**Human-Wildlife Conflict Mitigation Measures Adopted by the Farmers of Telangana**

**Abstract:**

Mitigation of Human-Wildlife Conflict (HWC) in agricultural regions depends not only on awareness but also on the accessibility and effectiveness of available technologies. This study assessed the adoption patterns of HWC mitigation measures among farmers in Telangana. A total of 300 respondents were selected using a purposive sampling method from conflict-prone districts one mandal from each district and 5 villages from each mandal and 20 farmers from each village those who have experienced crop damage by wildlife conflict across three Agro-climatic zones. Data were collected through pretested and structured interview schedule and analysed using frequency, percentage and class interval method. The findings revealed that although various mitigation measures- such as scare devices, guarding, and noise devices were completely adopted, most were perceived as only partially effective. High cost but more reliable tools like solar fencing and monkey guns etc. were partially adopted due to lack of awareness, financial constraints and limited institutional support. The mitigation measures like human hair collected from local barber shops, placing dried cakes made from dung of local pigs burnt by placing them in earthen pots around the field etc have adopted rarely. Despite the availability of these strategies, adoption remains limited, often due to multiple constraints. These include high installation and maintenance costs (as in the case of solar fencing), lack of awareness, insufficient government subsidies, and a general mistrust in the long-term efficacy of introduced solutions. Many farmers revert to traditional deterrents such as scarecrows, loudspeakers, or community guarding, not necessarily because they are effective, but because they are culturally familiar, low-cost, and require minimal external support. The results suggest a pressing need for promoting affordable, scientifically validated technologies and improving policy-level support to ensure that effective conflict mitigation tools are both available and accessible to smallholder farmers.

**Keywords:** Adoption, Agriculture, Animal deterrents**,** Conflict, Damage, Farmers, Mitigation, Monkey, Wild boar

**Introduction:**

Agriculture provides the primary means of income for small and marginal farmers across the world. However, with the growing human population, the demand for increased food grain production has intensified. To increase the production, we are putting pressure on natural resources, resulting in habitat loss, deforestation, and greater competition for land and water etc. These changes bring humans and wildlife into closer proximity, leading to competition over shared resources. It is within this context that Human-Wildlife Conflict (HWC) emerges.Human Wildlife Conflict (HWC) refers to the negative interaction between human and wildlife which lead to threat human livelihoods, economic losses, property damage, and sometimes harm to both people and wildlife.

As human settlements and agricultural lands expand into previously undisturbed ecosystems, interactions between humans and wild animals have become more frequent and severe. The consequences of HWC are significant and multifaceted, including crop damage, livestock loss, property destruction, and, in severe cases, human injury or death. Conflict-causing species vary by region but commonly include elephants, tigers, wild boars, and monkeys etc. Much of the existing HWC literature in the world and in India is focused on large mammals such as elephants and big cats etc due to their dramatic impacts and importance in conservation.

Larger animals like elephants (Elephas maximus), Tiger (*Panthera tigris*), Leopard (*Panthera pardus*), nilgai (Boselaphus tragocamelus) can cause extensive, frequently abrupt damage to a wide variety of crops (Sekhar, 1998; Singh & Kumara, 2006), despite rodent’s historical systematic attention due to their consistent damage to field and stored crops (Parshad, 1999).

In forest-adjacent agricultural landscapes of Telangana, farmers frequently contend with crop damage caused primarily by wild boars (*Sus scrofa*) and monkeys (*Macaca radiata*). These species are responsible for significant economic losses, damaging a wide array of crops including maize, paddy, groundnut, vegetables and banana, fruit crops etc.

 Field management of these species is particularly challenging due to their characteristics, which include group foraging, mobility, and, in the case of primates, high intelligence and adaptability. For instance, wild boar attacks have become common in several agro-ecological zones in Telangana, with one reported case near the Singur Dam in Medak district resulting in the destruction of nearly 200 acres of sugarcane. Similarly, monkey populations in fruit-growing regions of both northern and southern India, including parts of Telangana, have caused considerable crop losses due to their adaptability and habituation to human settlements (Imam *et al*., 2002).

 To manage these conflicts, a variety of mitigation measures have been developed and promoted, broadly categorized into physical, chemical, biological, behavioural, and community-based strategies by various researchers.

**Physical measures** include solar-powered electric fencing, stone trenches, and barbed wire barriers, which aim to physically prevent animal intrusion (Chelliah *et al*., 2010; Kumawat *et al.*, 2021).

