



## Research Article

# A STUDY ON MANAGING CROP DAMAGE BY WILD ANIMALS IN HIMACHAL PRADESH

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**Abstract:** The economy of Himachal Pradesh is predominantly agricultural and majority of its population is dependent on this sector. However, the farmers are facing the crop damage problems due to the crop raiding by wild animals. The study has mainly intended to study the nature and extent of crop damage by wild animals. The study has also highlighted the types of animals involved in crop damage and it has even reviewed the existing government policies and have extended the suggestive remarks on the policy issues. Study evidently noted that the sudden increase of the population of wild boar has substantially increased the crop damage in the state. Since, wild boar observed to be the most problematic animal for the farmers in regard to crop damage. Study has highlighted the farmers' suggestions that fencing should be done across the boundaries of the fields so that the wild animals find it difficult to venture in it and cause damage, moreover, festivals like 'Van Mahotsav' should be celebrated at regular intervals so as to celebrate nature and natural things which will eventually create a harmony between farmers and wild animals.

**Keywords:** Crop damage, Wildlife management, Agriculture development, Agriculture disaster management

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## Introduction

As human and livestock population has increased immensely, forest encroachment has been effected, which paved a floor to grazing activities, cultivation of wastelands and deforestation. Due to such human disturbances and habitat loss the wild animals have been affected to a great extent, some became endangered, some extinct, and those who survived, learnt to live in man designed habitat successfully. For many years, the natural habitats of the country have been altered because of human [20]. Most of the highlands and some of the lowlands have been modified into agricultural and pastoral land. This has led to encroachment into wildlife habitats. The constriction of wildlife habitats resulted in severe competition for natural resources between wild animals and the local communities. This in turn resulted in wildlife human conflict [24]. These animals enter human settlement and their fields for food and causes damage to agriculture and horticulture crops. Until recently, there has been little attention given to vertebrate species that damage crops, particularly crops of small-scale farmers in tropical and sub-tropical regions. Birds are also recognized as significant pests. The main damage is caused by their feeding activities. Herbivorous and omnivorous species of birds damage the agriculture [22]. Humans have lived in close relationship with wildlife and have shared resources like space, habitats, and food for a long time, which have stiffened to a nearly perfect competition [12]. Human encroachment on wildlife habitat has thus resulted in an increase in conflicts between humans and wildlife [15]. In tropical and subtropical regions, the extension of farming into the forest interior makes wild animals farm pests, and the degree of tolerance of the damage caused changes over time [11]. The farmers try almost every possible method to keep away animals off their fields. They beat drums at night, try to scare away the animals, some put snares in their fields, some produce sounds and others want to kill them through guns [19]. The extent and intensity of damage may also vary depending on the cropping pattern, wildlife population density and behavior, and food availability in wild habitats [21]. The people faces a lot of difficulty due to this conflict, sometimes even the farmers are attacked. Crop losses to wildlife may have various impact on farming households.

These include high guarding investment, disruption of schooling for children who have to help guard fields and increased risk of injury from wildlife [8]. There are numerous campaigns and efforts being run by the government and some organizations to save wildlife. But here in such situation it becomes a need of a farmer to cull an animal. In India, crop damage is very common along the immediate periphery of wildlife sanctuaries and national parks [5], as is the case at many other sites in Africa and Asia. The losses incurred by farmers may make communities living close to protected areas antagonistic and intolerant towards wildlife, which can undermine and impede conservation strategies [17]. The farmers in developing countries often have limited access to cash and are rarely compensated for their losses hence the individual economic losses suffered from crop-raiding can be relatively high [4].

The increasing rate of decrease in forests and encroaching agriculture land is leading to an up rise in animal invasion of fields which has leads to a drastic change in farmers perception towards them. The harmony between a farmer and wild animals seems to be a next impossible thing [2]. As far as the compensation for the damaged crop from wild animal is concerned, once the damage has been assessed, the victim sends his application for compensation to a compensation fund which must approve it. This fund is financed by the state as well as by contributions levied on the issue of hunting licenses [3]. Compensation is funded by the state alone in respect of those species which may not be hunted, such as swans. Where damage by geese is involved, the holders of hunting permits must each pay the sum of 25 florins, which brings in around 750,000 florins to the fund. The remaining one and a half million florins needed to indemnify damage caused by geese, including protected species of geese, are contributed by the state [6]. This has led to a resentment among farmers and a hatred towards animals. The Himachal Pradesh is a mountainous state in Western Himalayas. The state has a geographical area of 55,673 sq.km. with elevation ranging from 350 mts. to 7000 mts. There are 5 rivers namely Beas, Sutlej, Ravi, Chenab and Yamuna. These are perennial rivers fed by snow and rainfall.

## Material & Methods

The descriptive research design was adopted for the concerned research study. A Multi Stage Random Sampling design technique was used for the present study. The selection of the research area in the Kandaghat block of district Solan, Himachal Pradesh was made purposively. In the present study the total number of respondents for the collection of primary data in Kandaghat block was 60 reported from 5 panchayats out of total 24 panchayats. 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. Simple mathematical and statistical tools, including Arithmetic mean, standard deviation and Total Weightage Score method were used for satisfying the objectives with a view of keeping the analysis simple and easy to understand. The arithmetic mean has been applied to study the opinion of the sample respondents on 5-point scale for different statements [10]. Total weightage score method in which we have to provide different Weights according to their importance and multiply the values of the items (X) by the weights (W) as provided. Then add all the values to obtain the total weights of all the items and the one which get highest score will get the first rank and the one which get the lowest score will get the lowest rank [13]. Likert scaling (bipolar scaling method), measuring dual inclined responses in terms of positive or negative response to a statement [14]. The concerned research paper was initiated with the key objectives to study the nature and extent of crop damage by wild animals, to study the types of animals involved in crop damage and to review the existing government policies and to receive the extension of the suggestive opinions of farming community on the policy issues crop damage management.

## Results and Discussion

1. Nature and the extent of crop damage by wild animals:
2. Village wise distribution of sampled household in study area

It was observed that the total number of respondents for the collection of primary data in Kandaghat block was 60 reported from 5 panchayats out of 24 panchayats of the block.

Table-1 Village wise distribution of sampled household in study area

Panchayat	Village	No. of respondent
Mahi	Shamlech	6
	Kadhar	6
Kahala	Daunti	6
	Kahala	6
Shrinagar	Dhali	6
	Adda	6
Bisha	Bisha	6
	Dihari	6
Basha	Basha	6
	Kohari	6
Total		60

Field Survey, 2017

## Demographic profile of the respondent

As far as the demographic profile of the respondent is concerned, it was indicated that 58 are males compared to the 2 females, as depicted from [Table-2]. The education status of the respondents was also revealed as 18.33 percent respondents attained primary education, 50 percent managed to get middle education and only 19 percent respondents were matric and above. The majority of respondents have attained their middle education.

Table-2 Demographic profile of the respondent

Particulars	Value
<b>Gender</b>	
Male	58
Female	2
Average age of respondent (Year)	49
<b>Education status of respondent</b>	
Primary	11 (18.33)
Middle	30 (50.00)
Matric and above	19 (31.67)

Field Survey, 2017

## Occupational Pattern of the respondent

It can be seen from the [Table-3] that agriculture was the dominant occupation of 73.33 percent respondents whereas 15 percent of respondents were engaged in service, 11.67 percent as can be seen runs their business. Thus it can be concluded that the major occupation of the respondents is agriculture.

