

Monkey menace in Nepal: An analysis and proposed solutions

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Abstract. Monkey menace is a prevalent issue in South Asia and Southeast Asia, where Rhesus macaques are considered pests of major field crops. In Nepal, factors such as monoculture cropping patterns, forest fragmentation, degradation of natural habitats, and changing agricultural practices contribute to increased monkey menace and human-macaque conflict. Factors such as cropping season, food resource distribution, crop variety, wild food availability, and distance from forests and farms influence the frequency and intensity of crop raiding. This study introduced non-human primates, their status, and availability in Nepal, and analyzed different crops raided by monkeys along the Buddhi Gandaki River, frequency and crop raiding season of monkeys in Jhor Mahankal and Goldhunga and suggested some solution measures for the monkey menace in Nepal. Maize was the most raided crop, while pumpkin was the least. The total percentage of crops raided was 24.62%, with an average crop loss of 29.24%. Crop raiding was most prevalent during the spring season (45%), followed by the rainy season (39%), and least prevalent during the winter season (16%). Rhesus macaques refrained from raiding crops with bitter or spicy flavors, such as turmeric, bitter gourd, chili, ginger, and mustard. The suggested control measures need to be followed to mitigate the monkey menace and manage the human-wildlife conflict.

Keywords: Human-non-human primates, Rhesus macaques, Crop raiding, Monkey menace, and Human-wildlife conflict

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1. Introduction

Primates are a varied group of mammals, including monkeys, apes, humans, and other related animals, recognized for their skillful hands and feet, ability to see with both eyes, and highly developed brains. This group, although sometimes called monkeys, does not include tree shrews, lemur-like forms, apes, or humans. However, it does exhibit a significant evolutionary and adaptive variety. Among primates, monkeys, second only to humans, have adapted exceptionally well to various environmental conditions, thriving in tropical forests, dry savannas, mountains, villages, temples, and even bustling cities (Van Hoff, 1990). Primates can be observed in the tropical regions of South America, Africa, and Asia. These intelligent creatures inhabit various habitats within these continental areas, ranging from lush rainforests and high mountain ranges to open savannas and desert environments (Harcourt & Dunbar, 1989).

Multiple factors, including seasonal timing, the spatial and temporal distribution of food resources, crop characteristics and qualities, the presence of wild food sources, proximity to forests, and distance from neighboring farms, influence the degree of crop raiding (Hill, 2000). Communities located on the outskirts of the National Park have clear and identifiable patterns of agricultural theft. The incidence of agricultural raiding varies among groups, with some communities experiencing higher frequencies and others experiencing lower frequencies. What is the process by which Rhesus macaques choose places for crop raiding? Curiosity drives this inquiry.

Specific research has indicated a significant occurrence of crop raiding within a 100-meter radius of forested regions. In contrast, it is minimal on farms more than 300 meters away from the forested areas (Hill, 1997). The proximity of neighboring farms and the distance from the farm itself both have a significant impact on crop raiding (Hill, 2000). Hence, it is not advisable to

establish agricultural projects near protected areas. The region's altitude also plays a role in determining wild food availability. As the altitude rises, the abundance and variety of food in the forest decrease. As a result, monkeys tend to have a higher population density at lower elevations. Primates not only engage in crop raiding and physical aggression towards humans, but they also generate conflict by snatching bags, damaging property, stealing food, and plundering rubbish. Moreover, certain monkey groups have recorded incidents of aggression towards humans.

A significant number of non-human primates reside in human-altered environments and are classified as agricultural nuisances (Pebsworth & Radhakrishna, 2020). Various studies have shown that baboons (*Papio hamadryas*), macaques (*Macaca mulatta*), vervet monkeys (*Chlorocebus pygerythrus*), and chimpanzees (*Pan troglodytes*) are drawn to cultivated foods like domesticated fruits, maize, sweet potatoes, and rice when their natural habitats are reduced or fragmented by human activities. These studies include research conducted by Hansen et al. (2020), Ganguly and Chauhan (2018), Patterson et al. (2018), Sengupta and Radhakrishna (2018), Boug et al. (2017), Bryson-Morrison et al. (2017), Koirala et al. (2017), and Hockings et al. (2009). Sengupta and Radhakrishna (2018) have provided empirical evidence demonstrating that the raiding of crops, particularly those high in calories, has led to an increase in reproduction and group size among primates. Consequently, this has resulted in escalated crop destruction and heightened conflicts between humans and wildlife.

2. Status of monkey in Nepal

Rhesus macaques are commonly found in the temples of Nepal, where they rely heavily on human food for subsistence. Local residents often offer them food as a form of charity. In Hindu mythology, these macaques are associated with the deity Hanuman. Although South Asian countries hold high regard for them, their conduct frequently contradicts the ideas of the local populace (Medhi et al., 2007). Instances of individuals being assaulted, harmed, and bitten by Rhesus macaques are frequent in urban and suburban regions of Bangladesh, resulting in retaliatory measures and unfavorable attitudes towards the species. Similar issues are also prevalent in Nepal.