**Chemical deterrents**, such as repellents made from dried cakes made from dung of local pigs, coconut ropes soaked in a sulphur + pig fat oil mixture, spraying dung solution capsaicin or other substances, are applied around crops or field perimeters to discourage foraging by wildlife (Kumar *et al*., 2012).

**Biological measures** include planting unpalatable or barrier crops such as chili, agave, or citronella to deter animals like monkeys and boars (Sharma *et al*., 2020).

**Behavioural techniques** involve scare devices, reflective tapes, noise makers, and regular human patrolling to disrupt animal movement patterns.

**Community-based approaches** include collective guarding, rotating watch groups, and participatory monitoring systems to detect and respond to wildlife threats collaboratively (Treves *et al.,* 2006).

These methods vary in their effectiveness depending on species targeted, local conditions, and farmer participation, and often a combination of methods is used.

This study seeks to examine the extent of adoption of HWC mitigation strategies by farmers in Telangana, with a focus on species-specific practices. Findings will help inform targeted extension services and policy frameworks aimed at promoting coexistence between farming communities and wildlife, ensuring both ecological balance and agricultural sustainability.

**Methodology:**

**Description of the study area:**

The present study was conducted in Telangana due to its rich and diverse array of flora and fauna, making it one of the ecologically significant regions in India. The state is home to wide variety of plants and animals. With more than 2,939 plant species, 365 bird species, 103 animal species, 28 reptilian species, and hundreds of invertebrate species, the state has a diverse range of biodiversity (Telangana Forest Department, 2023).

Among the mammals, 108 species have been recorded across the state’s forests and protected areas. These include charismatic and ecologically significant species such as Tiger (*Panthera tigris*), Leopard (*Panthera pardus*), Sloth Bear (*Melursus ursinus*), and Indian Gaur (*Bos gaurus*). Other notable mammalian species include the Wild Dog (*Cuon alpinus*), Striped Hyena (Hyaena hyaena), Indian Fox (Vulpes bengalensis), Wild Boar (*Sus scrofa*), Spotted Deer or Chital (*Axis axis*), Blackbuck (*Antilope cervicapra*), Blue Bull or Nilgai (*Boselaphus tragocamelus*) etc. (www.tsbiodiversity.org).

Among the primates, the region is home to monkeys, such as the Bonnet Macaque (*Macaca radiata*) and Rhesus Macaque (*Macaca mulatta*), as well as the Common Langur (*Semnopithecus entellus*) etc.

**Sampling Procedure:**

A purposive sampling technique was employed to ensure regional representation across the state's three agro-climatic zones. Three districts Mancherial, Bhadradri Kothagudem, and Nagarkurnool representing the Northern, Central, and Southern Agro-Climatic Zones, respectively, served as the study's sites. High forest cover, closeness to protected areas, and the recorded incidence of Human-Wildlife Conflict particularly with wild boars (*Sus scrofa*) and monkeys (*Rhesus Macaque*) were the three main factors that were used to specifically choose these districts (Fig 2 and 3).

**Selection of study area and sample:**

Mancherial district includes parts of the Kawal Tiger Reserve, one of the major protected areas in northern Telangana. With over 38% of forest cover (FSI, 2021), wild boars and monkeys regularly cause agricultural damage in the area, particularly in mandals like Luxettipet, which are next to forest tracts. Reports of wild boar assaults on farmers (Telangana Today, 2023) justify its selection for conflict research.

Bhadradri Kothagudem, in central Telangana, has the state's highest forest cover at around 66% (Deccan Chronicle, 2023). It includes the Kinnerasani Wildlife Sanctuary, and mandals like as Sujathanagar and Laxmidevipally are frequently subjected to crop depredation because of their closeness to these ecosystems. The ecological richness and overlap of agricultural fields with forest boundaries make it an attractive location for studying species-specific conflict and farmer responses.

Nagarkurnool district comprises the southern forest environment and includes portions of the Amrabad Tiger Reserve, which is one of India's greatest tiger habitats inside the Nallamala forest range. With a forest cover of around 47.8% (FSI, 2021), localities like Amrabad mandal commonly report wildlife invasions on crops. Crop damage reports in this region have also increased, including both wild boars and monkeys.

