



Conflict due to Assamese Macaques (*Macaca assamensis* McClelland 1840) and crop protection strategies in Kaligandaki River Basin, Western Nepal

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Abstract

This study was conducted on conflict due to Assamese Macaques (*Macaca assamensis* McClelland 1840) and crop protection strategies in Kaligandaki river basin, Baglung and Parbat Districts, Western Nepal. Field survey was conducted from 25 October to 22 December, 2015. Questionnaire survey was carried out to estimate the crop protection strategies and crop damaged by the macaque with the local inhabitants in the Kaligandaki River Basin VDCs. Stratified random sampling method was used to select respondent for the questionnaire survey. Out of 654 river basin households, 92 respondents were selected as sample size from the study area. Maize was the highest raided crop 46.95% followed by 15.91% paddy, 15.11% potato, 10.84% millet, 6.88% wheat, 2.05% pulses, 1.59% fruits and 0.66% vegetables. The most commonly used crop protection strategy in guarding their field were by constant vigilance 50%, 25% of field owners use "Scarecrows" 20% used dogs, 5% farmers used tin-box and catapult to chase the macaques from the crop fields.

Key words: Assamese Monkey, Crop damage, Western Nepal, Questionnaire

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Introduction

In Nepal there are two species of macaques; *Macaca assamensis* and *Macaca mulatta*, and one species of Langur; *Semnopithecus*

entellus, with subspecies distributed from the Tarai plain to the high mountain range (Chalise, 1995). The Rhesus monkeys (*Macaca mulatta* Zimmermann, 1780) are

found freely ranging in wild as well as in urban religious places. The Langur monkeys (*Semnopithecus entellus* Dufresne 1797) are found freely ranging in wild forest and marginal areas of Nepal (Southwick *et al.*, 1982). The other species Assamese monkey (*Macaca assamensis* McClelland 1840) reported from mid-hills and high Montana forest of Nepal, whose ecological and behavioral details are still largely unknown (Chalise, 2006).

The Assamese Macaques is categorized as threatened due to its limited distribution of less than 22,000 km², an expected area of occurrence of about 914 km² with ongoing decline in area, lessening population and narrowing quality of habitat. As stated of its restriction of occurrence, rising threats to the individual and its habitat, and decreasing number in fragmented patches, the Nepal Assamese population is categorized as Endangered. As well as the National parks and wild life conservation Act of 1973 has listed the Assamese Macaque as a protected species of Nepal and kept appendix II of CITES (Chalise *et al.*, 2005). Because of their distribution pattern, Assamese Macaque population would have been more influenced by forest habitat deterioration compared with Rhesus Macaque populations (Wada, 2005). The fragmented distribution of the Assamese Macaque seems inadequate for maintaining a viable population in Nepal. There has been few studies to estimate the minimal viable population size necessary for the conservation of not only Assamese Macaques, but *macaca* in general (Wada, 2005). Species viability can be measured by evaluating population dynamics and environmental effects (Fa and Lind, 1996).

In Nepal, crop damage is very common along the mid-hills, high mountain

area, Terai and immediate periphery of national parks and reserves. Primates are considered to the pest of field crops Langurs in Sworgadwari forest of Pyuthan, Sangekhola of Tanahun, Assamese Macaques of Hariharpur Gadhi, Rhesus Macaques in Ghodaghodi of Kailali and Pashupati, Swoyambhu, Thapathali and Sankhu of Kathmandu, and elsewhere (Chalise, 2000). Rhesus Monkey was considered most crops damaging, while physical hurt and harassment were also perceived monkey related problem in the Gulmi area. Shouting and chasing with using stone and catapult were the common local deterrent method against monkeys (Aryal and Chalise, 2013). However, Upreti (1990) noted that buckwheat and barley were repeatedly destroyed by wild pigs, langurs, and macaque monkeys in Langtang and Rara national parks. Little quantitative information on crop loss or damage is available for this study area on the edge between continuous forest and dense human habitation zones along the southern boundary of the national park area (Jackson, 1990).

Materials and methods

Research site

The study was conducted in Baglung and Parbat districts of Dhawalagiri Zone. It lies in the western development region of Nepal. The district Baglung is a part of Province No. 6, with its district headquarters baglung, cover an area of 1,784 km² and have a population (2001) of 268,938. Parbat district is a hilly area of Nepal. The district Parbat is a part of Province no 4 and one of the seventy-five district of Nepal. The district, with Kusma as its district headquarters, covers an area of 494 km² and has a population (2001) of 157,826. Study site is located between 83°35'29.2" to 83°35'72"

longitude and 28°05'24.2" to 28°19'45" latitude and elevation ranges between 560 m to 1650 m.

