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Crop Depredation by Monkey Outside Protected Area in Nepal; Costs, Conditions and Perceptions

Human wildlife conflict outside the protected area is increasing in Nepal however; government and their conservation partners are mainly focused in biodiversity issues within protected areas only. This study was conducted in Jaidi village of Baglung district to analyze the status of crop damage and people's perception on such damage caused by monkey. Data were collected through series of community consultation, field observation and household survey at 10% sampling intensity. The annual crop damage in volume and cost was 183.46 kg/HH and NRs 7659.77/HH respectively. Amount of damage was significantly different with different varieties of crops (p=0.000). Multiple linear regressions showed that amount of crop was significantly dependent on the distance of farm from the forest area (ß= -0.052, p= 0.000), available water source (ß= -0.059, p= 0.000), respondents house (ß= 0.021, p= 0.000), and nearby settlement (ß= 0.038, p= 0.000). More than half of the respondents were unwilling to conserve monkey due to damage caused to their crops. The willingness to monkey conservation and the extent of damage are found to be dependent. This study recommends to formulate the human monkey management plan outside the protected area.

Key words: Human-Wildlife conflict, Crop depredation, Compensation, Conservation.

Human-wildlife conflict outside protected area in Nepal's mid-hills is increasing due to increasing forest cover. It has caused the significant loss to people which should be addressed for effective wildlife conservation outside protected area.

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Introduction

Human-wildlife conflict (HWC) is posing threat to the conservation of many wildlife species (Dickman, 2010; Air, 2015). The growing human population creates competition between people and wildlife (Dickman *et al.,* 2011), resulting human wildlife conflict. HWC has been widely recognized as one of the most challenging issue for wildlife conservation worldwide (Dowie, 2011; Woodroffe *et al.,* 2005; Acharya *et al.,* 2016). Crop damage caused by primates is one of the most wide spread and common example of human and non-human primate conflicts especially in areas where local people depend on agriculture to fulfill their subsistence needs (Hill, 1998). Crop raiding is one of the causes of conflict from herbivorous animals which is mainly associated with farmers (Air, 2015). Improved strategies are urgently needed to reduce the HWC by promoting the co-existence of wild animals and people (Woodroffe *et al.,* 2005; Dickman *et al.,* 2011; Acharya *et al.,* 2016).

Compensation provided by the government is not effective in reducing conflict because it is inadequate as it covers only the range of species (Nyhus *et al.,* 2005). Nepal has the provision of providing compensation for damage caused by fourteen animals only *viz*. Elephant, Rhino, Tiger, Bear, Common Leopard, Snow Leopard, Wild Boar, Clouded Leopard, Boar, Wolf Wild Water Buffalo, Mugger Crocodile, Asiatic Rock Python and Guar (DNPWC, 2017). Primates including the macaque are considered as highly devastating crop raiders. With their extensive repertoire of cooperative behaviors, opportunistic life-style, and non-specialized and omnivorous dietary tendencies, primates such as baboons (Forthman-Quick, 1986), vervets (Boulton *et al.,* 1996), and macaques (Pirta *et al.,* 1997) are highly adaptable and take readily to living alongside humans in rural or sometimes

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urban and semi-urban settings. Crop raiding is an essential component of the ecology of primates to survive nearby the human settlement (Naughton-Treves *et al.,* 1998).

Crop raiding by primates is particularly problematic in Asia and Africa, with the most common (and successful) "pest" species including members from the genera Macaca, Papio, and Cercopithecus (Hill, 1997) and these primates' complex social organizations, ability to utilize both terrestrial and arboreal habitats, and reliance on non-specialized and omnivorous diets contribute to their crop-raiding success (Forthman-Quick 1986). Crunch of natural food and easy availability nutritious human food could be the most important cause of the intensity of crop raiding and this is more obvious in Nepal where humans and monkeys share common resources to meet their daily needs (Aryal and Chalise, 2013).

