

Original Research Article

Community Perception, Damage Assessment and Mitigation Strategies of Human–Elephant Conflict in Goalpara District of Assam

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Abstract: Goalpara district of Assam is widely known for human-elephant conflict. The four Forest Range offices-Goalpara Sadar Range, Central Range of Krishnai, Rangjuli Range and Lakhipur Range are involved in forest conservation and conflict mitigation activities in the district. The present survey was conducted across these four ranges of Goalpara district using questionnaires and interviews. The study examines the severity and impacts of human-elephant conflict, community perceptions of elephant behaviour and administrative initiatives for conflict mitigation and elephant conservation. Among the participants, 72.2% perceived elephants as a source of fear and the remaining 27.8% viewed elephants as indifferent animals and considered coexistence with elephants possible. The major impacts of human-elephant conflict included crop damage (64.2%), property damage (13.6%), livestock loss (6.8%), psychological fear (5.6%) and physical injuries (3.7%), while 6.1% reported no elephant-related damage. In addition, 4.3% of respondents reported the loss of family members, while the remaining 95.7% were aware of human-elephant conflict in the area. Official records showed 159 male and 77 female deaths due to elephant attacks in the district between 2011 and 2025. The conflict has also affected the elephant population, with 56 elephant deaths recorded between 2010 and 2025 across the four ranges. These deaths were mainly attributed to electrocution, other human-induced causes and natural death. Integrated measures, such as low-current solar-powered electric fencing, plantation of elephant-preferred food species, eviction of forest encroachments, awareness programmes, and safe deterrent use can help mitigate human-elephant conflict while supporting elephant conservation.

Keywords: Afforestation, community, damage, conservation, human-elephant conflict, mitigation

Introduction

The Asian elephant (*Elephas maximus*), categorised as Endangered in the IUCN Red List, faces a declining population primarily due to widespread habitat loss and fragmentation (Williams *et al.*, 2020; Luo *et al.*, 2022). India is home to approximately 60% of the world's Asian elephant population (Williams *et al.*, 2020). The estimated number of this endangered species remaining in the wild worldwide is 48,323–51,680 individuals, and the most recent estimate for India is 22,446

individuals (range: 18,255–26,645) based on the DNA-based Synchronous All India Elephant Estimation (SAIEE) (Qamar *et al.*, 2021–2025).

Northeast India, particularly Assam, is recognised as a critical region for conservation of the Asian elephant (Baillie *et al.*, 2004). The North Eastern Hills and Brahmaputra Flood Plains are home to an estimated 6,559 elephants (95% CI: 5,444–7,680), with approximately 41,000 square kilometres of habitat (Project Elephant

Synchronised Census, 2002; Daimary and Deka, 2025). The elephant population is highly fragmented, occurring in discontinuous habitat patches (Qamar *et al.*, 2021–2025). Elephant distribution spans the Himalayan foothills, stretching from northern West Bengal through Assam, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura and Meghalaya. Notably, regions in the South Bank and western Assam (including parts of Meghalaya) still support relatively large elephant populations (Choudhury, 1999). Assam has an estimated 4,159 (95% CI: 3,395–4,924) wild elephants, representing about 19% of India's total and 8–9% of the global population (Project Elephant Synchronised Census, 2002; Sukumar, 2003; Qamar *et al.*, 2021–2025).

However, the rapid growth of the human population is leading to habitat degradation through forest encroachment, widespread poaching, logging, unsustainable extraction of forest resources and agricultural land expansion, which is creating human–elephant conflict (Kushwaha and Hazarika, 2004; Fernando *et al.*, 2005; Wilson *et al.*, 2015; Luo *et al.*, 2022).

The human–elephant conflict in Assam has become a seasonal occurrence, marked by substantial crop loss, property damage, and human fatalities, which often leads to retaliatory killings of elephants (Gureja *et al.*, 2007; Talukdar *et al.*, 2024). Goalpara district in Assam is a clear example of the difficulties caused by human–elephant conflict. The elephant corridors between Goalpara district of Assam and the border state Meghalaya facilitate elephant movement into human settlements where they feed on crops, damage homes, and contribute to rising pressures (Daimary and Deka, 2025). Large areas of forest in Goalpara have been converted to farmland and the remaining forest patches are often fragmented and degraded (Hazowary and Baruah, 2025). Elephants find refuge in these small areas and nearby tea plantation areas as they cross the landscape (Wilson *et al.*, 2015). Crop raids and property damage in Goalpara exhibit seasonal patterns, indicating predictable movement and conflict trends (Wilson *et al.*, 2015; Nath *et al.*, 2022). In Goalpara, the issue is being handled

by four forest ranges: Goalpara Sadar Range, Central Range of Krishnai, Rangjuli Range and Lakhipur Range (Medhi, 2021).