In Nepalese culture, individuals who frequently make mistakes are called monkeys due to mischievous behavior. A famous Nepali saying exists: "A monkey neither builds its own home nor allows others to build theirs," highlighting their destructive tendencies. This saying reflects the general perception of people towards them. Additionally, some individuals associate monkeys with theft, as they are known to pilfer edible items from homes, earning them the label of 'thieves.' Moreover, monkeys are also considered quite cunning (Hill & Webber, 2010).

The species, unfortunately, is not included in Nepal's protected list, unlike in India, where they are safeguarded. This lack of protection has dire consequences. In Nepal, farmers often kill them, considering them pests. This exploitation is further exacerbated by the absence of legal safeguards. If they were designated as protected, the public would prefer to observe them within the park. Such conflicting attitudes pose significant challenges to conserving the species.

The majority of primates face threats such as hunting, capture for captivity, and research. For research purposes, Nepal, a South Asian country, exported Rhesus macaques to laboratories in the United States. However, in 2009, the government decided to prohibit this export due to strong opposition from the public and non-governmental organizations (NGOs). This public outcry and active participation in conservation efforts highlight the crucial role of individuals in protecting these species.

3. Crop raiding by monkeys

The conversion of natural landscapes into agricultural crop fields, pastures for domesticated livestock, and urban centers in certain regions has led to a significant conflict between humans and wildlife (Acharya et al., 2017; Madhusudan & Karanth, 2002). This conflict is particularly important in the field of conservation biology (Dickman, 2010). The destruction of forests and the deterioration of natural habitats have led to a significant increase in human-animal conflict, posing a major issue for wildlife managers across the globe (Siljander et al., 2020).

Acharya et al. (2017) found that the majority of research on human-wildlife conflict in Nepal has focused on determining the responsible wildlife species and measuring the economic harm to crops through the use of questionnaires given to local farmers in the study regions. Currently, the government does not possess a comprehensive national database that tracks the location, frequency, and circumstances of Rhesus macaque crop raiding. However, it is worth noting that Rhesus macaques are now recognized as one of the top 10 animal species responsible for crop raiding in Nepal (DNPWC, 2017).

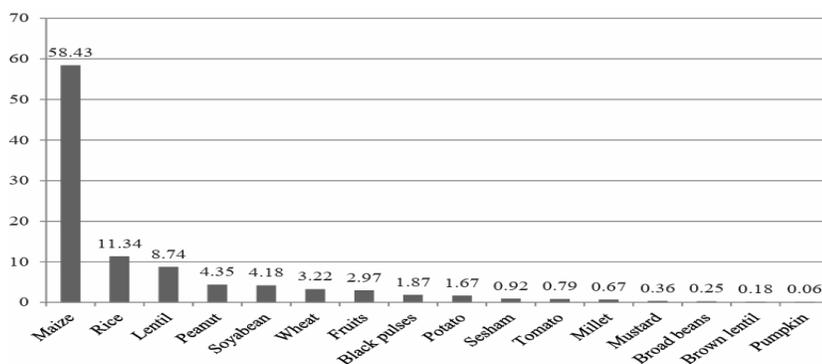


Figure 1. Different crops raided by monkeys along the Budhi-Gandaki River (Ghimire & Chalise, 2018)

The study discovered that maize (*Zea mays*) was the most heavily raided crop. It was followed by fruits, black pulses (*Vigna mungo*), potatoes (*Solanum tuberosum*), Chesham, tomatoes (*Solanum lycopersicum*), millet (*Pennisetum glaucum*), mustard (*Brassica nigra*), broad beans (*Vicia faba*), pumpkin (*Cucurbita pepo*), soybeans (*Glycine max*), peanuts (*Arachis hypogaea*), tomatoes (*Solanum lycopersicum*), pumpkin (*Cucurbita pepo*), and mustard (*Brassica nigra*). Crops with the highest raiding percentages are as follows: maize 58.43%, rice 11.34%, lentil 8.74%, peanut 4.35%, soybean 4.18%, wheat 3.22%, fruits 2.97%, black pulses 1.87%, potato 1.67%, sesame 0.92%, tomato 0.79%, millet 0.67%, mustard 0.36%, broad beans 0.25%, brown lentil 0.18%, and pumpkin 0.06%. The overall agricultural raiding rate was 24.62%, with an average crop loss of 29.24% (Ghimire & Chalise, 2018).

