A photograph of two elephants in a lush green forest. The elephants are partially obscured by dense foliage and tree branches in the foreground. The elephant in the center is looking towards the camera, while the one on the left is partially hidden. The background is filled with vibrant green leaves and tree trunks.

LIVING WITH  
**ELEPHANTS**  
IN ASSAM

A HANDBOOK

ASSAM HAATHI PROJECT



*Living with*  
**elephants**  
*in Assam*

**A handbook**

ASSAM HAATHI PROJECT



## **Living with Elephants in Assam: A handbook**

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This publication is also available in Assamese.

For additional copies of this publication please contact the Assam Haathi Project.

**[www.assamhaathiproject.org](http://www.assamhaathiproject.org)**

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Sonitpur West Division  
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Rashtriya Gramin Vikas Nidhi

Sonitpur

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Borjhar, Dhankona, Balipara

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Apurba Basumatari (Rangapara)  
Bapkon Mili (Dharikati)  
Biplab Kumar Sundi (Borjhar)  
Birbal Limbu (Naharoni)  
Dhan Das (Gamani)  
Dipankar Bora (Depota)  
Dipu Borah (Haleswar)  
Jayanta Kumar Nath (Niz Bihaguri)  
Kartik Koch (Gabharu)  
Narottam Sahani (Tarajuli)  
Narayan Nath (Chariduar)  
Nichendra Nath (Saroka)  
Raju Bagh (Rupajuli)  
Rana Udia (Sessa)  
Rudra Chetri (Jhawani)  
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Nichinta, Bangkanda  
*AHP Monitors*

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Devananda Rabha (Khermohora)  
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Dimbeswar Nath (Lalabori)  
Dugdha Nath (Nichinta)  
Dwipen Rabha (Dosrapara Matia)  
Kushal Nath (Silorbori)  
Ripunjoy Nath (Nichinta)  
Rubul Rabha (Guria)  
Subhash Rabha (Mogho)

ESI

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# An Introduction to Living with Elephants

If you are reading this handbook, it is likely that you have had experience with elephants: they may have destroyed your crops, damaged your property, or perhaps injured someone you know.

This handbook is meant to

- help you understand elephants better;
- explain why people and elephants come into conflict;
- explain why it is important for people and elephants to live together; and
- help you protect your crops, homes and family from elephants.

The handbook consists mainly of step-by-step instructions and advice on how to put in place measures to protect your crops and property. The methods shown in this handbook have been used successfully by communities working with the Assam Haathi Project (AHP). The methods use only locally available material and are affordable; therefore they can be used by any community that faces problems with elephants. You might also use the ideas in this handbook to develop new techniques of protecting your crops and homes—if you do so, please let us know so that we can share your ideas with others.

If you have any questions about elephants or about the information provided in this handbook, please contact:

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African elephant



Asian elephant

## About Elephants

**T**here are **two species of elephants**: the African elephant, scientifically known as *Loxodonta africana*, and the Asian elephant, scientifically known as *Elephas maximus*.

There are several differences in appearance and behaviour between African elephants and Asian elephants. The African elephant is bigger and has larger ears, while the Asian elephant has humps on the top of its head, and a more sloped back. Unlike the female African elephant, the female Asian elephant does not have tusks.

**It is the Asian elephant that is found in Assam**, and most of this handbook is about the Asian elephant. The Asian elephant is found in other parts of India as well as in Bangladesh, Bhutan, Brunei, Cambodia, China, Indonesia, Laos, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand and Vietnam.

The Asian elephant found in the wild is the same as the elephants you may have seen in a zoo, circus, or carrying logs down the road. These tamed elephants, or their ancestors, would have originally been captured from the wild.

**Asian elephants live mostly in forests**, although they can travel long distances and through a variety of different habitats. In Assam, many elephants leave the forests at certain times of the year and often travel to rivers and wetlands. It is during this time that they often move through areas with villages and crops. It is not known exactly what leads them to undertake these journeys, but it is probably linked to a need for food or water.

Asian elephants are vegetarians. Because of their large size, they must spend a lot of their time eating and require around 150 kg of fresh forage, and up to 200 litres of water every day.

The number of Asian elephants left in the wild has declined dramatically. **Today only around 30,000 wild Asian elephants remain in the world**; this is a very

small number when you consider that Assam alone has a human population of nearly 27 million. **Assam is very important as it is home to around 5,000 of these elephants.**

The number of Asian elephants in the wild has dropped for several reasons including:

- loss of habitat
- poaching for ivory
- hunting for meat
- retaliatory killing
- capture for taming



### **Asian Elephant Quick Facts**

- An adult elephant can weigh up to 5,400 kilograms and grow to a height of 3.2 metres at the shoulder.
- Elephants generally live to about 60–70 years.
- Elephants often live in groups (herds) of just a few to dozens of animals.
- Elephant herds are matriarchal; a herd is usually led by an older female.
- Older male elephants often form small groups or live on their own.
- Females generally give birth at the age of 18–20 years.
- Nursing mothers are assisted by close female relatives, and the entire herd collectively protects the young ones.
- Elephant calves spend a lot of time playing with each other. They like to toss and retrieve objects. This helps them in learning. Group play with other calves also allows them to forge relationships which determine their place in the herd hierarchy.
- Elephants communicate through touch, smell and sound. They can produce a very low-frequency sound, which humans cannot hear, to communicate across long distances.

**Loss of habitat (forests and grasslands) is the most serious threat.** Asian elephants rely on the forest for food, water and shelter. Much of Assam's forests have been cut down to be replaced by villages and croplands, or damaged by illegal wood collection. Less forest land means fewer elephants. Also, as forests disappear, elephants are forced to move through populated areas, thus bringing them into conflict with people, which often results in the death of elephants and people.

The World Conservation Union (IUCN) produces a Red List of all species threatened with extinction. The Asian elephant falls in the 'endangered' category, which means that **there is a *very high* risk of the Asian elephant becoming extinct in the wild.**



## Elephants and People

**M**an shares a unique relationship with the elephant, particularly in Asian countries where elephants have been working and living alongside people for hundreds of years. Many Asian cultures have special legends and stories about elephants, and of course in India the elephant is associated with Lord Ganesha, the elephant-headed god.

**It is sad that such a majestic and culturally important animal could become extinct in the wild in the near future because of conflict with people.**

Forests are an important natural resource; used sensibly, they can provide *both* resources for people *and* a home to elephants and many other animals that live there. Forests are also very important for many other reasons; for example, they clean the air we breathe and bind the soil, helping to stop flooding and soil erosion. Sadly, forests are being cut down at a rate much faster than they are able to grow back, and **soon the forests will disappear, and with them the animals and plants that live there.**

The loss of the forests means that elephants are forced to enter areas occupied by villages and fields, and their search for food, water and shelter increasingly brings them into conflict with people.



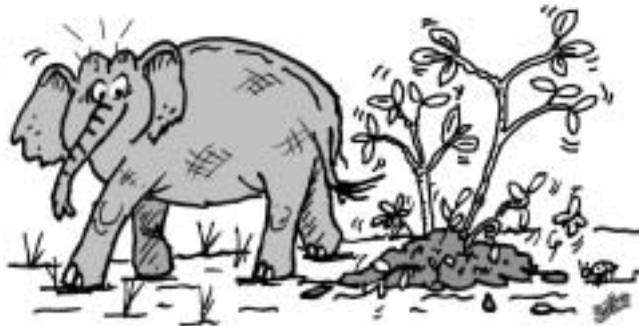
**Human–elephant conflict (HEC)** occurs when elephants damage fields and property in their search for crops and stored grains, and sometimes people are injured or even killed. Elephants suffer too; they are attacked when they use the routes they have travelled for many generations, which are now unsafe for them. They also face man-made hazards, such as trains and power lines, which kill many elephants each year.

## Why is it important to save the elephant?

Elephants have been part of our lives for centuries, and the disappearance of this majestic and unique animal means losing a significant part of our religious beliefs and cultural identity.

Elephants are an important part of nature. **They are a key species as their existence is linked to many natural processes, and losing them would affect many other life forms.** For example, many plants rely on elephants for seed dispersal and germination: elephants eat their seeds and help them disperse and grow in new areas. Elephant dung also provides food for beetles, flies, worms and other insects. In fact, there are some animals that live exclusively on elephant dung; many of these are insects and important pollinators. Elephants also clear paths through dense forests; the paths are then used by other animals and also allow new plants to establish, which increases the diversity of plant life.

These are just a few examples. As you can see, **if elephants disappear, several other animals and plants would follow suit and many natural processes would be disturbed, affecting us humans as well.**



# The Assam Haathi Project

**T**he Assam Haathi Project (AHP) works in **close partnership with communities that are affected by human–elephant conflict.**

The project began in July 2004 and is managed and coordinated by **Chester Zoo**, a large zoo in England, which carries out conservation work around the world, and **EcoSystems-India**, a trust for biodiversity conservation based in Assam.

The AHP also has the support of the State Forest Department, Government of Assam, respective district administrations and local conservation organisations.

**The Assam Haathi Project has two main aims:**

- 1 To work with communities to develop methods to reduce human–elephant conflict and allow people and elephants to co-exist.
- 2 To collect information to understand elephant behaviour and movement patterns, and to use this information to plan ways of protecting elephants in the future.

**This handbook provides a tool to assist with the first aim of the project, namely reducing human–elephant conflict by helping people.**

Our second aim – understanding elephant movements and behaviour – is achieved through AHP researchers and a network of monitors. The AHP field team members are all from communities affected by human–elephant conflict. They have been trained to