HWC in and around Protected Area (PA) is common issue in most of the forum with little discussion about HWC outside the PA. The increased conflict and crop depredation of local people by wildlife remained as the root cause of failure of conservation of wildlife and thus resolving conflict between human and wildlife is pre-requisite for ensuring sustainable conservation Community forestry is recognized as the successful program for managing forest resources especially mid-hills of Nepal (Paudel, 2014; Paudel, 2015). Forest area in mid-hills area has been increasing (DFRS, 2015) and consequently the number of wildlife is also increased (Pandit and Bevilacqua, 2011). Outcome of community forestry in general is satisfactory/ praiseworthy, but emerging HWC as a result of expansion of forest area is unintended negative consequence. There is legislative provision of providing compensation to the damage caused by charismatic animals only in Nepal (DNPWC, 2017). Conflict between human and monkey outside PA is increasing day by day with increasing damage caused by monkeys to the crops. Continuity of such situation will escalate the human wildlife conflict which ultimately leads to killing of wildlife as revenge. So there is an urgency to reduce HWC outside PA through appropriate compensation of damage caused by the wildlife. There is need of comprehensive assessment on damage caused by wildlife including monkey and formulate proper legislation to resolve HWC. This study was conducted to analyze the status of crop damage and people's perception against damage caused by monkey.

Study Area

This study was conducted in formerly Jaidi Village Development Committee (VDC) now ward no 7 of the Jayamuni Municipality of Baglung district of Nepal (Fig. 1). Hill Sal (*Shorea robusta*) forest, chilaune (*Schima wallichii*) katus (*Castanopsis indica*) forest and utis (*Alnus*

Fig. 1: Location of Jaidi VDC in Baglung district and Nepal.

nepalensis) forest are the dominant forest types in under the area of VDC. There are 1006 households (HHs) in this VDC with total population of 4195 including 1790 male and 2405 female (CBS, 2014). Brahmin, Chhetri, Thakuri, Sanyasi, Magar, Damai,Kami and Sarki are dominant caste in this VDC. The micro climate of this VDC is warm summer and mild winter. Agriculture farming is the main occupation of people residing in this VDC with rice, wheat, millet, paddy and corn being major agricultural crops cultivated by farmers.

Method and Materials

Data collection

Community meeting was conducted to obtain general information about the status of crop damage by monkey and local rate of agricultural products. Questionnaire contained both open and closed questions that were pretested before data collection in order to test its effectiveness. Questionnaire was designed to gather information about the amount of crop damaged and respondent's perception towards monkey conservation and compensation scheme. A total of 100 households (at 10% sampling intensity) were surveyed using random sampling ensuring the representation of different categories of people. The number of total households and surveyed households in each ward is given in Table 1. Key informant interview was conducted among teachers, elderly citizen, local leaders and chairperson of community forest user group that were considered to be familiar about the locality.

Table 1: Surveyed HH number in different wards.

Ward	Household	Sampled HH
1	144	14
2	169	17
3	155	15
4	57	6
5	83	8
6	73	7
7	134	13
8	123	12
9	68	7
Total	**1006**	**100**

Data analysis

Data obtained were fed into Ms-Excel and Statistical Package for Social Science (SPSS version 14) and analyzed accordingly. Cost of crop damage per household was calculated by using the following formula,

$$\text{Cost of damage} = \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} (qij \times pij)}{N}$$

where,

q= Quantity of crop damaged in kg

p= Price of crop damaged in US $

i= varieties of crops

j= households

N= total number of households

Analysis of variance (ANOVA) was conducted to test the significance of mean difference between the different varieties of crops. In case the difference was found significant further least significance difference (LSD) was conducted to test significance of mean difference between each varieties of crops.

Estimating parameters of crop damage

The effect of field's location in the crop damage has been observed by the previous researches (Hill, 1997; Hill, 2000; Bayani *et al.,* 2016). They established the relation between the amount of damaged crop and the distance from the forest. In this study we examined the relation between the amount of crop damaged by monkeys with four parameters of field's location *viz.* distance from water sources, distance from respondent's home, distance from nearby settlement and distance from forest. An econometric model was developed and multiple linear regression was carried out to analyze the combined effect of these four parameters on the amount of crop damaged.

The econometric model was,

$$Y = C + ß_1X_1 + ß_2X_2 + ß_3X_3 + ß_4X_4$$

where,

Y = Amount of Crop Damage in Kg

C = Constant

X_1 = Distance from water sources (meter)

X_2 = Distance from respondents home (meter)

X_3 = Distance from nearby settlement (meter)

X_4 = Distance from forest (meter)

$ß_1$, $ß_2$, $ß_3$and $ß_4$are the coefficient associated with these parameters which denotes the marginal effect of the change in corresponding parameter to the amount of crop damaged.

