Biological Forum
an International Journal (SI-AAAS: CS March 21&22, 2025)
17(5a): 01-05(2025)
ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Assessing Wild Boar (*Sus scrofa* L.) Damage and its Management Solutions in Agriculture Crops of Himachal Pradesh

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(Received: 30 March 2025; Accepted: 24 April 2025; Published online: 14 May 2025)
(Published by Research Trend)

ABSTRACT: In Himachal Pradesh, wild boars (*Sus scrofa*) pose a serious threat to agricultural crops, severely damaging a variety of crops such as vegetables, paddy, wheat, and maize. As they forage for food, their rooting activity destroys crops, seedlings, and plant beds, causing farmers to suffer significant financial losses. Because of their large numbers and ability to adapt to a variety of habitats, these opportunistic feeders regularly raid fields, causing significant damage, especially during the sowing and harvesting seasons. The challenges of managing wild boar populations in agricultural regions of Himachal Pradesh are intensify due to their ability to thrive in the region's varied topography. Study was undertaken from September 2023-2024. This study assesses upto 60% presence and habitat of wild boar in fields of two villages –Charatgarh and Dehlan in districts of Una. The damage primarily occurs when the animals forage for food, uprooting crops, trampling young plants and consuming harvested crops. In Una, like many other parts of Himachal Pradesh, the wild boar population has been increasing, exacerbating the problem of crop damage. Farmers in the region have reported significant losses of upto 80% in crop yield due to wild boar activity, affecting their income and food security. Management strategies for mitigating wild boar damage include fencing (80%) and the use of non-lethal deterrents (50%) such as noise devices, olfactory repellents, and guard animals. Efforts to manage wild boar populations in Una include the installation of electric fences, the use of noise-making devices and the involvement of local communities in monitoring and protecting crops. This paper explores the extent of wild boar damage to crops in Himachal Pradesh and examines the existing management strategies, highlighting their effectiveness and challenges.

Keywords: Wild boar, Management, Damage, Himachal Pradesh, Economic losses, Foraging, Olfactory repellents.

INTRODUCTION

The Himachal Pradesh is a mountainous state in Western Himalayas. In these hilly areas of India, where the farming community typically engages in mixed farming to satisfy their diverse needs, agriculture is the primary source of income for the vast majority of the rural people. The state has a geographical area of 55,673 sq.km and its elevation ranges from 350 mts to 7000 mts. The Beas, Sutlej, Ravi Chenab and Yamuna are the five rivers. These are perennial rivers fed by snow and rainfall. The farmers use virtually every possible strategy to keep away animals off their crops. They beat drums at night, try to scare away the animals, some set snares in their fields and some make sounds. The intriguing and hardy Indian wild boar (*Sus scrofa*) can be seen roaming across a variety of environments, including grasslands, woodlands and forests. Typically, females weigh between 50 and 100 kg, while males average between 80 and 200 kg. These sturdy creatures are 90 to 150 cm long. Although their coats can range from dark brown to black, juvenile boars frequently have pastel stripes. In addition to being an eye-catching characteristic, their long, pointed nose has a keen sense of smell, which is essential for foraging. Their short tail is topped with a tuft of fur, and their prominent, curving tusks—especially in males—are essential defense mechanisms. The footprints of these secretive animals have characteristic cloven hooves with bilaterally symmetrical pug marks and dew claw imprints. They can be identified in the field by their tracks, which are bigger at the front than the back and display three distinct toes. Known for their nocturnal habits and tendency to live alone or in small groups, Indian wild boars are omnivores that consume a wide range of small animals, fruits, and plants. A fascinating species in the Indian wilderness, they can adapt to and flourish in a broad variety of settings. Cropping patterns, wildlife population density and behavior, and food availability in natural environments can all affect the degree and severity of damage (Piyush *et al.*, 2018). It was found that, in the current situation, the net and total

