

COMMUNITY- BASED MITIGATION STRATEGIES

**For African Savanna Elephant
Crop Raiding**

Sponsored by:



TABLE OF CONTENTS

Introduction: The Five Strategies	i.
Beehive Fences	1
Kasaine Metal Strip Fences	4
Other Deterrents	8
Zai Pits	10
Half Moons (U-bands)	12
Natural Pesticide	13
Elephant Resistant Crops.....	14
Seed and Crop Alternatives	15
Kitchen Gardens	16
Fodder Production	18
Hadithi & Basket Weaving	19
Zawadisha’s Micro-loan program	20
Beekeeping	21
Elephant Safety	24
How to Secure Food & Water Stores	25
The Importance of Elephants	26
How to Preserve Habitat for People & Elephants	27
Acknowledgements & References	29

To credit this manual please cite as follows:

Von Hagen, R.L., Kasaine S., Lepczyk, C., Schulte, B.A., 2021. Community-Based Mitigation Strategies for African Elephant Crop Raiding. Technical Manual.

For more information or corrections for this manual or information on the workshop programs please contact Lynn Von Hagen at: lvonhagen@comcast.net

All images used within are copyright free, used with permission, and/or credited.

All measurements for materials are initially displayed in the units commonly found in Kenya and then converted to metric (if needed) for clarity.

INTRODUCTION

Karibuni. This guide was created to assist rural African communities like yours that live amongst elephants and other wildlife. Places such as the Kasigau Wildlife Corridor of Kenya (where the Elephants and Sustainable Agriculture in Kenya (ESAK) project originated) has free-ranging elephants that sometimes interact with humans. This area lies between Tsavo East and West National Parks and is an important wildlife corridor. Conflicts occur because of competition for space, food, and water, which most often happens near wildlife refuges. Crop raiding by elephants and other wildlife is the most common form of these interactions. Thus, this manual was created to help share ways for communities to live in coexistence with elephants through five key strategies:



*Strategy 1: **Deterrent Methods.*** Find safe, effective, and practical methods to prevent elephants from entering farms



*Strategy 2: **Climate Smart Agriculture (CSA).*** Improve crop yields through smart farming practices in response to the effects of climate change



*Strategy 3: **Alternative Livelihoods.*** Identify other ways to earn money than just farming



*Strategy 4: **Safety Around Elephants.*** Learn appropriate behavior around elephants to enhance personal safety



*Strategy 5: **Environmental Stewardship.*** Understand the roles of elephants and people in maintaining a healthy ecosystem

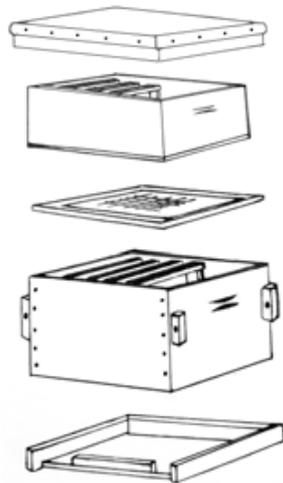
These strategies can help protect people, their farms, the environment, and wildlife. We hope this manual and the accompanying workshop will provide ways to improve life in the village for everyone and promote peaceful co-existence with elephants.

Beehive Fences

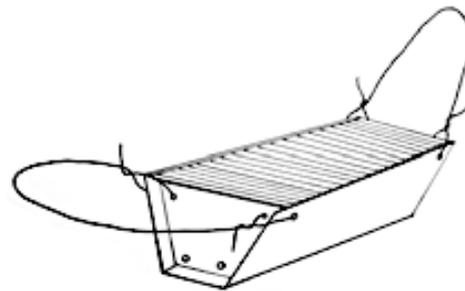
Beehive fences are an effective way to prevent elephants from entering your farm. In addition, you can harvest honey and sell it to make extra income.

To construct beehive fences for one acre you will need:

- 12 Beehives, either type (see diagrams below)
- 12 Dummy beehives made from an 8' X 4' (2.4 X 1.2 m), 9 mm plywood sheet
- Drill or something to bore holes in wood
- 48 posts (you can coppice *Commiphora* trees which regrow)
- 500 m fencing wire to link hives
- 70 cm long iron sheets
- Thatching grass, sticks, & binding wire for shades



Langstroth Hives



Kenyan Top Bar Hives

Figure 1: The two types of beehives used in this manual

Step 1: Prepare your posts. They should be approximately 2.5 m high and need to be pre-treated for termites. You can use an environmentally friendly pesticide (better for the environment) or used engine oil. Prune rather than cut trees, and *Commiphora* trees can be used as a living bio-fence. *Mkurumbutu* (*Melia volkenseii*) and *Neem tree* (*Azadirachta indica*) can also be used and they are not preferred by termites. Allow posts to cure for 2-3 days.



Figure 2: A farmer coating his posts to prevent termites

Strategy 1: Deterrent Methods

Step 2: Prepare the dummy hives by using the plywood sheet and cutting 12 rectangles that are 55 cm long by 35 cm short. Use a drill to cut holes as shown in Figure 3.

Step 3: Measure your field and dig holes approximately 75 cm deep. These will be in a 7 m, 3 m, 7 m spacing pattern (see Figure 4). Make sure you will surround any crops and leave any currently existing fencing in place, making the beehive fences the outer layer of protection. Insert the posts and make sure they are firmly in the ground by tamping the dirt or using stones.

Step 4: Attach the wires to each beehive and dummy hive so that they will hang at chest height in the center of each 3 m section (see Figure 4).

Step 5: Hammer a 4-inch (10.16 cm) nail on the inside of each post in the 3 m sections.

Step 6: Hang the beehives and alternate them with dummy hives in each 3 m section.

