

# WILDLIFE CONSERVATION PLAN FOR GARE PALMA COAL MINES AREA AT TAMNAR, DISTRICT-RAIGARH, CHHATTISGARH

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**Abstract-** Conservation of Biodiversity is essential for the survival of the biosphere. Biodiversity consists of two components: richness, or taxonomic diversity, and evenness, or the distribution of individuals among taxa. Anthropogenic factors are eroding both the richness as well as evenness components of the biodiversity, jeopardizing the survival of human race itself. This realization has initiated serious efforts towards conservation of both the components of biodiversity. One of the causes for the erosion of biodiversity has been recognized to be the mining activity. The present study is going to centralized at Gare-Pelma Coal Blocks which is a part of Mand -Raigarh Coalfields at District Raigarh Chhattisgarh. Some of the important minerals of our country are lying below the forests. Opencast mining of such areas are bound to result in the destruction or fragmentation of the habitat. If the area under mining is not having any endemic species then the mining will result only in the reduction in the genepool, i.e. the evenness component of the biodiversity. However, mining an area with endemic species will have more drastic effect on biodiversity. Similarly, if the area falls under crucial migratory route of a species then also the mining may have some impact on such migratory species. Thus, it is required to evaluate the area, going to be mined, for any endemic and endangered species and any direct or indirect impact on biodiversity.

## KEYWORDS:

Flora and Fauna,Biodiversity,Habitat,Conservation.

## INTRODUCTION-

Mining is required for development. Then, is the mining antithesis of development? No, it cannot be provided sufficient measures are taken to offset the impact on biodiversity. Present account is, thus, an evaluation of the status of the biodiversity of the

proposed mining lease area, and proposed offset measures to any negative impact on biodiversity. Wild elephants move from the State of Orissa to Jharkhand State. During this they use the land of Chhattisgarh State as Corridor. The animal left the area of Chhattisgarh somewhere around 1904 and re-entered in 1986, after almost a gap of about 82 years.. This is not peculiar as the animal has re-entered the area of Andhra Pradesh state, after a gap of about 200 years. Districts of Chhattisgarh, through which the elephants move are Raigarh>Korba>Sarguja>Jashpur. Presently applied area for coal mining is in Gare-Pelma, Raigarh District of Chhattisgarh State. However, the presently, Gare Palma Coal Mine is not an elephant habitat nor is a part of project elephant. The animal visits the buffer zone at irregular intervals, ranging from six months to a year.

Bear is a nocturnal animal. Generally it remains within the forest area, but rarely intrudes within the village area. This is mainly due to the Mahua flower because Mahua trees are most common around the village areas. Therefore intrusion of the bear near to the village area is more during the months of Mahua flowering, the Months of March and April. Approach of the animal near the village areas in other months is extremely rare. Bears are reported in the buffer zone, but their density is never very high. A good study on bear has been made in the central India by Bargali et al (2004).

**Location Details:** Figure 1.1 gives the location of GarePelma Coal Blocksare a part of MandRaigarh Coalfields. The area is located in Survey of India Toposheet No. 64 N/8 & 64 N/12 on 1:50000 scale.

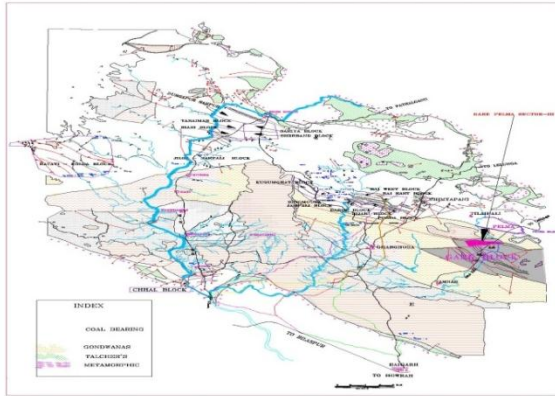


Fig. No. 1.1 location map

### CONSERVATION PLAN:

#### 1. Conservation Plan for Bengal monitor lizard (*Varanus bengalensis bengalensis*)

**Habit:** They are often found in agricultural areas. Bengal monitors shelter in burrows that they dig or crevices in rocks and abandoned termite mounds. It is mostly diurnal in habit.

