

INTRODUCTION

1.1. Background

Vultures play a vital ecological role through the rapid consumption of animal carcasses. They are supposed to be a sweeper of the ecosystem and play significant role on ecosystem to make it clean and healthy. Vulture can finish off carcasses of adult cattle in about 20 minutes (Ali and Ripley, 1983).

Out of 23 species of vultures found in the world, 16 species of vultures are from family Acciptridae (The old world vultures) and 7 species are from family Cathartidae (The new world vultures). Nine species of vulture have been recorded in Nepal, namely: White-rumped Vulture (*Gyps bengalensis* Gmelin, 1788), Slender-billed Vulture (*Gyps tenuirostris* Gray, 1844), Red-headed Vulture (*Sarcogyps calvus* Scopoli, 1786), Indian Vulture (*Gyps indicus* Scopoli, 1786), Egyptian Vulture (*Neophron percnopterus* Linnaeus, 1758), Bearded Vulture (*Gypaetus barbatus*, Linnaeus, 1758) Himalayan Griffon (*Gyps himalayensis* Hume, 1869), Cinereous Vulture (*Aegypius monachus* Linnaeus, 1766) and Griffon Vulture (*Gyps fulvus* Hablizl, 1783) (BCN and DNPWC, 2016). Among these six (WRV, SBV, RHV, EV, BV and HG) are resident breeders, one is a winter migrant (CV), one is a passage migrant (GV) and one is a vagrant species (IV) (BCN and DNPWC, 2011; DNPWC, 2015). Vultures are found on every continent except Antarctica and Oceania. These are scavenging birds ranging from medium to large sized birds that are dependent on the carcasses of dead animals.

Vulture get food from their crops for their young instead of carrying prey to the host, they usually do not kill their own prey which classify them as raptor. Vultures have weak feet with talon and bare head to prevent the feathers from becoming dirty while feeding.

Vultures are the primary consumers of carrion in Asia and Africa with and individual gyps vulture consuming around 1 kg of tissue every three days (Mundy *et al.*, 1992). They also have an important cultural role in the consumption of human dead bodies in the form of sky burials within Nepal, Tibet (Pokhrel, 2015).

Status of Vultures in Indian Sub-continent

In the past decade, among the nine species of vultures recorded in Indian sub- continent (Prakash *et al.*, 2003), five species of vultures are in gravedanger of extinction (IUCN, 2012).

Population of *Gyps bengalensis*, *Gyps indicus*, and *Gyps tenuirostris* have declined by more than 99% in India (Prakash *et al.*, 2003; Pain *et al.*, 2004) and in Pakistan annual rate of decline appear to be increasing. Further two more species of vultures red headed vulture and

Egyptian vulture have rapidly declined in the recent years (Cuthbert *et al.*, 2006). The study of (Rondeau *et al.*, 2004) had shown the same percentage as in Indian subcontinent of decline of vulture population in rural area of sudano-sahelian savannas of West Africa's Burikina Faso, during the past 30 years.

Due to this decline, all five species are now listed threatened by the IUCN. (Red list of threatened species except Egyptian vulture which is listed as Endangered altogether four are listed as critically endangered which is the highest threat category of the IUCN.

Status of vulture in Nepal

Nine species of vulture found in Asia have been recorded in Nepal which are placed within the family Accipitridae and order Accipitriformes (Bird life international, 2014).

Out of nine species, five are Gyps species ie. White rumped vulture (*Gyps bengalensis*), slender billed-vulture (*Gyps tenurostris*), Himalayan Griffon (*Gyps himalayansis*), Eurassian Griffon (*Gyps fulvus*), long-billed vulture (*Gyps indicus*). Other vulture species include; red headed vulture (*Sarcogyps calvus*), Egyptian vulture (*Neophron percnopterus*), Lammargier vulture (*Gypaetus barbatus*) and Cinerous vulture (*Aegypus monachus*).

White-rumped vulture, slender-billed vulture, Egyptian Vulture, Red-headed vulture, Himalayan Griffon and Lammargier are resident breeders whereas Eurassian griffon is passage migrant and Cinerous vulture is winter visitor (Grimmelt *et al.*, 2003; DNPWC/MoFSC/GoN, 2009)

The long billed vulture which was found to be limited in India and Pakistan only (Decandido *et al.*, 2012) has also been recorded from Nepal recently but the status of long billed vulture is not known.

Inskipp and Inskipp (2001) observed the evidence of drastic decline of vultures in the different parts of Nepal.

In the past decades, the white-rumped vulture was the most common vulture in the lowland of Nepal (Fleming *et al.*, 1984). The population of white-rumped vulture in Koshi Tappu decreased by 85.35% between 2000 to 2003 (Baral *et al.*, 2004).

Monitoring of vulture population in lowland of Nepal between 1995 to 2011, revealed declines of 91% and 96% for White-rumped vulture and Selender-billed vulture respectively (Chaudhary *et al.*, 2012). Similarly population of Bearded Vulture and Himalayan griffon in upper mustang delined by 80% during 2002-2008 (Acharya *et al.*, 2010) and 70% during 2000-2005; respectively (Acharya *et al.*, 2009) .

Table 1. Conservation status of vulture in Nepal

common name	scientific name	Status		Breeding status
		IUCN Red list	cites appendix	
White rumped vulture	<i>Gyps bengalensis</i>	critically endangered	II	Resident breeder
Slender billed vulture	<i>Gyps tenuirostris</i>	critically endangered	II	Resident breeder
Long billed vulture	<i>Gyps indicus</i>	critically endangered	II	Recent visitor
Himalayan griffon	<i>Gyps himalayansis</i>	least concern	II	Resident breeder
Eurasian griffon	<i>Gyps fulvus</i>	least concern	II	Passage migrant
Red headed vulture	<i>Sarcogyps calvus</i>	critically endangered	II	Resident breeder
Egyptian vulture	<i>Neophron percnopterus</i>	Endangered	II	Resident breeder
Cinereous vulture	<i>Aegyptius monochus</i>	Near threatened	II	Winter visitor
Lammergeier vulture	<i>Gypaetus barbatus</i>	least concern	II	Resident breeder

The most catastrophic and fast decline of the white rumped vulture and other *Gyps* related vulture has been found in South Asia. The death of vulture was first observed in 1997 among oriental white rumped vulture in Keoladeo national park in India and all over India (Prakash 1999, Prakash *et al.*, 2003, Prakash *et al.*, 2007).

The decline of vultures were also recorded in Nepal and Pakistan (Baral *et al.*, 2005, Gilbert *et al.*, 2006)

All declines have been coincided with the peak use of veterinary drug (Diclofenac) in south Asia. Only a small proportion (one in 130) of carcass contaminated with lethal level of diclofenac can cause the observed vulture mortality rate (Green *et al.*, 2000).

After identifying diclofenac as the major cause of the decline of vulture population in Africa and South Asia, a group of governmental and non-governmental organizations tried to establish vulture restaurant since 2000.

Vulture restaurant is a place where vultures are feeding supplementary safe food (Poudel, 2012). Many vulture restaurants have been established in the world and the main objective of these restaurants is to conserve vulture population by providing supplementary food in safe feeding site or to provide diclofenac free carcass for vulture (Monadjem *et al.*, 2004). Old and

disabled livestock are collected and cared until their natural death and these dead livestock are placed at a designated place for vultures to feed. This helps to reduce the risk of spread of diseases, keep sociocultural and religious aspects. This also provides an opportunity to raise the public awareness on vulture conservation. Vulture restaurant is also linked with income generation activities and improvement of the livelihood of local people. Local communities operate the vulture restaurant by providing old and disabled livestock so that after their natural death they can provide safe food for vulture and provide vulture conservation activities in that area. In return local communities receive income directly or indirectly from tourism and from the cattle. The community can sell skin to the leather industry and bones and manure to the fertilizer industry.

Initiation of vulture restaurant, also known as vulture safe feeding site took place in 2006 in Nawalparasi district (Paudel, 2012) so far seven vulture safe feeding sites have been established in six districts of Nepal which are situated in Pithauli Nawalparasi district, Khutiya Kailali district, Ghanchowk Kaski district, Ramdhuni forest Sunsari district, Lalmatiya and Bijauri of Dang district. Awareness raising programs targeting various groups such as veterinarians, pharmacist, school children, government agencies, conservation partners and local communities are some major vulture conservation programs in action.

The Government of Nepal prepared and implemented the Vulture Conservation Action Plan for Nepal (2009-13); and renewed the Vulture Conservation Action Plan for Nepal (2015-19), which is currently being implemented (DNPWC, 2015). Organisations like Bird Conservation Nepal (BCN), has been supporting this vulture conservation action plan in Nepal since then.

After finding the alternative drugs Meloxicam which is also used to treat a variety of ailments in domesticated ungulates, in 2006 Nepal, India, Pakistan banned the production and use of veterinary drugs diclofenac.

Green *et al.* (2004) concluded the other reason for the decline of vultures other than diclofenac. Poisoning the carcasses that are placed to kill other animals i.e. leopard, jackal, cat), reduced food availability, falling of nesting tree especially those with active breeding attempts, disturbance and destruction of the nest to prevent vulture nesting above the agricultural land and dwelling, hunting for medicinal purpose etc.



Figure 1: Vulture Safe feeding sites in different districts of Nepal. (Source: BCN)

1.2. Objective of the study

1.2.1. General objective

The main objective of the study is to explore the sustainability of vulture safe feeding sites in Dang district, Nepal

1.2.2. Specific objectives

- To study the breeding success of white rumped vulture (WRV) in Ucha-Nimbu community forest (UNCF) of Dang district.
- To identify peoples' knowledge, attitude, perception towards vulture and Jatayu restaurant for the conservation of vulture
- To access livestock description and the carcass disposal mechanism outside the Jatayu restaurant as food for vulture.
- To find out the potential threats to vulture conservation in the study area.

1.3 Justification of study

Vulture's population has been decreased in Nepal. Among nine species of vultures, four species (*Gyps bengalensis*, *Gyps tenuirostris*, *Gyps indicus*, *Sarcogyps calvus*) are listed critically endangered and species *Neophron percnopterus* as endangered in the IUCN red list (IUCN, 2011).

Diclofenac, NSAID, which are used to treat the livestock, was found to be main reason for the decline of vulture population catastrophically. Though there are other reasons for the decline of the vulture such as poisoning the carcass to kill other animals, reduced food availability, disturbance and destruction of the nest, hunting of them for medicinal value. Despite the ban of diclofenac in veterinary use since 2006 in Nepal, India, Pakistan, it is necessary to study on this drug whether it is available in the market or not.

As the establishment of Vulture Safe Feeding Site was necessary for providing carcass free from diclofenac to the vulture, it seems necessary to find out the possibilities for its sustainability in the future too.

Many researchers have been conducted research study on various topics in various places about vulture however few researches have been conducted for study of sustainability of vulture safe feeding site in Dang district. Various management models and approaches have been taken for the conservation of vulture so this study might be highly beneficial for Bird Conservation Nepal, funding support for this project, for obtaining data for sustainability of vulture safe feeding sites in Dang district Nepal.

1.4 Limitations of the study

Data for Population status and distribution of vulture could not be taken which might be limitation of this research study.

2. LITERATURE REVIEW

2.1 In National Context

Fleming *et al.* (1984) found White-rumped vulture as most common vulture in the lowland of Nepal. Inskipp and Inskipp (2001) recorded 20-40 numbers of White-Rumped Vulture in Nepal in 1982.

Inskipp and Inskipp (1985) observed small population of white rumped vulture during 1980-1982 in Kathmandu valley.

Giri and G.C. (2000) observed the good population of *Gyps bengalensis* and *Gyps tenurostris* in Suklaphanta wildlife reserve.

Baral *et al.* (2000) found the decline of vulture in lowland of Nepal from 310 to 160 during the period of April 1993 to July 2000. During March 2002, the number reached to 64 in Rupandehi district near Lumbini.

Giri and G.C. (2002) noted total 15 nest (79%) were built on Silk cotton tree *Bombax cibeal* 16% on pipal (*Ficus religiosa*) 50% on karma (*Adina cordifolia*) only one pipal tree contain double Nest. Total 9 nests were recorded (5 White-Rumped Vultures, 3 Slender billed and 1 unknown Vulture). Nineteen Nest in January (9 White Rumped, 7 Slender billed, 3 unknown) were seen. 38 Carcasses were recorded in study area. 7 dead vultures were recorded in different nesting location. 28 adult, 5 sub-adult and 4 Juveniles of White-rumped Vultures were recorded on January 2nd. 15 adult, 4 sub adult and 3 juveniles of Slender billed vultures on Jan 4th in different 3 flocks were recorded.

Virani *et al.* (2002) concluded 45 white backed vultures dead in eastern Nepal and five were observed in western Nepal where first survey of vulture was conducted in Nepal in 2000-2002.

Baral *et al.* (2004) observed the massive decline of *Gyps bengalensis* in Koshi Tappu wild life reserve and other parts of Nepal.

Baral *et al.* (2005) concluded 64 nested vultures in Rampur, Nepal. Falling of kapok tree, use of diclofenac poisoning were threats to vulture population.