Analysis of perception

Perception of residents of the study area was analysed by categorizing them into highly affected, moderately affected and less affected category. We performed Chi-square ($\chi 2$) to analyse the association between the extent of damage and perception of respondents on monkey conservation and expected compensation.

Results

Crop damage

Maize, millet, mustard, paddy, pulses and wheat were identified as key crops damaged by monkey in the study area. The annual crop damage was calculated to be 183.46 kg/HH worth US$ 75.10 /HH (Table 2). Maize was found to be the most damaged (100.16 kg/HH/year) while mustard was least damaged in terms of amount of damage per households. However, in terms of damage percentage maize was most damaged while millet was the least damaged crops. One way ANOVA shows that the annual production and damage quantity and its costs are significantly different (p=0.000) (Table 3). Further the LSD test showed that the mean difference in the cost of damage is not significant between mustard and millet (p=0.401).

Table 2: Quantity and cost of damaged crops per households.

Crop varieties	Annual production in kg	Damaged amount in kg	Total Production in US $	Cost of damage (US $)	Damage %
Maize	288.82	100.16	113.26	39.28	34.68
Millet	105.08	7.29	41.21	2.86	6.94
Mustard	21.18	2.32	5.19	0.57	10.95
Paddy	630.00	49.49	185.29	14.56	7.86
Pulses	49.98	8.51	68.60	11.68	17.03
Wheat	105.08	15.69	41.21	6.15	14.93
Total	**1200.14**	**183.46**	**454.76**	**75.10**	**16.51**

Table 3: F and *p* values to test the mean difference of total production and damage between different varieties of crop.

Parameters	F-value	p- Value
Annual production in kg	333.874	0.000
Damaged amount in kg	187.107	0.000
Total Production in US$	216.143	0.000
Cost of damage US$	189.170	0.000

Parameters of crop damage

The result of the multiple regressions on the effect of different parameters on the amount of crop damage is presented in Table 4. The coefficient of distance from water sources and average distance from forest were found negative (-0.052 and -0.059 respectively). Likewise, coefficient of distance from home and distance from settlement is found positive 0.021 and 0.038 respectively. The regression coefficient of all four variables were found significant (p=0.000) at 5% level of significance.

People's perception

About 88 % of the respondents suggested that there is increasing trend of damage caused by monkeys while 12% suggested no change in trend. About two third (61%) of the respondent expected compensation against crop damage from the Government (Fig. 2). Half of the respondents (50%) suggested that the compensation should be provided for crop damage while 27% did not respond at all. About 54% of the respondents were not interested to conserve monkey while only 8% were strongly interested to conserve this species.

Chi-square tests showed that the perception on change in crop damage scenario and responsibility for paying damage are not associated with the extent of damage (p>0.05) while the perception on compensation provision and willingness to monkey conservation are found significantly depended on the extent of crop damage (p<0.05) at 5% level of significance (Table 5).

Discussion

Amount of damaged crop

The annual crop damage amount in the studied VDC was found to be 183.46 kg/HH that worth US $ 75.10 /HH. Crop damage is identified as one of the common type of HWC which has widespread impact. The amount of damage differs in places to places depending upon the intensity of the raiding. Ghimirey (2012) determined that the cost of damaged crops was US$ 726.02 /HH/year in Makalu Barun National Park. The economic value of the damage in our finding is less than one made by Ghimirey (2012). His study was concentrated on the periphery of the National Park which is more affected than the other area and hence the cost of damage is higher than our finding. Our finding on total damage is also contrasted with the finding of the studies carried out in the protected areas. Annually crop equal to the US$ 210.02 per household was damaged by wildlife nearby the Gaurishankar conservation area Nepal (Awasthi and Singh, 2015). Amount of damage is obviously lower outside PA in comparison to the damage occurred in or around protected area. There is no PA nearby study area and hence there is low abundance of wildlife including monkey. This result in the lower amount of damage in the study area than the damage reported in the villages nearby the PA.

