildlife habitats are being converted into settlements, agricultural lands and other forms of landuse in order to cater to the needs of the growing population. Terai forest areas had been decreased at an annual rate of 1.3 in between 1961-1977.This increase in human population and the resulting loss, degradation and fragmentation of habitats through human activities such as logging, animal husbandry, agricultural expansion and development projects has led to an increase in HWC (WWF 2008).

1.4 Consequences of Human-Wildlife Conflict

Damages by wildlife can have catastrophic economic consequences for vulnerable households. The major sources of HWC include crop and property damage, livestock toll, harassment to the people, sometime even death. The consequences of the human-wildlife conflict are more serious in the tropics and in developing countries (FAO 2009, Treves 2007).

1.5 Management of Human-Wildlife Conflict

The socio economic impacts of HWC can be minimized through different methods. Physical barriers to prevent the animal movement into the human settlements may be feasible only in few cases. A barrier against elephant would be very expensive to create (Sukumar 1994). Electric fencing has been reported one of the most effective preventive measure for saving the farmer's crop, property and life around the corridors and protected areas from herds of wild elephants. The impacts of wildlife on people can be reduced to some extent through proper management of its habitat. Such management has to be balanced between the need of wildlife and local people (Sukumar 1994). Wildlife populations that came into severe conflict with humans interests may have to be directly managed to keep their levels below tolerable limits (Sukumar 1994). To mitigate the impacts of wildlife on people, a variety of social security schemes should be made as a part of conservation plans (Sukumar 1994). With the aim to minimize human-wildlife conflict and motivate local communities towards biodiversity conservation in Nepal, WTLCP provided cash support of 350 thousand rupees each to Buffer Zone Management Council (BZMC) of Shukhlaphanta Wildlife Reserve (SWR) and Bardia National Park (BNP) for wildlife damage relief funds (WTLCP 2010). The formulation of the Wildlife Compensation Policy, 2065 is another effort done by Government of Nepal (GoN) to mitigate the HWC.

1.6 Predator Proof Enclosure support Program

Predator-proof enclosure support program is one of the measures prescribed by the Hariyo Ban, Nepal to deter Human Wildlife Conflict (HWC) for reduction of livestock depredation by wildlife. WWF TAL has made a huge investment a total of Twenty-one lakh, eight thousand, four hundred and forty-three (Rs. 2,108,443) and supported 186 families to build predator proof enclosure (targeted to small livestock goats/pigs/sheep).

1.6 Objectives of the study

The key purposes of the survey were as follows:

- To assess effectiveness of predator proof enclosure for reducing cases of livestock depredation
- To track the outcomes level information from target groups
- To gather information on community's perception about enclosure
- To document success stories
- To know about issues and challenges if any

CHAPTER II

2. LITERATURE REVIEW

The literature of review is summarized as follows:

2.1 Causes and Consequences of Human Wildlife Conflict

A study on "Park and People Conflict" by Shrestha (1994) showed that Habitat destruction, population pressure and food shortage were the major causes for the arising of the HWC. The major wildlife species were Rhino, Deer, Tiger and Leopard. The major problems were crop damage and livestock toll. The crop loss was found to be the acute one.

A study on "Park people conflict- A case study from Beldandi VDC adjacent to Suklaphanta Wildlife Reserve of western lowlands, Nepal" by Malla (2003) showed that the park people conflict was due to resource use problem, grazing problem, wildlife damage and resettlements problems. Average loss per household due to crop damage is NRs. 962/yr and that of property damage was NRs. 751/yr.

A Study on "Elephant- Human conflict in Western Terai Arc Landscape" (Bhatta 2003) showed that the economic loss of the crop damage per year based on the household survey was NRs. 5, 00,346 in Shuklaphata and NRs. 8, 86,000 in Bardia. A Study on "Human-Wildlife Conflict in Nepal" done by the WWF Nepal (2007) showed that Jhapa and Bardia were the most severely and about equally affected by human-elephant conflict in terms of crop damage, were every year a household losses nearly a quarter of their total annual income from crop production. A study on "Human-Wild Elephant interaction in the Royal Suklaphanta Wildlife Reserve, Nepal" (Baral, 1999) showed that total crop damage by wild elephant was 33,307.42 kg for the year 1998-1999. Out of the total crop damage, paddy loss was 31,449.94 kg followed by maize 1857.49kg. Chital, Elephant, Wild boar few found to be three major wildlife pests in this study.

A study on "Human–wildlife conflicts in a fragmented Amazonian forest landscape: determinants of large felid depredation on livestock" by Michalski et. al. (2005) was found that clear peaks of depredation during the peak calving period at the end of the dry season. The study was conducted in in the region of Alta Floresta, a prosperous frontier town located in northern Mato Grosso from 2001 to 2004 using participatory rural appraisal and lancet map. The mean proportion of cattle lost to large felids in 24 months for the region varied according to the herd class size (500: 0.82%; 500–1500: 1.24%; 41500: 0.26%) but was never greater than 1.24%. The highest annual monetary costs were detected in large cattle ranches (41500 head of cattle), reaching US$ 885.40.

A study on "Effects of human–carnivore conflict on Tiger (Panthera tigris) and prey populations in Lao PDR" by Johnson et.al (2006) showed that the relative abundance of large ungulates was low throughout whereas that of small prey was significantly higher where human density was lower. The estimated tiger density for the sample area ranged from 0.2 to 0.7 per 100km2. Tiger abundance was significantly lower where human population and disturbance were greater. Three factors, commercial poaching associated with livestock grazing followed by prey depletion and competition between large carnivores, are likely responsible for tiger abundance and distribution.

2.2 Human Wildlife Conflict Management

A study on "People Wildlife Conflict in Lelep and Tapethok VDCs of Kangchenjunga Conservation Area (KCA)" is carried out in Lelep and Tapethok VDC of KCA using questionnaire method by Khatiwada (2008) showed that local people adopted the different techniques to protect croplands from wild animals. Fencing, Scarecrow, stone throwing and sound producing were common techniques to protect the crop land from wild animals. Local people guard their crop field during crop ripening seasons. This study also showed that mike and cassette supported by KCAP to chase wild animals from croplands in Tapethok was ineffective after 2/3 days of its establishment. Now a day the wild animals became habitual for all chasing techniques and ignored them easily, Obstacles creation as stone wall fencing, trench and electric fencing are only way to protects crops from wild animals but these all are unfeasible in the study area due to the sparse croplands.

A study on "A Case Study on Human-Wildlife Conflict in Nepal (With particular reference to Human-Elephant Conflict in Eastern and Western Terai regions)" by WWF (2007) showed that Jhapa and Bardia were the most severely and about equally affected by human-elephant conflict in terms of crop damage, as households here had lost nearly a quarter of their total annual income from crop production. The qualitative and quantitative analysis showed that the severity of the problem is reflected by various measures undertaken at the community level to mitigate HEC in all the sectors. Most people applied one or more measures to cope with HEC. Among them, chasing with fire, use of noise and explosives, and regularly guarding the fields were the most widely used measures in all the sectors. Apart from this, high voltage electric fence in Jhapa and improved fencing (mainly, digging trenches and planting hedgerows) in Shukla were also commonly practiced. Despite the wide spread application of measures v.i.z. chasing with fire, use of noise and explosives, and regularly guarding fields, these were not considered to be effective in mitigating HEC by the people of Bardia and Jhapa The respondents from Shukla, however showed clear preference for these measures. Likewise, electric fencing was rated positively by Jhapa while the respondents in Bardia and Shukla were unsure about its effectiveness.

A report on "Common Ground-Solutions for reducing the human, economic and conservation costs of human wildlife conflict" by WWF (2008) showed that in Namibia different methods both traditional and modern were employed at a field level to keep wildlife away from humans and human property, with varying levels of success. The major methods were artificial barriers (electric fences, protection of water points, chilli pepper fences, chilli bombs), alternative water points for elephants, elephant trip alarms and improved livestock husbandry. This also showed that one technique alone will not be sufficient – a package of different techniques should be designed that is specifically tailored to meet the needs of the local situation. HWC varies enormously spatially, temporally and between species, and therefore responses and management approaches must be flexible.

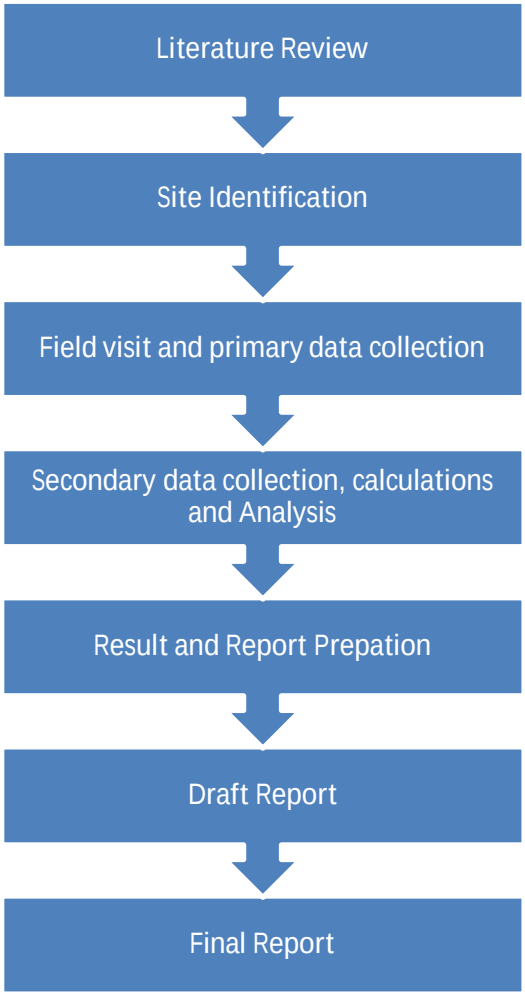
Human-wildlife conflict can be managed through prevention strategies at the initial stage and take action towards addressing its root causes, a protection strategy are implemented when the conflict is certain to happen or has already occurred and mitigation strategies attempt to reduce the level of impact and lessen the problem. The main approached programs for this are community awareness at local level, direct and/or indirect compensation in the event of loss, voluntary relocation of local communities, guarding animals, translocation of problematic animals and human-wildlife education toolkit for farmers and communities (WWF, 2005, FAO 2009, Madden 2004)

CHAPTER III

3. METHODOLOGY

3.1 Research Design

A systematic and integrated methodology was followed. Major elements of the methodology include the use of primary and secondary information. For primary information collection, the methods such as; household questionnaire survey, face to face interaction using checklist and key informant interview were followed. An Excel tool was used for the analysis of the collected data. The collected data were presented in different manner and analyzed critically. The chart 1. Below depicts the methods and materials used for conducting survey and preparing report.



