

## Human–Wild Pig Conflict in Selected States in India and Mitigation Strategies

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**Abstract** – We investigated the human–wild pig conflict in 5 different states in India. In these states, the wild pig populations are fragmented and relatively isolated all over. Agricultural crop depredation and attacks on humans being by wild pigs is a major problem. During 1990-2008, a total 309 human killing and injury cases were caused by wild pigs in these states. There was marked monthly variation in human casualties. Highest number of casualties occurred in November (n = 61). Wild pigs caused maximum human casualties in forests (73.8%) than crop fields (21.7%) and villages (4.5%). Highest number of 92 human casualties occurred in the age group of 41-50 years. Highest number of 97 human casualties occurred between 0801-1200 h (n = 97). Damage to agricultural crops by wild pigs was of varying extent (5-36%). As a result, people have developed antagonistic attitude towards the wild pigs which adversely affect the conservation efforts. Recommendations have been made for reducing the human–wild pig conflict in these states.

**Wild pig / conflict / human casualties / crop damage / mitigation**

**Kivonat** – Ember–vaddisznó konfliktus India néhány államában és mérséklésének lehetőségei. India öt különböző államában vizsgáltuk az ember-vaddisznó konfliktust. Ezekben az államokban a vaddisznó-populációk fragmentáltak és szinte teljesen elszigeteltek. A legnagyobb problémát a mezőgazdasági terményekben okozott kár és az emberek elleni támadások okozzák. 1990 és 2008 között ezekben az államokban 309 esetben okozták ember halálát és sérülését. Az emberi áldozatok száma havonta változott, a legtöbb eset november hónapban fordult elő (n = 61). A vaddisznók a legtöbb balesetet az erdőterületeken okozták (73,8%), ezt követték a termőföldek (21,7%), majd a falvak (4,5%). Leggyakrabban (92 eset) az áldozatok 41 és 50 év közöttiek voltak, és a támadások döntő többsége (97 eset) reggel 8 és déli 12 óra között történt. A mezőgazdasági terményekben okozott kár 5 és 36% között változott. Az emberek ellenséges magatartást vettek fel a vaddisznóval szemben, ami hátrányosan hat a természetvédelmi törekvésekre. Javaslatokat tettünk az ember-vaddisznó konfliktusok csökkentésére ezekben az államokban.

**vaddisznó / konfliktus / emberi áldozatok / vadkár / mérséklés**

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## 1 INTRODUCTION

The wild pig (*Sus scrofa*) is one of the most widely distributed large mammals. It has always been associated itself with man, and successfully utilises the human altered landscape (Fadeev 1975, Erkinaro et al. 1982). Being a resilient and fast breeding animal, it is capable of expanding and establishing its population in new areas (Erkinaro et al. 1982, Ahmed 1991).

Agricultural crop depredation by wild pigs is a major problem in many parts of India. Wild pigs raid crops and utilises the agro-ecosystem for food resource and shelter. The wild pigs notoriety as a crop pest is universal (Tisdell 1982). Presently the wild pig populations are fragmented and relatively isolated all over. Some of these isolated populations became locally overabundant and depend upon agricultural crops especially in and around protected areas (PAs) or managed forests (MFs) - village interface areas for a major part of their food requirement.

There is paucity of information on ecology and conflict aspects of wild pigs from Indian sub-continent; the available information is of general nature and fragmentary (Anonymous 1890, Mason 1893, Brander 1923, Ali 1927, Morris 1929, Rao 1957, Schaller 1967, Santaipillai – Chambers 1982, Prater 1980, Tiwari 1985, Shafi – Khokhar 1986, Ramachandran et. al. 1987, Ramdas 1987, Ahmed – Samant 1989, Ahmed, 1991). In the western ghats of Maharashtra state, man and wild pigs interaction has been briefly studied by Ahmad (1991).

The problem of crop damage by wild pigs has been widely reported from Rajasthan and Madhya Pradesh (Rajpurohit – Chauhan 1993, 1996). According to Maekin (1970), Andrzejewski – Jezierski (1978) and Genov (1981), the damage to crops increases when there is less natural food available in forest and artificial feeding of wild pigs could reduce crop damage. Besides agricultural crops, it causes damage to ground vegetation, orchards, forest plantations and possibly acts as carrier of some infectious diseases. As a result, there has been increasing trend in the human–wild pigs conflict in and around protected areas, managed forests and human settlements throughout the country. Consequently, people have developed antagonistic attitude towards the wild pigs and which is adversely affecting the conservation efforts. For mitigation of crop damage problem, fencing was suggested as an effective technique (Hone – Ackison 1983). Use of techniques to trap wild pigs has the potential to develop as effective applicable management tool. This paper presents the findings of our study on the human–wild pig conflict in the selected states in northern and central India and suggests mitigation strategies.

## 2 STUDY AREA

The study was conducted in and around different protected areas in the state of Madhya Pradesh, Uttar Pradesh, Himachal Pradesh, Uttarakhand, and Rajasthan (*Figure 1*). Tropical, subtropical, and temperate forest vegetation, high altitude mixed forests and sub-alpine & as well as alpine pastures. Forests are interspersed with villages & agricultural areas in the low-lying areas. Villages, hamlets and cultivation are revenue lands under private ownership. People are dependent on the forest resources. Economy based on forest, agriculture and livestock.

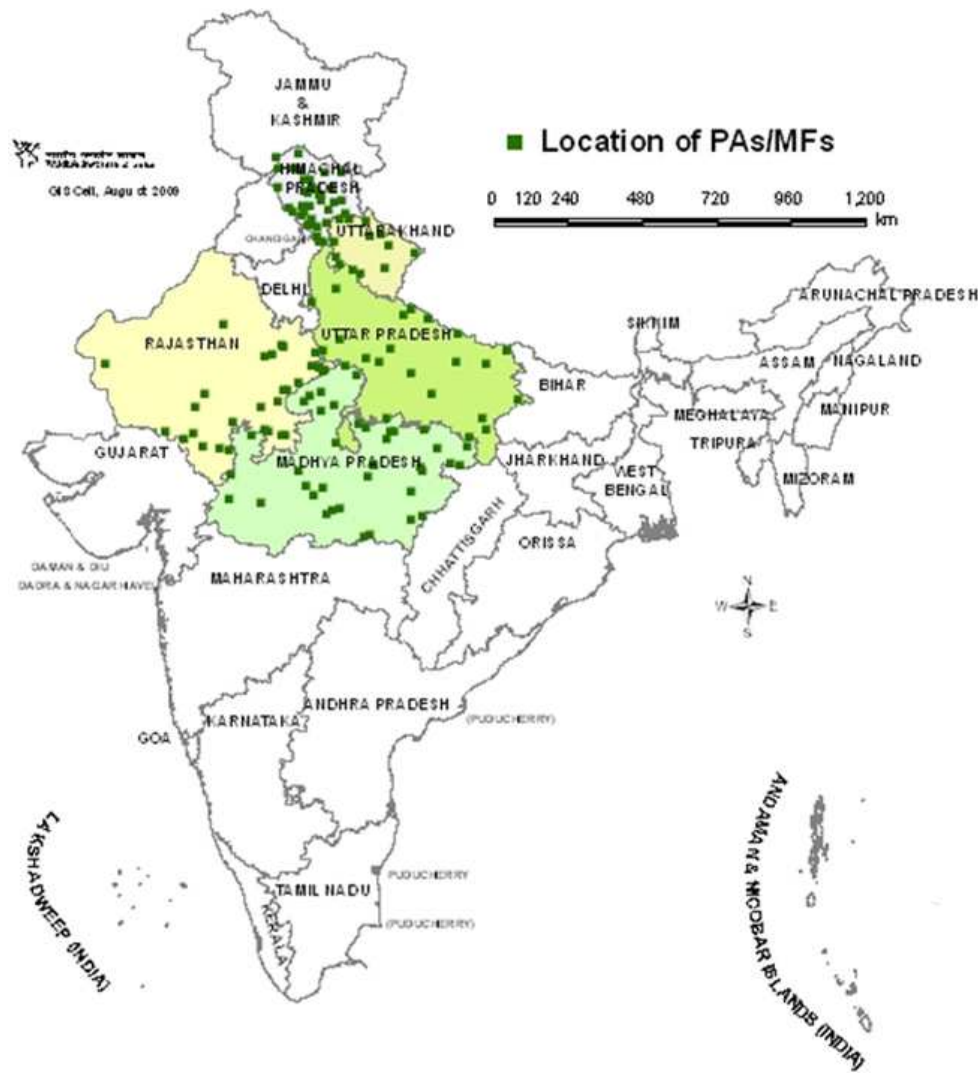


Figure 1. Map of India showing the study areas: five states and location of protected areas and managed forests

### 3 METHODS

Information on nature and extent of human-wild pig damage problems was collected from the villages located in and around protected areas (PAs) and managed forests (MFs) of Madhya Pradesh, Uttar Pradesh, Himachal Pradesh, Uttarakhand, and Rajasthan states. Wild pigs-human conflict has been evaluated based on the information collected from the office record of forest department, questionnaire survey of the villages and interview of the victims or their families and analysis of human casualty cases. Field managers were also contacted to know about the gravity of the problem in their areas of jurisdiction.

Following this, villages and affected areas were surveyed to collect the information on the area profile, human casualties, and circumstances of attacks, agricultural cropping pattern, and nature and extent of crop damage by wild pigs, collection of non-timber forest produce and fuel wood by the villagers and traditional control methods etc. in well-designed questionnaire formats. After the questionnaire surveys, the villages were categorized as affected and non-affected. Then few agricultural crop fields were randomly selected and the crop damage assessment was done using ocular estimation method. Information on compensation paid for the losses and year-wise payments was also collected.

### 3 RESULTS AND DISCUSSION

#### 3.1 Human casualties

During 1990-2008, a total 309 human killing and injury cases were caused by wild pigs in 5 states, namely, Madhya Pradesh, Uttar Pradesh, Himachal Pradesh, Uttarakhand, and Rajasthan. Maximum cases occurred in Himachal Pradesh ( $n = 100$ , 32.4%), followed by Madhya Pradesh ( $n = 77$ , 24.9%), Uttarakhand ( $n = 61$ , 19.7%), Rajasthan ( $n = 48$ , 15.5%) and Uttar Pradesh ( $n = 23$ , 7.4%) (Figure 2). Wild pigs accounted for 12 (3.9%) human deaths as compared to 297 (96.1%) injury cases. Thus the injury cases were significantly high than death cases ( $\chi^2 = 24.42$ ,  $df = 4$ ,  $p < .001$ ).

Wild pig habitats interspersed with villages and crop fields resulted in frequent encounters with humans. During this period, most of the human casualties by wild pigs occurred in the periphery of the PAs/MFs and few occurred inside. Most of these attacks were accidental and occurred when these victims ventured into the forests for collection of non-timber forest produce in forests, fuelwood, fodder, medicinal plants, or to graze their livestock and while working in their crop fields or providing crop protection or moving in vicinity of villages.

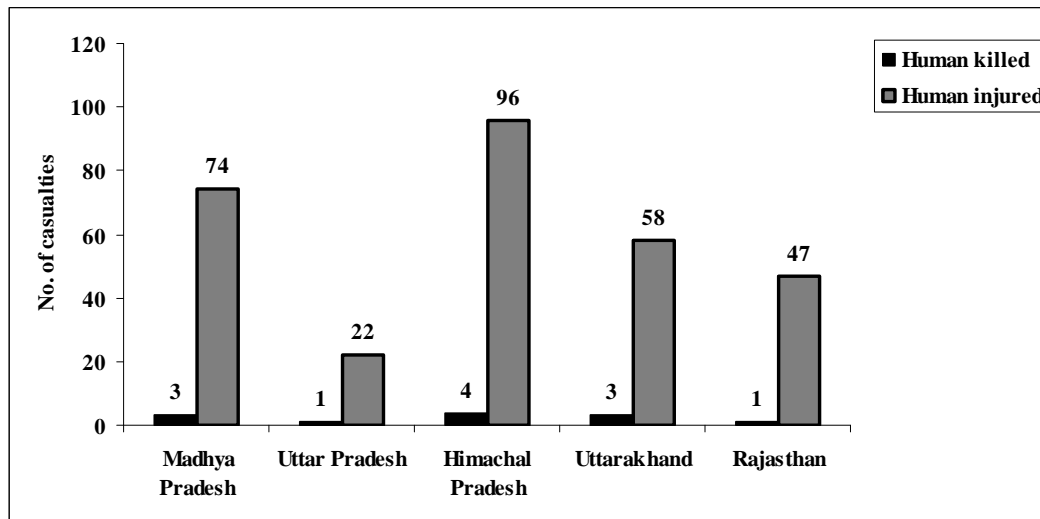


Figure 2. Humans killed and injured by wild pigs in different states during 1990 to 2008

Among males, there were 7 human killings and 204 injury cases, whereas among females, there were 5 human killings and 93 injury cases. All these human casualties showed an increasing trend from 1990 to 2008. Males were found to move extensively inside forest for collection of non timber forest produce and they were engaged more in agricultural fields for farming activity. So they were exposed more and succumbed to wild pig attacks more than the females.

#### 3.2 Monthly variation in casualties

We observed marked monthly variation in human casualties during 1990-2008 (Figure 3). Human casualties occurred in all the months but they showed variation in different years. Out of 309 cases, highest number of casualties occurred in November ( $n = 61$ , 19.8%), followed by December ( $n = 44$ , 14.2%), January and August ( $n = 31$ , 10% each), October ( $n = 29$ , 9.4%), September ( $n = 23$ , 7.4%), March ( $n = 21$ , 6.8%), July ( $n = 19$ , 6.2%) and so on.

Human casualties were comparatively less during April ( $n = 13$ , 4.2%), May ( $n = 9$ , 2.9%) and June ( $n = 11$ , 3.6%). Monthly variation in human casualties is directly correlated with activities of villagers in forests, crop fields and villages.

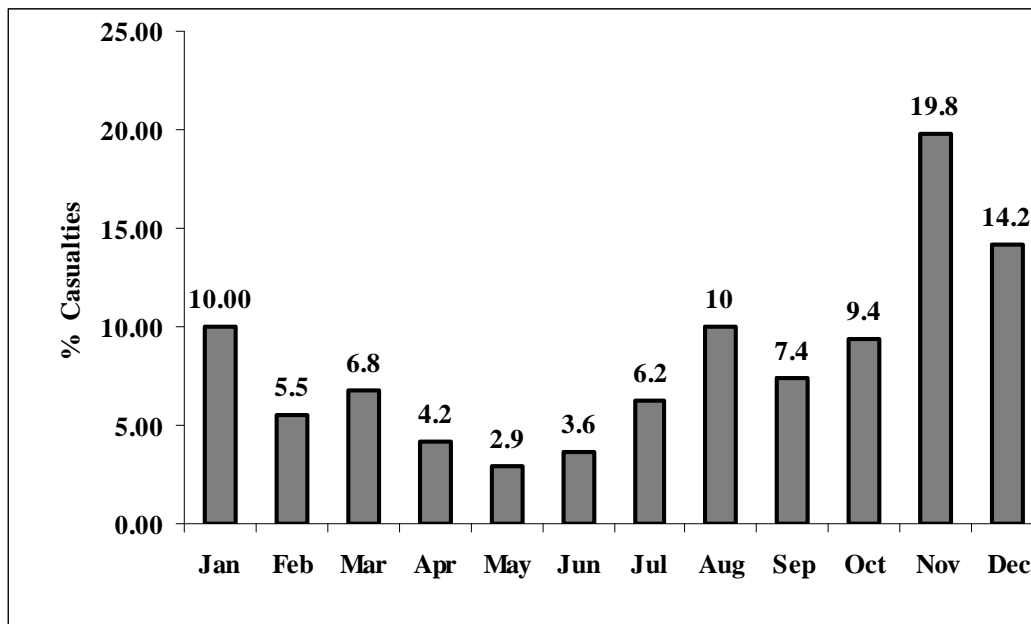


Figure 3. Monthly variation in occurrence of human casualties in different states during 1990 to 2008

### 3.3 Place of casualties

Wild pigs were responsible for maximum human casualties in forests (73.8%), followed by crop fields (21.7%) and a few incidences occurred in villages (4.5%) (Figure 4). Highest human casualties occurred in the forests of Himachal Pradesh ( $n = 73$ ), followed by Madhya Pradesh ( $n = 61$ ), Uttarakhand ( $n = 44$ ), Rajasthan ( $n = 37$ ) and Uttar Pradesh ( $n = 13$ ). Whereas in crop fields, the attacks on human being were highest in Himachal Pradesh ( $n = 22$ ), followed by Madhya Pradesh ( $n = 61$ ), Uttarakhand ( $n = 14$ ), Madhya Pradesh and Rajasthan ( $n = 12$  each) and Uttar Pradesh ( $n = 7$ ).

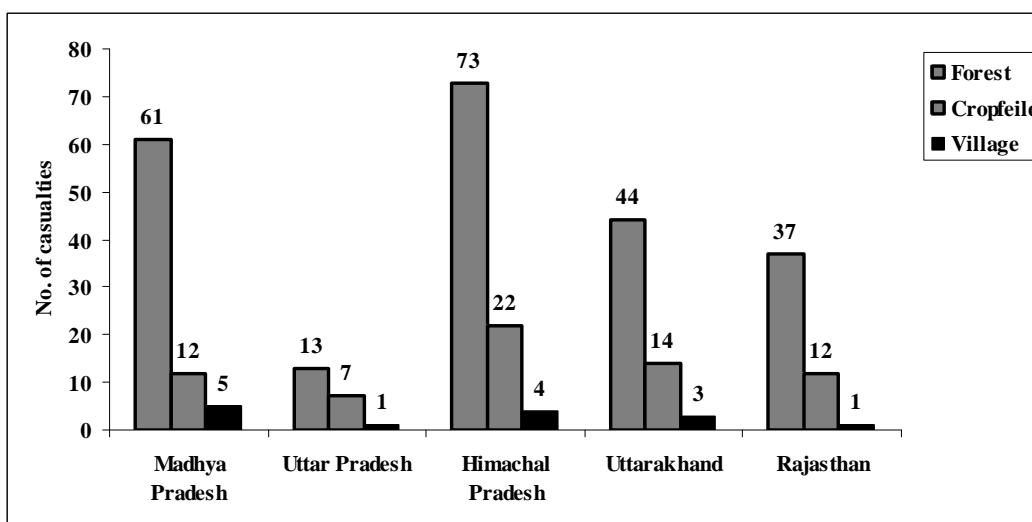


Figure 4. Place of human casualties by wild pigs in different states during 1990 to 2008

Most of these cases occurred when people were engaged in non-timber forest produce collection and livestock grazing; farming activities i.e. crop sowing, crop protection, walking through crop fields, harvesting and defecation activity.

### 3.4 Age of victims

Out of total 309 human casualties by wild pigs, age group of 289 cases was recorded in five different states during 1990-2008 (Figure 5). Among these cases, highest number of 92 human casualties occurred in the age group of 41-50 years. There were 62, 48 and 44 casualties in the age group of 31-40 years, 21-30 years and 51-60 years respectively. Wild pig attacks on the age group of 61 years and above, 11-20 years and 1-10 years were found to be only few i.e. 23, 17 and 3 casualties respectively.

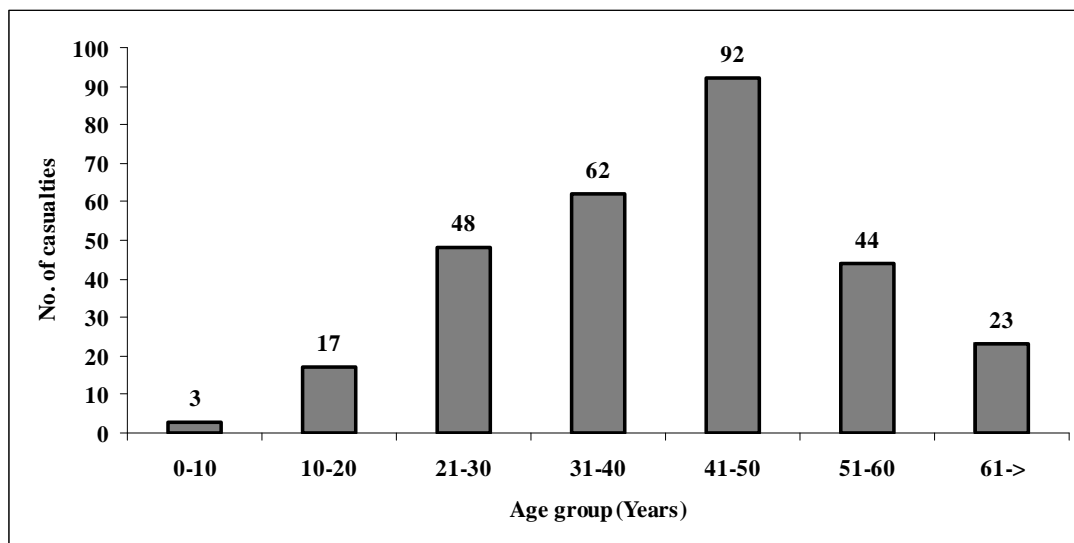


Figure 5. Age group of victims of wild pigs in and around PAs and MFs during 1990-2008. (n = 289)

### 3.5 Time of attacks

The time of attacks by wild pigs was recorded for 251 cases (Table 1). Highest number of 97 human casualties by wild pigs occurred between 0801-1200 h (n = 97), followed by 1601-2000 h (n = 82), 0401-0800 h (n = 34), 1201-1600 h (n = 26) and so on. Only very few casualties occurred during 2001-2400 h (n = 9) and 0001-0004 h (n = 3).

Table 1. Time of human casualties by wild pigs in and around PAs and MFs during 1990-2008 (n = 251)

| Time (hrs) | No. of cases |
|------------|--------------|
| 0401-0800  | 34           |
| 0801-1200  | 97           |
| 1201-1600  | 26           |
| 1601-2000  | 82           |
| 2001-2400  | 9            |
| 0001-0004  | 3            |
| Total      | 251          |

### 3.6 Crop damage

Crop depredation by wild pigs is enormous. Agricultural crops: sugarcane (*Saccharum officinarum*), maize (*Zea mays*), groundnut (*Arachis hypogaea*), barley (*Hordeum vulgare*), wheat (*Triticum vulgare*), rice (*Oryza sativa*), gram (*Cicer arietinum*), bajra (*Pennisetum typhoides*), jowar (*Sorghum vulgare*), moong (*Phaseolus mungo*), sweet potato (*Ipomoea batatas*), phaphar (*Phygopyron esculantum*), madua (*Elusine corocana*), cholai (*Amaranthus vulgaris*) and katu (*Sashurea costus*) were found to be damaged to varying extent (5-36%) in different Uttar Pradesh, Himachal Pradesh, Rajasthan and Madhya Pradesh (Figure 6).

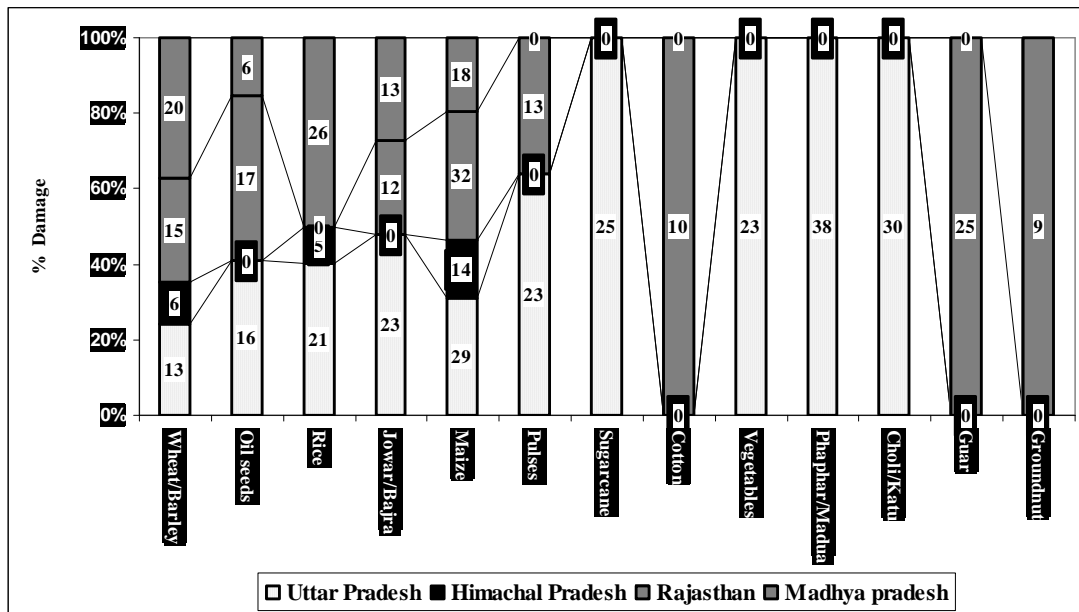


Figure 6. Agricultural crop damage by wild pigs in 5 different states during 1990-2008 (Crop names explained in text)

In Uttar Pradesh, damage to madua crop by wild pigs was highest (38%), followed by damage to cholai and katu (30%), maize (29%), sugarcane (25%) and jowar, bajra and pulses (23%). Wheat and barley crops were least affected by pigs. In Himachal Pradesh, wild pigs caused maximum damage to maize crop (14%), followed by wheat/barley (6%) and rice (5%). In Rajasthan state, damage to maize crop was highest (32%), followed by damage to guar (25%), oil seeds (17%), wheat/barley (15%), pulses (13%) and jowar/bajra (12%). In Madhya Pradesh, wild pigs caused maximum damage to rice crop (26%), followed by wheat/barley (20%), maize (18%), jowar/bajra (13%), groundnut (9%) and oilseeds (6%). Zero level of damage in the chart indicates that the crops were not grown in those areas.

Other oilseed and legume crops damaged are mustard (*Brassica campestris*), til (*Sesamum indicum*), moth (*Vigna aconitifolius*), guar (*Cyamopsis psoralioides*), matira (*Citrullus vulgaris*), tinda (*Citrullus vulgaris*), jeera (*Cuminum cyminum*), isabgol (*Plantago ispaghula*), methi (*Trigonella corniculata*), raira (*Brassica juncea*), chili (*Capsicum annum*) and pea (*Pisum sativum*). Mature crops were highly susceptible to damage. Today, these problems have aggravated beyond tolerable limits and have resulted into direct conflicts between people and wild pigs.

#### 4 RECOMMENDATIONS

People should remain alert and vigilant while moving in forests and crop fields especially at the time when wild pigs are active.

Use of local protective methods, co-operative guarding of matured crops is necessary. Wire fences with white, flying, flashing ribbons or plastic strips that produce scaring sounds and other frightening devices should be used in and around crop fields. