

Efficacy of Management Strategies against Animal Menace in District Una, Himachal Pradesh, India

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ABSTRACT

In India also, problems of wild and stray animal damage to crops has emerged as an important management issue. Crop-raiding by locally overabundant populations of wildlife has been reported in many parts of the country. Field surveys revealed that about 30-40% of the crop is damaged by wild/stray animals. A study was conducted to ascertain the causes and efficacy of the management strategies being adopted to mitigate the animal menace in the foothills of Shiwaliks of North-Western Himalayas locally known as *Kandi* region in Himachal Pradesh. It was observed that neelgai is the dominant species in the area adjacent to the forests and stray cattle in other areas away from the forests. Over-exploitation of the forest resources by humans, reduction in population of carnivores, *Lantana* infestation in the forests and abandoning of unproductive domestic cattle were the main factors responsible for the enhanced animal menace. Among

the management strategies adopted fencing was quite effective in curbing the animal menace. Most of the management strategies adopted were location as well as species specific and no single approach was able to curb the animal menace completely.

Keywords Crop raiding, Management strategies, Economic losses, Wildlife.

INTRODUCTION

Crop raiding is the movement of wild animals from their native habitat onto agricultural land to graze on crops grown by people for their own sustenance. Insects, plant diseases, and weeds were once thought to be the most serious pests threatening agricultural food output, but animals have now surpassed them in some regions. Damage to agricultural crops caused by wild/stray animals has been reported since pre-historic times. The shrinking natural habitats in the recent times, has retracted the wildlife into small pockets. The damage is concentrated in the areas closer to these pockets and the extent of damage is enormous (Watve *et al.* 2016). The introduction of the Wildlife Protection Act (1972) in the country has resulted in a considerable increase in the population of many wildlife species thereby making a few of them overabundant. These species have become ecological dislocates as a result of disparate and often incompatible land use practises (Chauhan 2011). Animal damage has emerged as the most serious threat to field crops in places adjacent to protected

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zones or near woods. Neelgai, wild boars, monkeys, and stray cattle have wreaked havoc on the farming community in India's North-West Himalayan region (Pandey *et al.* 2019). Neelgai, an antelope revered by Hindus, has increased in population outside of protected regions. Agricultural crop damage by it has been widely reported from all over the country (Schultz 1986, Chauhan 2011). The wild boar (*Sus scrofa*) is one of the most widely distributed large mammal and distributed in North Africa, Europe and Asia (Vasudeva Rao *et al.* 2015a). The National Institute of Disaster Management stated that between 2007 and 2012, the Himachal Pradesh has lost 2,200 crore worth agriculture produce due to monkey menace. Similarly, 250 villages in Jammu region lost farm produce in 15,596 ha costing Rs 33 crore every year due to attacks by wild monkeys (Reddy 2018). Now the 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. The damage to the crops is to such an extent that some of the farmers have abandoned the cultivation of the crops, while others are forced to spend sleepless nights in the fields to protect their crops from damage. As a result the net returns are most of the times negligible or even sometimes negative in case crop is completely damaged by the animals (Kumar *et al.* 2016).

The aim of this paper is to document farmers' knowledge and experience of wild animals menace in Shiwalik region of North-Western Himalayas. The extent of damage to crops and to identify factors that help predict how vulnerable any farmer might be, would also be recognized/highlighted. The management strategies that farmers' employ to curb the wild animal menace and efficacy of these methods in the area would also be identified.

MATERIALS AND METHODS

Study area

The study was conducted in the Una and Amb blocks of Una district, Himachal Pradesh, India. Geological-

ly, the area forms a part of the Shiwalik hills constituting piedmont and alluvial piedmont. The soils in the region are having low-medium fertility with low water retention capacity. The farmers in the region are generally small and marginal. Maize and wheat are the predominant crops of the region during *kharif* and *rabi* respectively, in addition, pulses and oilseeds are also cultivated on small scale.