Table-3 Occupational Pattern of the respondent

Occupational Pattern	Number	Percentage
Service	9.00	15.00
Business	7.00	11.67
Agriculture	44.00	73.33
Total	60.00	100.00

Field Survey, 2017

## Land use pattern of the sampled household

It is shown in [Table-4] that out of total area about 29.59 percent is irrigated land and about 70.41 percent is unirrigated land. The table shows that cultivated land is about 61.27 percent. The ghasni is comprising 30.98 percent and barren land in the area is around 7.75 percent. Therefore, it is revealed that the area is not having sources of irrigation and has some form of barren land and ghasni as well.

Table-4 Land use pattern of the sampled household

Particulars	Area (Bighas)	Per cent
Total area	15.13	100.00
Irrigated	4.48	29.59
Un-irrigated	10.65	70.41
Cultivated land	9.27	61.27
Ghasni	4.69	30.98
Barren land	1.17	7.75

Field Survey, 2017

## Types of crops grown

In reference to the kinds of crops grown in the research area, the research data was collected from the sample distribution of 60 farmers from the given area. In result it was observed that among cereals growing farmers, [Table-5] 38.33 percent grow wheat, 46.67 percent grow maize and 41.67 percent farmers grow barley. And considering vegetables grown in the area 61.67 percent farmers grow tomato, 53.33 percent grow capsicum, 36.67 percent farmers grow cabbage, 48.33 percent grow pea, 45.00 percent grow cauliflower and 35.00 percent farmer grow beans. Among fruit crops 55.00 percent grow peach, 50 percent farmers are cultivating plum and 46.67 percent farmers are cultivating apricot. Therefore, it can be seen that the farmers grow mostly vegetables crops in the area.

Table-5 Types of crops grown

Particulars	Number of sample farmers (60)	Percent
<b>Cereals</b>		
Wheat	23	38.33#
Maize	28	46.67
Barley	25	41.67
<b>Vegetables</b>		
Tomato	37	61.67
Capsicum	32	53.33
Cabbage	22	36.67
Pea	29	48.33
Cauliflower	27	45.00
Beans	21	35.00
<b>Fruits</b>		
Peach	33	55.00
Plum	30	50.00
Apricot	28	46.67

Field Survey, 2017

## Crops mostly damaged by the wild animals

In reference to the kinds of crops grown in the research area, the research data was collected from the sample distribution of 60 farmers from the given area. In result it was observed that the damage to crops by wild animals as reported is given in the [Table-6] stated that the wild animals have caused the damage to the wheat crop specifically to an extent of 23.33 percent, maize 18.33 percent and barley 21.67 percent respectively. Among vegetables tomato was the most damaged crop with 73.33 percent damage, followed by pea and capsicum with 71.67 and 68.33 percent respectively.

The cabbage and cauliflower were almost equally affected, whereas the least damage was to beans (46.67%). It was also noted that among fruits, peach crop is highly damaged (51.67%), apricot (48.33%) and the least affected is plum (43.33%). This finding also matched with the study of [18]. Therefore, it concludes that large number of vegetable crops are being destroyed by the wild animals.

Table-6 Crops mostly damaged by the wild animals

Particulars	Number of sample farmers (60)	Percent
<b>Cereals</b>		
Wheat	14	23.33#
Maize	11	18.33
Barley	13	21.67
<b>Vegetables</b>		
Tomato	44	73.33
Capsicum	41	68.33
Cabbage	29	48.33
Pea	43	71.67
Cauliflower	29	48.33
Beans	28	46.67
<b>Fruits</b>		
Peach	31	51.67
Plum	26	43.33
Apricot	29	48.33

#14/60 \*100=23.33% Field Survey, 2017

### Periodicity of invasions

It can be seen from the [Table-7] that most of the wild animal invasions were on daily basis (55%). The monthly invasions were reported in case of 33.33 percent of household. The annual invasions were reported by 11.67 percent of sampled household.

Table-7 Periodicity of invasions

Invasions	Number of sample farmers (60)	Percent
Daily	33	55
Monthly	20	33.33
Annually	7	11.67

Field Survey, 2017

### Decrease in family income due to crop damage

In the [Table-8] the Likert scale method was used for analyzing the decrease in family income due to crop damage. The mean score from the respondents was calculated and was found 4.07 which indicated that all the respondents agreed for decrease in their family income due to crop raiding by wild animals.