Total area of Baglung site VDCs is 71.3452 km² where as Parbat site VDCs is 33.357 km². The study area lies in between tropical to temperate belt of Nepal. This study area has a unique geographical feature having both North and South facing topography. The rain-bearing wind from the Bay of Bengal blows from the east towards west of Nepal during the rainy season. The climate of study area and its vicinity is mainly dry and wet (Source: NG/ RDHM Pokhara). The average maximum temperature was recorded (27.70°C) and minimum temperature was recorded (15.30°C) (Source: NG/RDHM Pokhara). According to the climatic data, average monthly relative humidity (at morning) of the area 77.17% and average monthly relative humidity (at evening) of the area 78.15%. The highest precipitation was recorded (553.6 mm) in the month of July during the study period, while there were not recorded of precipitation in the month of November and December (Source: NG/ RDHM Pokhara). The study area is rich in biodiversity. The reason for this may be due to presence of alluvial soil along the basin of this large Kaligandaki River, and high productivity of tropical deciduous riverine forest (Chalise, 2013). In broad classification, the study area falls in *Shorea-Diospyros* zone (Paudel, 2016). Mixed type of forest is found in the study area. Tropical deciduous riverine forest sub-tropical grassland and sub-tropical evergreen forest are the forest types in the study area (Chalise, 2013).

Methods

Study area was divided into four blocks namely Block A (Chisti, Jaidi, Arjewa and

Binamare VDCs), Block B (Kusmisera, Amalchaur and Narayansthan VDCs), Block C (Siwalaya and Pang VDCs) and Block D (Nangliwang and Dhairing VDCs). Blocks were designed on the basis of habitat character (Rijal, 2014). Which were separated by large Kaligandaki river i.e., Block A and B from Baglung District site where as Block C and D from Parbat District site.

Questionnaire survey

Stratified random sampling method was used to select respondent for the questionnaire survey. The main habitats of the Assamese Monkey were along the Kaligandaki River Basin therefore, out of 654 river basin households, 92 respondents were selected as sample size from the study area. To estimate the crop protection strategies and crop damaged by the Assamese Macaque in the study area questionnaire survey was conducted from 25 October to 22 December, 2015 to collect information with the local inhabitants in the Kaligandaki River Basin VDCs.

Results

Crop raiding

In the study site crop raiding was found to be the major problem caused by the monkey. Among the respondents crop raiding was reported by 80% but the extent of crop raiding was found to be different areas. Crop raiding was found to be highest at Block A Aduwabari village of Chhisti VDC Baglung (78%) followed by the Block D Dhairing, at the edge of Salyan village with rocky out crop of Dhairing VDC Parbat least to the crop raiding (61%). Major crops raided by monkeys included maize, potato, millet, wheat, paddy, pulses, vegetables, (pumpkin, bean, cauliflower,

cabbage etc.), and fruits (pear, peach, cucumber, etc.). In which maize was the highest raided crop. From the total 92 respondents, total loss noted was 46.95% of maize, followed by 15.91% paddy, 15.11% potato, 10.84% millet, 6.88% wheat, 2.05% pulses, 1.59% fruits and 0.66% vegetables (Fig. 1). Most of the respondents had very limited crop land to grow their crops. Out of this respondents, 50% respondents were facing more trouble from the crop raiding problems and 5% respondents had already left some land fallow due to severe crop raiding problem.

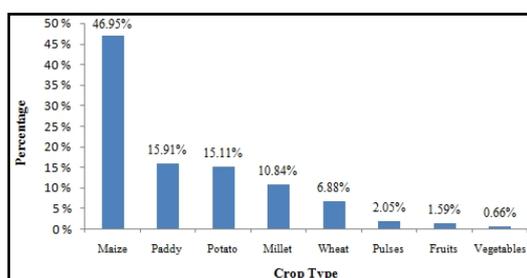


Figure 1. Crop damage (%) by Assamese Macaques in the Kaliganaki River Basin Baglung and Parbat districts Nepal, 2016.