Data collection

A questionnaire was designed and field surveys were carried in Una and Amb block of district Una, Himachal Pradesh, India to generate data related to finding the root cause of animal menace, management strategies adopted and efficacy of these methods in curbing the animal menace. Preferential ranking technique by the respondent farmers was utilized to rank the dominant animal species causing damage to the crops. Based upon the outcomes of the survey and feedback, the reasons behind this human-animal conflict, dominant animal species, strategies being adopted to manage the wildlife menace at different levels and the efficacy of the different methods being adopted were documented. In addition to that, what needs to be done further to curb this animal menace was also recorded based on farmers' feedback.

RESULTS AND DISCUSSION

Dominant animal species in the region and factors responsible for enhanced crop raiding incidences

The crops of the farmers living near the forest areas/protected areas are prone to crop raiding by the wild/stray animals. The farmers have developed location specific strategies to manage the human-animal conflict. Wildlife species such as wild boars, antelopes, monkeys and rats were viewed as very destructive, because of the high numbers involved and frequency of damage associated with them (Agyeman and Baidoo 2019). Neelgai was ranked I on the basis of per cent damage to the crops in the fields adjacent to forest area followed by stray cattle (II), wild boars (III) and monkeys (IV), whereas stray cattle followed by wild boars and Neelgai were ranked I, II and III by the respondents in the fields which were away from

Table 1. Ranking of the various animal species as per percent damage.

Sl. No.	Name of the species	Rank given on the basis of % damage	
		Fields adjacent to the forest area	Fields away from the forest area
1	Neelgai	I	III
2	Stray cattle	II	I
3	Wild boar	III	II
4	Monkey	IV	-
5	Other birds and animals	V	IV

the forest area (Table 1). Also as per the respondents per cent damage was much lower in the areas away from the forests. So, the location of the farm was a major factor influencing the per cent damage and the species responsible for crop raiding incidences. There has been exponential growth in the number of the crop raiding incidences over the years as per the feedback of the respondents'. The present study revealed that the main reasons behind increase in crop raiding incidences is *Lantana camara* infestation in the forests (rank I) followed by abandoning of unproductive domestic cattle (rank II), the exploitation of forest resources by humans (rank III), conversion of grasslands into farms (rank IV), reduction in the population of carnivores (rank V), ban on hunting of wild animals (rank VI) and other factors (Table 2). Kumar *et al.* (2022) and Sagar (2016) have also reported similar reasons for the increased incidences of crop raiding as all these factors have resulted in the shrinkage of habitat, enhanced wild/stray animal population and reduction in natural resources on which wild animals were dependent.

Susceptibility of the crops to animal damage

The respondents revealed that the cereals, fodder crops and pulses were the most preferred (Table 3). Oilseeds like sesame and raya are little bit tolerant, whereas (*Eruca sativa*) were found to be safe against damage by the animals. It was also observed the cereals (wheat and maize) are highly prone to crop raiding even then farmers are growing these crops on larger areas due to ease in marketing of these crops as they are procured by the government agencies on minimum support price (MSP). Taramira and was

Table 2. List of factors responsible for enhanced crop raiding incidences.

Sl. No.	Factor	Rank given
1	Over-exploitation of the forest resources by the humans	III
2	Reduction in population of carnivores	V
3	<i>Lantana</i> infestation in the forests	I
4	Abandoning of unproductive domestic cattle	II
5	Conversion of grasslands into farms	IV
6	Ban on hunting of wild animals	VI
7	Others	VII

immune to animal damage but the yields are very low in case of tramaira which results in poor returns to the farmers. Kumar *et al.* (2022) also reported that the crops preferred by the farmers for cultivation were the crops which are most vulnerable to crop raiding incidences. Hence, the preference of a crop to be grown is based on a compromise between the different costs and benefits, labor requirements, harvesting, storage, food preparation and preferences and marketing etc. as reported by Hill (1997), similar views were expressed by the respondents also.