cropped area had decreased by 12.66 and 17.35%, respectively, as a result of the animal menace compared to the pre-threat period. Animal menace harmed 33.03% of the total cropped land, with stray and feral animals affecting 54.69 and 45.31% of the total, respectively. An estimated 25358 per farm was lost economically as a result of animal menace in field crops, with wheat accounting for the largest part (32.48%), followed by paddy (13.27%) and maize (12.22%) (Thakur *et al.,* 2022). The district's overall size is 1540 square kilometers, of which 303.84 square kilometers are forest land, or around 50% of the district's total area (3144 square kilometers), demonstrating the significance of forests in the lives of the hill people. Several studies have suggested that there is a correlation between crop damage and wild boar population growth, according to several studies. For example, the edge effect of the forest, ditches, stone walls, bushes, or tree rows near agricultural fields can increase the likelihood of crop damage. Other authors have suggested that some agricultural crops are more susceptible to wild boar damage because of the stage of maturity and the extent of the cultivable areas or owing to the nocturnal activities of this species (Schley *et al*., 2008; Thurfjell *et al*., 2009; Amici *et al.,* 2012). The wild boar and stray cattle are also becoming a threat to the crops in some states. Keeping this in view, the increasing pressure from the farming community on some of the State Governments has resulted in declaration of some species, having higher damaging efficiency as vermin and allowed its hunting. There is so much damage to the crops that some farmers have given up on growing them, and others are compelled to spend restless nights in the fields in order to keep their harvests safe. Because of this, the net returns are typically insignificant or perhaps even negative in the event that the animals totally destroy the crop. In conclusion, wild boar crop raiding is a significant problem for Indian farmers, as these animals can damage a wide range of crops and cause severe economic losses. Addressing the issue requires a combination of preventive measures, better land management practices, and community cooperation (Kumar *et al.,* 2016).

MATERIAL AND METHODS

Study Area: The current study on assessing wild boar damage was conducted during 2023-24 in maize crop. The management techniques was carried out from sowing to harvesting stage of maize crop. The primary data for the present study was collected with the help of questionnaire. The secondary data for the present study was collected from journals, magazines, research articles, newspapers, and website. The entire district of Una falls in Shivalik Hills region. The district may be divided into two physiogr aphical parts: (i) Irrigated Plain Valley Tract; and (ii) Rainfed Hilly Tract.

The location of present study was near Una district of Himachal Pradesh Cordinates of Dehlan -31°25.42′N 76°20.06′E, Cordinates of charatgarh -31°40.02’N 76°31.36 ‘E. The study area includes two villages, Charatgarh and Dehlan each with unique geographical, climatic, and agricultural characteristics. **Charatgarh**, covering an area of 1.61 km², experiences an annual rainfall of 1200 mm. This village thrives with the cultivation of wheat, maize, paddy, potatoes, tomatoes, and various other vegetables. In terms of wildlife, Charatgarh is home to wild boar, Nilgai, and stray animals, contributing to its diverse fauna. On the other hand, **Dehlan**, which spans a larger area of 53.88 km², receives slightly less rainfall, at 1000 mm annually. The village also grows a similar range of crops, including wheat, maize, paddy, potatoes, tomatoes, and other vegetables. Wildlife in Dehlan includes wild boar, Nilgai, and stray animals, similar to Charatgarh. Both villages reflect a mix of agricultural productivity and the presence of key wild mammalian species, making them ecologically significant. The study was initiated with interviews with the people asking whether they have come across Wild boar at locations where their agricultural activities are carried out and if wild boar problem exists the parameters like at which stage of the crop the damage has occurred, during what time of the day damage intensity is high, and the traditional methods which are being used to deter the wild boar were recorded.

Wild Boar Damage Assessment. To assess the damage, sampling was done by selecting 5 patches of $2m^2$ in each field of 1 acre by covering each side and centre of the maize during initial stages in field of Charatgarh and Dehlan. Fields were selected to assess damage and for management purpose was of 1000sqm area. The damage to agricultural crops was particularly severe, affecting maize, vegetables like potatoes, and fodder crops such as sorghum.

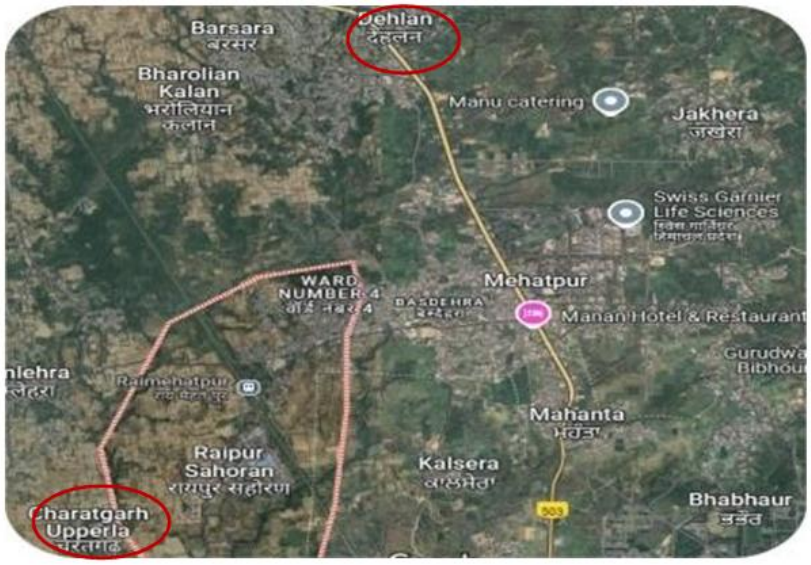

Fig. 1. Map depicting the study areas in Himachal Pradesh.

