

Evaluation of a low-tech method, pepper-grease, for combatting elephant crop-raiding activities in Kakum Conservation Area, Ghana

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Abstract

A low-tech method for preventing elephants from destroying farms around Kakum Conservation Area in Ghana was assessed to evaluate its efficacy in warding off marauding elephants. Sixty fenced and 60 unfenced farms located at the peripheries of the protected area were selected and each inspected regularly for 12 months. One hundred twenty farmers were interviewed on the use of the pepper-grease fence to determine their level of knowledge of the efficacy of the method. In 75% of the fenced farms, elephants came close to the fence but never crossed it; they never visited 20% of these farms and only 5% attempted to break through or enter. Of the farms that were not fenced at all, elephants raided 75% completely. Most of the respondents (76.7%) had good knowledge of the pepper fence. Their major sources of information were the staff of the Wildlife Division and agricultural extension agents (54.5%); 31.1% had heard about it from other farmers. Only 14.4% got their knowledge from observing other farmers. In practice, 26.7% said they used it effectively, 22.2% partially, and 51.1% did not practise the method at all. Cost and difficulty of acquiring materials were the main issues affecting lack of adoption. The results support the recommendation that government and non-governmental agencies supply inputs to farmers consistently.

Résumé

On a examiné une méthode de technologie élémentaire pour empêcher les éléphants de détruire les fermes autour de la zone de conservation de Kakum afin d'évaluer son efficacité d'écarter les éléphants en maraude. Soixante fermes clôturées et soixante fermes non clôturées situées à la périphérie de la zone protégée ont été sélectionnées et chacune inspectée régulièrement pendant 12 mois. On a également interrogé cent vingt agriculteurs sur l'utilisation des clôtures enduites de graisse de poivre pour voir leur niveau de connaissance de l'efficacité de la méthode. Sur 75% des fermes clôturées, les éléphants se sont approchés de la clôture, mais ne l'ont jamais traversée; ils n'ont jamais visité 20% de ces fermes, mais ils ont tenté d'enfoncer ou d'entrer dans 5% d'entre elles. Parmi les fermes qui n'étaient pas du tout clôturées, les éléphants ont complètement maraudé 75% d'entre elles. La plupart des sondés (76,7%) avaient une bonne connaissance de la clôture de poivre. Leur principale source d'informations était le personnel de la Division de la faune et les vulgarisateurs agricoles (54,5%), alors que 31,1% en avaient entendu parler par d'autres agriculteurs. Seulement 14,4% ont obtenu leur connaissance en observant d'autres agriculteurs. En pratique, 26,7% ont dit qu'ils pratiquaient cette méthode effectivement, 22,2% partiellement et 51,1% ne l'avaient pas pratiqué du tout. Le coût et la difficulté d'acquisition du matériel étaient les principaux problèmes qui affectaient le taux d'adoption. Les résultats appuient la recommandation que le gouvernement et les organisations non gouvernementales doivent fournir des intrants aux agriculteurs de manière cohérente.

Introduction

Human–elephant conflict occurs wherever elephants and people share the same habitat. This situation is no different in Kakum Conservation Area (KCA), where many farms are cultivated near the area's boundary (Thouless 1994; Kangwana 1995; Barnes 1996; Barnes et al. 2005). The increasing number of crop-raiding incidents, and hence human–elephant conflict, is manifest in the increase in reported cases and complaints from farmers whose farms are located at the frontiers of the park boundaries (Oppong et al. 2008; Monney et al. 2010). Consequently, various efforts and methods have been used over the years to reduce this conflict generated by elephant crop raiding. First, the culling system. Whenever a crop-raiding incident was reported, the wildlife authority unit (Game Control Unit, Goaso) was asked to kill the problem animal and give the meat to the local people to placate them. As a result, between June 1987 and August 1988 (a 16-month period), six elephants were culled in KCA after crop-raiding incidents that were estimated to cost USD 1,920.23 (Parren and de Graaf 1995). The deficiencies of this method were untimely delivery, expense, and threat to the elephant population as well as it being a post-mortem solution to the raiding problem. Moreover, often the problem animal was not identified but rather any individual conveniently near the site was killed to satisfy the demand for action and revenge by the aggrieved community (AWF 2005) and to provide meat as compensation for crop damage.