3.2 Study Areas

The baseline survey on effectiveness of predator proof corral was conducted in 186 household who were supported by WWF Hariyo Ban Program to build modern predator proof corral of twenty buffer zone community forest user group or user communities of Shukhlaphanta National Park (kanchanpur), Bardiya National Park (Bardiya) and Banke National Park (Banke). The table below shows the details of the studied areas of all three districts (Kanchanpur, Bardiya and Banke);

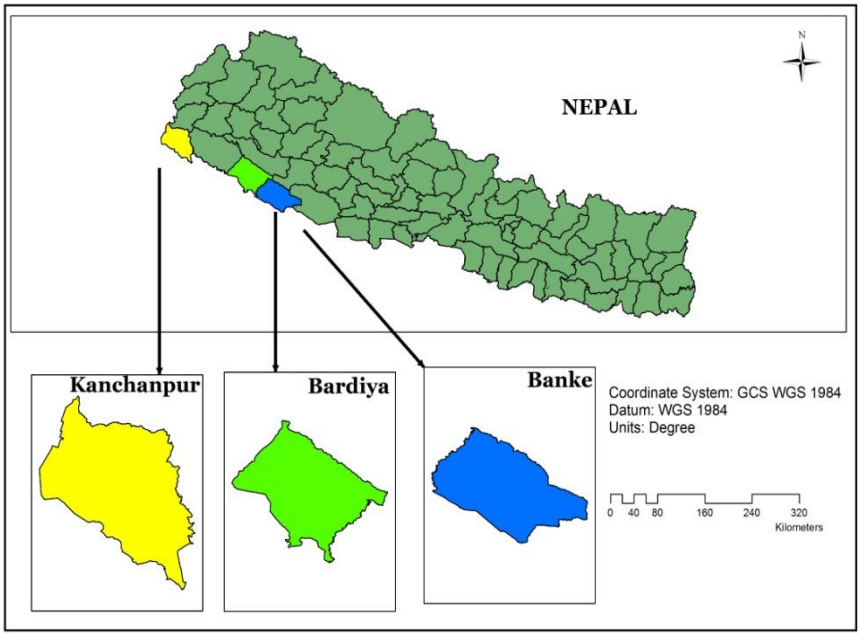
S.N	Name of BZCF/UC	District	Municipality	Ward No.	Tole	Total Households
1	Dautari UC	Kanchanpur	BhimdattaMuncipality	19	Bag phata	21
2	Pragati UC	Kanchanpur	BhimdattaMuncipality	19	Bag phata	22
3	Baijanath UC	Kanchanpur	Bhimdatta Municipality	19	Bagphata	10
4	Shrijana UC	Kanchanpur	Bhimdatta Municipality	19	Bag Phata	8
5	Devijarai BZCF	Bardiya	Thakurbaba municipality	2	Balati	14
6	Bhawaniphanta BZCF	Bardiya	ThakurbabaMuncipality	2	Pratabpur	2
7	Janachetana BZCF	Bardiya	Thakurbaba Municipality	2	Perahani	2
8	NA	Bardiya	Thakurbaba Municipality	1	Dumreni	8
9	Neulapur BZCF	Bardiya	Thakurbaba Municipality	3	Neulapur	15
10	Sundartapu BZCF	Bardiya	ThakurbabaMuncipality	2	Sujanpur	5
11	Sihabahini BZCF	Bardiya	Thakurbaba Municipality	2	Sihabahini	5
12	Amreni BZCF	Bardiya	ThakurbabMuncipality	2	Amreni	8
13	Aapkholi BZCF	Banke	Raptisonari Rural Muncipality	9	GuruwoGau	15
14	Madu CFUG	Banke	Raptisonari Rural Muncipality	2	Maduwo	5
15	Ashok CFUG	Banke	Raptisonari Rural Muncipality	2	Madui	5
16	Shivashankar BZCF	Banke	Raptisonari Rural Muncipality	2	Gobarpur	14
17	Pragatisil BZCF	Banke	Raptisonari Rural Muncipality	9	Mahadewa	14
18	Sharamjibi BZCF	Banke	Raptisonari Rural Muncipality	9	Uttar puruba	2
19	Jhijhari BZCF	Banke	Raptisonari Rural Muncipality	9	Udden	7
20	Bagsal BZCF	Banke	Raptisonari Rural Muncipality	9	Dhakeri	1

3.3 Buffer Zone

A buffer zone is defined as an area surrounding a national park or a reserve which has been set aside for perpetual use of the natural resources benefitting local people who are deprived of using the natural resources contained in parks and reserves because of their protected status. The National Parks and Wildlife Conservation Act (NPWC) of 1973 (fourth amendment 1993) defines a buffer zone as that "surrounding area of parks or reserves which have been declared by the Government of Nepal to provide local people use of forest resources on a regular basis." The primary aim of creating buffer zones was to establish social and natural buffering between settlements and the park by reducing pressure on parks from settlements and vice versa so that park and people relations may be improved (Sharma, 1990; Bhatta, 1994; Heinen & Mehta, 2000). The act provisioned the pull back of up to 50% of the revenue generated by parks and reserves for use in support of community development. According to BZ Management Regulation 1996, the Conservation Warden shall make a detailed management plan of the buffer zone in order to implement the buffer zone management program. While making detailed management plan he/she shall incorporate the plans of the Buffer Zone User Committee (BZUC) and the Buffer Zone User Group (BZUG). The Buffer Zone User Group is formed at the very bottom level primarily in small settlements or hamlets. BZUG is comprised of representatives of all the households in the settlement. Buffer zone user committee (BZUC) is formed from among these BZUGs. The BZUC coordinates with all BZUGs and acts as bridge to connect BZUGs and the BZMC (Buffer Zone Management Committee). In general BZUC is formed at the VDC level. There can only be a maximum of 15 BZUCs in a park/reserve. The Buffer Zone Management Committee (BZMC) is at the top of the hierarchy and acts as a decision making body. It is comprised of BGZUCs, local government representatives and the Conservation Warden. Its task is to allocate the budget among different BZUCs and it monitors the overall program. The National Park/Reserve Warden acts as a member secretary in this BZMC.The term for members of the BZMC is five years.

3.4 Studied sector

Figure 1. Map of Nepal showing the locations of three studied sector Kanchanpur, Bardiya and Banke.



3.4 Site Description

3.4.1 Shuklaphanta National Park

The Shuklaphanta National Park is a protected area in the Terai of the Far-Western Region, Nepal. It covers the area of 305 km^2 (118 sq mi). The area is covered by open grassland, forests, riverbeds and tropical wetlands. It is at an altitude of 174 to 1,386 m (571 to 4,547 ft). It was established in 1976 as Royal Shuklaphanta Wildlife Reserve. A small part of the reserve is in the northern side of the East-West Highway. It is there to create a path for seasonal Migration of wildlife into the Sivalik Hills. The Syali River forms the eastern boundary of this national park. The international border with India makes the national park's southern and western boundary.

The Indian Tiger Reserve Kishanpur Wildlife Sanctuary is in the southern part of this reserve. It is a protected area of 439 km2 (169 sq mi). It represents the Tiger Conservation Unit (TCU) SuklaPhanta-Kishanpur.Itcovers 1.897 km2 (0.732 sq mi) blocks of alluvial grasslandsand subtropical moist deciduous forests. The protected area is part of the Terai-Duar savanna and grasslands ecoregion. It is one of the best-conserved examples of floodplain grassland. It is included in the Terai Arc Landscape.

The climate of the region is subtropical monsoonal. The mean annual rainfall in this area is 1,579 mm (62.2 in). The rainfall occurs from June to September and is highest in August. The winter months of December and January are fairly cold. The daytime temperature during this time of year is 7–12 °C (45–54 °F). Sometimes frost can also be seen. From February onwards temperatures rise up to 25 °C (77 °F)

in March. The temperature reaches up to 42 °C (108 °F) by end of April. When the first pre-monsoon rains reach the area in May, humidity increases.