Table-8 Decrease in family income due to crop damage

Particulars	Average Response	Weightage	Total
Strongly agree	0.38	5.00	1.92
Agree	0.40	4.00	1.60
Indifferent	0.12	3.00	0.35
Disagree	0.10	2.00	0.20
Strongly disagree	0.00	1.00	0.00

Field Survey, 2017

### Quantity of produce is affected leading to less production

The [Table-9] depicts that Likert scale method was used for the analysis of effect of crop damage on livelihood, the mean score from the respondents was calculated and was found 4.45 which indicates that farmers response falls between strongly agree and agree. Similar results were found by [23]. It means that most of the respondents agree that the quantity of produce is affected due to crop raiding by wild animals which eventually lead to less production.

Table-9 Quantity of produce is affected leading to less production

Particulars	Average Response	Weightage	Less Production
Strongly agree	0.58	5.00	2.92
Agree	0.33	4.00	1.33
Indifferent	0.07	3.00	0.20
Disagree	0.00	2.00	0.00
Strongly disagree	0.00	1.00	0.00
Mean Score			4.45

Field Survey, 2017

### Quality of produce is affected fetching less prices in the market

It is shown in [Table-10] that using Likert scale method the mean score from the respondents was found to be 3.83 which is near about agree. It means that some of the respondents agree that the quality of produce is affected by crop damage by wild animals which fetch poor prices in the market to the farmers.

Table-10 Quality of produce is affected fetching less prices in the market

Particulars	Average Response	Weightage	Less Prices
Strongly agree	0.33	5.00	1.67
Agree	0.38	4.00	1.53
Indifferent	0.17	3.00	0.50
Disagree	0.03	2.00	0.07
Strongly disagree	0.07	1.00	0.07
Mean Score			3.83

Field Survey, 2017

### Examining the types of animals involved in crop damage

#### Animal involved in crop raiding

It can be seen from the [Table-11] that the wild boar is the most problematic animal in this area as was reported by 78.33 percent farmers. The monkeys and the barking deer also cause a huge damage. The Himalayan langur causes least disturbances with 21.67 percent response. It is revealed that the wild boar is the most problematic wild animal in the area. As according to the present study done in Kandaghat block it was revealed that the wild animals were threatening peoples lives as was reported by 24.19 percent of respondents.

Table-11 Animal involved in crop raiding

Wild Animals	Number	Per cent
Rats	19	31.67
Monkeys	40	66.67
Porcupine	16	26.67
Wild Boar	47	78.33
Barking Deer	31	51.67
Parakeets	23	38.33
Langur	13	21.67

Field Survey, 2017

Reviewing the existing Government policies on the regulation of animal damage:

There has been a practice of paying compensation/relief due to losses caused to human beings and domestic livestock by the wild animals. The rates for compensation in case of livestock are not comparable to the actual loss. In case of attack on human beings, there are different rates to compensate the loss. In case of minor injury a sum of Rs.10000/- is paid to the affected person. In case of grievous injury a sum of Rs.75000/- is paid. In case of death of human being Rs. 150000/- and in case of permanent disability a sum of Rs.1 lakh is paid as compensation. There is no provision of paying compensation for loss to crops. The amount of compensation is much below the market value [16]. Suggestions seek from the farming community regarding government policy issues:

### Causes of crop raiding

It is illustrated in [Table-12] that the major reasons of crop damage was sudden increase in the population of wild boar with a strong response of 61.67 percent. The majority of farmers also believed that the Government protects wildlife to a large extent (51.67%). However, 50.00 percent farmers argued that the shortage of the forest land and encroachment into forest land which the habitat of wildlife. Some of the farmers also said that lack of fencing is also one of the main reason. This finding also matched with the study of [1]. It can be observed that the wild boar is the most problematic animal.

