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EFFECTIVENESS OF ELECTRIC FENCING IN SRI LANKA IN MITIGATION OF HUMAN ELEPHANT CONFLICT: THE ROLE OF SOCIAL ASPECTS

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ABSTRACT

Human elephant conflict (HEC) has become a major environmental issue in Sri Lanka, which is at an escalating trend with more elephant and human deaths, property damages, and many recoverable and unrecoverable losses. Fragmentation and loss of natural habitats, disturbances of migratory routes due to increasing human settlements are the prominent reasons for the conflict. With a view of mitigating the HEC, a number traditional as well as introduced measure has been adopted by communities and Department of Wildlife Conservation. Among the various abatement strategies, electric fences appear to be the most preferred.

Against this background, the study on the five electric fences namely, Kandaketiya, Kalagama, Herathgama, Mahaweli System G and Lunugamvehera was carried out with the objective of finding out the effectiveness of electric fences in Sri Lanka. The data were collected from 238 respondents and officers in DWLC regional offices. The study revealed that proper maintenance of the electric fences is the key factor for their effectiveness. The level of community participation for maintaining of the electric fences and acceptance levels of the fences is depicted through their attitudes and perceptions. Further, involvements of community based organizations (CBOs) were crucial in establishment and maintenance. Social factor appear to more important than technical factors. The study makes suggestions based on findings for improved level of community participation and acceptance for effective fencing.

The study targets to evaluate the role of social factors to increase the effectiveness of electric fencing in Sri Lanka. The specific objectives are; to investigate the social acceptance and perception of mitigation measures of the conflict and to identify the needed measures to improve the social acceptance and community support on electric fencing.

INTRODUCTION

Elephant is the key animal species with supremacy in the Sri Lankan wild from the ancient periods of time. Similar to most of the endangered species in the wild, extinction of elephants is at an ascending trend in the world. The main causes for this were the excessive level of habitat encroachment and poaching by human.

In Sri Lanka, the present elephant population is approximated between 3,160 and 4,405 elephants (Kemf & Santiapillai, 2000). During last fifty decades the forest cover got reduced in more than 18 % with the increase of human population from 8 million to 19.5 million. As a result, elephants have to limit their territorial boundaries to national parks and some forest pockets in Northeastern, Eastern and Southern parts of the island. The coexistence between humans and elephants has been deteriorated during past few decades. Encroachment and replacement of the forestlands for slash and burn cultivation, expansion of human settlements towards elephant habitats were intensified during last few decades.

Competition for the scarce land, food and water has created the conflict between humans and elephants over the time.

Crops, houses and some instances human lives are frequently damaged by roaming elephants. The human encroachment at a higher degree left the elephants to complete dependency on cultivated crops. Since the traditional mitigation strategies are now lack in effectiveness in high HEC areas, farmers are forced to use different ways to harm elephants.

Number of strategies such as promulgation of protected areas by resettlement of people, translocation of aggressive male elephants, elephant drives, electrical fences, compensation payments and conservation aimed other measures have been taken by the governmental as well as non-governmental authorities. Among currently practicing measures for mitigating human-elephant conflict, electric fences are considered as the most effective measure. If the electric fences have been strategically located, it acts as very effective elephant barriers (De Silva, 1998). The electrified fences appear to be the people's solution to the elephants' problem by physically separating their territories. In this context, the effectiveness of the electric fences is mostly depending on the social acceptance.

METHODLOGY

The theoretical framework of sampling procedure, data collection, data analysis, details of the selected electric fence and the sample areas has been presented in this chapter.

Selection of the electric fences and areas for the study

Based on the severity of the HEC, geographical location and involving organizations in operational activities of the fences, following five electric fences were considered for this study: Kandeketiya electric fence near Victoria-Randenigala-Rantambe Sanctuary, Herathgama electric fences near Kahalla-Pallekele Sanctuary, electric fence around Mahaweli System G, Kalagama electric fence at Balaluwewa-Kalawewa sanctuary and Lunugamvehera electric fence at Lunugamvehera National Park.