Community-based approaches are essential for reducing human–elephant conflict. Positive attitudes towards elephants and active participation of local communities in conservation efforts can make long-term measures, such as habitat protection, more successful. However, for these initiatives to be effective, a thorough understanding of conflict dynamics, at both the community and regional levels, is important (Wilson *et al.*, 2015). This preliminary study is based on a detailed survey within the four forest ranges and evaluates the patterns of human–elephant conflict over the past decade, with emphasis on public awareness and how well conflict-mitigation measures are working.

Materials and methods

Study Area: Goalpara district, located in western Assam, covers an area of 1,824 km² and lies between 25°53'2" to 26°30'2" N latitude and 90°07'2" to 91°05'2" E longitude (Fig. 1). It shares its southern boundary with the forests of the East Garo Hills district of Meghalaya, which influence wildlife movement, particularly that of elephants. Goalpara district has four forest ranges: Goalpara, Central Range of Krishnai, Rangjuli and Lakhipur, which are involved in maintaining forest resources and biodiversity, monitoring human encroachment and managing human–elephant conflict. The district consists of 829 villages and had a population of around 1,008,959 as per the 2011 Census, resulting in a population density of approximately 553 persons per square kilometre. Of the total 1,824 km² area, Goalpara district has 36,915.27 hectares of forest cover and 10,200 hectares of cultivable land.

Data collection: A survey was conducted among 162 individuals in Goalpara district, Assam, during 2024–2025. The respondents included both males and females from different occupational backgrounds, including students, service holders, businesspersons, homemakers, and farmers (Fig. 2D–G). The survey involved interviews at 51 different sites such as

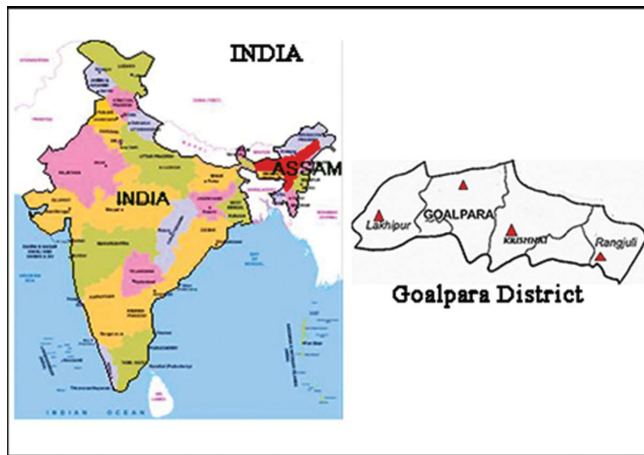


Fig. 1. Map of the study site- Goalpara district of Assam, India; highlighted regions indicate the study sites: Goalpara Sadar Range, Central Range of Krishnai, Rangjuli Range and Lakhimpur Range. (Map source: <https://lotusarise.com/maps/india-map/>, <https://www.Mapsofindia.com/maps/assam/districts/goalpara.htm>)



Fig. 2. **A:** An elephant herd in a paddy field at Urpada Beel, Agia, in September 2023; **B:** an elephant herd in a paddy field at Darangiri in 2023; **C:** elephants consuming rice straw at night, as recorded by local villagers of Duhikata village in December 2024; and **D–G:** community survey conducted in Goalpara district, Assam.