One mandal with the greatest prevalence of agricultural loss from wildlife was found in each of the three research districts (Mancherial, Bhadradri Kothagudem, and Nagarkurnool) based on the forest cover and the reported frequency of human-animal conflict. These mandals were chosen after doing initial field research and consulting with regional agricultural officers and representatives of the Vertebrate Pest Management Division (ICAR). From each selected mandal, five villages were purposively chosen based on reports of high wildlife-induced crop damage. 20 members from each village those who are the victims of crop damage by wild boar and monkey has been selected and interviewed (Table 1). The identification of these villages and respondents was facilitated by interactions with Agricultural Extension Officers and through focus group discussions (FGDs) with local farming communities, which helped validate the frequency and severity of wildlife conflict.

**Selection of Research design:**

An ex-post facto and exploratory research design was used to assess the adoption of Human-Wildlife Conflict (HWC) mitigation measures by farmers.

According to Kerlinger (1973), "Ex post facto research involves the researcher analyzing the consequences of an independent variable that has already occurred in the natural course of events." As noted by Kothari (2004), exploratory research is primarily conducted to explore a problem that is not clearly defined, and it serves as the groundwork for developing hypotheses and guiding future research directions.

Ex-post facto research design is used was suitable as the adoption decisions and conflict experiences had already occurred. Exploratory research design was used gain deeper insights into the patterns related to human-wildlife conflict, particularly in areas where limited prior research existed.

**Development and Administration of Interview Schedule:**

Data were collected using a structured and pre-tested interview schedule with a specific focus on covering all types of mitigation measures adopted by farmers. The Interview schedule was developed with consultation with advisory committee and experts from social sciences, vertebrate pest management, wildlife conservation, agricultural extension etc to ensure relevancy and validity. The level of adoption was measured using a three-point continuum scale (fully adopted-2, partially adopted-1, no adoption-0). Scoring pattern followed by Rahman (2007) was used with suitable modifications.

Before administering the final schedule, pre-testing was conducted with a group of 60 farmers in non-sample area under similar condition. After following these steps, the finalized interview schedule was used to collect primary data collection.

**Data Collection and Data analysis:**

The data was collected from 300 respondents i.e. 20 respondents from each village thus a total of 15 villages in the year 2024. Frequency and percentage were used for calculating response analysis of each item. Respondents were categorised as low, medium, high level of adoption by using exclusive Class interval technique.

**Operational definitions of Adoption levels:**

**Complete Adoption:**

This category refers to respondents who consistently and continuously uses the recommended mitigation measure throughout the cropping period or as per the required frequency without interruption or modification.

**Partial Adoption:**

This includes respondents who initially used the mitigation measure but discontinued its use after some time. Partial adoption may be due to perceived ineffectiveness, cost constraints, labor requirements, or practical difficulties.

**No Adoption:**

Respondents who have never used the mitigation measure at any point, either due to lack of awareness, accessibility, interest, or belief in its relevance.

These classifications align with the diffusion and adoption stages described by Rogers (2003).

**Results:**

This section discusses and evaluates the study's findings on how farmers employ various wild boar and monkey crop damage prevention measures. The data from Tables 1& 2 and Figure 1 shed light on the extent to which farmers apply traditional, physical, mechanical, biological, and chemical and non-chemical approaches. The findings also reveal the general degree of adoption and the factors that influence these behaviours. The findings are addressed in the following subsections, which categorize mitigation methods according to their level of adoption: Complete adoption, Partial adoption, No adoption.

**Completely Adopted Measures:**

 According to the data in table 1, a significant proportion of farmers have fully adopted some mitigation strategies.

 Among traditional/indigenous methods of wild boar mitigation measures, all farmers (100%) adopted lifelike model (scarecrows) resembling a human figure in the field to deter monkeys, followed by (99.33%) farmers employed arranging used sarees of different colours around the crop, Use of loudspeakers (98.33%) to play barking of multiple dogs to deter monkey**s**, Use of firecrackers to scare away monkeys (95.33%), Use of Local dogs for scaring away wild boars (80.67%), Guarding field (80.00%).

 In terms of Physical methods GI wire fence around the crop was completely adopted by 40.33% of farmers followed by Iron wire fixed with sharp razor blades at regular distance of 1 ft away by 30.67%, digging 2 ft wide and 1½ feet deep trench around the cropped area at a distance of 1 ft by 20.33% farmers, barbed wire around the field in 3 rows with first row at the height of 1 ft by 20% of farmers,.