Description of the area and the electric fences

Kandeketiya electric fence at Victoria-Randenigala-Rantambe Sanctuary

Kandeketiya electric fence in Kandeketiya Divisional Secretariat Division has been established to prevent elephant damages coming from Victoria-Randenigala-Rantambe Sanctuary which located in Central region of the country and extends approximately 41,600 hectares. The fence was constructed during 1998 to1999 period from Uma oya to Pathagala rock extending approximately up to 9 km. Due to the Accelerated Mahaweli Development Programme (AMDP), the forest cover was extensively cleared loosing a substantial land extent from these catchments for the huge reservoirs. It has arisen a number of environmental issues like human elephant conflict. Approximately 75 to 100 elephants living in this

sanctuary invade nearby villages in search of food. The study was conducted for totally 47 households from the villages protected with fence namely Akkiriyawatta, Maliyadda and Wewathenne and the villages that do not protected with electric fence such as Lemasooriyagama, Othalawa, Serasumthenne, Serupitiya, Meeriyabedda and Theripehe.

Herathgama electric fences near Kahalla-Pallekele Sanctuary

Herathgama electric fence in Northwestern region of the island protects mainly Polpithigama D.S.Division from the attacks by the elephants in Kahalla-Pallekele Sanctuary. This sanctuary is located within three Districts extending 21,690 hectares. The sanctuary consists of 20 to 30 elephant's in resident herd and 80 to100 in migratory herd. The forest is one of the resting-places of migrating herds between Wilpattu and eastern forests of the country. The fence was constructed in 2000-2001 period extending about 33 km from Siyabalangamuwa reservoir to Immihaminegama villages covering Herathgama, Irrudeniyaya, Thibbatuwewa, Pothana, Koonwewa, Siyabalangamuwa, Pothuwila, Galahitiyawa. The survey was included 58 households from the villages in fenced areas namely Siyambalangmuwa, Siyambelewa, Hatangama, Thibbatuwewa, Galahiyawa, Herathgama, Nikawewa, Pothuwila, Irudeniyaya, Mahapitiya, Bambaragalayaya, Pansiyagama and the villages not covered by the electric fence such as Jayalanda, Meegalewa, Kankanigama, Kalankuttiya and Govigammanaya.

Electric fence around Mahaweli System G

Mahaweli System G locates in between the Dambulukelle forest and the Wasgamuwa National Park. Being a comparatively narrow land strip, elephants migrate through this settlement area. The Electric fence of Mahaweli System G extends approximately 105 km. It was constructed in 2000-2001. The Mahaweli System G is totally covered by this electric fence. The study was conducted in three areas namely, Atthanakadawala-Seegala, Galmulla and Damanayaya covering 43 households considering before and after fence scenario.

Kalagama electric fence at Balaluwewa-Kalawewa sanctuary

The Kalagama electric fence in Anuradhapura District with approximately 10 kilometers in length was established in 2001. The fence lies from Konpolayagama to Undurawa along the boundary of Kalawewa- Balaluwewa sanctuary, the catchments of Kalawewa and Balaluwewa reservoirs. The sanctuary is a transit as well as habitat for many (100-128) elephants. Data was collected from the villages namely Undurawa North, Kalagama, New Balaluwewa and Dambewatuna.

Electric fence at Lunugamvehera National Park

The Lunugamvehera electric fence extends 17 km in length that considered for the study. It initiated from the Wilamba Wewa (reservoir) closer to the National Park and continues towards the direction of Yala National Park. Lunugamvehera National Park (23,499.77 hectares) is located in Hambantota district in the Southern region of the island. Human encroachment for cattle

feeding is a severe issue at the National Park in which around 150 elephants are living. The villages namely Kiulara, Thanamalwila and Ranawarawa were considered the villages without having coverage from electric fence. Punchiappujandura, Lunugamvehera, Boogahawewa, Gestupana, Colony 1, Colony 2 and Padikepuhela, Karawile, Thammennawa and Hunathuwewa villages were considered the protection from electric fence including number of 60 respondents.