Amjonga, Bakhrakhuti, Bakrapur, Athiabari, Baksalpara, Batabari, Belpara, Bhandra, Barmatia, Budalong, Deosila, Damra, Dhupdhara, Dudhnoi, Dwarka, Habanggiri, Jakhowapara, Kahibari, Kasumari, Kathakuti, Gathiapara, Makalipara, Kherpara, Khungkhranjani, Lakheraj Mandalgram, Laskerpara, Mariampur, Moish khulipara, Panditpara, Pachim Kathiapara, Pub Kathiapara, Puranipita, Rangjuli, Rowmari, Madang, Saoraghat, Sarapara, Shilluk, Tengabari, Thekashu, TENGASOT, Bodahapara, Bamunpara, Khakshipara, Kalyanpur, Meselkhuwa,

Borjhar, Udaipur, Chesa Jhora, Patpara Pt-iii and Dheniabari in Goalpara district using an open-ended questionnaire. The interviewees were aged between 16 and 75 years, and were selected for their experience and knowledge of human–elephant conflict in the region. Additionally, details of human and elephant deaths due to conflict were collected from the Rangjuli Forest Range Office and the Office of the Divisional Forest Officer, Goalpara Forest Division.

Result

Among the respondents ($n=162$), 39.5% were male and 60.5 % were female. In terms of occupation, 35.8% were students, 16.7% were involved in business, 14.8% were employed in government or non–government jobs, 22.8% were homemakers, and 9.9% were farmers. Of the 162 individuals surveyed, 62.7% reported having paddy farms, regardless of their primary occupation.

The respondents were aware of human–elephant conflict and 87.7% had personal experiences with elephants. Among the respondents, 64.2% reported crop damage, followed by property damage (13.6%), livestock damage (6.8%), psychological effects (5.6%) and physical injuries (3.7%), while 6.1% reported that elephants had not harmed them in any way. In addition, 4.3% of respondents reported the loss of family members, while the remaining 95.7% were aware of human–elephant conflict in the area. When asked about their perception of elephants, 72.2% considered them dangerous, whereas 27.8% viewed them as indifferent animals and believed that coexistence with elephants is possible. Additionally, 73.3% of respondents were aware of the involvement of local authorities in monitoring the issue.

Elephants commonly enter villages in search of food and mainly feed on paddy, young bamboo leaves, sugarcane, banana and other fruits and vegetables (Fig. 4). They arrive in the evening to feed on crops, remain overnight, and then move to a new location early in the morning. Elephants were also observed feeding on paddy during the daytime from October to January, before or during harvesting. Herds comprising 6–20 elephants were

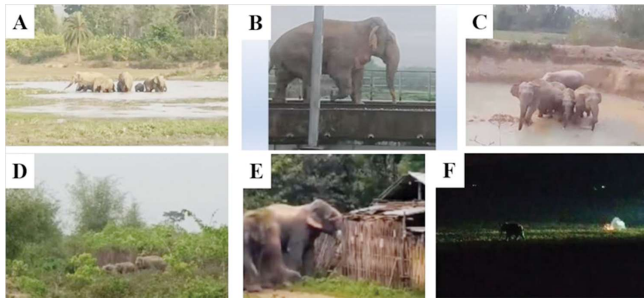


Fig. 3. **A**, A group of elephants bathing, drinking water, and cooling off in a pond at Solmari in September 2024; **B**, a wild elephant on the newly constructed Harimura Railway Bridge in Goalpara in May 2025; **C**, elephants bathing in a pond at Rangjuli in 2024; **D**, elephants feeding on bamboo leaves in Rangjuli; **E**, an elephant damaging a house in Goalpara in 2020; and **F**, elephants being driven away from human settlements using firecracker deterrents in Bolbakra village, Agia.

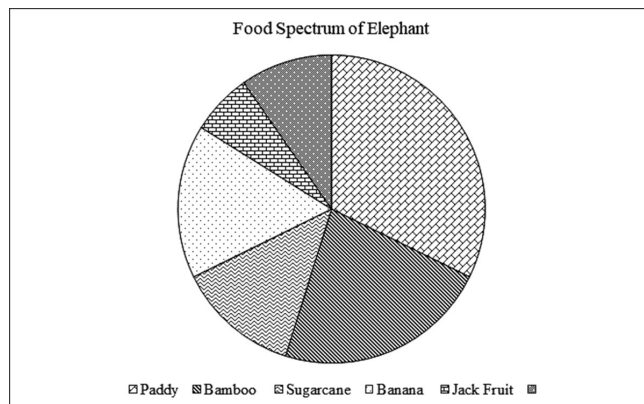


Fig. 4. Food spectrum of elephants recorded during the survey in Goalpara district, Assam.

