

Farmers' Perceptions about Elephant Crop Raiding in Sindhudurg District, Maharashtra, India

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Abstract. For nearly 15 years, elephant crop-raiding has intensified in the Sindhudurg District, the northern-most limit of wild Asian elephants in the Western Ghats. We conducted a questionnaire survey to study farmers' attitudes towards elephant crop raiding, current compensation schemes and crop protection measures with possible coexistence approaches. The study revealed that coconut, rice, areca palm, banana, and cultivated bamboo were the crops most susceptible to raiding. Farmers strongly believed that coexistence with elephants will not be possible in a landscape where the elephants' natural habitat can no longer support their nutritional needs. However, 97% of the respondents replied that elephants should be protected and therefore were receptive to potential changes in cropping patterns.

Introduction

Human-elephant conflict (HEC) is a serious conservation and social problem and has been on the increase throughout Asian elephant (*Elephas maximus*) range (Gubbi *et al.* 2014). HEC has been observed in the interface of humans and elephants since ancient times (Sukumar 1989). Only 55% of the historical natural habitat of Asian elephants remains intact (Sarma & Easa 2006). Nearly 80% of wild Asian elephants live outside conventional protected areas, in close proximity to human habitations (Singh & Kumar 2014). Like its African counterpart, which has been found to spend most of its time outside park boundaries (Granados *et al.* 2012), unprotected habitat is an important component of Asian elephant range. However, it results in a complex interface between elephants and humans, causing negative interactions.

The states of Maharashtra and Goa, including the Forest Division of Belgaum, were not part of traditional elephant range. An elephant herd from the Haliyal-Dandeli Forest Division moved into Belgaum Forest Division in 2001 (Baskaran 2013). Since November 2002, especially from Dandeli Wildlife Sanctuary, wild elephants started intruding the forests of Sindhudurg and

Kolhapur Districts of Maharashtra (Mehta & Kulkarni 2013). This emigration of elephants into a previously unoccupied range drew a lot of attention in the socio-political spheres of Sindhudurg District. HEC was caused largely due to crop raiding. Within this context, the present study was conducted to understand farmers' perceptions and attitudes towards elephant crop raiding, current ex-gratia schemes, and effectiveness of the crop protection measures combined with possible coexistence approaches.

Material and methods

Study area

Sindhudurg District (15°37' to 16°40'N and 73°19' to 74°18'E) is the southern coastal district in western Maharashtra State, having 121 km of coastline (Fig. 1). It has borders with Kolhapur and Ratnagiri Districts of Maharashtra on the eastern and northern side respectively, while the state of Goa flanks it on the south. The total geographical area of the district is 508,523 ha. Topographically, the district is subdivided into three regions: (i) the western coastal strip; (ii) the eastern Sahyadri mountain range, including its offshoots; and, (iii) the strip in between of small plateaus and flat lands.

The Sindhudurg District receives an average annual rainfall of 3287 mm during June to September from the southwest monsoon. The climate is hot and humid in the summer and mild during the winter. The average maximum and minimum temperatures are 38°C and 13°C, respectively. About 50% of the Sindhudurg District is covered with moist deciduous and semi-evergreen forests. Approximately 89% of the forests have private or community ownership (Forest Survey of India 2015).

The total population of Sindhudurg District is around 850,000, of which around 87% is rural. The district has a low population density of 163 persons per km² and a high literacy rate of 85%. The agricultural sector holds a major share (60%) in the district's economy (Census of India 2011). Major crops include rice, millet and pulses. A large proportion of land has been brought under orchards consisting of mango, cashew, coconut, areca palm, bamboo, banana, pineapple, and para rubber trees. Spices such as nutmeg and black pepper are also cultivated within coconut orchards. Home gardens are the traditional agro-forestry system.