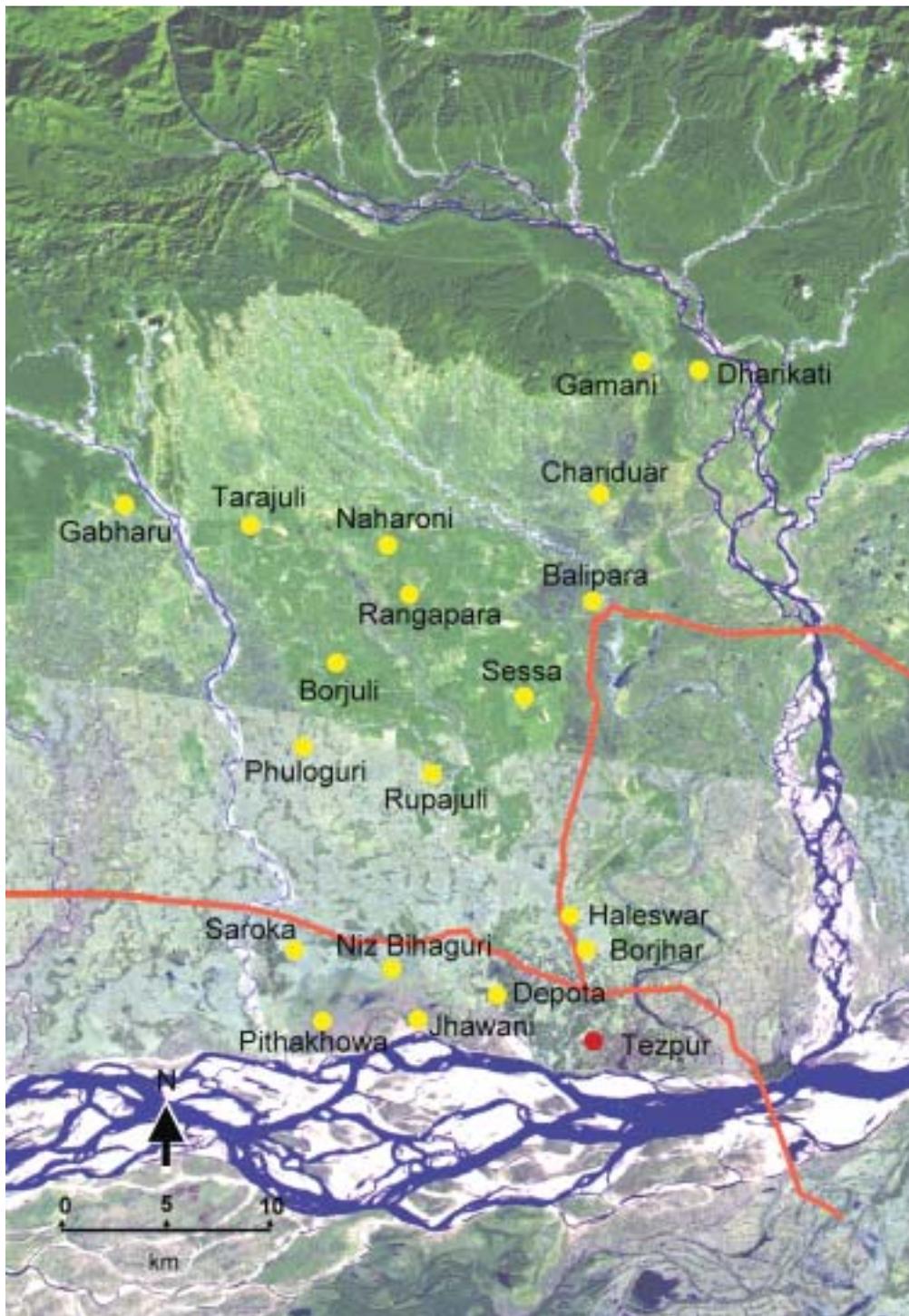




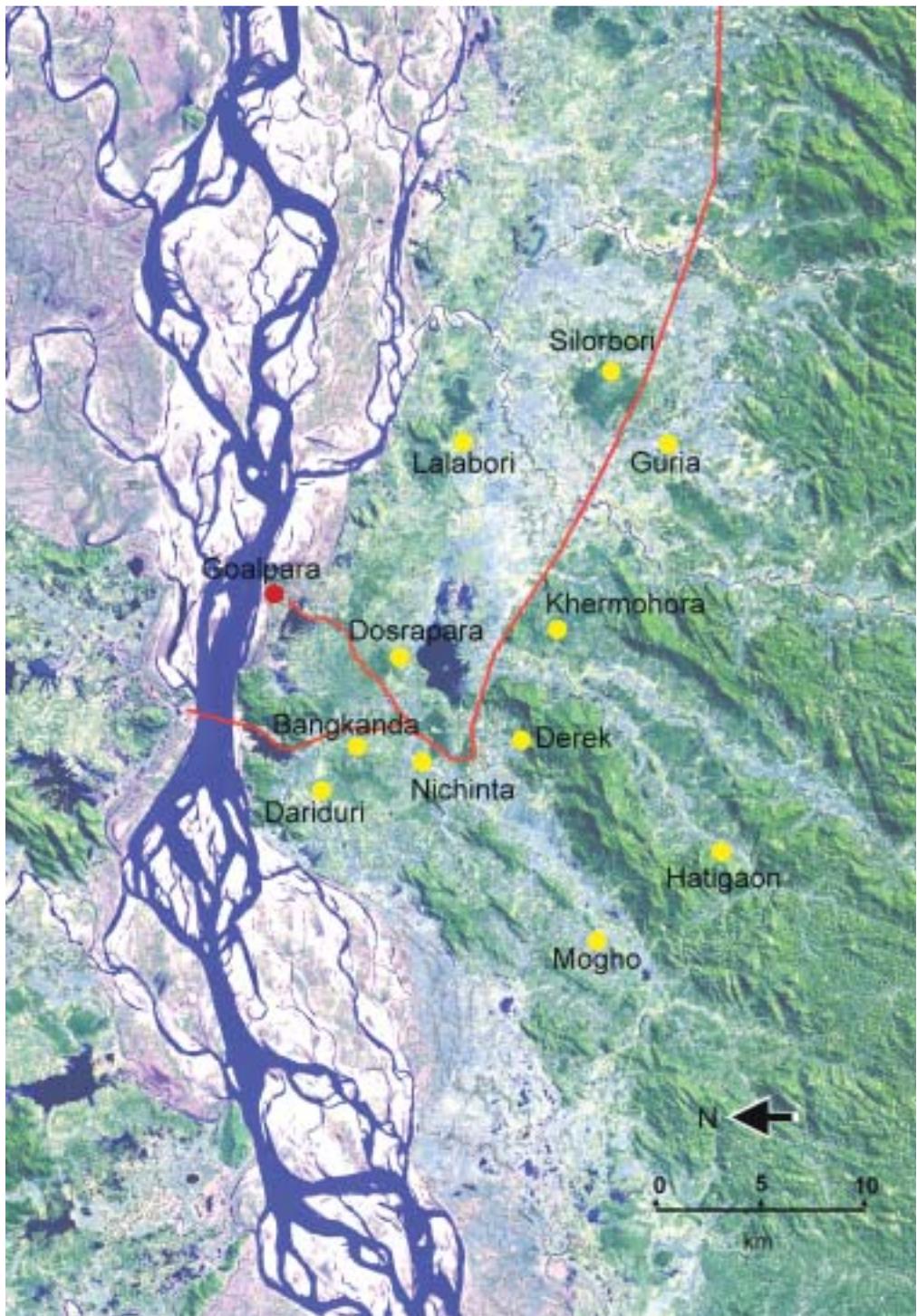
record information when an elephant herd enters the area that they monitor. Data collected include such information as the number of elephants, what they were doing, and the extent of crop and property damage. Locations are also recorded using a satellite-based Global Positioning System (GPS) at the sites of elephant activity, which allows all information to be stored in a computer database. The GIS (Geographical Information System) software then makes it possible to quickly look at the data and prepare plans to help the affected communities in reducing such incidents of conflict. The information collected also helps in understanding the behaviour of elephants and their movement patterns across a wide area.

**You too can help in this process.** The AHP works in two field sites: Sonitpur and Goalpara districts (see the maps on following pages). If you live in or around an AHP field site and have information on elephants that have passed through, please contact the local AHP staff (call 361 223 1412). They can forward the information you contribute so that it becomes a part of the database.

## Sonitpur: AHP Monitored Locations



## Goalpara: AHP Monitored Locations



# How to Protect your Crops and Homes

**H**uman–elephant conflict is common in many parts of Asia and Africa. Many different methods have been used over the years to try to reduce the conflict and help people and elephants live together. The following sections of this handbook look at some of the more successful methods and describe how to use these methods.

## **Important points to remember before using any of these methods**

1. You must have an understanding of how elephants move and behave within your area. Before you start, you should think about the following questions:
  - a. Which time of the year do elephants cross or visit your area?
  - b. At what time of the day do they come?
  - c. Which areas have been damaged by elephants in the past?
  - d. Which areas are the most vulnerable?With these observations in mind, you can make a better plan.
2. You must have the support of the community to help fund, install and maintain these methods. This is important to ensure that the methods work effectively.

The methods for protecting homes and fields from elephants fall into three categories:

- **Warning systems**

These methods sound an alarm to let us know that elephants are approaching.

- **Barriers**

These methods prevent elephants from moving into particular areas.

- **Deterrents**

These methods discourage elephants from entering areas and can also be used to chase elephants away.

In the last part of this handbook we also include ideas for **lifestyle changes** (alternative livelihoods and farming options) – ways in which you can do things to reduce the overall impact of elephants on your crops and homes.

Many of these methods work best when used in combination. Elephants are also very clever and may learn to avoid methods put in place to keep them away, so you may have to vary the methods used over time, or even modify the methods after a period. A combination of different methods can also be used for greater effect.

There may also be new or improved ways to reduce human–elephant conflict that are not in this handbook yet. Please use this book for guidance, but feel free to modify these methods if you think you can make them work better so long as elephants are not harmed. You may have new ideas – please do talk to an AHP team member about them so that we too may learn and help serve you and others better. We also need to make sure that your suggestions don't put people or elephants in danger.

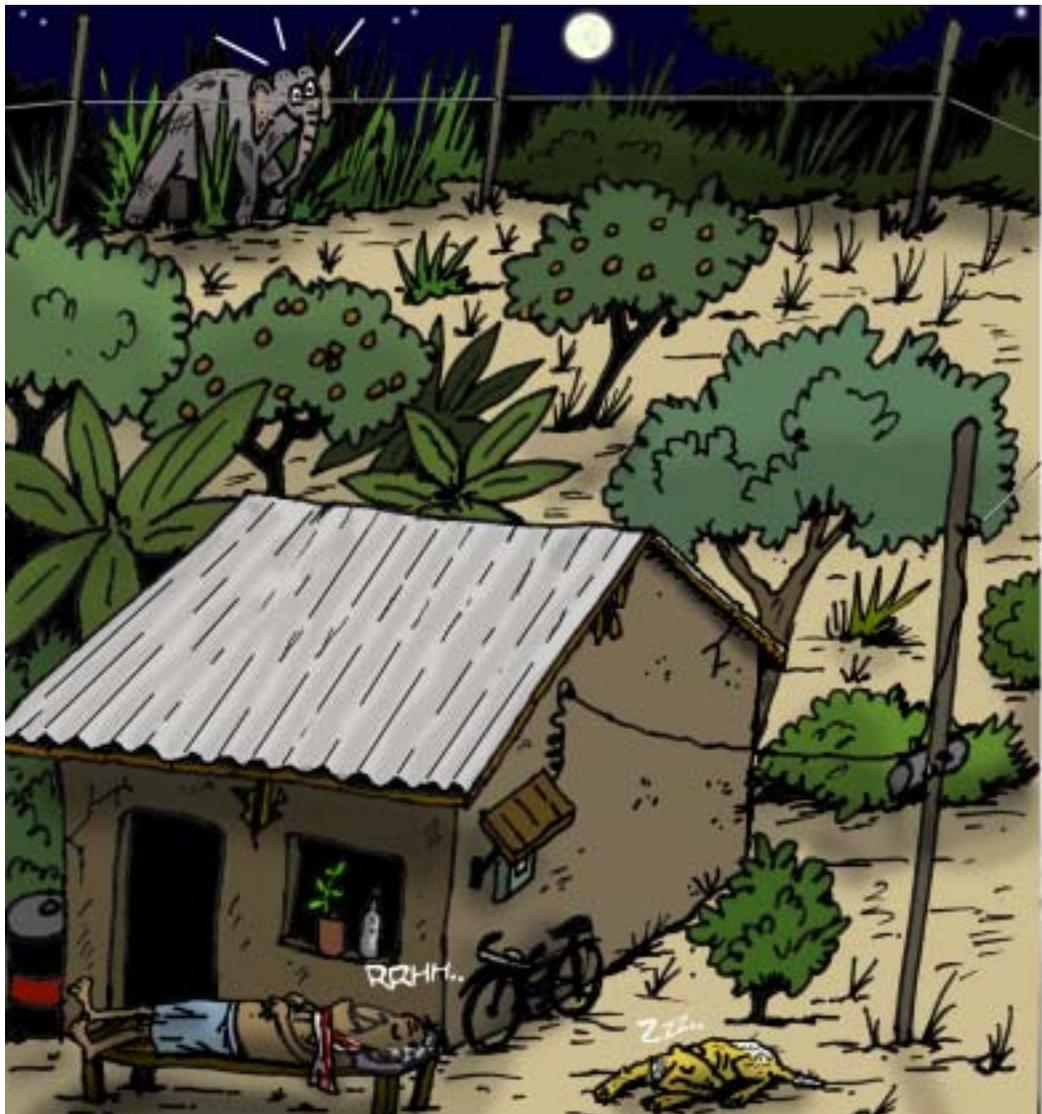
Do remember that the best long-term solution to reduce conflict with elephants is to protect forest areas for them. By making the right choices and exploring lifestyle changes (see the chapter Alternative Livelihoods) it is possible for you to play a part in this as well.



