The Study on Crop Damages by Wild Animals in Sri Lanka Giving Priority to Human Elephant Conflict (HEC) and Finding Viable/Sustainable Community Driven Practices

1st draft

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Introduction

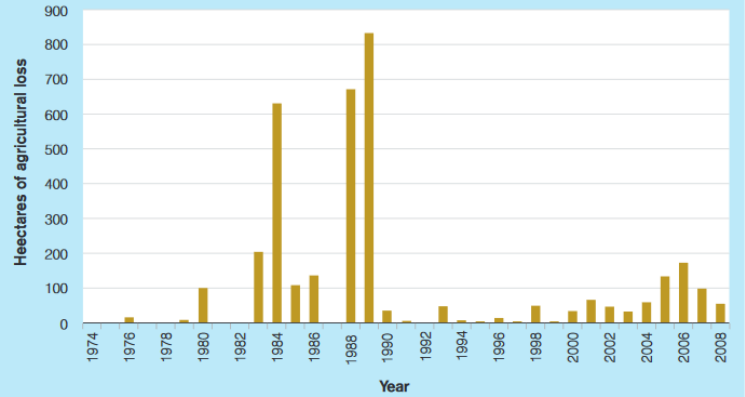
Farmers in main agricultural districts of Sri Lanka face serious threats from wild animals. Crop lands in many areas, especially in remote areas are destroyed by wild animals in search of food. Invasions from elephants and wild bows are very common. Also, the impact from peacock in the districts like Monaragala and Hambantota cannot be left unaddressed. Many home owners in urban areas complain huge quantities of tender fruits and crops dropped by monkeys in their flight from to one tree to another. The depletion of forest resources had been forcing animals to look for food in farmlands. They not only eat, but also destroy large amounts of unripe fruits. Monkeys, wild boar and elephants inflict damage to any crop. Elephants can destroy crops in vast areas in no time.

When a herd of elephants enter a plantation or a paddy field, a large number of paddy, trees, coconut palms, bananas, etc are destroyed. The farmers had urged the authorities to find a permanent solution to the issue. Despite ad hoc measures taken following a street demonstration held after a fatal elephant attack, no permanent solution is in sight.

These wild animals, mainly in peripheral areas of national parks and wildlife sanctuaries, increasingly pose a risk to farmers around those regions. Farmers are inflicted with crop losses and other damages when herds of such animals occasionally stray from their habitats and enter farmlands, destroying the fields and plantations. Growers of cereals like paddy and maize, horticulture crops such as banana and vegetables, and cash crops like sugarcane, apart from plantation crops are among the worst affected by the straying wild animals. While there are no official estimates on losses inflicted by the wild animals, activists peg the losses at about a third of the output. About 30 to 35 per cent of the output gets impacted by wild animals, monkeys and birds in many districts. Studies on challenges faced by farmers indicate that most people whose farming activities are impacted by the presence and abundance of wild animal

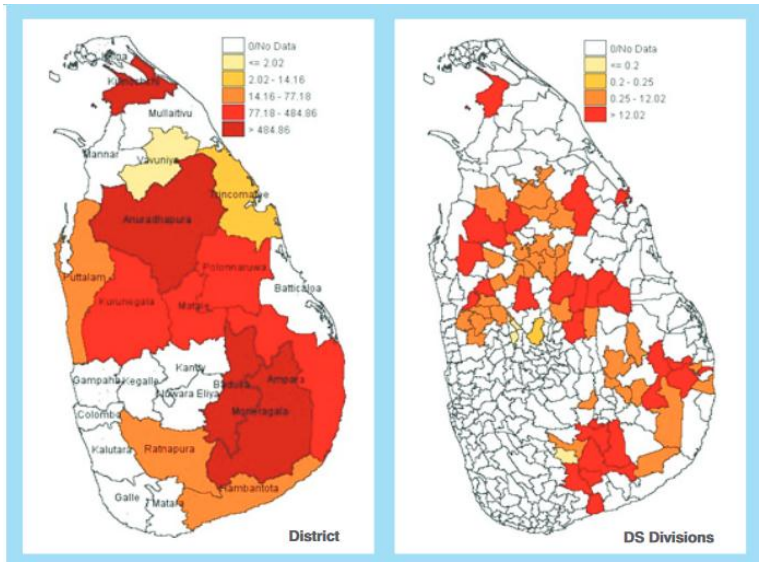
species are the resource poor local farmers. Various studies have shown that previous research has concentrated on understanding only the socio-economic dynamics of human-wildlife interaction with very limited understanding of the basic issue. Hence, there is a need to map the extent and severity of this issue and come up with an efficient and effective way to reduce the damage caused.

