USAID
FROM THE AMERICAN PEOPLE

Northern Tanzania Rangelands Initiative
Improving lives. Protecting nature.

Human-Elephant Conflict Handbook

A Guide to Crop Protection from Elephant Raiding

Lessons learned from Burunge, Enduimet and Randilen WMAs

HONEYGUIDE

Contents

Introduction

Elephants raiding crops challenges their coexistence with farmers Communities need to introduce strategies to reduce losses and avoid lethal retaliation against the endangered species.

This booklet has been developed by Honeyguide in collaboration with communities living adjacent to conservation areas directly affected by wildlife conflicts on their farms and in their bomas. It is based on practical lessons learned from three Community Wildlife Management Areas (WMAs): Burunge WMA, Randilen WMA, and Enduimet WMA. These communities have implemented human elephants conflicts prevention for four years, and have gained invaluable experience and data. We have monitored each team's progress and effectiveness, as well which elements of the Human-Elephant Conflict (HEC) Toolkit they have used- from LED Flashlights, Air Horns, Chili Crackers to Roman Candles, and further long-term deterrence strategies like Chili Fences and Chili Bricks.

This handbook outlines current problems in human elephant conflicts, and includes an introductory guide to Elephant Behavior. More pragmatic instructions like Elephant Safety Guidelines, Instructions on how to use the Human-Elephant Conflict (HEC) Toolkit, and further strategies like Chili Fences and Chili Bricks will be the most useful in the field.

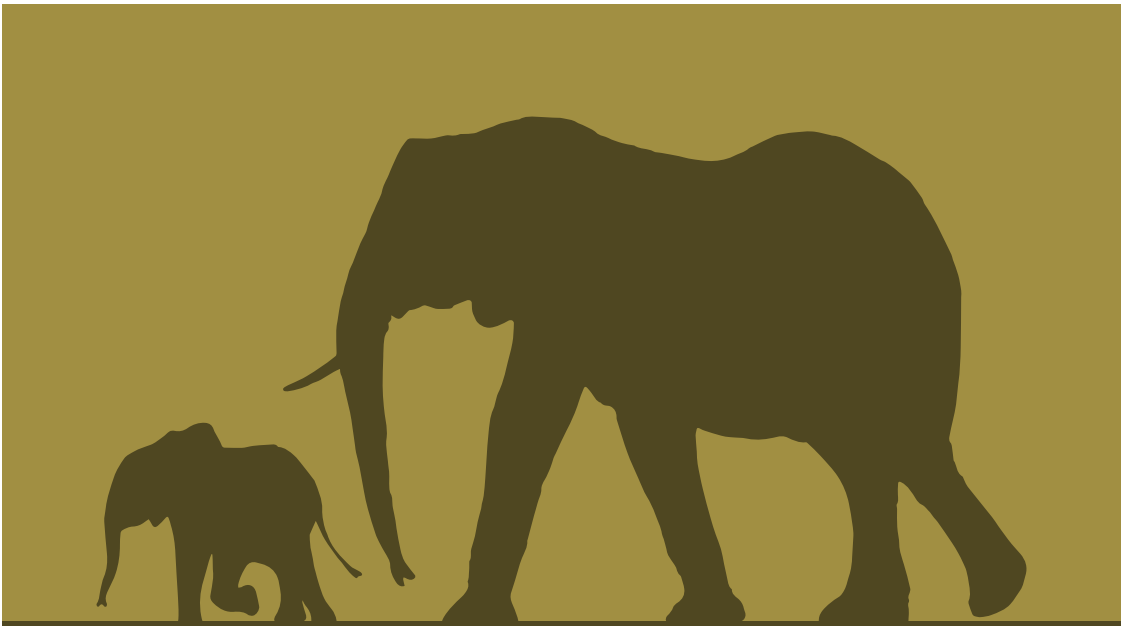
An appendix contains more reference background information on the past performance of the toolkit, building community HEC teams at a grassroots level, and the importance of collecting data in HEC incidents that will help wildlife and communities to peacefully co-exist in the same area, and derive mutual support and benefits from the workings of the WMA.

Current HEC Problems

As human settlements convert more natural vegetation to farmland and occupy traditional wildlife migration routes, people and wild animals come into more frequent contact, often with disastrous results for both. In northern

Tanzania when wildlife – especially large, dangerous species like elephants – disperse from protected areas to raid crop fields, they can devastate the livelihood of subsistence farmers, who all too often retaliate by killing the next unlucky lion or elephant passing by.

WMA projects involve a high level of community participation and project ownership, aiming for sustainable, community-run solutions.