Shultz *et al.* (2004) recorded the residue of diclofenac in dead vultures from Rampur. The result indicated that diclofenac is poisonous to vulture causing kidney failure with clinical sign of visceral gout prevalent.

Cuthbert *et al.* (2006) observed the decline of red headed vulture in the Indian sub-continent including Nepal.

Acharya (2006) observed the decline of population density of *Gyps bengalensis* in upper Mustang by 94% between 2003-2004 and the use of pesticides herbicides and availability of diclofenac in that area were responsible for the decline of vulture population.

Baral and Gautam (2007) found the decline of vulture due to human impacts such as human population growth and associated deforestation, grazing and cropping the reduction of traditional food sources.

Virani *et al.* (2008) found no evidence of decline of *Gyps himalayensis* in Annapurna conservation area and concluded that they may not have faced the same degree of diclofenac poisoning in Annapurna conservation area.

Paudel (2008) observed the maximum number of *G. himalayensis*, *Neophron percnopterus*, *G. bengalensis* and *Aegypius monachus* though diclofenac availability was still threat.

DNPWC/MOFSC/GoN (2009) said that vultures cannot survive as diclofenac use continues hence conservation priority must be first to prevent the exposure of vulture to diclofenac contaminated food.

MOFSC (2009) noted that *Gyps bengalensis*, *Gyps tenuirostris* and *Sarcogyps calvus* are critically endangered.

BCN research found 16% annual decline in white rumped vulture from 2002 to 2009 in Nepal.

BCN research found that the average breeding success for white rumped vulture of Nepal is 64%

Acharya *et al.* (2010) found the decline of *Gypaetus barbatus* in upper mustang by 73% between 2002-2008.

Sharma (2012) noted that the use of diclofenac as a veterinary NSAID for treating livestock in south Asia, posed a high risk of toxicity to vultures scavenging because it was thought to metabolise into diclofenac in domesticated ungulates.

2.2 In Global Context

Munday *et al.* (1992) noted that the vultures are the primary consumer of carion in Asia and Africa.

Prakash *et al.* (1999) found decline of vulture population of *Gyps bengalensis* and *Gyps indicus* by 95% between 1988 to 1999 in keoladeo national park of India.

Gilbert *et al.* (2000) observed high proportion of decline of three species of vulture in Pakistan where 78% of dead adult and 63% sub adult had visceral gout.

Prakash *et al.* (2003) noted the decline of vulture population throughout the Indian continent by 95%.

Pain *et al.* (2003) recorded that many vultures have disappeared from many parts of their former ranges due to the shortage of food and loss of habitat.

Shultz *et al.* (2004), Prakash *et al.* (2005) found the evidence from India and Nepal that support diclofenac hypothesis.

Ruxton and Huston (2004) noticed that gyps vultures are the only extant vertebrates that survive by locating and feeding exclusively from dead animal and are regarded as obligate scavengers.

Green *et al.* (2004) concluded that the nonsteroid anti-inflammatory drugs (NSAID) diclofenac is the main and only one cause of the population decline of vulture population.

Oaks *et al.* (2004) indicated that vultures are exposed to diclofenac when they feed from carcasses of livestock that have died within a few days of treatment and contain toxic residues of the drugs and he found diclofenac was the main cause of decline of vulture population.

Rahmani (2004) found many other factors such as infectious diseases, environmental contamination accidental poisoning along with exploitation and persecution for the decline of population of vulture.

Swan *et al.* (2006) observed that vultures that consume sufficient tissue from the treated carcass die from the effect of diclofenac induced kidney failure with clinical sign of visceral gout prevalent in all birds.

Swan *et al.* (2006) discovered that NSAID; meloxicam to be safe to Indian critically endangered *Gyps* sps and several other scavenging birds. There was no change in feeding behavior or body mass or any increase in uric acid related to treatment of vultures dosed with meloxicam as occurred in vultures dosed with diclofenac.

Prakash *et al.* (2007) observed the decline of vulture population by 1990, where white backed, slender-billed and long-billed vulture have been declined by 97% and white-rumped vulture by 99% in India from 1992 to 2007.

Gilbert *et al.* (2007) found that vulture restaurant can reduce the death of vulture but not eliminate vulture mortality through diclofenac exposure and thus provide the valuable measures in reducing population decline.

Green *et al.* (2007) found that carcass contaminated with diclofenac were sufficient to have caused vulture decline at the observed rates without the involvement of any factors in India between 2004 to 2005.

Bowden (2009) identified a safe alternative drug removing diclofenac from the environment and establishing a full scale conservation breeding program for further reintroduction once diclofenac had been removed.

Das *et al.* (2010) found that all species of gyps vulture tested so far are highly sensitive to diclofenac.

Cuthbert *et al.* (2011) noted that there is a decline in the prevalence and concentration of diclofenac in their tissues of domesticated ungulates carcass in India after the ban of diclofenac since 2006.

Prakash *et al.* (2011) found the stabilization of the population of long billed and slender – billed vultures and increase in the oriental white backed vulture population in India between 2007 to 2011 in road transect survey.

Chaudhary *et al.* (2012) noted the increase in vulture population in Pakistan.

Ogeda *et al.* (2012) found that Egyptian and red headed vultures are threatened by a variety of problems including change in natural and agricultural system.

3. MATERIALS AND METHODS

3.1 The Study Area

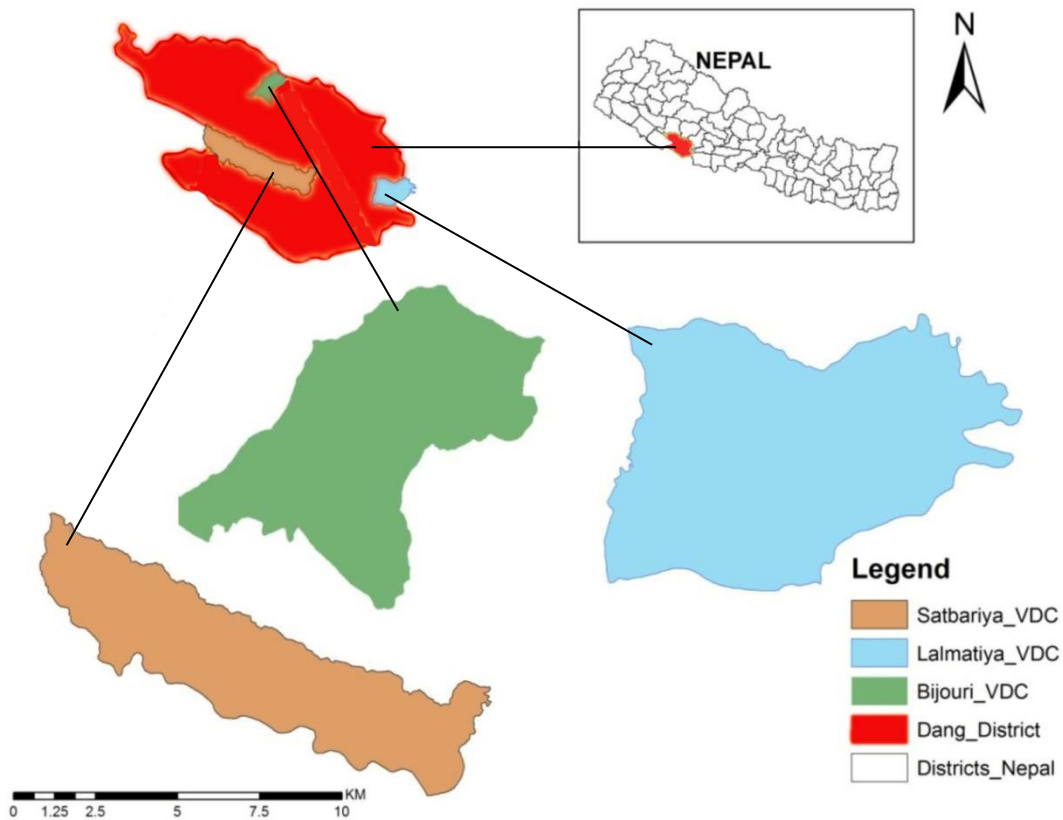


Figure 2: study area

3.1.1 Dang District

Dang is located in inner terai 410km west of the capital city Kathmandu in mid-western Nepal. It is situated in 82° to 82.46° longitude and 27.45° to 27.67° latitude. It lies at 213-2058 m of elevation. The district covers $2,955\text{km}^2$ with the population of 548,141 according to the census of 2011. The district consists of the larger easterly and upstream portions of the parallel inner terai valley of Dang and Deukhuri enclosing ranges of hills and mountain.

3.1.2 Location

Vulture safe feeding site is situated in Kalika Community Forest of Lalmatiya V.D.C. of Dang district. The VSFS lies very close to the town of Bhalubang and Lamahi and is located along the east west highway. Cowshed is approximately 100metre north from the highway and feeding station is 5 min away from community forest office.

Another VSFS is situated at Bijauri in Bhulke Community Forest, Dang District. It is closer from Tulsipur Dang .It is 41 km north from Lamahi dang on the East-west highway 18 km west of Ghorahi and 5 km north of Bijauri.

3.1.3 Climatic Description

Dang has tropical, sub-tropical and warm temperate type of climate. Spring (March to May), summer (June to August), autumn (September to November) and winter (December to February) are four distinct seasons in this area. The climatic condition of Dang is characterized by hot climate with prevailing monsoon rain with annual temperature ranging from 15-40 °C. November, December, and January are too cold while June and July are hot. Dang district has the elevation from 300 m to 2000m with varying climatic condition from lower tropical to sub-tropical climatic zone.

Table 2. Showing climatic description

Climate Zone	Elevation Range	% of Area
Lower Tropical	Up to 300 meters	18.10%
	Up to 984 feet	
Upper Tropical	300 to 1,000 meters	69.90%
	984 to 3,280 ft.	
Subtropical	1,000 to 2,000 meters	12.00%
	3,280 to 6,560 ft.	

Average annual rainfall in the district is about above 1500mm. In the last 20 years the yearly maximum rainfall is 1800 mm and minimum is 1300mm. Similarly, by comparing the recent temperature data with that of last 20 years, the climate change can be noticed clearly.

3.1.4 Vegetation

Dang district consist of sub-tropical to mixed dry tropical deciduous forest. In valley *Shorea robusta* (Sal) is dominant. In hilly region there is mixed dry tropical deciduous forest. *Terminalia alata* (Saj), *Dalbergia sisoo* (Shisham), *Adina cardifolia* (Karam), *Dillenia pentagyna* (Tantari), *Mangifera indica* (Mango tree), *Ficus religiosa* (Peepal tree), *Bombax ceiba* (Simal) are most common species.

Mixture of *Typha angustifolia* (Khar) and *Saccharum spontaneum* (Kans grass) grassland is observed in good condition in Sisahaniya VDC. The forest is found covered with sal tree near the VSFS in Bijauri. Thakuri (2009) had reported 246 bird species during his survey and five different species of vulture (*G. bengalensis*, *G. himalayansis*, *S. calvus*, *N. percnopterus* and

G. tenuirostris) in the area. Mammals like *Elephas maximus* (Elephant) and *Boselaphus tragoamelus* (Nilgai) are seasonal visitors. *Melursus ursinus* (Sloth bear), Terai Langur, Rhesus monkey, leopard, hyena, etc are also found in this area (Pokhrel and Shah, 2008).

3.1.4 Socio-economic Description

Dang with steep, virtually uninhabited southern slopes of the Mahabharat range is another cultural buffer zone between traditional Tharu lands and the culturally distinct middle hills where Brahmins and Chhetris are dominant and ethnic groups such as Gurung, Rai, Magars are very few in numbers and are migrant. Dang has droughty and agriculturally unproductive land. Alluvial to sandy type of soil is found and most people of Dang are based on agriculture, animal husbandry, fish farming and poultry farming. The main cereal crops produced in Dang valley are paddy, maize, wheat. Cash crop includes oil seed, potato, sugarcane etc. Winter seasonal, summer seasonal and non-seasonal types of crops are cultivated throughout the year.

3.2 Materials

GPS (Global Positioning System)
Binocular
Camera
Questionnaire

3.3 Methods

3.3.1 Preliminary Field Survey

Preliminary survey was done to gain the knowledge about the study area. The survey was conducted in Lalmatiya, Kaptangunj and Bijauri of Dang district during September 2015 to find out VSFS, vulture occurrence, community structure site for questionnaire survey in vulture safe feeding site. Local people and trained personnel were consulted in this record.

3.3.2 Nest Census

According to Postupalsky (1974), an active nest is the one in which egg has been laid. The nest from which a chick gets fledged is termed as successful or productive nest. To study the breeding success of WRV, nests were counted and nest occupancy was recorded. Nest monitoring was carried out from (Dec.5-2015, 5-April-2016, and May 2-2016) to assess the nest status and breeding success. GPS was used to locate the coordinates of the nests. Name of the tree species and crude height of the nest on the tree were also recorded.