Agricultural Loss due to Animal Attacks (in Hectares)



As you see, time serious distribution of agriculture loss due to animal attacks shows intriguing distribution with highest loss in latter parts of 80s. Overall, the distribution is erratic up to 1999. There is an increasing trend in the loss during the period from 2007 to 2015.

Agricultural Loss due to Animal Attacks (in Hectares) – Spatial Distribution,



Spatially, districts like Anuradhapura, Moneragala and Badulla have the highest agricultural loss and districts clustered around the Northern and South Western parts of the island have experienced low levels of agricultural loss.

Finding solutions for Human-elephant conflict considering a national disaster

Human-Elephant conflict is one of the man-made disasters in Sri Lanka because various anthropogenic activities have influenced to enhance this problem. However, this problem can be controlled by using disaster management cycle. Normally, there are four major phases of a disaster i.e. Mitigation, Preparedness, Response, and Recovery. Mitigation is the phase that can be used to find long-term solutions for the issue where structural and non-structural solutions can be used but these solutions are different from disaster to disaster. Preparedness means short-term solutions for the problem i.e. after knowing the risk of some disaster preparedness is needed but even preparedness methods are different from disaster to disaster. Response means when actually facing the disaster, there are some activities to do and these activities also are changed from disaster to disaster. The final phase is the recovery it means after occurring disaster, some activities should be carried out to come back to normal or achieving resilience and these activities are changed according to the nature of a disaster.

Fair Mitigation process for Human-elephant conflict

There is no long-term preparedness could be observed in the areas for this problem because people have pointed out that relevant officers have not taken essential remedial actions to resolve this problem at least making an

electric fence. More than 90% request this solution as a long-term solution for this problem. But there is no such kind of structural methods instead the government has given permission to use license guns during the cropping seasons and after cropping season guns should be returned. Due to giving these types of guns, some farmers shoot at elephants and considerable numbers of elephants become deaths due to shooting on deference to their crops. But if it is necessary to solve this problem sustainably there are a lot of mitigation methods where both structural and non-structural methods should be used. Habitat enrichment is one of the essential activities where plants should be grown in the jungles which are favorite by elephants and forest cover should be enhanced by planting trees to provide enough food and space for the elephants. Policy planning, land-use planning are essential for conserve elephants. Physical barriers such as cleric fence, log fence, drainage, biological fences such as limes, Palmira, etc can be used as repulsion methods. Conducting research on elephant behavior and caring out education or awareness building of the value of elephant conservation are essential for a sustainable solution for this problem.

Pre Preparedness for Human-elephant conflict

Farmers are using various preparedness methods such as keeping the torch, crackers, Aliwedi, Making huts on the roof to protect their crops at nights, etc. But they are not using traditional methods such as Mantara, because people believed that those methods are not effective at present, most of the time they Recovery like to guns than other methods. However, at present new technology should be used to give early warning for the people using Geographic Information System (GIS) and remote sensing. Capacity building is essential to find effective solutions to this issue. Flat houses are very effective for villages because elephants frequently coming to the villages but most people of these villagers are living in very poor clay

houses. Though old people know the behavior of elephants, young people have no knowledge about elephant behavior and how to escape. Therefore it is essential to give training for all people living in these villages. The communication system should be developed to inform relevant parties.

No Response to Human-elephant conflict and various damages

When elephants come to villages people have to response. Hence response activities should be identified to chase elephants and protect their crops and property. But due to the response, people become deaths due to the attack of the elephants. Usually, people use various noises to chase elephants. People who always undergone to elephant problem think that elephants as their enemies that is why some farmers use illegal methods to kill elephants such as Hakkapatas, Poison, shooting etc. Most of the time, crops such as banana, Coconuts destroy by the elephants. However, the mechanism should be developed with the help of relevant officers to response for this problem such as making training group for chasing elephants, capturing cruel elephants and releasing them to suitable places. Especially, isolated elephants attack to humans than elephants living in the herd. Therefore, people should be the educated behavior of elephants and escaping methods.

