

NORTH INDIAN ASIATIC ELEPHANT POPULATION CONFLICT WITH MAN WITH REFERENCE TO CROPS DAMAGE

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Introduction

Very little attention has been paid to study the interaction between elephants and agriculture on ecological considerations. Eleven villages of six forest divisions viz. Dehradun, Haridwar, Kotdwar, Ramnagar, Haldwani and East Tarai (Haldwani) of North Indian region (erstwhile U.P.) were chosen by the author to study the problem of raiding of agricultural crops by elephants between the years 1995 and 2000.

Study Area

The total agricultural crop area of the study villages is 18,088 ha out of which 15.92% is affected by elephant raids. Main agricultural crops of the area are – sugarcane, wheat and mustard grown as Rabi crop and paddy, maize as Kharif crop. Mango and other fruit plants are also grown in orchards. Elephant raids damage the agricultural crops by trampling, grazing and browsing. The pattern of damage by elephants in all the eleven villages as observed by the author during 1995-2000 period is shown in Table 1.

Order of preference of crops by elephants for grazing

The crop-wise damage by elephants during the same period (1995-2000) has been studied by the

author; the statistical details are given in Table 2.

The crops which have suffered maximum damage by elephant raids obviously are the most favoured crops viz maize, sugarcane, mustard and wheat. Orchard is also included as a category in agricultural crops. The damage to crops is inflicted by trampling, browsing and grazing. These three types of damages are depicted in Fig. 1

Pattern of feeding: Elephants by nature, are, browsers as well as grazers and damage to different crops through these two patterns varies from crop to crop. This variation is depicted in Fig. 2.

It is clear from the Fig. 2 that the order of preference of crops for grazing is maize, mustard, wheat, groundnut, sugarcane, paddy, millets and orchards whereas sugarcane, maize, mustard, wheat, paddy, groundnut, millets and orchards is for browsing. The ground nut area suffered most through grazing (74.7% of the total) followed by mustard (74.5%), maize (73.4%), wheat (69.1%) and millets (63.3%) in that order.

Extent of wastage of crop while feeding : Elephants, apart from damaging the crops by feeding; also damage crops by trampling only, and also trampling while browsing and grazing. The emphasis was put upon the study of the ratio of these three patterns of

Table 1
Pattern of damage by elephants in all the eleven villages.

Name of Village	Crop Area (ha)	Damaged Area (ha)	Area Damaged By			
			Trampling	Browsing	Grazing	Total
			%	%	%	%
1.Chhiddelwala	2,447	511	9.82	6.21	4.48	20.87
2.Bandarjood	3,014	376	1.38	3.90	7.20	12.47
3.Rasoolpur	3,411	829	4.414	4.69	15.21	24.30
4.Kauria	26.5	0	0.00	0.00	0.00	0.00
5.Shyampur	1,490	322	5.34	7.27	9.01	21.63
6.Sigaddi(Laideavour)	3,244	526	2.50	4.44	9.27	16.22
7.Grastonganj	767	31	0.93	1.01	2.10	4.04
8.Ratanpur	2,720	215	1.98	1.95	3.99	7.92
9.Chunkam/Muhan	244	6	1.50	0.00	1.05	2.56
10.Dhikuli	474	14	1.51	0.00	1.43	2.94
11.Chorgalia	250	48	17.20	0.00	2.00	19.20
Total Area (Ha.)	18,088	2,789	-	-	-	-
Damage in Percentage		15.92	3.91	4.11	7.90	15.92

* IFS (Retd.).

Table 2
Crop-Wise Damage.

Name of the Agricultural Crop	Crop Area (ha)	Damaged Area (ha)	Damage (%)
Groundnut	428	49.31	11.52
Maize	964	211.16	21.90
Millets	39	2.46	6.31
Mustard	1,895	362.45	19.13
Orchard	595	14.43	2.42
Paddy	5,504	776.69	14.11
Sugarcane	1,739	359.69	20.66
Wheat	6,924	1,102.96	15.93
Total	18,088	2,879.15	-
Damage in %			15.80

Table 3
Crop Damage Vis a Vis Pattern of Feeding.