Data collection

The Forest Department (FD), Maharashtra Govt., has been implementing a compensation scheme for loss of crops, property, or human injury caused by wild animals (Table 1). Data on elephant crop raiding for the entire Sindhudurg District between 2002 and 2015 were obtained from the Divisional Forest Office, Sawantwadi. This secondary data revealed that the talukas (administrative subunit of a district) with the highest number of villages affected were Kudal (52% of crop raiding cases), Sawantwadi (29%) and Dodamarg (14%). Vengurla, Kankavli, Malwan and Vaibhavvadi talukas had crop raiding but were comparatively less affected. Devgad taluka was unaffected by elephant raids. Therefore, four villages from each of the three talukas that had the highest rates of crop raiding were selected for this study. The selection of villages was based on (i) highest number of crop raiding instances per village, and (ii) the spatial distribution of villages, to get a representative sample covering the conflict zone.

Door-to-door interviews were conducted during December 2015 and February 2016. A total of 180 farmers (15 individuals in each village) were interviewed using a structured questionnaire. The respondents (each representing a household) were selected from those affected by crop raiding, based on tabulated compensation data. Data were recorded in a local language Marathi and later translated into English. Detailed notes were recorded for each response, categorized and numerically coded and entered in Excel. When possible, group discussions were conducted and site inspections made for verification of findings. Geographical coordinates of farms of the interviewed farmers were recorded with a Garmin GPS receiver (Fig. 1).

Results

General profile of the respondents

Ages of respondents ranged from 20 to 95 years and most represented the age class 60–69 years. A large proportion of respondents (82%) had educational qualifications lower than Secondary School Certificate (SSC) examination. While 13%

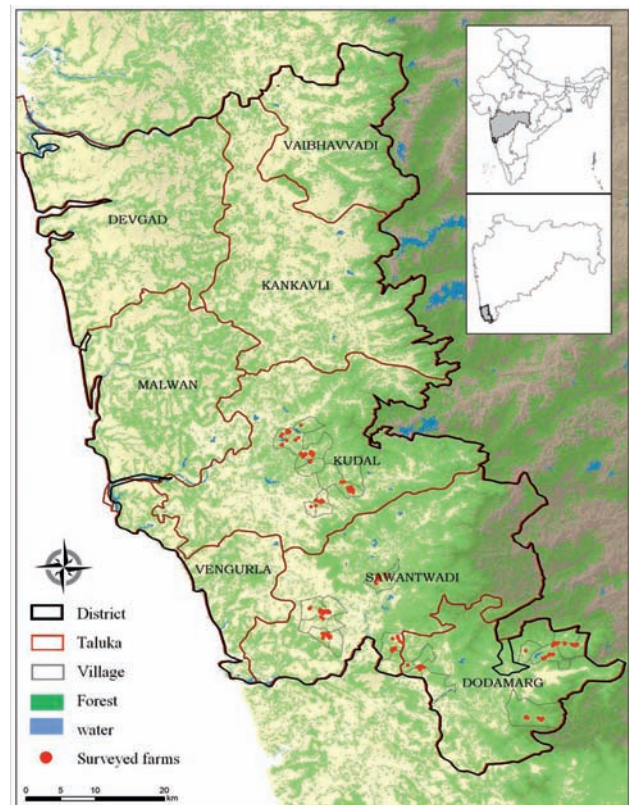


Figure 1. Map showing locations of surveyed farms in Sindhudurg District.

Table 1. Ex-gratia payment scheme for crop damage, livestock and human death/injury by elephants. Economic losses for crops are based on the projected yield per unit area. Source: Revenue and Forest Department, Govt. of Maharashtra, summarized from the Govt. Resolutions WLP-10.08/CH.NO.270/F-1 on 02-07-2010 and WLP-2012/CH.NO.337/F-1 on 12-04-2013 (in Marathi language).