 Among biological measures like growing thorny bushes and xerophytes like *Cactus* spp., *Euphorbia caducifolia*, *Euphorbia neriifolia*, *Opuntia elatior*, *Opuntia dillenii*, *Ziziphus oenoplia*, *Ziziphus mauritiana*, *Agave americana*, and *Caesalpinia crista* to prevent damage of wild boar to crop (95.67%).

**Partially Adopted measures:**

 Based on the data presented in Table 1, several mitigation strategies have been partially adopted by farmers to protect crops from wild boar damage, reflecting varying levels of acceptance and implementation.

 Among physical methods, the use of chain link meshes of 3 feet height, maintained at 1 foot distance from the crop, emerged as the most partially adopted strategy, with 65.33% of farmers employing it. This was followed closely using barbed wire arranged in three rows around the field, with the first row 1 foot distance above the ground, partially adopted by 62.33%. Other notable physical methods include digging trenches (2 ft wide and 1.5 ft deep) around the cropped area at 53.00% partial adoption, and the use of iron wire fixed with razor blades, partially adopted by 50.00%. GI wire fencing and solar fencing (12 volts) were also utilized to a moderate extent, with partial adoption rates of 39.00% and 37.33%, respectively. Bioacoustics, though less common, were still adopted by 24.00% of farmers.

 Among biological methods, the practice of using karanda plants as a bio-fence around crops saw the highest partial adoption at 42.00%, followed using castor crops as a border around maize (38.67%) and safflower crops as a border around groundnut (24.67%). In terms of traditional or indigenous practices, field guarding was partially adopted by 19.67% and spreading human hair around the field by 10.66%. On the other hand, chemical and non-chemical methods such as spraying egg solution around the field were partially adopted by 23.33%, while coconut ropes soaked in a mixture of sulphur and pig fat oil were adopted by 14.00%. Methods involving pig dung, like spraying dung solution or using dung cakes in earthen pots, saw very limited partial adoption, at only 2.00% and 1.66%, respectively.

 In the case of monkey mitigation strategies, among traditional/indigenous methods the most prominently partially adopted method was the use of Professionally trained dogs to chase the monkeys, with 65.33**%** of farmers implementing this technique. This was followed closely by hiring labour, which had a partial adoption rate of 52.33%. In physical methods use a monkey-proof mesh to prevent damage to field as well as kitchen garden, adopted by 37.67% followed by installing acoustic devices in the field (18.67%).

 Among the mechanical methods Solar fencing around fields to deter monkeys was partially adopted by 28%, while net to capture monkeys and translocate them to other places were reported by 24.67% of farmers.

**No Adoption:**

 Data presented in Table 1, speaks about mitigation strategies have not been adopted by farmers to protect crops from wild boar damage.

 Among Traditional/Indigenous methods for wild boar mitigation measures 87% of farmers have not adopted human hair collected from local barber shops around the field.

Among physical methods 72.33% of farmers have not been adopted use of bioacoustics, 57% of farmers not adopted solar fence around the field with 12 volts electricity.

 Among biological methods 73% of farmers have not been adopted practice of having 4-5 rows of safflower crop as a border crop around Ground nut followed by practice of having 4-5 rows of castor crop as a border crop around Maize (58%).

 Among chemical and non-chemical methods no respondent (98.33%) adopted placing dried cakes made from dung of local pigs burnt by placing them in earthen pots around the field followed by spraying dung solution on soil to the width of 1 ft around the crop collected from local pigs (98%), arrange coconut ropes soaked in a sulphur + pig fat oil mixture in 3 rows around the field by keeping 1 ft distance between the rows with the help of wooden poles (84.6%), spraying egg solution 20 ml/lt of water around the field by 74% of farmers.

In case of monkey mitigation measures no farmer (100%) has adopted placing bananas and biscuits mixed with red chilli powder around the field followed by 29.33% of farmers have not adopted professionally trained dogs to chase the monkeys in traditional/indigenous methods.

Among Physical methods no farmer (100%) has adopted Sealed tiny packages of boneless dry fish pieces throughout field to keep away monkeys followed by 79.67% of farmers not adopted installing acoustic devices in field.

Among mechanical method no farmer (100%) has adopted sterilization method to control the population of monkeys, followed by 82% of farmers didn’t adopt monkey guns, 70% of farmers have not adopted use net to capture monkeys and translocate them to other places, 66.33% of farmers have not adopted Solar fencing.