Name of Crop	Agriculture Crop Damaged by Elephant			
	Only Trampling	Trampling during Browsing	Through Trampling During Grazing	Total
	%	%	%	%
Maize	3.83	4.80	13.27	21.90
Sugarcane	6.88	7.05	6.73	20.66
Mustard	2.75	4.17	12.21	19.13
Wheat	3.42	3.86	8.65	15.93
Paddy	4.58	3.82	5.71	14.11
Groundnut	2.11	2.38	7.03	11.52
Millets	2.82	1.28	2.21	6.31
Orchard	0.00	1.17	1.26	2.42
Total Damage%	3.91	4.11	7.90	15.92

damage. The data collected for the same is being given in Table 3.

The study reveals that in spite of more areas being raided, the damage among main agricultural crops was comparatively low in wheat and paddy whereas the damage was more in maize followed by sugarcane and mustard. The damage percentage was calculated as given in Table 3. It was found that maize has the highest damage percentage of 21.90 followed by sugarcane 20.66 and mustard 19.13. Crops like wheat, paddy and groundnut suffered moderate loss whereas millets and orchards, the least.

The crop wise figures for damage by trampling during browsing and grazing combined are compared with trampling figures, which is a sort of pure wastage in the course of feeding. It is apparent from the Fig. 3 that maximum wastage is in sugarcane followed by paddy, maize, wheat and mustard. The wastage in the orchards is very insignificant.

Degree of damage to crops : On analysing the data given in Table 1, it is observed that elephants damaged 15.92% area out of which grazing comprised 7.9% followed by browsing-4.11% and trampling-3.91% respectively. The Table 4 gives an idea of damage in various villages under study and the nature of damage done by the elephants singly or in herd. The worst among such villages were Rasoolpur (21.63%). Chidderwala (20.87%), Shyampur (21.63%), Chorgalia (19.20%), Sigaddi (16.22%) and Bandarjood (12.47%). In rest of the villages, the damage was insignificant. The worst hit villages are situated near the forest.

Degree of economic loss apart from crop damage: Assessment shows that the damage caused by elephants to crops is very high. The indirect losses apart from elephant raids are also significant and have led to avoidable investments on preventive measures like flashlights, digging, trenches etc. Moreover unnecessary wastage of energy in order to