No Reasonable Recovery System for Human-elephant conflict

There is no enough recovery system for the human-elephant conflict in the country because elephants damage to the people causing many problems such as crop damage, property damage, and human casualty but there is no proper compensation system developed by the government. According to the perception of people living in HEC areas, there is no any compensation for crop damage but rarely give compensation to house

damages. At present, the government pays 50,000-100,000 thousand rupees per human death due to elephant attack but Villagers request to pay 200,000 rupees for crops damage per acre while at least one million per human death caused by an elephant.

People criticize that when causing elephant death due to farmers, government give punishment either charging money or been kept in jail but when people become death due to elephant attack, there is not enough compensation. Therefore, it is essential to introduce an insurance system for the farmers to build the capacity to cope with this menace.

Path to Solution

According to the agriculture department statistics, appropriately 35% of the agriculture production is lost due to animal attacks in the recent past. In national level head of state and relevant authorities have taken some immediate actions to mitigate the damage by proposing few new initiatives. The main issue is elephant attacks as most of the irrigated agriculture lands are located or surrounded by national parks or producted areas. The popular term that call this situation as Human Elephant Conflict (HEC), many government institutions, experts (both local and global) are involved in finding the viable solution and try many options to control the situation.

We have given more concentration on Human Elephant Conflict in this study as two of the three BACC sites are highly vulnerable to this situation. We are investigating few options, where the government institutions and CBOs can be more effectively involved to find a viable/Sustainable solution for the HEC.

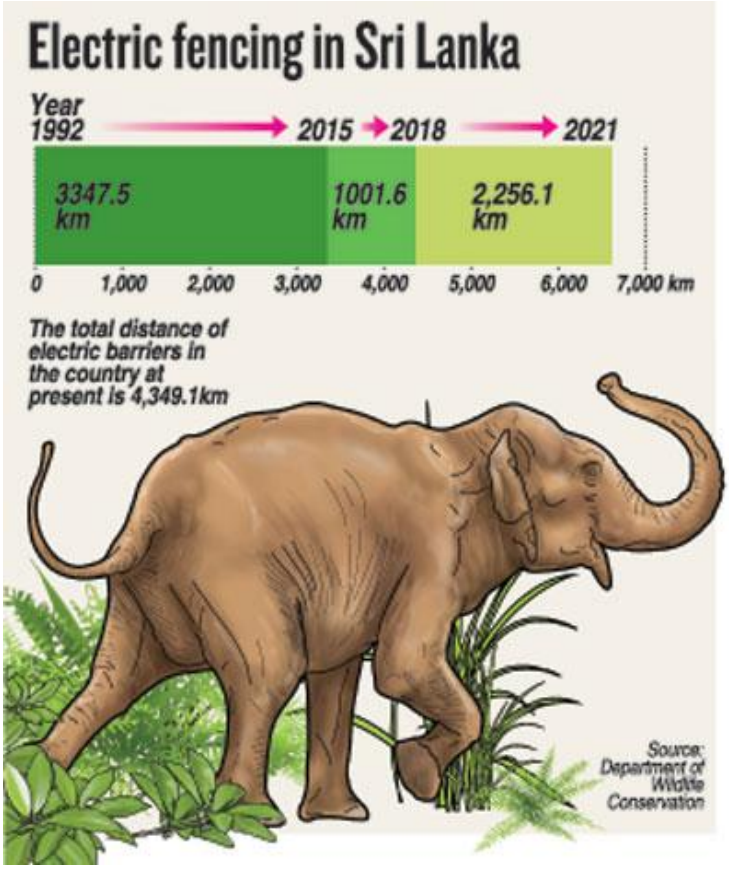
Solution 1

The popular and most effective solution in national level is the Electric fence.