Commodity damage	Ex-gratia payment
Agricultural crops	
< 2000 INR (30 USD)	200 to 2000 INR (3 to 30 USD)
2001 to 10,000 INR (30 to 154 USD)	2000 to 6000 INR (30 to 92 USD) OR 50% of total cost
> 10,000 INR (154 USD)	6000 to 15,000 INR (92 to 230 USD) OR 30% of total cost
sugarcane	400 INR (6 USD) per ton
Horticultural crops	
coconut	2000 INR (30 USD) per tree
areca palm	1200 INR (18 USD) per tree
mango	1600 INR (25 USD) per tree
banana	48 INR (0.7 USD) per plant
other fruit crops	200 INR (3 USD) per tree
Livestock injury/death	
death (cattle)	75% of current market rate OR 10,000 INR (154 USD) (whichever is less)
death (sheep, goat and other)	75% of current market rate OR 3000 INR (46 USD) (whichever is less)
permanent disability to cattle	30% of current market rate OR 3000 INR (46 USD) (whichever is less)
serious injury to livestock	total medical treatment, max. 1000 INR (15 USD)
Human injury/death	
death	500,000 INR (7692 USD) per person
permanent disability	400,000 INR (6154 USD) per person
serious injury	100,000 INR (1538 USD) per person
minor injury	7500 INR (115 USD) per person

of the respondents had educational qualifications above SSC, 5% were uneducated.

Most respondents (89%) reported farming as their sole occupation, while 9% had another source of income in addition to farming. The reported annual income of 86% of the respondents was less than 50,000 INR (769 USD; 1 USD = 65 INR) and only 10% earned more than 100,000 INR (1538 USD) per annum. The households consisted of 48% kachcha houses (house with mud walls) and 52% pakka houses (house built with stone, or bricks, cement etc.). 78% of the households had less than six family members.

Land use profile

Average land-holding of respondents was 4.98 ± 8.16 ha, including an average 1 ha and 2.7 ha land under agriculture and horticulture respectively. A profile of crops cultivated by surveyed farmers is

shown in Figure 2. Figure 3 shows the predominant crops cultivated by surveyed farmers in the three talukas. Bamboo was a preferred crop in Kudal and areca palm and banana in Dodamarg (Fig. 3). Cashew was cultivated by a similar proportion of farmers in each of the three talukas. Relatively

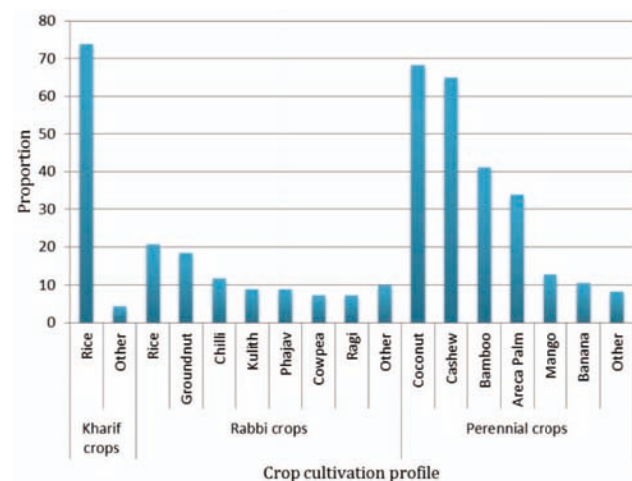


Figure 2. Crop cultivation profile of respondents in Sindhudurg District.

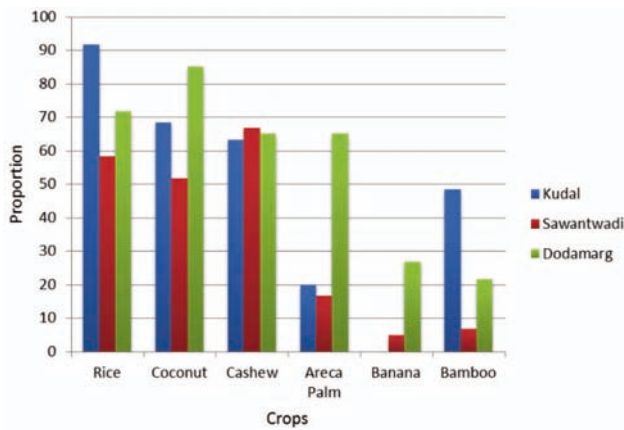


Figure 3. Major crops cultivated by surveyed farmers in the three taluka.

smaller proportions of farmers cultivated rice and coconut in Sawantwadi.