**Habitat:** It is found in a wide range of habitats, viz. forest, river banks, by the side of nullah, and agricultural land. It occupies burrows, dense vegetation, hollows of trees, rock cracks and crevices.

**Behaviour:** Mainly ground dweller, but is a very good climber as well. Bengal Monitors are usually solitary and usually found on the ground although the young are often seen on trees. They shelter and spend nights in burrows or crevices in rocks, make use also of abandoned termite mounds. In the night their body temperature drops below ambient. In the morning they raise their body temperatures by basking before commencing activity and for this reason they are rarely active early in the morning and most active in the afternoons when temperatures are highest.

**Food:** Their normal prey consists of beetles, grubs, orthopterans, scorpions, crabs, snails, ants and other invertebrates. Vertebrate prey is comparatively rare and includes frogs, fish, other lizards, snakes birds and their eggs and rodents. They sometimes capture roosting bats.

**Threat:** Monitor lizards are hunted for skin and their body fat. Its eggs are considered a delicacy and the

entire animal is also eaten. Unani, the Greco-Arabian system of medicine, recommends the use of various body parts of monitors to cure numerous ailments. The population of the Common Indian Monitor, *Varanus bengalensis* has alarmingly dwindled throughout the Indian sub-continent mainly due to excessive exploitation of the adults for their commercially valuable skins, as food and in traditional medicines. Habitat loss due to large-scale deforestation, urbanization, dams and hydroelectric projects and other biotic factors are also responsible for the population decline of the species.

**Conservation Status:** Status: Not Listed (IUCN 2000); Endangered (ESA).

**Conservation measures:** There is no scarcity of food or habitat to the animal. Preventing poaching will be the single most important factor in the conservation of the species, for which awareness programmes should be run frequently.

#### 2. Conservation Plan for Pavocristatus (Indian Peafowl)

The Indian Peafowl (*Pavocristatus*), is also known as the Common Peafowl or the Blue Peafowl, The peacock is the **national bird** of India.

**Habitat:** It is found in forests, but can live also in cultivated regions and around human habitations and is usually found where water is available.

**Food:** It is an omnivorous bird. It's diet consists of small mammals like: mice, reptiles like lizards and snakes, amphibians, arthropods like: insects, ticks, termites, ants, locusts and scorpions, seeds, fruit, vegetables, flowers, leaves, and minnows in shallow streams and so on. With its strong bill it is able to kill a snake, even a cobra. Around cultivated areas, peafowl feed on a wide range of crops such as groundnut, tomato, paddy, chilly, and even bananas. Around human habitations, they feed on a variety of food scraps and even human excreta.

**Conservation Status:** IUCN Red List, Least Concern species.

**Threat:** Poaching of peacocks for their meat, feathers and accidental poisoning by feeding on pesticide treated seeds are known threats to wild birds. Methods to identify if feathers have been plucked or have been shed naturally have been

developed as Indian law allows the collection of feathers that have been shed. However, presently, there is no severe threat to this species, primarily for its status as a National bird and secondarily due to religious belief this species is protected. But its train feathers are in great demand for commercial purposes and are the main threat to its survival. Their loud calls make them easy to detect, and in forest areas, often indicate the presence of a predator such as a tiger.

**Conservation:** They are generally protected by religious sentiment and will forage around villages for scraps. The people living in the surrounding area should be rewarded for timely information about disturbing and/or poaching of the bird. The bird has a wide range of food items, hence, improvement of and protection of the bird in the buffer zone will provide sufficient food to the animal.

