

# 1. INTRODUCTION

## 1.1 Background

The population which is defined as a collective group of organisms of the same species occupying a particular space has various characteristics which, although best expressed as statistical functions, are the unique possession of the group and are not characteristic of the individuals in the group (Odum 1971).

Some animals do not occupy all their potential range even though they are able to disperse into the unoccupied areas. Thus individuals choose not to live in certain habitats, and the distribution of a species may be limited by the behavior of individuals in selecting their habitats (Odum 1971).

Nepal is rich in pheasants, there are eight species of pheasants found in Nepal. There are nine sub-species of Kalij pheasants found in the world (Hermans, 1986). Only three integrating races of Kalij pheasants are found in Nepal. They are White Crested Kalij (*Lophura leucomelana hamiltonii*), Nepal Kalij (*Lophura leucomelana leucomelana*) and Black-backed Kalij (*Lophura leucomelana melanotus*) (Hermans, 1986). Nepal Kalij has different morphological characteristics which differ markedly with other two subspecies found in Nepal. White crested Kalij (*Lophura leucomelana hamiltonii*) is inhabitant of the western Himalayas, from Indus river in the west to the Ghagra river in the western Nepal. The Nepal Kalij Pheasant (*Lophura leucomelana leucomelana*) is found in central Nepal from the Ghagra river to the Arun river in east. The Black-backed Kalij (*Lophura leucomelana melanotus*) lives in the extreme eastern area of Nepal eastward through Sikkim (Herman, 1986).

The crest on the head and red “mask” around the eyes is a distinguishing mark of Nepal Kalij, therefore it can be easily identified in the field. The male and female Kalij differ considerably in appearance. Male is bluish black with white speckling on its lower back and bright red color around the eyes. They have glory blue back narrowly edged with white feathers at lower black rump and upper tail converts. The wing converts are white the chin

and fore neck are darker and glossier, rest of under parts more whitish. Tail is glossy black and brown of broad arching sickle-shaped feathers. The female Kalij are fairly plain and are medium brown color with darker or lighter spots. The gray feathers of the under parts conspicuously dark centered and producing a scaly or scalloped effect. Naked orbital skin scarlet seems as in male tail black, not arching of pointed (Hill, D.A. and Robertson, P. A. 1988).

The Nepal Kalij roosts in flocks (Baker 1928), The Kalij usually returned to the roost about sunset and the height of roosting branch varying from 4.5 to 8 m (Gautam 1999). It is possible to locate roost from the accumulation of fecal matter below the perch (WPA 1980). They show strong site fidelity to roost and communal rooster, roosting generated in a group of 3 to 5 individual (Gautam, 1999).

The Nepal Kalij, as a ground feeder bird, is always found foraging on the ground (Gautam 1999). Food items of Kalij include grains, shoots, insects and their larvae, and small reptiles (Ali and Ripley 1969). Gautam (1999) analyzed the food of the Nepal Kalij are found of 27.30% of leaves, 25.50% of roots, 21.25% of seeds, 11.96% quartz, 6.30% of animal components, 6.30% of whole plants and 2.49% of flowers.

The Kalij Pheasant is classified as Least Concern. Does not qualify for a more at risk category by IUCN & CITES. Widespread and abundant taxa are included in this category. Males are rather variable depending on the subspecies involved, but all have an at least partially glossy bluish-black plumage, while females are overall brownish. Six to nine cream eggs are laid in a shallow scrape lined with leaves and rubbish. Female incubates for 20 to 23 days. Male takes no part in nesting but may rejoin after chicks have left the nest. Foraging and feeding Kalij Pheasant includes the area along roadsides, clearings, and in forests for seeds and insects. Male has a crowing call and courtship call is a shrill which is pig-like squeal (Frank Finn, 2010).

The only eggs known of this species are a pair of eggs and a clutch of five obtained by Mr. Ferry from the Nepalese in the hills immediately above Bettiah (Frank and Finn, 2011). They were taken on the 25th June and 23rd May and are just like the eggs of *G. hamiltonii* but are very deep pink-buff in colour. They measure from 46.1 x 27.7 to 53.0 x 39.0 mm. Similar to

those of the preceding bird and apparently ascending the hills as high as 9,000 ft. The Nepalese who brought in the two clutches of eggs above referred to said they were very common and that they trapped many birds of both sexes on the eggs, taking both birds and eggs for food. They only get them in forest and most often close to streams. Scully records this Pheasant roosting in flocks. (Baker, 1928)

Nepal Kalij pheasant has a length which can range from 50cm to 73cm while it has a wingspan of no more than 50cm. The preferred habitat of this bird are almost all types of forest of Nepal (Gowan, P. J. K. 1994). This pheasant lies between 6 and 10 eggs per clutch, which the female will incubate for approximately 25 days, however they have been known to sometimes lay and successfully raise 2 clutches of eggs in a single season (Gaston, 1980). The Nepal Kalij pheasant is very similar in appearance to the White Crested Kalij pheasant and the Horsfields Kalij pheasant, which has often led to inbreeding between the three in captivity, even if this is usually by accident. Through its range this bird is fairly common, preferring to live in areas which are not easily accessible or destroyed for building by people (Subedi, 2006).

Around Nepal foothills Kalij has been studied scarily and no study has been done in Ramechhap and Okhaldhunga and other district so far.

## **1.2 Objectives of the study**

The main objective of the study was to assess status and habitat of *Lophura leucomelana leucomelana* in Narmadeswor VDC, Okhaldhunga. The specific objectives of the study were to:

- ) To determine population status
- ) To analyse habitat utilization patterns
- ) To evaluate conservations threats perceived on Kalij pheasant in the study area

### **1.3 Rationale of the study**

Present study has assessed the population status, habitat selection pattern and conservation threats of the Nepal Kalij in Narmadeswor VDC area, which represent middle hills of Nepal. It is hoped such ecological information could be useful to monitor population and habitat and to determine conservations needs of Kalij in this area and for similar habitat in Nepal.

### **1.4 Statement of Problem**

Nepal Kalij is the common species which is abundantly found in all most all habitat types and forest. But also nowadays it is being threatened by habitat loss, poaching and negative attitude of people. Gautam (1999) had done the study on habitat utilization pattern and feeding habits of the Nepal Kalij Pheasant in the northern hills of Pokhara valley and reported the Kalij has been threatened by many factors including poaching. Subedi (2006) also found the same result in Hemja, Kaski.

### **1.5 Limitations of the study**

The study was limited by the following factors; a) The study was based on direct observations in the study area, no reference of area available, b) The study was limited due to financially and was not allocated adequate time due to completion of academic year of university.

## 2. LITERATURE REVIEW

Baker (1928) studied that the Nepal Kalij Pheasant roost in flocks. Baker (1928) quoted Hodgson's report, as "The Nepal Kalij is by far the commonest pheasant in Nepal and its range is the central region, never found in Tarai seldom in the Cachhad (the most elevated portions of Nepal)". He also described the scully notes in stray feathers', "Nepal Kalij is common wherever thick forest is found from Hetauda (Makawanpur district) in the Dun to valley of Nepal usually seen in pairs or in parties of from 3 to 10. Biswas (1974) explained that Kalij Pheasant occurs in Pakistan, India, Nepal, Bhutan, Bangladesh, Myanmar, Thailand, China and United States. In Nepal, it is fairly common and wider spread resident and reported from 245-3050m altitude. Maximum height recorded is 3660m in May 1954.

"The Nepal Kalij is usually reckoned to be the lowest living of all our pheasants and this is true of its lower limit (Roberts, 1979). The Nepal Kalij is most affected by hand of man by shooting (Roberts, 1979), tripping, egg collections throughout its range. Roberts (1979) also described that the Nepal Kalij does not call and live in thick cover. Roosting sites could be spotted by dropping at the foot of trees. Roberts (1980) studied that it is elusive, but dazzled by a flash lamp an entire family may be shot, one by one, as it roosts at night. Roosting sites can be spotted in advance by the dropping at the foot of trees. Being usually found close to villages, it is a victim of local hunting.

Majpuria (1981-1982) studied that himalayan pheasants of Nepal are widely known and little studied birds very little is known of their breeding in the wild, behavior or status in the country. Nepal Kalij Pheasant *Lophura leucomelena leucomelena* is fairly common endemic (Inskipp and Inskipp, 1983) resident sub species in middle hill area. Ali and Ripley (1983) accepted that Nepal Kalij pheasants are communal rooster on the branches of trees. They listed food items of Kalij as grains, seeds, shoots, insects and their larvae and small reptiles. They also described that Nepal Kalij is fairly common in mountain surrounding, the duns and valleys and they preferred to live forest with heavy scrub under growth, partial to the neighborhood of water and terraced cultivation.