Management strategies adopted by the farmers

Crop raiding is not a new phenomenon. Farmers have evolved a number of practices to check the animals menace against damaging their crops. These practices are based on the resources available with an individual farmer. In developed countries farmers are resource rich and resort to advance technologies to combat crop raiding, whereas, in developing countries the marginal and small farmers have little access to highly priced technology. A range of practices has evolved in such countries, relying on simple, manpower based techniques to tackle crop raiders. Similarly, the farmers in the region are adopting different location specific and animal specific management strategies to minimize the crop raiding. Some of these management strategies are listed below:

Crop diversification

The damage to crops from wild animals has forced the farmers to change their cropping pattern, which are generally relished by monkeys to newer crops

Table 3. Susceptibility of the crops to animal damage.

Sl. No.	<i>Kharif</i> season		<i>Rabi</i> season	
	Crop	Immune/susceptible	Crop	Immune/susceptible
1	Maize	Susceptible to all the animal species	Wheat	Susceptible to all the animal species
2	Sugarcane	Susceptible to damage from wild boar and Neelgai	Chickpea	Susceptible to all the animal species as well as birds
3	Fodder crops	Susceptible to all the animal species	Raya	Moderately tolerant to some of the species
4	Sesame	Tolerant to most of the species	Fodder crops	Susceptible to all the animal species
5			Taramira	Immune to most the animal species and susceptible to birds

like *Aloe vera*, ginger, garlic, turmeric, medicinal, safflower, aromatic plants, flowering annuals, which are not consumed/damaged by monkeys. Farmers are avoiding cultivating crops, which are highly susceptible to damage near forests and try to change cropping patterns by growing other crops. The susceptibility of the crops to the animal damage was studied and it was concluded that wheat, maize and pulses are highly susceptible to animal damage (Table 2), while taramira, sesame and ashgourd are tolerant/immune to animal menace. Kumar *et al.* (2016) has reported that in the animal damage prone areas taramira can be taken as alternative crop to wheat/mustard as it is least damaged by the animals.

Traditional methods

The local farmers have devised and tried certain unique innovative methods by using indigenous knowledge at their village level to curb this menace. The most common traditional methods prevalent are – manual guarding of the fields, use of *scarecrows*, live fencing around their field boundaries, beating bells/drums in crop fields, use of animal excreta, use of dogs to scare away the animals, cow urine, other waste like rotten vegetable leaves producing foul smell and making fence of shining tapes around the crop fields, crackers. Meena *et al.* (2014) and Vasudeva Rao *et al.* (2015b) have also reported similar traditional methods for mitigation of the crop raiding incidences. The traditional methods of scaring away the wild animals are location, resource and animal specific in the region and also they are not highly effective in curbing the animal menace. The traditional methods are also labor intensive and keeping in view, the shortages of labor in agriculture sector are not viable option.

Fencing

Farmers of the region are installing different type of fencing depending upon the dominant animal species available in the area and proximity to forest area. The various types of fences being installed by the farmers are given below:

Barbed wire fence

Barbed wire fencing is highly effective in preventing wild animals from entering into the cropped area and is quite durable in nature. The barbed wire fencing consists of 5-6 strands of barbed wire stretched on permanent posts approximately 10-12 feet apart. The barbed wire is stretched tight during installation and stapled tightly to each post. A barbed wire fence is used where a greater repelling action against livestock is required. It sometimes contributes towards injury to the animals trying to trespass. However, some resource poor farmers use barbed wire on wooden posts which eventually rot so ongoing maintenance is needed in that case. The wooden posts require the harvesting of wood. The iron/cemented posts are very costly and beyond the approach of poor farmers. But the barbed wire fencing is ineffective against the damage from wild boars and monkeys.