Our result showed that maize was the most damaged (34.68%) crop. Likewise the percentage of crop damage to total production was 6.94%, 10.95%, 7.86%, 17.03% and 14.93% for millet, mustard, paddy, pulses and wheat respectively. Pokharel and Shah (2008) study in Dang district had similar findings with maize being heavily damaged followed by wheat, rice and potato. Aryal and Chalise (2013) from their assessment at Gulmi district reported that the monetary loss of maize was 48% of the total damage. Hill (2000) in her study in Uganda found that cassava and maize were most frequently damaged by baboon. Similar to our finding study carried out by Awasthi and Singh (2015) at Gaurishankar Conservation Area, Nepal reported that maize contributes to about

Table 4: Results of the multiple regression model of different parameters on amount of crop damage.

Variable	Coefficients	Std. Error	t-value	*p*-value
Constant	50.561	5.374	9.408	0.000
Distance from water sources in m*	-0.052	0.009	-6.045	0.000
Distance from home in m*	0.021	0.004	5.431	0.000
Distance from settlement in m*	0.038	0.008	4.778	0.000
Average distance from forest in m*	-0.059	0.008	-7.102	0.000
*Significant at 5% level of significance				

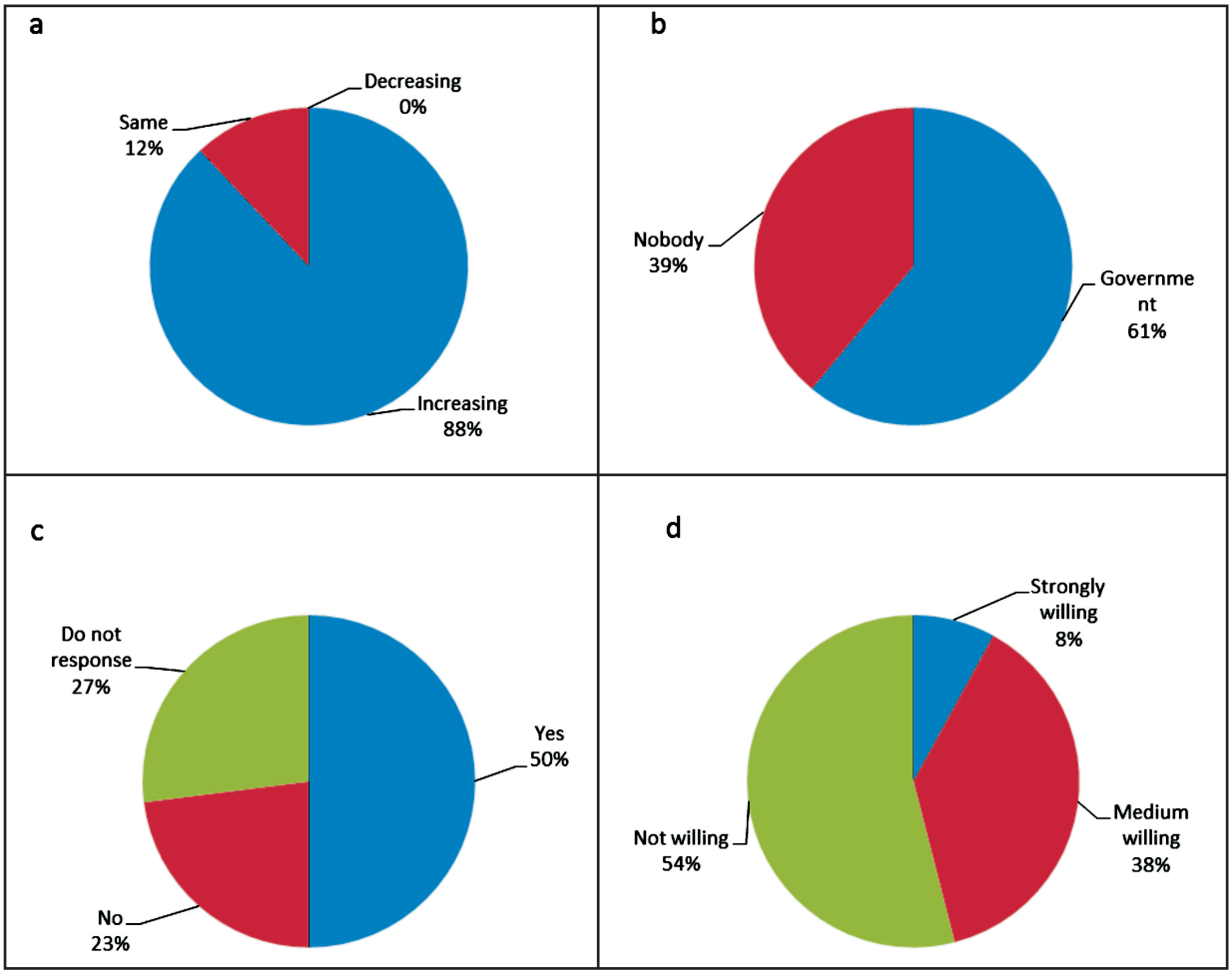

Fig. 2: Perception of people a) Perception on crop damage scenario, b) Response on responsible agency for payment of losses c) Response on whether compensation should be provided or not d) Willingness to monkey conservation.

Table 5: Chi-square and p-values obtained to test association between perception and extent of damage.

Perception on	X^2- value	p-value
Change in crop damage scenario	0.216	0.894
Responsibility for paying damage	0.898	0.638
Compensation provision*	21.8	0.000
Willingness to monkey conservation*	25.44	0.000
*Significant at 5% level of significance		

38.9% of the total crop damage indicating as the mostly damaged crop by wild animals. High foraging efficiency with maize (Air, 2015) could be important cause for maize being most damaged crop. Maize provides readily nutritious food than other crop therefore monkey raided maize in higher intensity than other crop. During the interaction with the local people, they reported that it would be easier for monkey to take away maize from the field than other crop. This also contributes to the higher damage of maize than other crop.

Parameters of crop damage