## Early warning systems

### TRIP WIRE ALARMS

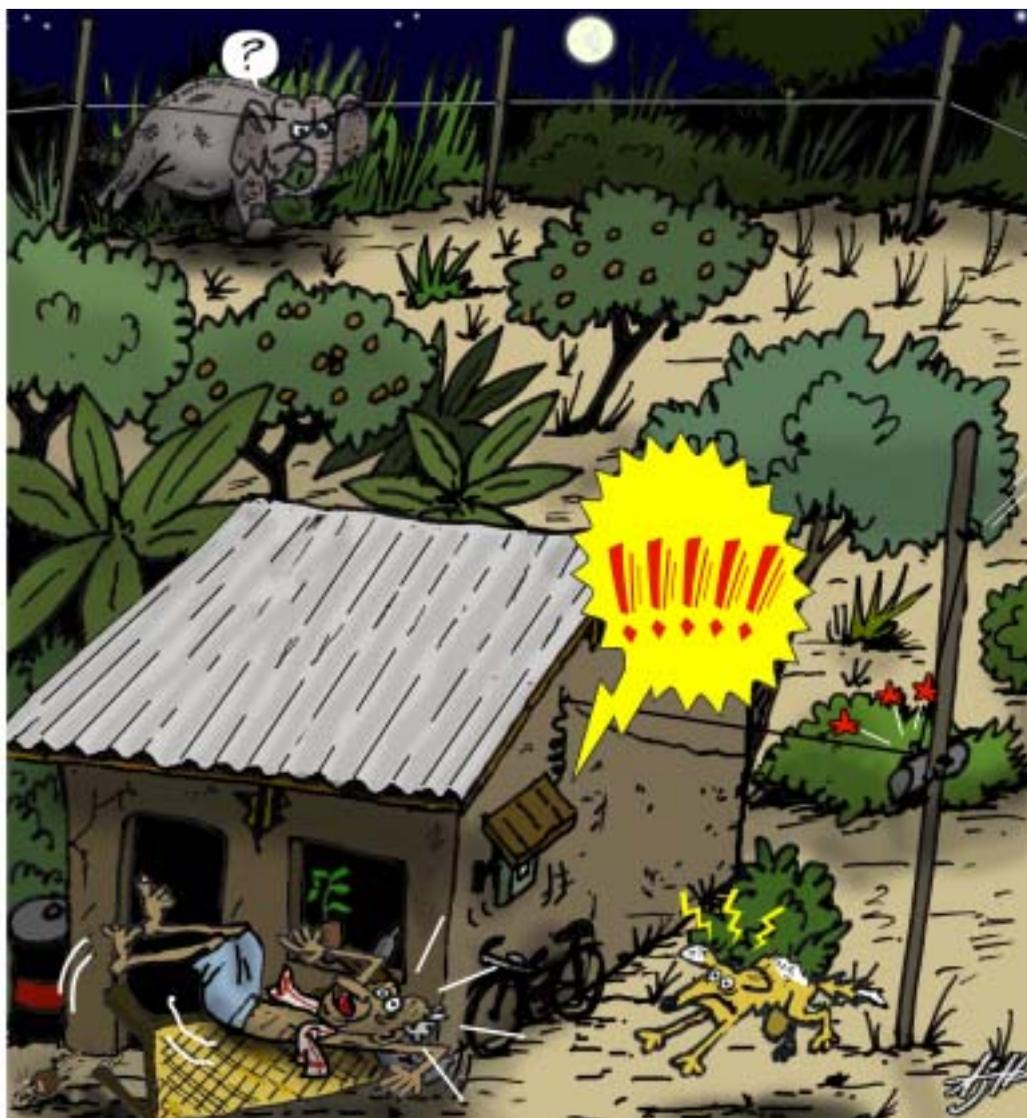
Trip wires work as excellent early warning systems. They cause an alarm to sound when elephants are approaching crops or homes. The alarm is triggered when elephants either break, push or pull a string or wire strung between poles around the area being protected. This gives you extra time to respond and to chase the elephants away. Often, villagers stay awake through the night to



watch over their crops; the trip wire alarm systems allows them to rest at home, and warns them of approaching elephants.

### How to install and use

**Step 1:** Before installing a trip wire, past and recent movements of the elephants into the village and sites of human elephant conflict should be considered. This will ensure that the trip wires are set up in the best places to protect the most important or vulnerable areas. Prepare a rough map of the area to be protected and mark possible elephant entry and exit points.



## Material needed

Item	Quantity	Where to buy	Cost
Poles ( 3 m long bamboo or wooden poles)	1 pole for every 10-12 m of wire	Village or local market	Rs. 20 (bamboo) to Rs. 120 (wood) per pole
Galvanised iron wire (20-22 gauge) or strong nylon string	Equal to the length of perimeter of the area being protected	Hardware or general stores	Rs. 65 per kg (GI wire)
PVC pipe (10 cm diameter, 30 cm long)	1 for each switch	Hardware stores	Rs. 50 per unit
U-shaped nails	1 for each pole	Hardware stores	Rs. 1 per unit
Electrical toggle switch	1 for each door bell	Some electrical stores	Rs. 40 per unit
Flexible electric wire (pair of 0.5 mm insulated wires)	Equal to the length from the switch to door bell	Electrical stores	Rs. 10 per metre
Battery operated doorbell	1 or 2 (1 for each household with bell)	Some electrical stores	Rs. 120 per unit
Battery (AA 'pencil' cells)	A pair for each bell	General stores	Rs. 20 for a pair
Tools (hammer, pliers, machete, crowbar, hand-saw, hand-drill, insulation tape)	1 set	Hardware stores	Rs. 700 per set



**Step 2:** Drill a hole of appropriate diameter in the middle of the PVC pipe to fit the switch. Attach the electric wire to the switch and then fit the toggle switch. Tie the PVC pipe (parallel to the trip wire) on to a tree or pole closest to a house where the door bell is fitted. Tie the end of the trip wire to the stalk of toggle switch making sure that the PVC pipe and toggle switch are positioned in such

a way that pressure on the trip wire will put the switch on. A breakable cotton (sewing) thread secured to the pole may be tied to the switch stalk so that it keeps the switch pulled in the *off* position and prevents false alarms.



Drill a hole to fix the toggle switch



Attach wire to the switch



Fix the toggle switch to the pipe



Tie the pipe to a tree for support



Attach the trip wire to the toggle switch

**Step 3:** Erect the poles around the area you want to protect. Determine the direction from which the elephants may come and erect the poles across that direction at a distance of about 300–400 m from the area you wish to protect. You may aim to protect crop fields, granary or paddy stores, fruit trees in homestead gardens and homes. Make sure that one end of each pole is buried deep enough (about 50 cm) so that it remains stable and reaches at least 2.25 m above the ground. Erect the poles 10–12 m apart. Drive the U-shaped nails or hooks into each pole at a height of about 2.1 m and ensure that the GI wire passes through the eye of the nail or hook easily. The trip wire is usually installed at a height above 2 m so that livestock and people can pass under but adult elephants cannot.



Drive the U-nail into the pole at 2.1 m height



Pass the GI wire through the eye of the hook

**Step 4:** Tie the electric wire connected to the toggle switch securely around a pole or a tree and run this to the doorbell alarm unit. Tie the other end of the electric wire to a post and then connect it to the battery-operated doorbell placed either inside or outside the house. Use insulation tape to cover naked wire joints to prevent false alarm. Usually a house at a distance of about 50 to 100 m from the switch is selected for the purpose. If the distance is greater, additional poles are used to bring the trip wire to the house. The shorter the electrical wire the better.

Once installed, the trip wire alarm should sound whenever the trip wire is pulled or pushed tripping the toggle switch on. Test that the trip wire system works by tripping it manually. Ensure that the toggle switch is secured firmly so as to prevent false alarms and adjust it to the cotton thread as mentioned in Step 2.



Place the alarm inside or outside the house and run electrical wire from the toggle switch to the alarm



## Maintenance

- Once a week, check that all of the poles are firm and that the wire is not broken or sagging. The GI wire should be taut and should pass freely through the eye of the hooks on the poles.
- Twice a week, check that the alarm and the switch are working.
- If elephants are known to be in the area then check the whole system more often – every day, if necessary.
- If the GI wire is broken, it will have to be reconnected or replaced. Wire can be repaired by twisting it back together, but make sure that the joined wire can move through the hooks freely.

### Advantages

- Relatively cheap, materials easily available
- Easy to install and maintain
- Can be moved to protect different areas

### Disadvantages

- Accidental breaks and false alarms can occur
- GI wire can be stolen, or can rust

## **Points to remember**

- The maximum length of a trip wire unit should not be more than 500 m.
- Make sure the doorbell alarm is placed where one can easily hear it.
- Protect the alarm bell from rain, excessive moisture and dust.
- Trip wires do not deter elephants by themselves – they are an early warning device and must be used along with other methods to drive the elephants away. Spotlights and chilli smoke are effective ways to do this.

## Early warning systems

### WATCHTOWER

Crop raiding by wild elephants occurs unexpectedly, particularly in areas bordering reserve forests or wildlife parks, often during peak crop season. A watchtower can help villagers to spot or hear approaching elephants early and allows more time to use deterrent methods.

A watchtower is simply a structure with a platform a few metres high that can support one or two people and from which the surrounding area can be observed for elephants. It can be either be on a tree or as a stand-alone structure.



"I have a feeling we are being watched!"