Study sites	Most frequently raided crops (N)				Total
	Maize	Wheat	Potato	None	
Jhor mahankal	15	9	8	18	50
Goldhunga	33	5	10	2	50
Total	48	14	18	20	100

(Air, 2015)

A notable disparity existed in crop raiding occurrences between the two designated study sites. The Goldhunga area exhibited the highest susceptibility to crop raiding, whereas the Jhor Mahankal area experienced a comparatively lower risk. Maize was the most frequently targeted of the raided crops, especially in the Goldhunga region. On the other hand, wheat and potatoes were raided less frequently than maize.

Study sites	Raid season			Total
	Rainy & Summer (June-August)	Spring (March-May)	Autumn (September-November)	
Jhor mahankal	25	22	3	50
Goldhunga	14	23	13	50
Total	39	45	16	100

(Air, 2015)

The *Rhesus macaques* did not damage the following crops: Turmeric, Chili, Ginger, Mustard, and Bitter gourd (Air, 2015). Crop raiding was most prevalent during the spring season (45%), followed by the rainy season (39%), and least prevalent during the winter season (16%). Between the two villages, there was a statistically significant difference in crop raiding across different seasons.

4. Crops grown vs. raiding

The intelligent *Rhesus macaques* refrained from raiding crops with bitter or spicy flavors like turmeric (*Curcuma longa*), bitter melon (*Momordica charantia*), chili (*Capsicum annuum*), ginger (*Zingiber officinale*), and mustard (*Brassica nigra*). According to Sekhar (1998), Nilgais (*Boselaphus tragocamelus*) and wild boars did not disturb the mustard plants in India.

Many farmers prefer maize due to its high return on investment compared to the labor required for cultivation. While wheat, rice, potatoes, and millet are important crops in the region, they are less favored because they demand more labor. Maize plays a crucial role in the livelihood of many in Asia, making it a target for raids that can lead to negative perceptions of wildlife. It was noted during the field study that the selection of crops involves a balancing act between the expenses and advantages linked to the specific crop. Various factors, including labor demands for planting, harvesting, storing, and cooking, as well as food choices and cultural practices, influence the choice of crops cultivated (Hill, 1997).

Rhesus macaques demonstrate cleverness in selecting the most advantageous crops for their benefit, as well as intelligence in choosing the optimal location to access abundant food resources over an extended period of time. The varying levels of crop raiding observed in the two research regions serve as a prime illustration of this behavior. Jhor Mahankal, situated within the Shivapuri forest, is a tranquil area. Because of their preference for disturbed environments, this *Rhesus macaque* population engages in more activities in this particular region. On the other hand, Goldhunga is traversed by the Trishuli highway and houses an Army barrack that safeguards the National Park, along with the Nagarjuna Palace, where the former King of Nepal, Gyanendra Bikram Shah, resides with his family. Human activities are more prevalent in the Goldhunga area than in the Jhor Mahankal region (Air, 2015).

5. Some solution measures for the monkey menace

The problem of monkey nuisance is complex and necessitates a collective effort to develop prompt short-term strategies for urgent alleviation, as well as a long-term framework for a sustainable resolution. Adopting the following activities is mandatory:

1. Implementing non-lethal tactics: Loud noises, water sprays, and physical barriers can deter monkeys from infiltrating human settlements and agricultural lands.
2. Promoting natural habitats: Develop or maintain green areas and forests to provide a suitable habitat for monkeys without infringing on human settlements.
3. Sterilization programs: Enforcing sterilization initiatives aimed at controlling the growth of the monkey population can effectively regulate their numbers within urban settings.
4. Educational campaigns: Educate communities on the importance of refraining from feeding monkeys and how to co-exist peacefully with them.
5. Community-based management: You, the local community, are vital in overseeing the monkey population. You can effectively manage the situation by implementing structured feeding zones, waste management plans, and community-led initiatives.
6. Research and monitoring: It is essential to stay informed. It is crucial to allocate resources to conducting research aimed at enhancing our comprehension of monkey behavior and population dynamics. This knowledge will serve as a foundation for developing more efficient management strategies and keeping you updated on their progress.
7. Waste management: Utilize efficient waste management strategies to decrease the accessibility of food supplies for monkeys in both urban and rural regions.
8. Natural barriers: Use prickly shrubs or barriers to deter monkeys from accessing agricultural lands and gardens.

6. Conclusions

Monkey menace is one of the emerging human-wildlife conflicts in Nepal for several reasons, viz., change in cropping patterns in the agricultural landscapes and destruction of their habitats through increased forest fragmentation. This study revealed that crop raiding by *Rhesus macaques* reduced farmers' income significantly. The crop type and distance from farm fields to the forest area affected crop raiding. In this context, changing the cropping pattern would be a better option. Instead of a monoculture cropping system, a mixed-crop farming system would be a better preventive measure for reducing crop raiding and annual income from major crops by non-human primates.

Conflicts of interest. The authors mentioned that none of them have a conflict of interest when it comes to this article.

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