Fig. 1

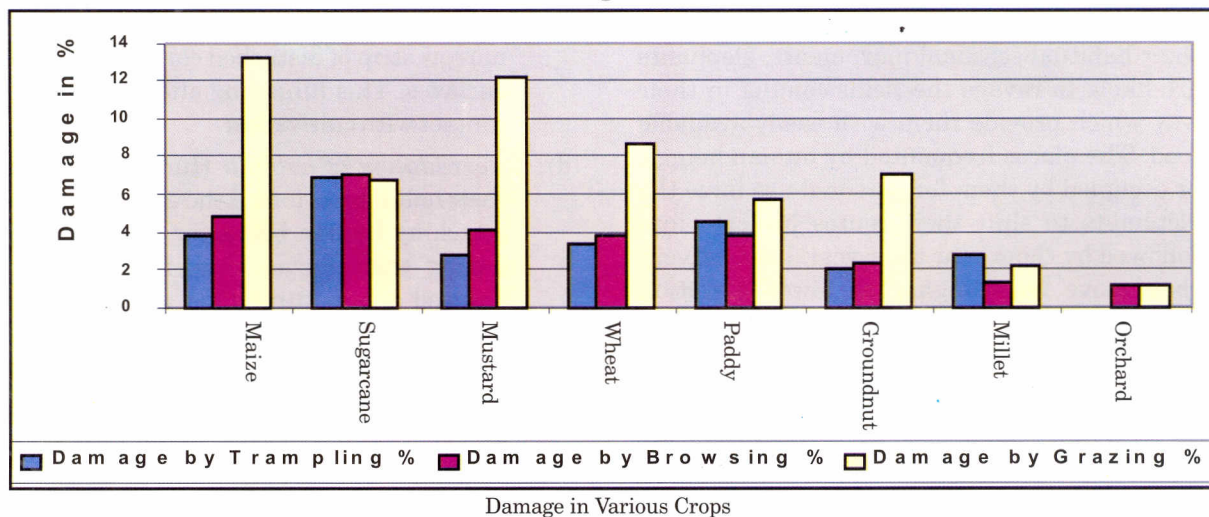
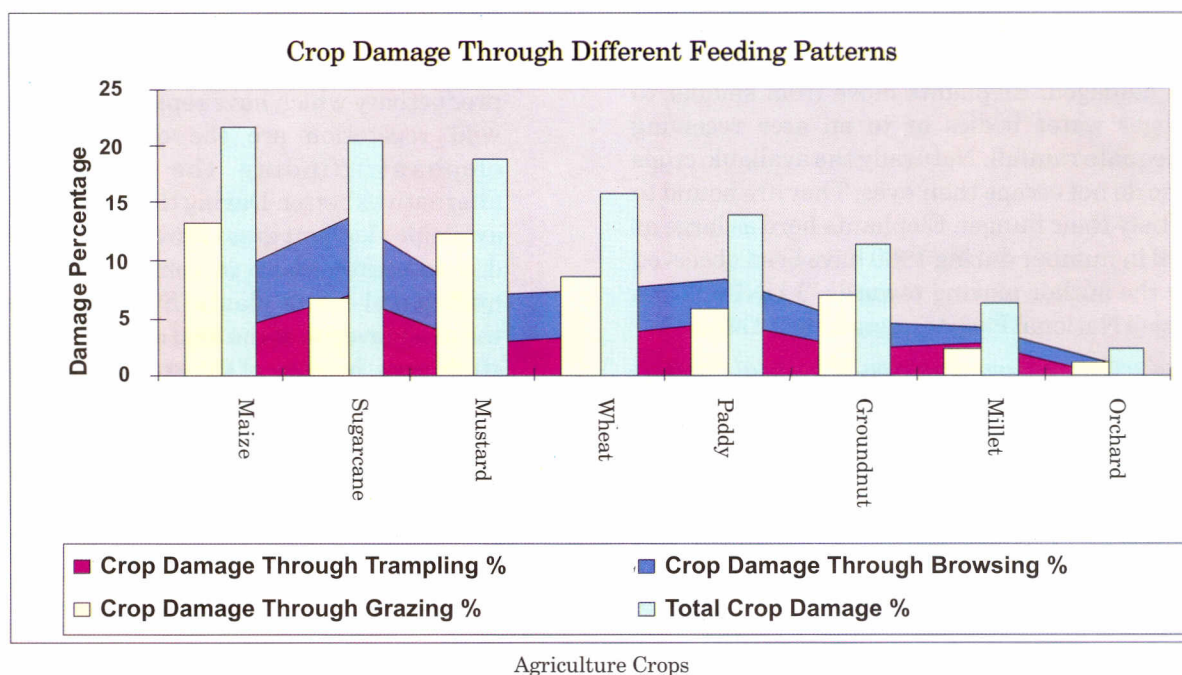


Fig. 2



keep a vigil on elephants has resulted in loss of man-hours. The following data represents such economic losses in two categories i.e. villagewise and cropwise:

From the above statement based on the data collected during the survey, it is clear that Bandarjood, Chiddelwala, Shyampur suffered heavy loss. Reason for this is that these villages are situated at the peripheries of forests and have a rich fertile agriculture land. Besides, they grow valuable agriculture crops. Chunkam, Chorgalia, Dhilkuli, Grastonganj and Ratanpur villages have moderate losses, whereas Kauria village was the lucky one, which escaped almost unhurt.

It was also observed that the economic loss

remained more or less constant over a period of several years as the area raided remained nearly the same.

