ASIATIC ELEPHANT CONSERVATION PROGRAM
PROJECT REPORT: 2009-2010

Wildlife Conservation Division,

Department of Forests & Park Services,

Ministry of Agriculture & Forests

Contents

Executive Summary

Human-Elephant Conflict (HEC) continues to be the greatest challenge for elephant conservation in Bhutan (Bhutan National Human-Wildlife Conflicts Management Strategy) as in the rest of the world (N. W. SITATI et al. 2003). HEC as it is generally known impedes the functioning of day to day lives of many communities living in - southern Bhutan. With the funding support of international donors, efforts have been made to conserve elephants through habitat management and adoption of direct HEC mitigation interventions. For many years the Wildlife Conservation Division (WCD) and WWF Bhutan has been working closely to maintain co-existence of wild elephants and - humans.

In the year 2009 – 2010, the WCD of the Department of Forests and Park Services initiated a project on Asiatic Elephant Conservation with financial support from WWF Bhutan. The main objective of the project was to provide immediate HEC mitigation measures in selected HEC hotspots and simultaneously enrich our understanding on HEC. The project therefore assessed and mapped out the existing elephant habitats in the country, supported management of herd of eight elephants in - Gedu, installed solar fencing in Singey and Umling geogs and carried out community awareness workshops. Elephant population density is now estimated at 0.641 elephant / sq. Km with a 95% CL of 0.038 elephant/sq. Km to 2.246 elephant/ sq. Km, meaning there are about 496 elephants in Samtse and Sarpang.

Introduction

In Bhutan, - elephants have always been revered as a figure equivalent to - god, and is known by various names such as *Meme Sanjay (Grandpa Buddha)* by the Sharchopas and Ganesh Bhagwan by the Hindu Lhotsampas. Harming this large mammal would be the last thing to ever cross the minds of these people. Therefore, without the danger of being hunted for their invaluable tusks as - elsewhere in the world, elephants freely range in Bhutan. Also elephants are protected by the country's law (Listed in Schedule I of the Forests and Nature Conservation Act of Bhutan, equivalent to Appendix I of CITES).

This legal status guarantees complete protection for these animals in Bhutan, but for how long can we rely on this status and the value that these animals have in the minds of the people when the communities living in elephant country suffer huge economic losses through damage to crops and property by these animals? It may only be a matter of time before elephants suffer retaliatory killing by the angry farmers whose livelihood is at stake. Threats to life and property, and damage to crops by elephants are the biggest economic loss and social pressure on the farmers of southern Bhutan (issued raised in the National Assembly by the people's representatives). As per the reported cases by the affected farmers, the degree of damage caused by an elephant during a single incident is by far greater than that caused by any other ungulates in other parts of rural Bhutan (Bhutan National Human-Wildlife Conflicts Management Strategy). The case is similar elsewhere in China where elephants were responsible for large-scale crop and property damage, which caused serious human–elephant conflicts in the region (Zhang and Wang 2003)

Such a constant state of fear and regular economic losses without the government's timely and much needed intervention is likely to invite criticism and amplify the communities' negative perception towards conservation in generaland elrphants in particular.. If that happens it would be very difficult to change the mindset of the communities and to bring them back on board to support elephant conservation.

Although there are no recent reports of poaching of elephants for their tusks within Bhutan, the recent increase in damage incidences by elephants is likely to increase the chances of elephants being killed or injured by the communities in retaliation. Studies have shown that injured elephants are much more dangerous and less tolerant of human presence, thereby increasing the risk to life and property. Recognizing the emerging threats to both humans and elephants alike, the Royal Government of Bhutan and WWF jointly initiated this project.

Description of project sites

Elephants have always migrated to and from India up into Bhutan's foothills along the Indo-Bhutan borders according to season and food availability. Although elephants are found across the whole range of - southern Bhutan, available funds necessitated prioritization of project sites in the following territorial divisions and protected area:

1. Gedu Territorial Division
2. Samtse Territorial Division
3. Samdrupjongkhar Territorial Division
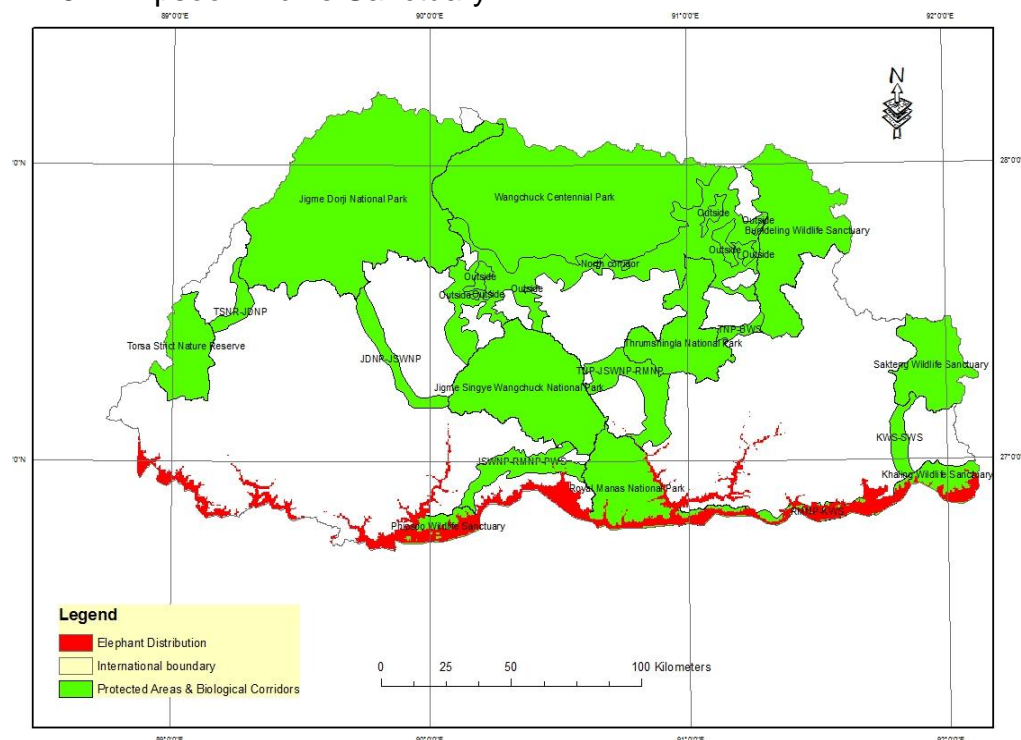4. Sarpang Territorial Division and
5. Phipsoo Wildlife Sanctuary.

Fig 1: Elephant distribution across Bhutan

Aims & Objectives:

The aim of the project is to address the HEC and conservation of viable elephant population in southern Bhutan. The objectives of the project are :

1. To provide mitigation measures in a selected pilot sites to reduce crop damage incidences.

2. To sample the area for elephant signs and confirm the presence of elephants in that grid and also to get an estimate of the relative number of dung piles in the grid

3. To support initiatives to manage a heard of eight elephants in Gedu.

PROJECT ACTIVITIES

Output 1: Human Resource developed at Wildlife Conservation Division, Territorial Divisions and National Parks

Activity 1.1: Hire regional expert to assist WCD with survey designing and analysis of data.

Elephant experts from WWF-International and Wildlife Institute of India (WII) were hired to assist WCD and field staff to carry out the field survey and subsequently analyze the data. The then Coordinator (Elephant Program, NCD) and 20 forestry staff, mostly the focal person for elephant conservation from the fields were trained in data collection and data analysis methods. Subject to the method discussed during the consultation meeting, standard data collection formats was designed (adapting to the Bhutanese situation) to be used for surveys for population assessment (attached survey form as Appendix 1).

Following the training, a survey to assess current elephant population was carried out in Samtse, Sarpang and Phipsoo in the month of June and May, 2010.

Fig 2: Participants of training workshop on population assessment and habitat management of elephants at Phuntsholing

Output 2: Quality of elephant habitat verified, mapped and assessment of elephant population