**Overall adoption level of farmers:**

The data from the table 2 and figure 1 depicts that majority (57.34%) of the respondents fall into the medium adoption category, indicating that they are implementing some mitigation strategies, and their adoption is not comprehensive. A significant portion (23.33%) of farmers have a low adoption level, suggesting barriers such as lack of awareness, financial constraints, or ineffective implementation of mitigation measures. Only 19.33% of farmers exhibit a high adoption level, implying that relatively few have fully embraced and integrated effective strategies to reduce conflict. This pattern suggests the need for enhanced awareness programs, improved access to affordable and innovative, effective mitigation techniques, and better support from Government and Extension agencies to encourage wider adoption of conflict mitigation measures.

**Table 2. Overall adoption level of Human Wildlife Conflict Mitigation Measures**

|  |  |  |
| --- | --- | --- |
| **Sl. No.** | **Adoption level of mitigation measures** | **Response** |
| **Number** | **Percent** |
| 1 | Low (57 to 63) | 70 | 23.33 |
| 2 | Medium (63 to 69) | 172 | 57.34 |
| 3 | High (69 to 75) | 58 | 19.33 |
| **Total** | **300** | **100.00** |

 **Fig. 1. Distribution of respondents according to overall adoption level**

**Discussion:**

Most of the farmers have completely adopted traditional/Indigenous methods like scarecrows, guarding, arranging sarees, firecrackers, loudspeakers, use of dogs etc due to their low cost, locally accessible and culturally acceptable. The use of biological methods is also popular because such methods are with low maintenance, low cost and act as a natural deterrent. A similar study was conducted by enaiang *et.al* (2011), Meena *et.al* (2014), Hussain *et.al* (2018), Pandey *et.al* (2019), Bhargavi *et.al* (2022), Jaleta *et.al* (2023) and Yeshey *et.al* (2023) showed that most of the farmers followed traditional or indigenous methods like guarding, fire crackers, loudspeakers and few farmers adopted biological methods like growing thorny bushes and physical methods like fences.

Some methods like fencing, solar fencing, digging trenches were partially adoptable because of their higher installation costs, labour demands and maintenance cost. These findings were in accordance with the results of Barua *et. al* (2013).

Some methods like spraying dung solution around field, use of chemical and non-chemical methods, use of boneless dry fish around field are not at all adopted by all farmers due to lack of awareness, high cost and non-availability of material. These results are line with the findings of Nyhus (2016).

Sterilization method is not adopted by most of the farmers because of legal constraints and ethical concerns. In India Monkey is regarded as hanuman which makes it legal methods socially unacceptable. These findings are similar with the findings of Southwick *et. al* (1996).

Despite the availability of these strategies, adoption remains limited, often due to multiple constraints. These include high installation and maintenance costs (as in the case of solar fencing), lack of awareness, insufficient government subsidies, and a general mistrust in the long-term efficacy of introduced solutions. Many farmers revert to traditional deterrents such as scarecrows, loudspeakers, or community guarding, not necessarily because they are effective, but because they are culturally familiar, low-cost, and require minimal external support. This is especially evident in India, where interventions are often implemented without adequate consideration of local socio-economic conditions or species-specific behavior (Karanth *et al*., 2013; McManus *et al*., 2015). So future research should develop innovative and affordable measures that aim to evaluate the long-term efficacy, scalability, and ecological impact of both traditional and modern deterrents to guide more sustainable human-wildlife conflict mitigation strategies.

**Table 1. Response wise analysis of farmers based on adoption level of human wildlife conflict mitigation measures among farmers**