### Material needed

- Strong poles of bamboo or timber (four 8-m long pieces and eight 4-m long pieces for a free-standing tower; less bamboo will be required if the watch tower is built on a tree)
- Wooden planks to build a platform about 2 × 2 m square (bamboo can also be used)
- Bamboo and thatch for a 2.5 × 2.5 m roof over the platform
- Bamboo for a ladder
- Nails, nuts and bolts, ropes and GI wire

The material and labour costs will vary depending on the type of watch-tower. While a skilled carpenter with two assistants should be able to build a free-standing watch tower in 3–4 days (material cost: about Rs. 2,000 for bamboo tower and Rs. 5,000 or more for a timber one), a couple of farm hands can build a bamboo '*machan*' on a tree in a day or two (material cost: about Rs. 1000). It is also possible to use steel angles in place of poles but the cost of a steel watch tower with wooden floor and galvanised iron roof will be over Rs. 30,000. The above costs are approximate and assume use of ordinary ('non-*sal*') timber acquired locally.

### How to build and use

The construction for watchtowers can vary depending on the locality and availability of material and skilled labour. Whichever method you use, please consult a civil engineer or someone who knows about buildings to **make sure it is safe and will support the weight of the people who will be on it, even in a storm.**

The steps below describe the general principles of building a watchtower:

**Step 1:** Sturdy poles of adequate height should be used as the main stays for the tower and these should be properly secured using concrete and steel bases. If concrete bases are not used, the bottom end of the poles may also be buried at least a metre deep in the ground, but they should be inspected regularly for signs of rotting or termite damage. Cross pieces should be used to strengthen the vertical poles in free-standing towers. These can be fixed using strong ropes or nuts and bolts.

**Step 2:** The tower platform should be placed at least 5 m above the ground. Wood planks or solid bamboo of adequate thickness and strength should be used for the platform and these should be properly secured using nails or nuts and bolts. Build a safety railing around the platform using bamboo.

**Step 3:** Build a small roof above the platform using locally available material, e.g. thatch or palm leaves. Make sure it is strong enough to endure a thunderstorm. A bamboo ladder may be used for climbing.

Below are some examples of watchtowers made using different material. The picture on the left shows a platform on a stand-alone bamboo structure. The picture in the centre shows a watchtower which uses a strong, large tree as the support structure. The tower in the picture to the right is a more expensive watchtower built using iron angles; this type of watchtower needs a lot of community input to source the materials and labour required.



Bamboo tower



Tree machan



Steel watch tower with GI sheet roof

## Maintenance

Regular checks should be made to ensure that the tower is stable. Repairs may be needed on occasion.

### Advantages

- Can be an effective early warning system as one usually hears the elephants when they are still at a distance.
- Relatively cheap if made from locally available material.
- Can be made on trees.

### Disadvantages

- Does not give all round protection as elephants may come from different directions.
- Requires people on watch to be awake and alert, often throughout the night, thus affecting their health and day-time activity.

### Points to remember

- Before starting to build a watchtower think carefully about the best position. It should have a good view of the areas that need protection as well as the directions in which the elephants may approach. It should also be situated at a spot from where it is possible to use elephant deterrents and easy to warn others.
- If using timber, make sure it is legal – **please do not take wood from protected forests!**
- The poles can be protected from elephant damage by wrapping barbed wire around them.
- Binoculars and spotlights will help observers to spot elephants more easily.
- Like the trip wires, the watchtowers do not deter elephants by themselves – they must be used alongside a method to drive the elephants away.

# Barriers

## ELECTRIC FENCING

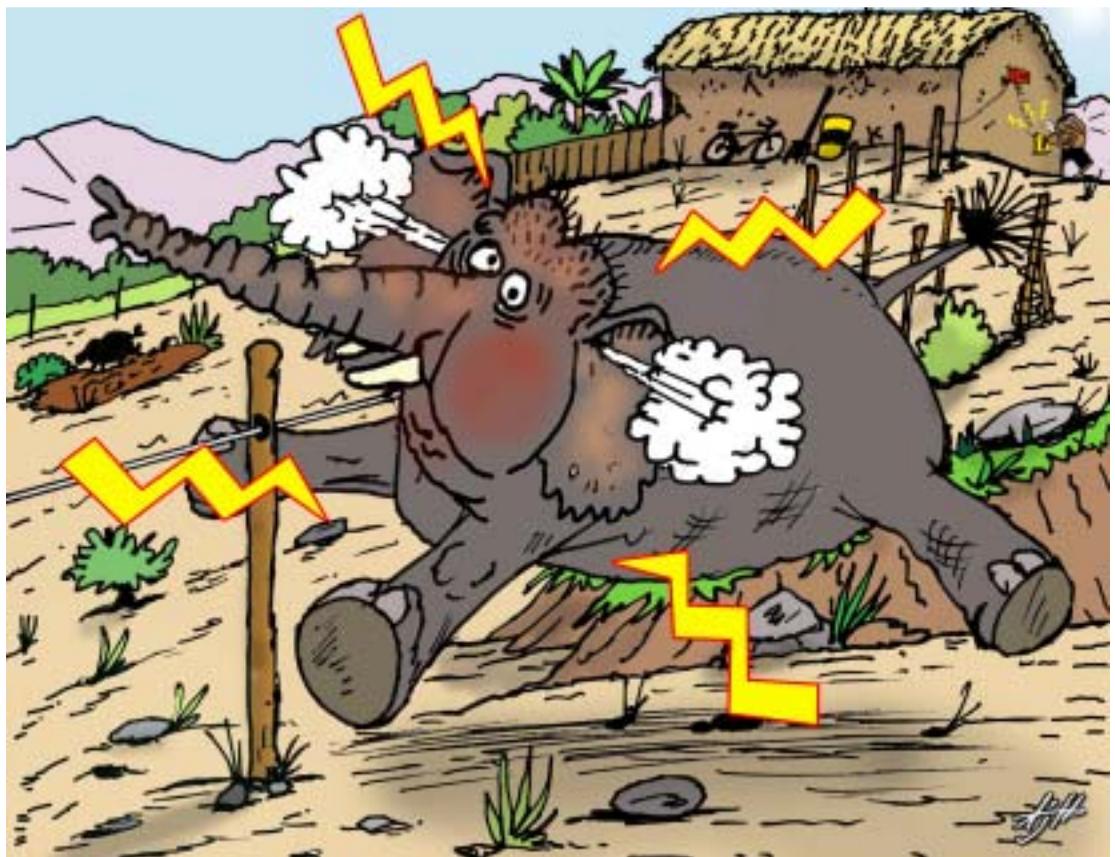
Electric fences of different designs have been used in several HEC projects throughout Asia and Africa. The success of these fences varies from project to project. Here we describe a type of electric fence that the Assam Haathi Project has tested, and which probably best suits the conditions in Assam and other parts of south and southeast Asia.

**IMPORTANT :** There have been reports of regular domestic or industrial power lines being used for fences by people in areas of elephant conflict. Sometimes this is done through a battery operated 230 V inverter. These practices are *extremely* dangerous and illegal. They can kill elephants and are a serious threat to human life.

An electric fence uses one or more exposed metallic wires as a barrier. These wires carry pulses of very high voltage but low ampere electric current. These pulses of very short duration pass through the wires every 1-2 seconds. If any living creature standing on ground touches the wire it receives a **non-lethal** shock like a sharp sting. The electric pulses are generated by a machine called an energiser. The energiser usually operates from a battery which is charged either by solar panels or a mains battery charger.

The electrical pulse originating from the energiser must complete a circuit for any creature to receive a shock. The current passing through the live wire must travel back to the energiser to complete the circuit. The current can pass through a living creature to the soil and through ground rods inserted in the soil back to the energizer. It can also return to the energiser through a ground wire running along the live wire.

It is very important to properly **ground** the power fence system as most of its problems are due to grounding faults. In the fence described here the grounding is achieved through soil. Earth rods inserted deep in the ground carry the returning current back to the energiser. Moist soil is a good conductor of electricity and most of the power fences described here are around irrigated fields. If the straight line distance of the farthest post from the grounding system is more than a kilometre or if the soil moisture is low, it may be necessary to include a ground wire running along the live wires. But one must first check the line voltage at the distant posts before fixing ground wires.



### Material needed for a 1-km 2-strand solar powered electric fence

Item	Quantity	Cost (Rs.)
Fence energizer 1.5–2.5 joules	1	16,000
Solar panel 12V 35W SPV module	1	11,500
Solar charge controller 10 A	1	1,500
Tubular lead-acid battery 12V 150Ah	1	13,000
Lightning diverter	1	1,500
Grounding system: GI rods/strips/ pipe, GI wire, nuts, bolts, washers	1 set	2,500
G.I. Wire 12-gauge, hot-dip galvanized iron	150 kg	11,250
Reel insulator	200	1600
Strain insulator	50	1000
Insulation sleeves	250	750
Wire-connecting clamps	40	320
Easy-way wire strainer or tension ratchet	35	3150
Tension spring	35	3150
Spring gate	4	1600
Fence alarm system	1	6,000
Power fence warning signs	20	800
Digital peak voltmeter	1	6,000
Field line tester	1	950
Standby battery charger (optional)	1	4,000
Tool kit for maintenance	1	1000
<b>Total material cost except posts</b>		<b>87,570</b>

Other costs vary depending on availability of posts and skilled labour:

Posts (wooden or concrete posts of 15–20 cm diameter and at least 2.9 m or 9.5 feet height)	100	10,000 to 20,000
Labour charges for post and wire installation	70 man-days	8,400 to 10,500
Energiser installation and system testing	4 man-days	6,000 to 8,000
<b>Cost of posts and labour</b>		<b>24,400 to 38,500</b>

Thus the **total cost** of 1-km long 2-strand solar powered electric fence may vary from Rs. **1,11,000** to **1,26,000**. This cost will go down if fence posts are available cheaply or if there are suitable trees that can be used as posts. It may further reduce if the affected community provides free labour. The additional cost for increasing the length of the fence up to 3 km will only include that of posts, wire, strainers, insulators, clamps, springs and labour.

### How to build and use

It is worth spending some time thinking about the best position for the electric fence. Ask questions about where the most vulnerable and valuable areas are, and where the electric fence would be most effective. Please note that the initial installation of a power fence and associated equipment should be carried out under direct supervision of a trained person.

**NOTE:** The installation of an electric fence needs active involvement of the local community. The community must share at least some of the costs to have a feeling of ownership. Since the fence requires regular inspection and maintenance, community participation is essential. Many power fence systems sponsored and installed by authorities have failed when the community did not participate in their maintenance and security. It is also advisable to consult an expert, as incorrect installation or maintenance could damage the equipment or make the fence unsafe.

**Step 1:** Prepare a rough map of the area to be protected indicating the position of the fence posts and the fence design in consultation with the community. Make an estimate of materials required and consult an expert. Acquire all the material before beginning installation.



Rough map of the area to be protected



Some power fencing supplies (clockwise from top left): reel insulator, strain insulator, easy-way wire strainer, tension spring, tension ratchet

**Step 2:** Install the fence posts about 10 m apart along the line indicated in your map. Strain posts are placed either at an end or a corner or among other fence posts, usually at intervals of about 100 m. They need to be sturdy as a pair of strain posts bears the load of every 100 m section of the fence. The posts should be at least 2.9 m long and about 60 cm of each should be buried securely in the ground. The portion of the post remaining underground should be painted with burnt engine ('black') oil and wrapped in a polythene bag to prevent rotting and termite damage. Trees can also be used if they are available along the fence line. Remove all ground vegetation under the fence line.