Regarding the conservation and the management of the park, the Shuklaphata was initially designated as Royal Hunting Reserve in 1969. Later in 1973, the area was changed into Royal ShuklaPhanta Wildlife Reserve. At first it had an area of 155 km^2 (60 sq mi). The area was made bigger to its present size in the late 1980s to link the flood plains of the Terai to Churai hills so as to facilitate the seasonal migration of wildlife.[6] A buffer zone of 243.5 km^2 (94.0 sq mi) was added in May 2004.[1] In 2017, the status of the protected area was changed to a national park. The government's effort through DNPWC is assisted by various conservation agencies such as WWF Nepal, NTNC and UNDP. More importantly perhaps is the WWF Nepal's involvement in launching the Western Terai Landscape Complex Project (WTLCP) to bring about landscape level conservation in and around SWR. Bhuju et al. (2007) documented following significant achievements made in recent years in SWR.

• Maintenance of six water holes, 22 km trench, and 10 km of barbed wire fence • Construction of three 'machans', and 22 km of fire lines .

• Two poaching units established in order to control the poaching and illegal slaughter of wild animals.

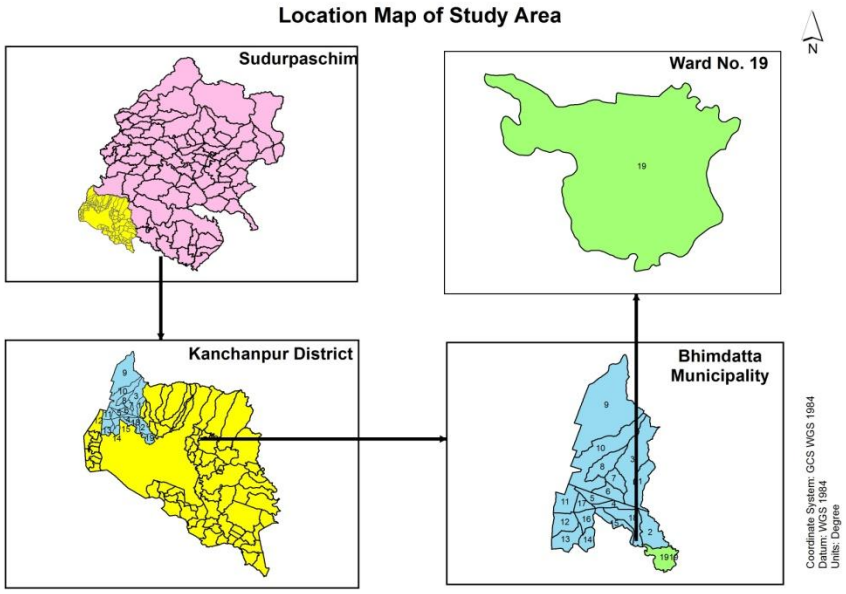
• Nominated by CITES as A site for Monitoring of Illegally killed elephants (MIKE)

• Formation of a Tiger Conservation Action Plan to increase the number of breeding tigers

• Establishment of 422 user groups (DNPWC/PCP 2002)

• Development of databases and annual and five-year plans of 40 user groups with the technical and financial support of the SWR/PCP (DNPWC/PCP 2002).

Figure 2. Map showing the surveyed area of Bhimdatta Municipality of Sukhla studied centre



3.4.2 Bardia National Park (BNP) and Buffer Zone

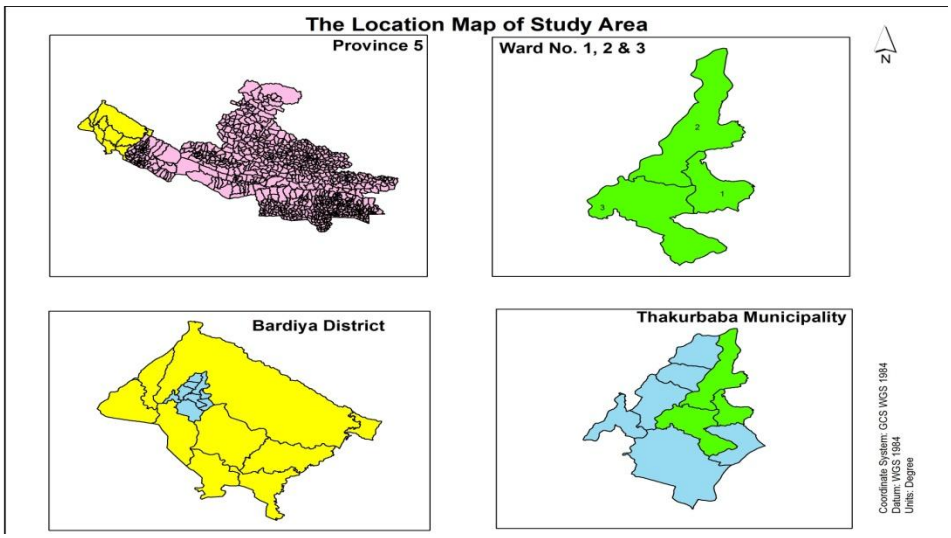
Located in the Bardia and Banke District of the western Terai and covering 968 km2 , Bardia National Park (81o 15'E and 28o 30'N) is the largest protected area in the Terai. In contrast to 16 many other isolated habitat fragments in the western part of the Terai landscape of northern India and Nepal, narrow natural corridors still connect BNP with Shuklaphanta Wildlife Reserve in the west, Katarniaghat Wildlife Sanctuary and Dudhwa National Park in India to the south, and a large tract of government forest to the east.

The Park spreads across Chure hills in the north and riverine flood plain in the south within the altitudinal range of 152 to 1441 m. The climate here is subtropical monsoonal type with three distinct seasons: cool-dry (November to February), hot dry (March to June) and monsoon (July to October). Average annual rainfall amounts to 1500 mm and it occurs mostly between June and September, somewhat later than the rest of the country (Bolton 1976). Average temperature in the cool season drops to 10 o C in January while in the hot dry season temperature may rise up to 41 o C in May (Dinerstein 1979). Seven major vegetation types (Jnawali and Wegge 1993) are distributed in the landscape complexes comprised by Karnali floodplain, the Babai river, Churia hills (Bhuju et al. 2007). Sal forest is the most widely distributed as it covers 70 percent of the total area. Khair-Sissoo Forest is the pioneer association occurring alongside the rivers. Moist riverine forest is patchily distributed in depressions along the watercourse. The well drained flat lands were mostly occupied by the mixed hard wood forests. In addition to this, three types of grasslands viz. floodplain grasslands, wooded grasslands and phantas have been located in the park in flood plain areas, forest edges and in the previously cultivated areas, respectively.

BNP has the Nepal's largest population of elephants that roam between the Park and adjacent forested areas in India. It also contains the largest biomass of ungulates per km^2 reported from anywhere in Asia, and these include endangered swamp deer (Cervus duvauceli), spotted deer (Axis axis), hog deer (Axis porcinus), sambar deer (Cervus unicolor), nilgai antelope (Boselaphustragocamelus), and the four-horned antelope (Tetracerusquadricornis) (Andersen and Naess, 1993). The Karnali floodplain also harbors a population of rhinoceros (Rhinoceros unicornis) which had been relocated from ChitawanNatitonal Park. The park is also well known for leopard (Panthera pardus) and one of the highest recorded tiger (Panthera tigris) densities in the world (Wegge et al. 2004).

In order to address the park-people conflict, the 327 km2 of area around BNP was declared as the Buffer Zone in 1996. Historically, the Buffer Zone area was settled by the Tharu people, but as a result of substantial immigration over the last 60 years the present population has become ethnically mixed. The majority of the villagers live in a subsistence economy in which land and livestock holdings are the principle economic assets. Paddy (Oryza sativa), Maize (Zea mays), Wheat (Tricticumaestivum), Lentil (Lens culinaris), and Mustard (Brassica campestris), are the principle crops and are mostly grown for domestic consumption. Livestock is economically important as a source of milk, manure, draft-power, and cash income. The park is being managed by the Department of National Parks and Wildlife Conservation (DNPWC) and the Nepalese Army is guarding and enforcing the existing rules and regulations including controlling poachers, stopping illegal fishing, checking boundaries, preventing encroachment into the park, and preventing livestock grazing and extraction of resources by local inhabitants. Besides this, other partner agencies are also assisting DNPWC's conservation and development efforts. Among them the key institutions include, WWF, NTNC, CARE Nepal and UNDP.

Figure 3: Map showing surveyed area ofThakurbaba Municipality of Bardiya studied centre



3.4.3 Banke National Park (BaNP)

Banke National Park (BaNP) was established as 10th Park in July 2010 for biodiversity conservation at the landscape level. The Park is linked with trans-boundary Landscape that joins Suhelwa Wildlife Sanctuary in India through national and community forests towards south. It connects with Bardia National Park (BNP) towards west which further links with Katerniaghat Wildlife Sanctuary in India via Khata corridor.

BaNP (550 square kilometer) lies in Banke district and its buffer zone (343 square kilometer) covers parts of Banke, Bardia, Dang and Salyan districts of Mid Western Development Region. The park is located between 810 39'29" to 820 12'19" east longitude and 270 58'13" to 280 21'26" north latitude. The core area is delineated by Chisapani-Obary section of east-west highway and cultivated land in the south, the Churia ridge in the north, Shiva khola in the east and Kohalpur- Surkhet road in the west. The core area of the Park (61.5%) entirely falls in Banke district and buffer zone (38.5%) falls in Banke district in the south and west, and Dang and Salyan districts in the north. The main objectives of establishment of this national park is to conserve endangered species of wild flora and fauna and their habitat, for the promotion of eco-tourism and to strengthen trans-boundary biological corridor.