The regression coefficients of the distance from nearby settlement and own home to the farm were negative and significant at 5% level of significance ($p<0.05$). This implied that farther the crop field from respondent's home and nearby settlement, the higher will be amount of crop damaged by monkey. Farmer could effectively protect the crop by guarding the crop field against monkey if it is located closer to his home. In contrast if the distance of crop field is far from farmers home there is a chance of crop field unattended by farmers due to his travel time from home to field. Some farmer's stated that they were less concerned about crop damage which was grown far from their home. The amount of damage was affected not only by the distance from the farmer's own home but also from the location of the nearby settlement from the crop field. Crop damage was lower in crop field that was closer to settlement compared to damage to the field that was far away. People's presence and their activities may prevent monkeys from damaging crops.

Factors likely to affect vulnerability to crop raiding by wildlife include the distance from farm to forest edge, the number of other farms lying between any field and tree habitats (Hill, 1997, 2000). Findings of our study are similar to these findings. The regression coefficient of the distance from forest and water sources were significant ($p<0.05$) with negative value, suggesting that damage

amount decreases with increase in distance from water sources and forest. The findings of this study are consistent with the findings of the Naughton-Treves (1998) in regards to relation between damage amount and distance to forest. Her study in Kibale National Park, Uganda found that about 90 % of damage occurred within the 160 meter of forest boundary.

Our finding on effect of distance of farm from forest was consistent with the findings of the study conducted by Hill (2000) in Uganda where she found no record of damage in farms lying more than 450m beyond forest boundary. The mean frequency of damage was found decreasing with increase in distance from forest edge (Bayani *et al.,* 2016). Amount of crop damage was observed negatively correlated with the distance from the forest at Shivapuri National Park, Nepal (Pandey and Bajracharya, 2015). Negative correlation between incidence of crop-raiding and distance to the forest was observed by Regmi *et al*. (2013) in their study in Langtang National Park, Nepal. Less damage to crops was observed in the farms located 1000m far from the forest area (Sahoo and Mohnot, 2004).This has implication on where we should focus our activity regarding the crop protection. Farms which lies far from the home and nearby settlement but nearer to forest and water sources needs to be cultivated with the alternative crops which are less preferred by monkey. This would be helpful in reducing the quantity and cost of damage resulting reduction in human monkey conflict.