Hermans (1986) reported that there are nine sub species of Kalij pheasants found in the world. Only three integrating races of Kalij pheasants found in Nepal. The black-backed *Lophura leucomelena melantus* lives in the extreme eastern area of Nepal eastward through Sikkim. Johnsgard (1986) described that Kalij pheasants are omnivorous, eating almost anything from bamboo seeds to small snakes and lizards, and wide variety of foods including berries, grass, herbs, shrubs, roots and diversity of insects, worms and larvae.

Inskipp and Inskipp (1991) studied that the species was described by J. Latham without precise locality, later, given as Nepal by Baker, first definitely recorded by W.J. Kirkpatrick during 1793. Inskipp and Inskipp (1991) and Madge and Mc Gowan (2002) described in their studies that Kalij is one of the more adaptable pheasant species found in many habitat types and frequents in all types of forests (including sal, oak, spruce and rhododendron, and other evergreen and deciduous forests) with dense undergrowth.

Gautam (1999) studied habitat use of Nepal Kalij at Dhital VDC of Kaski district in Nepal for his Master's Degree thesis. He reported that the maximum numbers of birds were existed in closed forest with high understorey followed by closed forest with low understorey, terraced field and open forest. Grimmett et al. (2000) described that the male Kalij pheasant is about 65-73cm and female is 50-60cm in length. Both sexes have red facial skin and down curved tail. Three intergrading race occur in Nepal; white crested *L. l. hamiltonii* (male has white or grey brown crest, broad white barring on rump) black crested or Nepal Kalij *L. l. leucomelanos* (male has blue black crest and white barring on rump, and heavily scaled upper parts) and black crest and white barring on rump, and heavily scaled upper parts) and backed *L. l. melanota* (male has blue back crest, and blue black rump that lacks pale scaling). Female is reddish brown, with grayish-buff fringes producing scaly appearance.

Subedi (2006) studied population status habitat use and conservation threats of Kalij Pheasant in Hemja area of Kaski district for her Masters Degree. She identified *Castanopsis indica* as main roosting tree species followed by *Schima wallichii*, *Angelhardia spicata* and *Myrica esculenta*. WPA India (2008) published in its research report that the birds keep in pairs or small groups and feed in open areas early in the morning. They are very shy and run

quickly for cover at the slightest hint of alarm. The bird does not seem to have a mating call but emits a low chirrup accompanied with wing shirring or wing drumming.

As the species seems to be tolerant to habitat changes, it is thus not particularly threatened by habitat loss WPA (2008) India.

Though the Kalij pheasant is kept under least concerned species and very few studies are done on this species But, there is not any study was done till now about this species in Narmadeswar VDC, Okhaldhunga.

### 3. MATERIALS AND METHODS

#### 3.1 Study area

The present study was carried out at Narbadeswar VDC of Okhaldhunga district in Nepal.

##### 3.1.1 Location and boundary

The study area lies between approximately  $27^{\circ} 19' 0''$  North latitude and  $86^{\circ} 30' 0''$  East longitude. Narbadeswar VDC is bordered by Ramechhap district and lies near to the Manthali, headquarters of Ramechhap district. (Figure 1)

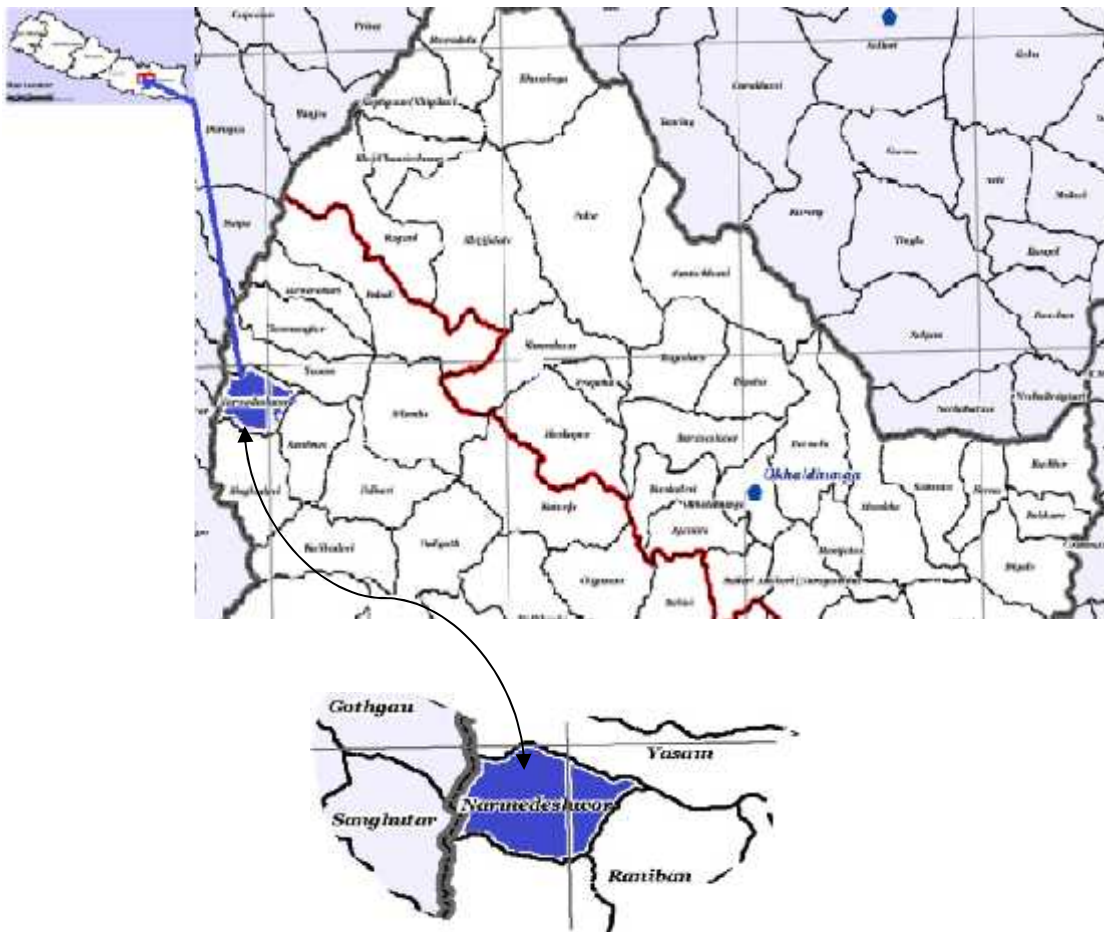
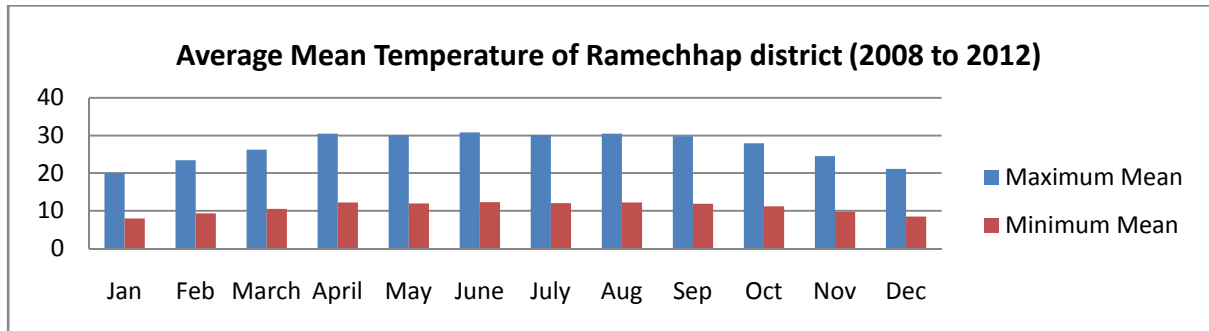


Figure 1: Location of study area in Nepal



### 3.1.2 Climate

The temperature varies from lowest 7 – 9°C in January to maximum 30 - 31°C in May/June month. Thus, the average temperature seems to be 16°C minimum and 28°C maximum. Temperature distribution is not uniformed. The lower part of study area is warmer than the higher elevation.



The rainfall varies from nearly 1 mm in December to 196 mm in July. The highest rainfall was on June, July and August which was 132 mm, 195 mm and 157 mm respectively and the list was on January, February, November and December which was 9 mm, 8 mm, 4 mm, and 1 mm respectively.