Out of the total 92 respondents, a total of 61.18 hectare of land was utilized for the cultivation of crops. In that land area, total yield of crop was expected to be 688.29 quintals but 567.74 quintals was observed yield during the study time. It is indicated that 120.55 quintals of crops was lost by the Macaques, on the basis of average monetary value was accumulated from Baglung Bazar (Tab. 1). Among the various raided crops, maize was found highly raided that worth the loss Rs. 226400. All together, the loss of raided crops worth Rs. 558926 from questionnaire surveyed area the result showed that 14.98

quintals of crops was raided in each hectare of land (Tab. 2).

Table 1. Local market price of crops at Baglung Bazar.

S.N.	Crops	NRs/Quintal
1	Maize	4000
2	Potato	5000
3	Millet	3800
4	Wheat	3500
5	Paddy	6500
6	Fruits	4500
7	Pulses	10000
8	Vegetables	6000

Crop protection strategies

To protect crop fields and orchards from wildlife including Assamese Macaque, farmers used many methods. These methods include patrolling and guarding the fields by farmers including their children, Scarecrow, Tin-box, throwing stone with “Catapult”, keeping Dogs, fencing with thorny twigs etc. The most commonly used crop protection strategy in guarding their field by constant vigilance during crop seasons. This method was used by 50% of the farmers in the study area. 25% of field owners use “Scarecrows”(a device to scare the animals from the field). Few farmers about 20% used dogs for crop protection to chase the macaques away, while the remaining 5% farmers used tin-box and catapult (a device made with rubber to hit the distant objects) to chase the macaques from the crop fields (Fig. 2).

Along with above methods all the farmers commonly fence their farms using thorny twigs and branches of different trees and shrubs as protective measures. Despite all these measures of crop protection, macaques do manage to invade the crops.

Table 2. Crop raiding rate of Assamese Macaque in study area.

Crops	Total land (ha)	yield (Quintal)			Loss	
		Expected	Observed	Quintal	NRs	Quintal/ha
Maize	15.19	118.12	61.52	56.6	226400	3.72
Paddy	18.54	312.51	293.33	19.18	124670	1.03
Wheat	12.71	104.76	96.46	8.3	29050	0.65
Millet	4.13	64.81	51.74	13.07	49666	3.16
Potato	5.56	43.63	25.41	18.22	91100	3.27
Pulses	2.51	13.32	10.87	2.46	24600	0.98
Fruits	1.23	19.43	17.51	1.92	8640	1.56
Vegetables	1.31	11.71	10.91	0.8	4800	0.61
Total	61.18	688.29	567.74	120.55	558926	14.98

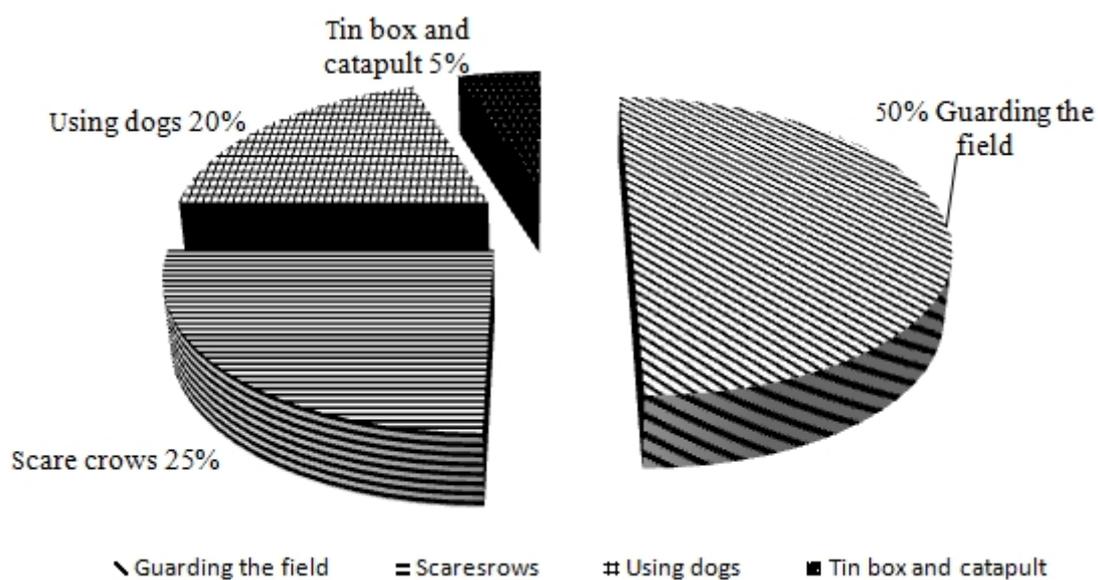


Figure 2. Different crop protection strategies used by farmers in the Kaliganaki River Basin, Baglung and Parbat districts Nepal, 2016.