Data collection

A well-structured questionnaire was prepared for household survey in selected sample areas. The expected data to collect were general household information, land ownership, behavioral pattern of the wild elephants, number of crops and property damages, number of injuries, number of human deaths before and after the electric fence, severity of the damages, attitude of the villagers towards the electric fencing. HEC related information such as numbers of human deaths, numbers of injuries, numbers of property damages, numbers of plant destructions and numbers of crop damaging incidences were collected from key informants. Relevant secondary information includes total number of elephant related incidences during past few years, existing mitigating measures was collected from government institutions such as DWLC, Mahaweli Authority and divisional secretariat officials in relevant areas. The information on electric fences was also obtained.

RESULTS AND DISCUSSION

Considering the damage incidences both in fenced and non-fenced areas, the effectiveness of the electric fences have been evaluated on avoidance of damages. The Kandeketiya electric fence has not shown a substantial reduction in the number of incidences. Because of the inadequate length of coverage by electric fence and the elevated human activities in elephant habitats are the main reasons.

Table 1. The effectiveness of electric fences in damage avoidance in 2003

	Damage reduction in each site				
Incidences	**VRR**	**KP**	**Mahaweli S.G**	**Kalagama**	**LMV**
Human deaths	1	0	2	3	0
Human injuries	3	3	0	0	3
Property damages	9	6	2	9	1
Plants destruction- Coconut trees	28	123	194	17	92
Plants destruction - other trees	29	30	89	72	114
Crop damages-	10	15	113	146	145

Paddy lands					
Crop damages-- other	0	-9	21	96	81
Damages to stored paddy	3	13	4	5	0

According to the findings in table 01, the Kandeketiya electric fence has shown its effectiveness by avoiding human injuries. The electric fencing seems to be less effective in avoiding human deaths and damages to stored paddy. Slight increases of the incidences can be experienced in property and other crop damages. Related to the Herathgama electric fence, the number of incidences is fairly low and there are no records on human deaths or injuries. Plants destruction by elephants appeared to be fairly high even after establishing the fence may be due to weak points. Meanwhile the effectiveness of Kalagama electric fence at Balaluwewa-Kalawewa sanctuary is fairly high. However, plant destruction has not decreased satisfactorily. The Lunugamvehera electric fence shows high effectiveness in avoiding damages.

Most of the fences are not functioning at expected levels of effectiveness. Some reasons that affect the effectiveness of the electric fencing are partially and incomplete maintenance, lack of community participation to various activities related to maintenance of the fence. The human elephant conflict in Kandeketiya was arisen with the implementation of Accelerated Mahaweli Project which damaged elephant habitat, migratory routes as well as the human -elephant co existence.

Table 2. Satisfaction of stakeholders on electric fencing as a HEC mitigation measure

Response	VRR	Kahalla-Pallekele	System G	Kalagama	Lunugam-vehera
Separation with a fence	44.20%	38.89%	81.60%	60.00%	62.43%
Translocation of aggressive elephants	25%	20.37%	12.20%	13.50%	20.91%
Complete drive	11.50%	-	-	-	-
Establishment of a corridor	-	12.96%	-	-	6.66%
Plantation of fodder trees	-	12.96%	6.10%	16.67%	-
Establishment of elephant conservation & management unit	-	7.40%	-	9.83%	10.00%
Relocate villages	15%	-	-	-	-