Activity 2.1: Assessment of elephant population and its habitat

The survey was conducted in two Dzongkhags of Samtse and Sarpang in the total area of the 800 km^2 (Fig 1 & 2) which lies along Indo-Bhutan border. The undisturbed sub-tropical forest, undulating foothills and availability of food has made these areas attractive to elephants especially during growing seasons. These habitats also host important populations of predators (tiger, leopard and dhole) and their prey (gaur, sambar, muntjac, wild pig, langur and macaque.
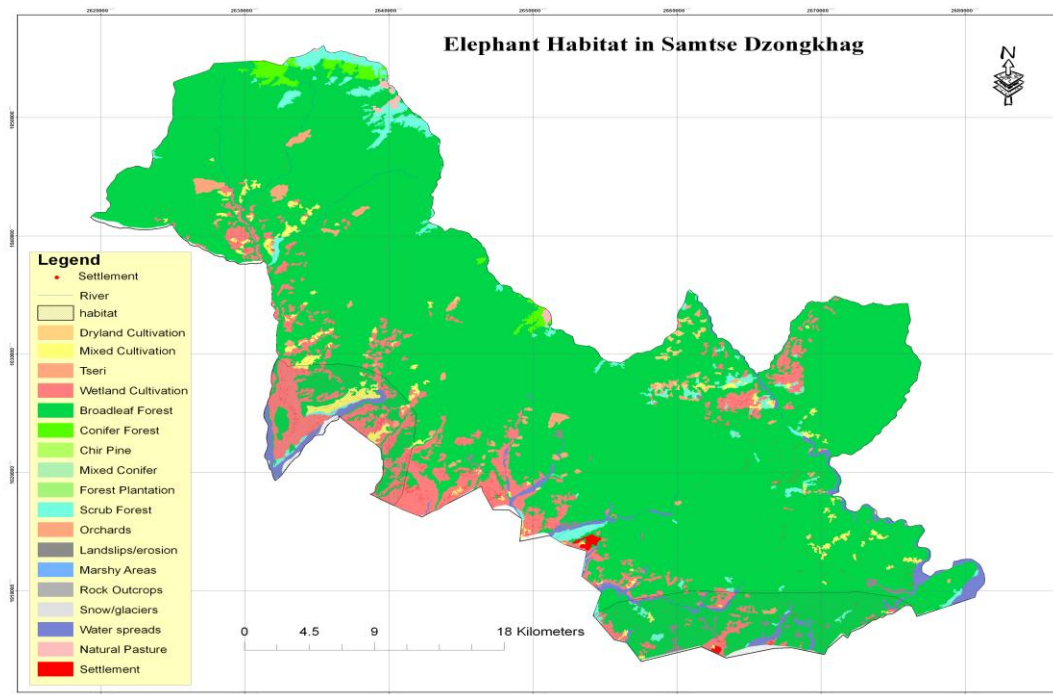
Fig 3: Elephant distribution in Samtse Dzongkhag
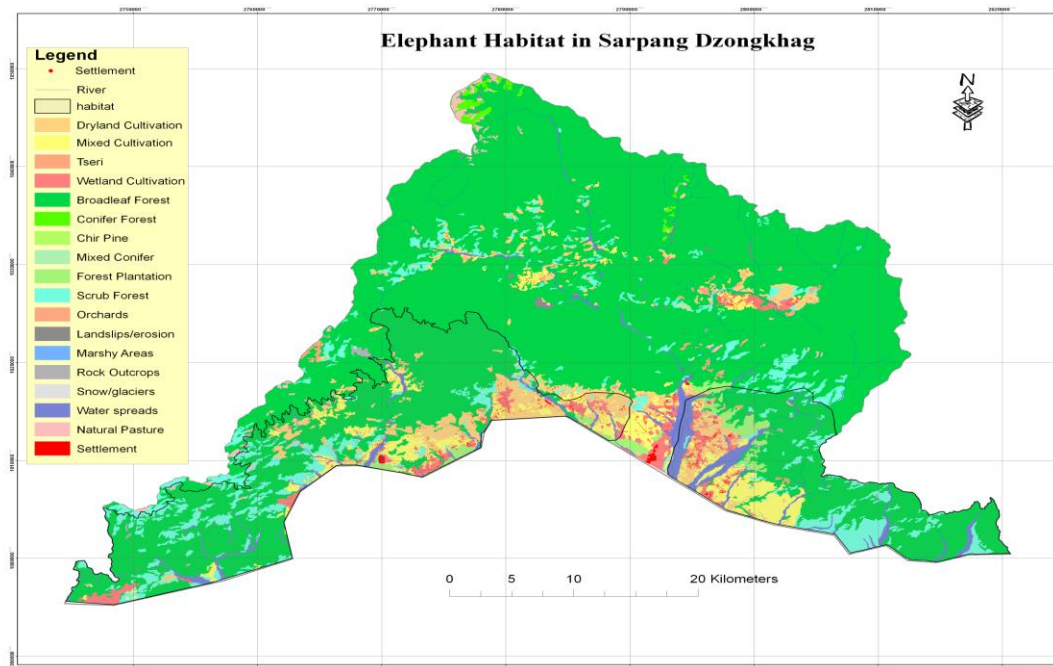