People's perception

Formulation and implementation of effective wildlife management strategy requires information about people's feelings, perceptions and attitudes towards wildlife (Bahuguna, 1986; Berkmuller 1986; Priston, 2005; Chauhan and Pirta, 2010). Human can be economically affected through destruction and damage to property and infrastructure (e.g. agricultural crops, orchards, grain stores, water installation, fencing, pipes), livestock depredation, transmission of domestic animal diseases, such as foot and mouth diseases (Distefano, 2005) which ultimately could cause negative perception on people regarding wildlife conservation. In this study the majority of the people responded that the amount of crop damage has been in increasing trend. Chauhan and Pirta (2010) from their study in Shimla, Uttar Pardesh India concluded that the residents of Shimla perceived more conflict with monkeys in comparison to the nonresidents coming for short duration. Residents suffered more loss from monkey which increases the negative perception towards monkey. Less palatable food in the forest and increase in monkey population itself were perceived as major cause of crop raiding by monkey (Aryal and Chalise, 2013). Not a single respondent responded decrease in the crop damaged by monkey. Recent assessment showed increased forest cover in Nepal (DFRS, 2015). Biodiversity including wildlife species is increasing in community forests (Acharya, 2004) although there is need of comprehensive assessment for confirmation (Shrestha *et al.,* 2010). In the study conducted by Pokharel and Shah (2008), 93.8% of the responded have perceived that the wildlife number has been increasing at the community forest area.

The perceptions of the people on the compensation and willingness to monkey conservation have been found associated significantly with the extent of damage. This shows that the people whose crop has been damaged in higher amount are not satisfied with the present compensation provision. They stressed that government should compensate for their crop loss. This has been reducing the people's perception to conserve monkey. About 88.5% respondents suggested for provision of relief fund to those who suffers from crop damage by monkey (Pokharel and Shah, 2008). Lack of awareness about the compensation has caused the higher number of non-response in this study regarding the compensation.

Conclusion

The annual crop damage by monkey was found to be 183.46 kg/HH worth US$ 75.10/HH. Quantity of damage significantly varied with crops varieties (p=0.000). Multiple linear regression showed crop damage was significantly dependent with the distance of farm from the forest area (ß= -0.052, p= 0.000), water source (ß= -0.059, p= 0.000), own home (ß= 0.021, p= 0.000), and the settlement (ß= 0.038, p= 0.00). People's willingness to monkey conservation was found very low as more than half of the respondents were not willing to conserve monkey. The willingness to monkey conservation was found dependent on the extent of damage. There is urgency to formulate legislation for reducing human-monkey conflict outside PA in Nepal.

नेपाल में संरक्षित क्षेत्रों के बाहर बन्दरों द्वारा फसल लूटमार: लागत, स्थितियां तथा अनुभव

गणेश पौडल एवं तेज कुमार श्रेष्ठा

सारांश

नेपाल में संरक्षित क्षेत्र के बाहर मानव-वन्यजीव संघर्ष बढ़ रहा है। तथापि, सरकार एवं उसके संरक्षण सहयोगी केवल संरक्षित क्षेत्रों के भीतर जैवविविधता विषयों में मुख्यत: केन्द्रित हैं। बन्दरों द्वारा उत्पन्न फसल क्षति के स्तर तथा इस प्रकार की क्षति पर लोगों के अनुभव का विश्लेषण करने के लिए बैगलंग जिले के जैदी गाँव में यह अध्ययन किया गया। दस प्रतिशत प्रतिचयन तीव्रता पर समुदाय परामर्श, क्षेत्र प्रेक्षण तथा परिवार सर्वेक्षण की श्रंखलाओं के जरिए आँकड़े एकत्रित किए गए। आयतन तथा लागत में सालाना फसल क्षति क्रमश: 183.46 kg/HH और NRs 7659-77/HH थी। क्षति की मात्रा फसलों की अलग-अलग किस्मों (p=0.000) के साथ महत्वपूर्ण रूप से भिन्न-भिन्न थी। बहु रैखिक समाश्रयण ने दर्शाया कि फसल की मात्रा वन क्षेत्र से फार्म की दूरी (ß = -0.052, p= 0.000), उपलब्ध जल स्त्रोत (ß = -0.059, p=0.000), उत्तरदाता के आवास (ß = 0.021, p= 0.000) तथा निकटवर्ती व्यवस्थापन (ß = 0.038, p= 0.000) पर महत्वपूर्ण रूप से निर्भर थी। उत्तरदाताओं में आधे से ज्यादा उनकी फसलों को पहुँचाई गई क्षति के कारण बन्दरों का संरक्षण करने के प्रति अनिच्छुक थे। बन्दर संरक्षण के लिए सहयोगशीलता और क्षति की सीमा निर्भर पाई गई। इस अध्ययन में संरक्षित क्षेत्र के बाहर मानव-बन्दर प्रबंध योजना को सूत्रित करने के लिए संस्तुतियां की गई हैं।