### **3. Conservation Plan for Sloth Bear (*Melursus ursinus*)**

**Introduction:** Bear is a nocturnal animal. Generally it remains within the forest area, but rarely intrudes within the village area. This is mainly due to the Mahua flower because Mahua trees are most common around the village areas. Therefore intrusion of the bear near to the village area is more during the months of Mahua flowering, the Months of March and April. Approach of the animal near the village areas in other months is extremely rare. Bears are reported in the buffer zone, but their density is never very high. A good study on bear has been made in the central India by Bargali et al (2004).

**Habitat:** Sloth bears, in the area, occupy a wide range of habitats including forests, scrublands, and grasslands where boulders and scattered shrubs and trees provide shelter. The most common shelter is a den, a cavern like structure generally in rocks.

**Home range:** To date, there is no definitive research detailing the exact nature of the home range of the sloth bear. The size of the home range of an individual sloth bear will vary with the concentration of high energy food sources. Thus, the more concentrated the food sources, the smaller the range necessary to maintain an animal.

**Habit:** The sloth bear is more inclined to attack man unprovoked than almost any other animal. Sloth bears avoid areas where human disturbance is high,

however, the bear raid peanut, maize, and fruit crops. Sloth bears like to escape from the heat of the day and forage for food at night. They will start to become active as the sun starts to set. This is also the time when many insects such as termites are more active.

They are generally nocturnal, occasionally approaching near to the village area even during the day time. Locally they prefer isolated shelters below rocks and caverns to spend their day time hours. Occasionally, near to the village area, after consuming large amount of mahua (*Madhuca latifolia*) flower they remain sleeping below the tree late after sun rise.

**Food:** Sloth bears subsist primarily on termites, ants, and fruits. This is the only species of bear adapted specifically for myrmecophagy (ant and termite-eating; the ratio of insects to fruits in the diet varies seasonally and geographically. Most bears are opportunistic omnivores. As such, their activities are governed by the availability of food items and dietary components within their habitat. When trees are in fruit, usually during the monsoon season, sloth bears dine on mango, fig, ebony, and other fruits, and also on some flowers. However, ground dwelling ants and termites, dug out of their cement-hard nest mounds, are a year-round staple. They have special liking for the honey for which the animal can climb trees and knock down honeycombs, later collecting the sweet bounty on the forest floor. Beetles, grubs, ants, and other insects round out their diet. During food shortages, sloth bears will eat carrion. In March and April, they will eat the fallen petals of mowha trees and are partial to mangoes, sugar cane, the pods of the Amaltas and the fruit of the jack-tree. Sloth bears are extremely fond of honey. Sloth bears will also climb and shake fruit trees to obtain food. They will also eat leafy plants, sugar-rich fruits, nuts, root, tubers, berries, vegetables, honey, eggs and small vertebrates like rodents. Will also eat virtually any carrion which they may discover. Seasonal availability and geographic location are the biggest factors determining the primary food sources of sloth bears.

Some studies have shown that sloth bears are mainly myrmecophilous but in another study of the scat it has been observed that *Ficus* species dominated in all seasons. expressed as percent dry-weight, plant matter dominated in all seasons. Similarly, a study on sloth bears in central India has found that fruits were eaten year round and were the mainstay of the diet from February to June, whereas termites, ants, and honey were the predominant foods in other months.

A study on the scat of bear, in the central of India has revealed following to be present in the scat and hence forming the food item of the bear. Months of their local availability has been added with each of the food item.