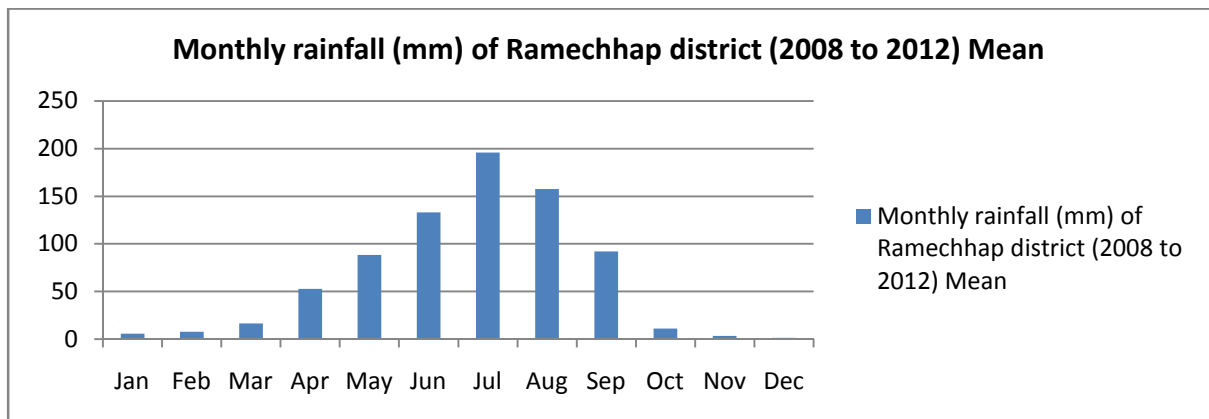


Figure 3 – Average Monthly Precipitation recorded at Monthly (nearly Narmadeswor VDC of Okhaldhunga district), 2008-2012 (Source: Department of Hydrology and Meteorology, Government of Nepal)

### **3.1.3 Forest and Vegetation**

The vegetation of this area is largely represented by middle-hills vegetation type (temperate) which is dominated by Sallo (*Pinus roxburghii*) forest followed with Sal (*Shorea robusta*) and other associated tree species of the study area are Sirish (*Albizia sp.*), Uttish (*Alnus nepalensis*), Badhar (*Artocarpus Lokoche*), Kattush (*Castanopsis indica*), Bakle (*Dodecadenia*), Pate (*Eurya cerasifolia*), Mango (*Mangifera indica*), Amala (*Phyllanthus emblica*), Gurash (*Rhododendron arboretum*), Bhalayo (*Semecarpus anacardium*) etc. (Field study 2012)

Among the shrubs Kurilo (*Asparagus racemosus*), Chutro (*Berberis asiatica*), Sisau (*Grandinia palmate*), Dammaru (*Machyura cochinchinensis*), Bilaune (*Maesa sp.*), Guiye Angeri (*Melastomala normale*), Rudilo (*Mycatanthes arborlristis*), Aiselu (*Rubus ellipticus*) are commonly found in the Narmadeswor area. Similarly common herbs are Dattiwan (*Achyranthus aspera*), Akhle jhar (*Alternanthera sessilis*), Sarpako makai (*Arisaema tortotusum*), Patti (*Artimesia vulgaris*), Banmara (*Eupatorium adenophorum*), Gandhe (*Houlluynia cordata*), Kholesag (*Nasturtium officinale*), Pani Amala (*Nephrolepis cordifolia*), Chari Amilo (*Oxalis cornicalata*) etc. (Field study 2012)

### **3.1.4 Fauna**

Faunal inventory in the study area is still to be done. The study area is inhabited by some medium and small sized mammals which were observed and named by locals includes Rhesus Monkey (*Macaca mulatta*), common langur (*Semnopithecus entellus*), Common Mongoose (*Herpestes edwardsii*), Purupine (*Hystrix indica*), Barking deer (*Muntiacus muntjack*), Jungle cat (*Felis chaus*), Jackal (*Canis aureus*) and Common leopard (*Panthera pardus*). Some of the common bird species are common myna (*Acridtherus tristis*), Red vented bulbul (*Pycononotus barbatus*), Jungle crow (*Corvus splendense*), Peacock (*Pavo cristatus*) etc. Many common snakes are found while many varieties of lizard are also found which are morphologically different but could not be identified scientifically during the study.

### **3.1.5 Human settlement and agriculture**

There are many small settlements around the study area. Major dense villages are Satlung, Rajaya, Jogitar, Tar and Damaidanda. The local inhabitants are Brahmin, Chhetri, Newar and other ethnic groups like Damai, Sarki, Kami, and Gharti. The occupations of them are mainly depending on agricultural practices. Crop cultivation is supplemented by animals husbandry. The major crops cultivated are rice, corn, wheat, mustard, etc.

### **3.2 Reconnaissance Survey**

Related books and journals was studied before and during this study to acquire the information on birds ecology. A preliminary field survey was made during the month of January, 2011 to select sample sites and habitat during survey interaction with local people was made on the distribution and abundance for reconnaissance survey, the forest area and wilderness parts of the study area was categorized into 4 categories. Each category was divided into more than one block as per topography and extent of landmarks for observation. Local villagers were interviewed to obtain information on Kalij area in Narmadeswor, Okhaldhunga.

### **3.3 Field Survey**

The field survey was carried out to collect data on population, habitat selection and conservation threats of kalij pheasant from January 2011 to November 2012. Binocular was used as a visual aid. Other instruments like camera, stationery, clip board, compass etc.. are also used.

### **3.3.1 Population Census**

The study was done on the basis of clusters or area sampling in the possible habitat of pheasant. Transect was made in each cluster and sample unit constructed for bird count. These transect and units were also used for vegetation survey.

a. Call count method

Crossing each survey area through transect made recorded from centre of the calling station at a radius of 300m. (Lelliot, 1981)

b. Direct observation

Population was counted by direct observation with the help of 10 x 40 magnification binoculars. For this purpose each probable site was taken as local area and studied from the vantage point for the better view of grassland, forest as well as activities of birds. Care was taken not to disturb them consequently the counting of nest was done to estimate the population distribution.

Population size of Kalij was determined by roost survey method too. Simple presence and absence in different habitats may be the only way of collecting meaningful data whereas dawn and dusk be the best time to census many cryptic birds (Bibby et al., 2000). In the daytime visit, roost of the Nepal Kalij was observed and marked. Roost site was confirmed on day visit observing droppings (pilus) in the forest floor under the roosts site. In roost survey method, counting birds at roosts, involve direct counts of the bird's present, even unstructured, non ending, informal interviews was used to provide observers with an idea of species that could be expected before visiting the area (Bibby et al., 2000).

Table: 1 Schedule of the study

SN	Particulars	Date
1	Literature survey	January – February 2011
2	Reconnaissance survey	March – May 2011
3	Data collection	March – May 2011 August - September 2011 October 2011 – December 2012 January – March 2012
4	Draft writing	May – June 2013
5	Draft thesis writing and submission	December 2013
6	Final thesis submission	January 2014 (Proposed)

A total of 3.6 km<sup>2</sup> of Kalij visibility area was included for calculation by establishing four transects and laying 36 quadrates.

$$\text{Kalij pheasant density} = \frac{\text{No. of Kalij Observed}}{\text{Area Covered (sq. km.)}} = \text{Kalij per square Kilometer}$$

### 3.3.2 Habitats

On the basis of the forest and the land found in the study area, types of the habitat is classified;

- a. Open forest (OF) or grass land; The large area of land which were not used for cultivation is now covered with *Arundinella nepalensis* Trin (Khar) which has no tress less shrub covered.
- b. Shrubs land and open forest; This included few trees of Sal *Shorea robusta* and many species of shrubs.

c. Closed forest of high understorey (CFHU); Mixed forest of Sal (*Shorea robusta*) and Sallo (*Pinus roxburghii*) with high understorey along with dense shrub cover with grasses and pteridophytes.

d. Terraced field (TF); TF are confined to the vicinity of villages, where villagers largely cultivate maize, wheat and paddy.

### **3.3.3 Vegetation sampling and identification**

3.6 km<sup>2</sup> of land was utilized as the study area in which 36 quadrates were laid down of 10 x 10 m. size. Nine quadrates were laid in each sites; Jogitar, Rajaya, Maitar and Satlungtar. Height of the trees, girth at breast height > 10 cm and height of the lowest branch were measured. Some species of trees were identified in the field by the help of local people and matched with field guide. Unidentified vegetation was protected by preparing herbarium and was taken to National Herbarium Godawari, Lalitpur for identification. The total number of trees in each sample was counted. From the data obtained by this method, the density and frequency was calculated. Frequency is the number of sampling unit (%) in which a particular species occurs. Thus frequency of each species was calculated with following formula (Rao and Gupta 1998).

$$\text{Frequency (\%)} = \frac{\text{Total number of quadrates in which species occurs}}{\text{Total number of quadrates studied}} \times 100$$

### **3.3.4 Habitat use**

Habitat use of Kalij was analyzed by observing animal in various habitats.

#### **a. Line Transect Method**

Due to different topography and slopy land equal transect can not be made in each habitats. So, four transect in terraced field, four in open forest, three in closed forest with low understorey and two in closed forest with high understorey was made with different length. All the four types of habitat were traveled along the line transect to assess habitat utilization

by *Lophura leucomelana leucomelana*. The population of Kalij pheasant was counted by direct observation through transects. Three different blocks of time were set of observation; 0600-0900, 1100-1400 and 1500-1800 to assess habitat use and record other associated behaviors of birds.

b. Habitat use and preference

Kalij, their nests and roosting sites were observed and recorded. The habitat preference was analyzed by using habitat preference rating index (HPI). HPI was prepared by dividing the percentage of animals observed in each habitat types by percentage to transect traversed in each habitat (Mishra 1982)

### **3.3.5 Roost analysis**

The Nepal Kalij pheasants generally roost on the branches of trees at night. For the confirmation of the roost in the tree, accumulation of droppings below the perch (WPA 1980) was observed. After confirming weather, the trees were utilized for roosting or not by the Kalij Pheasant, height of the tree, girth at breast height, and height of lowest branch from ground was recorded.

### **3.3.6 Questionnaire survey**

20% of the total households were taken for the questionnaire survey which is conducted in four numbers of wards of Narmadeswor VDC to gather information on the threats of Kalij. A set of questionnaires were prepared with several options where the respondents select the appropriate alternatives for them.

Each respondent was asked to rank their view on issues then a total score for each option was obtained adding the scores for that option by each respondent, then percentage for each was calculated as recorded score divided by the maximum possible score that the option could have (*Bhatta 2002*).

## 4. RESULTS

### 4.1 Population status of Kalij Pheasant

An average of 14 individuals of Kalij, pheasant were counted in four visits during this study period. Seasonal count ranged from 4 individuals in March to 20 individuals in August – September. Similarly, there were 11 individuals in March - May, 12 individuals in October – December and 10 individuals in January – February in the year 2011/012 (Table 2).

Table – 2: Seasonal variation in population and population density of Kalij in Narmadeswor VDC (2011-2012).

SN	Season	Number	Density (No/km <sup>2</sup> )
1	March to May	11	3.05
2	August to September	20	5.55
3	October to December	12	3.33
4	January to February	10	2.7
5	March	4	1.11
	Average	$57/4=14.25$ 14	3.15 (Average density)

The population density of the Kalij pheasant in Narmadeswor VDC was highest in August to September 2011 (5.55/km<sup>2</sup>) and lowest is in March 2012 (1.011/km<sup>2</sup>) (Figure 4). The population density was found 3.05/km<sup>2</sup> in March to May, 3.33/km<sup>2</sup> in October to December and 2.70/km<sup>2</sup> in January to February (Figure 4).



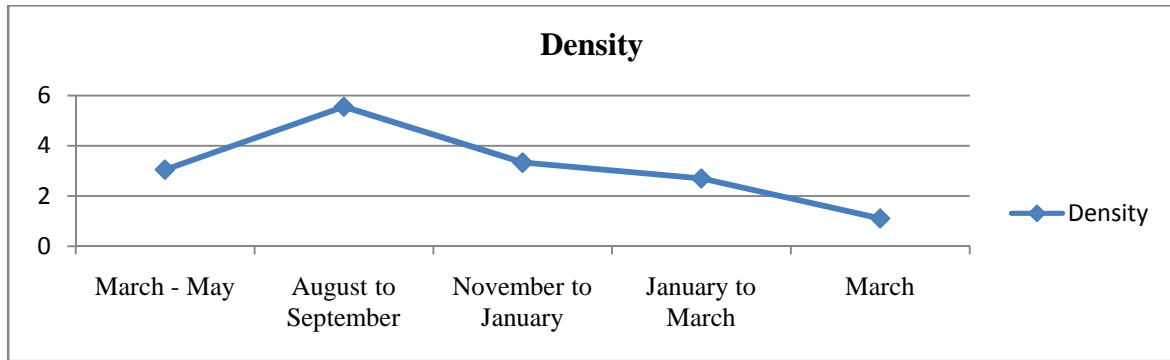


Figure 4: Seasonal variation in Population Density of Kalij Pheasant in Narmadeswor VDC (2011-2012)

## 4.2 Habitats

### 4.2.1 Vegetations

Vegetation of the Nepal Kalij Pheasant habitat in Narmadeswor VDC consists of mixed grasses and herbs, climbers, shrubs and trees. A total of 22 species of trees, 8 species of shrubs and 29 species of herbs, 8 species of climbers and 16 species of grass were identified.

#### A. Tree species

Altogether 22 species of tree were studied in the study area among which Sallo (*Pinus roxburghi*) and Sal (*Shorea robusta*) were abundantly found in the study area, which is followed by Uttis (*Alnus nepalensis*), Badhar (*Artocarpus lakoocha*), Tanki (*Bauhinia malabarica*), Simal (*Bombax ciebl*), Pate (*Eura cerasifolia*), Bedal (*Ficus clauata*), Pipal (*Ficus religious*), Kutmiro (*Litsea monopetala*), Amala (*Phyllanthus embli*), etc were also found in the study area. (Detail list is in Appendix – 1)

#### B. Shrubs species

Altogether 8 shrub species were found in the study areas which are Kurilo (*Asparagus racemosus willd*), Chutro (*Berberis asiatica Roxb. Ex DC*), Sishnu (*Grandinia palmate*), Dammaru (*Maclura cochinchinensis Corner*), Bilaune (*Maesa chisca*), Guiye Angeri (*Melastomala normale D. Don*), Rudilo (*Mycatanthes arborlristis*) and Aiselu (*Rubus ellipticus J. E. Smith*). (Detail list is in Appendix – 1)

### C. Herbs species

Total of 29 species of herbs were observed in the study area among which Dattiwan (*Achyranthus aspera* L.), Akhlejhar (*Alternanthera sessilis*), Sharpako Makai (*Arisaema tortuosum* (Wall.) Schot), Gaulato (*Boehmeria humiltoniane* Wedd), Tori Jhar (*Capsella bursapastris* L. Medik) etc are some of them. (Detail list is in Appendix – 1)

#### 4.2.1.1 Vegetation characteristics

The density of trees was 17 per 10m x 10m quadrat, the most frequent species was found *Pinus roxburghii* (96.66%) followed by *Shorea robusta* (83.33%), *Mangifera indica*, *Phyllanthus emblica*, *Alnus nepalensis*, *Schinra wallichii* and *Syzygium cumins* (Table 3). Species like *Ficus religiosa*, *Ficus Clavata* and *Castanopsis indica* are represented with low frequency.

Table: 3 Frequency of Tree species

Species	Frequency (%)
<i>Pinus roxburghii</i>	96.66
<i>Shorea robusta</i>	83.33
<i>Mangifera indica</i>	63.33
<i>Phyllanthus emblica</i>	33.33
<i>Alnus nepalensis</i>	33.33
<i>Schinra wallichii</i>	26.66
<i>Syzygium cumins</i>	16.66
<i>Ficus religiosa</i>	10.00
<i>Ficus clavata</i>	6.66
<i>Castanopsis indica</i>	3.33

#### **4.2.2 Habitat utilization**

A habitat is an ecological or environmental area that is inhabited by a particular species. Though the Kalij Pheasant were found almost all types of forest in Nepal.

A. Closed forest with high understorey (CFHU)

The habitat whether trees are closed and rich of ground vegetation is termed as closed forest with high understorey, where the pheasant find more chances to escape and hide enemies and is selected by most of the individuals.

CFHU habitat is frequently used by Nepal Kalij pheasants with 27 individuals and highest percentage i.e. 47.30%. CFHU were largely used for nesting, roosting, foraging etc.

B. Closed forest with low understorey (CFLU)

The habitat whether trees are closed but has very less ground vegetation is termed as closed forest with low understorey.

15 individuals were observed in this habitat during study period, which is equal to 26.31% of the total sighting.

C. Open forest (OF)

The forest in which trees are at the distance and consist of very less ground vegetation is called open forest.

The lowest number of individuals were recorded in this area which were only 6 individuals and it accounted 10.50%.

D. Terraced Field (TF)

The area which is utilized by the people for the cultivation is termed as terraced field. In TF habitat only 9 individuals of Nepal Kalij pheasants were observed, 15.78% of the total number. In this habitat Nepal Kalij was mostly seen in between morning to evening.

### 4.2.3 Habitat Preference Rating Index

The habitat preference rating index also shows the highest preference towards CFHU (1.30) followed by closed forest with low understorey (0.92) open forest (0.75) and terraced field (0.74) (Table 4, Figure 5)

Table 4: Nepal Kalij Pheasant Habitat Preference Index (HPI)

Habitat Type	Number of Kalij	X*%	Y #%	HPI <sup>^</sup> (X/Y)
Closed Forest with high understorey (CFHU)	27	47.30	36.28	1.30
Closed forest with low under story (CFLU)	15	26.31	28.57	0.92
Open forest (OF)	6	10.50	13.90	0.75
Terraced field (TF)	9	15.78	21.25	0.74
<b>Total</b>	<b>57</b>			

\*X= Percentage of bird observed in each habitat types.

#Y= Percentage of transect traversed in each habitat type

<sup>^</sup>HPI=Habitat preferences rating index

## 4.3 Roost Analysis

### 4.3.1 Roosting behavior

Nepal Kalij is mainly found roosting in a group and showed strong and site fidelity to roosts. The roosting group of Kalij pheasant saw 2 to 5 individuals.

### 4.3.2 Roost Habitat Selection

During this study, a total 30 roosting trees belonging to four species were recorded. Among the trees 15 were *Pinus roxburghii* (Sallo), 10 were *Shorea robusta* (Sal), 3 were *Mangifera indica* (Mango) and 2 *Phyllanthus emblica* (Amala).

Table 5: Characteristics of Roost trees of the Kalij in Narmadeswar VDC, Okhaldhunga.

SN	Tree species	Height of Tree (Meter)	Girth of Breast height (Meter)	Height of lowest branch (Meter)
1	<i>Pinus roxburghii</i>	17	1.4	7
2	<i>Pinus roxburghii</i>	15.5	1.2	7
3	<i>Pinus roxburghii</i>	15.5	1.4	6
4	<i>Pinus roxburghii</i>	14	1.08	9
5	<i>Pinus roxburghii</i>	13.6	0.98	5
6	<i>Pinus roxburghii</i>	13.5	1.1	5.5
7	<i>Pinus roxburghii</i>	12	0.73	7
8	<i>Pinus roxburghii</i>	11.5	1.1	6
9	<i>Pinus roxburghii</i>	10.5	0.92	5.5
10	<i>Pinus roxburghii</i>	10.5	0.84	6.5
11	<i>Pinus roxburghii</i>	10	0.86	7
12	<i>Pinus roxburghii</i>	10	0.78	6
13	<i>Pinus roxburghii</i>	7.5	0.61	5.5
14	<i>Pinus roxburghii</i>	7.5	0.65	5.5
15	<i>Pinus roxburghii</i>	7.5	1.1	4
16	<i>Shorea robusta</i>	8	0.6	4
17	<i>Shorea robusta</i>	8	0.4	4.5
18	<i>Shorea robusta</i>	8	0.5	6
19	<i>Shorea robusta</i>	7.5	0.39	4.5
20	<i>Shorea robusta</i>	7	0.39	4.5
21	<i>Shorea robusta</i>	7	0.4	4
22	<i>Shorea robusta</i>	7	0.35	2
23	<i>Shorea robusta</i>	7	0.4	5
24	<i>Shorea robusta</i>	6	0.57	4.5
25	<i>Shorea robusta</i>	6	0.5	3.5
26	<i>Mangifera indica</i>	12	0.9	4.5
27	<i>Mangifera indica</i>	9	0.5	5.5
28	<i>Mangifera indica</i>	8	0.65	4.5
29	<i>Phyllanthus emblica</i>	8	0.48	5
30	<i>Phyllanthus emblica</i>	6	0.35	3.5
	<b>Mean (X)</b>	<b>9.69</b>	<b>0.92</b>	<b>5.27</b>

The Kalij showed a strong preference toward *Pinus roxburghii* tree for the selecting of roost. About 50% of Kalij in Narmadeswor found to be used *Pinus roxburghii*. The mean height of *Pinus roxburghii* was 11.74 meter, girth at breast height was 1.5 meter and mean height of lowest branch 8.03 meter. *Shorea robusta* (33.33%), *Mangifera indica* (10%), *Phyllanthus emblica* (6.67%) were used in study area (Table 6).

Table 6: Roosting trees of Nepal Kalij in Narmadeswor VDC.

SN	Species	Total	%	Mean height (m)	Girth at breast height (m)	Height of lower branch (m)
1	<i>Pinus roxburghii</i>	15	50	11.74	1.35	6.17
2	<i>Shorea robusta</i>	10	33.33	7.15	0.45	4.25
3	<i>Mangifera indica</i>	3	10	9.67	0.68	4.83
4	<i>Phyllanthus emblica</i>	2	6.67	7.00	0.42	4.25

#### 4.4 Conservation threats

##### 4.4.1 Perception of respondents on threats to Kalij

The conservation was described and cause of the threats was given by different heading named as; destruction of crops by Kalij, firewood and timber collection, disturbance by people, egg collection and poaching and livestock grazing. Destruction of crops by Kalij ranked highest value. (Table 7 and Figure 5).

Table 7: Household survey in relation to cause of threats in the wards of Narmadeswor VDC

Ward No.	Total household	Sample	Cause of threats				
			Destruction of crops	Firewood and timber collection	Disturbance by people	Egg collection and poaching	Livestock grazing
1	250	50	48	45	47	40	15
2	140	28	28	20	25	22	5
3	100	20	15	16	19	15	5
4	105	21	18	15	19	17	10
Total	<b>595</b>	<b>119</b>	<b>109</b>	<b>96</b>	<b>110</b>	<b>94</b>	<b>35</b>

#### **4.4.1.1 Destruction of crops**

Kalij feeding in the crop field is a serious cause of conflicts between man and Kalij because of destruction of crops by Kalij. Among 129 respondents, 109 express negative attitude towards Kalij, Many of them wanted to eliminate the Kalij. Thus it became a great threat to Kalij.

#### **4.4.1.2 Firewood and timber collection**

In Narmadeswor area, the firewood is main sources energy. People bring fire wood from forest. Occasionally, people are allowed to collect timber from the community forest where they cut trees of their need or easy to carry. Sometime they fell down even the roost trees of the Kalij. 96 respondents shared this practice is threat to Kalij conservation which cause habitat degradation and disturbance to Kalij.

#### **4.4.1. Disturbances by people**

Human activities in the forest such as collection of forest resources, livestock grazing and using forest trails disturbed the habitats and daily activities of the Kalij. 110 respondents point out this cause as conservation threats.

#### 4.4.1.4 Egg collection and poaching

People in the study area informed there is poaching of Kalij using tools such as snare and catapult. Local people collected eggs of Kalij and such activities also effect the survival of Kalij. 94 respondents informed that poaching and egg collection threats its survival.

#### 4.4.1.5 Livestock Grazing

The grazing area (forest and grass land) is foraging area for Kalij, thus livestock grazing also disturbed habitat and feeding activity of the Kalij. 35 respondents shows this cause as threats to Kalij.

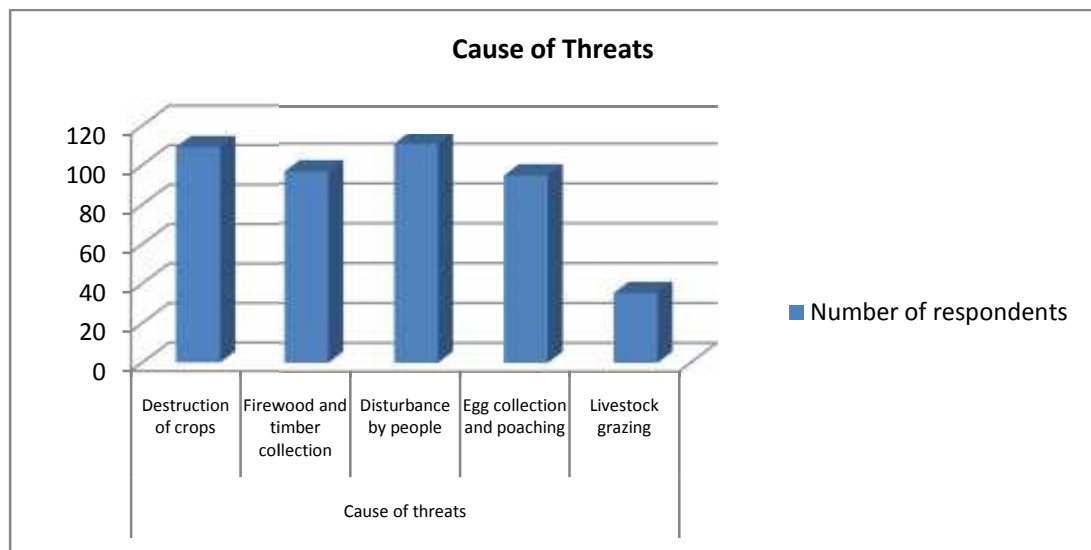


Figure 5: Response of local people on threats for Kalij pheasants

#### 4.4.1.8 Attitude of Respondents

Among 129 respondents, although 26.34% respondents express positive attitude towards Kalij which were mainly elders and religious people who are against hunting and killing but 73.66% respondents express negative attitude towards Kalij (Table 8), because of its feeding



behavior in the agricultural fields many of them wanted to eliminate the Kalij which was the great threats to Kalij pheasant conservation at Narmadeswor.

Table 8: Attitudes of people towards Kalij in the Wards of Narmadeswor VDC (in %)

<b>Attitude of local people</b>	<b>Ward Number</b>				
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>Total (n=129)</b>
Negative attitude	78	71.42	70	75.23	73.66
Positive attitude	22	28.58	30	24.77	26.34

## 5. DISCUSSION

### 5.1 Population status

During the study period, an average of 14 individuals were recorded at Narmadeswor VDC. During the study, the highest density ( $5.5/\text{km}^2$ ) was measured in August to September and the lowest was estimated in March ( $1.1/\text{km}^2$ ). The estimated population density of Blood pheasant ranged from 2.6 to  $3.9 \text{ pairs}/\text{km}^2$  in Pipar (Lesslliot and Yonzon 1980) and the estimated breeding population density was  $4.42 \text{ birds}/\text{km}^2$  in the lower Kaligandaki valley, Mustang (Acharya 2004). (Gaston and Singh 1980) found 6 pairs of Cheer pheasant per sq. km. in Chail Wildlife Sactuary, Himanchal Pradesh, India.

The density of population fluctuates with season in study area. In which high number of Kalij were found in the month of August to September. Breeding season starts from April through June (Baker 1928) and October was post breeding season. They may easily found feeding ground, roosting tree and other. While in March, least number 5 of Kalij was found. Because breeding start after this month (Ali and Ripley, 1969). So, in this month they start to pair. In some occasion even single male or female was found. They engaged in nesting and hiding. But in January to March, density of Kalij was recorded higher than in March and lower than in other months because they didn't come totally out from nesting and breeding ground. New cheeks were not come out from nest for foraging. In December, January and February, the result showed higher density than in March because in these month pheasants came out to agricultural field for feeding grains, left after harvest by respondents in early morning and evening.

### 5.2 Habitat Selection

The adaptation of each species suits it to a particular habitat and rule out its use of other places (Gautam 1999). Adequate habitat consists of suitable breeding ground, resting place, enough drinking water and plenty of food species, which always provide an opportunity to wildlife to increase and maintain their number (Bhatta 2002).

In my study area, there was presence of different types of habitat. But Nepal Kalij were recorded high percentage (47.3) in CFHU and least in OF (10.5) and TF (15.78). Similarly result was found by Gautam (1999). He found 49.42% of Kalij in CFHU and least 10.34%. In OF and in TF 12.64% in Dhital VDC, Kaski, Nepal, found by Subedi (2006). She found 44.66% of Kalij in CFHU and least 11.66% in OF and in TF 16.60% in Hemja, Kaski, Nepal. Mishra (1996) also found similar result in Majatal, Harasang wildlife Sanctuary, India. In his study he found 35% of Kalij in CFHU and least in TF (19%). Ali and Ripley (1983) mentioned that the Nepal Kalij were utilized affected forest with heavy scrub undergrowth and partial to the neighborhood of water and terraced cultivation. The highest habitat preference rating index (HPI) for Nepal Kalij in Narmadeswor was found in CFHU (1.30) and least in TF (0.74). Similar result was found by Gautam (1999) in Dhital, VDC, Kaski, Nepal. He recorded 1.44 for CFHU and OF (0.72) and TF (0.55) the same result was obtained by Subedi (2006) in Hemja, Kaski, Nepal. She recorded 1.23 for CFHU, OF (0.83) at TF (0.78).

Though Nepal Kalij prefers all most all habitat types but it was found that CFHU is most prefers by them. It is because in this type of habitat, it could found suitable breeding and resting ground and the best place to hide from the predator. Cover is an important feature of habitat for pheasants because it provides protection against predators and inclement weather and safety for breeding hens (Severinghouse 1979), which Nepal Kalij could found in CFHU. TF and OF are least preferred Nepal Kalij because this type of habitat could be more risk to the animals by the ground predators as well as flying birds (Gautam 1999). Other possible factors might be disturbance by cattle grazing and human activities for example grass and wood collection (Subedi 2006).

### **5.3 Roost analysis**

In my study area, I recorded out of 30 roost trees, 15 were *Pinus roxburghii*. In Narmadeswor, the most frequent species was *Pinus roxburghii* 96.66% which is the most used (50%) by Kalij followed by *Shorea robusta* (33.33%). *Pinus roxburghii* was recorded highly used species by Kalij because this tree has high canopy and crown. It contains more branches scattered horizontally, which provided perch branch of Kalij. Because of high crown and canopy predator couldn't found easily the Kalij roost in the tree. Gautam (1999) also studied in Dhital VDC, Kaski, Nepal, he found 29 *Castanopsis indica* trees among 35 roost trees. Frequently used species was *Schima wallichii* equal to 96.57% but roosting value of this species has only 5.71%

of total study area. The same study was carried by Basnet 2006 where she found the frequency of *castanopsis indica* has only 80% but roosting frequency accounted 85.85% among the total roosting trees. Some results is found by Subedi (2006) in Hemja VDC, Kaski.

Yasmin (1994) recorded *Dalbergia sissoo* and *Albizia lebbeck* were preferred by blue peafowl in Aligarh district India. He found height of trees was 12 to 13 meter and height of first branch of tree was 3 to 5 meters could be due to achieve the greater protection and being the different species from Kalij. Similar type of study was done by Islam and Crawford (1984-1985) on western Tragopan in Northeastern Pakistan; they recorded 28m tall with 2.1 meter diameter at breast height, 3 meter height of lowest branch from the ground which are taller and bigger than the roosting tree of Kalij in Narmadeswor, could be due to some different behavior of Tagopan in selection of roost tree. Predation can be major population control mechanism in gallinaceous birds (Hill and Robertson, 1988) and roost tree selection is most probably influenced by predation. Other large birds such as Turkeys (Hoffman, 1968) and vultures (Thompson et al. 1990) also use old and mature trees with the greatest height.

Rutgers and Norris (1970) described the roosting perches of Nepal Kalij were 6 feet above the ground and safer from heavy rain and storms but this was for captive. Kalij in Narmadeswor used the trees for roost which has the mean height 9.69m, girth at breast height 0.92m and the height of the lowest branches 5.27m. Kalij choosed this parameter because it could found favorable condition such as to height from predator and able to be out from the environmental risk. So the value is lower than my observation but similar result was found by Gautam (1999) and Subedi (2006). Gautam (1999) recorded Kalij used roost tree with mean height 11.63 meter, girth at breast height was 0.66 meter and height of lowest branch was 4.21 meter where mean height seemed to be higher than my study but girth at breast height and height of the lowest branch was seemed to be lower than my study. Subedi (2006) recorded that Kalij used roost trees with mean height 7.29 meter, girth at breast height was 0.47 meter and height of the lowest branch was 4.79 meter which is seemed to be lower than my study, this could be due to adaptation in roost selection, topography and slope of the study area.

In my field study flock size up to 5 was recorded and some time single male and female can also be found. The single male might be replaced by another competent males or it is the rest one which could escape from the hunt (Gautam 1999). Baker (1928) also observed roosting of Nepal Kalij in flocks.

## 5.4 Conservation Threats

The Nepal Kalij in Narmadeswor in Okhaldhunga has suffered directly or indirectly by man. Feeding of Kalij on the crop is the major threat to Kalij in the study area. People shows totally negative attitude towards Kalij Pheasant due to this reason which is followed by firewood collection, and disturbance in the roosts of Kalij, timber collection, poaching, egg collection, and grazing.

Local people of Narmadeswor area showed negative attitude towards Nepal Kalij, because Kalij come to their agricultural field for feeding and destroy all the crops.

Firewood and Timber collection were other important threats to Kalij in Narmadeswor. It was also mentioned for this species in Dhital by Gautam (1999). Respondents of the Narmadeswar VDC have the trend of bringing firewood and timber from the forest which is main habitat of the Kalij Pheasant.

People move to the core of forest for the different purposes like as to collect leaves, timber, firewood etc where they get encounter with Kalij as well as disturb the roost of Kalij which is another threat for conservation.

Every kind of poaching method was found to be practiced on Kalij in Dhital (Gautam, 1999). Poaching as one of the threat of Kalij Pheasant in Narmadeswor VDC but none of the modern technique of poaching is used. People poached Kalij by using traditional method.

Grazing is another threat to Kalij though it is least important. Livestock was allowed to graze freely in forest which has adversed affect to the wildlife as well as Nepal Kalij (Gautam, 1999). In western Himalayas of India domestic stock can also cause dramatic alterations to patch work of semi-natural habitats and production momo cultures typical of most agricultural areas which cause the habitat degradation similar threat faced by Tragopan in India and Pakistan (Mc Gown and Garson 1995). In Narmadeswor VDC, most of the grazing field is covered by community forest and maximum of the slope land is covered by commercial growing of Khar (*Themeda villosa* poir).

## 6. CONCLUSION AND RECOMMENDATIONS

### 6.1 Conclusion

Nepal Kalij is found mainly in central and eastern Nepal. In Narmadeswor VDC of Okhaldhunga district. This species is distributed to almost all types of forest along with terraced cultivation.

The density of population varies with changing season. Due to post breeding period, the highest density was recorded in August to September and least in March due to engaged of Kalij in nesting and pairing.

From vegetation analysis a total of 22 species of trees, 8 species of shrubs and 29 species of herbs, 8 species of climbers and 16 species of grass were recorded in Narmadeswor, Okhaldhunga. Only 10 species of trees were analyzed to calculate frequency because other were found in very small number. *Schima wallichii* was recorded as frequent species and followed by *Castanopsis indica*, *Alnus nepalensis*, *Myrica esculenta*. Closed forest with high under storey was highly preferred by Kalij in Narmadeswor. In this habitat Kalij could easily found nesting, foraging, roosting and feeding ground and felt secure than other. Open forest was least preferred by Kalij in Narmadeswor as they couldn't find easily favorable condition for feeding, roosting and foraging. Predator could find it easily in this habitat.

*Pinus roxburghii* was highly used by Kalij for roosting. Average height of *Pinus roxburghii* is 11.74 meters. This tree species provided safe perch to Kalij. They roost on flock of family parties.

Many threats were recorded in study area on the basis of information given by local people. The main threats was due to the feeding of Kalij on crop which shows negative attitude of the local people towards Kalij and make them against the conservation.

## **6.2 Recommendation**

On the basis of this study, I would like to recommend following points;

1. There is no specific information on population status, foraging and breeding habitats of Kalij pheasant, so it is necessary to research on these topics to understand its ecology.
2. Timber and firewood collection, disturbance in the roost of Kalij, poaching and cattle grazing in Narmadeswor area should be controlled with rule and regulation and regulated through awareness program.

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## Appendix – 1

### Tables

Recorded flora in the Habitat of *Lophura leucomelana leucomelena* in Narmadeswor VDC, Okhaldhunga.

Table I: List of Tree Species

SN	Tree species	Local name	Family
1	<i>Albiza sps</i>	Siris	<i>Legumibnosal</i>
2	<i>Alnus nepalensis</i>	Uttish	<i>Betulaceae</i>
3	<i>Artocarpus lokoche</i>	Badhar	<i>Horaceae</i>
4	<i>Bauhinia malabarica</i>	Tanki	<i>Leguminosal</i>
5	<i>Bombax Ciebal</i>	Simal	<i>Bombacaceae</i>
6	<i>Castanopsis indica</i>	Katush	<i>Pheagaceae</i>
7	<i>Dode cadenia sp.</i>	Bakle	<i>Lauraceae</i>
8	<i>Eura cerasifolia</i>	Pate	<i>Theaceae</i>
9	<i>Ficus bengalenses</i>	Bar	<i>Moraceae</i>
10	<i>Ficus clauata</i>	Bedal	<i>Moraceae</i>
11	<i>Ficus lacor</i>	Kavro	<i>Moraceae</i>
12	<i>Ficus religious</i>	Pipal	<i>Moraceae</i>
13	<i>Ficus uriculata</i>	Wibro	<i>Moraceae</i>
14	<i>Litsea monopetala</i>	Kutmiro	<i>Laurancea</i>
15	<i>Mangifera indica</i>	Mango	
16	<i>Phyllanthus emblica</i>	Amala	
17	<i>Pinus roxburghi</i>	Sallo	
18	<i>Rhododendron arboreaum</i>	Gurash	<i>Ericaeae</i>

19	<i>Schima wallichii</i>	Chilaune	<i>Theaceae</i>
20	<i>Semecarpus anacurdium</i>	Bhalayo	<i>Anacardiaceae</i>
21	<i>Shorea Robusta</i>	Sal	
22	<i>Syzygium cumins</i>	Jamun	<i>Myrtaceae</i>

Table II: List of Shrub Species

SN	Shrub species	Local name	Family
1	<i>Asparagus racemosus willd</i>	Kurilo	<i>Liliaceae</i>
2	<i>Berberis asiatica Roxb. Ex DC.</i>	Chutro	<i>Berberidaceae</i>
3	<i>Grandinia palmate</i>	Sishnu	<i>Urtaceae</i>
4	<i>Maclura cochinchinensis (Lour.) Corner</i>	Dammaru	<i>Moreceae</i>
5	<i>Maesa sp.</i>	Bilaune	<i>Myrsinaceae</i>
6	<i>Melastomala normale D. Don</i>	Guiye Angeri	<i>Lecythidaceae</i>
7	<i>Mycatanthes arborlristis</i>	Rudilo	<i>Uleaceae</i>
8	<i>Rubus ellipticus J.E. Smith</i>	Aiselu	<i>Rosaceae</i>

Table III: List of Herbs Species

SN	Herbs Species	Local name	Family
1	<i>Achyranthus aspera L.</i>	Dattiwan	<i>Amaranthaceae</i>
2	<i>Alternanthera sessilis</i>	Akhlejhar	<i>Amarntnacea</i>
3	<i>Arisaema tortotuosum (Wall.) Schot</i>	Sharpa ko Makai	<i>Araceae</i>
4	<i>Capsella bursapastris (L.) Medik.</i>	Tori Jahr	<i>Cruciferae</i>
5	<i>Centella asiatica (L.) Urban</i>	Ghod tapre	<i>Umbellifereae</i>

6	<i>Colocasia antiquorum</i>	Karkalo	<i>Araceae</i>
7	<i>Drymaria diandra</i> Blume	Avijalo	<i>Caryophyllaceae</i>
8	<i>Dryopteris filixmax</i>	Uinu	<i>Polypodiaceae</i>
9	<i>Duchesnea indica</i> (Andr.) Focke	Bhuikafal	<i>Rosaceae</i>
10	<i>Eupatorium adenophorum</i> Spreng	Banmara	<i>Compositae</i>
11	<i>Gonostegia hirta</i> (Blume) Mig.	Aternu	<i>Uricaceae</i>
12	<i>Hauullunya cordata</i>	Gandhe	<i>Sauraniaceae</i>
13	<i>Hedychium</i> sp.	Paniswaro	<i>Zingiberaceae</i>
14	<i>Inula cappa</i> DC.	Gaitihar	<i>Compositae</i>
15	<i>Nasturtium officinale</i> K. Br. Ex Aitm	Khole sag	<i>Cruciferae</i>
16	<i>Nephrolepis cordifolia</i> (L.) Presl	Pani amala	<i>Davalliaceae</i>
17	<i>Oxalis corniculata</i>	Chariamilo	<i>Oxalidaceae</i>
18	<i>Phyllanthus clarkei</i> Hook.	Paite	<i>Euphorbiaceae</i>
19	<i>Phyllanthus niruri</i> L.	Bhui Aushelu	<i>Euphorbiaceae</i>
20	<i>Polystichum nepalense</i> (Spreng)	Paniamala	<i>Aspidiaceae</i>
21	<i>Pteris biaurita</i> L.	Guesotara	<i>Pteridaceae</i>
22	<i>Renwardtia indica</i> Dum.	Pyauli	<i>Linaceae</i>
23	<i>Rhus javanie</i>	Hadgunio	<i>Anacardiceae</i>

Table IV: Monthly mean maximum temperature ( $^{\circ}\text{C}$ ) of Manthali of Ramechhap district (20 KM far from Narmadeswar VDC, Okhaldhunga (2008 to 2012))

Months	2009	2010	2011	2012	2013	Mean
Jan	20.6	19.6	20.1	19.7	19.8	19.96
Feb	25.3	23.3	23.4	21.9	23.4	23.46
March	21.4	27.9	27.1	25.7	29.3	26.28
April	33.6	30.8	29.2	30.1	28.9	30.52
May	30	29.6	29.8	30.2	30.6	30.04
June	30.1	30.7	31.4	30.8	31	30.8
July	29.3	30.7	30.2	30.5	29.9	30.12
Aug	29.1	30.4	30.3	31.4	31.4	30.52
Sep	29.9	29.8	29.7	30.1	29.4	29.78
Oct	26.6	28.7	28	29	27.3	27.92
Nov	24.3	25.5	24.6	24.7	23.5	24.52
Dec	21.6	21.1	20.9	21.2	21.1	21.18

Source: Department of Hydrology and Meteorology, Nepal Government

Table V: Monthly mean minimum temperature (0C) of Manthali of Ramechhap district (20 KM far from Narmadeswar VDC, Okhaldhunga (2008 to 2012)

Months	2008	2009	2010	2011	2012	Mean
Jan	6.5	7.5	7.1	6.9	7.5	7.1
Feb	10.7	10	9.9	9.6	10.3	10.1
March	13.2	12.3	13.7	12.8	15.9	13.58
April	18.6	15.4	16.5	16.9	16.6	16.8
May	19.1	19.2	19.3	17.6	19.3	18.9
June	20.8	21.6	21.6	21.1	21	21.22
July	21.7	22.5	22.4	22.1	22.1	22.16
Aug	21.4	22.2	22.1	22.5	22.6	22.16
Sep	21.4	20.8	20.7	21	21.1	21
Oct	17.4	17.8	16.9	17.6	16.2	17.18
Nov	12.7	13.2	12.4	13.3	11.1	12.54
Dec	9.1	8.8	8.9	8.3	8.7	8.76

Source: Department of Hydrology and Meteorology, Nepal Government

Table VI : Monthly rainfall (mm) of Ramechhap district (2008 to 2012)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008	11	0	56	25.5	59.5	187	166.2	131	59.5	0	0	0
2009	0	0	20.5	18	177.5	69	224	160	27.5	51	0	6.5
2010	0	9	3.3	52.5	55.5	29.5	223.5	140	89.4	0	0	0
2011	10.5	17	2.5	74	104.5	254.5	129.5	194.1	170	4	16.5	0
2012	7.5	13	0	94.5	45.5	124.5	235.5	162.5	114	0	0	0
Mean	5.8	7.8	16.46	52.9	88.5	132.9	195.74	157.52	92.08	11	3.3	1.3

Source: Department of Hydrology and Meteorology, Nepal Government



Table VII: Monthly maximum humidity of Ramechhap district (2008 to 2012)

Months	2008	2009	2010	2011	2012	Max. Mean
Jan	77.6	78.8	85.5	85.4	87.4	82.94
Feb	80.5	79.2	82.5	73.7	80.7	79.32
March	70.5	69.7	71.6	64.8	65.8	68.48
April	78	62.6	65.9	65.9	70	68.48
May	75	71.7	61.7	72.8	69.8	70.2
June	74.2	74.3	69	78.6	73.2	73.86
July	84.1	83.2	86.9	83.2	83.2	84.12
Aug	83.9	87.2	88.9	87.2	85.5	86.54
Sep	83.3	85.6	88.5	87.3	87.1	86.36
Oct	74.8	85.8	76.4	85.3	82.5	80.96
Nov	75.3	81.3	79.5	87.5	85	81.72
Dec	82.3	87	83.7	93	90.1	87.22

**Source:** Department of Hydrology and Meteorology, Nepal Government

Table VIII: Monthly minimum humidity of Ramechhap district (2008 to 2012)

Months	2008	2009	2010	2011	2012	Min. Mean
Jan	66.5	67.6	61	61.7	66.8	64.72
Feb	60.4	59.8	66.3	50.1	53.5	58.02
March	57.5	58.2	59.4	44.9	49.2	53.84
April	74.6	50.3	53.4	47.6	56.3	56.44
May	73.8	65.2	56.6	58.1	49	60.54
June	71.1	67.8	58.7	67.4	61.2	65.24
July	79.4	76.2	70.5	76.2	75.5	75.56
Aug	82.6	80.3	77.8	77.9	75.6	78.84
Sep	74.8	78.6	84.6	78.4	73.5	77.98
Oct	71.4	70.4	68.1	73.2	59.1	68.44
Nov	68.4	67.4	68.5	69.1	52.6	65.2
Dec	74.1	64.4	73.8	64.6	58.7	67.12

**Source:** Department of Hydrology and Meteorology, Nepal Government

Table IX: Monthly maximum temperature of Ramechhap district (2008 to 2012)

Months	2008	2009	2010	2011	2012	Max. Mean
Jan	24.7	26.6	25.4	22.3	22.9	24.38
Feb	28.7	29.1	28.4	28.8	28	28.6
March	32.5	31.6	34	31.9	33.9	32.78
April	37.7	36.4	37.4	34.3	37.3	36.62
May	36.7	35	37.6	35.1	37.3	36.34
June	35.3	37.5	36.4	35.5	37.1	36.36
July	34.7	26.1	35.3	34.4	34.5	33
Aug	33.9	35.6	34.2	33.6	35	34.46
Sep	35.5	35.1	34.8	34.1	34.3	34.76
Oct	33.6	32.8	32.2	32.6	32.8	32.8
Nov	29.8	29.3	26.7	27.4	28.2	28.28
Dec	26.5	26.6	25	25.4	24.9	25.68

**Source:** Department of Hydrology and Meteorology, Nepal Government

Table X: Monthly maximum temperature of Ramechhap district (2008 to 2012)

Months	2008	2009	2010	2011	2012	Min. Mean
Jan	8.6	10.4	9.7	6.5	8.1	8.66
Feb	10.8	11.5	11.6	8.5	9.6	10.4
March	13.5	13.7	13.8	14	13.6	13.72
April	22.1	19.7	23.7	17.4	18	20.18
May	17.8	20.9	22.9	20.6	22.1	20.86
June	22.2	23.7	24.6	23.3	25.2	23.8
July	24.1	24.3	23.5	24.1	25	24.2
Aug	23.9	23.2	23.2	22.6	24.5	23.48
Sep	22.9	22.2	22.2	18.3	23.7	21.86
Oct	18.2	18.8	18.3	17.3	18.2	18.16
Nov	13.6	14.9	14.3	13.5	11.9	13.64
Dec	11	12.3	8.8	10.4	9	10.3

**Source:** Department of Hydrology and Meteorology, Nepal Government

## Appendix - 2

### Household Surveys

Household Questionnaire Survey on Kalij Pheasant in Narmadeswar VDC with local people. This questionnaire is being given to find out what people know about Nepal Kalij. You do not have to answer these questions if you do not want to. I will not write your name on the questionnaire and no one will know which answers are yours. Answering the questions will take about 40 minutes. You can skip any questions you like by saying. “skip” or stop answering anything at any time, you choose. Do you have any questions for me right now about the survey?

Would you like to participate in the survey? (If yes, proceed to ties/1)

1. Name of interviewer: Interview Date:
2. Village Name (or approximate location) elevation (m)
3. Respondent’s Gender: Age: Occupation:
4. Total Village population (Number persons/house holds):
5. Do you recognize pheasant?
  - a. Yes
  - b. No
6. Indicate kind of evidence found with tick below;  
Droppings \_\_\_\_\_ Sighting \_\_\_\_\_
7. Describe the place where the sign was found (e.g. trail, base of tree, terraced field, rocky area, streamed etc.)
8. If a sighting how many Kalij were seen in a group?
9. How is Kalij pheasant like? Describe distinctive physical feature?
10. How may Kalij do you think use this area?
11. Do Kalij come to your agricultural field?
  - a. Yes
  - b. No
12. Are they here all year or seasonally?
  - a. All year
  - b. seasonally only
13. What is your opinion about Kalij?
  - a. Good
  - b. Bad
  - c. No opinion

14. Should they be protected or eliminated and why?
15. Do local people and any kinds of benefits about the Kalij?
16. Have you seen the nest of Kalij?
  - a. Yes
  - b. No
17. If yes, in which habitat is the nest found?
  - a. Tree (which type),
  - b. Bush
  - c. Ground
  - d. rice field
18. In which season Kalij hatch chicken?
  - a. Winter
  - b. Summer
  - c. Other
19. How many eggs do the Kalij hatch in one hatching? Do you like to collect egg of Kalij?
20. Do the Kalij live with other birds?
21. Are the Kalij poached?
  - a. Yes
  - b. No
22. Do grazing in forest effect the Kalij?
  - a. Yes
  - b. No
23. Do the human activities effect the Kalij?
  - a. Yes
  - b. No
24. Do NGO/INGOs, Government run programme for conservation of habitat of Kalij?
  - a. Yes
  - b. No
25. Are the people who pouch the Kalij punished?
  - a. Yes
  - b. No
26. What types of punishment are they given?
27. Who pouch the Kalij?
  - a. Villagers
  - b. Outsiders
  - c. Children
28. What type of tool is used for pouching?

(End of interview): Thank you very much for answering these questions for me. I appreciate your ability to help me for providing these information.

## Appendices – 3

### Photos



#### 1. Study area



2. Measuring to make the quadrate



3. Taking DBH of the roosting trees



4. Gathering information of different vegetation in the study area.



5. Female Kalij, at roosting site.



6. Male Kalij, foraging in terraced field