most frequently observed in the region, as reported by 52.5% of respondents, followed by herds of 6 elephants (33.3%) and herds of more than 20 elephants (11.7%) (Fig. 3, 4). Among the respondents, 84% had observed both calm and aggressive behaviour in elephants, while 10.7% witnessed only peaceful behaviour and 5.3% witnessed only aggressive behaviour when elephants appeared in residential areas and paddy fields. According to villagers, elephants usually become aggressive when disturbed by humans or when an elephant is accidentally separated from its herd. In such situations, the elephant may become restless and damage crops or property. Additionally, after harvesting paddy, elephants enter residential

areas in search of food and frequently raid paddy storage houses (locally called *bharal*). Villagers use fireballs, high-voltage torches, and firecrackers to evacuate them, save the paddy and the paddy-storing house—*bharal*. However, this occasionally led to conflict.

According to 17.9% of respondents, they had become accustomed to elephant incursions. However, villagers who had experienced serious damage, such as destruction of houses and crops, damage to cattle sheds, major property loss, or the loss of family members in the conflict, considered elephants dangerous. Such experiences also caused psychological stress among affected families. Economic losses have prompted young people to pursue various business ventures rather than farming. Some farmers have shifted their interests from paddy cultivation to cattle farming and rubber plantations, as elephants do not eat rubber plants (respondent from village – Budalong). Meanwhile, some people view elephants as nature's spirits or divine entities, so they bow to them and avoid causing disturbance. For others, minor crop damage or occasional elephant visits have become negligible. They have started to believe in coexistence with elephants. In the Kahibari locality, to reduce conflict and protect seasonal crops, especially paddy, from elephant damage, locals planted separate patches of crops between the main paddy field and the elephant territory to feed the elephants. This strategy proved effective in such villages, where elephants eat from the designated area and do not engage in destructive activities. While 73.3% of respondents acknowledged the involvement of local authorities, all respondents considered human–elephant conflict a critical issue and 97.3% expressed interest in participating in awareness programmes to address it.

Across the four ranges, 236 human deaths due to human–elephant conflict were reported between 2011 and 2025. During this period, the highest number of incidents was recorded in Goalpara Sadar Range, with 94 deaths (39.8%), followed by Rangjuli Range with 59 deaths (25.0%), Central Range of Krishnai with 42 deaths (17.8%),

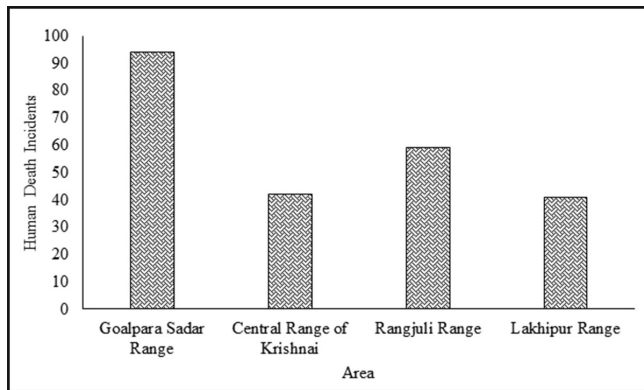


Fig. 5. Human death incidents due to human–elephant conflict in Goalpara Sadar Range, Central Range of Krishnai, Rangjuli Range, and Lakhipur Range of Goalpara district, Assam, during 2011–2025.

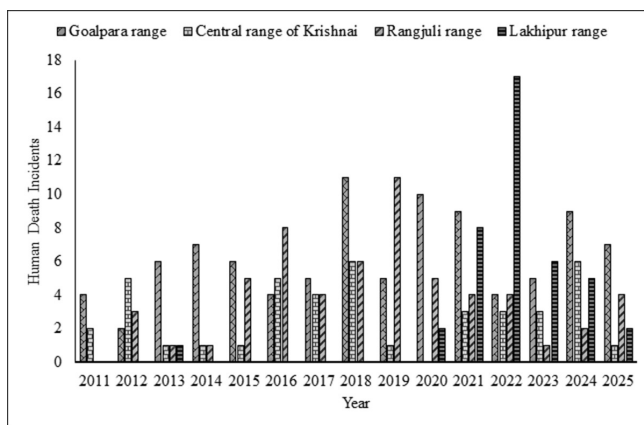


Fig. 6. Year-wise graphical presentation of human deaths due to human–elephant conflict in the Goalpara Sadar Range, Central Range of Krishnai, Rangjuli Range, and Lakhipur Range of Goalpara district, Assam, during 2011–2025.