Fix posts approx. 0.75 m into the ground



Place intermediate posts 10 metre apart and make every 11th post a strain post on long straight stretches

**Step 3:** Fix reel insulators on each post except on the corner and strain posts. Tie the insulators with GI wire, ensuring that the wire passing over the insulator's outer groove is covered with insulation sleeve. Keep the insulator hole parallel to the fence line. For a 2-strand power fence described here the upper insulator should be fixed at a height of about 2.2 m. The height of the lower insulator will depend on the need to provide safe underpass to people and livestock. In stretches where such underpasses are required the height of the lower line should be at least 1.8 m from the ground; if an underpass is not required it could be 1.5 m. If the fence line is passing over a water body, make sure small boats can pass safely under the fence wire. Allow for sag on long stretches and do not forget to hang brightly coloured warning signs from the lower wire. If the fence line needs to pass over a major road with vehicular traffic, use high posts on either side of the road. Fix a single wire a couple of metres higher than the tallest vehicle that could come on the road. To prevent elephants from using the road, loose wires may be hung from fence line down to about 2.2 m. If required, 'gate-hooks' may also be provided on lower wires between two posts to provide access.



Prepare the insulator and wire ties



Fix reel insulators on intermediate posts

**Step 4:** Fix strain insulators on the corner and strain posts at the same height as the reel insulators fixed on intermediate posts. Use insulation sleeves on the wire connecting the insulators to the post. Fix a tension spring on the strain insulator but this is required only on one end of each length of wire between two strain insulators. Measure the distance between two strain / corner posts and cut a length of wire longer by about a metre. Tie one end of this wire to the tension spring on one side and pass the other end through the eye of the reel insulators fixed on intermediate posts. Finally tie the other end to a strain insulator (or tension ratchet attached to the insulator if this is used instead of easy-way wire strainer). Make sure that the wire ends are tied very securely by twisting and winding them several times. Use a wire twister (a 180 mm × 20 mm × 4 mm piece of iron with a hole of the size of wire diameter near one end) for this purpose. Tighten the wire by attaching an easy-way wire strainer anywhere in the middle and using the rotating handle. If tension ratchet is used, tighten it using a spanner. Do not tighten each length of wire fully at the first go but do it alternately in steps to prevent tilting of the posts.



Fix strain insulators and tension spring on strain and corner posts; here a tree is being used as a strain post



Make the strain insulator ties strong; use insulation sleeves and fix the spring only on one end of each wire length



Fit easy-way wire strainer



Tighten the wires by winding it on wire strainer



Fix gate-hooks

**Step 5:** It is important to fix vertical post-protecting strands on each post; otherwise the elephants soon learn to push it down. Usually three vertical wires are fixed, as close as possible to the post, on the side from which the elephants may approach. On the intermediate posts, each vertical wire is tied to the topmost horizontal line and twisted around the second horizontal line and brought close to the ground. On the corner and strain posts the vertical wires originate from the top jumper wire (a ring of wire connecting one length of wire to the next) and runs down after twisting around the second jumper. A couple of reel insulators are attached to a wire ring tied on the post at about 15–20 cm above ground. The vertical wires on either side of the post are passed through the eye of each



Strain post (5-strand fence)



Corner post: notice the supports

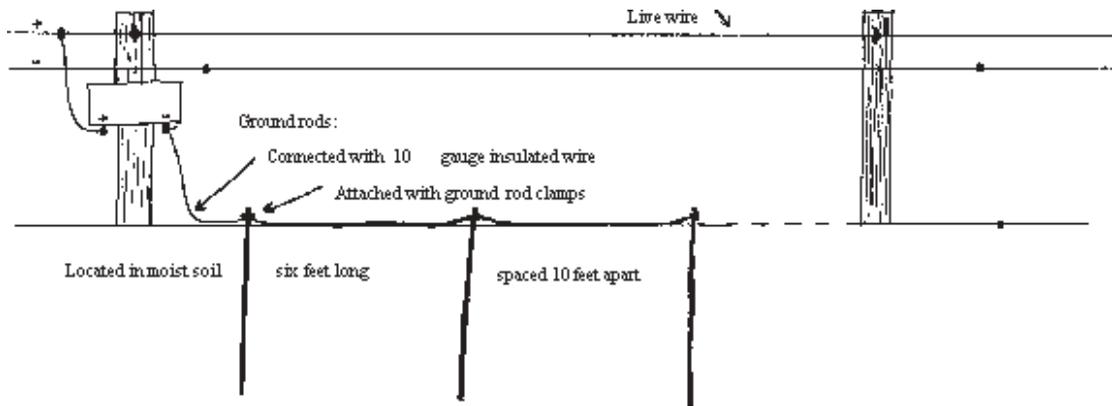


Jumpers and vertical post protection wires on strain post (2-strand fence)

of these insulators and are tied to the lower end of the middle vertical wire. This way the elephants are unable to touch the post with their feet or trunk without getting a shock.

**Step 6:** The energiser should be placed in a hut or a safe and covered housing at a location not too far from a fence post (i.e. close to the middle of the fence). The live terminal of the energiser should be connected to the fence lines using a wire and clamps. The energiser can now be connected to the output terminals of the solar charge controller of the battery or directly to the battery. Place the solar panel securely on the roof of the hut in a shadow free area and tilt it a little towards south to catch the maximum amount of sunlight.

A fence alarm system should be installed with the energiser to warn the community in case the fence is touched or damaged by any animal. The lightning diverter protects the energiser from damage during thunderstorms and is fixed outdoors between the energiser and the fence line. This is a simple device but needs professional help for installation.



Grounding system

**Step 7:** As mentioned earlier, it is essential to install an effective grounding system for the power fence to work. At least three 1.8 m long galvanised iron rods (15 mm diameter) or GI strips (6 × 50 mm) or GI pipe (20 mm) should be used for grounding the energiser. These should have a sharp wedge at the bottom and a small (1 cm diameter) hole near the top. These should be driven 1.7 m into the soil at least 3 m apart, and should be connected to each other and to the energiser using 10 gauge GI wire. The wire is clamped to the holes using sturdy GI nuts, bolts and washers. If the soil is dry, more rods of larger size may be needed. This system should be installed close to the nearest fence post from the energiser in an area where the soil is likely to remain moist throughout the year (e.g. near a pond or stream). It should be away from path of human or cattle movement, and any other earthing systems (e.g. for domestic electric supply) or any metal pole.



Solar panel on the roof



Energiser and battery



Lightning protector



Warning signs and notice about the power fence



A 5-line power fence good for all large animals



2-line power HEC fence in AHP project area

## Maintenance

Regular maintenance is essential.

- Vegetation must be cleared regularly from the ground under the fence, especially close to the fence posts where the post protection wires lie within 15–20 cm of the ground (the power fence will not work properly if any part of the fence line touches ground vegetation, or even the post).
- Posts and strands must be regularly monitored and repaired if necessary.
- Voltage must be checked regularly with a peak voltmeter. This requires minimal training (from somebody familiar with the system or a member of the AHP team). Good performance of an electric fence depends on its

output voltage. To deter elephants, the voltage should be above 8 kV; if it drops below 6 kV, it will not work against elephants.

- If the fence is solar powered, the batteries will need periodic maintenance. All connections must be kept clean and dry. A protective layer of petroleum jelly will help. The electrolyte level within the batteries must be topped up with de-ionized / distilled water occasionally. The battery voltage should be checked once a month, and old batteries should be replaced.
- If the GI wire is broken it will have to be reconnected or replaced. Wire can simply be repaired by twisting it back together or by using a wire-connecting clamp.

<b>Advantages</b>	<b>Disadvantages</b>
<ul style="list-style-type: none"><li>• Can be an effective deterrent.</li><li>• Solar-powered fences are not affected by power cuts.</li><li>• The batteries charged with solar power can also be used for domestic lighting through an inverter (one should take care not to drain the batteries or the power fence will fail to work).</li><li>• The fence alarm also works as an early warning device.</li><li>• Large areas can be protected.</li></ul>	<ul style="list-style-type: none"><li>• May need professional help for installation and regular maintenance. Energisers and other fencing supplies are not easily available in many areas.</li><li>• Solar panels and batteries are expensive and the latter need replacement every few years.</li><li>• Rusting of GI wires, grounding system may reduce their effectiveness over time (regular maintenance prevents this).</li><li>• Requires co-operation of the entire community, which is often lacking.</li></ul>

### **Points to remember**

- The power fence is not a foolproof barrier against elephants. It will work only if the elephants approach the fence at their normal cautious pace and touch the fence wire with their trunk or other parts of their body while exploring. The fence will not work against an elephant which is running or is being chased. The animal will simply crash through the fence, often breaking the wires even before getting a shock.
- Power fences are not feasible in areas which flood regularly. They may be impractical in areas with high people or livestock movement like village markets.

## Barriers

### TRENCHES

Elephants have difficulty crossing ground that is uneven. A dug-out trench can provide a simple barrier to elephant movement. Trenches are ideal for protecting homesteads. They also keep out intruding livestock and act as a boundary.

Trench barriers are very common in Meghalaya and some parts of lower Assam, particularly where hard red soil is found. The Rabha and Garo communities have traditionally used the trench barrier method to keep elephants away.

### How to build and use

Once the area to be protected is identified, dig a trench at least 2 m wide and 1.5 m deep around it. Use the excavated soil to create a wall 1m tall on the inside edge of the trench. Plant bamboo, chilli, lemon or cane on the top of this wall to increase the effectiveness of the barrier. Until this live fence is ready, bamboo fencing may be made on the edge of the wall.



Trench

## Maintenance

- Every two weeks check that the trench is in good condition and not damaged.
- In the rainy season some erosion to the trench may need repairs.
- Also during the rainy season silt can get collected in the trench, which will need to be removed regularly.

### Advantages

- Relatively cheap and easy to dig.
- Also works as livestock barrier and a boundary.
- Live barriers (bamboo, chilli or lemon plants) can be of economic value.

### Disadvantages

- It occupies more land than other barriers.
- The trench itself cannot be used for any productive activity.
- Requires regular maintenance and repairs. Removal of silt during rainy season is needed.

## Points to remember

- Any barrier or fence should always be erected on the inside wall of the trench.
- In some areas with sandy or alluvial soil this method won't work due to erosion, particularly in the rainy season. For the same reason trench barriers do not work in floodplains.
- Create a slope and an outlet for rainwater to drain out.



# Barriers

## BUFFER CROPS

A buffer zone is an area that surrounds a region prone to damage by elephants. It separates the area that needs protecting from the area from which elephants are most likely to approach.

An attractive feature of buffer zones is that they can be made up of a crop that can provide you with extra income. Crops such as jute, citrus, ginger, turmeric, vanilla, oil seeds like castor and mustard, and tea are all examples of crops that can be cultivated depending on local soil and climatic conditions. All of these are plants that elephants do not like to eat but can provide an income.



