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Economic impact of human-wildlife conflicts on agriculture-based livelihood in the forest buffer zones of Tamil Nadu

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Abstract
Human-wildlife conflicts are a concern in Tamil Nadu. Various species were responsible for the human-wildlife conflict, which includes elephant, tiger, leopard, wild pig, monkey, Indian Gaur etc., Study objectives were to assess cost value of crop/livestock loss incurred by farmers as well as to identify drives of human-wildlife conflicts and explore mitigation measures on agro-based communities of Tamil Nadu. Data collection was done using interview schedule administered to randomly selected 240 human-wildlife conflict affected farmers from top four Human-wildlife conflict affected districts of Tamil Nadu viz., Erode (human-gaur conflict), Coimbatore (human-elephant conflict), Krishnagiri (human-wild pig conflict) and Kancheepuram (human-monkey conflict). Majority (48.3%) of the elephant conflict respondents experienced losses which was in the range of Rs.25,001 and Rs.50,000, followed by 45.0 per cent of them suffered losses above Rs.50,001during the period of two years of study. The major losses created by the elephants on the farmers were recorded in paddy field followed by *ragi* (finger millet) and coconut. Nearly one-third of the respondents reported loss to their properties. Among the respondents, only one-fourth of them confirmed that they had lost property worth below Rs.10,000. Majority of the losses (88.3%) to property is with human-monkey conflict among all the four conflicts. Monkeys were more likely to attack children than adults, and when adults were attacked, they frequently attacked women.

1. Introduction

Human-wildlife conflict (HWC) is a significant issue in forest buffer zones, where human settlements and agriculture coexist with wildlife habitats. Wild animals are frequently forced into closer proximity with human settlements in search of food and space, thereby increasing the likelihood of conflict (Distefano, 2005) [4]. In Tamil Nadu, forest fringe communities rely heavily on agriculture for their livelihood, making them particularly vulnerable to wildlife-induced damages. Various species were responsible for the human-wildlife conflict, which includes elephant, tiger, leopard, wild pig, monkey, Indian Gaur etc.,(Sharma et al., 2021) [8] Human–wildlife conflict was traditionally viewed to occur 'when the needs and behaviour of wildlife impact negatively on the goals of humans or when the goals of humans negatively impact the needs of wildlife'. Human-wildlife conflicts (HWC) in Tamil Nadu's forest buffer zones have created significant economic challenges for agriculture-based communities, affecting crop production, livestock rearing, and overall rural livelihoods (Milda et al., 2023). [6] Tamil Nadu is experiencing a sharp increase in human-wildlife conflicts, with the 2024-25 fiscal year recording 80 human deaths - the highest in five years. Additionally, the state has documented 4,235 crop damage

incidents, 259 livestock deaths, 176 cases of property damage and 138 human injuries (Chaitanya, 2025a) [2, 3]. Wild pigs emerge as the most significant agricultural pests in Tamil Nadu, which accounts for 94.4% (3,117 cases) of all crop damage incidents and cause 13 human deaths and 161 injuries annually (New Indian express, 2025). Wild boar mainly targets groundnut (23%), paddy (19.9%), sugarcane (10%), maize (9.5%), tapioca (7.82%), banana (4.6%), and corn (6%) (Indian Express, 2025). The state's forest cover of 24.5% (below the national average) contains rich biodiversity, including a stable elephant population of 3,063 and a tiger population that has nearly quadrupled since 2005-06 to 306 individuals. This thriving wildlife, combined with expanding human settlements and agricultural lands, has intensified conflicts in buffer zones.
Despite this, there remains a gap in understanding the economic impact of human-wildlife conflicts on agriculture-based livelihood in the forest buffer zones of Tamil Nadu. This study aims to bridge that gap by assessing cost value of crop/livestock loss incurred by farmers as well as to identify drives of human-wildlife conflicts and to explore visible impacts of human–wildlife conflict and their hidden consequences.

Methodology

Among the 38 districts of Tamil Nadu state, the study was purposively carried out in Erode (human-gaur conflict), Coimbatore (human-elephant conflict), Krishnagiri (human-wild pig conflict) and Chingelpet (human-monkey conflict) district of Tamil Nadu state due to the high incidence of human-wildlife conflict in these districts on the basis of secondary data obtained from various sources. Farmers who had at least one wildlife conflict incidence in their lifetime were selected for the study. Sixty farmers were selected randomly from each district, thus a total of 240 farmers were selected from four districts for the study. Data were collected using semi structured interviews, complemented by free listing techniques, non-specific prompting, and reading back.

Results and Discussion

Losses to crops of wild animal conflict affected farmers

The losses to crops by different wild animals were shown in the Table.1. Majority (48.3%) of the elephant conflict respondents experienced losses which was in the range of Rs.25,001 and Rs.50,000, followed by 45.0 per cent of them suffered losses above Rs.50,001. The major losses created by the elephants on the farmers were recorded in paddy fields followed by *Ragi* (finger millet) and coconut. From Table1, it could be concluded that monkey was the least problematic species as it caused losses below Rs.10,000 to majority of the farm (96.7%) when compared to other species. This is mainly due to the fact that most of the monkeys were preferred to stay near the human habitats rather than near agricultural fields.

Table 1: Distribution of losses to crops of wild animal conflict affected farmers (N=240)

Losses to crops (Rs.)	Wild animals				Total
	Elephant	Pig	Monkey	Gaur	
Below 10000	1 (1.7%)	29 (48.3%)	58 (96.7%)	22 (36.7%)	53 (22.1%)
10001-25000	3 (5.0%)	13 (21.7%)	1 (1.7%)	6 (10.0%)	23 (33.3%)
25001-50000	29 (48.3%)	14 (23.3%)	1 (1.7%)	21 (35.0%)	65 (27.1%)
Above 50000	27 (45.0%)	4 (6.7%)	0 (.0%)	11 (18.3%)	42 (17.5%)

Losses to properties of wildlife conflict affected farmers

Properties losses to human are considered as visible impact of HWC. This negative interaction results into several nuisance and actual physical damage to personal and public properties. From the table 2, it could be found that majority (67.1%) of the HWC respondents reported that there was no loss to their properties. Nearly one-third of the respondents reported loss to their properties. Only one-fourths of them confirmed that they had lost property worth below Rs.10,000. The properties usually damaged by elephants include pipelines, shops, cattle shed in the backyard, *etc.* Monkeys usually damage the flower pots, go away with the home made papads, and the provisions procured by the people from shops especially from women and children. Wild pig usually damages the kitchen garden in the backyard. By seeing the table 2, majority of the losses (88.3%) to property is with human-monkey conflict among all the four conflicts

Table 2: Frequency distribution of losses to properties of wildlife conflict affected farmers (N=240)

Losses to property (Rs.)	Wild animals				Total
	Elephant	Pig	Monkey	Gaur	
No loss	51 (85.0)	51 (85.0)	7 (11.7)	52 (86.7)	161 (67.1)
Worth above Rs.10,000	9 (15.0)	3 (5.0)	53 (88.3)	5 (8.3)	70 (29.2)
Woth below Rs.10,000	-	6 (10.0)	-	3 (5.0)	9 (3.8)

Note: The values within brackets refer to row-wise percentage

Visible impacts of human–wildlife conflict and their hidden consequences

The visible impact of injury, or fatality injury as a result of encounter with wildlife were diminished physical and psychological well-being of individual and family, poor employment opportunities, and burden of livelihood shifted to women and children. Due to the effect of these HWC, the common mitigation measures taken by the affected people include relocation of family, people were afraid more before dawn and dusk. They also felt that injured persons should be provided with suitable compensation. Same findings were recorded by Ogra and Badola, (2008) [7], Barua *et al*, (2013) [1] and Manral *et al*., (2016) [5].

The other visible impact faced by the respondents of this study includes crop-damage, and various other forms of property damage such as broken fencing or water pipes. The consequences of this impact affect food security and agricultural sustainability and leading to reduction in economic and social capital. The farmers of the study area following different mitigating procedures such as crop and livestock guarding, physical barriers, deterrents, use of buffer crops, and loans to offset loss to prevent the entry of wild animals into their farm vicinity. These measures will lead to spend more money to protect their crops, which is considered as a hidden cost. Ogra, 2008 [7] confirmed the same in her study.

Crop-raiding events often led to a series of hidden costs for villagers in the study area. Such costs include increased workloads and diminished physical wellbeing, especially for women. Some of the respondents reported that when food supplies are reduced due to crop-raiding, men are forced to move out village in search of work and women removed or replanted damaged crops. Similar output was recorded in Central India. These activities place women at greater risk of heat exhaustion and exposure to insect-borne disease than their male counterparts.

Further, there is an increased workload associated with repairing fences damaged by elephants (used primarily to restrict livestock movement). Further, the HWC affected farmers confirmed that all the family members were

engaged for two days to complete the repair works. Women supported men by providing poles for fence, while men completed the actual repairs.

Hidden costs of elephant attack include fear, economic hardship and/or increased workload. Over 90 per cent of respondents expressed that they feel afraid when they leave the village boundaries and enter the forest.

Conclusion

Human-wildlife conflict continues to erode the agricultural productivity and socio-economic resilience of communities in Tamil Nadu's forest buffer zones. A multi-pronged strategy combining technological, institutional, and community-based interventions is essential for sustainable coexistence. Ineffective deterrents such as setting fires around fields at night, guarding crops and herding livestock were methods employed to minimize human-wildlife conflicts. Local people suggested erection of an electrified fence to reduce trespassing of wild animals from protected area to human settlement.

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