Causes of Crop raiding	Number	Percent
Increasing population of monkeys	16.00	26.67
Translocation of monkeys	10.00	16.67
Sudden increase in population of wild boar	37.00	61.67
Lack of fencing	28.00	46.67
Shortage of jungle and encroachment	30.00	50.00
Government is protecting wildlife	31.00	51.67
Wild animals attack during night	7.00	11.67

Field Survey, 2017

Table-13 Suggestions to overcome crop damage problem

How to overcome crop damage problem?	Highly Recommended (3)	Moderately Recommended (2)	Least Recommended (1)	Total weightage Score	Rank
Fencing	31	29	0	151	II
Subsidies/Funds/Assistance	44	16	0	164	I
Permission to kill problem animals	8	18	34	94	V
Compensation of crop damage	32	20	8	144	III
Using poisoning agents in food crops	13	27	20	113	IV

Field Survey, 2017

Table-14 Suggestions to harmonize farmers and wild animals

Farmers and wild animals live in harmony	Highly Recommended (3)	Moderately Recommended (2)	Least Recommended(1)	Total weightage Score	Rank
Compensation in case of damage	29	31	0	149	I
Catching and Relocating of problem animals	8	13	39	89	V
Scaring off animals	9	19	32	97	IV
To make alternate water points for wild animals	26	26	8	138	II
Celebrating many other festivals like "Van mahotsav"	18	27	15	123	III

Field Survey, 2017

### Suggestions to overcome crop damage problem

[Table-13] reveals that the farmers liked the suggestion of subsidies, funds and assistance the most to overcome the crop damage problem as the suggestion is given rank 1st. In this analysis, the total weightage method was used for ranking the suggestions to overcome crop damage problems. Similar results were found by [7]. The suggestions of fencing and compensation were also liked by farmers as these were rated rank 2nd and rank 3rd respectively.

### Suggestions to harmonize farmers and wild animals

It is indicated in the [Table-14] that the total weightage method was used in ranking the suggestions given to the farmers regarding harmonizing farmers and animals, according to their response in this study. This finding was matched with the study of [9]. The farmers liked the suggestion of compensation in case of crop damage the most and they ranked it 1st. The farmers also liked the suggestion of making alternate water points for wild animals and ranked it 2nd. The farmers were willing to harmonize with wildlife and liked the suggestion of celebrating many other festivals like "Van Mahotsav" and ranked it 3rd. The least liked suggestion was of catching and relocating of wild animals and was ranked 5th accordingly.

### Conclusion

The study concluded that since the economy of Himachal Pradesh is predominantly agricultural and majority of its population is dependent on this sector. The vegetables and other cash crops play a crucial role in agricultural development in the state. However, the farmers are facing the crop damage problems due to the crop raiding wild animals. The farmers have to cope with these animals and on the same page forest cover is reducing due to an encroachment, wildlife habitat is reducing. The crop damage is resulted as when the animals venture into the agricultural fields in search of food. The study has observed that the family income of farming community has drastically decreased due to crop raiding by wild animals. It was also revealed in the study that farmers agree that the quantity of produce is affected due to crop raiding by wild animals which eventually lead to less production whereas some of the respondents agree that the quality of produce is affected by crop damage by wild animals which fetch poor prices in the market to the farmers. Study categorically reported that wild boar is the most problematic animal in this area, followed by monkeys and the barking deer. The Himalayan langur causes least disturbances with 21.67 percent response. The major reasons of crop damage were the sudden increase of the population of wild boar with a strong response of 61.67 percent. The majority of farmers also believed that the Government protects wildlife to a large extent. The main reason is the shortage of the forest land and the encroachment into forest land which destroys the habitat of wildlife. Some of the farmers also said that lack of fencing is also one of the main reason. It can be observed that the wild boar is the most problematic animal and one of the main cause of crop damage. Thus considering the menace of wild animals on the crop damage aspects, it was

substantially suggested by the farming community that the fencing should be done across the boundaries of the fields so that the wild animals find it difficult to venture in it and cause damage. The subsidies and any other financial assistance to farmers can be of a great assistance in coping with this crop damage problem. There should be a provision of compensation in case of crop damage by wild animals just like the compensation is granted in cases of natural calamity. The alternative water points can be made for wild animals so that they stay away from the farm lands. The various festivals just like 'van mahotsav' should be celebrated at regular intervals so as to celebrate nature and natural things which will eventually create a harmony between farmers and wild animals.