A Guide to Elephant Behavior

Elephants form deep family bonds and live in tight matriarchal family groups of related females called a herd. The herd is led by the oldest and often largest female in the herd, called a matriarch. Herds consist of eight to 100 individuals depending on terrain and family size.

When a calf is born, it is raised and protected by the whole matriarchal herd. Males leave the family unit between the ages of 12 - 15 and may lead solitary lives or live temporarily with other males.

Elephants are extremely intelligent animals and have memories that span many years. It's this memory that serves matriarchs well during dry seasons when they need to guide their herds – sometimes for tens of miles – to watering holes that they remember from the past. They also display signs of grief, joy, anger and play.

Recent discoveries have shown that elephants can communicate over long distances by producing a sub-sonic rumble that can travel over the ground faster than sound through air. Other elephants receive the messages through the sensitive skin on their feet and trunks.
With poor eyesight, elephants depend largely on their sense of smell and hearing to understand their surrounding environment.

Males have been known to form bachelor herds, but there is a great deal of aggression among them. The fight for who will dominate the group is never ending. This tension is why many of the males choose to leave the bachelor herd and venture out on their own. If the male is very weak it may be forced from that bachelor herd as well. The males rarely hurt each other physically when they are fighting for the right to mate though. Most of the time the younger males will back away from the older ones.
We now know that male elephant social systems are highly complex and males selectively choose who they spend time with. Males tend to seek out the company of the oldest males in a social group, and – in a similar way to female matriarchs – it is now believed that these older bulls are repositories of social and ecological knowledge that is vital to the stability of the herd.

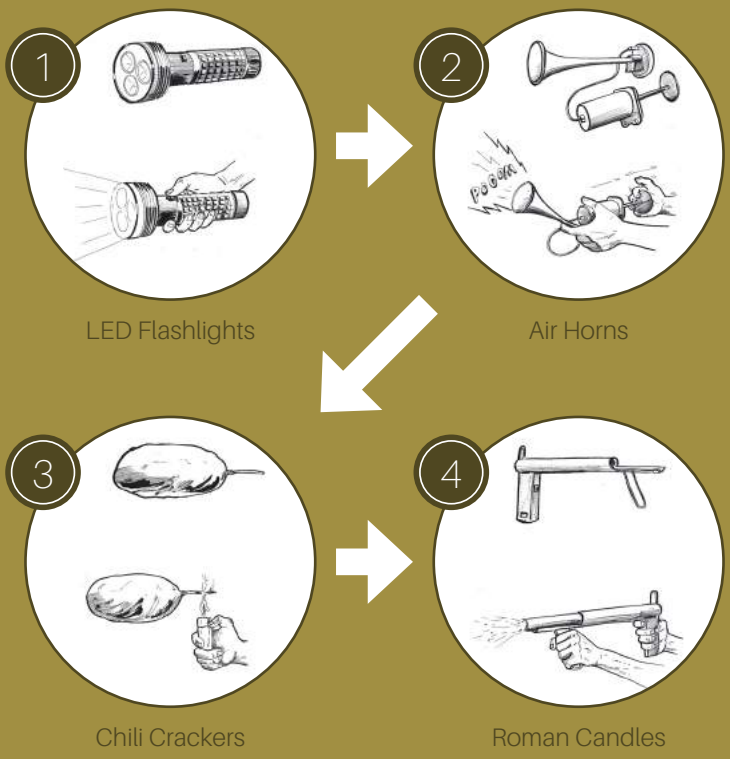
Strategies to reduce crop losses to elephants should consider that most bulls consume crops infrequently. So, killing elephants for eating crops is unlikely to significantly reduce crop loss. Taking lethal action is also costly, for it affects those older bulls who are more likely to be eating crops. Killing these older bulls removes a crucial source of ecological knowledge as well as important breeding individuals. This is particularly damaging to elephant populations already under threat from ivory poaching.

There are much better non-lethal options for reducing crop losses to elephants such as those discussed in this handbook. These approaches require strong commitment, community buy-in and ingenuity. They offer promising outcomes for improving the chances of farmers and elephants being able to coexist peacefully.

The Human-Elephant Conflict (HEC) Toolkit

Honeyguide has developed a Human-Elephant Conflict (HEC) Toolkit that uses a sequential order of methods to prevent crop destruction.

They are:



The objective of the HEC Toolkit is to cause elephants, over time, to react to some of the less confrontational deterrents, such as spotlights and bullhorns, thus decreasing the use of more expensive and risky measures like the roman candle. Honeyguide monitors all HEC incidents across its project areas to improve and adapt the toolkit.