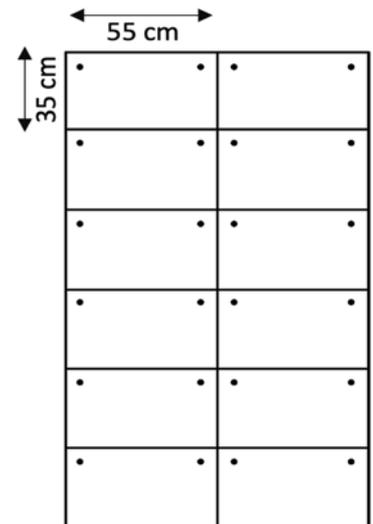


Figure 3: A plywood sheet cutting pattern for dummy hives

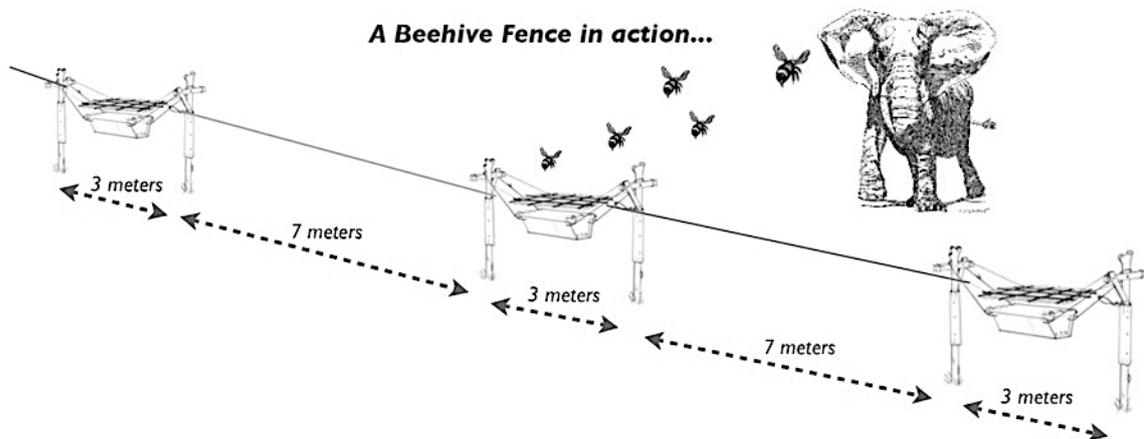


Figure 4: A deployed beehive fence



Figure 5: Villagers creating a lattice frame

Step 7: Create shades to keep the beehives cool. One method is to build a simple thatched roof by connecting sticks with binding wire to make a lattice frame and then attaching grasses to the top. If you cannot make lattice frames, you can use the same plywood 55 cm X 35 cm dummy hive pieces. Suspend the shades from the wire 1.2 m above the hives as shown in Figure 6 below.

Strategy 1: Deterrent Methods

Step 8: Wire together the beehive fence. Using strong fencing wire, link each beehive and dummy hive to the next one. This interlinking wire should be attached to a loop made in the wire hanging the beehive and must be on the inside of the fence so the beehives will swing should an elephant try to enter.

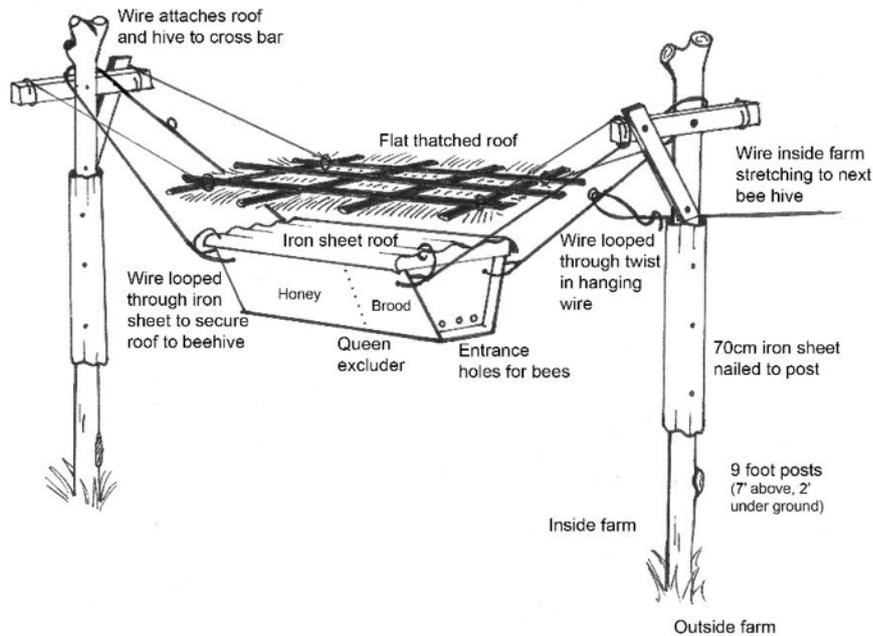


Figure 6: Example of how to hang a Kenyan top-bar hive

Step 9: To protect against honey badgers either you can create a honey badger guard by bending wire mesh sheets over the hives or you can wrap 70 cm iron sheets elevated 60 cm off the ground around the poles next to the active beehives. Secure them with nails.



Figure 7: A honey badger protector

These are the basic steps to building a beehive fence. See the section on beekeeping on page 21 to learn how to manage your bees. It is important to keep the fence in good working order to prevent elephant raids, so make sure shades are intact and poles are sturdy.

For more information on beehive fences, contact Save the Elephants, Elephants and Bees Project in nearby Sagalla or visit www.elephantsandbees.com.

For a full beehive fence manual visit:

<http://elephantsandbees.com/wp-content/uploads/2019/07/LKING-2019-Beehive-Fence-Construction-Manual-4th-edition.pdf>



Material, photos, and illustrations provided by Save the Elephants

Kasaine Metal Strip Fences

Kasaine or metal strip fences were designed to help keep elephants out of farms as they can be afraid of the loud noise the fence makes when the wind blows. No fence is 100% effective at keeping elephants from entering farms, but the fences are designed to surround farms and reduce crop raiding by elephants.

To construct metal strip fences, you need the following tools and materials depending on the length of fence you wish to construct:

- *Mabati or other galvanized metal sheets (also called iron sheets), gauge 32-30 (each sheet makes approx. 35 m of fence).*
- *Tin snips*
- *Binding wire*
- *Hammer and a few nails*
- *Pesticides for termite prevention*
- *Container/bucket to soak posts*
- *Fence posts-purchased or cut in a sustainable manner*
- *Instrument for digging (digging bar, shovel or jembe)*
- *Measuring instrument*
- *Gloves for protection*



Binding Wire

Step 1: Decide the size of the area that you wish to protect and dig holes around the perimeter every 8 meters. Each hole should be approximately 0.5 m deep.

Step 2: Sturdy posts are a necessity. If the posts are too small, the fence will sag or cause the poles to snap from the weight. For our test fences, we purchased poles that were approximately 26 cm in circumference and 2 m high. Dry posts can be debarked to help with treatment. Using a commercially purchased pesticide (eco-friendly versions are available), soak the bottom of posts (the part that will be buried) in a container for 30 minutes. This soaking helps to prevent/minimize invasion by termites. After treatment, place the posts into the pre-dug holes, fill and tamp the dirt.