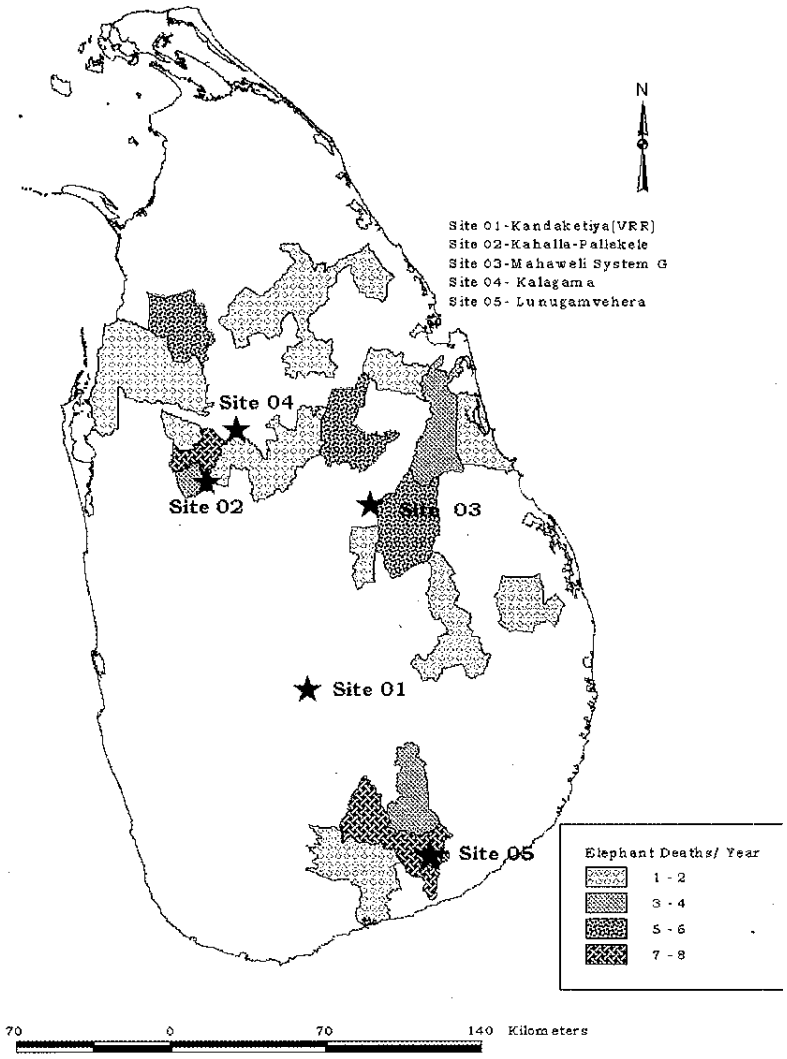
One of the main tools that are available to prevent crop raiding by elephants is electric fencing. However construction of permanent electric fences around paddy fields causes a problem in their maintenance and is detrimental to elephants.

More than 1,000 kilometres of electric fences have been erected by the Department of Wildlife Conservation (DWC) in the last three years alone in an effort to mitigate the impact of the human-elephant conflict.

From 2015-2018, the length of electric fencing put up around the country to keep elephants out of human habitation is 1001.6km. The total distance of electric barriers in the country at present is 4,349.1km or 281 fences.



2019- 2021 a period of three years the DWC expects to erect a further 2,256.1km of fencing. This will bring the total extent of electric fencing to 6605.2km or 15 times the length of Sri Lanka.



The barriers, all of which are solar-powered, are located around parks, reserves and sanctuaries that border villages. The most number of fences– 52 of them making up 780km–are in Polonnaruwa. Moneragala follows in second place with 34 fences — 524.6km in length. And Anuradhapura is third with 35 fences and 491.3km in extent. At the other end of the table, Mullaitivu has only four fences, 56.3km in length.

There were also several elephant drives–chasing them from one place to another using thunder flares and serpent flares (elephant crackers)–during the same period.

Making the Fences More Effective

According to local people, electric fences will be more effective if combined with other mitigation measures. Among the suggestions made by them were establishing corridors between forest areas to deter migrating elephants from invading human settlements and enriching the elephants' habitat by planting fodder trees in the forest.

One problem is the destruction of fences by illegal timber fellers and illicit liquor producers. Such activities can be policed by well-organized community-based groups. Community organizations thus have a useful role to play protecting and managing any electric fences in their vicinity.