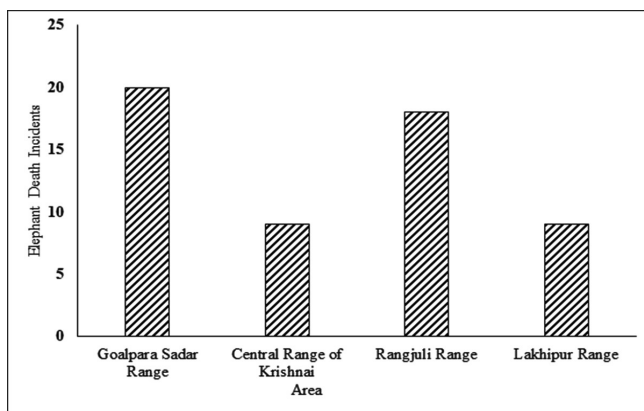


Fig. 7. Elephant death incidents caused by natural and human-induced factors in Goalpara Sadar Range, Central Range of Krishnai, Rangjuli Range, and Lakhipur Range of Goalpara district, Assam, during 2010–2025.

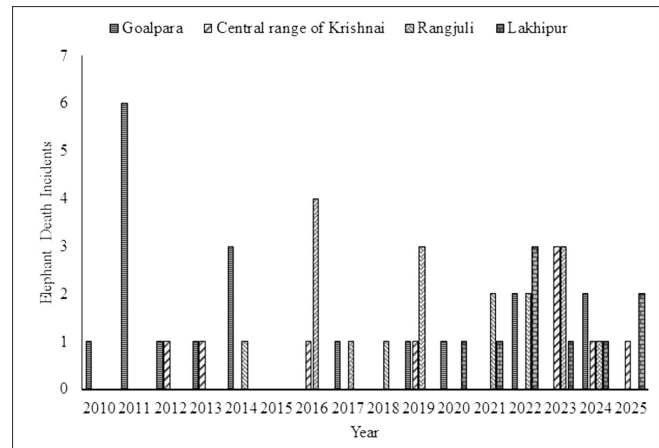


Fig. 8. Year-wise graphical presentation of elephant death incidents caused by natural and human-induced factors in Goalpara Sadar Range, Central Range of Krishnai, Rangjuli Range, and Lakhipur Range of Goalpara district, Assam, during 2010–2025.

and Lakhipur Range with 41 deaths (17.4%) (Fig. 5). Fig. 6 shows annual human deaths in conflicts across four forest ranges. Of the recorded incidents, 159 were males (67.4%) and 77 were females (32.6%). By age group, 189 cases were adults (92.2%), 11 were children (5.4%) and 5 were adolescents (2.4%).

Elephant deaths were also recorded, with 56 incidents reported across the four ranges between 2010 and 2025 (Fig. 7). Of these, 29 were males (51.8%), 24 were females (42.9%) and 3 were of unidentified sex/status (5.4%). By age group, 19 elephants were between 2.5 months and 10 years (33.9%), 7 were sub-adults aged 11–20 years (12.5%) and 15 were adults over 20 years (26.8%).

Fig. 8 shows that 20 elephants died in the Goalpara Sadar Range (35.7%), 9 in the Central Range of Krishnai (16.1%), 18 in the Rangjuli Range (32.1%) and 9 in the Lakhipur Range (16.1%). The death cause comprises natural deaths (33, 58.9%), accidental deaths (20, 35.7%) and 3 (5.4%) were in data-deficient condition. Within the accidental deaths, 15 elephants died due to electrocution (75%) and 5 elephants died due to human-induced causes (25%).