Damage Percentage (%): The percentage of plants in the plot that are damaged calculated as

$$\frac{\text{Number of Damaged Plants}}{\text{Total Number of Plants}} \times 100$$

RESULTS AND DISSCUSSION

The Krishi Vigyan Kendra (KVK) in Una offers invaluable insights into the agricultural landscape of the region, especially through its annual reports, which provide a deep dive into local crop patterns. By consulting local agricultural records and data from KVK, we can understand the diversity and productivity of crops cultivated in the district. In Una, wheat leads the way with 32,981 hectares under cultivation and an impressive production of 1,65,000 metric tonnes, yielding an average of 50 quintals per hectare. Maize follows closely with 30,939 hectares and a production of 1,55,000 metric tonnes, maintaining a similarly high yield of 50.1 quintals per hectare. Rice, though cultivated on a smaller scale with 2,023 hectares, still contributes a substantial 10,000 metric tonnes, while oilseeds and pulses provide crucial contributions to the agricultural economy, with oilseeds covering 1,881 hectares and pulses 495 hectares. Additionally, fodder crops, essential for livestock, are grown over 1,645 hectares, yielding 8,000 metric tonnes with an average of 48.6 quintals per hectare. Wild boar damage in maize fields across Himachal Pradesh has become a growing concern for farmers, significantly impacting crop yields. To assess the extent of this damage, a comprehensive sampling was conducted by selecting five 1m² patches in each acre of maize field, covering both the center and the edges of the crops. The analysis of 1000 sqm plots revealed substantial wild boar damage to maize crops, with an average of 33.43% of plants affected. Damage ranged from 21.05% to 45.45%, illustrating the significant threat posed by wild boars. This destructive trend not only affects maize but extends to vegetables like potatoes and fodder crops such as sorghum, posing a serious challenge to agricultural productivity in the region. The data underscores the urgent need for effective wildlife management strategies to mitigate these losses and protect the livelihood of local farmers. Management strategies for mitigating wild boar damage often rely on a combination of physical barriers and non-lethal deterrents. The two primary methods mentioned—fencing and non-lethal deterrents— are commonly used, each with their own advantages and limitations. Fencing is one of the most effective methods for preventing wild boars from entering agricultural fields, forests, or other protected areas, providing a physical barrier that limits their access (Singh and Kumar 2018).

Physical Methods:

Live fences around the crop: The farmers plant live plants that are thorny in nature (Xerophytic plants) like *Opuntia* sp., *Zizyphus* sp., *Agave* sp., are planted outside of the fields on the bunds to prevent the wild boars from entering in the fields. This method is proven to be 40% successful in evading the wild boars from entering the agricultural fields (Rao, 2015).

Use of coloured sarees

The farmers have tried tying the coloured sarees around the fence making the wild boar to assume the presence of human beings. It is also noted that the sarees are damaged by the wild boar and very less efficient. Around 30% of the damage is being controlled through this method.

Barbed wire fence. Erecting a barbed wire fence around the field in three rows, with the first row positioned just 1 foot above the ground, has proven to be highly effective in preventing wild boars from entering the cropped area. This simple yet powerful barrier has been especially beneficial in protecting maize crops. The use of barbed wire fences as borders around maize fields resulted in impressive yield improvements, reaching 1049 kg per hectare during the Kharif season and 1781 kg per hectare during Rabi. These figures are significantly higher compared to the control yields of 786 kg per hectare (Kharif) and 908 kg per hectare (Rabi). In fact, this innovative fencing method led to an increase in yields by 14.33% during Kharif and 31.14% during Rabi, demonstrating its

effectiveness in boosting crop productivity and safeguarding against wildlife damage (Piyush *et al*., 2018).

Chain link fence. The installation of chain link fences around maize crops is a simple yet highly effective solution for creating a durable barrier against wild boars. By fixing 3-foot-high chain link meshes around the crop, with a 1-foot distance maintained from the crop itself, farmers can significantly reduce wildlife damage. This method proved to be highly beneficial, with maize yields reaching 1066.3 kg per hectare during the Kharif season and 1069 kg per hectare during Rabi. These results are notably higher than the control yields of 786 kg per hectare (Kharif) and 780 kg per hectare (Rabi). The use of chain link fences led to an impressive yield increase of 15.13% during Kharif and 14.71% during Rabi, showcasing its effectiveness in enhancing crop productivity while providing a long-lasting and reliable solution for protecting maize crops (Rao, 2015).