What Should Be Done

The findings shows that a thorough appraisal is needed before electric fences are established and that adequate resources should be invested in their construction and maintenance. Local people should be involved in a fence's planning and construction. They should also be supported so that they can play a role in maintenance and protection.

Appraisals should pay attention to present land use patterns, the degree of habitat fragmentation in surrounding areas, elephant behavior (population size, migratory pattern etc.) in nearby reserves, and local peoples' priorities and perceptions of the elephant threat.

A successful strategy to deal with the elephant problem must be much more far-reaching than it is at present. Such a strategy should include a comprehensive land use planning exercise where elephant habitats (i.e., park areas) are grouped and interconnected by elephant corridors. The elephants' habitat should then be enriched and fenced.

Cost effectiveness should be the prime criteria in shaping any strategy. For example, in some situations the translocation of aggressive elephants may cost less than fencing. Electric fencing should be seen as part of such a long-term, holistic approach, not a stand-alone solution.

An elephant in the vicinity of the village

Reconstruction of the electric fence

One of the most importance factors that determine the life time and success of an electric fence is its level of maintenance. Many paddy fields in Sri Lanka are irrigated from small rain-fed tanks. Such fields are usually cultivated only in the main cultivation season of ‘Maha’, during the north-east monsoon from about November to April. Therefore such fields lie fallow for about 8 months of the year. Some fields may also not be cultivated at all in some years, depending on the rainfall and may lie fallow for years. Fields cultivated with water from irrigation development schemes maybe cultivated in both the Maha season and the secondary cultivation season or ‘Yala’ from about May to September. In many cases, the extent of Yala cultivation is less than that of Maha and only a part of a tract of paddy is cultivated in Yala due to shortfall of water. Even if an entire tract is cultivated two seasons in a year, there are 2-3 months in between the seasons when the tract is not cultivated and lies fallow.

During the cultivation period the farmers construct huts in the fields and live there and guard the paddy. During the fallow periods they live away from the fields in their villages. Therefore, if permanent electric fencing is constructed around paddy fields there is no one to maintain them during the fallow season. The fences leak current and become ineffective. Elephants tend to break such fences around fields where there are no people.

Solution 2

Bio Fencing

Palmyra Bio-fence is a cost effective, long term solution to the second most frequently reported disaster in Sri Lanka. Planted alongside the electrical fence the Bio-Fence provides an effective protective barrier against elephant attacks. On expiration of the electrical fence the Bio-fence functions as a solitary shield with numerous socio-economic and environmental benefits; 1 km of Palmyra fencing adds 2500 trees to the vegetation cover of the country and produces a minimum of 270 metric tons of nutritious feed for wild elephants. Palmyra is an income source for poor villagers, a means for rural employment, a medicinal source and a carbon fixing medium. The new fencing technology is a climate friendly, environment friendly, cost effective and a long-lasting technology to mitigate the impacts of HEC.

Planting of four rows of Palmyra trees (BorassusFlabellife), in zig-zag pattern as bio fence along the conflict affected areas together with the short term electrified fence. The effective period of electrified fencing is 10 to 12 years by which time the Palmyra trees would have grown sufficiently providing an effective, sustainable, viable and elephant- friendly shield; blocking the animals entrance into human territory and providing them with fruit they relish.

Palmyra fencing as an alternative to electric fencing because:

- They are robust trees and are never damaged by wild elephants
- Survive around 100 years
- No maintenance needed (Battery, solar panels, regular clearing etc.)
- Free from community and government obligations
- Drought resistant
- Flood tolerant (even more than 45 days continuous inundation)
- Resistant to salinity
- Fire tolerant

Palmyra Bio-fence

Cost comparison between electric fence and bio fence

	Electric Fence	Bio fence
Cost of installation/ planting (zigzag) per km.	Rs. 500,000	Rs. 72,000
Cost of maintenance per km. per year	Rs. 25,000 (without solar panel)	Rs. 5000 (for first 3 years and thereafter '0' cost for about 100 years)
Effective period (life of the fence)	10 to 12 years	80 to 100 years