Discussion

Extensive forest encroachment in Assam, India, has increased human–elephant conflict (Wilson *et al.*,

2015). Elephants, once considered a symbol of harmony in nature, are now becoming a source of fear (Gureja *et al.*, 2007). The findings indicate that human–elephant conflict has had serious consequences for affected households, particularly through crop damage, property loss, livestock loss, and, in some cases, the death of family members. These observations highlight the multidimensional impact of human–elephant conflict, extending beyond economic damage to include fear, insecurity, psychological stress and loss of life. People who have experienced severe damage often perceive elephants as a source of fear, which may adversely affect their mental well-being. Government data revealed that each year, human life is lost due to conflict. During 2011–2025, Goalpara Sadar Range recorded the highest number of human deaths due to elephant attacks, with 94 cases, while Rangjuli Range ranked second, with 59 cases (Fig. 5, 6). On 29 October 2019, five people were killed by an elephant, named Laden, from 6.15 am to 10.30 pm (According to the Rangjuli Forest Office record, <https://scroll.in/latest/944072/assam-captured-relocated-elephant-dies-of-cardiac-arrest>, last accessed 10.11.2025). After the incident, the elephant was immediately translocated to Orang National Park, and a few days later, the elephant died due to cardiac arrest (<https://scroll.in/latest/944072/assam-captured-relocated-elephant-dies-of-cardiac-arrest>, last accessed 10.11.2025). Elephants are driven into conflict with humans, particularly in agricultural areas (Fernando *et al.*, 2005). The survey results also showed that conflicts often occur during the paddy growing time (August to October) and paddy harvesting time (November to December) and affect mainly people living near paddy fields. The present study revealed that human deaths caused by elephants occurred during paddy grazing in agricultural fields from August to December (57.41%) and during attempts by elephants to raid stored paddy from *bharal* (traditional granaries) (42.59%). Recent research indicates that human–elephant conflict predominantly takes place between dusk and dawn (Venkataraman *et al.*, 2005). Crop-raiding mostly takes place from late evening to early morning (Sitati *et al.*, 2003; Venkataraman *et al.*,

2005). The study (n= 39) revealed that most people were killed during night (41.0%), or during periods of low light, such as early morning/dawn (17.9%), and in evening/dusk (10.3%). People were also killed in the morning (17.9%) and afternoon (12.8%). The severity of conflicts includes damage to crops and farms or houses, injury to people, or, in extreme cases, killing them (Gureja *et al.*, 2007). A study by Daimary and Deka (2015) also reported the deaths of four men and one woman by elephant attacks from the Goalpara district. Retaliatory actions by humans often follow such incidents. Although no direct records of elephant killings were obtained, throwing boulders to injure them eventually disturbed their behaviour and indirectly harmed the elephants. Between 2010 and 2025, a total of 56 elephant deaths were recorded in Goalpara district, with ages ranging from 2.5 months to 50 years; of these, six deaths occurred in 2011 in the Goalpara Sadar Range, while elephant deaths were reported across all ranges in 2023 and 2024 (Fig. 7, 8). This is lower than earlier reports, which recorded 437 human and 175 elephant deaths in Assam due to the conflict in 1997 and 2001 (Gureja *et al.*, 2007). A recent study (2020–21) reported that the Goalpara district has an Asiatic elephant population of approximately 112–125 individuals (Daimary and Deka, 2025). In the present study, respondents reported witnessing elephant herds of more than 20 individuals, although herds comprising around 6 elephants were more frequently observed, particularly in Rangjuli Range. These herds mainly come from the Garo Hills, across the Assam–Meghalaya border to the north and south of the Brahmaputra, in Goalpara and Kamrup districts (Zimmermann *et al.*, 2009; Daimary and Deka, 2025). The destruction of forests in Goalpara, caused by anthropogenic activities, has resulted in food and shelter insecurity for elephants, compelling their movement from the hills into human settlements and thereby intensifying human–elephant conflict (Talukdar and Kalita, 2014; Daimary and Deka, 2025). The size of their home range varies with the availability of food, water and shelter (Sukumar, 2006). Goalpara is dominated mainly by sal (*Shorea robusta*) forests. The development of routes through the sal forest and the expansion of land for rubber,

tea and paddy cultivation in the surrounding areas are causing habitat destruction and fragmentation (Medhi, 2021). However, such monoculture cultivation is detrimental to biodiversity (Das and Hazarika, 2025) and directly or indirectly affects elephants. Additionally, railway lines, road construction and road upgradation have affected elephants and other animals, as two elephants died due to train accidents at Banglapara under Rangjuli Range on 6.11.2016 and 7.11.2016. The frequency and severity of conflicts were influenced by the presence of cultivated land and the proximity of towns and roads to elephant habitats (Sitati, 2003). The core reason is due to global loss of wildlife habitats and the growing human population; conflict between humans and elephants has escalated significantly (Sukumar, 2006).