Perceptions on elephant crop raiding preference

Majority of the respondents (66%) said that elephants entered villages because they liked cultivated crops. Most farmers identified coconut as the crop most susceptible to raiding (Fig. 4). From the remaining crops, banana was the most commonly raided in Kudal, followed by rice and bamboo, while in Sawantwadi and Dodamarg it was rice, followed by areca palm and banana.

Compensation extent

Data on compensatory payments by FD between 2002 and 2015 revealed that, of 4598 farmers who claimed compensation, 64% claimed only once; 30% 2–5 times; and 6% >5 times. During this period, the FD paid 113,370,904 INR (1,744,168 USD) compensation to the farmers of Sindhudurg

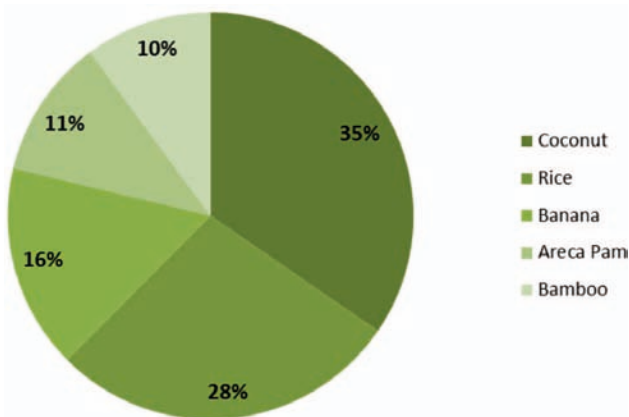


Figure 4. Most preferred crops by elephants.

District. Compensation claimed by individuals ranged from 96 INR (1.5 USD) to 518,160 INR (7972 USD). The average compensation amount given was $12,393 \pm 17,693$ INR (190 ± 272 USD). The highest cumulative amount of crop compensation was given in Kudal (58,531,731 INR, 900,488 USD), followed by Sawantwadi (29,969,716 INR, 461,072 USD) and Dodamarg (21,968,438 INR, 337,976 USD).

Perceptions of ex-gratia scheme

A total of 64% of interviewed farmers made claims for all crop-raiding cases on their farms. The rest claimed compensation for some cases only. The maximum number of times a farmer claimed compensation was 47; the mean number of claims per farmer was 4.23 ± 5.42 and for acceptance of claims, the maximum was 47 and the mean 3.57 ± 4.98 . The surveyed respondents had submitted 744 compensation claims in total. Of these, 79% were accepted by the FD and the rest rejected. Out of the accepted claims, 97% were compensated, while the other 3% received nothing. The period required to receive compensation ranged from 2 to 24 months (mean = 6).

Of the 21% rejected claims, many farmers (40%) were unaware of the reason for rejection. Others cited the following: (i) their land was designated as forest in the past, (ii) necessary land-record documents were not available in time, and (iii) they were unable to procure consent from all concerned mentioned in land records. The majority (96%) of respondents said that compensation is ineffective for resolving HEC.

Crop protection

Of the respondents, 60% employed crop protection measures. The most commonly used methods were, use of firearms (24%), beating of drums to chase crop raiding animals (13%) and night vigilance (12%). Other methods included the use of chilli smoke, high-powered hand-held torches, solar/electric fencing, trenches, lighting of fires, lanterns or electric lamps along the farm boundary, use of ropes smeared with oil and chilli powder, barbed wire fencing, tying of old saris along the farm boundary, and putting household

Phenolic disinfectants or kerosene along the farm boundary. Only eight farmers in the present study had experience using solar-powered electric fencing and all of them considered it to be the most effective crop protection measure.