References

Air A. (2015). *Crop raiding and conflict: Study of Rhesus macaque-human conflict in Shivapuri-Nagarjun National Park, Kathmandu Nepal*, M.Sc. thesis, Norwegian University of Science and Technology: 34 pp.

Acharya K.P. (2004). Does community forests management supports biodiversity conservation? Evidences from two community forests from the mid-hills of Nepal. *J. Forest and Livelihood*, **4**: 44-54.

Acharya K.P., Paudel P.K., Neupane P.R. and Köhl M. (2016). Human-wildlife conflict in Nepal: patterns of human fatalities and injuries caused by large mammals. *PLoS ONE*, **11**(9): 1-18.

Aryal K. and Chalise M.K. (2013). Human-monkey interface in Arkhale and Nayagaun, Gulmi, West Nepal. *Nepal J. Zoology*, **1**(1): 30-40.

Awasthi B. and Singh N.B. (2015). Status of human-wildlife conflict and assessment of crop damage by wild animals in Gaurishankar Conservation Area, Nepal. *J. Institute of Science and Technology*, **20**(1): 107-111.

Bahuguna V.K. (1986). Survey of public opinion for wildlife-A case study. *Indian Forester,* **112**(10): 874-880.

Bayani A., Tiwade D., Dongre A., Dongre A.P., Phatak R. and Watve M. (2016). Assessment of crop damage by protected wild mammalian herbivores on the Western Boundary of Tadoba-Andhari Tiger Reserve (TATR), Central India. *PLoS ONE*, **11**(4): 1-18.

Berkmuller K. (1986). Attitude barriers to eco-development and people's participation. *Indian Forester*, ***112***(10): 949-953.

Boulton A.M., Horrocks J.A. and Baulu J. (1996). The Barbados vervet monkey (*Cercopithecus aethiops* sabaeus): Changes in population size and crop damage 1980–1994. *Inter. J. Primatology*, **17**: 831–844.

CBS (2014). *Nepal in figures*. Central Bureau of Statistics, Nepal. Retrieved from http://cbs.gov.np/image/data/ Publication/Nepal%20in%20Figures%20English%202014.pdf on 28.11.2016.

Chauhan A. and Pirta R.S. (2010). Public opinion regarding human-monkey conflict in Shimla, Himachal Pradesh. *J. Human Ecology*, **30**(2): 105-109.

DFRS (2015). *State of Nepal's forests*. Forest Resource Assessment (FRA) Nepal, Department of Forest Research and Survey (DFRS). Kathmandu, Nepal.

Dickman A. (2010). Complexities of conflict: the importance of considering social factors for effectively resolving human–wildlife conflict. *Animal conservation,* **13**:458-466.

Dickman A.J., Macdonald E.A. and Macdonald D.W. (2011). A review of financial instruments to pay for predator conservation and encourage human–carnivore coexistence. *Proceeding of National Academy of Science of the United States*, **108**(34):13937–13944.

Distefano E. (2005). Human-Wildlife Conflict worldwide: collection of case studies, analysis of management strategies and good practices. Accessed at https://www.tnrf.org/files/E-INFO-Human-Wildlife_Conflict_worldwide_case_studies_by_Elisa_Distefano_no_date.pdf on 30 November, 2016.

DNPWC (2017). Wildlife Damage Relief Guideline, 2013 (Second Amendment, 2017). Department of National Parks and Wildlife Conservation, Kathmandu, Nepal.

Dowie M. (2011). *Conservation refugees: the hundred-year conflict between global conservation and native peoples*. MIT press, 341pp.