Reasons for Raids

Reasons for raids by elephants on agricultural fields are many like:

- (a) *Seasonal migration:* In the study area it was observed that the movement of elephants and raids to the agricultural fields are common during their natural seasonal migration. The elephant corridor stretching from Dehradun Forest Division to Corbett National Park is traversed by them. Although this corridor has been fragmented by various non-forest

activities, elephants still traverse through it to venture out of their natural habitat. During their habitual seasonal movements, elephants are likely to ravage the fields coming in their way which provide them with easily available food. The places frequented by human beings, or occupied by them for personal use force the elephants to shift their routes hitherto fore followed by them year after year. Instinctively, they move from higher to lower elevation habitats. Elephants in herds are likely to attack crops more than the lonely ones.

- (b) *Competition for water:* Elephants' need for water is well met by the rich water sources like the Ganga, the Yamuna, Kosi, Sharda, Gaula, Ramganga and Soheli rivers and other perennial sources enroute. Sometimes they also target water sources in the villages like ponds and irrigation reservoirs enroute. In the process, the traversed agricultural fields may be damaged. Elephants move from smaller to bigger water bodies or to an area receiving adequate rainfall. Naturally the available crops also do not escape their eyes. They are bound to satisfy their hunger. Elephants herd as large as 100 in number during 1980 have been observed by the author moving towards "LUNISOT" in Rajaji National Park to quench their thirst.
- (c) *Reduction or fragmentation of natural habitat:* Elephants confined to a small isolated habitat are more likely to raid crops. Frequency of raids increases with their passage from one habitat

to another becoming narrow. Most of the elephants are forced to move through the narrow strip of disturbed corridor between two enclaves. This funneling effect increases their contact with cultivation.

- (d) *Degradation of habitat:* Human occupation of their habitat has forced the animals to resort to attacking human beings or devastating crops during their movements. Deforestation has reduced the natural food resources to bare minimum which contributes to their marching out from their natural refuge and explore human population areas. Thus, paucity of natural resources, forces them towards raiding of crops.
- (e) *Sumptuous and wholesale replacement of Crop:* It is natural that an elephant will opt for more relishing and healthy alternative in comparison to wild vegetation. The crops of good quality, easily digestible, sans toxins and productivity which have replaced the erstwhile wild vegetation are the other reasons for elephants finding the human grown alternatives better. During the rainy season the available elephant grass proves to be less edible due to coarse fibers in comparison to softer millets and maize plants. Sweet sugarcane is the most favorite of the food connoisseur. In the study area, because of the excessive cultivation of sugarcane, the elephant incursion is more frequent and unavoidable. Crops growing on low levels are free of undesirable plant growths.