Farmers were generally receptive to potential changes in cropping pattern, for example, planting non-palatable crops with higher market value. A few (7%) suggested planting turmeric, ginger, and black pepper in high crop raiding zones, as an effective method for reducing crop raiding since elephants apparently did not consume them. Farmers also suggested that planting nutrient rich food plants in the natural habitat/reserve forests might minimize crop raiding.

Expectations from FD

All respondents expected the FD to resolve the problem of crop raiding. Other expectations included construction of solar fencing around the forest area (12%), declaration and management of continuous Reserve Forest patches as protected areas (8%), or planting food plants in the Reserve Forest (7%). Respondents expected greater cooperation from FD in resolving compensation issues. Other expectations by farmers included capturing problem animals, increasing the amount of compensatory payments and providing compensation within 15 days.

Perceptions on elephant protection

When asked whether elephants should be protected, 97% of the respondents replied in the affirmative. However, there was difference in opinion as to why they should be protected. The majority (56%) of respondents said they should be protected because they are part of nature and elephants are one of the most magnificent animals, and another 36% said because of religious reasons. Only 7% said that they should be protected because of legal protection requirements in the Indian Wildlife Protection Act.

Discussion

The majority of farmers cultivated rice in the Kharif (monsoon) season whereas only very

few cultivated other seasonal crops in Kharif. On the other hand, a large variety of crops were cultivated in Rabi (post monsoon) season. Most households had coconut and cashew orchards or homesteads. Areca palm and bamboo were found to be cultivated by a relatively large proportion of households. Therefore, crops raided by elephants were found year round in the surveyed villages.

Compensation scheme

None of the farmers were satisfied with the amount they received and the time required for receiving payment. Most felt that compensation did not justify the cost involved in reporting and pursuing the claim, let alone the crop loss. This was possibly one of the main reasons behind not reporting minor or sometimes even major crop losses. The rejection of many claims for administrative reasons also probably contributed to discontent with compensation. We found that bamboo (*Dendrocalamus stocksii*) was cultivated in the study area and that elephants commonly raided it. A previous study (Patil 2014) also noted the widespread cultivation of bamboo in the study area. Unfortunately, bamboo was not included in the compensation scheme, which may have contributed to the lack of acceptance of the compensation scheme.

Perceptions on elephants

Despite experiencing HEC, almost all of the interviewed farmers felt elephants should be protected. Our findings confirm that the largely sympathetic view towards elephants is a reflection of age-old religio-ethical values prevalent in India. Allendorf *et al.* (2015) reported similar findings around Shwe-U-Daung Wildlife Sanctuary, Myanmar, where 77% of the respondents believed that elephants should be protected. Nath *et al.* (2015) conducted a questionnaire survey of 562 residents around Manas National Park, Assam and also found similar positive attitudes towards elephants. Thus, community attitudes that facilitate conservation of elephants are prevalent in many Asian countries.

Coexistence

It is a positive sign that most respondents despite experiencing crop raiding, stated that elephants should be protected. Even though the farmers promoted protection of elephants, they believed that the presence of elephants and agriculture are not compatible. They also believed that co-existence was not possible in a landscape where there is insufficient forage available in the natural habitat while attractive crops were found nearby. However, they were ready to accept elephants if the FD could somehow restrict their passage through croplands. Farmers also perceived that the absence of a formal protected area in Sindhudurg District was a major hindrance to co-existence.

Although the problem of elephants crop-raiding in Sindhudurg District of Maharashtra is recent, there are no signs that it will be solved soon. Despite several lacunae in the existing compensation scheme, it probably prevented alienation of affected people. To be more effective, it needs to be more participatory and pro-active. We found an overall positivity towards conservation issues of elephants among the affected farmers.

Acknowledgements

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