Solution 3

Community driven practices related to traditional knowledge

Wooden Fence – (Danduvata)

A wooden fence called the Danduvata, made by stacking and tying fallen and trimmed tree stems and branches, is set up around the entire Kumburuyaya (Paddy Field) to prevent wild animals from raiding crop. In addition, a scarecrow (Pambaya) is erected and a Takeya (a rough bell-type object) is hung to scare away birds and tiny animals. Farmers would keep watch over their Kumbura throughout the day and night in rough-hewn watch huts called 'Pela' to chase away raiding animals. *This method mainly isolated dry zone villages in northern and north.*

Danduvata

Traditional Practices of Farmers

In the Kandalama and Minneriya area farmers believe that unless a coconut is hung to please the Minneriya God, wild elephants will damage their crops. Therefore, each season almost every farmer performs an offering and hangs a coconut in the field before cultivation begins. They also participate in the communal rituals held at the temple this.

Similar rituals are performed in other areas. In Manampitiya, for example, all farmers visit the temple and make offerings before they start cultivating their crop. Then each farmer receives a coconut, which is hung in the fields to keep wild animals away. After the harvest, farmers put aside some paddy and perform a ritual in the field for the same purpose. The harvest must not be consumed before this ritual has been performed.

Pirith

Pirith is Buddha's teaching for laymen and involves chanting specific verses in a group. Each verse deals with some aspect of good living. Some of these prescriptions are used for crop protection. The verses are used to charm sand and water. These are then sprinkled thinly over the field.

Sometimes symbols are painted on an ola leaf and hung in the corners of the field. A pirith is more effective if the one who performs it leads a pious life and refrains from robbery, sexual misbehaviour, eating animal protein or drinking alcohol.

Using mantra and working on astrological timing.

The repetitive chanting of mantras, which are specific sounds, cause a vibration in the environment. This influences the spirits to bring about the desired effect. In the mantra Gods or religious leaders, like Lord Buddha or the Prophet Mohammed, can also be called upon and their great achievements are recalled. A yantra can be described as a symbolic drawing liked by a particular spirit. Drawing a yantra involves following certain laws. If these laws are not carefully followed not only will the yantra have no effect, but evil things may happen. For the spirit to occupy the yantra it has to be enlivened with specific verses, or mantras.

Each mantra is different and depends on which animal is being addressed. When elephants are threatening the crops, the mantra must be accompanied by placing a charmed coconut flower in the middle of the plot. If the animal concerned is a wild boar, a glowing fire stick is charmed and dipped in the paddy field.

After the Kem is performed, the chanted and energized water is sprinked over the rice field.

Knowledgeable about rituals in agriculture such as seed selection, land preparation for sowing, and determining the right moments for sowing and harvesting will also minimize animal attack

Solution 4

Citrus Fence;

In Monaragala and Badulla districts of Uva province some farmers with the help of different organizations have tried and tested planting orange and live trees around home gardens to protect crops and rice stored in homes from raiding elephants, with reasonable success.

Solution 5

The Devise

Looking at all options that are available around affected farmers, this is one of the practical/viable solution that small scale farmer can practice until the national level solution been implemented.

This solution now been popular among the farmers in southern part of the country that can be replicated by other parts of the country. Some NGOs, research projects use this as a best practice at present.

The electric circuit runs by DC current, which fix to 12 votes vehicle battery.

The method

The fences around the land, with locally harvest low cost poles, fix the aluminum wire three lines from 1 to 3 feet and connect n to circuit. As it is very low electric shock, it will not effect humans. As a safety measure “danger” sign is installed.

This unit can prevent and keep away elephant and other wild animals.

This device has been successfully practices in home gardens/ Small paddy lands (1 to 2 hec) in Southern and Uva provinces.

Name and Address of few Farmers who use the devise:

Name	Address
K.B. Somadasa	Padikepuhela, Beralihela Land 1 hectare
K. L. Janaka	Land No 18/A, Padikepuhela, Beralihela Land 1 hectare
Cost per Unit	
Per Unit	LKR 28,000
Battery	LKR 18,000
Wire	LKR 105,000.00
Total cost per unit	LKR 151,000.00

These are the some pictures of the installation

Connecting the wires

The fence