## **Buffer zones generally fall into three broad categories.**

### **Deterrent**

Elephants tend to avoid certain plants such as lemon, chilli and patchouli, which could also be used as buffer crops.

### **Barrier**

Densely planted vegetation (for example, bamboo) can be difficult for elephants to move through. If these are planted as a buffer crop they can be an effective barrier. However, one should remember that growing plants to such a size and density takes time, and young plants may even be eaten by elephants.

### **Crop buffer**

Often it is useful to have a buffer zone with low-value edible plants around valuable crops to provide extra time to spot elephants approaching and implement other methods to chase them away. This is particularly true if crops border forest areas which are occupied by elephants.

### **Do they work?**

Buffer zones have been shown to be effective in some cases but ineffective in others. Effectiveness will vary depending on the nature of the conflict, the buffer type used and its size and positioning. Types of buffer crops will also be dictated by the growing conditions available. It is advised that other mitigation methods should be used as a primary method to keep elephants away but different buffer types are worth investigating as they may prove effective.

A buffer zone could be planted with a crop that is commercially viable but not eaten by elephants, such as black pepper, jute, ginger, tumeric, mustard and oilseeds, but you must remember that elephants may just walk through these to reach the more desirable crops you are trying to protect.

<b>Advantages</b>	<b>Disadvantages</b>
<ul style="list-style-type: none"><li>• Buffer crops can provide an additional income.</li><li>• Buffer crops provide additional time for one to employ other deterrents.</li></ul>	<ul style="list-style-type: none"><li>• You may need very large or dense areas of buffer for it to be effective.</li><li>• Growing conditions must be suitable.</li><li>• Effectiveness varies.</li><li>• It takes time for a buffer zone to grow.</li></ul>

## Deterrents

### LIGHT AND NOISE

Elephants usually enter agricultural fields and villages when it is dark as this is a time when fewer people are around and they feel safer. Light and fire, in combination with noise, have been traditionally used to scare away elephants. These techniques are still widely used, largely because they are very cheap and easily available. Today however there are some modern alternatives that can make the use of light or noise more effective.

Usually fire torches (cloth dipped in kerosene and wrapped on bamboo) and bush fires are used to create light to scare elephants away. But the use of battery-operated spotlights is becoming popular. Such lights operate on 6 or 12 volt batteries, but 12V 55 watt halogen spotlights have proven to be particularly effective. Commercial rechargeable spotlights are available in the market. These spotlights, however, operate on a 6V battery and often have inferior quality electronic parts causing the battery to discharge quickly and take longer to recharge. Also the replacement 6V bulbs are not easily available.

Considering the above problems, the Assam Haathi Project (AHP) has developed a rechargeable 12V 55W halogen spotlight which is more efficient and trouble-free. The AHP spotlight unit consists of three separate components: battery, battery charger and a hand-held search lamp.

The AHP spotlight has many advantages over other lights.

- It is powerful, producing a brighter spot of light.
- It has a high capacity, sealed maintenance-free battery (7Ah).
- It is robust.
- It is made from locally available materials and can be repaired easily.
- It is relatively cheap.
- It can be recharged using domestic or solar power.
- Battery can be charged even at low voltages (130–240 V).
- Charger unit prevents over-charging of the battery.
- Charger unit is separate and need not be carried around.
- The battery and lamp are light and portable.



To acquire the AHP Spotlight please contact your nearest AHP team member or the project office (for contact details please see page v).

AHP Spotlight

## Maintenance

- Battery socket and charger terminals must be kept clean.
- The battery must be kept charged.
- When in regular use the battery must be charged for 8–12 hours. Avoid overcharging as it may damage the battery.
- Never operate the spotlight on a discharged battery as this may lead to battery damage.
- If the spotlight is not used for a long period, it may be necessary to charge the unit for 3 to 4 hours once a week.
- Spotlight should be handled carefully. Avoid dropping or knocking it against hard surfaces.
- Keep the entire unit dry and do not expose to rain.
- Keep a spare bulb (H3 12V 55W) – a fog-lamp bulb is available in most automobile spare parts' shops.

### Advantages

- Can be used at a safe distance from the elephants.
- Portable and rechargeable battery unit with a shoulder strap.
- Low running cost and low maintenance.

### Disadvantages

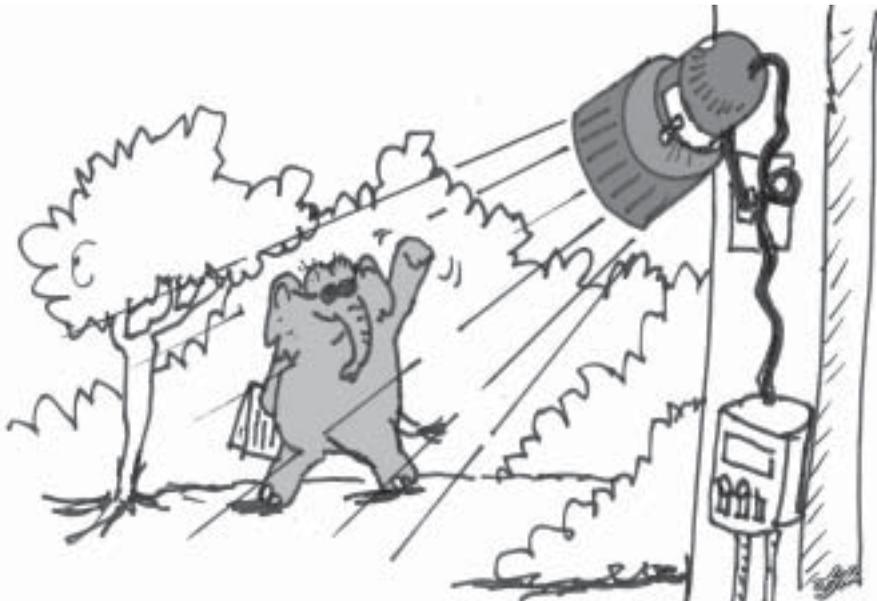
- Elephant may become habituated to the light over time.
- Needs reliable power supply or expensive solar panel for recharging.
- Although relatively cheap it can still be unaffordable for some villagers (shared community spotlights can solve this problem).

Traditional **noise-making** devices such as drums, and loud shouting continue to be in use. In addition, use of firecrackers is becoming increasingly common.

**IMPORTANT:** A major limitation of using light and noise is that elephants get accustomed to these if used regularly, and they may become less effective over time. It is best not to depend solely on light and noise to protect your crops and homes but use these alongside other methods described in this handbook.

**WARNING:** To use light and noise methods you will have to be relatively close to the elephants. If the elephants get scared by these methods, they may run in any direction, or possibly become aggressive. If elephants are running around in the dark it may become dangerous for people as well as the elephants.

**It is best if you all work together to try and chase the elephants in one particular direction. Always consider this carefully to ensure that your actions do not put others in danger.**



## Deterrents

### USING CHILLIES TO KEEP ELEPHANTS AWAY

Elephants do not like chillies. Assam has some of the hottest chillies in the world, such as the *bhot* or *Naga jolokia* (*jolokia* is Assamese for chilli). If used in the right way chillies can be effective for keeping elephants away from crops and homes. Of the many varieties of chillies grown in Assam, *bhot jolokia* has proven to be the most effective deterrent. Although for the methods described here *bhot jolokia* has been used, you may use any other extra-hot varieties of chilli.

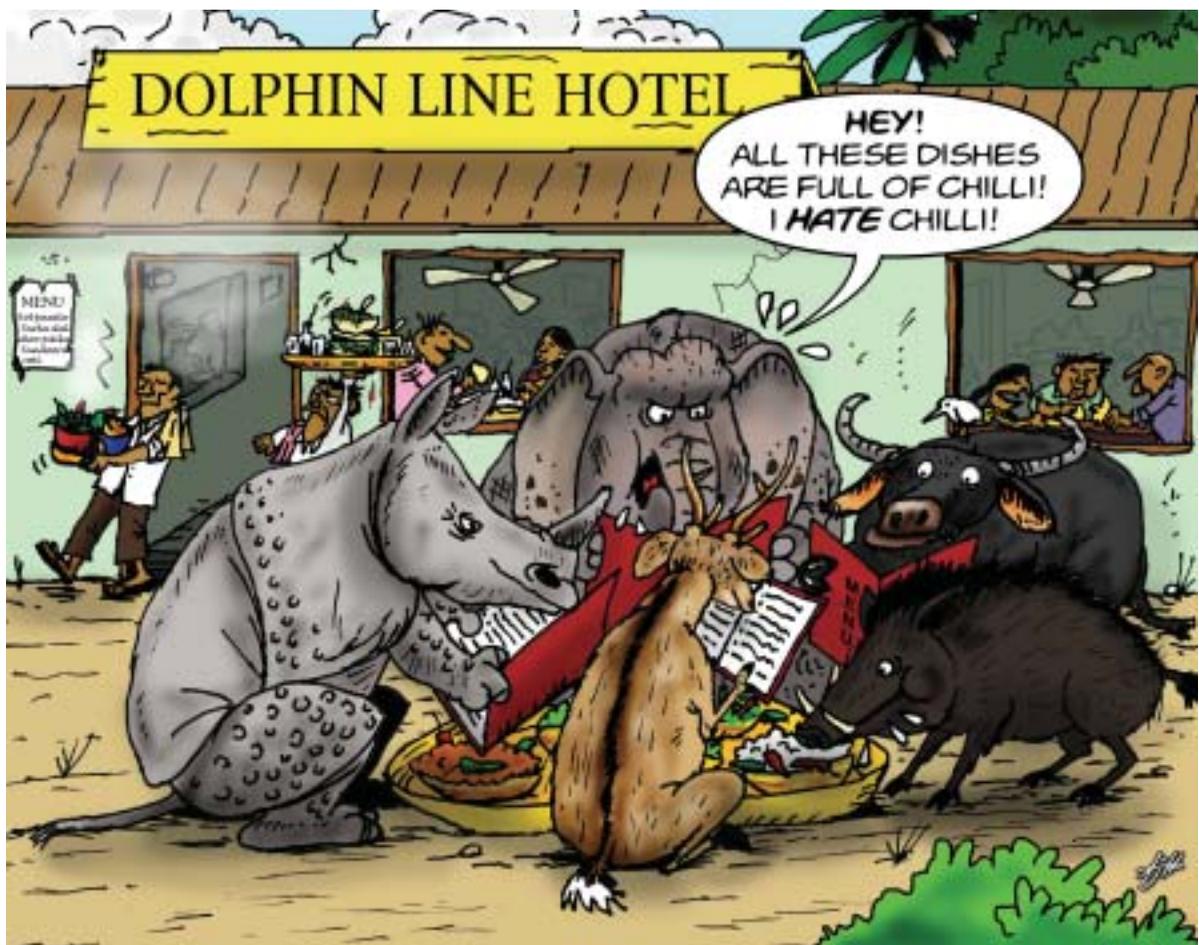
### Chillies can work in several ways to help communities reduce conflict with elephants

- Elephants are sensitive to smoke from burning dry chillies.
- Ropes smeared with a mixture of chilli paste and used automobile grease make effective fencing against elephants.
- The chilli plant itself is avoided by elephants and can be used as a physical barrier.
- Chilli is a lucrative cash crop, providing alternative income and reducing dependency upon crops such as paddy, which elephants like.