Common types of fences include electric fences, which deliver a mild shock that discourages boars from crossing, and strong mesh or wire fences, which are ideal for areas where boars might push through or dig under barriers. To be effective, these fences should be at least 1.5 meters (about 5 feet) tall to prevent climbing or jumping. However, challenges such as high installation costs, ongoing maintenance, and the difficulty of monitoring large or remote areas can complicate their use. In addition to fencing, non-lethal deterrents like noise devices, scent repellents, and guard animals also serve to deter wild boars. Noise devices, such as sirens or ultrasonic sounds, disturb boars but may lose effectiveness as the animals habituate to the sounds. Olfactory repellents, such as predator urine or pungent odors, are effective but require regular reapplication, especially after rain. Guard animals like livestock guardian dogs or donkeys can help protect areas from boars but require proper training, care, and supervision. Despite their potential, these methods face challenges related to consistency and the variability of their effectiveness. Research on wild boar damage in Himachal Pradesh, particularly in the Una region, highlights several key concerns. Authors emphasize the significant threat wild boars pose to agriculture, particularly to maize and wheat crops. The primary issues discussed include the escalating frequency of crop raids, the resulting economic losses for farmers, and the challenges in implementing effective control measures (Thakur *et al.*, 2022; Rao 2015; Piyush *et al.*, 2018; Mishra *et al.*, 2024). Researchers also point out the role of habitat encroachment and changing agricultural practices in increasing wild boar populations. Furthermore, there is a growing call for integrated management strategies, combining fencing, deterrents, and community involvement, to minimize crop damage while balancing wildlife conservation efforts.

Table 1: Feedback of Questionnaire survey from farmers.

1	Damage caused by wild animals over agricultural crops?		
	Agree (100%)	Disagree (0%)	Not Known (0%)
2	Which type of crops is damaged by wild animals?		
	Rabi (83%)	Kharif (12%)	Zaid (5%)
3	Which stage of crops from prone to damage of wild animals is observed?		
	Germinating (69%)	Developmental (12%)	Harvesting (19%)
4	From how much time they suffer from problem of wild animals?		
	Less (2%)	Moderate (5%)	More (93%)
5	The average how much damage caused by wild animals to the agriculture crops?		
	Less (3%)	Moderate (7%)	More (90%)
6	Which period of time (Day/Night) more wild animals are observed?		
	Day (12%)	Night (86%)	Not Known (2%)
7	How many wild animals observed at a time?		
	Solitary (2%)	Herd (97%)	Not Known (1%)
8	Do they observe the habitats of wild animals?		
	Agree (97%)	Disagree (0%)	Not Known (3%)
9	In which type of season (Summer/Winter), more damage by wild animals?		
	Summer (15%)	Winter (85%)	Not Known (0%)
10	What kind of management methods adopt by the farmers to protect the crop from the attack of wild animals?		
	Use of Barbed Fencing		
	Agree (85%)	Disagree (10%)	Not Known (5%)
	Use of Electric Wire		
	Agree (100%)	Disagree (0%)	Not Known (0%)
	Scaring of animal from crop fields		
	Agree (50%)	Disagree (0%)	Not Known (0%)

In this study, we designed a survey to assess the broader impact of wild boar damage and its management in crop fields. Our findings revealed that wildboar damage was an alarming aspect that cause 56% damage of crop. Farmers experience significant crop damage due to wild boar raiding activities. Effective management strategies must be implemented to mitigate the damage caused by wild boar activities. The combination of deterrents, such as fencing, bioacoustic devices olfactory repellents, and active monitoring, alongside promoting community-driven approaches to safeguard crops and protect farmers' livelihoods.

CONCLUSIONS

The effects of crop raiders can often be disastrous because the animals may completely destroy a crop in a single night. Understanding and controlling animal damage problems is a precondition for resource management in most manmade ecosystems to which wildlife species have successfully adapted. There are several solutions for preventing damage and controlling animal populations, but each one has benefits and drawbacks

FUTURE SCOPE

The growing issue of wild boar damage in agricultural landscapes, particularly in Himachal Pradesh, presents an urgent need for comprehensive, sustainable management strategies. As human-wildlife conflict intensifies with the increasing wild boar population, future research and management solutions should aim to achieve a harmonious balance between agricultural productivity and wildlife conservation.

Acknowledgement. I am very thankful to Department of Zoology and AINP-VPM, ICAR New Delhi for providing the guidance and necessary resources.

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How to cite this article: Anshul and Manoj Kumar (2025). Assessing Wild Boar (*Sus scrofa* L.) Damage and its Management Solutions in Agriculture Crops of Himachal Pradesh. *Biological Forum*, *17*(5a): 01-05.