Biodiversity and Habitat of Banke National Park BaNP contains an array of eight ecosystem types such as Sal forest, deciduous Riverine forest, savannahs and grasslands, mixed hardwood forest, flood plain community, Bhabar and foot hills of Chure range. It is a home to 124 species of plants, 34 species of mammals, more than 300 species of birds, 24 species of reptiles, 7 species of amphibians and 58 fish species. 90% natural forest coverage composed of mainly Sal, Karma, Khair and Sissoo. Three species of mammals (tiger, striped hyaena, four-horned antelope), four species of birds (giant hornbill, black stork, Bengal florican, and lesser florican) and two species of reptiles (gharial crocodile and python) residing in

the Park are protected by the National Parks and Wildlife Conservation Act 1973. The habitat of flood plain, foot hill and Churia hill are of prime concern to conserve major focus species such as royal Bengal tiger, Asiatic wild elephant and four-horned antelope. Furthermore, the Rapti River on the south and Babai River on the north forms the life line of the Park.

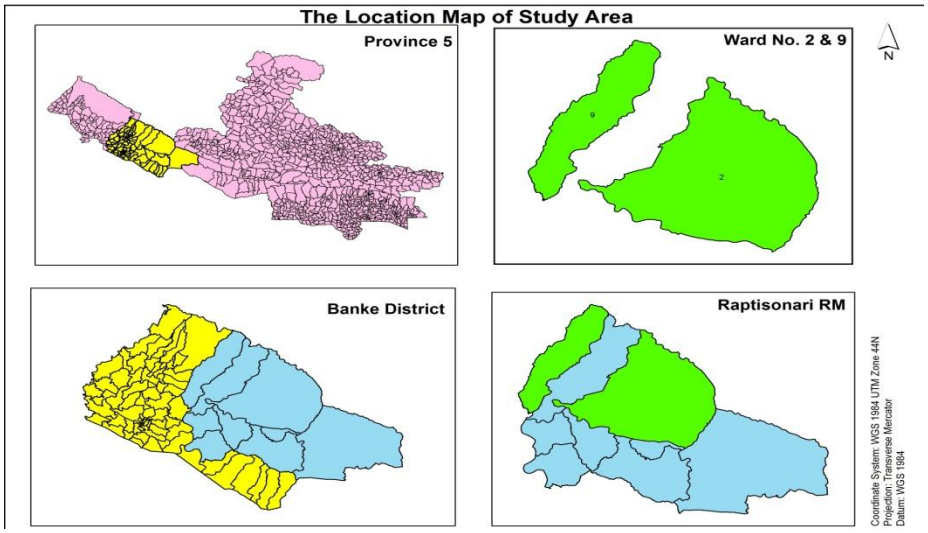
The area has 8 ecosystems with 124 plant species (83 trees, 5 climbers, 36 shrubs). Different types of wildlife were present in the area. About 32 species of mammals, over 300 species of birds, 22 species of reptiles, 7species of amphibians and 50 species of fish were present in the area. 32 species including 7 protected species and 11 rare and endangered species of 23 mammals were present. Over 300 species including 3 protected species of avi-fauna and 22 species including 2 protected species of reptiles were present in the BaNP area. This area accounts 7 species of and more than 55 species of fishes.

The Park has three distinct seasons: winter, summer and monsoon, each providing a unique experience. From October to early March, weather is dry and cool. From April to June, temperature grows up to 450C in May/June. The hot humid days gives way to monsoon rains that lasts until September. The altitude in this area varies from 153m1247m and has a tropical and sub-tropical monsoon. The area lies in Churiya and has river valleys and flood plains.

Buffer Zone area of BaNP is extended in 14 VDCs, seven from Banke district (Khaskusum, Kanchanpur, Mahadevpuri, Kohalpur, Chisapani, Navbasta, and Rajhena), three from Dang district (Goltauri, Panchkule, and Purandhara) and three from Salyan district

(Kalimati Rampur, KalimatiKalche, Kavrechaur) and one from Surkhet district (Belawa). The user committees and the user groups will have their own work plans and financial resources channeled through buffer zone management committee to utilize in conservation, community development, income generation, and skill enhancement and conservation education program.

Figure 4: Map showing the surveyed areas of Raptisonari Rural Municipality of Banke studied centre



3.6 Data collection techniques and tools

3.6.1 Secondary data collection

The secondary data and information were collected and collated from reports, newsletter, research papers, published and unpublished articles, books, journals, annual report of different organizations, and websites. Literatures were reviewed in two phases, before and after field visits.

Secondary Information such as baseline data and universe file of Households (HHs) who were benifited by predator proof corral from all three districts Bardiya, Banke and Kanchanpur were provided by the TAL office of Hariyo Ban Program located at Kohalpur, Banke.

3.6.2 Primary data collection

IHS, KIIs, IDIs and observation were main techniques used for primary data collection. Interview guidelines and checklists were used for data collection.

A total of 186 household were benifited with predator proof corral by the support of Hariyo Ban Program located in three districts Banke, Bardiya and Kanchanpur. Out of 186 households, 61 from Bhimdatta Municipality (kanchanpur), 62 were from Thakurbaba Municipality (Bardiya) and 63 were from Raptisonari Rural Municipality (Banke).

Information about the effectiveness of modern predator proof corral were collected by means through set of questionnaires asked with each individual who were benefited by predator proof corral and also with key informant from each districts. Set of questionnaires to be asked were prepared by the consultant in coordination with Hariyo Ban Program team.

CHAPTER IV

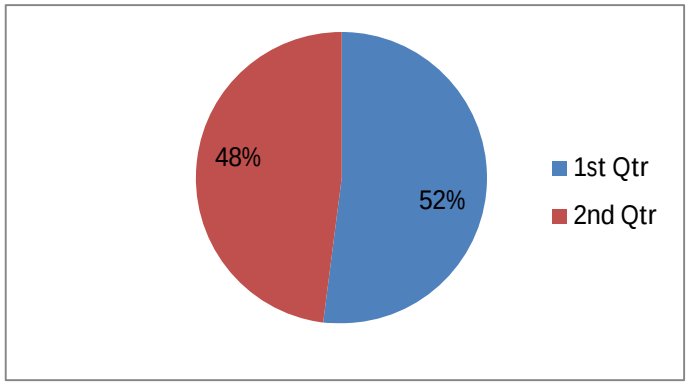
4. FINDINGS

The major findings of the study were stated in comparative form, which is mentioned below

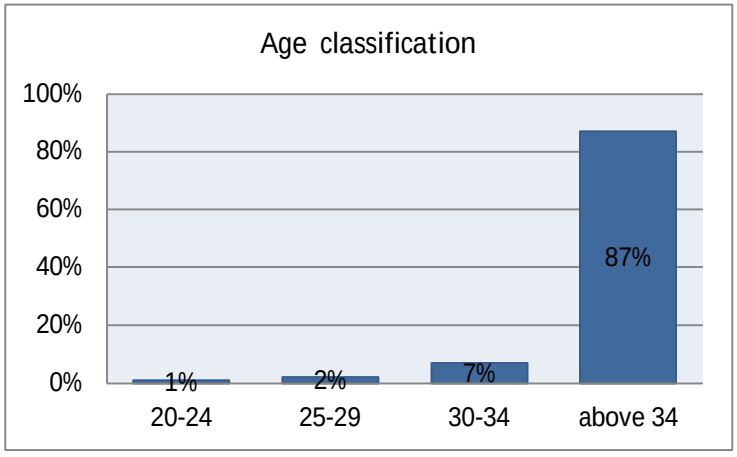
4.1 Basic Information

4.1.1 Gender: Among the total respondents, female respondent were higher (52%) than the male respondents (48%).

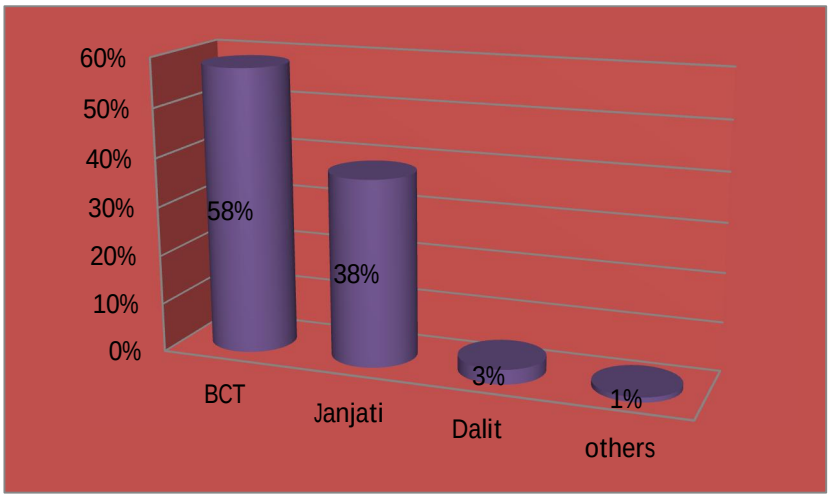
Out of total respondents 106 were direct beneficiary (means beneficiaries whose name was in the universe file of Hariyo Ban Program) and 76 respondents were other members of house.