Fig 4: Elephant distribution in Sarpang Dzongkhag

Methods:

Prior to field survey the field staff were trained in data collection

   a. A standard grid size of a 5x 5 Km was used for the survey across the entire
       elephant habitat. Each grid square was treated as a sampling unit and 30% of
       the grid squares overlaying the site were randomly selected for surveys. The

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size of the grid was based on resources (including staff), logistics and time available. Ideally as this is a country wide sampling there is a need to have a size that is large enough to reduce the number of sampling units and at the same time small enough to ensure that data is not too coarse

b. The base of the grid was aligned with the southern boundary of the sampling area. The outer edge of the grid (on the northern, eastern and western sides) was extended by one cell in each direction beyond the known current range/ distribution of elephants, to ensure that we were not missing areas on the periphery where the elephants' range may extend beyond the current known range (the current known range is not a well established boundary and there could be expansions in range in some areas and contractions in others).

Fig 5: Training of field staff in data collection for elephant survey at Sarpang Dzongkhag

c. Each selected cell was sampled using a reconnaissance transect (recce-transect).

   i. Transects do not follow a straight line but follow a predetermined direction that is designed to sample the diversity of the habitat contained within the grid.

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d. A general pre-planned direction and path of movement was followed, using game/ animal trails and paths that are easy to traverse.

e. Each transect was a minimum of 4km long (unless the terrain was very difficult and logistics do not allow a 4km long transect).

f. On each transect the following data was gathered on the number of dung piles sighted and at each such sighting data on habitat and terrain (slope) was also gathered. In addition ad hoc data on other elephant signs like tracks and feeding (debarking of trees) were recorded.

g. Data collection on transect

    i. Dung

        1. Only one person on the team made an observation and all dung piles sighted by that person alone were recorded to avoid biases due to observer. When others see additional dung when walking away from the transect (e.g. when going to measure the perpendicular distance) they were recorded only if the main observer can actually see and indentify them as elephant dung piles easily from the line. There should be no pointing to dung or assuming that the pile can be seen or moving around the line to try and see the other pile(s).

        2. All dung piles recorded were recorded as frequencies

        3. The perpendicular distance to the dung pile was measured. As transect is not straight line the perpendicular distance was measured from this imaginary line. By following this pattern we estimated the dung density which in turn will allow comparison between different areas.

        4. GPS location was recorded at each dung pile

        5. Habitat (vegetation type) and terrain (slope) were recorded at each dung pile (or a cluster of dung piles at anyone location)

    ii. Demographic data

        1. When any herd or male was sighted the following data were recorded.

            a. Number of animals seen – if the entire herd cannot be seen then record the number of elephants seen and then

add "+" sign to the number indicating that there were more animals (e.g. – 4 elephants are seen feeding at the edge of the forest and there are noises and movement inside the forest indicating that there are more elephants inside – record it as 4+)

b. When there is good visibility then the age and sex composition of the herd were recorded under these categories calf, juvenile, sub-adult and adult.

c. For males also recorded if they are makhanas (males without tusks) or tuskers

iii. Track/ transect route

1. The track mode in the GPS was used to mark all routes along with GPS locations of all dung piles.

iv. Major features or features that could affect elephants (vegetation, streams, terrain) that are observed were noted.

v. Data on elephant signs – tracks and feeding:

1. Tracks: tracks were recorded as fresh or old. In addition it was noted that if they were made by a single elephant or a herd. Where possible a few tracks (fore foot which is circular in shape) were measured (either circumference or diameter. The GPS of locations recorded.

2. Feeding signs: Clear signs of feeding were recorded and the GPS reading noted. The tree species fed on were recorded

3. In case of any confusion about the age of the dung photos were taken and in any confusion about the number of dung piles number of boli were recorded (Boli is a piece of elephant dung). Difference in boli sizes (greater than 15% in the circumference) was considered the boli from different elephants.

vi. Data on elephant distribution from villages and villagers:

1. Whenever villages or villagers were encountered at the time of transect walk data on elephant distribution and villages' seasonal activities were gathered from villagers.

2. In addition a separate data sheet was used to collect data on HEC.

Whenever villages fell in the sample grid they were visited and data collected.

Assessment of elephant population size and trend was estimated employing established dung-count survey methods (Barnes & Jensen 1987; Dawson & Dekker 1992; Barnes 1993, 1996; Barnes et al. 2001; Hedges & Tyson 2002; Hedges et al. 2005; Hedges & Lawson 2006).