Strategy 1: Deterrent Methods

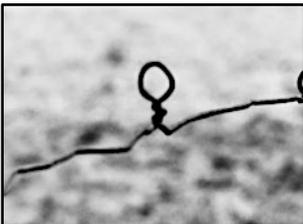


Iron sheets being cut into strips

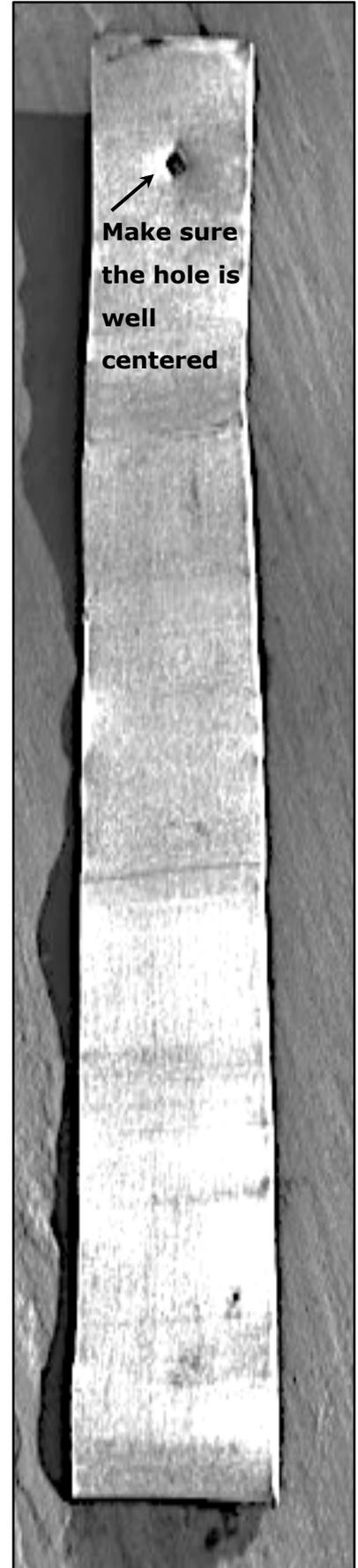
Step 3: Take mabati metal sheets and cut with tin snips against the corrugated grain along the length of the metal.

Cut strips that are approximately 4-5 cm in width for the full length of sheet. Use gloves as the metal can be sharp and cut skin. Once you have the long strips, cut each strip into pieces that are each approximately 13-18 cm long. You can use the metal strip pictured on this page for a template. For each piece, use a hammer and nail to pierce the metal, creating a hole at the top. Do not make the hole too close to the edge of the metal, as it can wear down over time.

Step 4: Cut a strip of binding wire approximately 12 m long. Use a nail to make a twist in one end of the wire at 1 m. You can do this by slightly bending the wire, and then using the nail as a lever to create a twist by making two solid turns of the nail. When strips are added and the fence is mounted, these twists prevent the strips from sliding together in a large clump. If the pieces cannot move freely, the fence will not make noise when blown by the wind. If you are constructing the fence at your farm, you can tie the long piece of wire to the post where the section of fence will be erected at 1.5 m high. Otherwise, you can construct each



Example of a twist

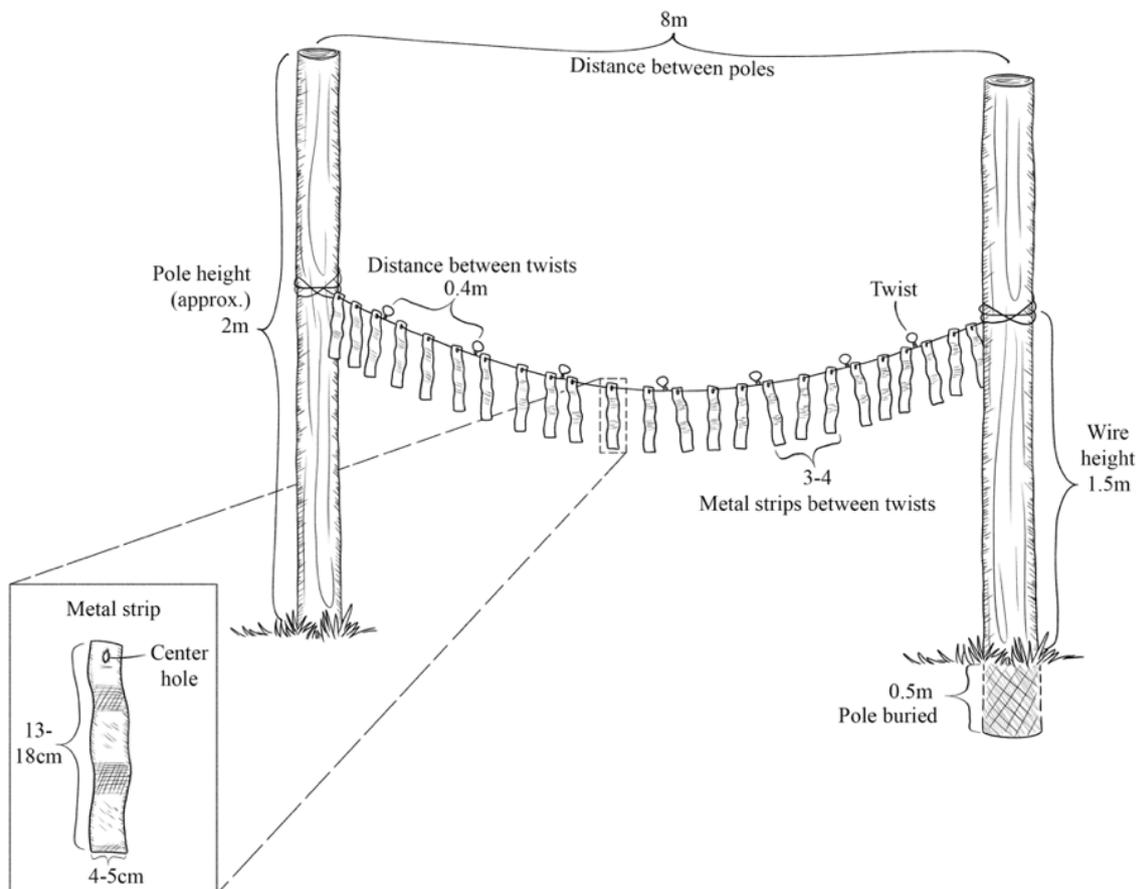


A metal strip-actual size

Strategy 1: Deterrent Methods

length of fence elsewhere and transport it to the site to hang. After tying the length of wire, you should have some room between the point it is tied off to the post and the first twist. You can adjust the lengths of wire that you initially cut for subsequent strands as this space will vary depending on the thickness of your posts. It is important to check for sagging of the fence, the center should not drop below 1.25 m.

Step 5: String the fence. Place 3 pieces of metal strips after the first twist. Measure 0.4 m from the first twist and make another twist after the metal pieces have been placed (see below). Continue repeating placing metal pieces, then twists till you near the end of the wire. Make sure there is one final twist before attaching the length of wire to the other pole and make sure to leave approximately 1 m of room for twisting the wire onto the pole. Repeat this process till you have completely encircled the area and connected all of the poles with fence wire.