Breeding success of WRV was determined by using formula

Breeding success = Productive nest/active or occupied nest* 100

3.3.3 Questionnaire survey

Questionnaire survey was conducted in Bishnupura and Ward number 4 of Lalmatiya, Syalapani and Kuiretaal (Ward number 9) of Bijauri in order to find out the people's attitude towards vulture conservation.

Altogether 300 households were selected 200 from Lalmatiya area and 100 from Bijauri area. This was done by using stratified random sampling method. The survey was conducted during October 2015 in Lalmatiya and March 2016 in Bijauri. Questions were framed to seek the information about mortality of vulture due to diclofenac and any other reasons, to know the current status of vulture ie either increasing or decreasing or constant, to know the benefit and harm caused by vulture in their area. The number of livestock available in their area was recorded and the disposal mechanism of dead cattle was also noted.

The interview with local people was focused on vulture, vulture safe feeding site, household livestock ratio, NSAID monitoring.

The questionnaire was focused on people's attitude towards vulture safe feeding site and the likelihood of success with new conservation initiatives in the study area. The information was collected through various means. Maximum households (with one person from each house of age 20-70 years) in adjacent areas were interviewed using semi structured questions. To maintain effective interaction, adults above 20 yrs old were interviewed giving more priority to the household.

Though the questionnaire was on English medium they were asked by translating in Nepali. Local words were used and technical jargons were avoided whenever possible. The questionnaire survey about veterinary drugs was carried out from Bhalubang to Bijauri. They were asked regarding the current trends of the uses and prevailing stocks of NSAID in the agro-vet shop whether diclofenac is used or not, what are other alternative drugs, the number of livestock cases for treatment, set of questionnaire was asked which is attached in appendix.

Descriptive analysis was performed from the collected data and presented by pie chart, bar diagram and line graph.

3.3.4 Direct Field Observation

Carcass is also food of other scavengers like dog, crow, eagle etc. Direct field observation was done to find out the possible threats to vulture inside the vulture restaurant. The competition for food between different animals was identified by direct observation. A list of suggestions and probable future threats were detected by group discussion with the participation of local people, forest officer, and Jatayu Restaurant staff.

3.3.5 Focal Group Discussion

Focal group discussion was done by gathering of forest officer, forest users, committee members, Jatayu Restaurant management committee member, teacher etc. Discussion was done to find out the possibilities of long term sustainability of vulture restaurant and preferable management policy of VSFS in future was identified.

3.3.6 Group Discussion

During the field survey, different meetings with local people were organized to discuss - about the sustainability of vulture safe feeding site. During this, every person of age group 20-60 was included and their view were taken and analyzed about the merits and demerits of restaurant in their place. During the discussion period people were informed about the

conservation policy for conservation of vulture and the benefit of having VSFS near their area.

3.3.7 Secondary data collection

Secondary data were collected from published and unpublished data from BCN, articles, reports, book, internet and previous related articles and after collecting from different sources these secondary data were reviewed. Data were edited after they are collected to detect errors to ensure accuracy and well arrangement.

3.4 Data Analysis

The data collected from the primary and secondary data sources were analysed through Microsoft excel and SPSS (Statistical package for social science).

4. RESULTS

4.1. Breeding success of White-rumped vulture

4.1.1. Distribution of Nest

The survey was conducted during 6-Dec-2015, 5-Apri-2016, 2-May-2016). During the survey, altogether 19 nests were observed in UNCF of Dang District. All the nests belong to White-rumped vulture (WRV). All nests were built on Saaj tree (*Terminalia tomentosa*).

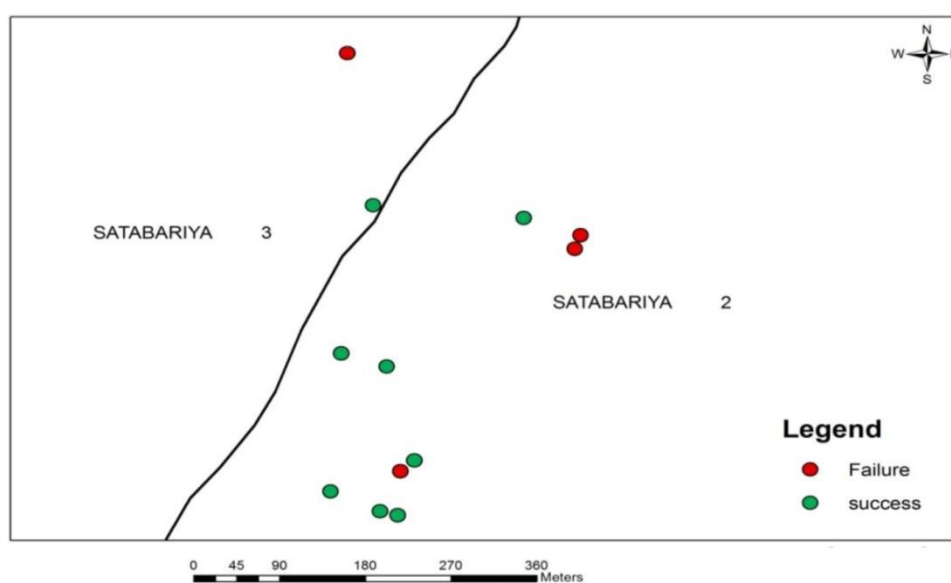


Figure 3: Nest distribution of WRV in Uchanimbu Community Forest

4.1.2. Breeding Success

Among 19 nests of White-rumped Vulture found in UNCF of Dang district, 14 were productive (Fledged chick) and rest 5 were failed to fledge chick. The breeding success of white rumped vulture was found to be 74%.

Table 3:-Breeding success of white rumped vulture

Vulture species	Active nest	Productive nest	Breeding success (Active nest as primary unit)
White rumped vulture	19	14	74%

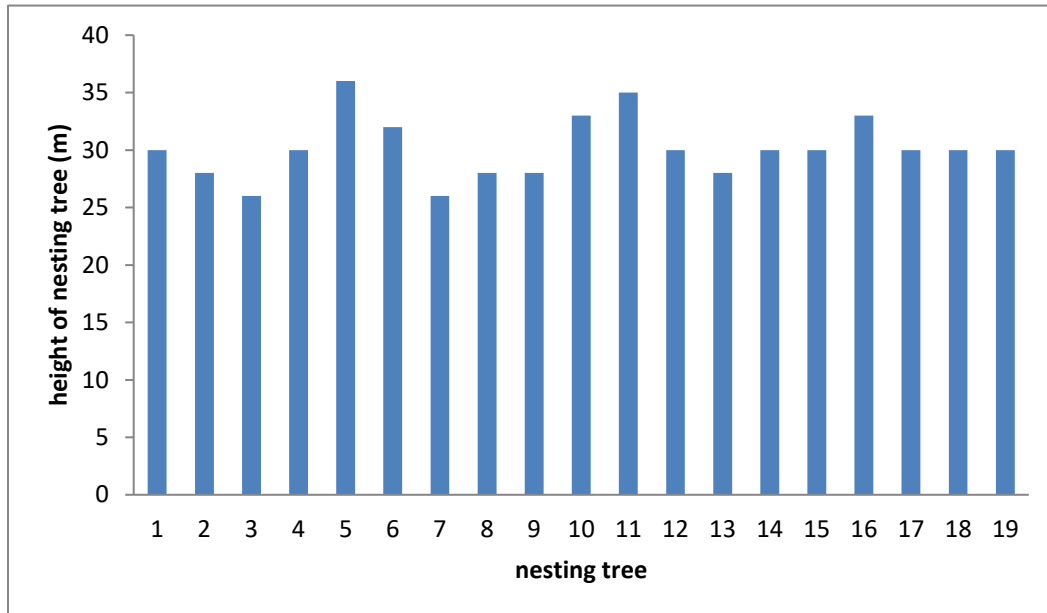
4.1.3. Characteristics of the nesting tree

The analysis of the nesting tree was done to identify their characteristics in term of their height of the tree at which nests were built.

4.1.3.1 Height of the tree

The analysis of the height of the tree suggested that White rumped vulture prefer taller tree than the shorter one as big tree make them easy during flight and the nests too are quite safe

due to the height. As vultures are big bird they need big and strong tree for nesting which is verified by the utilization of big tree Saaj (*Terminalia tomentosa*). The maximum height of the tree in which the nest was built was found to be 38 meter and the minimum height was 32 meter. Similarly, the average height of the tree was 34 meters.



4.1.3.2 Nesting height

The maximum height at which nest was built was 36 m. and the minimum height was 26 m. The mean height was found to be 30 m. The height at which the nest was built is shown in the fig.5.

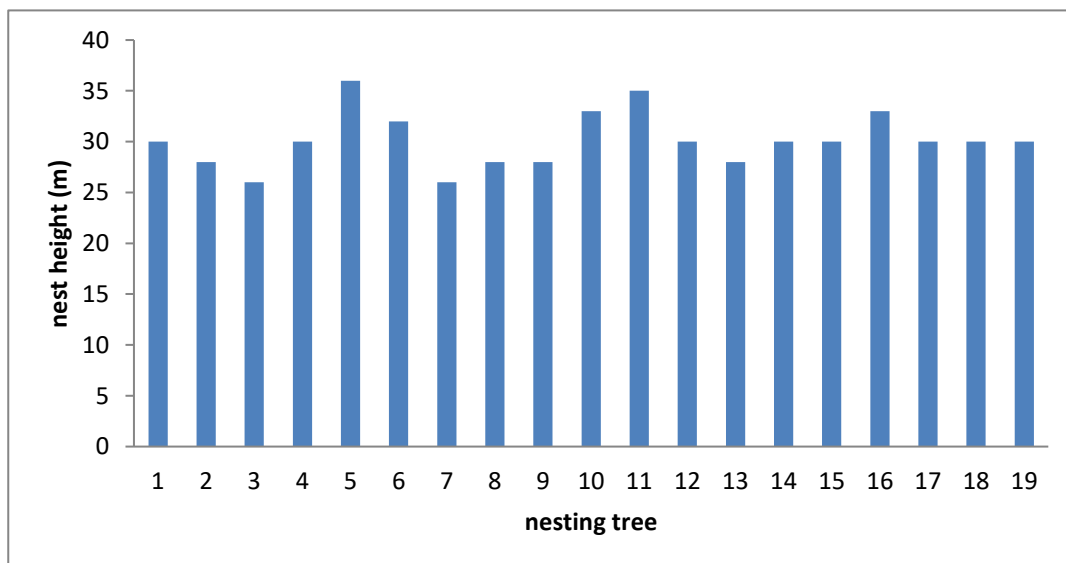


Figure 5. Showing heights at which nest were built on the nesting tree.

4.1.4 Relationship between nesting height and tree height

From the calculation, the correlation between the height of the tree and the height of the nest was found to be highly +ve ($r= 0.829$) at 0.01 level of significance from which it can be said that height at which the nests were built was height dependent on the height of the tree

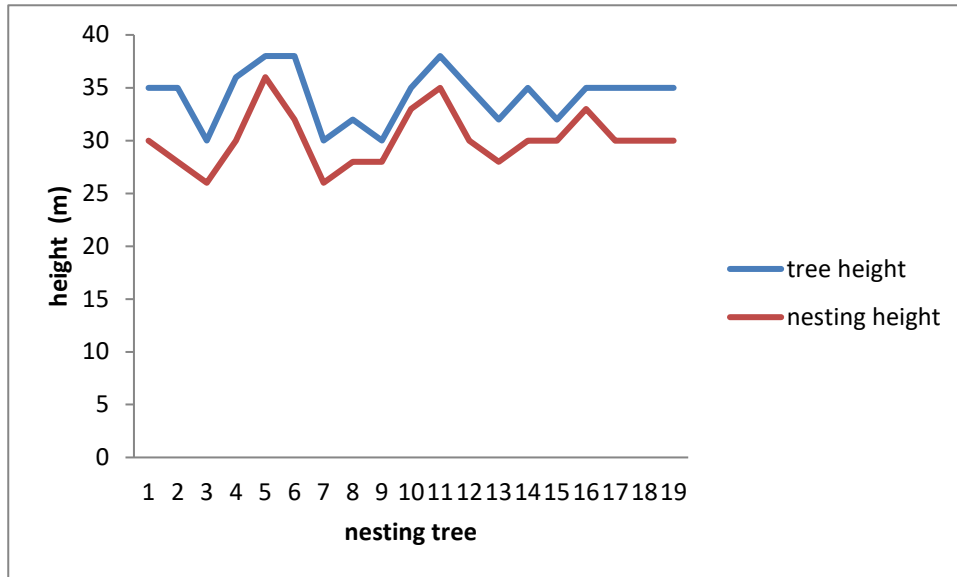


Figure 6. Showing relationship between height of the tree and the nesting height.

4.2 People's view on knowledge, attitude and perception towards vulture and vulture conservation

4.2.1 Socioeconomic characteristics of the respondents

4.2.1.1 Gender

Out of 300 respondents interviewed, 108 (36%) were male and 192 (64%) were female.

4.2.1.2 Age Structure

For the effective interaction only adults above 18 years by age were interviewed. The table below shows the frequency and percentage

The table below show the frequency and the percentage of the respondents at different age group which was done as per the central bureau of statistics guideline of Nepal 2011.