Forthman-Quick D. L. (1986). Activity budgets and the consumption of human foods in twotroops of baboons (Papio anubis) at Gilgil, Kenya. In: *Primate Ecology and Conservation* (J.G. Else and P.C. Lee Eds.), Cambridge University Press, 221-228 pp.

Ghimirey Y. (2012). *Status and Threat Assessment of Assamese Macaque: A study on Human-Macaque conflict in Makalu-Barun National Park, Nepal*. Technical Report submitted to Primate Conservation Incorporated, USA.

Hill C.M. (1997). Crop-raiding by wild vertebrates: The farmer's perspective in an agricultural community in western Uganda. *Inter. J. Pest Management*, **43**(1):77-84.

Hill C.M. (1998). Conflicting attitudes towards elephants around the Budongo Forest Reserce, Uganda. *Environmental Conservation*, **26**: 218-228.

Hill C.M. (2000). Conflict of interest between people and baboons : Crop raiding in Uganda. *Inter. J. Primatology*, **21**(2):299-314.

Naughton-Treves L. (1998). Predicting patterns of crop damage by wildlife around Kibale National Park, Uganda. *Conservation Biology*, **12**(1): 156-168.

Naughton-Treves L., Treves A., Chapman C. and Wrangham R. (1998). Temporal patterns of crop-raiding by primates: linking food availability in croplands and adjacent forest. *J. Applied Ecology*, **35**(4): 596-606.

Nyhus P.J., Osofsky S.A., Ferraro P., Madden F. and Fischer H. (2005). *Bearing the costs of human–wildlife conflict: the challenges of compensation schemes*. *In: People and Wildlife, Conflict or Coexistence?* (R. Woodroffe, S. Thirgood and A. Rabinowitz, A. Eds.), Cambridge University Press, Cambridge, 107–121 pp.

Pandit R. and Bevilacqua E. (2011). Forest users and environmental impacts of community forestry in the hills of Nepal. *Forest Policy and Economics*, ***13***(5): 345-352.

Pandey S. and Bajracharya S.B. (2015). Crop protection and its effectiveness against wildlife: A case study of two villages of Shivapuri National Park, Nepal. *Nepal J. Science and Technology*, **16**(1): 1-10.

Paudel G. (2014). Analysis of equity, poverty and sustainability aspects of community forests of Nepal. *VIKAS* (A Journal of Development), **36**(1): 89-96.

Paudel G. (2015). Forest resource income variation in mid-hills of Nepal: a case study from two CFUGs of Parbat district, Nepal. *Inter. J. of Environment*, ***4***(3): 1-10.

Pirta R.S., Gadgil M. and Kharshikar A.V. (1997). Management of the rhesus monkey *Macaca mulatta* and hanuman langur *Presbytis entellus* in Himachal Pradesh, India. *Biological Conservation*, **79**: 97–106.

Pokharel G.K. and Shah K.B. (2008). Role of Community Forests in Faunal Diversity Conservation: A Case Study of Community Forests within Satbariya Range Post of Dang District. *Nepal J. Science and Technology***, 9**: 111-117.

Priston N.E.C. (2005). *Crop-raiding by Macaca ochreata brunnescens in Sulawesi: reality, perceptions and outcomes for conservation.* PhD thesis University of Cambridge.

Regmi G.R., Nekaris K.A., Kandel K. and Nijman V. (2013). Crop-raiding macaques: predictions, patterns and perceptions from Langtang National Park, Nepal. *Endangered Species Research*, **20**: 217-226.

Sahoo S.K. and Mohnot S.M. (2004). A survey of crop damage by Rhesus monkeys (Macaca mulatta) and Hanuman langur (Semnopithecus entellus) in Himachal Pradesh, India. *Tiger Paper*, **31**(4): 1-7.

Shrestha U.B., Shrestha B.B. and Shrestha S. (2010). Biodiversity conservation in community forests of Nepal: Rhetoric or reality. *Inter. J. Biodiversity and Conservation,* **2**(5): 98-104.

Woodroffe R., Thirgood S. and Rabinowitz A. (2005). The future of coexistence: resolving human-wildlife conflicts in a changing world. *In: People and Wildlife, Conflict or Coexistence?* (R. Woodroffe, S. Thirgood and A. Rabinowitz, A. Eds.), Cambridge University Press, Cambridge, 390-398 pp.