1. Black ant and their egg: Available all round the year but more during winter and summer season.
2. Red ant and their eggs: Available all round the year but more during winter and summer season.
3. Termite and their egg: Available all round the year
4. Honey Bees: Available all round the year but more during late winter and summer season
5. *Ficus benghalensis* (Bargad), *Ficus religiosa* (Pipal): Summer season
6. *Ficus virens*: Winter, Summer
7. *Ficus racemosa*: Winter summer
8. *Ficus glomerata* (Gular): Summer
9. *Ziziphus mauritiana* (Ber), *Ziziphus oenopia* (Makoy) and *Ziziphus nummularia* (Jharberi): Winter
10. *Aegle marmelos* (Bel): summer
11. *Briedeliasquamosa Kasihi*: Late winter to early summer
12. *Diospyros melanoxylon* (tendu): Summer
13. *Buchanania lanzan* (Achar): Summer
14. *Schleichera oleosa* (Kusum): Summer
15. *Syzygium cumini* (Jamun): Summer
16. *Cassia fistula* (Amaltas) fruit: Rainy
17. *Madhuca indica* (Mahua) (flower): March-April
18. *Madhuca indica* (fruit): June-July
19. *Arachis hypogea* (Groundnut): Late rainy season
20. *Zea mays* (Corn): rainy
21. *Amaranthus spinosus* (Amaranth): Winter
22. *Mangifera indica*: Summer
23. *Artocarpus heterophyllus*: Summer
24. Bones, hair and animal tissue

Many of the non-timber forest produce, forming the food of the bear are collected like flowers and fruits of mahua (*Madhuca indica*) and fruits of bel

(*Aegle marmelos*), char (*Buchanania lanzan*), jamun (*Syzygium cumini*), and tendu (*Diospyros melanoxylon*). Such collection may limit their availability for bears. *Ficus* spp. are not used by local people, so are readily available for the bears. Thus *Ficus* spp. play important roles by providing supply of food throughout the year. This is particularly important during summer when there are no crops in fields to raid and fewer fruiting species, and bears find it difficult to dig for termite and ants.

**Threat:** Major threats to this species are habitat loss, poaching and conflict killings. Habitat loss is mainly due to over harvest of forest products, monoculture plantations (e.g., teak, eucalyptus), expansion of agricultural areas, human settlements, and roads. Poaching is mainly for the commercial trade in bear parts. Encounters resulting in conflicts between people and sloth bears occur mainly where the habitat has become severely degraded but still being used by both. The only natural threats to sloth bears are tigers (*Panthera tigris*) and possibly leopards (*P. pardus*). Dhole packs may also attack sloth bears. Asian elephants are reported not to tolerate sloth bears in their vicinity. The reason for this is unknown. Bear parts are valuable commodities in the trade for Asian medicines. Incentives for killing bears are therefore high. Although, bear is protected to varying degrees by national laws, however, they can be killed to protect life or property.

**Conflicts:** The sloth bear is more inclined to attack man unprovoked than almost any other animal. Major man-bear conflicts result during the mahua flowering season. Persons going early to collect the flower encounter the animal, frequently, some times the bear remain sleeping below the tree after consuming large amount of mahua flower and is one of the major causes of man-bear conflicts. Persons going to the forest for the collection of wood or other forest produce encounter the bear, inadvertently resulting in conflicts.

**Status:** *CITES APPENDIX: I: Indian Wildlife (Protection) Act (1972) (As amended up to 2002): Scheduled I; Part I; Indian Red Data Book (IUCN 1994): Not Listed; IUCN (1998) (Proposed); Vulnerable (National) and Data Deficient (Global); IUCN (2002) (Proposed): Vulnerable (Global) based on Version 2.3 1994 (IUCN, 2003). According to*

Alfred *et al.* considering the nature and degree of threats and trends reported, it is strongly recommended to include sloth bear in one of the endangered categories of IUCN. They are particularly vulnerable to loss of habitat because of their reliance on lowland areas, which tend to be the places most readily used by people. Poaching and trade in sloth bears or their parts is also common in many parts of their range.