Toolkit Instructions

What to Remember While Using the Toolkits

1. Avoid noise until you see where the elephants are.
2. The LED torch is the first tool to be used. If the elephant responds there is no need for the air horn.
3. Keep at least 10-15 meters away when first using the torch.
4. If the elephant is not responding to the torch use the air horn.
5. If the torch and then air horn fail to turn the elephant, use the chili cracker.
6. The Roman candle should only be used for aggressive bulls and groups with young ones not responding to the LED torch, air horn, and chili crackers.
7. Each toolkit tool be assigned to a different person – avoid one person handling the LED torch, air horn, and chili cracker on their own.
8. Decide who will be using the roman candle beforehand and always remember to aim directly at the elephants, not people.
9. If a solitary bull doesn't respond to the LED torch don't hesitate to use the roman candle.

Why It's Important to Follow the Toolkit Steps

The aim and purpose of this toolkit sequence is to drive and change the elephant behavior, and teach them to learn to stay away from the deterrents. In time, elephants will learn to stay away from people using the primary deterrents of LED torches, and airhorns. The more aggressive and risky methods of chili crackers and roman candles will be needed less and less.

Increasing success of the initial, lower cost methods such as LED torches and air horns will mean less use of the more costly chili crackers and roman candles, and lengthen the shelf life of the toolkits.

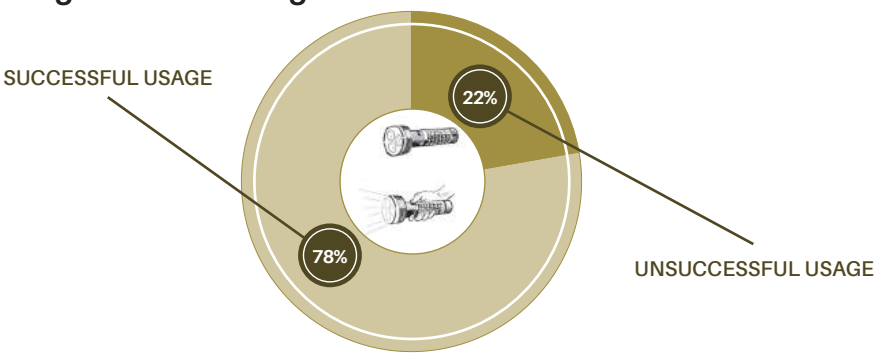
step 1

LED Flashlights

Most communities faced with crop-raiding elephants and other wild animals use basic flashlights or other lights as basic deterrents. These can have marginal success with some animals, but rarely elephants. However, new, more powerful LED lights which are far more effective have become readily available and more affordable in East Africa. Honeyguide recommends various lights in OLight's Intimidator Series and has found them to be effective when used by either villages crop protection teams or by wildlife scouts chasing elephants from farms.

Lights can easily be used by community volunteers and with minimal training, thus increasing the reach and impact of a given HEC intervention program.

Usage Of LED Flashlights



How to Use Them

The lights works best when in a strobe setting and when aimed directly at the eyes of elephants. They ward off elephants – particularly juveniles and females – in the vast majority of cases.

Where to Use Them

Used at the farm directly in front of the elephants (safe distance of 15 meters minimum).

When to Use Them

Like all interventions in the HEC Toolkit, high-powered LED lights are best used in deterring elephants before they enter a farm but, if not, are used immediately when elephants are encountered.

Pros:

- Low-level intervention with proven success
- Higher success with non-elephant crop raiders
- Variable success with elephants, especially juveniles and females
- Easily used by community member volunteers with minimal training
- Easy to cover vast areas with volunteers and flashlights

Cons:

- Elephants might easily adapt to lights and not view them as deterrents
- Some bull elephants already shown to be undeterred by lights
- Lights, if in the wrong hands, could be used for poaching
- Year-round upkeep and maintenance of the lights

Additional Considerations/Tips:

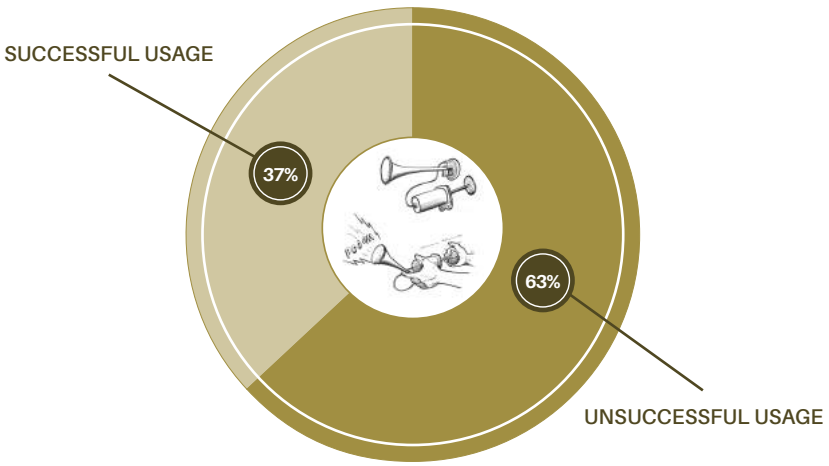
Honeyguide currently loans LED lights under contract to villages during the farming season. This empowers villages both to do the work of HEC prevention, to look after the tools, and securely store them in the off-season.