Disturbance shooting followed after it was realized that culling was not yielding any long-lasting solution to the problem. The disturbance method involves firing guns over the heads of crop-raiding elephants. But they became habituated to hearing the gunshots and were no longer getting scared off. This was coupled with logistical constraints and the long response time on the part of the wildlife guards who were mandated to carry out that activity (Azika SA, pers. comm.; Osborn and Parker 2003).

In an attempt to reduce the level of elephant crop damage and to further inspire the local community to co-exist with elephants, the Wildlife Division initiated a project 'Improve food security and farmers' livelihood' around KCA in December 2003. The project involved installing the pepper fence. Elephants are known not to eat the fruits of the chilli pepper plant as it is thought to irritate their sensitive nasal tissue. Once confronted

with a chilli experience, the combined smell from the oil, chilli and the fence rope becomes a psychological barrier. The project was supported by the Food and Agriculture Organization (FAO), the World Bank's High Forest Biodiversity Project and the International Fund for Animal Welfare (IFAW) in series. Phase 1 of the project was supported by FAO, phase 2 by the Global Environment Fund's High Forest Biodiversity Project and phase 3 by IFAW.

The objectives of the study were to evaluate 1) the efficacy of the pepper fence to ward off elephants from entering into adjacent farms to raid, and 2) the adoption rate by the farmers.

Study area

Kakum Conservation Area is made up of two adjoining wildlife reserves: Kakum National Park and Assin Attandaso Resource Reserve located between longitudes 1°30'W–1°51'W and latitudes 5°20'N–5°40'N (Figure 1). Rainfall distribution shows a bimodal pattern with an annual average between 1,500 and 1,750 mm (Wildlife Department 1996). Fifty-two communities border KCA and it is estimated that at least 36,620 people are living there. The structure of the population shows it is quite dependent, with persons aged less than 15 years forming 45% and those aged 65+ forming 4.6% of the total KCA population. The literacy rate among adults is high (Monney et al. 2010). The main occupation of the people living around KCA is farming and the area is thus surrounded by agricultural crops. The main crops cultivated are cassava, cocoa, maize and plantain (Wildlife Department 1996).

Materials and methods

Installing the fence requires these materials: wooden poles to peg around an entire farm, nylon rope tied to the pegged poles, hot dried pepper, grease or dirty oil (a used lubricant) and rags. The dry pepper is ground to a fine powder and mixed with old engine grease. If no grease is available palm oil residue or used car oil will work just as well. The pepper–grease or dirty oil mixture is smeared on bits of cloth or rags and hung on the fence; it is also smeared on the rope itself. The pepper deters elephants from touching the fence. When the elephants encounter the ropes, they either are repelled or walk round them (Parker et al. 2007).