In order to estimate elephant population density from the transect data on dung-pile assumptions of elephants' defecation (dung production) rates and dung-pile decay rates (strictly speaking, disappearance rates) were necessary. Following the recommendations given in Hedges & Lawson (2006), a mean defecation rate of 18.07 defecations per 24 hours with standard error 0.0698 was used for the Bhutan elephant survey. Since dung decay experiments are costly standard decay rates established at Manas Tiger Reserve (Jyothi Prasad Das & Bibhuti P. Lakhar, *unpubl. Data*) was used. All analysis was done using a DISTANCE program (Thomas et. al 2010) by Jyothi P. Das and elephant densities estimated by Dr. A. Christy Williams (WWF AREAS Program).

Results:

Elephant density in Samtse and Sarpang is estimated at 0.641 elephant/ sq. Km with a 95% CL of 0.038 elephant/sq. Km to 2.246 elephant /Sq. Km. Given this density presence of about 490 elephants have been estimated for a total area of 775 sq. Km in Samtse and Sarpang. Samtse alone is estimated to have about 110 individuals where as Sarpang area i.e. Sarpang Range & Phipsoo Wildlife sanctuary together have approximately 380 individuals.

*Table 1: Dung density in Samtse & Sarpang elephant habitat*

	Uniform+ Cosine	Uniform+ Simple Polynomial	Half normal+ Cosine	Half normal+ hermite Poly	Hazard rate
f(0)	0.497	0.43	0.52	0.37	1.3638

Density (km sq)	1382.9	1200.9	1448.5	1031.1	3788.5
CV (%)	61.43	61.29	61.39	61.3	78.45
Upper CL	4853.5	4210.8	5082.2	3615.4	15706
Lower CL	394.03	342.5	412.84	294.05	913.84
Chi square	47.76	54.4	45.45	92.63	31.53
p	0.33	0.38	0.31	0.44	0.1222
AIC	558.32	558.33	555.54	585.93	535.43

Ouput 3: Reduced incidences of crop and property damage

Activity 3.1: Solar electric fence

In line with the "Bhutan National Human-Wildlife Conflicts Management Strategy, 2009"
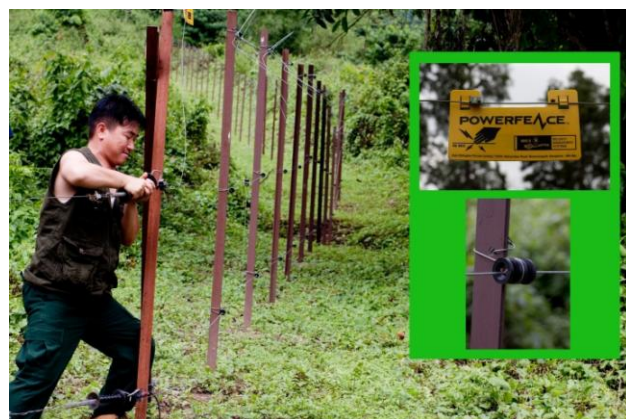
immediate mitigation measures were provided to the farmers in 2009-2010. Effort was made to make all the mitigation measures as community based initiatives.

Fig 6a: Electric fence in Senge, Sarpang Dzongkhag

Learning from the success and failure of solar fencing at Sipsu (Samtse Dzongkhag and Umling (Sarpang Dzongkhag, further pilot study was carried out in Senge Gewog, Sarpang Dzongkhag. A high standard solar fencing was erected using iron post and 3 strands of wire instead of 1 strand and wooden post as in earlier case. The 4.5 km solar fence covering an area of 271.19 acres had a part funding support from the UNDP. Since the construction of the fence last year, the people of Senge Gewog have started growing crops, and subsequently field report cited success in keeping elephants away from the fields. 50 households consisting of 340 people have benefitted from this mitigation measures.

Additional support to solar fencing at Umling: 2.57 Km solar fencing has been provided to Umling geog. The initiative benefits more than 420 households in five villages of Tashithang, Thongjazor, Dangling, Chubarthang and Dumgmin. The fencing

was erected in 2007. In 2010, an addition financial support from WWF helped resolve the immediate constrains faced by the community. The wooden posts were replaced with iron posts in the existing 2.57 Km old fence. Additional 2.3 Km fence was erected covering the main elephant entry points. In Tashithang village (who maintains fencing power supply) one set of 12 V lead battery was replaced, and an inverter further facilitated charging of battery using electricity, especially during monsoon when sky remains overcast and charging of battery by solar panel is incomplete.