Artwork by Brooke Bedal

Helpful Tips for Successful Metal Fences

- You can use certain Commiphora trees to make a living fence! If you own one of these trees you can prune it from the base and plant it, and it will grow as will the other stump.
- Keep extra binding wire around. If the fence is broken, you can adjust the line to twist the sections back together or make patches.
- To make a double Kasaine metal strip fence, you can put a second strand of wire and metal pieces below the first. This method is currently still being tested but seems to provide even more protection than a single strand.
- If you are able, remove the Kasaine metal strip fence between crop raiding seasons and store it, as elephants can become used to it over time. The less that wildlife are exposed to the metal strip fence, the less likely they are to become used to it.
- If you want to protect an area that people or vehicles need to pass through, you can fashion hooks out of wire at strategic points so people can take down the strand temporarily, pass through, and replace the strand.
- Eco-posts made from hard plastic are now available and resistant to termites.



A Commiphora campestris or Mbambara tree that will regrow if cut. Photo by Jason Eslamieh



A completed double metal fence

Using Noise to Scare Elephants

Elephants are afraid of people, so if you can make loud sounds when elephants are a safe distance away, they may leave. However, it is important not to get too close or startle elephants as they could become panicked or aggressive and attack you or be destructive. At night, a torch can help let them know you are there.



To make noise you can:

- *Beat a drum*
- *Blow a whistle*
- *Crack a whip*
- *Clap your hands*
- *Bang metal*
- *Use flash bangs*
- *Yell loudly*
- *Own a dog that will alert you*

Guarding or Patrolling

You can organize with your neighbors to watch for elephants when the crops are near ripening by patrolling on foot and keeping a safe distance if elephants approach. A watch tower makes it easier to see elephants from a safe distance. You can communicate with your neighbors to tell them elephants are nearby. You can also suspend a torch from a string and allow it to move in the wind to make elephants think humans are present.



Illustrations by Letitia Cookson, Save the Elephants, 2018

Chili Bricks

Elephants do not like the smell of chilis. You can create bricks out of dung and ground chili peppers to burn on the edge of your crop fields, which might deter elephants. Do not burn during the dry season and never leave fires unattended. You may also place chili bricks in a metal can to avoid an accidental fire.



Photo and info Chang a' et al., 2015.

To make chili bricks:

- *Mix 1 kg of ground chili & 2 kg of cattle or elephant dung in a bucket with a little bit of water.*
- *Shape them into round bricks & leave a depression on top*
- *Allow to dry for 2-3 days*
- *To burn, place a few pieces of charcoal in the depression*
- *Will burn for several hours*

Why Not to Use Acacia Fences for Elephants

Acacia branches have been traditionally used to create bomas for livestock and more recently to keep out elephants.

However, they do NOT work well for preventing elephants from crop raiding. Elephants can simply pick them up and throw them out of the way or walk across them. Cutting acacia branches also degrades natural forage for wildlife.



Instead, consider these options:

- *Create an outer layer of bio-fence with trees that elephants don't like, such as rough lemons or thick or spiny trees that make it hard for elephants to fit or walk through.*
- *Plant a barrier crop such as chilis that elephants won't eat*
- *Create empty buffer zones between wild areas and croplands that elephants may hesitate to cross or that make patrols or guarding easier*

Zai Pits

The construction of zai pits is an agricultural technique that originated in Burkina Faso. This method can improve soil quality and help retain water, promoting better growth of plants.

To create a zai pit on your farm you need the following tools and materials:

- *A shovel and jembe for digging*
- *Dung from cows or elephants*
- *Something to measure (a stick or handle will do)*
- *Straw or grasses*
- *Seeds or seedlings to plant*



Step 1: Measure out a square that is approximately 60 cm x 60 cm.



Step 2: Dig a square hole 90 cm deep and set the topsoil to the side. Separate top & subsoil.



Step 3: Line the hole with organic material such as straw or dried corn stalks.



Step 4: Add manure and replace some of the topsoil then mix topsoil and manure.

Strategy 2: Climate Smart Agriculture



Step 5: Replace enough of the soil to leave a small depression to catch water. Then add seeds or a planting of your choice.



Step 6: You can create multiple rows of zai pits, and the extra soil serves to funnel water to the pits.



The same farm as seen above in Sasenyi 2 years after growth with zai pits.

You can continue to supplement zai pits with manure or plant remains as mulch to fertilize the soil for continued plantings.

Half Moons (U-bands)

Half-moons, also called U-bands, are another agricultural method that originated in Burkina Faso. They funnel and retain water in places where it is needed most and improve the soil. As with other techniques, the addition of mulch with u-bands can improve crop yields.



Picture: Coulibaly, 2018

Step 1. Find the direction the water flows when it rains.

Step 2. Draw a straight line that is 4 m long and draw an arch to connect both ends of the line. The curved side should be downhill so that it will catch the water as it runs off.

Step 3. Dig 15 to 30 cm into the soil inside the half moon and pile the soil on the edge of the arc to a height of 5 to 10 cm.

Step 4. Add manure into the half moon and mix with some of the soil.

Step 5. Plant seeds in the half moon after rain. (Partey et al. 2018)



Half-moons ready for planting in Sasenyi.



Half-moon in Burkina Faso with maize.
Zougmore et al., 2003

Natural Pesticide

This recipe comes from Zawadisha and has been used regularly in the Tsavo area for many years. It is safe to apply directly to crops, but vegetables should be washed before consumption. For each batch, you can treat ¼ acre.

For this recipe you will need:



5 kg neem leaves



2 pieces garlic



2 onions



¼ kg chilis

and...

- 5 liters of water
- 1 cloth for straining
- Large pot and a place to boil away from your home
- 1 small piece of washing bar soap
- Sprayer



Step 1: Put all vegetables into the pot with 5 liters of water and boil for ½ hour (do not add soap yet).

Step 2: Remove from boil and add a small piece of wash-bar soap, let mix cool.

Step 3: Strain the mixture into a spray backpack or bottle.

Step 4: Once your vegetables have leaves you can spray the mixture directly



onto the plants. Do not wait for insects to appear. Use all the mixture and do not store leftovers. Thus, every time you apply you need to make a new batch.

Step 5: Reapply every 2 weeks till harvest and after any rains.

Photo: Future Agricultures Consortium

Elephant Resistant Crops

One key to preventing elephants from raiding your farms is to grow crops that elephants do not like. Elephant love maize, green grams, and cow peas. If you grow these crops, then you need to keep them near your home or protected. You can also grow other types of plants elephants do not like as a boundary crop on the outside of your farms. The following crops elephants do NOT like and in general will avoid.