Table 4: Age structure of the respondents

Age group in years	No. of respondents	percentage
20-30	79	26.3
30-40	62	20.7
40-50	78	26.0
50-60	48	16
60-70	33	11
Total	300	100

4.2.1.3 Education level

Education level of the respondents was categorized into five groups;

Illiterate- no formal education

Literate- who can read and write

Primary- one to five years of formal education

Secondary- upto eight years of formal education

SLC and above

Table 5: Education level of the respondents

Education of respondents	Frequency	percentage
illiterate	97	33.3
literate	67	22.2
primary	91	30.3
secondary	43	14.3
SLC and above	2	0.7
Total	300	100

4.2.1.4 Ethnicity of the respondents

Out of 300 respondents, 16.3% were Dalit, 36.3% were Janajati, 13.7% were Madhesi, 31.0% were Brahmin/Chhetri, 2.7% were from others ethnic groups.

Table 6: Ethnicity of the respondents

Ethnicity of the respondents	frequency	percentage
Dalit	49	16.3
Janajati	109	36.3
Madhesi	41	13.7
Brahmin/Chhetri	93	31.0
Others	8	2.7
total	300	100

4.2.1.5 Occupation of the respondents

Table 7: Occupation of the respondents

Occupation	frequency	percentage
Business	22	7.3
agriculture	136	45.3
house maker	135	45.0
abroad	6	2.0
Government service	1	0.3
total	300	100

Out of 300 respondents, 7.3% were involved in business. 45.3% were involved in agriculture 45% were involved in house making, 2% were in abroad and .3% were involved in government sector

4.2.2 People's view on knowledge towards vulture and vulture conservation

4.2.2.1 Level of awareness about vulture

Fig.7 shows that 300 /300 (100%) people in Lalmatiya and Bijauri know about vulture

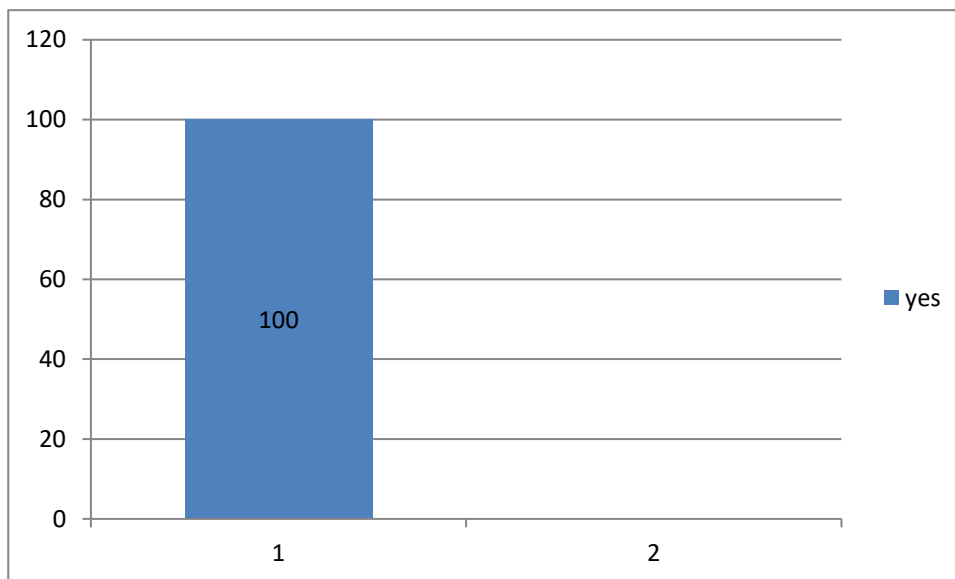


Figure 7. Showing percentage of people knowing about vulture

4.2.2.2 Number of dead vultures seen in their area

This pie chart shows 104/300 (35%) people have seen dead vultures in their area and 65% people have not seen dead vultures. Out of 104 people, 62% people observed only 1 dead vulture. 36% people observed 2 dead vultures and only 2% people observed 3-5 dead vultures.

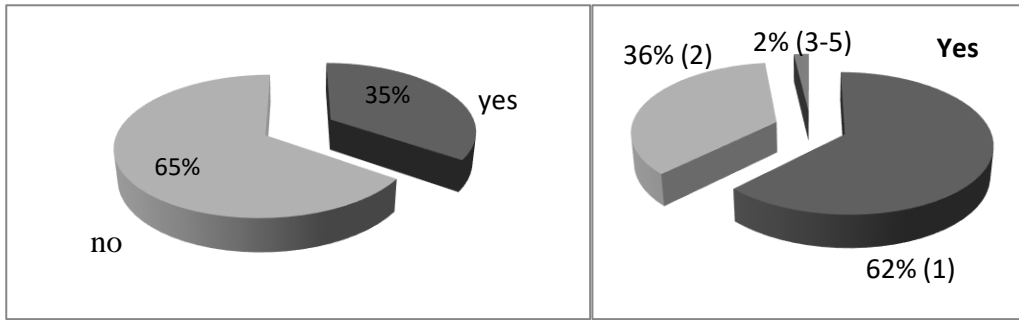


Figure 8: number of dead vultures seen in their area

4.2.2.3 Different view about the cause of death of vulture

Out of 104 people, 11% of them found human persecution as cause of death of vulture. Similarly, 18% people reported diclofenac (veterinary drug) as cause of it, 8% found it due to disease, 19% reported it due to food scarcity, 29% reported it due to old age, and 15% didn't know the cause for the death of vultures.

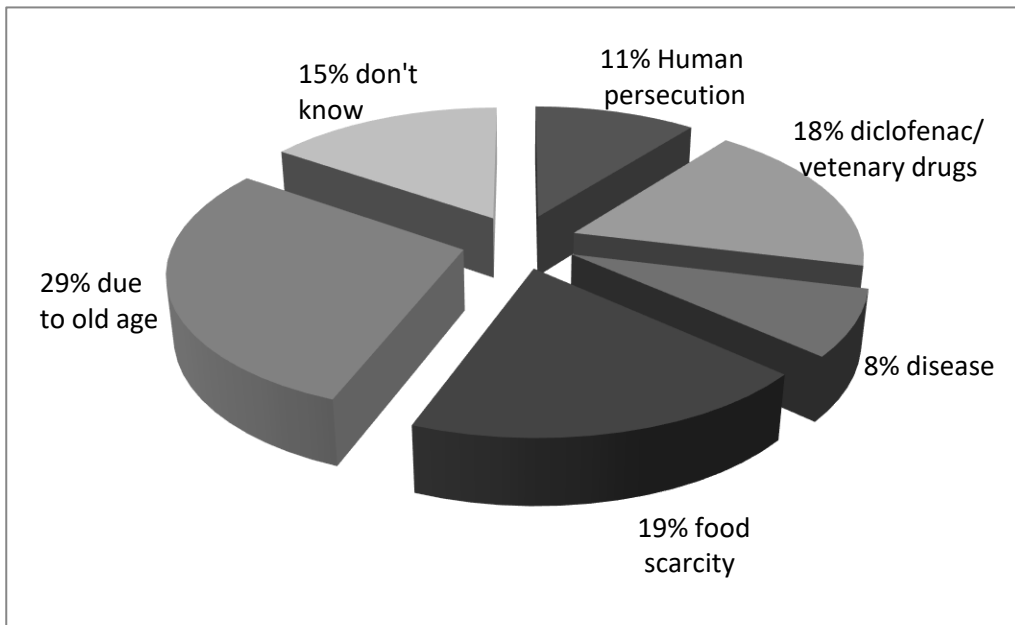


Figure 9: different views about the cause for the death of vultures

4.2.2.4 People's view about the status of vulture population

This figure shows that 70% people reported there was increase in vulture number compared to past, however, 16% people reported there was decrease in vulture number compared to past, and 14% people said there was no change in vulture number compared to past.

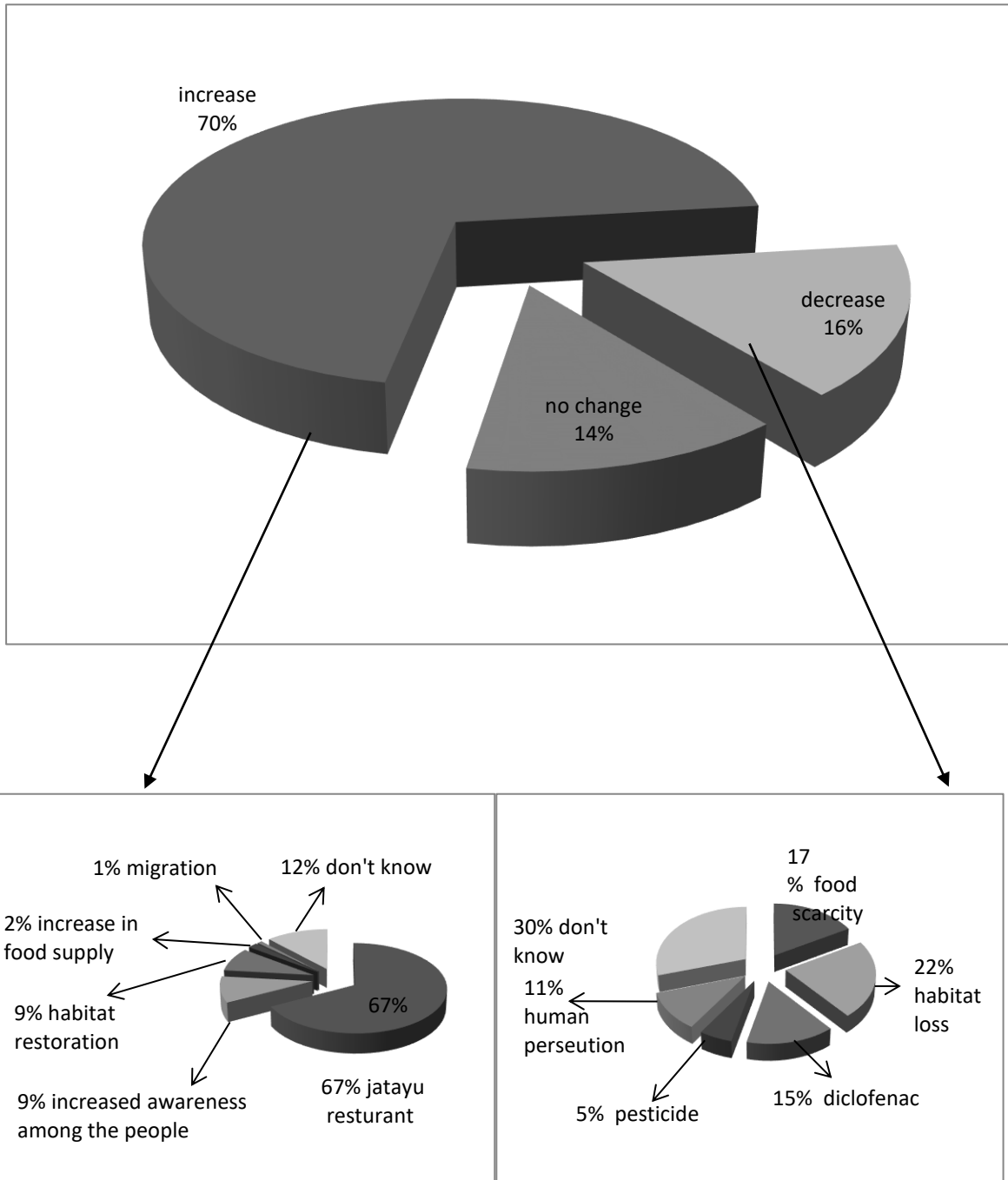


Figure 10: People's view about the status of vulture population

4.2.2.5 People's view regarding the importance of vulture

38% people said vultures are beneficial; however, 13% people said vultures are harmful. 22% people said vultures are both beneficial and harmful. Similarly, 20% people said vultures are neither beneficial nor harmful, and 7% people didn't know about it. Different people mentioned different reason regarding the importance of vulture.