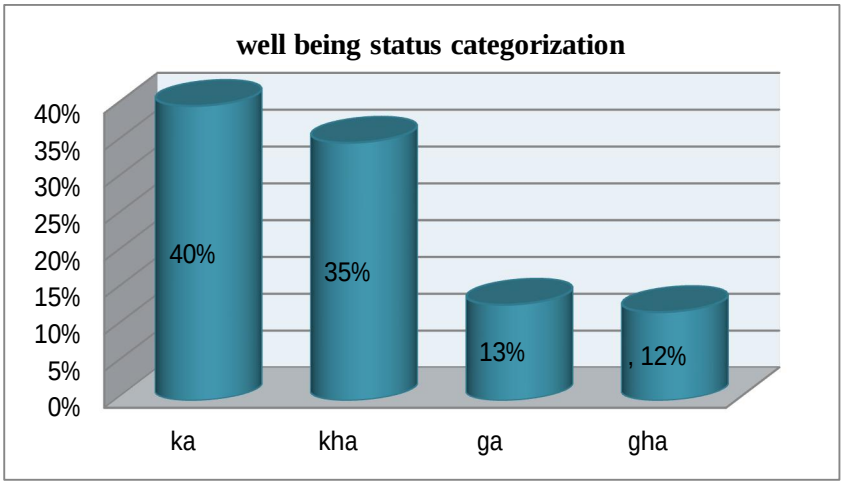
4.1.2 Age: Majority(87%) of the beneficiaries were above the age 34, followed by(7%) beneficiaries belonging to the age group 30-34, similarly (2%) of beneficiaries belonging to the age group 25-29 and only (1%) belong to age group 20-24. No one fall under the age group 15-19.



4.1.3 Caste/Ethnicity: Majority (58%) of the beneficiaries belonged BCT, 38% belonged to Janjati, 3% belonged to Dalit and 1% belonged to Newar.

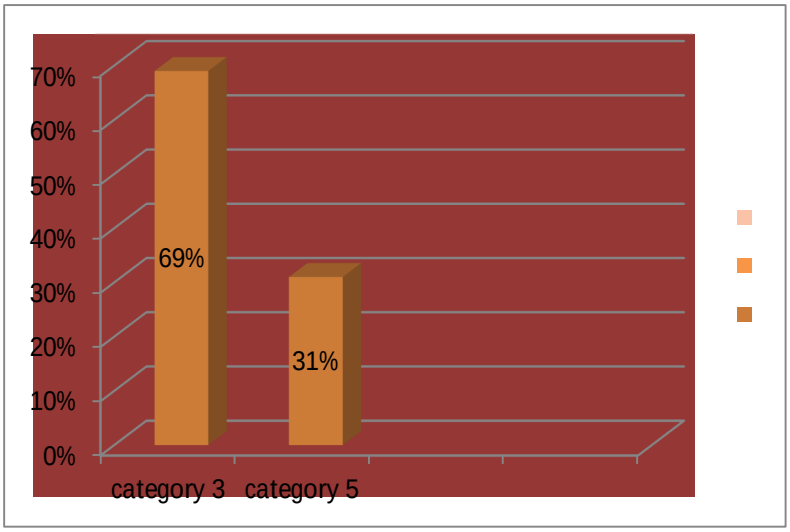


4.1.3 Well-being status: Majority 40% of the beneficiaries were ranked in the first category (ka), they are the one who has their own land to cultivate and its products are enough to feed throughout the year. The second highest35% beneficiaries were ranked in the second category (kha), followed by 13% beneficiaries ranked in third category (ga) and 12% beneficiaries were ranked in fourth category(gha).



4.2 Forest Dependency:

4.2.1 Forest dependency level: While doing survey it was found that majority of people i.e. 69% of beneficiaries fall under category 3 of forest dependency and 31% beneficiaries under category 5 of forest dependency. No one fall under category 1, category 2 and category 4.

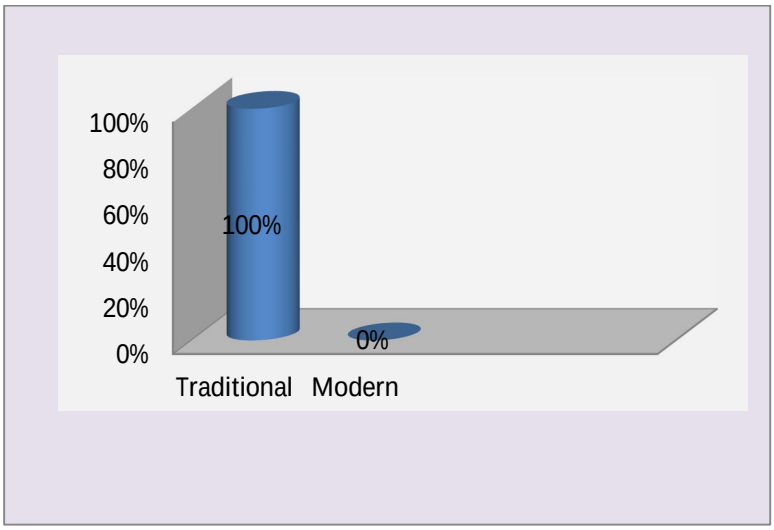


Here,

- Category 1 of forest dependency includes people who live inside forests, often living as hunter-gathers or shifting cultivators, and who are heavily dependent on forest for their livelihood primarily on a subsistence basis.
- Category 2 of forest dependency includes people who live near forests, usually involved in agriculture outside the forest, who regularly use forest products (timber, fuel wood, bush foods, medicinal plants etc.) partly for their own subsistence purposes and partly for income generation.
- Category 3 of forest dependency includes people who live near forests, usually involved in agriculture outside the forest, who partly use forest products (timber, fuel wood, bush food, medicinal plants, etc.) for their own subsistence purposes.
- Category 4 of forest dependency includes people who are engaged in such commercial activities as trapping, collecting minerals or forest industries such as logging. Such people may be part of mixed subsistence and cash economy.
- Category 5 includes the people who are not dependent on forests for their livelihood and subsistence purposes.

4.3 Effectiveness of modern predator proof pen information

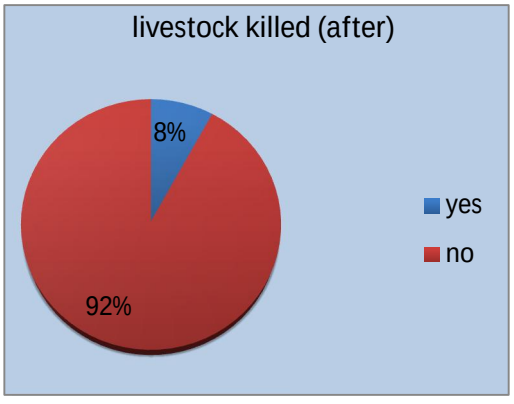
4.3.1 Corral design: All beneficiaries had traditional type of predator proof pen before, all made in their self investment.



4.3.2 Livestock kill

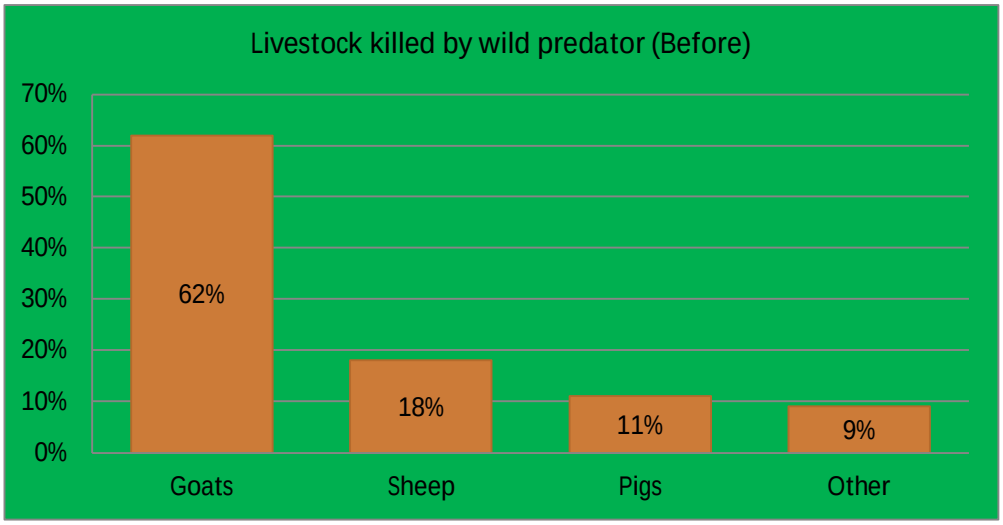
Before the construction of modern predator proof pen i.e. while they had traditional self-made predator proof pen, 167 livestock of 51% respondents were killed by wild predator at around 5 years of interval i.e from 2069 to 2074. But now after the construction of modern predator proof corral, 8% of respondents had faced the problem of livestock being attacked or killed by wild predator.

Out of the 8% respondents who had faced the problem of their livestock being killed by wild predator it was found that only two (3) livestock were killed by wild predator while inside corral, seven (7) were killed by wild predator while outside the corral and six (16) were killed by wild predator while grazing in forest.