|  |  |  |
| --- | --- | --- |
| **Sl. No.** | **Mitigation measures** | **Response** |
| **Complete Adoption** | **Partial Adoption** | **No Adoption** |
| ***f*** | **%** | ***F*** | **%** | ***F*** | **%** |
|  | **Wild boar mitigation measures** |
|  | **Traditional methods/ Indigenous methods** |
| 1. | Do you use Local dogs for scaring away wild boars | 242 | 80.67 | 47 | 15.67 | 11 | 3.67 |
| 2. | Do you guard your field to minimize the attack of wild boars on field | 240 | 80.00 | 59 | 19.67 | 1 | 0.33 |
| 3. | Do you spread the human hair collected from local barber shops around the field | 7 | 2.33 | 32 | 10.66 | 261 |  87 |
| 4. | Do you arrange used sarees of different colours around the crop | 298 | 99.33 | 1 | 0.33 | 1 | 0.33 |
|  | **Physical methods** |  |  |  |  |  |  |
| 5. | Do you use GI wire fence around the crop with the help of poles with a height of 1 feet from the ground | 121 | 40.33 | 117 | 39.00 | 62 | 20.67 |
| 6. | Do you use solar fence around the field with 12 volts electricity to prevent damage of wild boar to main crop | 17 | 5.67 | 112 | 37.33 | 171 | 57.00 |
| 7. | Do you use barbed wire around the field in 3 rows with first row at the height of 1 ft from the ground | 60 | 20.00 | 187 | 62.33 | 53 | 17.67 |
| 8. | Do you use Iron wire fixed with sharp razor blades at regular distance of 1 ft away from cropped area | 92 | 30.67 | 150 | 50.00 | 58 | 19.33 |
| 9. | Do you use chain link meshes of 3 ft height around the crop by maintaining a distance of 1 ft away from the crop | 76 | 25.33 | 196 | 65.33 | 28 | 9.33 |
| 10. | Do you use bioacoustics to minimize wild boar attack/damage to crops | 11 | 3.67 | 72 | 24.00 | 217 | 72.33 |
| 11. | Do you dig 2 ft wide and 1½ feet deep trench around the cropped area at a distance of 1 ft from crops to keep away the wild boars from the field | 61 | 20.33 | 159 | 53.00 | 80 | 26.67 |
|  | **Biological methods** |
| 12. | Do you practice of having 4-5 rows of safflower crop as a border crop around Ground nut to prevent damage of wild boar to main crop | 7 | 2.33 | 74 | 24.67 | 219 | 73.00 |
| 13. | Do you practice of having 4-5 rows of castor crop as a border crop around Maize to prevent damage of wild boar to main crop | 10 | 3.33 | 116 | 38.67 | 174 | 58.00 |
| 14. | Do you grow thorny bushes and xerophytes like Cacti sp Euphorbia caducifolia, E. meriifolia & opentia sp Opuntia alatior, O.dillenii, Zizipus sp Zizipus oenopolia, Z. mauritiana, and agave sp Agave americana, Caesalpinia cristata to prevent damage of wild boar to main crop | 287 | 95.67 | 8 | 2.67 | 5 | 1.67 |
| 15. | Do you grow karanda around the crop as bio fence to prevent damage of wild boar to main crop | 5 | 1.67 | 126 | 42.00 | 169 | 56.33 |
|  | **Chemical and non chemical methods** |  |  |  |  |  |  |
| 16. | Do you spray egg solution 20 ml/lt of water around the field to prevent damage of wild boar to main crop | 8 | 2.67 | 70 | 23.33 | 222 | 74.00 |
| 17. | Do you arrange coconut ropes soaked in a sulphur + pig fat oil mixture in 3 rows around the field by keeping 1 ft distance between the rows with the help of wooden poles | 4 | 1.33 | 42 | 14.00 | 254 | 84.6 |
| 18. | Do you spray dung solution on soil to the width of 1 ft around the crop collected from local pigs | 0 | 0.00 | 6 | 2.00 | 294 |  98 |
| 19. | Do you place dried cakes made from dung of local pigs burnt by placing them in earthen pots around the field | 0 | 0.00 | 5 | 1.66 | 295 | 98.33 |
| **Monkey Mitigation Strategies** |
|  | **Traditional/ Indigenous methods** |  |  |  |  |  |  |
| 20. | Do you hire labour to keep monkeys away from the crops | 61 | 20.33 | 157 | 52.33 | 82 | 27.33 |
| 21. | Do you use Professionally trained dogs to chase the monkeys | 16 | 5.33 | 196 | 65.33 | 88 | 29.33 |
| 22. | Do you use firecrackers to scare away monkeys | 286 | 95.33 | 11 | 3.67 | 3 | 1.00 |
| 23. | Do you use a lifelike model resembling a human figure is strategically placed in the field to deter monkeys | 300 | 100.00 | 0 | 0.00 | 0 | 0.00 |
| 24. | Do you place bananas and biscuits mixed with red chilli powder around the field | 0 | 0.00 | 0 | 0.00 | 300 | 100 |
|  | **Physical methods** |  |  |  |  |  |  |
| 25. | Do you use a monkey-proof mesh to prevent damage to field as well as kitchen garden | 152 | 50.67 | 113 | 37.67 | 35 | 11.67 |
| 26. | Do you install acoustic devices in the field to reduce crop damage by monkeys | 5 | 1.67 | 56 | 18.67 | 239 | 79.67 |
| 27. | Do you use Sling shot to scare away monkeys | 298 | 99.33 | 1 | 0.33 | 1 | 0.33 |
| 28. | Do you use Sealed tiny packages of boneless dry fish pieces throughout field to keep away monkeys | 0 | 0.00 | 0 | 0.00 | 300 | 100 |
|  | **Mechanical methods** |  |  |  |  |  |  |
| 29. | Do you use net to capture monkeys and translocate them to other places | 16 | 5.33 | 74 | 24.67 | 210 | 70 |
| 30. | Do you use Monkey guns to protect the crops | 32 | 10.67 | 22 | 7.33 | 246 | 82 |
| 31. | Do you use Solar fencing around the field to protect the crops | 17 | 5.67 | 84 | 28 | 199 | 66.33 |
| 32. | Do you use loudspeakers to play the barking of four or more dogs to lessen the lessen the monkeys’ threat | 295 | 98.33 | 3 | 1.00 | 2 | 0.67 |
| 33. | Do you follow sterilization method to control the population of monkeys | 0 | 0.00 | 0 | 0.00 | 300 | 100 |

 **Conclusion:**

This study sheds light on the practical reality that farmers, despite their willingness, are constrained by the lack of access to effective and affordable mitigation tools. Most rely on traditional or makeshift techniques—not because they are highly successful, but because they are simple, low-cost, and culturally accepted. The data reveal that innovative and scientifically backed methods like solar fencing and monkey guns are known to be effective yet remain out of reach for the majority due to high costs and lack of operational support. Even when adoption occurs, it often reflects a compromise between affordability and efficiency, rather than informed choice. The results underscore the need for policy-level changes that not only promote advanced technologies but also make them financially and logistically accessible to smallholder farmers. Future interventions should prioritize locally adaptive innovations, shared community models for high-cost tools, and integration of indigenous knowledge with formal extension services. Building such an ecosystem can transform mitigation from a survival strategy into a sustainable, community-driven solution. Traditional deterrents such as scarecrows, patrolling, and sound-based repellents are proving increasingly ineffective over time. These trends highlight the urgent need for integrated, site-specific, and community-driven vertebrate pest management strategies, developed in collaboration with research institutions and local stakeholders, and aligned with wildlife protection laws. Understanding farmer perceptions and adoption patterns of such mitigation techniques forms a critical foundation for improving policy, outreach, and practical solutions.

 

**Source:** Telangana Socio Economic Outlook (2023)

**Fig 2**. Total Forest Area as a % Geographical area

 

 **Source:** Sharma, P. K. (n.d.). *Wilderness of Telangana*. MCRHRDI.

**Fig 3**. Wildlife sanctuaries and National parks

Disclaimer (Artificial intelligence)

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**References:**

Ajaz Hussain, A.H., Rawat, G.S., Kumar, S.S. and Adhikari, B.S., 2018. People's perception on human-wildlife conflict in a part of Kailash Sacred Landscape-India and strategies for mitigation.

Barua, M., Bhagwat, S.A. and Jadhav, S., 2013. The hidden dimensions of human–wildlife conflict: Health impacts, opportunity and transaction costs. *Biological conservation*, *157*: pp.309-316.

Chelliah, K., Kannan, G., Kundu, S., Abilash, N., Madhusudan, A., Baskaran, N. and Sukumar, R., 2010. Testing the efficacy of a chilli–tobacco rope fence as a deterrent against crop-raiding elephants. *Current Science*: pp.1239-1243.

Deccan Chronicle. 2023. 12 Telangana districts tagged ecologically degraded. Available at: <https://www.deccanchronicle.com> (Accessed: 23 May 2025).

Eniang, E.A., Ijeomah, H.M., Okeyoyin, G. and Uwatt, A.E. 2011. Assessment of human–wildlife conflicts in Filinga range of Gashaka Gumti National Park, Nigeria. *Production Agriculture and Technology Journal*, 1: pp.15–35.

Forest Survey of India (FSI). 2021. *India State of Forest Report 2021*. Ministry of Environment, Forest and Climate Change, Government of India. https://fsi.nic.in

Government of Telangana. 2023. *Telangana Socio Economic Outlook 2023*. Planning Department, Government of Telangana.