#### Conservation Measures

1. Education will help to reduce bear-human conflicts and enhance a conservation ethic among locals,
2. Habitat improvements (government or community-based reforestation) would be helpful in alleviating conflicts.
3. Planting of fruit trees more particularly the spp. of *Ficus*, because *Ficus* spp. are not collected by man but form an important diet to the animal.
4. Promoting honey bee in the area will not only serve as food to the bear but will help also in warding off the elephant.
5. Red ant (*Oecophyllasmaragdina*) can be promoted easily to form colonies in the trees. This will serve as important source of insect diet and may compensate for the termite.
6. Artificial method to promote termite colonies should be developed.
7. Den like structures should be developed in the area if such structures are lacking or less in number in the area.
8. It is unfortunate that the conservation of Elephant and Bear go contradictory to each other.
9. Villagers should avoid growing crops of liking to bear like ground nut and corn etc. particularly near their den sites.
10. Translocation of bears from isolated habitat patches to more suitable areas should be carried out.

#### 4. *Elephas maximus* (Asian elephant) ssp. *Indicus* (Indian elephant)

Wild elephants move from the State of Orissa to Jharkhand State. During this they use the land of Chhattisgarh State as Corridor. The animal left the area of Chhattisgarh somewhere around 1904 and re-entered in 1986, after almost a gap of about 82 years.. This is not peculiar as the animal has re-entered the area of Andhra Pradesh state, after a gap of about 200

years. Districts of Chhattisgarh, through which the elephants move are Raigarh>Korba>Sarguja>Jashpur. Presently applied area for coal mining is in Gare-Pelma, Raigarh District of Chhattisgarh State. However, the presently, GarePalma Coal Mine is not an elephant habitat nor is a part of project elephant. The animal visits the buffer zone at irregular intervals, ranging from six months to a year.

#### Important points in the conservation of elephants

Following are some key points in the conservation of elephants:

1. Require 150-250 kg of plant food every day, with preference for grasses..
2. Evolved to a large size, with black colour. The black colour absorbs more heat.
3. Lack sweat gland to dissipate the body heat, hence, require a shade in sunny days, or require frequent cooling through wallowing or spreading water over the body.
4. A good source of water is required also for drinking.
5. Frequent dusting of the body or mud cover over the body is required to protect the body from the biting insects.
6. Change in cropping pattern by introducing crops disliked by elephant or the plants which act as elephant repellent (e.g. *Patchouli*, (Pachouli) *Helianthus annus*(Sunflower) *Capsicum annum* (Chilli)*Sesamum indicum*(Til)and *Citrus* should be promoted.
- 7.

#### 1. Habitat

Elephants are generalists, but use mainly scrub forest. They can be found in the jungle, but generally on the edge where open, grassy areas are accessible. They prefer areas that combine grass, low woody plants, and forest. Elephants rarely forage in one area for more than a few days in a row. In general, food, water and shade are the three basic resources that can be expected to influence the movement of the elephant (Sukumaret al, 2003). Their Home range ranges from 30-600 km<sup>2</sup>.

#### 2. Food

Elephants eat a wide variety of species of vegetation. They are herbivore, folivore and lignivore. More than 100-130 different species of plants may be eaten They prefer grasses, but they also consume bark, roots, leaves, wood, stems and leaves of trees, vines,

shrubs, tubers, bamboo and barn, An average day's intake is 150-200kg of wet vegetation. The proportions of the different plant types in their diet vary depending upon the habitat and season. Annual diet has been found to be dominated by grass. Maximum straying distance covered by the raiding elephant has been recorded up to 5.5km .

### 3. Time-activity budget of elephants

Generally they are active almost throughout the day during rainy and winter months, but during summer months they are active only in the morning and evening hours. They become active well before dawn and start their morning activities in the vicinity of the area where they spent night. Evening hour is the time for drinking and bathing especially during summers. In summer season percentage of movement is more due to lack of fodder species and shrinkage of natural water sources.

### 4. Food plants

Following plants reported as food by different workers. However, only the names of plants, local to the area, have been taken and the local names have been changed.