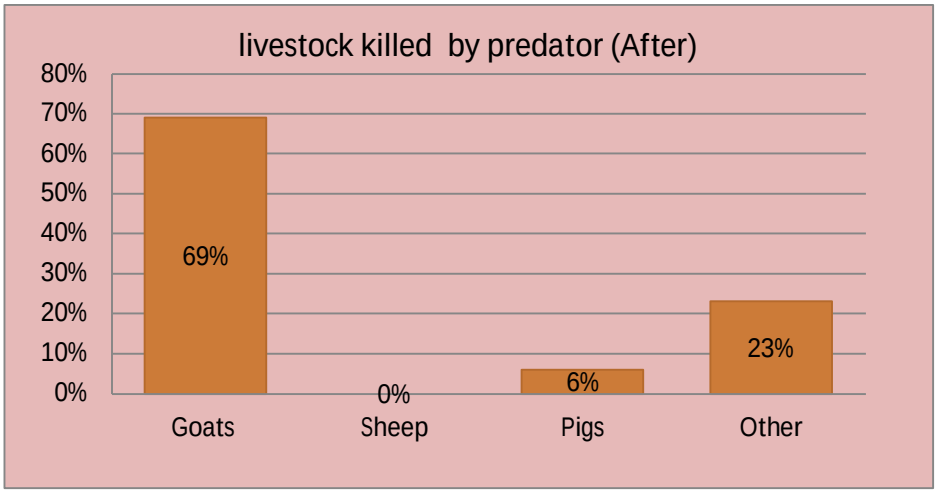


4.3.3 Detailed view of Livestock killed by wild predator before and after construction of modern predator proof pen

Before the construction of modern predator proof pen i.e. while they had traditional self-made predator proof pen, 167 livestock of 51% respondents were killed by wild predator out of which maximum number (62%) were goats, 18% were sheep, 11% were pigs, and 9% were other livestock.

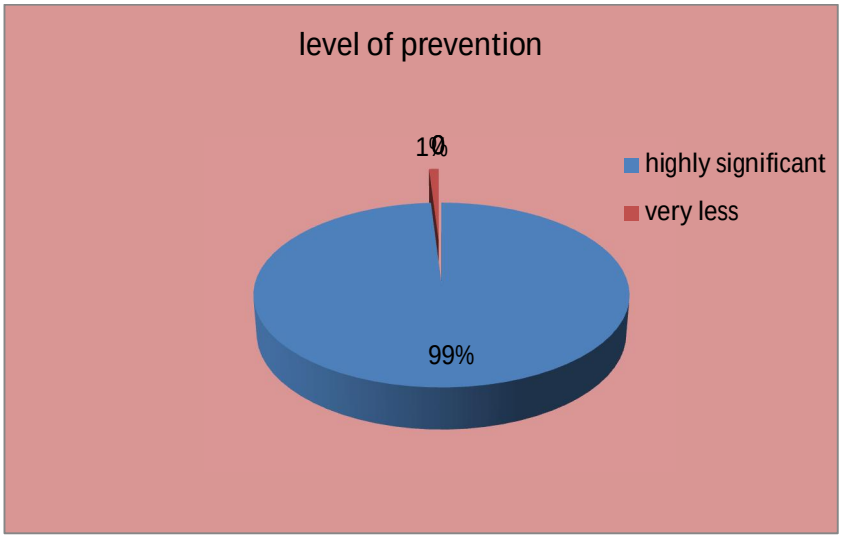


After the construction of modern predator proof pen, a total of 26 livestock of 8% respondent were killed by wild predator, out of which maximum number were (69%) were goats, 8% were pigs and 23% were other live stocks



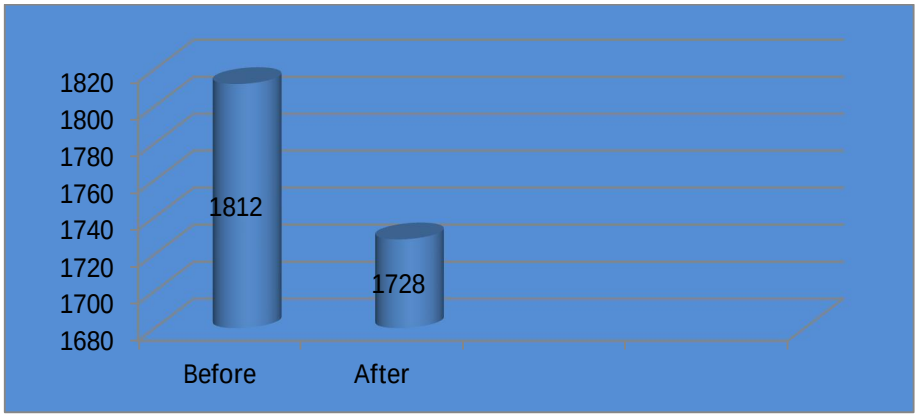
4.3.4 Effectiveness of modern predator proof pen to prevent livestock from wild predator attack

Out of the total respondents 99% responded that modern predator proof pen is highly significant to prevent livestock from wild predator attack, and only 1% responded that modern predator pen is very less effective to prevent livestock from wild predator proof pen due some technical difficulties.



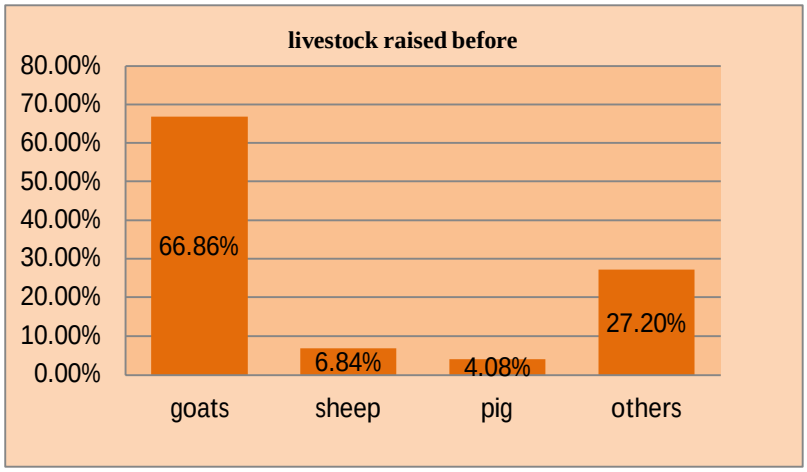
4.3.5 Livestock Raise

It was found from the survey that before the construction of modern predator proof corrals a total of 1812 livestock's were raised by the beneficiaries from all three districts. Number is kind of similar after the construction of modern predator proof i.e. after the construction modern predator proof pen it was found from the survey that beneficiaries from all three district were raising a total of 1728 livestock. But it was also found from the survey there have been increment in livestock selling particularly in goats, pigs and sheep's as compared to the time when they had traditional corrals.

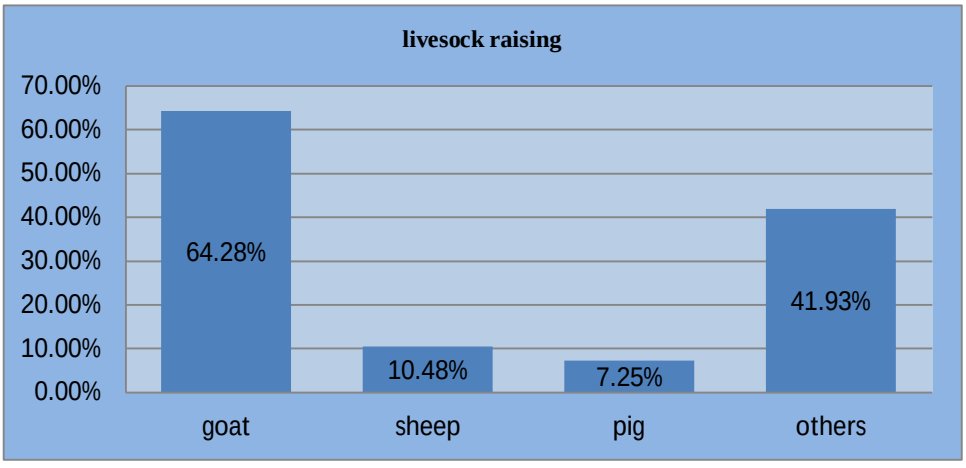


4.3.6 Detailed view of livestock's raise before and after the construction of modern predator proof corral

Before the construction of modern predator proof corrals it was found that a total of 1812 livestock were raised by the beneficiaries, among them highest in number were goat which was 1121 (61.86%), 124 (6.84%) were sheep's, 74 (4.08%) were pigs and 493 (27.20%) were others (which include 174 cow, 119 buffalo and 200 were bulls).

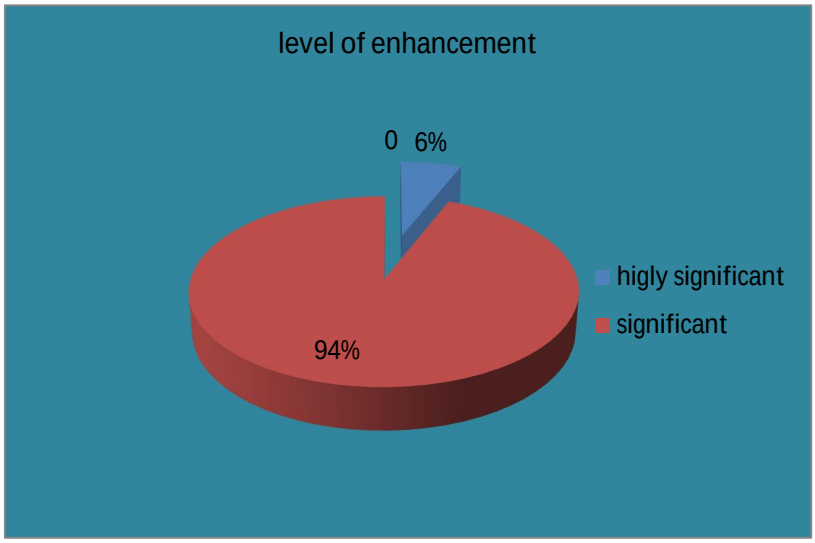


After the construction of modern predator proof corrals it was found a total beneficiaries from all three districts were raising a total of 1728 livestock's. Among the highest number is of goats which is 1116 (64.58%), 117 (10.48) sheep's, 81 (7.25%) pigs and 468 (41.93%) others (which include 161 cows, 119 buffaloes and 188 bulls).