Activity 3.2: Procurement of equipment for mitigation measures

In order to monitor elephant and aid mitigation of the HEC basic field equipment were provided to forest field offices at Gedu, Samtse, Sarpang, Samdrupjongkhar, Royal Manas National Park and Phipsoo wildlife sanctuary. (Table 1).

Table 2: Distribution list of equipment to field offices

	GPS	Binoculars	Search Light	Camera	Rugged Shoes	Field Bag
Gedu Territorial Division	1	1	0	1	2	2
Samtse Territorial Division	1	1	3	0	1	1
Sarpang Territorial Division	1	2	2	1	2	2
Samdrupjongkhar Territorial Division	0	0	1	0	2	0
Phipsoo Wildlife Sanctuary	1	1	1	0	1	0
Royal Manas National Park	0	1	1	0	1	1
WCD	1	1	3	0	1	0
Total	**5**	**7**	**11**	**2**	**10**	**6**

Activity 3.3: Consultative meetings held in 3 Dzongkhags.

Consultative meetings were held with stakeholders from three dzongkhags of Samdrupjongkhar, Sarpang and Samtse to identify effective management options to address the HEC. The objective of the consultative meeting was to discuss on the mitigation measures involving communities such as community crop guarding and crop insurance scheme.

The meeting was lead by the Chief Forestry Officer, WCD and elephant focal persons from the respective Territorial Divisions. Dzongkhag Agriculture, Livestock officers, Gups (Head of village) and communities actively participated in the meeting.

3.3.1: Consultative meeting in Samdrupjongkhar

A meeting was held in Sumdrupjongkhar with communities from geogs of Samdrupcholing, Jomotsangkha and Nganglam. The communities pointed out elephants, wild pig, tiger, leopard, deer and monkey as the main wildlife pests that raid crops, predate on livestock and damage properties. The losses over past three years sustained due to elephant were narrated as follow:

- Two women were killed and two were injured
- 21.30 acres of paddy raided by elephants
- 142 beetle nut trees damaged
- 2.35 acres of ginger field destroyed
- 2 semi permanent houses, a temporary hut and a kitchen were damaged
- A house hold items worth Nu 15,850 were damaged and 1,500 kg of stored maize were consumed by the elephants

Other damages were related to tiger (6 livestock killed); wild pig (61.5 acres of maize); and deer (debarking of citrus trees).

i) **The current mitigation measures practiced by communities included:**

- Lighting of fire and shouting Use of fire crackers
- Beating of empty vessels to produce loud sound
- Performing rituals

- Use of light and sound repellent
- Physically chasing away with support from forestry personals

Different methods of driving elephants have their own advantages and disadvantages and effectiveness. Following are the some of the recommendations/ requests that communities have made that might be useful to check HEC:

- Communities should be allowed to posses *Khandua* (locally made rifle) to shoot wild pig and also to fire blank shots to scare away the elephants.
- Establish compensation scheme for loss of lives, damage of property, depredation on livestock and raiding of crops.
- Approval to clear-off forests in and around the proximity of settlements
- Supply of effective and efficient field equipment to forestry personal to assist communities in driving away elephants from the village and fields.
- Digging trenches around the periphery of agriculture fields to keep away the elephants.
- Relocation of isolated settlements from the middle of the forest. The communities of Nunai, Deorali and Katarey village under Samrang Geog are interested in relocate themselves.
- Development of water holes and salt lick away from the village to prevent elephants from entering into village.

There was a general consensus among the villagers that the population of the elephants has increased in comparison to past many years which was evident from frequent sightings and regular raiding of crops. The cause of the conflict as believed by the farmers was mainly due to habitat fragmentation and food shortage.

3.3.2: Consultative meeting in Samtse
The consultation meeting in Samtse was held in Sipsu Geog with wider participations from the communities of Sipsu Gewog and officials from Dzongkhag, Forest Territorial Division and Range offices.

The communities from Hangay village expressed both successes and failure of solar fencing and sound and light device. Poor maintenance, damage by elephants, non-weather proof and low audibility were identified as the main factors of poor performance of solar fencing and sound and light devices.

3.3.3: Consultative meeting in Sarpang

In Sarpang a consultative meeting on human wildlife conflict was conducted in three affected geogs of the Senge, Dekiling & Shompangkha on June 1 and 15, 2010 respectively.