To mitigate the conflict, all ranges have been actively involved either independently or in collaboration with non-government organisations in conducting awareness programs in elephant-prone areas (Elephant Research and Conservation Division and Aaranyak, 2025). The forest department has adopted several preventive measures to reduce human–elephant conflict in Goalpara district. Solar-powered electric fencing has been installed in areas such as Agia, Krishnai, and Dabli. These fences operate with a low electric current, making them a safer deterrent for elephants while preventing accidental harm. The fencing is regularly monitored and maintained by the Forest Department to ensure its effectiveness. As an additional strategy, plantations of elephant-preferred food species such as banana, jackfruit, sugarcane and bamboo have been encouraged to provide alternative food resources and help reduce crop raiding in nearby villages. To promote afforestation with elephant-preferred plant species and reduce human–elephant conflict, an eviction drive was carried out to clear encroachment from around 135 hectares of land in Paikan Reserve Forest in Krishnai Range, Goalpara district (<https://nagalandpost.com/forest-land-cleared-during-eviction-drive-in-goalpara/>, last accessed 28.08.2026). The drive affected around 588 families and officials confirmed that nearly 95% of

the alleged encroachers had already left voluntarily (<https://prime24seven.com/national/goalpara-set-for-eviction-drive-as-most-encroachers-vacate-forest-land-voluntarily/>, last accessed 28.08.2026). In addition, conservation measures for sal forests were implemented through the combined efforts of the local community and the government (Rabha, 2014).

Although awareness drives by governmental and non-governmental organisations on forest conservation, human–elephant conflict mitigation, and coexistence with elephants have been effective (Elephant Research and Conservation Division and Aaranyak, 2025), such programmes need to be conducted more frequently. This is important because most respondents prioritised personal safety (74.7%) over economic loss (7.4%) and elephant conservation–coexistence concern (17.9%). Nevertheless, 17.9% of respondents recognised that coexistence with elephants is possible. The locals were also involved in the mitigation system, cultivating additional crops for elephants, a strategy that later proved effective for coexistence. The Assam Haathi Project, established in 2004, is run by Chester Zoo and Eco-Systems-India (NGO) and aims to reduce human–elephant conflict in Goalpara and Sonitpur districts of Assam by promoting non-lethal deterrents to prevent elephants from damaging livelihoods (Defra, 2008; Francis, 2021). Zimmermann *et al.* (2009) described the usefulness of crop and property protection methods, such as 1) early warning systems, 2) barriers and 3) deterrents. However, during the survey, it was noted that electrocution occasionally injures both elephants and humans. In some cases, injuries became fatal and resulted in elephant deaths, with 15 such cases recorded. Daimary and Deka (2025) observed similar incidents and also reported the death of a young boy due to electrocution. According to many studies, spotlights are much more effective when used in combination with other methods: noise, fencing and chilli smoke (Zimmermann *et al.*, 2009; Francis, 2021). Knowledge of forested habitats and elephant refuges helps the local community understand the spatial and temporal patterns of crop – raiding and

elephant movements in the area through participation (Zimmermann *et al.*, 2009). Therefore, the present survey results are in concordance with Osborn and Parker (2003). According to them, mitigating human–elephant conflicts is a key focus of conservation and enabling local communities to take an active role in addressing the issue is considered one of the most sustainable strategies (Osborn and Parker, 2003).

Conclusion

The present study highlights that human–elephant conflict remains a serious conservation and socio-economic concern in Goalpara district, Assam. It has caused significant crop, property, livestock and human losses, while also threatening elephant survival. Integrated mitigation measures, including solar-powered fencing, elephant-preferred plantations, encroachment removal, awareness programmes and safe deterrent use, are necessary to reduce conflict. Strengthening these measures through coordinated efforts between forest authorities, local communities and conservation organisations can support both community safety and long-term elephant conservation.

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