Fig. 3

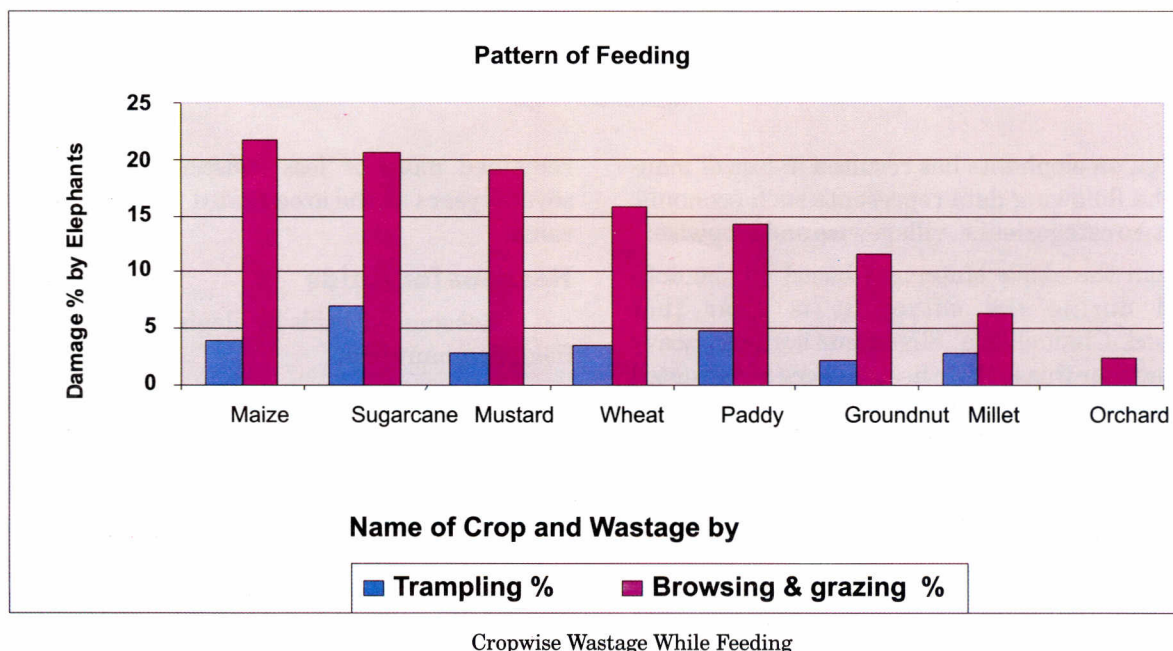


Table 4
Raids Upon Agriculture Crops in Various Villages.

Name of Village	Configuration of raid party and damage %		
	Single	Herd	Total
	%	%	%
1.ChhiddelWala	8.28	12.59	20.87
2.Bandarjood	4.14	8.33	12.47
3.Rasoolpur	8.14	16.17	24.31
4.Kauria	0.00	0.00	0.00
5.Shyampur	0.60	21.03	21.63
6.Sigaddi	5.20	11.02	16.22
7.Grastonganj	3.19	0.85	4.04
8.Ratanpur	6.10	1.82	7.92
9.Chunkam/Muhan	1.56	1.00	2.56
10.Dhikuli	1.94	1.00	2.94
11.Chorgalia	2.00	17.2	19.20
Damage Percentage	5.48	10.44	15.92

Table 5
Glimpse of the Villagewise Agriculture loss in a year.

Name of Village	Total Economic Loss (₹)	Loss per ha (₹)
1.Bandarjood	44,87,485	11,935
2.ChhiddelWala	43,95,885	8,606
3.Shyampur	33,11,112	10,275
4.Rasoolpur	8,21,065	990
5.Sigaddi(Jaidevpur)	5,31,659	1,010
6.Ratanpur	2,83,006	1,314
7.Grastonganj	92,007	2,970
8.Dhikuli	53,918	3,875
9.Chorgalia	40,080	835
10.Chunkam/Muhan	38,099	6,106
11.Kauria	-	-
Total Loss	1,40,54,316	4,882.19

(The figures are based on price index of year 2000).

(f) *Other reasons:*

- i. Forest Fires Caused by Graziers
- ii. Infirmary.

The elephants left wounded by poachers or animal catchers tend to enter human areas for food. Other factors may be old age, sickness or other physical infirmity rendering the animals incapable of procuring their natural food. This might persuade the beast to invade fields.

- iii. Heavy biotic pressure resulting in competition for fodder and grass.
- iv. Chance plays its role in wandering of elephants into a field. This chance discovery can later become a habit.

Solutions for the Problem

- i. Survey of eleven villages brings forth the

following age old methods to drive away the army of raiders:-

- a. Making noise by beating tin 'Kanastars'.
- b. Shouting in groups.
- c. Fire and Torches.
- d. Trenches.
- e. Flash lights, etc.

Their application achieves limited success. Elephants get habitual to these impediments and learn to ignore them. The elephant visits are abrupt. They might appear on the scene any time and anywhere and ransack the field for feast. To keep away these unwanted guests, following suggestions may prove effective.

- a. Immediate stopping of all non-forestry work within elephant habitat which causes disturbance to an elephant

Table 6*Glimpse of the Cropwise/Agriculture Loss in the area under survey in a year.*

Name of Crop	Economic Loss (Rs.)	Loss Per ha (Rs.)
Sugarcane	47,36,975	13,186.10
Wheat	42,17,687	3,823.90
Paddy	34,83,625	4,485.25
Mustard	12,32,000	3,399.05
Maize	1,92,723	912.69
Orchard	1,24,250	8,613.50
Groundnut	63,920	1,296.23
Millets	3,136	1,274.39
Total Damage %	1,40,54,316	4,882.19

habitat or its fragmentation. In Rajaji National Park, railway track between Haridwar and Dehradun as well as cantonment area in middle of the park are creating immense disturbance to elephant habitat and their movement.