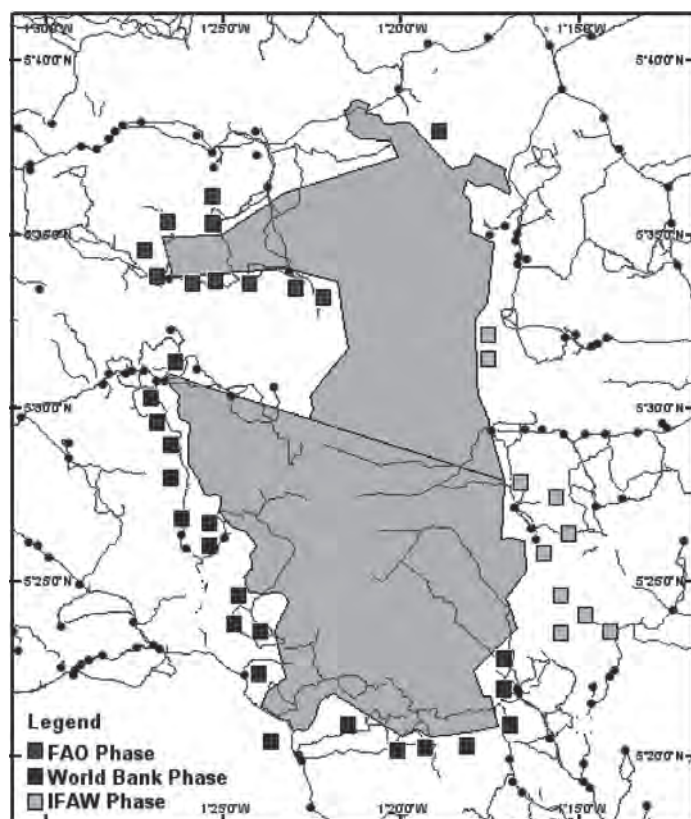


Figure 1. Kakum Conservation Area showing the implementation phases of the pepper fence.

Evaluation of farms

Sixty fenced and 60 unfenced farms located at KCA peripheries were selected and each inspected regularly for 12 months. One hundred twenty farmers were also interviewed on the use of the pepper-grease fences to find out their level of knowledge on the efficacy of the method.

Three categories of farms were identified:

- farms where best practices are being applied, for example, use of required proportions of pepper and grease, good fence with regular maintenance, etc.
- farms that partially applied the method, for example, use of less pepper and more grease, poor fence, etc.
- farms with no pepper fence deterrent

Thirty selected farms in each category were visited and observed to see whether after the fence was constructed elephants had visited the farm, had come close to the fence, and had destroyed any part of the fence.

Results and discussion

Elephant reactions towards pepper-fenced farms

Fenced farms. Elephants came close to 75% of the fences but never crossed them; they attempted to break through or enter 5% of these farms through different routes; they did not visit 20% of the farms.

Farms not fenced at all. Elephants raided 75% of these farms completely; they visited 16% but did not consume anything; they did not raid crops on 9% of these farms.

Farms with partial protection. Elephants raided 62%; they came close to 20% but did not enter or destroy anything; no elephant presence was registered on 18% of these farms.

Farmer attitude towards the pepper fence

Knowledge of the pepper fence method. Most of the respondents (76.7%) had good knowledge of the pepper fence; 23.3% had heard about it but had scant knowledge. The major source of the information was from the Wildlife Division staff, from where 37.8% of the respondents said they got the message; 16.7% said they heard about the pepper fence from agricultural extension agents; 31.1% heard about it from other farmers; only 14.4% got their knowledge from observing other farmers.

Of the farmers who practised the method, 26.7% said they practised it effectively and 22.2% practised it partially. However, 51.1% did not practise the method at all.

Factors facilitating adoption of pepper fence. Three main issues emerged as factors that facilitate adoption of the pepper fence: 55.6% of the respondents said acquiring materials was easy and that motivated them to adopt; 23.3% said it was difficult so they felt reluctant to adopt; 21.1% attributed the poor rate of adoption of the method to the high cost of buying materials.

Evaluating the influence of source of information on adoption rate. Of the 34 (37.7%) respondents who received information on the pepper fence from the

Wildlife Division staff, 44.0% practised the method while 66% did not. Of the 15 respondents (16%) who received the message from agricultural extension officers, 33.3% practised it effectively, 33.3% partially and 33.3% did not practise it at all. Out of 28 (31.1%) farmers who received the knowledge from other farmers, 14.8% practised it effectively, 32.2% did not practise it while 53.6% practised it partially. In addition, the source of information was found significant in positively influencing the effectiveness of practising the pepper fence method ($\rho = 0.33$, $p = 0.00$) (Figure 2).