**Application of research:** This research study would help the policy makers and the researchers to understand the intensity of crop damage being faced by the farmers. Moreover, through this research study an attempt has been made to instigate the government agencies to take an immediate step to control the catastrophic conditions of farming being faced by the farming community which is struggling hard to sustain their farming business.

**Research Category:** Agriculture disaster management

**Abbreviations:** TWS: Total Weightage Score

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### References

- [1] Amici *et al.*, (2012) *Agronomy for Sustainable Development*, 32(3), 683-692.
- [2] Bayani *et al.*, (2016) *PLoS ONE* 11(4), e0153854.



- [3] Bhattarai B.P. and Bhasnet K. (2004) *Proceedings of IV National Conference on Science and Technology*.
- [4] Bolwar A.C. (2015) *Journal of Global Biosciences*, 4(1), 1954-1960.
- [5] Chhangani A. K. and Mohnot S. M. (2004) *Primate Report*, (69), 35-47.
- [6] Cyrille de Klemm (1996) *Compensation for Damage Caused by Wild Animals*, Council of Europe Publishing, 18-84, 28.
- [7] Felix et al., (2013) *Brazilian Journal of Biology*, 74(4), 779-786.
- [8] Hill C. (2004) *Dimen. Wild*, 9, 279-286.
- [9] Jayson E.A. (1999) *KFRI Research Report*, 48.
- [10] Kothari C.R. (2009) *Research Methodology, Methods and Techniques*. New Age International Publisher, New Delhi, 15-40.
- [11] Knight J. (2001) *Anthropological Perspective*, 1-35. Routledge, London.
- [12] Knowledge Base Review Report. (2003) <http://www.nerc.ac.uk/research/programmes/lwec/documents/lwec-pr-watt-report.pdf>[2010 October].
- [13] Kumar R. (2014) *Research Methodology*. British Library Publications, New Delhi, India, 37-45.
- [14] Kumar R.C. (2008) *Research Methodology*. APH Publishing Corporation, New Delhi, India, 23-29.
- [15] Madden F. (1999) *Report to the International African Geography and Development*. Berkeley, University of California Press.
- [16] Musafir S.K. (2015) *Man- Animal Conflict in Himachal Pradesh*. MCT Phase IV (7th.Course), 15.
- [17] Nyhus P.J., Tilson R., Sumianto (2000) *Crop-Raiding Elephants and Conservation Implications at Way Kambas National Park, Sumatra, Indonesia*. *Oryx* 34, 262-274.
- [18] Nyirenda et al., (2013) *International Journal of Biodiversity and Conservation*, 5(11), 741-750.
- [19] Sekhar N. U. (1998) *Environ. Conserve.*, 25,160-171.
- [20] Sergey M. Govorushko (2012) *Natural Processes and Human Impacts, Interactions between Humanity and the Environment*. Springer Business Media, New York, 217.
- [21] Vijayan S. and Patil B.P. (2002) *Popula. and Environ.*, 23,541-559.
- [22] Wang S.W., et al. (2006) *Wildlife Society Bulletin* 34(2), 359-365.
- [23] Woolf Alen and Green Christian D. (2003) *Investigations of Crop Damage by Wild Turkeys in Illinois*. Final reports, 17.
- [24] Yalden D.W., Lagen M.J. (1992) *The Endemic Mammals of Ethiopia*. *Mammal Review*, 22, 115-150.