The communities of Senge gewog expressed their gratefulness to the department and donor agencies for constructing 4.5 KM solar fencing along the border of Senge village. Although it is too early to talk about the effectiveness of the fence it was evident that elephants were successfully kept away from the fields ever since the fence was erected. The communities of Senge geog have started to grow crops after almost a decade and were able to harvest the maximum yield.

Fig 7: Community Consultation meeting

The communities were also made aware of the success and the failures of solar fencing elsewhere. The measures were discussed on how such initiative can be made efficient and effective. Based on the common consensus of the participants the following activities have been agreed:

i. Construction of shade to protect solar fencing controlling unit

The communities have agreed to construct weather proof shade with CGI roofing for the controlling unit. As of now the unit is mounted in an open area (fig.8), which may result in leakage of water into the box and possibly damaging the parts.

Fig 8: Solar penal and controlling unit

ii. Clearing of bushes along the fencing.

The floor (width 1.5m) of the fence must be kept free from bushes and creepers to prevent current leakage and increase efficiency. It was therefore decided by the communities that a person from each household will from time to time participate in bush clearing along the fence line. It was proposed that an attendance register will be maintained and absentees shall be fined as per the decision of the committee. The money collected as a fine will be used for maintenance work.

iii. Sign Board

Since the erection of fence several people were electric shocked by the fence and hence during the meeting it was decided that signboards with proper cautionary message to warn people of the danger will be placed at the entrance and exit of the

area. Since communities does not fund provision for such activities the concerned organization were requested to fund such activities.

iv. Additional fence

The communities have requested for additional fence of 2 Km to block all possible elephant's route, especially from Tung Khola and Senge Khola. After the construction of the existing solar fence, it was observed that elephants entered the village through unfenced area of Tunga & Senge Khola. Elephants entering from these locations not only raid crops, but at the time of leaving they were unable to find the exit, and under the state of panic they end up destroying whatever came in their way. The concerned government agencies are requested to look for more such external supports.

v. Capacity building for solar fence care taker

The communities have nominated Mr. Monu Rai and Mon Bahadur Chhetri of Senge Gewog as a fence care taker. Their regular duties included to patrol area to check breakage of solar fence strand, damage to fence, operate the power and carry out the maintenance work. Till date the damage to fence was repaired by them without seeking expert support and hope to do so with acquiring proper maintenance training on solar/ electric fence.

vi. Spare parts for regular maintenance

The fence is frequently breached by the wild elephants and requires continuous maintenance. The left over spare parts and wires issued to community are almost used up. The community is not in the position to purchase such spare parts and at the same time the need to stock up such parts is urgent to avoid further damage to the fence. They have requested the concerned department to explore fund for maintenance activities and purchase of spare parts.

Table 3: Maintenance parts

SI No	Parts required
1	HT wire
2	Joint clamps
3	Spring tighter
4	Permanent tighter

Fig 9: Gedu Elephant Habitat

Output 4: Monitoring and Site Maintenance in Gedu

Activity 4.1: Monitoring of the elephants in Gedu

Gedu share a porous border with neighboring Indian state of West Bengal and without regular patrolling and monitoring it is likely that resident elephants at Gedu could become an easy target to poachers along the Indo-Bhutan borders. With support from this project two Division staff were deployed permanently in the area for close monitoring of the elephants' movement, health, reproduction and their habitats.

Fig 10: Dry water hole at Gedu Elephant Habitat (winter)

Activity 4.2: Maintenance of the salt licks, water holes and trails.

The following actions were undertaken under the project to provide adequate interim measures to this isolated population of elephant in Gedu:

1. Area demarcation
2. Maintenance of trails, water holes and salt licks
3. Fodder plantation

The WCD in collaboration with Gedu Territorial Division has surveyed the entire elephant distribution at Gedu and accordingly demarcated the habitat. The present 8 elephants at Gedu now have maximum available habitat of 34.44 sq.km. To conserve water for the drinking and wallowing during the dry season, a masonry wall of 21m x 2.1m x1m was constructed at Singhi. Four additional natural water holes were renovated and a 5km patrolling trails maintained
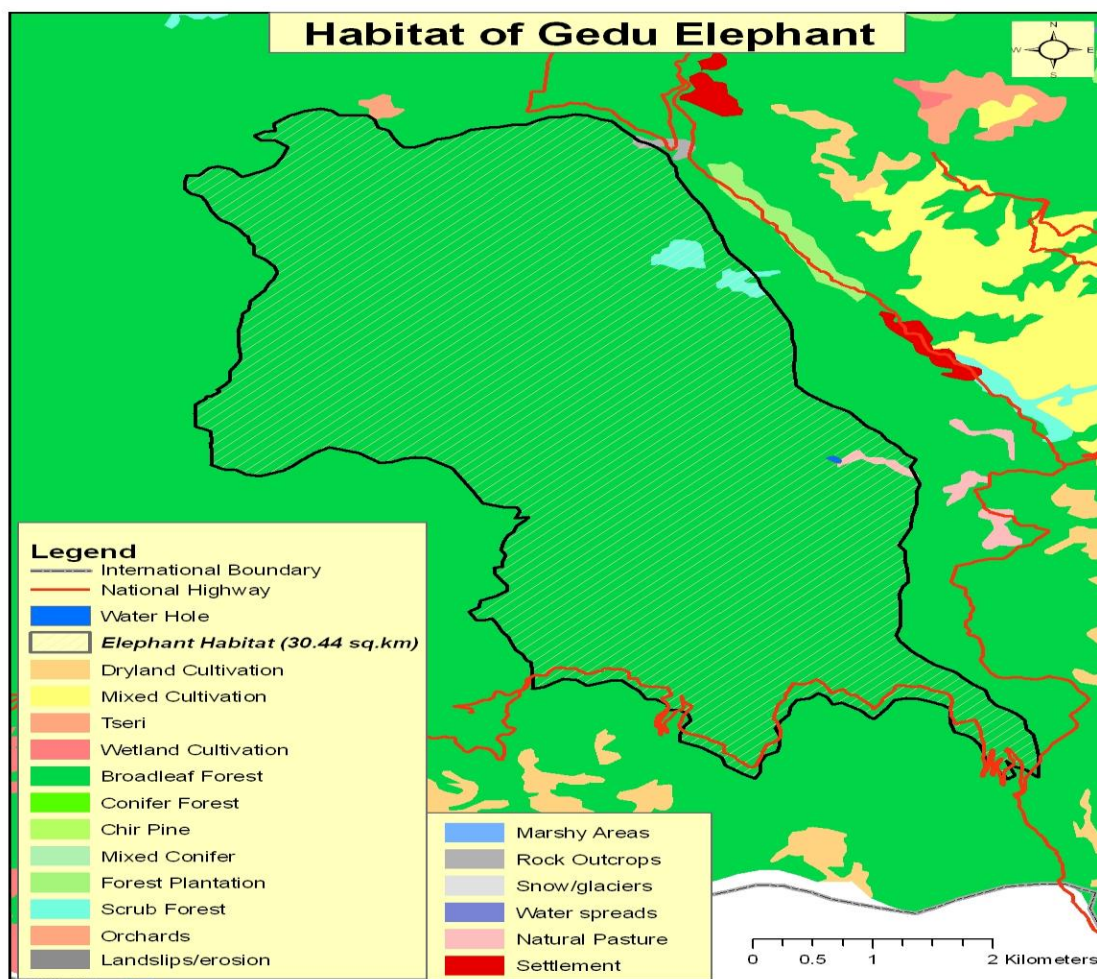
Fig 11. Elephant Habitat in Gedu

Table 4: A list of equipments procured for elephant habitat maintenance

Sl No	Tools	Nos	Remarks
1	Sickles	8	purchased
2	Crowbar	2	-do-
3	Spade	8	-do-
4	Shovels	8	-do-
5	Pick axe	5	-do-
6	Axe	2	-do-
7	Hammer (3 Kg)	3	-do-
8	Dressing hammer	5	-do-
9	Chisel	5	-do-
10	Patang	5	-do-

Activity 4.3: Purchase of seeds and seedlings for enrichment of existing plantation

Considering the limited size of natural habitat, the existing fodder species within the boundary of available habitat were maintained by clearing off unwanted bushes and climbers. The barren and degraded areas were replanted with the following fodder species:

   a. Nepier stump planting
   b. Napier seedling
   c. Wild ginger (Chrumpho)
   d. *Ficus* species
   e. *Erythrina* species (Phalado seed sowing)
   f. Willow stump cutting
   g. *Thysanolaena* (Amlisho)
   h. Banana rhizome

Conclusion:

Over the next subsequent years, we will continue working with our donor partners and the local communities to gather more scientific information and better understand the complexity of the elephant-human co-existence, and show community based elephant conservation as an effective strategy to conserve elephants in Bhutan.

ACKNOWLEDGEMENTS

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