step 2

Air Horn

Air horns are often available in East African countries for costs of less than 10% of the LED lights. They also require minimal training to the villages teams & scouts and have limited risk. Honeyguide uses this as its second deterrent in elephant confrontations. It is often used in tandem with LED lights, thus causing a simultaneous auditory and visual irritants for elephants and other animals.

Usage Of The Air Horn Method



How to Use Them

Air horns are best used together with LED lights, for a simultaneous auditory and visual irritant for elephants and other animals. The horn produces aloud and continuous noise that distracts the elephant sense of hearing. To make the noise the user should pump continuously and directly to the elephant.

Where to Use Them

At farms during an encounter with crop-raiding animals.

When to Use Them

Best used in tandem with LED strobe lights.

Pros:

- Inexpensive at about $10 USD per horn
- Requires minimal training to use, thus easily adopted by communities
- Success in deterring elephants proven, especially when with lights

Cons:

- Elephants might easily adapt to horns and not be deterred

Additional Considerations/ Tips:

Using LED lights and air horns together is best. Teams have used the LED lights and horn hundreds of other time, successfully in deterring elephants and many other wildlife that raid crops.

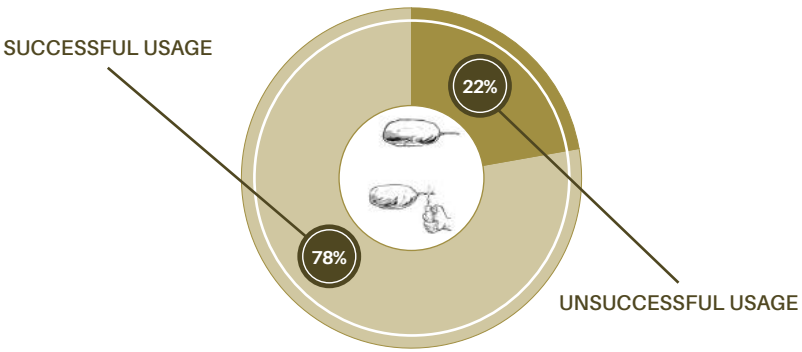
step 3

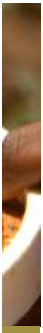
Chili Crackers

A Honeyguide innovation, chili crackers combine auditory and physical deterrents via chili powder and firecrackers. Honeyguide has experimented with chili crackers for more than four years, and is now using them systematically. Honeyguide has used more than 500 chili crackers in Randilen WMA alone and hundreds of others in additional protected areas.

As the number one most-used deterrent, they succeed, but have also showed signs of having decreased effect over time on certain bull elephants that refuse to get out of maize fields.

Usage Of Chili Crackers





How to Use Them

These are made from chili powder and a firecracker, all tied together in a condom, to create a chili cracker. The chili crackers are then lit and thrown above the heads of elephants, taking wind direction into account. The explosive sound of the device coupled with the chili powder irritant combine to form a powerful deterrent to elephants.

Where to Use Them

Best used to prevent elephants and other animals from entering or already entered into the farm in the first place if possible.

When to Use Them

Used after the lights and air horn have not worked. It's best to throw multiple chili crackers in succession, as a single cracker is often not enough to completely chase an elephant herd off a farm.