4.3.7 Households response on effectiveness of modern predator proof corral to enhance livestock business

All the beneficiaries responded about the effectiveness of modern predator proof corral among them 94% mentioned the pens are significant while 6 % mentioned it is highly significant to enhance livestock business.



4.3.8 Community response about the effectiveness of modern predator proof pen

Out of total respondents all respondents responded that the community members are enthusiast towards the effectiveness of modern predator proof pen. After the construction of modern predator proof pen they are much relieved from the worries and danger of their livestock getting eaten or killed by wild predator. People from the all target community are showing their interest in building these kinds of predator proof pens.

4.3.9 Motivation level of community people towards to built modern predator proof pen

While doing survey it was found that all community members were motivated towards to built modern predator proof pen because of its effectiveness against wild predator attack. It is helping them to raise to raise their livestock much safer than traditional pen. Livestock are the main source of income of people residing in buffer zone areas but the major problem they have to face is their conservation against wild predators. According to the respondents it was found that it was very difficult to save livestock from wild predator while they had traditional pens as they were open in shape wild predator found it easy to attack livestock but after the construction of modern predator proof cases of livestock being attacked or killed from inside the enclosure are almost negligible which is giving high level of motivation to the community people towards its construction.

4.3.10 Effectiveness of modern predator proof pen to replace traditional pen

Although the people from the all target group are highly motivated towards the construction of modern predator proof pen but the rate of replacement of traditional pen by modern predator proof pen is low. While doing survey it was found that community peoples are highly encouraged, highly motivated and enthusiast to replace traditional pen by modern predator proof but due to some technical and economical problem they are not able replace as per they want.

4.4 KEY INFORMANT INTERVIEW

Key person interviews consisted primarily of interviewing representatives from the BZUC who were involved at the decision making level. The interviews were conducted to learn and gather more detailed information about effectiveness of predator proof enclosures, to share their views and opinions regarding predator proof enclosures and what should be done to make it more effective.

A total of seven key informants were interviewed from all three district and they almost share common views regarding the effectiveness of modern predator proof corral to prevent livestock from being attacked or killed by wild predator. According to them it was found that modern predator proof pen is being very effective to prevent livestock from wild predator attack. People of the community were highly encouraged and motivated towards to construction of modern predator proof pen and it is slowly replacing traditional pen. They reported that modern predator proof pen are highly protective and safer than traditional pen as they are enclosed by enclosure from all sides and it is also being easier to put feed grasses to livestock in modern predator proof pen as compare to traditional pen.

4.5 Challenges and Problems

4.5.1 Problem in corral

Support of modern predator proof corral by Hariyo Ban Program is playing a mojor role in preventing livestock specially goats, sheeps and pigs which is helping targeted households from all three districts in increasing their economic status. But despite its lots of positive impact, still they are facing some problem in this. A total of 167 respondents stated the problems. One respondent has pointed out two or more problems and it was found that targeted households from all three districts are almost facing the same problem regarding corral such as:

- Problem of durable wood for constructing strong and more effective pens.
- Size of corral is small to raise more number of livestocks.
- Due to open shape of corral livestock suffer from extreme cold in winter season.

Among these all the problems majority of beneficiaries has spoken about the problem of durable wood for constructing more effective and long lasting pen.

4.5.2 Problem in business

Analysis of primary information collected from survey and observations revealed following problems in the business.

i. Lack of feed to the goats (fodder grass).

ii. No proper grazing area.

iii. Technical problems such as low levels of management, poor marketing management and lack of proper scientific information regarding commercial goat farm establishment.

iv. Lack of high productive exotic breed for cross breeding.

v. Threat of wild animals.

vi. Difficulty in disease identification and its treatment.

vii. Lack of skills and training in field of livestock raring business.

viii. Difficult to raise large number of livestock as the size of enclosure is small.

4.6 Advices and suggestion

In order to make corrals more effective beneficiaries from all three districts were also asked about their advices and suggestion about what can be done to make these pens more effective to prevent their livestocks from wild predator. A total of 132 resondents share their views regarding what can be done to make these pens more effective and almost all respondents have similar views, which include following points:

- Availabilty of durable and strong wood would help to make pen more effective.
- Size of the corral should be large so that more number livestock can fit inside it.
- Corral should be more compact so that in winter season livestock doesn’t have to suffer from extream cold.

CHAPTER V

6. SUCCESS STORIES

6.1 Some reported success stories of modern predator proof corral

1.

Parwati singh one of the beneficiaries of modern predator proof pen from Pragati user community, ward no-19, Baghphanta, Kanchanpur reported that intervention of modern predator proof pen has became huge success to safe livestock from wild predators.


Fig 1. Parwati singh key informant from kanchanpur

According to her Modern predator proof pen is highly effective to prevent livestock from wild predator attack. She illustrated effectiveness of modern predator proof pen by comparing present situation i.e. after the construction of modern predator proof pen with past situation i.e. while they had traditional type of pen. She reported that before the intervention of modern predator proof pen i.e. while they had traditional type of pen it was very difficult to protect livestock from wild predators. As traditional pen were open wild predator found it easy to attack livestock from it and used to take livestock (speciallygoats) from the pen because of which they had to face huge economic loss their main source of income is livestock business. To protect livestock from wild predator they had took an eye in enclosure whole night because of which they had to spend sleepless nights. But after the intervention of Modern Predator Proof Pen it completely protected livestock from wild predator attack. Wild predators are not able to enter inside corral because of which raising of livestock become much easier which is enhancing livestock business and also helping in improving their economic condition.


Fig 2. Predator proof pen

After the intervention of Modern predator proof pen they do not have to awake at night and spend sleepless night as they used to have while they had traditional pen. Intervention of Modern predator proof pen has also reduced Human Wildlife Conflict (HWC) as it decreases the rate of regular entry of wild predators in the community.

At last she concluded that Hariyo Ban Program support to build modern predator proof has played highly significant role to protect livestock and has been very effective for reducing economic loss. People of the community are highly encouraged and enthusiast towards the construction of modern predator pen.

2.

Phul Kumari Tharu one of the respondent from Shivashankar BZCF, Ward no.2, Gobarpur, Raptisonari Muncipality, Banke reported how Modern predator proof pen has been very effective to rearing livestock business and to protect livestock from wild predators. Phul kumari tharu and her husband Jeet bahadur tharu are doing goat rearing and selling business named as Anup Goat raring and selling firm in Raptisonari mucipality-2, Gobarpur, Banke which is the main source of income of their family. She reported that the idea of doing goat rearing business has came after when Hariyo Ban Program supported modern predator proof pen to their community. Effectiveness of modern predator proof to protect goats and other livestock from wild predators highly encouraged them to do goat raring business. Before the construction modern predator proof corral Phul kumari and her family had around 25 goats and to rare these they had traditional pen so, there was always a high risk of goats being eaten by wild predator. But after the support from Hariyo Ban Program to built modern predator proof corral risk of livestock being eaten from inside enclosure has completely removed which is highly motivating them in doing goat rearing business. She reported that till now their total investment to built modern predator proof corral to shelter goat is around 2.5 to 3 lakh. Phul kumari also reported that the main idea of doing gaot rearing has came when Hariyo Ban supported them with predator proof corral after then only they started goat rearing business it in large scale and registered their firm named as Anup goat rearing firm

Fig 3. Phul kumari Tharu owner of Anup goat raering firm, Raptisonari Municipality.

Fig 4.Hybrid goat at Anup goat raering firm

Phulkuamri and her family are now raring a total of around 45 goats and are also planning to increase number of goats. She also illustrated they sell 10 to 12 goats yearly which gave them yearly income of around 3 to 3.5 lakh. They are also raring hybrid goat which they bought from Chitwan which cost them about 2.5 lakh rupees. Phul kumari tharu also informed that they received a sum of rupees 1 lakh 25 thousand as an award from Raptisonari rural municipality to support their business.

Overall, she reported that the Modern predator proof pens are very effective to prevent livestock from wild predators and it encouraged and motivated members of community for raring livestock and doing livestock business. Phul kumari tharu and her family are really grateful towards the WWF Nepal support and contribution.

3.

Fig 5. Kali Bahadur Budha owner of Krishna Pashupanchi firm, Thakurbaba Municipality.

Kali Bahadur Budha is one of the beneficiary and also a key informant from Sihabahini BZCF. He is currently in the post of Treasurer in Shihabahini Corporative, Ward No.2, Thakurbaba Municipality, Bardiya. He is also running livestock business named as Krishna pasupanchiFarm ward no. 2, shihabhini, Thakurbaba Municipality, Bardiya. Kali Bahadur Budha is in goat rearing and selling business for almost 12 years but he started doing commercially since 2074 and registered it as commercial firm after when Hariyo Ban Program supported them with modern predator proof corral. He reported that while he had traditional type of pen he used to rare only 4 to 5 goats as there was more chances of goats being eaten or killed by wild predator from inside enclosure but after the construction of modern predator proof pen he slowly increased the number of goats and currently he is raering fifteen goats and also planning to increase their number.According to him modern predator proof pens are playing very significant role in protecting livestock and also to enhance livestock business which is providing great support to increase their economic status.