- b. Absolute and effective ban on human encroachments and settlements in elephant habitat. Settlement of Gujjars away from Rajaji National Park is an important issue to save elephant habitat from disturbance.
- ii. Control of grazing by domestic cattle to reduce competition for fodder and palatable grasses.
- iii. Provision of a buffer-belt of thorny vegetation/tree cover of at least 100 meters width between the forest boundary and cultivation.
- iv. Putting a ban on cultivating crops like sugarcane (which are tempting to elephants) to a distance of at least one km from elephant habitat.
- v. Eliminating disturbance within or near the natural corridor/ path used by elephants for movement from one enclave to another enclave.
- vi. Giving more emphasis to Eco-development activities in villages adjoining elephant habitat.
- vii. If the damage is too severe, trenches can be dug to stop the movement on a particular path.
- viii. In the acute drought periods, making water and fodder available in the habitat manually.
- ix. *Electric fences:* Occasionally, farmers run a strand of wire along the periphery of the field and electrify it with high voltage illegal connection. Apart from the danger to people or smaller animals coming in contact with the live wire which give them a fatal shock, few

elephants die almost every year from electrocution. Electric fence causing no grievous shock was first used in a coffee estate in the Biligirirangans many decades back to deter elephants but the practice was later discontinued. This fence is being revived in recent years in south India.

- x. *High voltage nonfatal electric fence:* Electrified fences of a nonfatal type have been used to keep a variety of mammals out of a particular area. The fence consists of one or more strands of high tensile (100 tanner tensile) galvanized steel wires at appropriate height above the ground on hardwood posts. For elephants, at least two strands at heights of 1m and 2m above ground should be used. Porcelain insulators may be provided at places where the wire comes in contact with the posts. The posts may be spaced upto 20m apart for a wire tension of 180 kg. The ground below the wire should be free of vegetation to prevent short circuit. The heart of the fence is the energizer (transformer) which typically gives an electric pulse of 500 V for 1/3000 second duration every few minutes. Owing to the high voltage (which is in practice 3000 V along the lines) an animal coming into contact with the wire receives a severe shock but the short duration of the pulse prevents any injury. The energizers may be made functional by a 12 V car battery or from the 110V/230V mains or even by solar cells. Each energizer can effectively power about 20 km of fencing.
- xi. *Anchored mela shikar:* Trained domestic elephants were successfully used in chasing away a herd of about 60 elephants which was raiding crops in West Bengal state during November 1980 (D.K. Lahiri Chowdhary). This type of chase without capture has been termed as anchored 'mela shikar'.

xiii. *Capture and translocation of elephants:* The population of Indian elephants in north at this moment does not warrant capture and translocation.

To implement above suggestions and

solutions, proper cooperation from and understanding among the public is necessary. Eco development programmes are a very good solution for getting cooperation of villagers adjacent to the habitat area of elephants.

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SUMMARY

The problem of raiding of agricultural crops by elephants in the foothills of Himalayas in Uttarakhand has been studied during the period- 1995-2000. The damage to the crops is classified in three categories viz. trampling, grazing and browsing. Maize is the crop most favoured by elephants followed by sugarcane, mustard and wheat. The damage to the crops varied from 21.63% to 12.47% in the villages studied. The damage remained nearly constant over the period. Seasonal migration, competition for water, reduction or fragmentation of natural habitat, replacement of crops by sumptuous crops etc. are the main reasons behind elephant raids. Forest fires infirmity, heavy biotic pressure resulting in increased competition for fodder and the element of chance are some other reasons for elephant raids.

Some of the solutions suggested for the problem are making noise by beating canisters, shouting in groups, lighting fire and torches, digging trenches and using flashlights etc. Other measures suggested are immediate stoppage of all non forestry works within the elephant habitat and absolute ban on human encroachment in elephant habitat. Control over grazing by cattle in the habitat areas, provision of a buffer belt of thorny trees at the forest boundary, ban on cultivation of tempting crops such as sugarcane, elimination of disturbances in and around the natural corridor used by elephants for movement, promotion of eco-development activities in the adjoining villages, digging of elephant proof trenches, and providing water inside elephant habitat during lean period etc. are also suggested.

Traditional electric fences are found fatal and are not recommended while high voltage non fatal electric fences are suggested which can be powered by solar batteries.

Anchored mela shikar, where trained domestic elephants are used to chase away rowdy wild elephants and capture and translocation of such rowdy wild elephants are also suggested as a solution.

Keywords : Elephant raids, Agricultural Crops, Crop damage, Grazing, Biotic Pressure.

फसलों को क्षति पहुंचने के सन्दर्भ में उत्तरभारतीय एशियाई हाथियों का मानव के साथ टकराव

के. एन. सिंह

सारांश

उत्तराखण्ड में हिमालय की तलहटी वाली पहाड़ियों में हाथियों द्वारा कृषि फसलों पर आक्रमण किए जाने की समस्या का 1995-2000 की अवधि में अध्ययन किया गया। फसलों को पहुंचती हानि को तीन श्रेणियों में वर्णित किया गया अर्थात् रौंदा जाना, चरा जाना और कुतर-डाला जाना। हाथियों की सबसे ज्यादा पसंदीदा फसल मकई है इसके बाद आती है गन्ना, सरसों और गेहूं की फसलें -। अधीत गांवों में फसलों को पहुंची यह हानि 21.63% से 12.47% तक रही। इस अवधि के दौरान यह हानि लगभग इतनी ही बनी रही। मौसमी प्रवजन, पानी के लिए स्पर्धा, प्राकृतिक प्राकृतावास में कमी या विखण्डन इनकी जगह सुस्वादु फसलों का लगाया जाना आदि हाथी आक्रमणों के प्रधान कारण रहे हैं। जंगल में लगती आग, कमजोरी, भारी जैविक दबाव जिससे चारा प्राप्ति के लिए स्पर्धा बढ़ गई और मौका पा जाना अन्य कारण इन हाथी आक्रमणों के हैं।

इस समस्या के सुझाए गए कुछ समाधान हैं, कनस्तर पीट-पीट, कोलाहल करना, समूह बनाकर चीखना-चिल्लाना, आग और मशाल जलाना, खाईयाँ खोदना, तेज रोशनियां उपयोग करना आदि। सुझाए गए अन्य उपाय हैं, हाथियों के प्राकृतावास में सभी गैर वानिकी कार्य तुरन्त बन्द कराना तथा हाथी प्राकृतावास में मानव अतिक्रमण पर पूर्ण प्रतिबंध लगाना, प्राकृतावास क्षेत्रों में पशु चराई पर नियंत्रण लगाना, वन सीमाओं में काटेदार वृक्षों की रोक-पट्टी बनाना, लुब्धक फसलों जैसे गन्ने की खेती पर प्रतिबन्ध लगाना, हाथियों द्वारा आने जाने के लिए प्रयोग किए जाते प्राकृतिक गलियारों में या उसके आस-पास विक्षोभ को दूर कर देना, आस पास के गांवों में परि विकास कार्यों को प्रोत्साहित करना, हाथी-रोधी खाईयां खुदवाना और पानी की कमी पड़ जाने वाले मौसम में हाथी प्राकृतावास के अन्दर पानी मिलना उपलब्ध कराना आदि भी सुझाए गए हैं।

प्रारम्भिक बिजली बाड़ विनाशकारी पाई गई है और इन्हें लगाने की सिफारिश नहीं की गई, जबकि अधिक वोल्टता वाली अविनाशक बिजली बाड़ लगाने का सुझाव दिया गया है। जिन्हें सौर बैटरियों से शक्ति प्रदान की जा सकती है।

एंगरमेली शिकार, जिसमें प्रशिक्षित पालतू हाथी बदमाश हाथियों को भगाने को उपयोग में लाये जाते हैं तथा ऐसे जंगली बदमाश हाथियों को पकड़ दूसरी जगह पहुंचा देना भी समाधान स्वरूप सुझाए गए हैं।