Sunflower



Garlic



Chili



Onions



Ginger



Rough Lemon



Okra



Lemongrass

Seed & Crop Alternatives

Maize

Many new drought-resistant maize varieties are available in Kenya. Look for these variations at your local farming cooperative. Another maize variety that is drought resistant is SAWA, released in 2019.

Drought tolerant maize varieties released under DTMA							
Variety name	Release year	Hybrid/OPV	Maturity range	Color	Owner	Suitable agro-ecologies	Yield (tons/ha)
KDV2	2007	OPV	Early (100-110 days)	White	DLS	Dry mid-altitude	3.0-4.0
KDV3	2007	OPV	Early (100-110 days)	White	FRESHCO	Dry mid-altitude	3.0-4.0
KDV4	2007	OPV	Early (100-110 days)	White	DLS	Dry mid-altitude	3.0-4.0
KDV6	2007	OPV	Early (100-110 days)	White	FRESHCO	Dry mid-altitude	3.0-4.0
KSDT01	2011	OPV	Early (100-110 days)	White	KSC	Dry mid-altitude	4.0-5.0
KDH3	2012	Hybrid	Early (100-110 days)	White	DLS	Dry mid-altitude	5.0-6.0
KM1101	2012	Hybrid	Late (135-145 days)	White	KALRO	Wet lower/upper mid-altitude	8.0-10.0
DSL H103	2013	Hybrid	Early-Int (110-120)	White	DLS	Dry mid-altitude	5.0-6.0
KM1201	2013	Hybrid	Late (135-145 days)	White	KALRO	Wet lower/upper mid-altitude	8.0-9.0
EMH1101	2013	Hybrid	Intermediate (125-135)	White	KALRO	Moist mid-altitude	8.0-9.0
H12ML	2013	Hybrid	Late (135-145 days)	White	KSC	Wet lower/upper mid-altitude	9.0-10.0
CKH10767	2014	Hybrid	Late (135-145 days)	White	FRESHCO	Wet lower/upper mid-altitude	8.0-9.0
CKH10773	2014	Hybrid	Late (135-145 days)	White	KALRO	Wet lower/upper mid-altitude	8.0-9.0
H13ML	2014	Hybrid	Intermediate (125-135)	White	KSC	Wet lower mid-altitude	8.0-9.0

Source: *Drought Tolerant Maize for Africa Initiative (DTMA), Tsedeke et al., 2015.*

Wheat

Kenya's Agricultural Research Institute (KARI) has created a new drought resistant wheat variety called Njoro-BW1.

Sorghum and Millet

Sorghum and millet are both crops that are drought resistant and have stable market prices as an alternative to maize. White sorghum is highly productive, but red sorghum is more resistant to birds.

Sorghum



Pearl Millet



Photo source: *Food Tank-The Think Tank for Food*

Kitchen Gardens

Kitchen gardens are an easy and beneficial way to grow vegetables to feed your family. There are multiple types, and you can use almost any container in which to grow your favorite plants.

To create a basic kitchen garden, you will need:

- A space to grow
- The type of container you wish to plant (jerry can, tires, plastic containers)
- Mulch or fertilizer
- Seeds for planting



Photo: Talk Africa, 2020

Step 1: Prepare the space. Make sure it receives sunlight and will drain well.

Step 2: Prepare the container (make sure to select a container that has been thoroughly cleaned or cannot leach chemicals) and add a 1:1 mixture of soil and manure.

Step 3: Add the seeds following planting directions for the type of plant.

Step 4: Water regularly.

To create a cone kitchen garden:



Step 1: Obtain Polythene sheets, called dam liners, or use round containers of different sizes.

Step 2: Mark the middle point of your sunlit, and well-drained site and arrange the plastic in a circle with 0.75 m maximum radius.

Step 3: Fill it with 1:1 ratio of soil and well decomposed manure. Repeat with smaller circles until you get to a comfortable height.

Step 4: After all soil is in place, water it and wait 12 hours

Step 5: Plant seeds or transfer plantings and water as needed

(Source: Joseph Wambugu, Farm Big Africa, 2020)

Kitchen Gardens-Sack Gardens

To make a sack garden you will need:

- 1 bag (plastic or jute)
- 50 kilos of soil
- 25 kilos of manure or compost
- 15 kilos of stones (3 to 7 cm width)
- A round container the same height as your bag, or a can open at both ends

Step 1: Wash and dry the bag and place a layer of stones 10-15 cm high.



Step 2: Place the tube or can vertically on top of the stone layer and fill with stones. Pack manure and compost around the tube.



Step 3: Repeat the operation until you reach the top of the bag. If you are using a can, remove it and reinsert as you get higher. At the top remove the container so that all that remains is the stones and soil.



Step 4: Make holes in the bag about 15 cm apart. Take care not to make too many holes at the bottom.

Step 5: Water thoroughly over the entire bag and stones.



Step 6: Carefully place seedlings into the holes in your bag & water again.



Step 7: Your bag is finished! Water twice daily if the weather is dry, or no need if there has been rain. You can use the organic pesticide provided in this manual. Make sure to remove sick plants, and you will have vegetables soon.

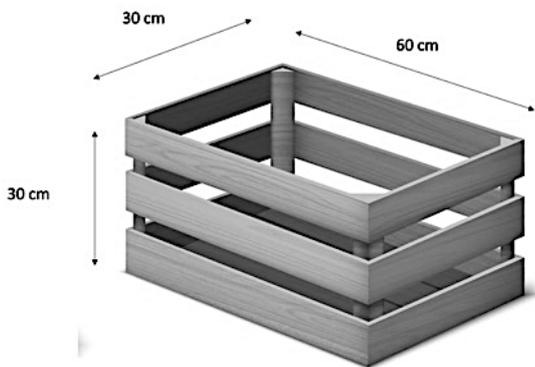


Info & illustrations provided by Solidarités International, 2016.

Fodder Production

When rains are insufficient to support the crops until harvest you can still make use of the stalks and other vegetative parts. Instead of allowing livestock to eat the plant remains you could till them into the soil to add nutrients as mulch or turn them into fodder to store for your livestock for later or to sell as additional income. To follow are instructions on how to build a wooden crate to create bales of fodder

Step 1: Remove any soil from the plant remains and allow them to dry in the sun



Step 2: Prepare a fodder crate. This can be shared with many households. To begin, collect pieces of scrap wood or purchase planks from the store.