As shown in the table 02, in Kandeketiya, most of the respondents agreed to physically separate from elephants by a fence. Forty-four (44.20%) percent of

the responses were with this solution. Peoples' attitudes towards electric fencing in the Polpithigama Divisional Secretariat Division, shows the preference to separate an area for elephants by a fence (38.89%) Attitude of the respondents in the Mahaweli System G (Bakamoona) towards electric fencing says that separation of an area by an electric fence is the best solution according to the majority of respondents (81.60%). It depicts the positive attitudes on the electric fencing by the people, and in the same way pointed out the effectiveness of the electric fence related to the System G. According to the responses, majority has kept more trust on electric fences. Earlier, more attacks of elephants had been come from catchment areas. With the establishment of electric fence, the trend of frequent visits of elephants into the villages has been declined. Therefore, peoples' attitudes on electric fence are at positive level, which is shown by the highest number of responses (60%) with the electric fencing as a solution. At present, there is a problem with the effective coverage of the electric fence due to poor maintenance. People are considerably much satisfied (62.43%) of the electric fences as a mitigation option. However, they are dissatisfied on the prevailing settings of the electric fences. Due to those weaknesses of location of the fence, people have an attitude that elephants are still entering into the villages. Some respondents pointed out that elephants might be visiting the covered area from other areas and other forests that are located in the same side of the Lunugamvehera electric fence. Therefore, the HEC is still a problem though it is not much severe as before. Though the functioning electric fences in study areas were able to reduce the exposure to elephant related incidences compared to the non fenced areas, peoples don't have 100% favors at electric fencing. The reason is they still suffer from some incidences. Therefore, it seems that combination of the mitigation measures rather than single measures are much effective and sustainable in existence.

The social aspects which are influencing on effectiveness of electric fences can be listed as follows;

1. Role of government organizations
2. Community support
3. Perception and attitudinal factors of the stakeholders
4. Forest links

The role of the government organizations includes the maintenance of regulations related to the land and conservation policies. In some instances, the government authorities have failed to enact the regulatory measures such as relocation of unauthorized settlers from the protected areas and corridors. It is therefore, the legal operations needs to be strengthened. In Victoria- Randenigala-Rantambe sanctuary area, such issue on relocation of settlers had been arisen.

Community support in maintenance of the fences is a crucial factor in effective electric fencing. The degree of community interest on participation in fence maintenance is found usually negative sloping with time. For the success of the electric fences, capacity development of community based organizations can be practiced.

People in the fenced areas are also interacting with the nearby forests for fulfilling their needs such as timber, firewood, herbs and cattle feeding etc.

Though these are illegal activities, the communities don't have other alternatives so that those issues needed to be considered in a reasonable approaches rather than imposing strict regulations. That kind of approaches brings the community much closer interacts with electric fences. In Lunugamvehera, the one of the influencing factor on fence failure is extensive cattle feeding in national park. Those can be limited using approaches such as establishing separate feeding areas, buffer zones for outside animals.

The electric fences acts as the barriers for accessing in to the forest recourses by the concerning communities. Therefore, those who are loosing their prevailing lands due to acquisition of lands for protected areas need to be allowed to use some extent of the land with certain restrictions. Therefore, wherever those routes of electric fencing are demarcated, a comprehensive pre- study is needed. If not, the disputes between community and authorities will be resulted and it makes the failures of the fences.

CONCLUSIONS

The study found that even the short-term benefits of electric fencing are not fully achieved in most of the cases. However, the weaknesses related to social related aspects need to be addressed. In such situations, the perceptions of the people in the conflict were not considered in policy making. The most important is community support in maintaining the fence. Community organizations have to play a role to protect the fence and keep clean the route of the fence. This needs to be supported by authorities by provision of funds and material (e.g. posts for replacement). Inability to achieve the intended benefits of the fences can be attributed to this factor mostly.

Electric fence related activities can be improved with close rapport and relationship between government authorities and community. Active village level organizations need to be given the responsibilities and authority with transferring benefits. Further, the community should be made to understand the importance of the fence is to reduce the conflict.

The tasks assigned for the communities need to be in flexible manner. The activities can be allocated with responsibilities and continuous monitoring. Further, the maintenance and related operations should be assigned for the communities not only in closer areas of the fence but also to the communities within the effective distance. The effectiveness of the electric fencing as well as the social acceptance can be improved with the approach of high level of community participation in all the stages of fence establishment. Integrated approaches along with electric fencing will be the best way to improve the as well as increase the level of community involvement.

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