Pros:

» Again, combines two known deterrents into one

» Inexpensive and easy for anyone to assemble given basic training

» Effective in deterring elephant herds if used in succession

Cons:

» Risk to the user and the elephant if used improperly

» Some bull elephants return to farm not long after being chased away

» Regular higher-level training required to ensure proper use

Additional Considerations/ Tips:

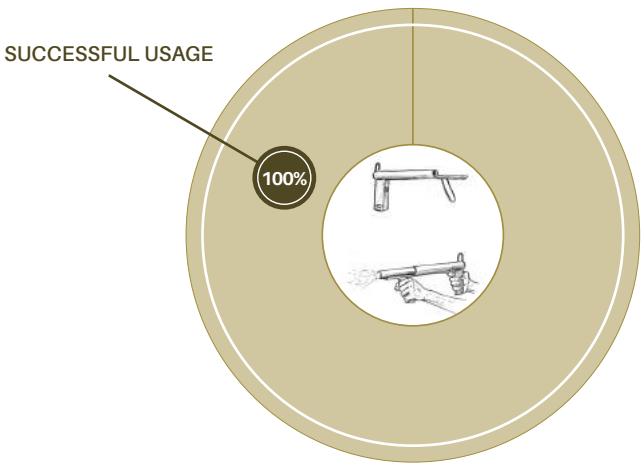
Honeyguide uses chili crackers as a low cost, mid-level deterrent. It has been easily adopted by the community teams.

step 4

Roman Candles

As a last resort, a modified roman candle firework is shot 10-15 meters into the air by a handheld launcher. The roman candles provide a series of loud explosions and accompanying extremely bright flashes. The principle here is the same as used in other HEC Toolkit interventions, to deploy known elephant deterrents at maximum level.

Usage Of Roman Candles



How to Use Them

Roman candles should only be used as a last resort, when bull elephants refuse to leave a farm after all other interventions have been deployed, or return to the farm not long after being chased away. Wildlife scouts with more training are usually best with this tool as it has more risk and requires more skill.

Where to Use Them

As a last resort. One should only use roman candles when elephants are aggressive and have actually been able to enter the farm and refuse to exit.

When to Use Them

After all other interventions in the toolkit have been used.

Pros:

» Proven to be extremely effective even in chasing off aggressive bull elephants

» Elephants rarely return to the farm the same night after intervention is used

Cons:

» Relatively expensive at approximately $30 per explosive

» Increased risk with larger explosion, requiring more training

» As of now, only provided by one supplier in Arusha, Tanzania

A table showing frequency and percentage of toolkit use

Deterrent method	Frequency of use			Percentage of use	
	Failed Usage	Successful Usage	Total Usage	% Failure	% Success
LED Flashlights	81	283	364	22%	78%
Horn	74	43	117	63%	37%
Chili cracker	22	77	99	22%	78%
Roman Candles	0	23	23	0%	100%
Total	177	426	603		

Further Strategies

Chili Fence and Chili Bricks

Various fences have been used in the past, such as beehive fences, which are expensive to build, and difficult to fill with bees. They require heavy poles, and are difficult to maintain on a large scale. By comparison, the chili fence is relatively inexpensive to build and maintain.

Elephants naturally avoid the smell of chili. Chili fences and chili bricks work day and night as an obstacle to elephant pathways, and force the elephants to follow the fence, redirecting them away from fields.

How to Build Them

Chili fences require minimal material and maintenance, as they are only used during the peak harvest seasons, unlike some other fences that must stay up year-round. The fences are made with **sisal ropes**, **poles**, **mutton cloths or rags**, **used motor oil**, **chili powder**, and **various tools for fence construction**. For the fence to perform properly, correct setup and maintenance during the right time of the year is vital. It is best to build a fence when the crop is ripe and almost ready for harvest (4-6 weeks before harvest).

Chili Fence Instructions

The following steps are a simplified version of the process.

1. Dig holes so that supporting poles will be 7-10 meters apart.



2 Grind chili into fine particles, mix with used engine oil (8-10kg of chili per 10 liters of oil).



3 Cut 15x10 cm cotton sheets and tie each corner of them to lines of sisal rope.



4 Soak the cotton sheets and sisal ropes in the concentrated chili oil mixture


5 Tie the sisal ropes to the poles tightly, leaving only one opening as an entrance.

6 About three pieces of saturated cotton sheets should be between each pole. Cover the entire boundary of the farm.

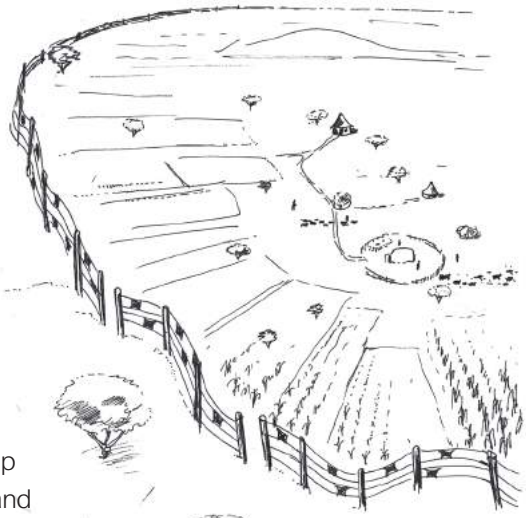
If the fence is too long, remember to insert openings after every kilometer and put watchtowers on the openings to prevent elephants entry. These openings will provide an exit for an elephant already in the fields, that the HEC team can guide the elephant through, avoiding damage to the rest of the fence.