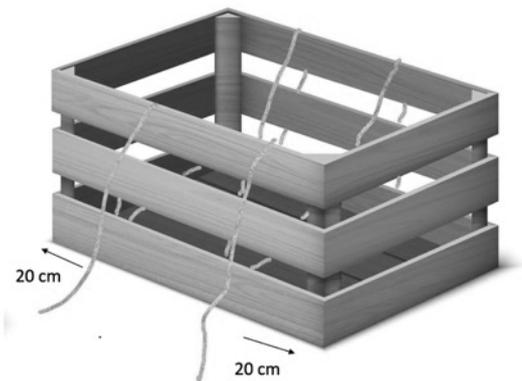
Step 3: Create a crate by cutting wood pieces and arranging them in a 30 cm wide × 60 cm long × 30 cm high pattern

Step 4: Cut two pieces of twine or plastic 150 cm in length and lay them inside the crate spaced 20 cm from each end.

Step 5: Take the plant remains and place them in the crate and compress by stomping on them.

Step 6: Tie both lengths of twine tightly and store the fodder in a dry area so there is no spoilage.

Step 7: Check for locally available vitamins and proteins from your farming cooperative that you can add to the fodder to improve the health of livestock.



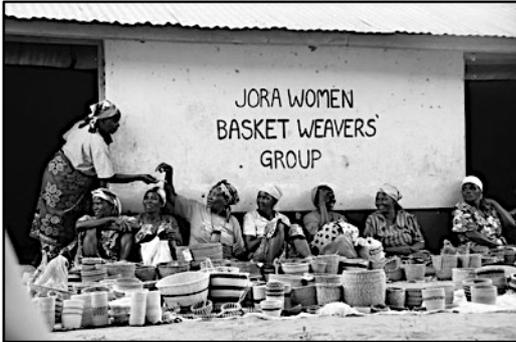
Info provided by Dr. Urbanus Mutwiwa of Jomo Kenyatta University of Agriculture and Technology.



Crate image credits: <https://www.freepik.com/vectors/food>>Food vector created by user15245033 - www.freepik.com

Hadithi Crafts Women's Groups

Hadithi Crafts Support CBO is a community-based organization (CBO) representing women's groups which make high quality handicrafts in the areas surrounding Wildlife Works Protected Area.



Hadithi's Mission is **Stronger Together:**

The organization plays a supportive role for the women's groups by building their capacity, improving the quality of their products, boosting sales through joint marketing efforts, sourcing materials for the

groups, teaching new techniques, and providing workshops in business and other important skills to improve their lives overall.

Hadithi crafts buys and sells the crafts from 59 women's groups, empowering over 1700 women from 20 villages, and these numbers are still growing. The Hadithi team is currently six local women strong. They are processing the many orders, sourcing, distributing, purchasing, training, sampling, and running the projects.



All of the profits from sales, as well as any money received from donations, are used to offer support to the women's groups.



Products the groups create are sisal & mkeka baskets, beaded jewelry, machine sewn products (like bags & stuffed animals), elephant dung paper, and recycled metal arts.

If you are interested in joining one of the women's groups, please contact Lore at +254717355126 or Mercy at +254717712209 or visit: hadithikenya.com

Photos and content provided by Hadithi.

Micro Loan Programs from Zawadisha

Micro loans are small loans for local Kenyan women intended to provide items like solar lamps, rain-water tanks, and clean cooking stoves provided by the charity Zawadisha.



The items are delivered directly to rural villages and the company also offers trainings in leadership, financial literacy, and micro-enterprises.

Collecting water, finding fuel wood, and cooking on inadequate stoves are some of the many challenges facing rural Kenyan families. Many women's groups exist in the community and Zawadisha works directly with these groups.

Women can choose eco-friendly lamps, cookstoves, rainwater tanks, or a variety of other useful household items. Zawadisha provides delivery of the items and financing.

Over 6-12 months the loan is repaid with small payments. After the loan is re-paid, one can apply for another loan for other needed items.

Peer Educators conduct free trainings across Taita-Taveta county and have served over 1300 rural women.

To contact Zawadisha to inquire about a micro-loan for your family, please contact Margaret: 0 719 662 187

Content & photos provided by Zawadisha



Some of the peer educators from Zawadisha

Beekeeping

Taking good care of your bees is essential for harvesting honey whether you are using beehive fences or simply raising bees for honey. Properly caring for your hives will cause wild bees to colonize them quickly. These guidelines are for Langstroth hives or Kenyan Top Bar Hives (see page 1).



Key Terms

Brood: Honeybee eggs and larvae that are raised in brood comb.

Brood nest: The area of a colony in which brood is reared.

Capped comb: Full honeycomb where bees have sealed the cells of honey with a white wax cap.

Colony: Family unit of bees comprising a queen, up to a few hundred drones, and up to 50,000 worker bees.

Drone: Male bees in a colony, raised from unfertilized eggs.

Hive tool: Simple instrument used to open hives, remove frames, and to scrape off excess propolis or wax.

Pollen: Powdery substance collected by bees from flower stamen and stored or used to feed the brood.

Nectar: A sweet liquid secreted by the flowers of plants used by bees to make honey.

Propolis: A resin-like substance made by bees from collecting gums and resins from trees and used as glue within the beehive. It has antiseptic properties.

Queen: The leader of the colony. She lays all the eggs and releases pheromones to direct the workers and drones.

Queen cell: A special, elongated cell in which a larva is fed royal jelly so that it develops into a new queen.

Royal Jelly: A nutritious milky substance produced by worker bees from water and pollen used to rear a new queen.

Worker: Female honeybees that carry out most of the functions in a beehive. Workers do not mate and do not lay eggs.

Colony Overview

Worker bees do all the work in the hive – rearing larvae, building wax honeycomb, guarding, cleaning the hive, tending the queen, receiving nectar from other workers returning from the field, converting nectar and storing it as honey, storing pollen, and even ventilating the hive to control temperature and humidity.



They also gather nectar, pollen, water, and propolis. Older worker bees will become 'guard bees' and defend the hive from pests and predators or 'scout bees' who will search for potential new beehives. The queen bee is the only fully developed female and leaves the hive only once or twice in her life to mate with drones. A colony without a queen cannot operate properly.

Attracting Bees for Colonization

It is essential to provide good conditions for the bees to be able to live a healthy lifestyle. You must provide *diverse vegetation* such as flowering acacia trees so that bees have adequate food. Providing *attractants* is good to bring bees to colonize your hives. Frames with fresh beeswax, brightly painted hives, and planting lemongrass are all helpful. *Clean hives* are important to retain bee colonies. Pests must be removed, and the hives cleaned periodically. Trimming brush below the hives is important too. You must *provide water* for the bees if there is no natural source nearby. Make sure to provide a way for bees to climb out of the water by adding sticks or a rock.