Solar fencing

The solar powered electric fence with pulsating current and these pulses are the “shock” felt by an animal that touches an electrified fence. Unlike a conventional fence, an electric fence is a psychological barrier such that animals learn to respect the fence. The fence is like barbed wire fencing with multiple strands of

plain wires and metal/cement/wooden posts to hold the strands in position. The wires carry low voltage current. The Solar Power Fence gives a sharp, short but a non-lethal shock to the intruder and creates psychological fear, against any tampering. Due to high voltage shock to the animals touching the fence, animals keep away from the fence and field is protected. Solar power fencing offers benefits like safety (human and animal), lower cost, ease of construction (relatively simple and easy to build, electric fences can be installed quickly and with minimum tools, saving time and money) and long life. The traditional fencing do not assure 100% protection of the fenced area from wild animals and monkeys, while solar power fencing assures maximum protection, it is effective during any season round the clock. Shende *et al.* (2018) has also discussed about the similar benefits of the solar fencing in management of crop raiding. The farmers have to keep the area near the fence vegetation free (shrub, herbs) to ensure the electric supply in the wires otherwise the electric current is lost.

Chain link fence

The fencing with barbed wire, live fence and solar fencing have one or other shortcoming which results in the damage to crops by the animals and fails the very purpose for which it was installed. So, now the farmers are going for installation of chain links of 5-6 feet high and 4x4 inch mesh size as fence. The fence is installed with concrete or iron posts as in case of solar or barbed wire fencing with three barbed or simple iron wires for support. It is effective against all type of animals except monkeys.

Efficacy of management strategies against animal menace

The fencing of the fields seems only the viable and effective solution against the wild animal menace. The efficacy of the different fences was also studied (Table 4) and calculated on the basis of the feedback from the farmers. The perusal of the table revealed that solar and live fences against monkey; solar and chain link fence are effective against Neelgai, stray cattle and wild boars. Hence, it can be concluded from this that solar and chain link fence are highly effective against wild animal menace.

Table 4. Efficacy of management strategies against animal menace.

Type of fence	Animal species	Efficacy (in %)
Traditional methods	All species	Labor intensive, location specific and not very effective
Barbed wire fence	Monkey	Not effective
	Neelgai	20-30%
	Wild boar	Not effective
	Stray cattle	40-50
Solar fence	Monkey	80-90
	Neelgai	70-80
	Wild boar	50-60
	Stray cattle	80-90
Chain link fence	Monkey	Not effective
	Neelgai	80-90
	Wild boar	80-90
	Stray cattle	90-100

Efficacy of the various fences was also studied against the wild boars by Vasudeva Rao *et al.* (2015a) and reported encouraging results in curing animal menace. Mishra (1997) reported that barriers natural or man-made spatially separate the animals from human settlements and prove effective. Electric fencing is successful in reducing human-animal conflict but fails due to inadequate or poor maintenance (Chauhan and Chowdhury 2002). The wild boars were able to dig beneath stone wall, while Neelgai can jump over 1.5 m fence (Sekhar 1998). So, the efficacy of the fences is also debatable as one type of fence is effective against one species, while it is not effective against other species. Still fencing provides some level of protection to the crops compared to fields without fencing.

CONCLUSION

Although crop damage may seem minor in comparison to the nation's overall food production, it is extremely important for the small farmers who must bear the brunt of the damage. 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 man-made 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. The

fencing of the farms is a costly affair for small and marginal farmers, so support from the government for installation of the fences is required. The management strategies being adopted by the farmers are location as well as species specific but still they are providing some relief to the farmers. So, concrete steps needs to be taken by the government to curb the animal menace. Although steps are being taken at the state government level, but strict implementation is required to curb the animal menace, such as harsh punishment for poachers; fencing of the forest area near human settlements to avoid human-animal conflict; and developing a policy for the eradication of lantana from forests, along with the allocation of funds and a partial to complete ban on the harvesting of wild products specific to the forest. Such government initiatives, with public participation, can result in the control of human-animal conflict and crop raiding incidents.

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