Where to Build a Chili Fence

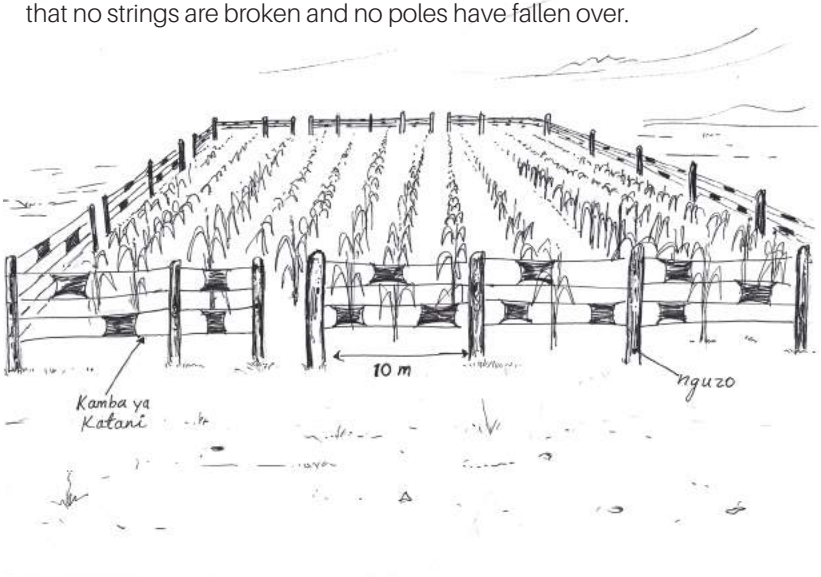
» When planning where to build a chili fence, you need to understand the movements of elephants trails heading into farm fields, and the corridors and pathways that they use.

» Careful layout or and consideration of alignment of farms to be fenced reduces the set up costs.

» It's good to maintain the fence after every seven (7day) when it's raining,But if there is no rain the fence should be maintained after every (14 day) it's good to keep up the maintenance so as to keep the fence effective and last long.



- The crops fenced need to be more ripe and matured to attract elephants toward them.
- It is best to build a fence when the crop is ripe and almost ready for harvest (6-12) weeks before harvest). This helps elephant not getting used to the chili fence, and eventually ignoring it. To reduce the maintenance cost it's best set up the fence when the crops are ripe and raiding intensity increases.
- Over time the chili fence smell that keeps the elephant out of the fields will fade and won't work effectively as when it was first set up. Its very important to refresh the chili oil mixture (using the same chili & oil mixture as when the fence was first set up) on the sisal strings and cloths, using a bucket of oil and cloth. Stick to a regular schedule, usually around every 14 days if the weather has been dry, and around every 7 days if it's been raining.
- Maintenance of the fence is very important. Farmers or villagers need to appoint someone who will be responsible for maintaining the chili fence .
- The volunteer will need to walk along the fence every day, to make sure that no strings are broken and no poles have fallen over.



Pros:

» Effective during peak crop-raiding period

» Easy to construct overall

» Modest maintenance requirement

» Modifiable for different HEC prevention tactics

» Requires proactive community involvement but not high capacity

Cons:

» Will not stop all animals from raiding farms

» Communities find poles to be too expensive

» Crop-raiding happens throughout farming season (not just harvest times)

» Rags with used motor oil often not properly disposed of after use

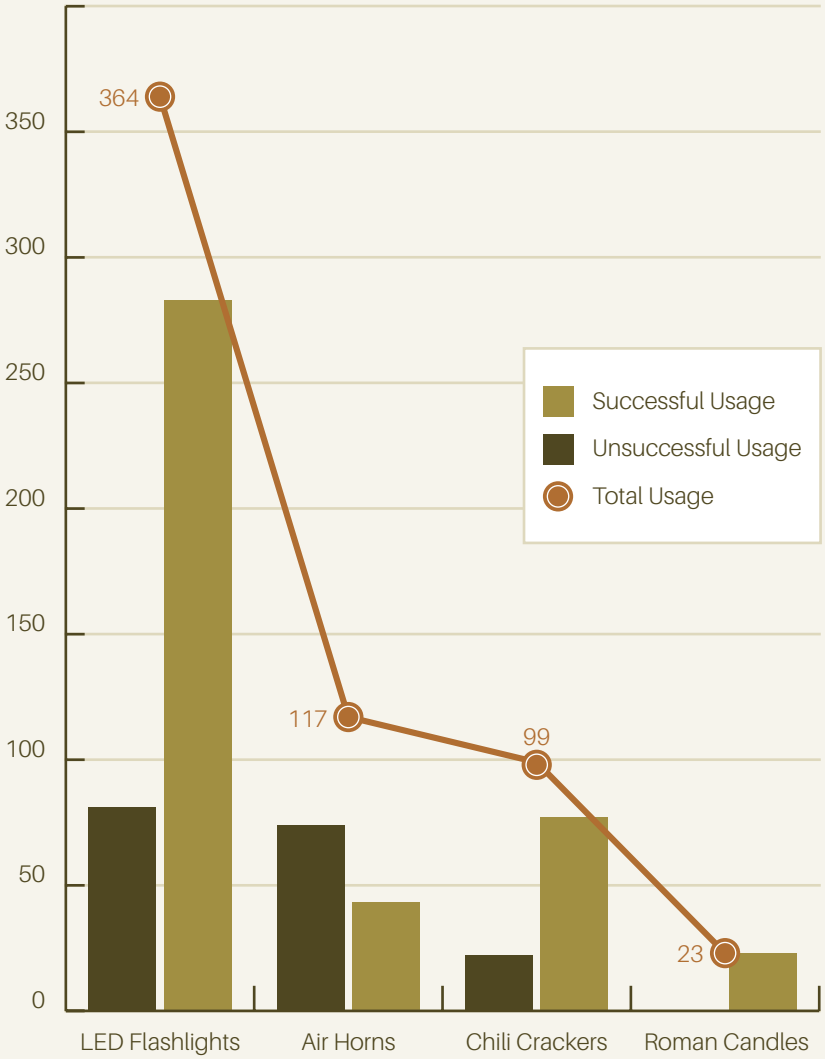
» No saleable byproduct (i.e. chili products as with other fence programs)

The Chili Brick

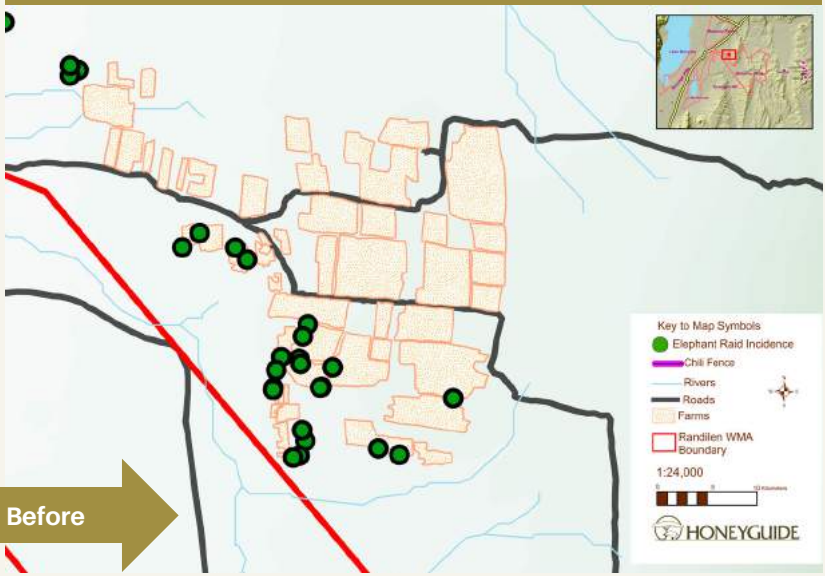
The chili powder and also be used to produce chili bricks that are burned to produce smoke at night to keep elephants away from crops. Chili bricks are made from wet cattle dung mixed with chili powder. The mixture is then moulded and dried in the sun for two to four days. The bricks are placed along the elephant routes and set on fire to produce chili smoke around the chili fence.

Appendices

Past Toolkit Use and Performance



Elephant Crop Raiding
Before and After Chili Fences



Before

After

Building Community HEC Teams

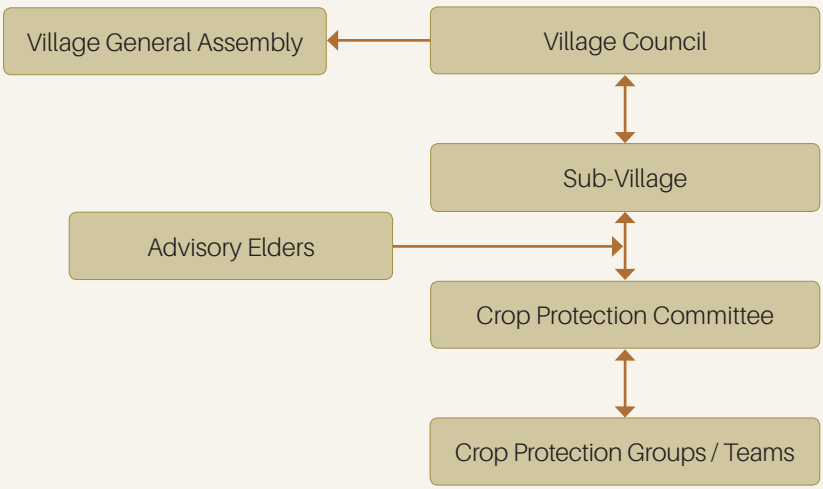
The establishment of the community HEC teams is done in collaboration of the WMA team and village leaders. The village will identify the problematic areas, then the WMA team will gather information on the animals that causes the highest crop damage, or areas with the most animal traffic, and lastly, the number of teams that will be needed to cover the village farmlands.

Thereafter, HEC team will plan the intervention strategy, train the teams, equip them and monitor their progress. The teams are very important for the villages for they serve as ambassadors in reducing communities' properties damages.

Process Used to Establish New HEC Teams

1. Official request for HEC mitigation support
2. Secure funds for implementation
3. Conduct preliminary HEC survey
4. Plan project implementation
5. Procurements of HEC prevention equipment (toolkits)
6. Establish and train community team
7. Distribute HEC prevention toolkits

Community Group Structure of Crop Protection in Villages and Sub-villages



Roles and responsibilities

Group	Responsibilities and Activities
Village General Assembly	The top organ of decision making on crop protection at the village level. It works closely with the District Council in executing its duties. All of the information on crop protection should be presented to the village general assembly.
Village Council	Councils receive reports of crop protection from the sub-village chairman, thereafter it presents them to the Village General Assembly.
Sub-village	Meetings at this level elect the crop protection committee, and appoint advisory elders. The sub-village has to submit reports of its meetings to the village council.
Advisory elders	These are the elders appointed in the sub-village meeting. They are responsible for advising the sub-village and the crop protection committee.
Crop Protection Committee	Constituted of youths elected in the sub-village meeting. The committee administers all the activities relating to crop protection by creating groups and teams which involve all the youths of the particular sub-village. The committee elects the chairperson, secretary, treasurer and members of the committee. The number of the members of the committee will largely depend on the needs of the sub-village in protecting the crops.
Crop Protection Groups and Teams	This involves all the youths of that particular sub-village together with the crop protection committee members. Each group or team collect data, and reports to the crop protection committee on every incident.

Data Collection

Monitoring Crop-Raiding Incidents

To monitor crop protection impact and constantly improved toolkits and techniques, ensuring every crop-raiding incident is recorded is vital, whether elephants are prevented from entering farms, or chased from them. Data collection is the responsibility of the village crop protection (VCP) team leader, who records every incident encountered on a simple incidents data sheet or notebook.

Each morning a HEC field monitoring officer will then verify all the crop-raiding incidents from the previous night. Incident data is entered using a special Crop Raids data form in an ODK smart-phone app. Data collected by a field officer includes:

» GPS location
» Village team involved
» Crop-raiding animal species and estimated numbers
» Pictures of damage (if any)
» Toolkit methods used to scare away the animals, and the exact sequence used

How Collecting HEC Data Helps

» Data helps to make appropriate decisions rather than estimations to make improvements.
» Data helps to show an area with high intensity of incidence in order to determine which method will be best used according to the information collected
» Helps to identify the effectiveness of toolkits and strategies implementation
» Identifying the species of animals involved in destruction, ranking them according to frequency of raids, and deciding on the appropriate measure to be used.
» Photos show the extent of damage

Elephant Safety Guidelines

These guidelines will help you stay safe during an encounter with an elephant.

Solitary elephants bulls can be very aggressive.

Avoid elephants during mating season.

Beware when elephants are trumpeting, or making a lot of noise.

Never use dogs while guiding the elephants out of farms or fields.

Avoid all-male bachelor herds keep safe distance from them.

Keep a minimum distance of 10-15 meters when first using a torch to find an elephant at night.

Avoid making any noise until you know where the elephants are.

Never get behind the young elephants, as this will anger the adults.

Don't drink alcohol while guiding elephants from farms.

For more information and comments please contact us at:
Tel. +255 677 175 11 Email. info@honeyguide.org

www.honeyguide.org