*Saccharumspontaneum*, *Thysanolaena maxima* and fruit parts of *Dilleniaindica*, are some of the other species recorded to be preferred by elephants. Some other food plants have been reported by the villagers of elephant moving areas of Chhattisgarh state. *Musa paradisiaca* (Kela), *Oryza sativa* (rice) eat very cleverly the fruiting part, only, in the barn yard they dismantle the heap of gathered rice. *Saccharumofficinarium* (Ganna) is one of the most preferred food item. *Dendrocalamus strictus* (Bamboo). *Ficus benghalensis* (Bargad). *Ficus religiosa* (peepal). *Artocarpus heterophyllus* (Kathal). *Miliusa velutina* (Bhilwa). *Pterocarpusmarsupium* (Bija). *Zea mays* (Maka). *Buchanania lanzan* (Char). *Gorugapinnata* (Kekad). *Caricapapya* (Papita).

**Some of the elephants develop fascination for country made alcoholic drinks called Handia.**

### 5. Threats

The pre-eminent threats to the Asian elephant today are habitat loss, degradation, agriculture and farming, grazing, mining, human interference, trade, pollution, hunting for ivory, insurgency, corridor loss, anthropogenic pressures on the habitat, man-elephant conflict, forest fires, illegal captures of live animals etc. Poisoning and disease are some other threats to the animal.

### 6. Conflicts

Due to frequent visit of the animal, conflicts have also increased between man and elephant in the area. However, never any fierce conflict has been reported. The villagers use fire crackers, drums and even burning tyre and tubes to scare the animal. Help from the forest department reaches quickly, provided the information reaches to them timely.

### 7. Conservation status

CITES APPENDIX : 1; *Indian Wildlife (Protection) Act (1972)(As amended up to 2009)*; Sheduled-1; Part-1; *Indian Red Data Book (IUCN, 1994)*; Vulnerable; (*IUCN 1998*) (Proposed); Vulnerable (National) and data deficient (Global); IUCN (2002) (Proposed); Endangered (Global) based on version 2.3 1994 (IUCN, 2003).

### 8. Conservation of the elephants in Gare-Palma block, mining area

Habitat destruction by man has threatened the survival of the Asian Elephant Therefore; maintenance of the habitat is the first requirement in the conservation of the elephants. If proper habitat is absent or is below the desirable standard, then it may be developed. Elephantsrequire, simultaneously, two types of habitats:

- a. Dense forest with tall trees and
- b. Scrub jungle and grasslands

Dense forest is required as refuge and protection from intense sun rays. While scrub and grasslands are required as a better feeding area. Tall trees are not a good source of food because their foliage and tender twigs are beyond the reach of elephant's trunk. It is only the fallen fruit and bark of such trees which can be eaten. It is generally difficult to peel off the bark from trees. In a scrub or a grassland, it is easy to feed. The food item may be foliage, tender shoot, entire plant or even the root, whichever is within their easy reach.

With respect to the area, there are two options for the conservation of the elephants:

- Restrict the elephants in a defined area
- Develop a corridor for long, may be interstate, migration route.

Best method for the management of elephant in Gare-Palma area will be a development of a corridor, or a

residence area, far beyond the lease area. The corridor, to be developed, must have both the dense forest with tall trees as well as shrubby areas. Now it depends upon the condition of the area to decide that the shrubby areas should be forming outer fringe to the tall tree area or should be in the middle or should be in patches in between the tall trees. The corridor belt should be of sufficient width and should be planned either away from the village settlements or the isolated houses near to their path should be shifted. Some of the food plant species suggested to be planted in the area are:

*Dendrocalamus strictus*, (Bans) *D. Rhedii* (Bans), *Bambusa arundinacea* (Bans), *Ficus benghalensis* (Bargad), *Ficus religiosa* (peepal), *Ficus glomerata* (Gular), *Ficus rumphii* (Jangali Bargad), *Ficus infectoria* (Pakar), *Artocarpus heterophyllus* (Kathal), *Miliusa velutina* (Bhilwa), *Pterocarpus marsupium* (Bija), *Phoenix sylvestris* (Chhind), *Phoenix acaulis* (Butachhind), *Buchanania lanzan* (Char), *Feronia elephantum* (Kaith), *Gorugapinnata* (Kekad), *Thysanolaena agrostis* (Hathighas), *Cymbopogon flexuosus* (ghas), *Themeda quadrivalvis* (Ghas), *Iseilemalaxum* (Ghas), *Bothriochloa pertusa* (Ghas), *Apludamutica* (Ghas) etc.