**IMPORTANT:** Strong chilli products are also very unpleasant for humans if these come into contact with your eyes or nose. **Always cover your nose and eyes when working with hot chillies** and wash your hands and any equipment thoroughly after use.

### Growing chillies

Chilli cultivation is common in Assam, but the production of *bhot jolokia* is localised. Given the potential of this chilli, both as a deterrent and as a cash crop that fetches good returns in the local markets, the community can benefit greatly by growing this crop. This chilli can be grown either from seed or seedlings, and both the methods for raising *bhot jolokia* are described here. **The suitable time for chilli planting is March–April.** The plants attain maturity in seven months and can bear fruit every four months throughout the year.



### Material needed

- Ripe chillies
- Polythene bags (approx. 10 × 15 cm)
- Well decomposed cow dung and soil
- Gardening tools (hand-trowel or '*khurpi*', spade, watering can, sieve)

## How to raise plants

**Step 1:** Select a plot of land which receives low intensity sunlight or where it is possible to provide a little shade. Measure the land area where you wish to grow chilli plants. You can grow about 60 plants on every *lessa* (13.4 m<sup>2</sup> or 12 × 12 feet) of land. To make a nursery, erect a thin shade using bamboo and palm leaves over a small portion of available land.

**Step 2:** To prepare the soil mixture for the seedlings, thoroughly mix three parts of soil with one part of cow dung. Fill the polythene bags with the mixture using a small stick to compact it. Make a few holes in the bags for draining out the excess water and keep the bags in the shade.

**Step 3:** Procure enough ripe chillies; each chilli has enough seeds to grow 10 seedlings. With a sharp blade or knife carefully slit the chillies and remove the seeds. Dig a 2–3 cm hole in the soil mixture of each bag and bury 4–6 seeds in it. Moisten the soil and place the bag in the shade.



Filling the polybags with prepared soil



Removing seeds from chilli fruit



Chilli seedlings



Seedling ready for transplantation

**Step 4:** Lightly water the polybags once a day just to keep the soil moist. The seeds will germinate and within a week tiny seedlings will appear. Continue to moisten the soil once a day but avoid overwatering. As the seedlings grow, you may increase the amount of water to keep the soil wet at all times. When the seedlings are about 15 cm high (this may take about two months), they are ready for transplanting.

### Seedbed

Seedlings can also be raised on a seedbed without using polybags. A strip of 1 m wide well-drained land raised by 15 cm is needed. This land may be treated with 4% formaldehyde solution to eliminate soil-borne pathogens. Saturate the seedbed with the formaldehyde solution, cover with polythene sheet or gunny bags for a couple of days. Then uncover and loosen the soil and leave for 2–3 days. Make 2 cm deep furrows at 2.5 cm intervals on the seedbed and sow the seeds in them. Cover the seeds with a thin layer of mixture made of sand and dry and sieved cow dung. Lightly water the seedbed and cover it with a thin layer of straw or banana leaves. Moistening the seedbed once a day. The seedlings will be ready for transplanting in about 30–35 days.

**Step 5:** If the selected plot for planting the chillies is not partly shaded by trees, make a bamboo framework over it to lower the intensity of sun. Loosen the soil with a hoe and dig 30 cm deep pits of about 25 cm diameter each. The pits must be at least 50 cm apart from one another. Mix the excavated soil with dung in the same proportion as in Step 2 and fill the pits halfway through. Remove the polythene cover carefully from a seedling bag and place the contents in the pit. Use the remaining soil mixture to fill the space around it. Smoothen the soil around the sapling and lightly water the plant to moisten the soil.



Dig a pit and fill with soil–dung mixture



Peel off the polythene bag



Smoothen the soil

**Step 6.** Water the plants every morning to keep the soil moist. Avoid flooding them and do not water if it rains. *Bhot jolokia* cannot withstand excessive watering. The plants will begin to flower after about three months, and 2–3 weeks later fruiting will begin. The ripe chillies, red in colour, will be ready for picking in about three weeks. Each plant bears about 15–20 fruits that can be harvested every four months.



Ripe fruit ready for harvest

If the plants show signs of disease or poor growth, or do not bear fruit, seek help from AHP members or the local agricultural department. AHP has established a chilli nursery in Sonitpur, and also distributes chilli seedlings free of cost to HEC affected community. Those interested can contact the AHP office.

#### **Points to remember**

- The *bhot jolokia* plants cannot withstand flooding or very strong sunlight.
- The soil should be well-drained and friable.
- They can be easily grown in homestead gardens; even the raised edges of mud huts are suitable.

## Deterrents

### CHILLI ROPE FENCING

Chilli mixed with automobile grease and thickly smeared over a simple rope fence can make a useful barrier against elephants. This method has been tried in Africa, and has worked well in AHP study areas. Although ripe chilli of any hot variety can be used, *bhot jolokia* appears to be the most effective.

#### Material needed for 100 m fencing

Fresh ripe chillies	100 grams	Rs. 15-20
Tobacco leaves (optional)	250 grams	Rs. 15-20
Automobile grease	500 grams	Rs. 90
Mortar-pestle	1 set	Rs. 200-300
Gloves	1 pair	Rs. 20-40
Protective glasses	1 pair	Rs. 60-100
Bamboo/wood poles	15-20 poles (each 2 m high)	Rs. 90 (bamboo); wood is costlier
Jute or coconut rope	100 m	Rs. 25-40



## How to prepare and use

**Step 1:** Prepare a rough map of the area to be fenced indicating the position of the posts. Make an estimate of materials required and buy the material before installation.

Before preparing the chilli-grease mixture please wear gloves and protective glasses to avoid irritation to hands and eyes. Pound or grind the chilli along with shredded tobacco leaves into a fine paste. Add this to automobile grease and mix well to make a thick paste. The mixture is now ready for use.



Select ripe *bhot jolokia*



Pound chilli and tobacco leaves



Mix well chilli-tobacco paste with grease



Mixture ready for application

**Step 2:** Position the poles as indicated in your map. If the length of the fence is more than 100 m, then coat the rope with the chilli-grease mixture, and tie it to the poles to form a fence around the protected area. If the length is less than 100 m, it will be easier to string the rope across the posts and then smear the chilli-grease mixture over it. Position the rope at a height (2 m) whereby cattle and people can pass under it. If cattle or human movement is low then the rope can be placed at a lower height. To protect houses and granaries, gunny sacks coated with the chilli grease can be hung in the immediate vicinity of the property to be protected.



Tie the rope where desired and coat it with chilli grease



For fencing more than 100 m, smear the rope with chilli grease and tie it later

**Step 3:** Put caution signs on the chilli fencing to prevent people from touching it. To retain the potency of the fencing, re-application of chilli grease is necessary. During the dry season, coat the rope with fresh chilli grease mixture every ten days. In the rainy months, the fencing may need fresh coats of chilli grease every 4–5 days.

#### **Advantages**

- Can be effective and cheap to make.
- Can make existing fences better barriers.

#### **Disadvantages**

- High maintenance; rope needs re-greasing frequently especially during the rains.
- Can be damaged or stolen.

#### **Points to remember**

- Do not touch the fence and make sure children and your neighbours know this!
- Apply fresh coats of chilli grease regularly to maintain its effectiveness.
- Wear gloves while making the chilli paste.
- New grease may be costlier but is better as it lasts longer even during the rains.

## Deterrents

### CHILLI SMOKE

Dry chilli when burnt together with other materials produces a very strong smoke which is an irritation to people, but even more so to the sensitive eyes and trunk of elephants. When chilli smoke is used in the right way, it can be very effective in chasing elephants away from crops or homes.

#### Material needed

- 1 cardboard piece (75 cm × 50 cm); discarded cartons can be used
- 5 tobacco leaves
- 15–20 dry red chillies, any pungent variety
- Dry straw, grass and weeds
- 1 m long stick
- Wire/string
- Large knife or machete



#### How to build and use

**Step 1:** Cut the cardboard to desired size and spread a mixture of dry straw, grass and weeds evenly onto it. Layer the mixture with tobacco leaves and place the dry chillies on top.



Spread straw, dry grass and weeds over the cardboard



Place tobacco leaves over straw and scatter chilli over them

**Step 2:** Start rolling the cardboard together from one end to form a cylinder, and tie it with the wire securely. Attach the roll firmly to a stick with wire or string, so that the roll can be held away from you when it is lit.



Tightly roll the cardboard from one end



Secure the roll with wire



Attach the roll to the stick



Chilli smoke ready for use

**Step 3:** When you need to use the chilli smoke, light the top end of the roll and let it start smouldering. Determine the wind direction. Once the smoke is dense and the smell of the chilli smoke is strong, approach the elephants from a direction so that the smoke drifts towards them. Do not approach the elephants closer than 50 meters. It may be possible to plant the smouldering sticks in the ground, or lay them on the floor, so that people can then safely move away from the elephants and smoke.

Each chilli smoke roll will last about 15–20 minutes. These can be made in advance and stored.

**Advantages**

- Material readily available and cheap.
- Easy to assemble and can be prepared in advance.
- Can be effective, especially when used in combination with spotlights.
- Any variety of chilli can be used.

**Disadvantages**

- Can be unpredictable if it is windy.
- You need to be relatively close to the elephants for it to work.
- Large quantities of chillies required.

**Points to remember**

- Do not go too close to the elephants.
- Ensure that the wind is not blowing the smoke towards people or livestock.
- Inform people in the vicinity about what you are doing so that they will not be in the way of retreating elephants.
- Avoid using the smoke deterrent if the wind direction is not suitable, as it could steer the escaping elephants towards habitation.

## Deterrents

### KUNKI

A kunki is a trained elephant used for a variety of tasks under supervision and care of a mahout. In some areas of Assam, kunkis are used to drive wild elephants away from crops or villages. Kunkis are either owned by individuals or by the Forest Department, although they are normally used by the Department.



Skilled mahouts can use their kunkis to chase away wild elephants from crop fields or village areas. Ideally, the elephants are chased as a herd, towards a forest, or another unpopulated area. **However, there are some problems with using kunkis:**

- Wild elephants, when driven, sometimes move towards other populated areas, cropland or crowds of onlookers.
- Kunkis can scatter herds making the wild elephants even more difficult to control, and threatening life and property.
- Kunkis chasing wild elephants may themselves cause damage to crops.

#### Advantages

- Relatively safe method as the villagers themselves do not need to be directly involved.
- Can be effective against large herds of elephants.

#### Disadvantages

- Kunkis are costly to maintain and hire.
- Kunkis themselves can damage crops.
- Kunkis are not always readily available when needed.
- Kunkis can scatter wild elephants unpredictably, causing much stress to the elephant herds. Such stress may lead to increased aggression later.

## Deterrents

### BEES

This is a relatively new method, which has been tried out in a few places in Africa and Asia. The effectiveness of using bees is as yet uncertain but the method is worth mentioning in this handbook as bees can also have the added benefit of providing additional income.

It is reported that elephants are uncomfortable with the sound of bees and are vulnerable to bee stings. In Assam there is a native bee called the Indian honey bee, *Apis mellifera indica*, which could be kept for this purpose.

Besides potentially keeping elephants away, bee-keeping also offers an alternative means of income with many advantages:

- The maintenance of hives requires minimal training and effort – and may be managed by women and the elderly.
- Bees form a natural part of the ecosystem, and will be beneficial for many plants and animals in the region.
- Apiculture (bee-keeping) is recognized by the state authorities as a cottage industry, which makes it cheaper and easier for interested parties to obtain the requisite training and funding.



## Unsafe Methods of Detering Elephants

A list of unsafe methods that are currently used against elephants in some areas is given below. We strongly recommend that these methods should NOT be used.

- **Missiles:** Throwing objects such as sticks, stones, catapult shots, burning rubber balls and glowing tinders may sometimes chase elephants away but these are just as likely to enrage the elephants and make them more dangerous. This may provoke aggression and attacks by the elephants.
- **Arms:** Weapons such as bows and arrows, pipe guns and shotguns kill or badly injure elephants. Not only is this illegal, but it also worsens the situation in the long term. Elephants that are injured or have been attacked are a lot more likely to be aggressive towards people.
- **Dogs:** Using dogs to try and scare elephants away is also more likely to provoke aggression and the elephants may turn around and chase the dogs who usually run back towards people or houses.
- **Poison:** In some regions poison has been used to kill elephants. It inflicts a slow and painful death of a protected wild animal, which is illegal.
- **Live-wire fencing:** Regular domestic or industrial power lines are reportedly being used for fencing in certain areas. This is *extremely* dangerous and illegal. It can kill elephants and is a serious threat to human life.



## Alternative Livelihoods and Farming Options

**E**lephants can cause a huge amount of damage to crops in a very short time. For subsistence farmers this can mean a major impact on their income for the year, and thus affect their livelihoods. When this situation worsens, retaliation against elephants commonly occurs.

This handbook looks mainly at ways to keep elephants away from your crops but you can also change the way you farm, or look for other ways to earn money, so that you are not almost completely dependent on your paddy crop.

### **Changing the way you grow paddy**

By collecting information on elephant movements and behaviour each year, you can help the Assam Haathi Project in its studies and also use the information yourself to help protect your crops. For example, you could grow different crops in an area that elephants do not normally visit or change the way you store harvested crops so that they are better protected.

You may also be able to increase the amount and quality of your crops, and thus make up for losses caused by elephants, through the use of better pest management or fertilizers, for example.

### **Growing different crops**

There are many crops that elephants do not eat, which grow in similar soil conditions as paddy and can yield a good income. Cultivation of cash crops such as chilli, ginger, garlic, black pepper, citrus fruits (lemon) and vanilla can be a viable alternative livelihood source. Many of these crops can also be used as barriers or deterrents to elephants as discussed in other sections of this handbook.

## **Livestock farming**

You can also use some of your land for alternative activities that can again bring an income which is unlikely to be affected by elephants. Activities that have the potential include poultry (including ducks) and piggery, fishery, and bee-keeping. However, farmers would require initial support through training in farming and animal rearing methods, technical know-how, loans, and market linkages. Assistance and advice with these issues can be found by contacting the organisations listed here.

## **Cottage industry**

You can also engage in non-agricultural activities to earn an income. Cottage industries include activities such as handloom, handicrafts and food preservation. Such industries are generally based on micro-finance and can be promoted with assistance of local self-help groups (SHGs), and voluntary groups and agencies. There are several micro-finance agencies at regional and local level, but many affected communities are not even aware of their existence. Again many of the organisations listed below can assist in setting up cottage enterprises. Individual entrepreneurs in a community could also be empowered to avail of loans to set up small businesses.

## **Resource support agencies**

The services offered by micro-finance as well as technical support agencies include training, exposure visits, demonstration, networking, operation of SHGs, marketing of products and provision of soft loans. Prior to implementation of alternative livelihood activities a need assessment of the community should be undertaken to ensure effective implementation. Some of the key organisations and agencies offering assistance include:

- Khadi and Village Industries Commission (KVIC)
- National Bank for Agriculture and Rural Development (NABARD)
- North Eastern Development Finance Corporation (NEDFi)
- North Eastern Regional Agricultural Marketing Corporation Ltd (NERAMAC)
- Rashtriya Gramin Vikas Nidhi (RGVN)
- Spices Board
- State Agriculture, Horticulture, Veterinary and Fishery Departments, Assam
- State Institute for Rural Development (SIRD)
- The Energy and Resources Institute (TERI)
- Tribal Cooperative Marketing Development Federation of India (TRIFED)

## Appendix

### **Guidelines for grant of *ex gratia* for loss of human lives and damages to crops and properties caused by wild animals under the centrally sponsored scheme “Project Elephant”**

The following guidelines will come into force with effect from 1st February 2004, for grant of *ex gratia* for elephant depredation to the people living outside/inside of any forest area, persons temporarily present in the forest area with authority and except those who are illegally present inside the forest area. The grant will be made available from the 100 percent centrally sponsored scheme “Project Elephant”.

1. Persons affected by the depredation of wild animals would be entitled for *ex gratia* grant for the loss of life, damage to crops or property as per the given scale:-
  - (i) Rs. 40,000/- per person killed including Rs. 5,000/- paid for last rites.
  - (ii) Rs. 20,000/- per person for permanent disability along with medical treatment.
  - (iii) Rs. 10,000/- per person against loss of single limb along with medical treatment.
  - (iv) Rs. 1,000/- for treatment for any injury.
  - (v) Rs. 500/- per cattle for damages to livestock subject to maximum of Rs. 2,500/-
  - (vi) Rs. 1000/- per *bigha* against damages to agricultural crops subject to maximum of Rs. 2,500/-
  - (vii) Rs. 2000/- for total damage to the dwelling houses.
  - (viii) Rs. 1000/- for partial damage to the dwelling house.
2. The Deputy Commissioner of the district concerned, on his own information or on the information furnished by the Forest Officers, would cause enquiry into the death/depredation and based on the report of

this enquiry assess the compensation to be paid according to the above norms.

3. Deputy Commissioner may entrust any of his officers or any of the Forest Officers in his district or Forest/Revenue Officers jointly for the purpose of enquiry and fix suitable time limit for completion of the enquiry.
4. The enquiry conducted by the Deputy Commissioner would ascertain that the death/injury/damage has been caused by the elephants and that the affected person is not an encroacher or a person involved in illegal activities during the occurrence of the incident. The damage to crops/cattle/property shall be assessed as is done by the Revenue staff normally.
5. The Deputy Commissioner will pass final orders regarding the amount of compensation to be paid, based on the enquiry report and the norms prescribed. These orders would be intimated to the Conservator of Forests concerned who would inform the Chief Conservator of Forests, (Wildlife) for release of funds for disbursement at the earliest.
6. In case of death, subject to availability of funds, the Divisional Forest Officer concerned will pay an amount of Rs. 5000/- on the spot to the next of kin of the victim for cremation and other rites.
7. Subject to availability of funds, Chief Conservator of Forests (Wildlife) would allot funds in advance to various Divisional Forest Officers in proportion to the possibility of occurrence of elephant depredation for disbursement of Rs. 5000/- referred in para 6 above.
8. Chief Conservator of Forests (Wildlife) would ensure maintenance of accounts of funds disbursed in the above manner as usual for the purpose of audit, etc.

Sd/- P.P. Varma,  
Principal Secretary, to the Govt. of Assam,  
Department of Environment and Forests,  
Dispur.

Memo No. FRW. 63/2003/10

Dated Dispur, the 19th January 2004



## North of England Zoological Society (Chester Zoo)

The Conservation & Science Division of the North of England Zoological Society (NEZS), which runs Chester Zoo, works to integrate *in situ* and *ex situ* conservation activities and support conservation initiatives in developing countries through partnerships, transfer of skills, training, and the sharing of access to resources. NEZS uses its variety of skills to provide technical input for conservation projects in the UK and abroad, in such fields as: conservation breeding, endangered species management, wild animal rescue, veterinary care, re-introduction, conservation education and awareness, and human-wildlife conflict. In 2004, NEZS initiated the Assam Haathi Project in collaboration with EcoSystems-India to mitigate the rising human-elephant conflict in Assam.

NEZS has twice received the Queen's Award for Enterprise for conservation, education and sustainability; was the first UK zoo to achieve ISO14001; has received over 80 awards in conservation, research, education, horticulture, tourism and marketing; and has raised £1.8 million for 375 conservation projects in 64 countries, further supporting many with capacity building in developing countries.

[www.chesterzoo.org](http://www.chesterzoo.org)



## EcoSystems-India

EcoSystems-India (ESI) is a non-profit Trust with a mission to *promote conservation of natural biodiversity with special thrust on threatened and endangered wildlife and their habitats, and to encourage sustainable and efficient management of natural resources*. ESI's activities are carried out through four working units: Rare & Endangered Species Conservation Unit (RESCU), Wildlife Health Unit (WHU), Natural Resources Management Unit (NRMU), and Capacity Building & Extension Unit (CBEU). The major projects undertaken by ESI have focused on conservation breeding (e.g. Pygmy Hog Conservation Programme, in partnership with Durrell Wildlife and IUCN/SSC Pigs Peccaries & Hippos Specialist Group), human-animal conflict mitigation (e.g. Assam Haathi Project), capacity building of NGOs (grassroots environmental NGOs), rescue and rehabilitation of endangered species (e.g. greater adjutant), community based ecotourism (e.g. in Eaglenest, Arunachal Pradesh) and environmental education. ESI seeks cooperation and action through partnerships with various stakeholders such as local communities (particularly youth, school teachers, women, village leaders), NGOs, educational and research institutions, and government agencies.

[www.ecosystems-india.org](http://www.ecosystems-india.org)



## Darwin Initiative

The Darwin Initiative (DI) is a small grants programme that aims to promote biodiversity conservation and sustainable use of resources around the world. The Initiative is funded and administered by the UK Department for Environment, Food and Rural Affairs (DEFRA). DI assists countries that are rich in biodiversity but poor in financial resources to implement the Convention on Biological Diversity (CBD) through the funding of collaborative projects which draw on UK biodiversity expertise. DI has funded 601 projects to date, partnering with 758 organizations in host countries, and 198 UK organizations.

The Assam Haathi Project is a recipient of Darwin Initiative grant (2007–2010).

[www.darwin.gov.uk](http://www.darwin.gov.uk)



## Living with Elephants in Assam A handbook

This handbook is for people living in areas with human-elephant conflict. It provides simple step-by-step instructions on ways to protect your fields and homesteads.

This handbook is meant to

- help you to understand elephants better
- explain why people and elephants come into conflict
- explain why it is important for people and elephants to live together
- help you protect your crops, homes and family from elephants.

The methods shown in this handbook have been used successfully by communities working with the Assam Haathi Project. Only locally available and affordable materials are used, so that they can be used by any community that faces problems with elephants.

[www.assamhaathiproject.org](http://www.assamhaathiproject.org)