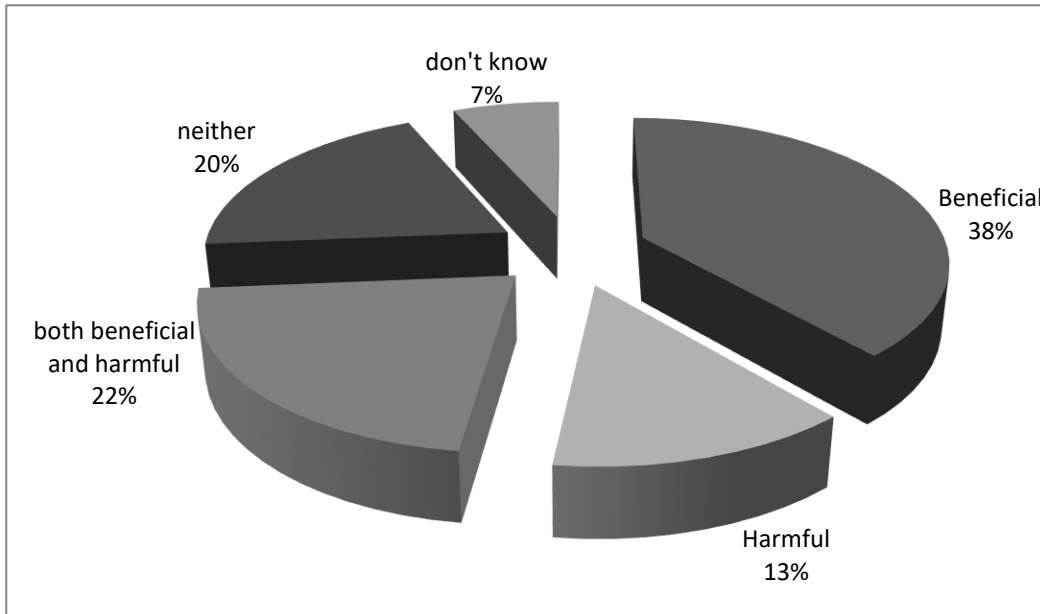


Figure 11: peoples view regarding the importance of vulture.

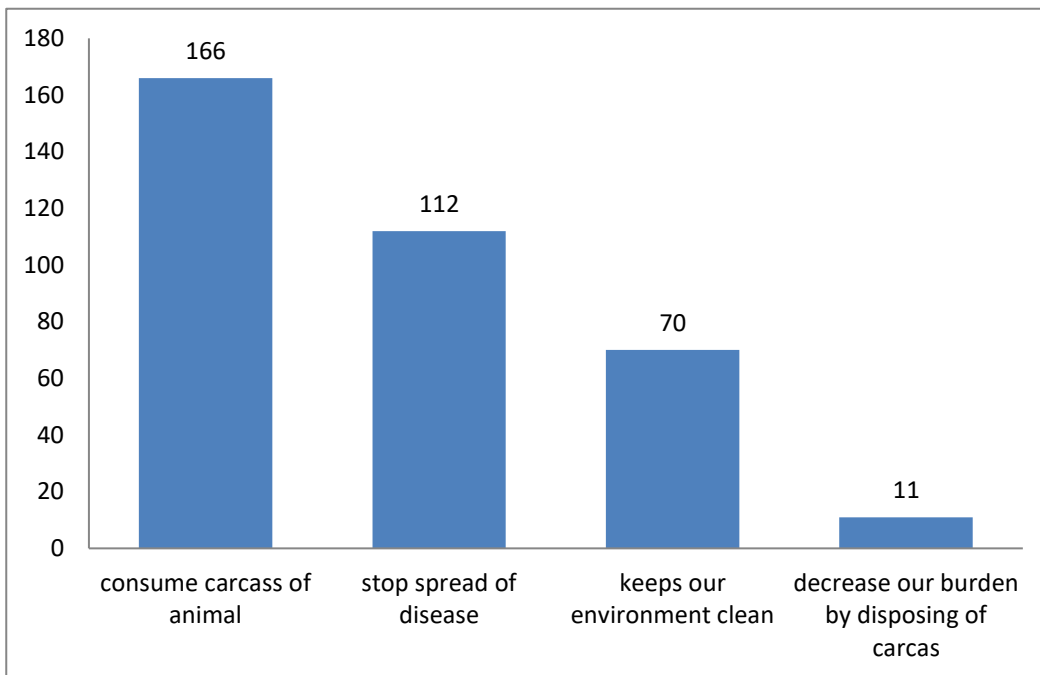


Figure 12: peoples view regarding the benefit of having vulture

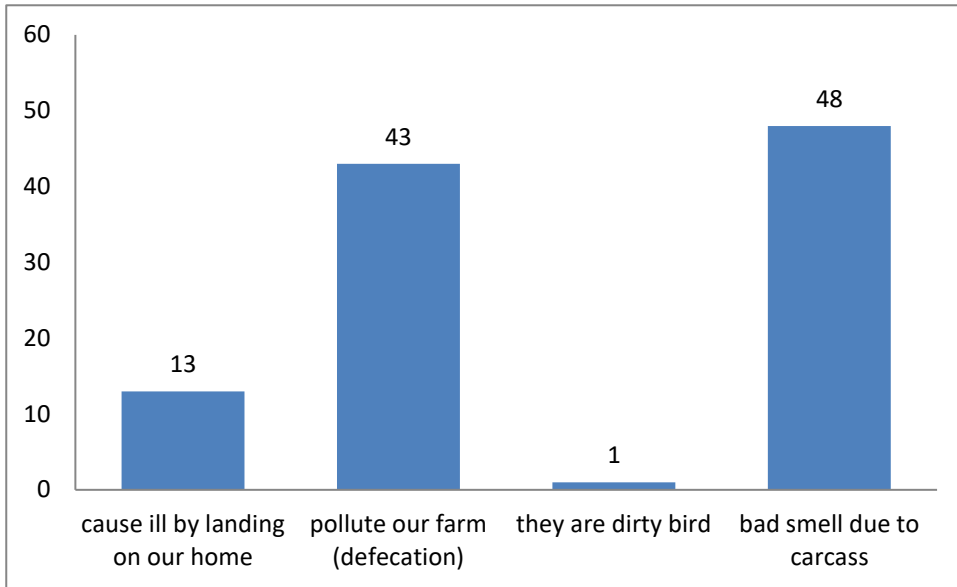


Figure 11: Peoples’ view regarding the harmful effect of vulture

4.2.2.6 NSAID’S survey

From the figure it shows that 64% were unknown about the diclofenac and only 28% know about the diclofenac during the survey. where only 23% have the information about meloxicam and 52% were unknown about it.

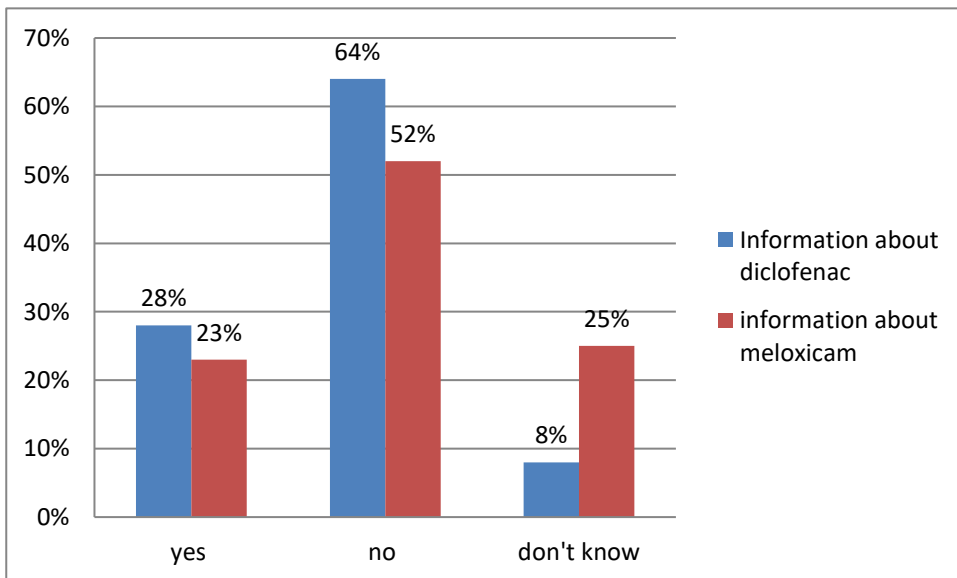


Figure 12: level of knowledge about diclofenac and meloxicam

4.2.3 People’s attitude towards VSFS for vulture conservation

4.2.3.1 People’s attitude towards establishment of VSFS and its sustainability development

The figure shows that 79% people know about the VSFS and 43% were in the favour for the establishment of VSFS. 43% were willing to be the part of VSFS and they want to help VSFS for its sustainability. 45% concluded that VSFS can sustain without foreign support also.

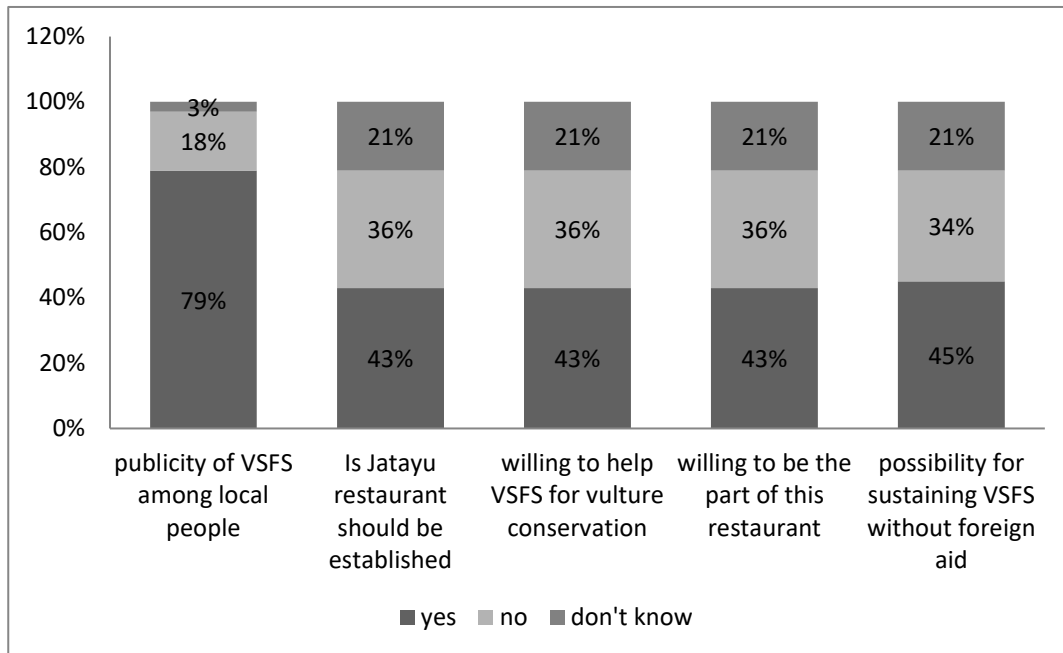


Figure 13: People’s attitude towards establishment of VSFS and its sustainability development

4.2.3.2 View of local people to help VSFS

10% people said they can help VSFS by promoting sites, 23% people can contribute old cows, 26% can provide hay, 7% can help it by not disturbing, 18% can help by pressuring local government, and 16% don’t know any reason for its sustainability.

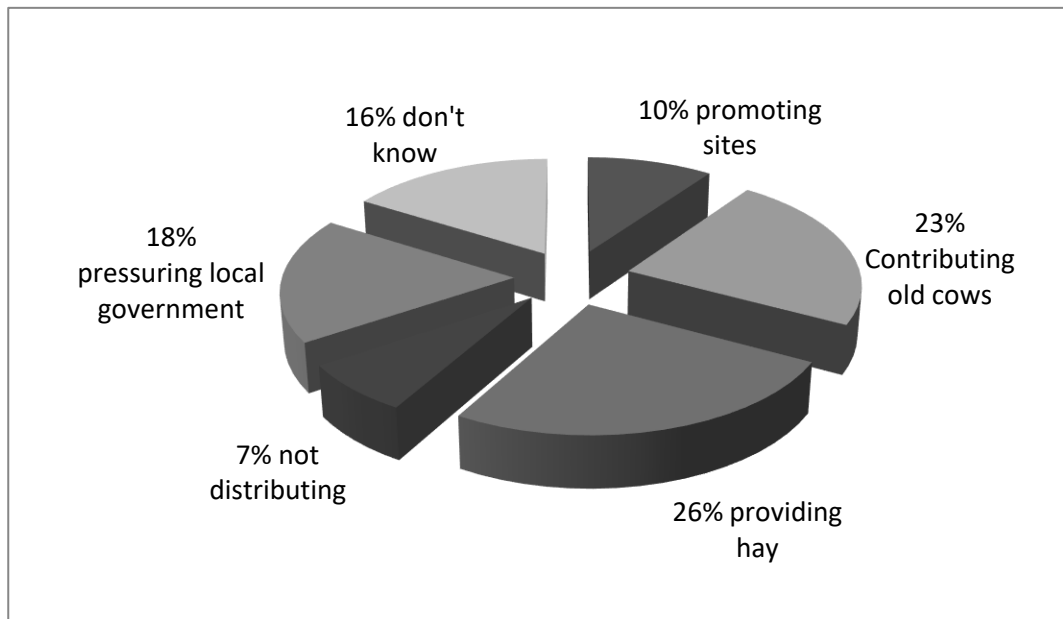


Figure 14: View of local people to help VSFS

4.2.3.3 People's view about responsible organization to conserve vulture

63% people said government should be responsible for it, 8% people said researchers should be responsible for it, 9% people said VSFS should be responsible, 8% people said public should be responsible, and 12% people don't know about it.

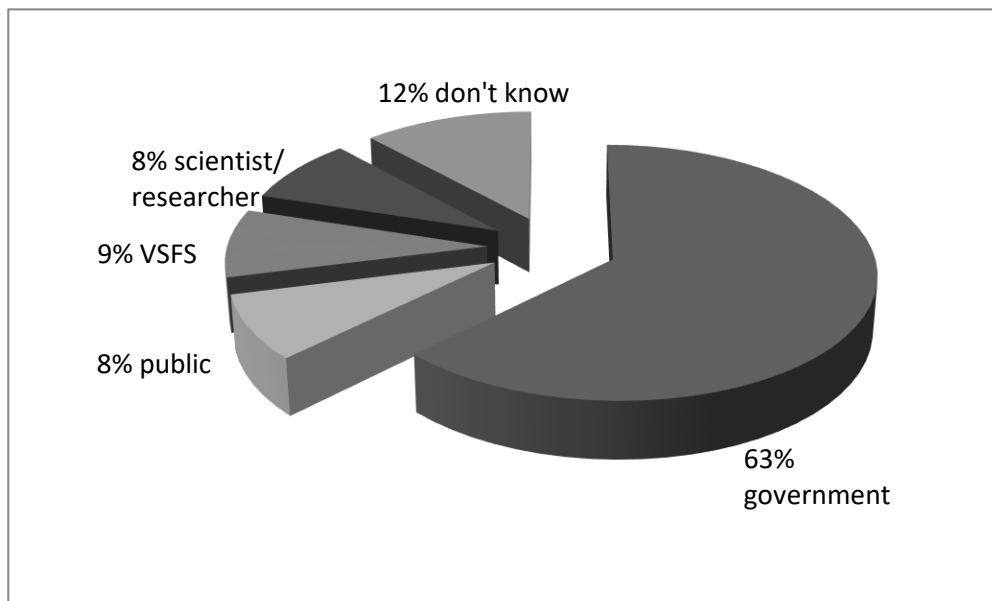


Figure 15: People's view about responsible organization to conserve vulture

4.2.3.4 Views for the improvement of VSFS

97 people said people's participation encouragement for both male and female equally for improving jatayu restaurant, 51 people said long term income generating program for local communities, 61 people said making school and college involved in the conservation programs, and 41 people don't know about it.

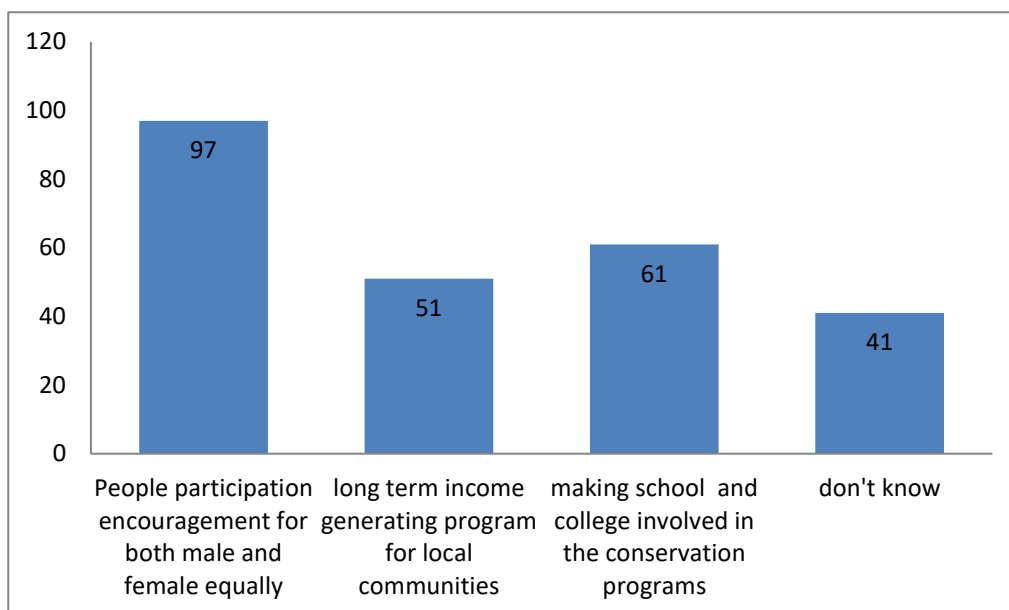


Figure 16: View of local people for the improvement of VSFS

4.2.4 People's perception towards vulture and VSFS for vulture conservation and its association with selected background characteristics

Table 8: People's perception towards Jatayu Restaurant

Category of the respondents		Do you know jatayu restaurant?			Chi-square value	P-value
		No	Yes	Don't know		
place	Lalmatiya	24.55%	75.5%	0.0%	27.557	0.000
	Bijauri	6.0%	87%	7%		
Ethnicity	Dalit	12.2%	85.7%	2.0%	9.027	0.340
	Janajati	14.7%	83.5%	1.8%		
	Madhesi	22.0%	75.6%	2.4%		
	Brahmin/Chettri	24.7%	73.1%	2.2%		
	others	12.5%	75.0%	12.5%		

Level of significance at 0.05

There is significant difference ($p \leq 0.05$) on knowledge of people about jatayu restaurant and vulture conservation in 2 places Lalmatiya and Bijauri.

However, there is no significant difference on awareness about jatayu restaurant and vulture conservation according to ethnicity i.e among Dalit, Janajati, Madhesi, Brahmin/Chettri and others.

In both places, Bijauri and Lalmatiya $\geq 75\%$ people know about jatayu restaurant which is similar among all the ethnic group of people.

Table 9: people's opinion on establishment of Jatayu restaurant.

Category of the respondents		Do you think jatayu restaurant should be established			Total	Chi-square value	P-value
		No	yes	dont know			
place	Lalmatiya	11	111	29	151	4.217	0.121
		7.3%	73.5%	19.2%			
	Bijauri	3	84	13	100		
		3.0%	84.0%	13.0%	100.0%		

Level of significance at 0.05

Regarding establishment of Jatayu restaurant, $\geq 70\%$ people said yes in their places ie Lalmatiya and Bijauri and there is no significant difference for both the places in this opinion ($P \geq 0.05$)

Table 10: Importance to set aside a place for vulture to live in

Category of the respondents		Importance to set aside for Vultures to live in			Total	Chi-square value	P-value
		no	yes	dont know			
place	Lalmatiya	9 4.5%	169 84.5%	22 11.0%	200 100%	49.104	0.00
	Bijauri	31 31.0%	50 50.0%	19 19.0%	100 100.0%		
Level of education	Illiterate	14 14.4%	70 72.2%	13 13.4%	97 100%	2.089	0.978
	Literate	10 14.9%	48 71.6%	9 13.4%	67 100%		
	Primary	12 13.2%	65 71.4%	14 15.4%	91 100%		
	Lower secondary	4 9.3%	34 79.1%	5 11.6%	43 100%		
	SLC and above	0 0%	2 100%	0 0%	2 100%		

Level of significance at 0.05

50% People in Bijauri and 84.5% people in Lalmatiya indicated there is necessity of setting aside a place for vultures to live in which both values are significantly different ($P=0.00$) but there is no significant difference in it according to the level of education ($p \geq 0.05$)

Table 11: Importance to educate the people about vulture conservation

Category of the respondents		Importance to educate the people about Vulture conservation			Total	Chi-square value	P-value
		No	Yes	don't know			
place	Lalmatiya	0 0%	174 87.0%	26 13.0%	200 100%	16.963	0.00
	Bijauri	7 7.0%	74 74.0%	19 19.0%	100 100.0%		
Level of education	Illiterate	4 4.1%	80 82.5%	13 13.4%	97 100%	24.640	0.002
	Literate	10 14.9%	48 71.6%	9 13.4%	67 100%		
	Primary	1 1.1%	79 86.8%	11 12.1%	91 100%		
	Lower secondary	0 0%	30 69.8%	13 30.2%	43 100%		
	SLC and above	0 0%	0 0%	2 100%	2 100%		

Level of Significance 0.005

Regarding people's opinion for importance to educate people for vulture conservation, ≥ 5 people said yes in both the places (Lalmatiya and Bijauri) of Dang and there is significant difference for this opinion in the places ($P \leq 0.05$). People of Lalmatiya reported there is need of educating people for vulture conservation. Similarly, there is significant difference among concept of people for educating them for vulture conservation according to their educating level ($p \leq 0.05$).

Table 12: importance to conserve the vulture for our future generation to see

Category of the respondents		Importance to conserve the vulture for our future generation to see			Total	Chi-square value	P-value
		No	yes	don't know			
place	Lalmatiya	35 17.5%	118 59.0%	26 13.0%	200 100%	2.946	0.229
	Bijauri	10 10.0%	64 64.0%	19 19.0%	100 100.0%		
Level of education	Illiterate	11 13.9%	52 65.8%	13 13.4%	79 100%	32.562	0.000
	Literate	15 22.4%	21 33.9%	9 13.4%	62 100%		
	Primary	10 12.8%	46 59.0%	11 12.1%	78 100%		
	Lower secondary	4 8.3%	40 83.3%	13 30.2%	48 100%		
	SLC and above	5 15.2%	23 69.7%	5 15.2%	33 100%		

Level of significance at 0.05

About 60% people in both places, Lalmatiya and Bijauri, said it is important to conserve vulture for our future generation to see. So, there is no significant difference in it according to place Lalmatiya and Bijauri. However, there is significant difference for this opinion among illiterate, literate, and educated people ($P \leq 0.05$)

4.3 Livestock description and carcass disposal mechanism

4.3.1 Livestock available in their area

Among 300 household in Lalmatiya and Bijauri, only 288 people kept livestock in their home. Out of which 215 people have goat/sheep, 100 people have hen/duck, 36 people have pig , 110 people have cow/ox and 40 people have buffalo.

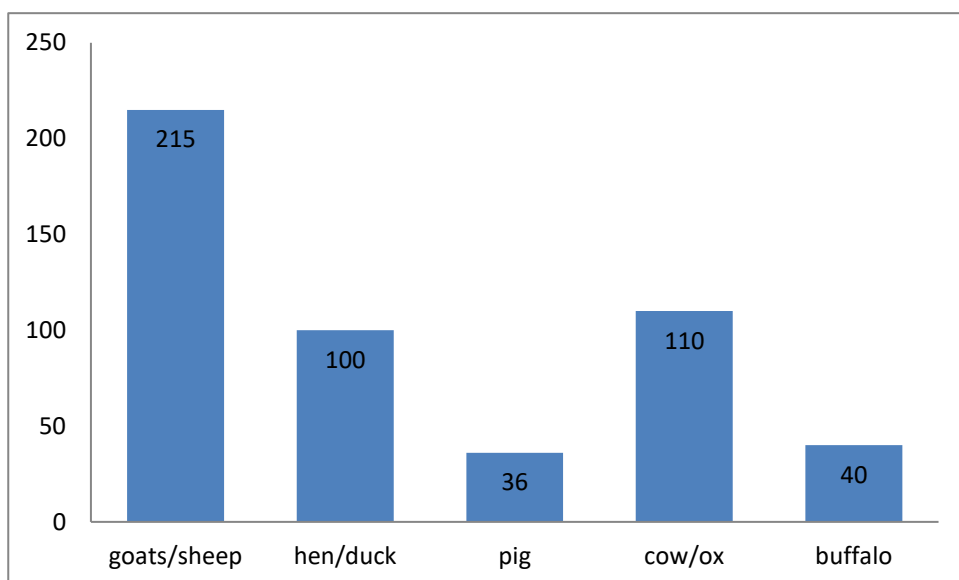


Figure 17 : number of domestic animals kept by people in Lalmatiya and Bijauri.

4.3.2 Do you call any vet when your livestock is ill?

This figure shows 94% people call vet when their livestock are ill and only 6% people don't call vet.

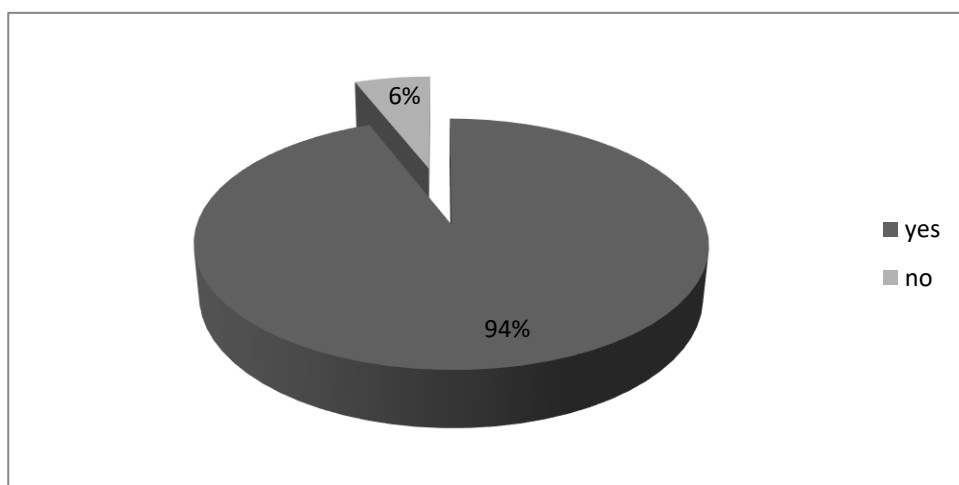


Figure 18: percentage of people who call vet doctor when their livestock are ill.

4.3.3 Management of old livestock

This figure shows that 42% of livestock were sent to vulture restaurant, 36% were care until natural death, 12% were sold to butcher, 6% were leave freely in nearby jungle, 3% were send to other village, 1% were send to other village.

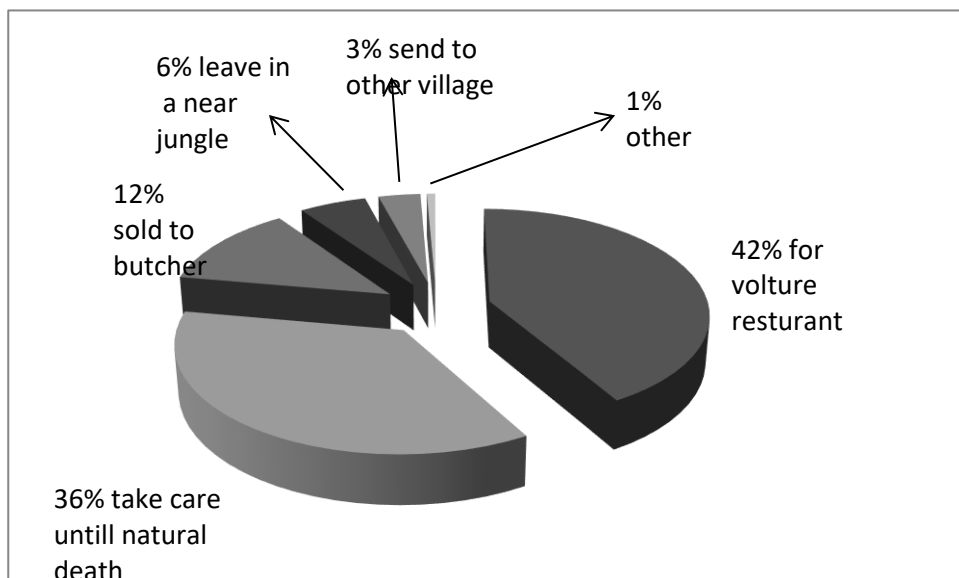


Figure19: Management of old livestock

4.3.4 Carcass disposal mechanism

This figure shows 37% people bury them when their livestock die. Similarly, 5% people sale them, 8% people eat them, 8% people simply throw, and 42% people give them to vulture restaurant for their feeding.

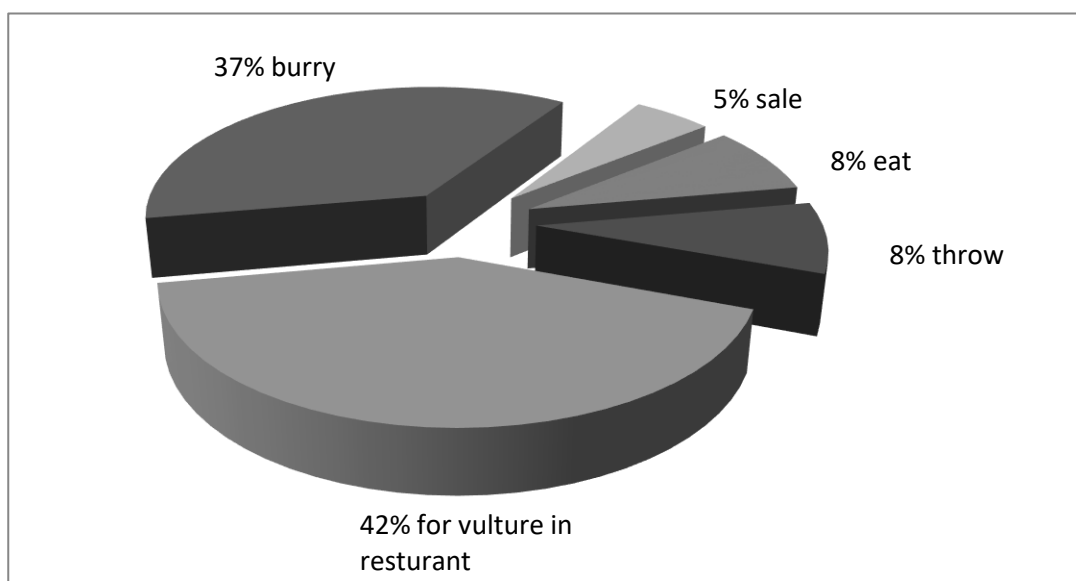


Figure 20: Carcass disposal mechanism

4.4 Potential threats to vulture

Diclofenac was found to be the main reason for the declination of vulture. Diclofenac was banned by government of Nepal on veterinary use and study area was already declared diclofenac free zone. Replacement of alternative drug, meloxicam, has not been effectively monitored. Vultures travel far away for food so there is still threats of illegal use diclofenac. Beside these other main threats include;

4.4.1 Carcass scarcity-sometimes there might be the availability of carcass but sometimes carcass may not be available for a week. Moreover, few people have habit of burial of dead animal without leaving it as food for vulture. Livestock rearing trend is constantly decreasing due to the attraction towards other easy business and lack of grazing land. This threat is likely to be challenging for vulture conservation in future.

4.4.2 Habitat destruction-Habitat destruction is one of the threats for vulture conservation. Illegal trade of large sized tree like saj, sal, sisoo, etc are increasing which is leading to the destruction of vulture nesting site.

4.4.3 Carcass consumption by other scavenger-During the field surveys other scavenger such as crow, feral dogs, eagles were found consuming the carcass available in the vulture restaurant. Especially increase of feral dog population lead to the shortage of carcass for vulture.

4.4.4 Inadequate conservation awareness- Due to the inadequate conservation awareness, people donot pay attention towards vulture conservation about the importance of vulture and their role in ecosystem. During the survey it was found that some people were hunting for the medicinal purpose. They said that they use the bone of vulture to treat the fractured bones. Still misconception is prevailing among the people regarding vulture.

4.4.5 Other threats-It includes the, high tension electric power lines (500m away from the feeding site), porcupine burrow which were directly seen during the field observation (Appendix: picture 1-6).

4.4.6 Questionnaire survey with agro-vet professionals

Questionnaire survey with agro vet professionals was carried out from Bhalubang to Lamahi and from Ghorahi to Bijauri. The main aim of the survey was to know the uses and prevailing stocks of NSAID in the agro vet shop whether diclofenac is used or not, what are other alternative drugs, the number of livestock cases for treatment in the agro vet shops in the study area and the attitude of agro vet professional towards conservation of vulture. All the interviewed vet professionals have the qualification of Junior Technical Assistant and mostly they have the experience of 5-10 years.

Usually Nonsteroidalanti-inflammatory drugs (NSAID) meloxicam was recorded in all agro-vets. They have started selling it in the place of Diclofenac. Meloxicam was sold in the name of Moflen, Moflen plus, Melocam plus, Melioswift plus. Mostly they sold the meloxicam mixed with paracetamol which are found in the form of injection and bolus. Most of the vet practitioners treated 2-5 domestic animals per day.

All the vet professionals have the knowledge about vulture and they were aware about the ban of Diclofenac which was the major cause for the decline of vulture population in the past. They agreed with the increase in vulture population after the ban of Diclofeanc.

5. Discussion

5.1 Breeding success

Breeding success is the process of bearing off-springs which determines the fate of bird population which help us to provide conservation approaches or measures for endangered species (Ruben Moreno-opo *et al.*, 2013).

In this study, 19 nests of White-rumped vulture were observed in UCNF of Dang district which were monitored periodically to determine the breeding success. Nesting trees were located at the edge of the forest and likely to experience human disturbance. All of the nest were found on *Terminalia tomentosa* but nest were also observed on simal (*Bombax ceiba*), Kabro (*Ficus lacor*) and bar (*Ficus bengalensis*) in Dang (Shrestha and Devkota, 2010). Similarly the most occupied nests were observed on saj (*Terminalia teracosta*) and sal (*Shorea robusta*) in Rupendehi (Chettri, 2013).

In this study, the tree selection by WRV during the nesting period is tall which are more than 32 m in height. The result is similar with the result of Subedi (2005) in Nawalprasi where it was 31.5 m in height (Chettri, 2013). However the average height of the tree in Himanchal Pradesh was 14.5 m (Thakur and Norang, 2012).

It is found that Gyps vulture prefer *Terminalia* species because they can easily beak small leafy twigs, assisted by vigorous wing flapping to build the nest (Ali and Ripley, 1968) where black vulture mostly prefer mature pines. (Poirazidis *et al.*, 2004)

In this study, based on active nest as a primary unit, breeding success was found to be 74% for white rumped vulture.

5.2 People's view on knowledge, attitude and perception towards vulture and vulture conservation

Establishment of VSFS in Dang is playing an important role for the conservation of vulture as it helps to provide public awareness on the need of conservation of vulture and it has been providing diclofenac free food to the vulture which was the main cause for the decline of vulture. From above figure we can say that 100% respondents knew about the vulture.

During the field visit, 70% of the people concluded that there was the increase in vulture number compared to past and 67% of the respondents pointed out jatayu restaurant for the increase in vulture number. On the other hand, 9% support for the increase awareness among the people, 9% pointed out for habitat restoration. Dhakal (2012) said the same reason ie establishment of Jatayu restaurant for the increase in vulture population in Lalmatiya Dang. Chaudhary *et al.* (2010) stated the same fact of increase in the maximum number of vulture arriving at single feed every year from 2007 to 2009 in VSFS of Nawalparasi.

But 14% respondents said that there is the decrease in vulture number and they pointed out habitat loss is the main reason for the decline of the vulture. The habitat loss is due to forest fire, falling down of *Bombax ceiba*. Though the respondents did not point out electrocution as the major threat but the problem of power line electrocution was found in Lalmatiya during

the study. A report by Chaudhary *et al.* (2012) found decline in number of vulture in Nawalparasi where electrocaution, poisoning, human persecution and decline in food supply were identified as future threat.

During the survey, 35% respondents said that they have seen dead vulture in their area. They concluded that the death of the vulture might be due to scarcity of food and due to old age. Beside these, 11% is found to be human persecution, 18% reported diclofenac, 8% disease and 15% were unknown about it.

Although all participants know about vulture, only 38% of them reported that vulture is beneficial to them and they said that it consumes the carcasses and stop the spread of diseases and keeps the environment clean where 13 % found that vulture is harmful to them and 20% found vulture neither beneficial nor harmful.

Though VSFS is creating the awareness about conservation due to different workshops and conservation programs held by BCN the later case indicates that few people are still unaware about the benefit of having vulture in their area.

This result suggests that it can be changed through proper information and providing different types of long term income generating programs and training to improve their livelihood.

Dhakal (2012) recorded 82% of respondent from Nawalparasi, Joshi (2014) recorded 73% of respondent from Baitadi and BCN (2016) recorded 89% of respondent from Terai arch landscape (TAL) who found vulture beneficial.

Despite establishment of VSFS in those study area, still 18 % were unknown about it. Out of 79% who were known about the establishment of jatayu restaurant, only 43% were positive to help VSFS for the vulture conservation. Out of 43%, 10% are willing to contribute through promoting the jatayu restaurant 23 % were willing to contribute by providing old cow and 26% by providing hay and many other reasons. About 63% respondents said that government should be responsible for the conservation of vulture. Similarly Dhakal (2012) found that 39% were unknown about the establishment of jatayu restaurant in dang and rupendehi district. While Shrestha (2014) found that only 1.45% were unaware about the establishment of jatayu restaurant in Nawalparasi district. This might be due to the awareness programme conducted by BCN about the vulture and jatayu restaurant for the conservation of vulture.

Dhakal (2012) found that equal male and female participation must be there for the improvement of VSFS which is similar to my finding.

Socioeconomic survey shows the higher proportion of female respondents than male respondents which might be due to the researcher was female therefore female respondent might have felt free to communicate.

KC and Timilsina (2013) said that age, education, gender, willingness to pay are significant factor for the conservation attitude but in some cases it may not play important role (Baral and Gautam, 2007b). In my study some educated people did not show interest for vulture conservation however few uneducated people also showed willingness to conserve vulture.

This study also reveals that some people have neutral attitude towards the conservation of vulture which can be changed by providing proper information about the vulture and vulture restaurant. Vultures are considered as unattractive and sign of bad luck in Nepalese society (Baral *et al.*, 2007) which might be responsible for people's no caring for the vulture of their area.

In Lalmatiya 75.5% people know about Jatayu restaurant similarly in Bijauri 87% know about it. Moreover 73.5% people in Lalmatiya and 84% in Bijauri are in favour of establishment of Jatayu restaurant. In addition 87% people in Lalmatiya and 74% people in bijauri said that it is important to set aside place to vulture to live in.

Similarly, our data shows educated people are in favour of establishment of Jatayu restaurant in compared to illiterate and less educated people for the conservation of vulture.

However there is no study conducted for people's perception towards vulture and vulture conservation for comparison to this study.

5.3 Livestock description and carcass disposal mechanism

Livestock are the major source of food for vulture and to sustain the VSFS. People's attitude to help VSFS was positive. During the field visit most of the people have reared goat and sheep as their livestock followed by hen and pig which cannot be used as food for vulture. However cow buffalo as livestock of people were in second position which can be used as food for vulture. This shows that this is preferable area for the jatayu restaurant in this area. Similar findings (Thapa, 2016) is observed in Nawalparasi and Palpa districts of Nepal which indicate Nepal as a whole is suitable place for establishment of VSFS in various parts as most of the people keep cow/buffaloes in their house as common livestock and these can be used as food for vulture after their death.

The disposal technique of the carcass in the study area seems to be favourable to the vulture as most of the people (42%) are interested in donating the dead cattle to the jatayu restaurant. 37% respondents were found to bury their livestock after death. This might be due to lack of awareness towards vulture conservation sometimes they were afraid of spreading of bad smell and disease and 8% sell their death cattle to butcher and 8% throw their dead cattle in open place. The similar study carried out in Baitadi showed that 60% of the people bury the carcass (Karmacharya, 2011) but in Rampur-24% and in Koshi-53% households used to bury the carcasses (Baral *et al.*, 2005; Khadka and Mandal, 2013). In contrary, Subedi (2005) recorded 70% of respondent from Nawalparasi district and KC and Timilsina (2013) recorded 53.8% of respondents from Kaski district who preferred to throw their dead livestock in open place.

Though many people were aware about the conservation of vulture, 42% of the people donate their old cow to vulture restaurant and the similar study carried out in Dang and Rupendehi. Dhakal (2012) showed that 33% of the people give the dead animal to the Jatayu restaurant. 36% of the respondents care their old livestock until their natural death. They said that they have reared their cattle with so much love and care then how can they send them to jatayu restaurant to become food for vulture after becoming old and unproductive. The similar case

is observed in Ghanchowk Paudel (2012) where old people consider cow as goddess. Still some respondents were found selling old livestock to butcher. This indicates that there is still lack of awareness for the vulture conservation.

5.4 Potential threats to vulture

During the field visit, many threats were seen inside the vulture restaurant. The main threats seen during the study was carcass scarcity. This threat may be challenging in the future for vulture conservation. Livestock rearing trend is decreasing due to the attraction towards other business. Most of the people were found burying their dead livestock. People have started consuming beef in many rural area of Nepal. This might lead to the scarcity of food to vulture.

Habitat destruction is also seen as threats to vulture. Illegal trade of large sized trees such as; saj, sal, sisoo was found ultimately leading to the destruction of vulture nesting site as vulture were found building their nest in saj and simal trees. Disturbance and hunting was also seen during the field study. Though it is not the serious problem in present but could be in future. Some people were found hunting of vulture for the medicinal purpose. They believe that vulture's bones are used to treat human bone fracture. Study in Ramechapp Phuyal (2012) and Dang Deukhary Shrestha and Devkota (2010) found the similar threats for the vulture.

Other scavengers like crow, feral dogs, and eagles were found consuming the carcasses inside the vulture restaurant. This consumption of carcasses by other scavengers may lead to the insufficient food supply to the vulture. Due to the lack of awareness, people donate pay attention toward vulture conservation, about the importance of vulture and their role in ecosystem so creating the awareness among the local people may help to conserve the vulture. Theft of meat, high tension power line (500m away from feeding site), porcupine burrow were also seen during the field visit. Similar findings were shown by other various researches by Dhakal (2013) and Ghimire (2016) in Dang, Nepal. These are also threats for vulture conservation in Nepal including Dang district.

According to veterinary professional, Diclofenac is not threat for vulture these days as this drug has been replaced by safe alternative drugs meloxicam.

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Altogether 19 nests of white rumped vulture were monitored out of which 14 nests were productive from which fledged successfully. The study of nesting preference of WRV revealed that they prefer *Terminalia tomentosa* for nesting. The study revealed that the relationship between the height of the tree and the nesting was found to be highly positive from which it can be said that height at which nests were built was highly dependent on the height of the tree. The nests were found to be built away from the settlement area which might be associated with higher degree of human disturbance.

The study area has two Vulture restaurants; one is situated in Lalmatiya and another is situated in Bijauri. Most of the people of Bijauri were found to have positive attitude towards vulture restaurant and they were benefitted directly or indirectly to improve their livelihood. But some people of Lalmatiya have dissatisfaction towards vulture restaurant of Lalmatiya which can be improved by creating awareness about the importance of vulture and vulture restaurant in their area. Various steps can be taken to fulfill the local people's satisfaction.

Moreover, most of the people were found donating the dead cattle to the jatayu restaurant as the food for vulture but almost 37% people were also found to bury the livestock after death which might be due to the lack of awareness towards vulture conservation.

The decline in cattle rearing practice is likely to have significant impact on the food availability for the vulture in the future. Other future threats include habitat loss, lack of awareness among the local people, carcass consumption by other scavengers are also the serious and potential threats to be concerned for the management of vulture conservation.

More people were interested to help VSFS and vulture conservation program which is positive part for the sustainability development of VSFS so local people's satisfaction and sustainability development program for VSFS by government and non-government organizations is essential for sustainability development of Jatatu restaurant in Dang District.

6.2 Recommendations

1. Due to difficult landscape, people of Bijauri couldn't bring their dead livestock inspite of having willingness to help Jatayu restaurant. So smooth road in sloppy area should be maintained in order to provide regular food supply to sustain the vulture population.
2. In order to solve this problem, Owner of the sure to die livestock should be given the sense of having religious piety if they donate the sure to die livestock to the Jatayu Restaurant.
3. Jatayu restaurant office in Bijauri is very far from the restaurant and there is no information centre of jatayu restaurant in Lalmatiya so it would be better to have its main office near to the restaurant.
4. The major part of success of Bijauri is the distribution of livestock to the local people to improve their livelihood and by creating different groups. So, Lalmatiya also should have the provision of livestock distribution.

5. Regular monitoring of the sites and identifying and conserving the probable nesting sites should be done from local and government level.
6. Awareness programs should be created for developing positive attitude of people towards the importance of vulture conservation. People should be discouraged to bury their dead livestock and selling of old livestock to butcher.
7. Availability of poison used for killing animals should be monitored and strictly prohibited. Various future threats such as habitat destruction should be discouraged, food scarcity should be managed.
8. Entry of local feral dogs and the wild scavenger in the vulture feeding site should be prevented by fencing the carcass feeding site of the vulture restaurant.

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8. APPENDICES

Annex-1: Nest monitoring form

S.N	Date	Time	Active Nest	Fledgling in Nest	Weather	Visibility	Remarks

Weather Code Sunny(s) Highly Cloudy (HC) Moderately Cloudy (MC)
 Rainy(R)

Annex-2: Socio Economic Status of respondents

Description of the respondent	No. of respondent	percentage	
Age group	20-30	79	26.3%
	30-40	62	20.7%
	40-50	78	26.0%
	50-60	48	16%
	60-70	33	11%
Education level	Illiterate	97	33.3%
	Literate	67	22.2%
	Primary	91	30.3%
	secondary	43	14.3%
	SLC and above	2	0.7%
ethnicity	Dalit	49	16.3%
	Janajati	109	36.3%
	Madhesi	41	13.7%
	Brahmin/Chettri	93	31.0%
	other	8	2.7%
occupation	Business	22	7.3%
	Agriculture	136	45.3%
	Building labor	135	45.0%
	Abroad	6	2.0%
	Government service	1	0.3%

Annex-3: Total number of livestock available around VSFS

Place	Total no. of household	Goat/sheep	Hen/duck	Pig	Cow/ox	buffalo
Lalmatiya	200	406	412	0	64	16
Bijauri	100	281	169	95	230	73
Total	300	687	581	95	294	89

Annex-4: Questionnaire form to local people

Your participation in this survey is voluntary. You will neither get any direct monetary benefits for participating nor penalized for not answering some or all of the questions. Any information gathered in this survey will be only used for the purpose of research. The interview is completely confidential; your name will not be associated with your answers. The purpose of this survey is to evaluate the perception of people on vulture conservation. Your cooperation will help in the conservation of vulture in Nepal.

Background information on respondent

Date:.....

Name of the respondent:

Age.....years

Gender: i) Male [] ii) Female []

Village:

VDC, ward no:

District:

Socio- economic condition

Occupation:

Education:

Ethnicity:.....

General information questionnaire on vulture

1).Do you know about vultures? Have you seen vultures in your area?

- a. Yes b. No

2). Have you seen a dead vulture in recent years?

- a. Yes b. No

3).If yes,

How many?

- a. one b. Two c. 3-5

- d. 6-15 e. More than 15

4).What could be the cause of death?

Human persecution

a. Poisoning

b. Diclofenac/veterinary drug

c. Disease

d. Food scarcity

e.old age

f.Don't know cause

5). Do you feel there is a change in vulture numbers compared to the past?

- a. Increasing

- b. Decreasing
- c. No change

If increasing, what could be the reason(s)?

- a. Jatayu Restaurant
- b. Increased awareness among public
- c. Habitat restoration
- d. Don't know
- e. Others.....

If decreasing, what could be the reason(s)?

- a. Food scarcity
- b. Habitat loss (kapok tree/others)
- c. Pesticides
- d. Diclofenac/veterinary drug
- e. Poisoning
- f. Electrocution
- g. Human persecution
- h. Others.....

6). Are vultures beneficial or harmful?

- a. Beneficial
- b. Harmful
- c. Both harmful and beneficial
- d. Neither
- e. Don't know

If beneficial, what could be the benefits of having vultures?

- a. Consume carcass of animals
- b. Stop spread of disease
- C.Keep environment clean (foul smell/pollution)
- d. Decrease our burden/workload by disposing of carcass
- e.Others.....

If harmful, what harms could vultures cause?

- a. Eat our livestock (chicken/goat kids)
- b. Cause ill luck by landing on our homes
- c. Pollute our farms (defecation)

- d. They are dirty birds
- e. Others.....

Questionnaires for the general information on livestock

7. What livestock and how many of them do you have?

- 1)Cattle
- 2)Buffalo.....
- 3) Calves (cattle).....
- 4) Calves (buffalo).....
- 5)Goats/Sheep.....
- 6) Hens/Ducks
- 7) Pigs
- 8) Others

8. Do you call any vet when your livestock is ill?

- a) Yes b) No

9).What do you do with your old livestock?

- a. For vulture restaurant
- b. take care until natural death
- c. sold to butcher
- d. leave in a near jungle
- e. send to other village
- f. other

10). What do you do when your livestock dies?

- a) Burry b) sale c) eat d) throw

11). Do you know about Diclofenac?

- a)Yes b)No c) Don't know

12). Do you know about Meloxicam?

- a)Yes b)No c) Don't know

13). Is it important to set aside a place for vultures to live in?

- a)Yes b)No c) Don't know

14). Is it important to educate the people about vulture conservation?

- a) Yes b) No c) Don't know

15). Is it important to conserve the vulture for our future generation to see?

- a) Yes b) No c) Don't know

16). Have you seen hunting of vultures in your area?

- a) Yes b) No c) Don't know

17). Do you know Jatayu Restaurant?

- a) Yes b) No c) Don't know

18). Do you think Jatayu Restaurant should be established?

- a) Yes b) No c) Don't know

19). Do you like to help VSFS to conserve vultures?

- a) Yes b) No c) Don't know

20).How can you help for its sustainability?

- a.Promoting site
- b.Contributing old cows
- c.Providing hay
- d.Not disturbing
- e.Pressuring local governments
- f.Others.....

21). Do you think VSFS is sustainable without foreign support?

- a) Yes b) No c) Don't know

22). Are you willing to be a part of this Restaurant?

- a) Yes b) No c) Don't know

23). Who should be responsible for the Vulture Conservation?

- a. Government
- b.Scientists/ Researchers
- c.VSFS People
- d.Public
- e.Others

24). Is Jatayu Restaurant is helping for improvement of the livelihood of local Communities?

- a) Yes b) No c) Don't know

If yes then how?

-
-

25). what are the advantages of having Jatayu Restaurant in your area?

-
-

26). what are the disadvantages of having Jatayu restaurant in your area?

-
-
-

27) What can be done by VSFS management committee and government level to improve the Jatayu Restaurant?

- a. People participation encouragement for both male and female equally
- b. Long-term income generating program for local communities
- c. Making schools and colleges involved in the conservation program
- d. Others.....

Annex -5: Questionnaire with agro vet professional

Date..... Name of the shop..... Proprietor.....

Village..... District.....

1) Year of experience of vet

- 1-5 5-10 >10 yrs

2) Formal education in vet.....

3) Animal being treated

- a.Domestic animal b. pet animals c. both

4) No. of cases in a day

- a.1 b. 2-5 c.6-10 d.more than 10

5) Non- steroidal Anti NSAID commonly used

- a.Diclofenac
- b.Meloxicam
- c.Nimsulide
- d.Other

6) Route of administration

- a.Injection b.bolus/oral c.both

7) Do you know that vulture population has declined?

- a.Yes b.no

8) what do you think is the reason for the decline in vulture population?

- a.Habitat destruction
- b.Food unavailability