Reasons for adopting the pepper fence method. 31.1% of the respondents said their farm produce was safe from elephant raiding; 24.4% said acquiring materials was relatively easy, 20.0% practised it because of its ability to deter elephants, and 24.4% adopted the method because of the fence's subsequent effect of improving crop harvests, which means their farm produce was safe and their harvests assured. Table 1 provides details of how the various reasons influence the adoption of the pepper fence method. Spearman's correlation indicated a significant relationship and explains about 45% of the model ($\rho = 0.45$, $p = 0.00$).

Reasons for farmer reluctance to adopt the pepper fence. 21.1% of the respondents blamed their reluctance to adopt the pepper fence on lack of subsidies from

the government, 22.2% did not believe that the method deterred elephants, 26.7% said it was very costly for them, and 30% said the method required extra labour. Table 2 provides details of how reasons for reluctance to adopt the pepper fence influenced the farmers who practised the pepper fence method.

Conclusions and recommendations

If well constructed and maintained regularly, the pepper-grease fence has proved to be effective in warding off elephants from entering farms adjacent to

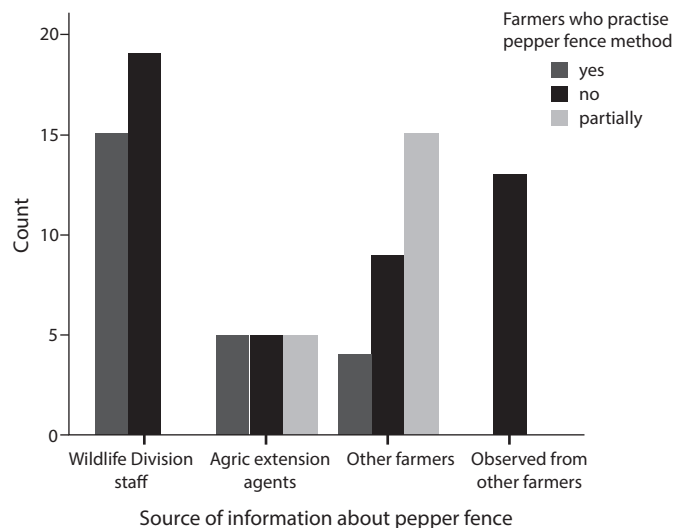


Figure 2. Influence of source of information on practice of pepper fence.

Table 1. Reasons for adopting the pepper fence method that influenced farmers who practised the method

Reasons for adopting the method	Farmers who practised pepper fence method		
	Influenced	Not influenced	Partly influenced
All farm products are secured	13	15	0
Easy to acquire materials	4	14	4
Able to deter elephants	4	10	4
Improves crop harvest	3	7	12

Table 2. Reasons for reluctance to adopt the pepper fence method that influenced farmers who did not practise it

Reasons for reluctance	Farmers who did not practise pepper fence method		
	Influenced	Not influenced	Partly influenced
No support from government	7	8	4
Don't believe it deters elephants	0	15	5
Costly	7	9	8
Extra labour	10	14	3



Wildlife staff demonstrate how to construct a pepper fence.

KCA. Massive destruction was recorded on farms that did not use this method. The resultant benefits were factors that motivated farmers to adopt the method, but lack of encouragement and support in supplying equipment and materials was a disincentive.

Respondents who received information on the pepper fence from wildlife officers and agricultural extension officers used the fence more effectively than those who received their information from other farmers, or where farmers observed the practice on their own.

Much as the respondents appreciated that using the pepper fence was beneficial to their crops and economy, they incurred extra costs than did other farmers in areas where there were no elephants. Hence they were not ready to adopt the pepper fence quickly or easily.

The Wildlife Division staff must be well resourced to educate farmers on the proper construction and use of the pepper fence. It is recommended that the KCA authority construct the pepper fence around the forest and manage it regularly to keep elephants in the forest.

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