Bamboos (*Dendrocalamus strictus*, *Bambusa arundinacea*) are one group of fast growing plants which can form a good proportion of diet to the elephants. Another bamboo species *Dendrocalamus rhedii* will be an exotic species to the area but is common in Western Ghats. It has a thin stem. Elephants have special liking for the bamboo plant and it is easy to grow the plant in sufficient quantity in short time.

With the vegetation it is essential to develop perennial sources of water with some salt ponds, within the conservation area. With the above following more steps required to be taken for the conservation of this flagship species:

- a. Forest officers required to be trained in Wildlife management.

- b. Frequent use of fireworks should be avoided. This may lead to develop immunity in elephants against the fireworks.
- c. Conflict with human is a major conservation problem, hence, need to be reduced to the lowest possible level.
- d. Anti poaching efforts strengthened.
- e. Awareness programmes should be run frequently.
- f. Interstate committee of Madhya Pradesh, Chhattisgarh, Jharkhand and Orissa Govts. should be constituted for elephants.

### 9. Some suggestions to escape elephant damage

Methods adapted to escape elephant damage may be categorized as i) Active and ii) passive methods:

#### i. Active methods

- a. Noise-making like shouting, drum beating, bursting fire crackers, firing gun shots into the air (by forest officials only),
- b. Using elephant torch light
- c. Pelting stones and lighted fuel-woods.
- d. Loudspeaker broadcasting of tiger roaring sound

However, the major drawback of using all these methods is that these may provoke the raiding elephants increasing the possibility of more damage to the crops and other properties as well as higher risk to the farmer's life. Further, If the active methods fail to be effective, singly, then combined effort should be made.

#### ii. Passive methods

- a. Change in cropping pattern by introducing some elephant repellent alternative cash crops (e.g. *Patchouli*, *Helianthus annuus*, *Capsicum annum* and *Citrus*).
- b. Digging trenches around village area.
- c. Planting sisal (*Agave Americana*) around village boundary.
- d. Solar fencing.
- e. Improvement of water sources.
- f. Raise/improve fodder resources.

Crops of elephant liking should be avoided, as far as possible. It have been observed in Gare-Pelma coalmine at Raigarh district in Chhattisgarh state that the elephants can move down and up in trenches of good depth. Sisal has been found to be good to prevent the elephants to cross the sisal planted area. The plant yields a good quality fibre. Electric fencing has also been suggested as one of the methods but in Assam it has been found to be a failure as the elephant have discovered techniques to break such fences, safely. In areas like Kamakshyanagar in Dhenkanal division in Orissa improvement of fodder resources in the forest has shown promising result of restricting the elephants more in the forest area.

Passive methods are always better to avoid man-elephant conflicts. More important are the selection of plants as alternative crop as well as plants to check the entry of elephants in to the settlement areas.

A good amount of researches and suggestions on the conservation and reducing its conflicts with human being is going on, resulting in suggestions coming frequently on these aspects.

- **Two doors in a house:** Most of the houses in villages have only one door or exit. In case the elephant enters the house through the door, the occupants can escape through another door.
- **Timely information:** Timely information to the helping person about the approach of elephants can reduce the conflicts as well as loss of human life. For this a network should be formed with the villages and the forest officers.
- **Elephant torch:** The elephant torch should be provided to each of the vulnerable villages.

Presently the torch is only with the forest officer, one torch for several villages.

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