Discussion

Crop raiding was found as a major cause of conflict though physical hurt and harassment, taking and grabbing of food materials were also reported as the problems caused by monkeys. Among the respondents crop raiding was reported by 80% but the extent of crop raiding was found to be different areas. Crop raiding was found to be highest at Block A, Aduwabari village of Chhisti VDC, Baglung (78%) followed by the Block D, Dhairing, at the edge of Salyan village with rocky out crop of Dhairing VDC Parbat least to the crop raiding (61%). Higher extent of crop raiding in former two is due to the settlement and crop field very near to the forest. Khatri (2006) found that 76% of respondents of Vijayapur Area of Dharan reported the crop raiding as a major problem. Similar in the study of McCourt (2005), 92% respondents of Hetauda were found to suffer from crop damage from monkeys, Adhikari (2013) 78% of respondents of Lamjung area reported crop raiding as a major problem. Chalise (2000) collected the information of crop raiding by the interviews in Lakuwa village of MBCA and reported that Rhesus and Assamese Macaques were the most crop raiders and langurs visited the least and the villagers blamed that among the two species, Assamese Monkey was the terrible than rhesus. This study couldn't be similar with this present study where the villagers blamed that among the two species, Rhesus Monkey were the terrible than the Assamese, and he stated that monkey raid heavily to the maize field 29% then followed potatoes 23% (tubers also), rice 13%, fruits 12%, and millets 12%. The tubers and fruits came to be 35% of the total loss and the total cereals came to be 65% loss in Lakuwa village but here this crop raiding ratio of fruit

and cereals crop was similar to this present study. Regmi (2008) reported crop raiding in LNP by 62% for maize, 23% for potato, 7% for millet, 6% for buckwheat and 2% for other, which result is similar to the finding of the present study. Khatri (2006) also supports that maize is the prominently vulnerable crops for raiding by primates. Adhikari (2013) found crop raiding by Assamese Monkey in Lamjung area, 44% maize followed by 27% potato, 13% millet, 7% wheat, 4% paddy, 3% fruits and 2% vegetables this finding also supports the present study might be due to the similar type of geology in between these two study sites.

Different preventive measures were applied to deter monkey, though chasing of monkey by shouting and guarding was found to be most effective and widely used measure. Local people usually protect their crop and chased monkey by shouting and guarding. Small hut locally called "Chhapro" were made to guard the field. Use of dog use of catapult and stone to chase monkeys, hitting tin boxes as well as other method like planting alternative crops were also found. Khattri (2006) in Vijayapur found the use of catapult to frighten the monkeys to be the most effective which is similar with present study. Bagale (2003) found guarding overnights as an effective crop protection technique in Lumbini area in order to protect their crops from Nilgai (*Boselaphus tragocamelus*) a nocturnal crop raider. In this present study guarding field as most employed crop protection technique in this large river basin from Assamese Macaque, a diurnal crop raider. Though the guarding/chasing is the most effective method of deterrent in which mainly the woman and children engage, it is time expensive and keeps people away from other activities (Southwick and Siddi-

qi, 1977; Bell, 1984; Southwick and Lindburg, 1986; King and lee, 1987; Pirta *et al.*, 1997; Knight, 1999; Hill, 2000) especially consumes the time of educational activities of children in such remote areas which further move the poor people backward through long lasting impacts. So the loss is invaluable in comparison with time rather than economy. Chhangani and Mohnot (2004) in a study in and around Aravallis of India, Calculated the percentage of crop protection methods by farmers as 60% guarding fields, 20% throwing stones, 15% using dogs and 5% others including dangerous method like single shot gun, potash bomb and high voltage electric current in which animals are usually killed or seriously injured but the farmers of this study areas were not used cruel type of crop protection strategies but in this study Guarding the field 50%, scare crows 25%, Using dog 20%, Tin box and Catapult 5% because like that of gun and potash bomb are prohibited by his majesties of government for the use to public. McCourt (2005) in Hetauda found stone throw catapult 40%, followed by chasing 20%, threaten 18% and stick wave 2%. Adhikari (2013) reported that Guarding and shouting 68%, stone and catapult 16% and hitting tin box and using dogs 12% from Lamjung Area but in this study Guarding the field 50%, Scare crows 25%, Using dog 20%, Tin box and Catapult 5% the difference between 68% guarding and shouting and guarding 50% may be due to the children of this study area are engaged in school for their study.

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