Fig 6.Krishna Pashupanchi firm.

He reported that after the intervention of modern predator proof corral livestock are safe from being attacked or killed by wild predator as it was used to happen when they had traditional type of pen and it is also easier to raise livestock such as goats and sheeps inside enclosure as compare to traditional pen. He also reported that support from Hariyo ban program to build modern predator proof pen highly encouraged and motivated people's of the society to build these kind of predator proof pen as a result modern predator proof are slowly replacing traditional type of pen but the major problem they are facing is shortage of durable wood to build strong and long lasting pen and also lack of fodder grass to feed livestock.

CHAPTER VI

8. CONCLUSION

This study provides a glimpse to view about the effectiveness of Modern predator proof pen to save or prevent livestock from wild predator attacks and its contribution to enhance economic level of beneficiaries. This present study concluded that

- Among 186 households from the checklist, it was found that total of 182 households from three districts Kanchanpur(59), Bardiya(61), and Banke(62) were benefited the modern predator proof pen.
- Among 182 respondent, 99.45% have made modern predator proof pen only after the support and encouragement from Hariyo Ban Program, 0.45% had modern predator proof pen already.
- 99% beneficiaries responded that Modern predator proof pen are highly significant to prevent livestock from wild predator attack 1% said that it is in between to prevent livestock from wild predators attack.
- Community members from benefited area are seems to be highly motivated and encouraged towards constructing Modern predator proof pen.
- The survey results that the most of the respondents farmers have poor wellbeing status, highly dependent on forest, mostly they were the people who live near forests, usually involved in agriculture outside the forest, who regularly use forest products (timber, fuel wood, bush foods, medicinal plants etc.) partly for their own subsistence purposes and partly for income generation. So, they should be motivated more for income generation activities. It was found that the farmers were also involved in Cooperatives.
- There were some motivating factors found in the survey: last year's earning from livestock sell was nearly half the total investment till date giving an insight of the profit, the farmers were seen actively in the conservation works conserving the forest as well as indirectly working for the protection of the wild animals too.
- Construction of Modern predator proof pen also results in to reduce Human wildlife Conflict.
- People seemed to be really grateful towards WWF contribution and support and expressed their willingness to work with it again.
- The major and only problem that was causing the death of livestock by wild predators was seen to be the traditional predator proof pen as it was open and unsafewhich is now completely out of sight and there is vast reduction in number of livestock killed by wild predators as for each household has modern predator proof pen constructed.
- Overall, modern predator proof pen holds an impressive and encouraging example to prevent livestock from wild predator attack and to enhance economic status of community members.

REFERENCES

BR Bhattarai. (2009): "Human Tiger *(Panthera tigris tigris*) conflict in Bardiya National Park". A study of Bardiya National Park, Nepal.

DP Ayadi. (2011): "Human Wildlife Conflict In Buffer Zone Area". A study of Banke National Park, Nepal.

Malla (2003) “Park people conflict- A case study from Beldandi VDC adjacent to Suklaphata National Park of western lowlands, Nepal”.

Allendorf, T.D. (2007): “Residents’ attitudes toward three protected areas in southwestern Nepal” J. Biodiversity and Conservation (2007) .

Bhatta, S. (2003): “Draft Report on Elephant- Human Conflict in Nepal Terai Park areas withParticular emphasis to Western Terai Arc Landscape”. Kathmandu, Nepal

BZMC (2010): “Major Raht File Bardia National Park”, Buffer Zone Management Council, Bardia National Park, Bardia, Nepal

Manoa, D. and Mwaura, F. (2016). Predator-Proof Bomas as a Tool in Mitigating Human-Predator Conflict in Loitokitok Sub-County Amboseli Region of Kenya. Natural Resources, 07(01), pp.28-39.

Acharya, K., Paudel, P., Neupane, P. and Köhl, M. (2016). Human-Wildlife Conflicts in Nepal: Patterns of Human Fatalities and Injuries Caused by Large Mammals. PLOS ONE, [online] 11(9), p.e0161717. Available at: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0161717.

DNPWC (2010): “Fact Sheet on Banke National Park and Buffer Zone Area” Department of National Park and Wildlife Conservation, Babarmahal , Kathmandu.

FAO (2009): “Human-wildlife conflict in Africa Causes, consequences and management strategies” Forestry paper, Food and agriculture organization of the United Nations Rome.

FAO (2007): “Nature & Fauna- Human-Wildlife Conflicts”, Food and Agriculture Organization of the United Nations, Ghana. J. Nature & Fauna Vol. 21, Issue 2 Retrieved from: http://www.fao.org/world/regional/raf/workprog/forestry/magazine_en.htm

Gurung, G. and Thapa, K. (2004): “Snow Leopard (Uncia uncia) and Human Interaction in Phoo Village in the Annapurna Conservation Area”, Nepal

WWF (2005): “Human Wildlife Conflict Manual-Wildlife Management Series”, World Wildlife Fund, Switzerland,

WWF (2006): “FACTSHEET: Human-animal conflict”, World Wildlife Fund, Switzerland

WWF (2005): “Human wildlife conflict manual 2005: Wildlife management series”, WWF-World Wide Fund for Nature Southern African Regional Program Office (SARPO)

WWF (2006): "Species fact sheet: Human-animal conflict" World Wildlife Fund, World Wildlife Fund International, Switzerland. Retrieved From: www.panda.org/species on 1May 2010

WWF (2007): "A Case Study on Human-Wildlife Conflict in Nepal (With particular reference to Human-Elephant Conflict in Eastern and Western Terai regions)", World Wildlife Fund, Kathmandu, Nepal.

ANNEXES

Annex 1: Checklist for beneficiary

Date: …….
Name of NRM: ……. Address: ……..Name of respondent: ……
Name of beneficiary: ……Age: ……. Gender: ……..... Contact: …….

1. How you are dependent in forest?
2. What type of predator proof pen you have before and now?
3. How much support you get from organization such as by Hariyo Ban, By Community forest and by other organization to build modern predator proof pen?
4. How many number livestock of were killed by wild predator before and after construction of modern predator proof pen and its economic impact?
5. Number of livestock you raised before and after the construction of modern predator proof pen?
6. Is modern predator proof is able to prevent livestock from wild predator attack?
7. Is modern predator proof pen assist to enhance livestock business in the community?
8. What kind of kind of responses are coming from the people in the community towards the effectiveness of modern predator proof pen?
9. Whether the modern predator proof pen encourages people in the community to build it?
10. Whether modern predator proof pen are effective to replace traditional pen from the community?
11. What is your view on WWF and its work in your community?
12. What are the major challenges and problems you are facing to make modern predator proof pen more effective?
13. What can be done to make modern predator proof more effective?

Annex 2: List of KIs

SN	Name	Name of BZCFUG/CF/UC	District	Municipality/Rural Municipality	Ward no	village	Post	Contact No
1	Parwatisingh	Pragati UC	Kanchanpur	Bhimdatta Municipality	19	Bagh Phanta	Vice chairperson of Pragati UC	
2	Dil Bahadur Singh	Shrijana UC	Kanchanpur	Bhimdatta Municipality	19	Bagh Phanta	Member of Shrijana UC	
3	Jayanti Jora	DautariUc	Kanchanpur	BhimdattaMuncipality	19	Bagh Phanta	Dautari UC	
4	Kali Bahadur Budha	SihabahiniBZCFUG	Bardiya	Thakurbaba Municipality	2	Sihabahini	TreasureinSihabahini Corporative	9848004900
5	Bhoj Lal Tharu	JanchetanaCFUG	Bardiya	Thakurbaba Municipality	2	Perahini	Chaiperson of Perahini UC and Member of Shree Ramnagar UC	9848033191
6	Khadak	Shivashankar	Banke	Raptisonari Rural	2	Gobarpur	Former Vice	984813753

	Bahadur KC	BZCFUG		Muncipality			Chairperson of Shivshankar BZCFUG	8
7	Ghan Bahadur Oli	Apkholi BZCFUG	Banke	Raptisonari Rural Muncipality	2	Guruwogau	Chairperson of Apkholi BZCFUG	9844820533

Annex 3: Checklist for KIs

Date: ……..
Name: ……..…….. Age: …… Gender: …….....
Address: ……...Name of BZCFUG/CFUG/UC: …… Post: ……..……..
Contact No.: ……

1. How mucheffective these modern predator proof pens are being so far?
2. What are the difference between traditional pen and these modern pens?
3. How effecting does these modern predator proof are being to reduce economic loss
4. What kind of responses are coming from the peoples in community about the effectiveness of modern predator proof pen?
5. Is there are people in the community except the beneficiary who constructed these kind of pens after being motivated from the effectiveness of modern predator proof pen?
6. What are your opinions and views regarding to make these pens more effective?

Some samples of predator proof pens


प्रो. जित बहादुर चौधरी
पान नं. ६०८७०५०
अनुप बाखापालन फार्म
रापती सोनारी-२, गोमारपुर, बांके
हाम्रो यहाँ बोयर क्रस पाठापाठी तथा स्थानीय जातका बाख्रा,
पाठापाठी बिक्रीबिक्री वितरण गरिनुका साथै खरिद पनि गरिन्छ ।

Disclaimer: This assessment is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of the Consultant and do not necessarily reflect the views of USAID or the United States Government.