Rogers, E.M., 2003. Diffusion of innovations, 5th edn Tampa. *FL: Free Press.[Google Scholar]*.

Imam, E., Kushalappa, C.G. and Kumar, A. 2002. A study on the impact of NTFP collection on some endangered species in the Karnataka region of the Western Ghats. *Current Science*, 82(6): pp.748–752.

Jaleta, B.D., Aticho, A.T. and Tesfaye, A. 2023. Factors influencing smallholder farmers' adoption of wildlife deterrents in Africa. *Journal of Environmental Management*, 324, p.116350. Available at: <https://doi.org/10.1016/j.jenvman.2022.116350>

Karanth, K.K., Gopalaswamy, A.M., Prasad, P.K. and Dasgupta, S., 2013. Patterns of human–wildlife conflicts and compensation: Insights from Western Ghats protected areas. *Biological conservation*, *166*: pp.175-185.

Kerlinger, F.N., 1966. Foundations of behavioral research.

Kothari, C.R., 2004. *Research methodology: Methods and techniques*. New Age International.

Kumar, M.A., Mudappa, D. and Raman, T.R.S. 2012. Asian elephants *Elephas maximus* and retention of natural vegetation in forested landscapes. *Current Science*, 103(6), pp.739–744.

Kumawat, R.N., Meena, H.R. and Meena, B.S. 2021. Adoption of crop protection technologies by farmers in wildlife-affected areas. Indian Journal of Extension Education, 57(2): pp.120–124.

McManus, J.S., Dickman, A.J., Gaynor, D., Smuts, B.H. and Macdonald, D.W. 2015. Dead or alive? Comparing costs and benefits of lethal and non-lethal human–wildlife conflict mitigation on livestock farms. *Oryx*, *49*(4): pp.687-695.

Nyhus, P.J. 2016. Human–wildlife conflict and coexistence. *Annual review of environment and resources*, *41*(1): pp.143-171.

Pandey, L., Arunachalam, A. and Joshi, N. 2019. Challenges of hill farming due to crop-raiding by wild pigs in the Indian Himalayan region. *Current Science*, *116*(6): pp.1015-1019.

Parshad, V.R., 1999. Rodent control in India. *Integrated pest management reviews*, *4*: pp.97-126.

Rahman, S., 2007. Adoption of improved technologies by the pig farmers of Aizawl district of Mizoram, India. *Livestock Research for Rural Development*, *19*(1): pp.1-5.

Sekhar, N.U. 1998. Crop and livestock depredation caused by wild animals in protected areas: the case of Sariska Tiger Reserve, Rajasthan, India. *Environmental conservation*, *25*(2): pp.160-171.

Sharma, P. K. (n.d.). *Wilderness of Telangana*. MCRHRDI. [https://mcrhrdi.gov.in/fcg22020/week2/pksharma/Wilderness%20of%20Telangana,SriPKSharmaIFS(Retd).pdf](https://mcrhrdi.gov.in/fcg22020/week2/pksharma/Wilderness%20of%20Telangana%2CSriPKSharmaIFS%28Retd%29.pdf)

Singh, M. and Kumara, H.N. 2006. Distribution, status and conservation of Indian primates. *Journal of the Bombay Natural History Society*, 103(2–3): pp.139–150.

Telangana Forest Department. 2023. *Biodiversity of Telangana*. Government of Telangana. Available at: <https://forest.telangana.gov.in>.

Telangana State Biodiversity Board, n.d. *Biodiversity profile of Telangana*. Available at: <http://tsbiodiversity.org/biodiversityprofile.html>.

Treves, A., Wallace, R.B. and White, S. 2006. Participatory planning of interventions to mitigate human–wildlife conflicts. *Conservation Biology*, 20(5): pp.1388–1397.

Telangana Forest Department. 2023. *Wildlife and Conflict Zones in Telangana*. https://forest.telangana.gov.in.

Telangana Today. 2023. Mancherial farmer injured in wild boar attack. https://telanganatoday.com/mancherial-farmer-injured-in-wild-boar-attack.

Yeshey, Keenan, R.J., Ford, R.M. and Nitschke, C.R., 2023. Sustainable development implications of human wildlife conflict: an analysis of subsistence farmers in Bhutan. *International Journal of Sustainable Development & World Ecology*, *30*(5): pp.548-563.