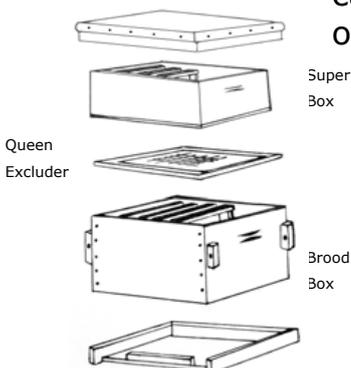


Maintaining & Managing Hives

African honeybees can be very aggressive, especially during the daytime, so it is ideal to maintain hives at night. Beehives should be away from your homestead, roads where people or vehicles may pass, or areas where children are present. To ensure you hives are successful, you must regularly check on your colonies. You must take care when cleaning and maintaining the hives or harvesting honey by doing the following:



1. **Wear protective clothing** such as a bee suit, gumboots, and gloves. Make sure everything is sealed tight so no bees can find a way in.
2. **Smoke the hive.** This makes the bees less aggressive when you enter the hives.
3. **Work slowly.** Being surrounded by bees can be scary, but have confidence that your bee suit will protect you. Move slowly and do not make loud sounds.
4. **Do not crush bees.** You must take care not to crush bees as you are working as it will alarm the other bees.



Langstroth Hive Care

If you use Langstroth hives you must wait for the brood box to fill with 5-6 frames of honey and active bees before adding on the superbox. This can take 2-4 months. If you add it too soon, pests could come. If you remove frames they must return to the same place. Once you add the superbox and the queen excluder, the bees will expand into the superbox and the brood box should NOT be harvested for honey. Small colonies are still working to establish themselves and may not produce honey the first time.

Harvesting & Processing Honey

Honey is the reward from hard work caring for your bees. Harvesting towards the ends of plant flowering season is a good time. Never harvest during the dry season or from the brood chamber as it can stress your bees and make them leave.



Step 1: Apply a few puffs of smoke into the beehive entrance and under the lid.

Step 2: Check the amount of honey present in each frame. Only frames with at least 75% capped honey should be harvested. Those remaining can be checked next season.

Step 3: Using a hive tool, take the full frames and brush away any bees. Place the frame into a bucket and cover with a cloth to keep away bees and bugs. Move the frames to a location to begin processing.

Step 4: Make sure all surfaces are clean and sterilize any containers with boiling water.

Step 5: Hold the frames above a catching tray and remove the wax cell caps. You can use the cappings as beeswax for candles.

Step 6: Remove the honeycombs from the frames and smash them in a holding pan to separate the honeycombs from the honey.

Step 7: Filter the honey from the combs through a fine mesh into a bucket. You can leave the honeycombs to drain overnight if secured, or you can squeeze the combs (with gloves on or clean hands). Filter the honey several times and then store in clean or sterilized glass jars.

Checking for Pests

Many pests can invade your beehives (see page 3 for protection from honey badgers) such as wax moths, ants, and hive beetles. Infestations can cause bees to leave the hives so proper inspection, cleaning, and maintenance is *important!*

All information and photos used with permission from the Elephants and Bees Project.

To learn even more about beekeeping, you can visit the following websites:

www.infonet-biovision.org/AnimalHealth/Beekeeping

www.elephantsandbees.com

www.honeycareafrika.com

www.apiconsult.com

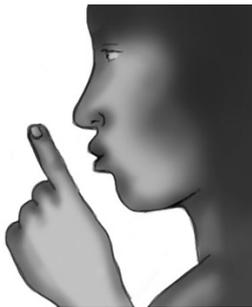


Safety Around Elephants

Elephants can be very dangerous and can harm or kill people in self-defense or because they are trying to protect their family. It is very important to keep a safe distance from elephants, even when you are protecting your farms.

If you are trying to move elephants away from your farms, you can use some of the techniques mentioned in this manual such as flashing a torch or making noise. However, do not chase elephants as they startle easily and can become aggressive or destructive. Many fences have been brought down because of chasing elephants. Elephants can become panicked and will destroy anything in their way to escape from you. This can put you in danger, damage your fencing, the fencing of your neighbors, or crops.

If you encounter an elephant in the bush. . .

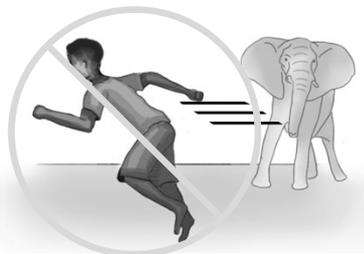


Be quiet!

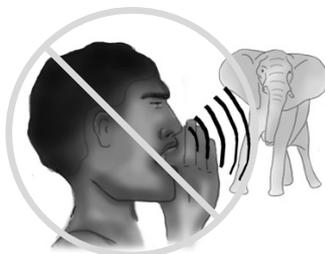


Turn and move away slowly until you are out of sight of elephants. Then continue to move away quietly.

Do NOT



Run away quickly



Shout at the elephants



Throw things at the elephants

Securing Food & Water Stores from Elephants

Elephants can smell food and water from a very far distance. Especially during the dry season, elephants may try to come close and raid food or water stores. Here are some tips for keeping your food and water safe from elephants.



Photo from Kwala News Network

To protect water stores or tanks you can try some of these methods:

- *Try to elevate the tank so that elephants can not reach it.*
- *Build a sturdy wall around the tank.*
- *Make sure there are no leaks or pooled water and water containers are tightly sealed.*
- *You can use the same methods for your water tanks as you do for crop fields*

To protect food stores, you can try the following:

- *If you must store food inside your home, make sure it is in tightly sealed containers.*
- *Apply some of the same methods used to defend your crops such as guarding.*
- *Secure food stores in a sturdy, locked building away from your home. Elephants can lift up mabati or open simple containers as they have great dexterity and intelligence, so make sure food stores are locked and secure.*
- *If you do not have the means to store your food, join with your neighbors to rent a secure structure until elephants are no longer seeking food.*

If elephants are persistently raiding your food or water stores, contact your local wildlife agency for assistance.

Why We Need Elephants in the Environment

While it can be very challenging to live near elephants, they play a crucial role in the ecosystem and economy of countries like Kenya. Therefore, it is important to find ways to coexist. Here are some great reasons to help protect elephants. . .

1. They are seed dispersers

Elephants play a vital role in the ecosystem by helping to spread seeds in their dung. Furthermore, elephant dung provides fertilizer for plants and trees to grow, and can be a source of food for animals like hornbills, and a home for insects like dung beetles.

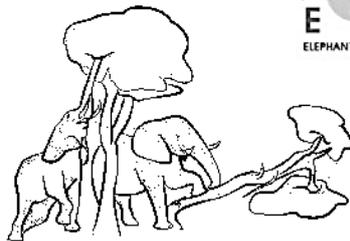
2. They are keystone species

Other communities of animals and plants depend on the presence of elephants. They also help to transform landscapes like changing forests into savannah. Without elephants, the ecosystem would struggle to support so many species.

3. They bring tourism

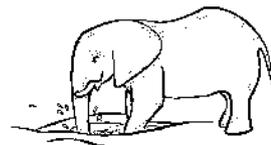
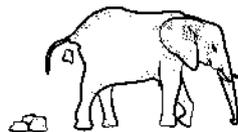
A large part of Kenya's economy is dependent on the attraction of tourists from other countries to see animals such as elephants. Without as many elephants, there would be less jobs in the hospitality sector.

Elephants break branches and make them available for other smaller animals to feed on.



Elephants leave deep tracks, which help seeds to grow and provide micro-habitats for other species.

Elephant dung is great fertilizer for seeds, provides food and shelter for other animals, and can be used to make fires or chili-dung bricks.



When elephants take mud baths, they often deepen waterholes. They also dig for water, creating water sources for other animals and people.

Illustrations by Christin Winter of EHRA & some materials from this page provided by the EHRA Peace Project, 2019

How to Preserve Habitat for People & Elephants



A local woman learns how to make eco-charcoal bricks from Wildlife Works

Sustainable Charcoal Production. Producing traditional bush charcoal is damaging to the environment and takes away natural food sources for elephants and other wildlife, which can make crop raiding more likely. One way to limit the damage is to make charcoal using sustainable sources. You can use small branches instead of cutting whole trees to produce charcoal. You can

also purchase eco-friendly charcoal rather than making your own. In the Tsavo area you can purchase sustainable charcoal from Wildlife Works by contacting Patrick at (0)707 441 025.

No Grazing in Wild Areas. Areas set aside for wildlife, such as community ranches and the National Parks, are places of refuge for elephants. Allowing cattle to graze in these areas or share water sources can take away food and water from wildlife except in areas set aside for mixed wildlife and livestock grazing with permission. Grazing can also cause dangerous encounters with wildlife, and by reducing resources in the wild, it may bring elephants and other animals closer to farms in search of food and water.

Sustainable Cutting of Wood. Removing wood from natural areas for fuel or construction material also reduces the amount of natural food available to wildlife. Planting trees on your farm is a responsible way to harvest wood products. By using only a few branches from each tree, individual trees can continue to grow. Certain Commiphora species can have branches cut and



A Melia volkenseii (Kurumbutu) forest. Photo: Better Globe Forestry

Strategy 5: Environmental Stewardship

still be regrown (See page 7). *Melia volkenseii* (Kurumbutu), *Acacia nilotica* (Mchemeri), and *Acacia robusta* (Mwaguba) are trees that are fast growing and seedlings are available for free from Wildlife Works within their project area. Contact George at 0 717 296 214 at the Wildlife Works Greenhouse to receive yours.

Bushmeat Poaching. Hunting and killing bushmeat is illegal and dangerous. It also offsets the balance between predators and their prey. If fewer prey species are available because they have been hunted, then predator species like lions and hyenas are more likely to come to farms in search of livestock for food. Setting snares is also illegal and can often injure innocent wildlife or even your livestock. Most animals caught in snares suffer needlessly and often the meat is left to rot. Handling and consumption of bush meat also has the potential to transfer dangerous diseases to human populations. Adopting many of the strategies in this manual can also help improve livelihood and prevent the need to rely on poaching.



This giraffe was treated by KWS and Wildlife Works after being trapped in a bushmeat poacher's snare.

The organizations, institutions, and individuals that helped to create the community mitigation workshops and this corresponding manual are dedicated to finding solutions that help local people while also preserving the environment and wildlife. We hope you have found some new solutions here and can benefit by bringing them into your daily lives.

Acknowledgements: This manual is a component of the doctoral work conducted by Lynn Von Hagen from Auburn University (AU). Lynn would like to thank her committee, co-authors and collaborators on this manual. We would like to thank the International Elephant Foundation and the Elephant Manager's Association for their financial support of the workshop programs. We also appreciate the contributions and support from Wildlife Works (WW), AU, Western Kentucky University (WKU), and Jomo Kenyatta University of Agriculture and Technology. Special thanks to all of the speakers and organizations represented at the workshop programs and for their contributions to this manual: Helen Kiute, Cara Braund from WW, Emmanuel Mwambingu of Save the Elephants, Gibran Mwanganda, Agricultural Extension Officer from Taita Taveta County Government, Peris Mbeyu and Monica Makori from Zawadisha, Lore Defrancq from Hadithi, Sophia Corde of WKU, and Benard Mwatate, Wildlife Works Ranger.

REFERENCES

- Ajanga, S. 2015. Maize variety options for Africa: Kenya Drought Tolerance Maize for Africa Initiative. Conference Proceedings. <http://hdl.handle.net/10883/4651>
- Chang `a A., Omondi R., Konuche J., Olson D., DeSouza N. 2015. Chili fences keep elephants out of crops! How to make and support chili fences.
- Coulibaly, A. 2018. Effect of zai pit and half-moon technologies on household income among small-scale farmers in Kita Cercle, Mali. Thesis Dissertation. Egerton University.
- Elephant-Human Relations Aid Project (EHRA). 2019. EHRA PEACE Project, Namibia. <https://www.ehranamibia.org/peace-project-ehra>
- Farm Big Africa. 2020. How to make a kitchen garden in Kenya: Cone kitchen garden. Retrieved 7/21. www.farmbig.net/2020/10/%20How%20to%20make%20a%20kitchen%20garden%20in%20Kenya%20Cone%20kitchen%20garden.html
- King, L. 2014. Beehive Fence Construction Manual. The Elephants and Bees Project. Save the Elephants. Nairobi, Kenya.
- King, L., Oldenburg, C., Cookson, L. 2018. 12 Tools to Live in Harmony with Elephants. Save the Elephants' Human Elephant Co-Existence Program.
- Partey, S.T., Zougmore, R.B., Ouedraogo, M., Campbell, B.M. 2018. Developing climate-smart agriculture to face climate variability in West Africa: Challenges and lessons learnt. *Journal of Cleaner Production*. 187: 285-295.
- Solidarités International. 2016. Gardening in Sacks, A Technique of Vertical Agriculture. Written by Adeline Adres, Illustrations by Eugen Briere & Thomas Higashiyam. Produced by the Technical and Programme Quality Department.
- Tsedeke, A., Regasa, M.W., Makumbi, D., Wawa, B., Abate, T., Regasa, M.W.; Makumbi, D.; Wawa, B.; Ajanga, S. 2015. Maize variety options for Africa: Kenya Drought Tolerance Maize for Africa Initiative. Conference Proceedings. <http://hdl.handle.net/10883/4651>
- Zougmore R., Kambou N.F., Zida Z. 2003. Role of nutrient amendments in the success of half-moon soil and water conservation practice in semi-arid Burkina Faso. *Soil Tillage Research* 71: 143-149.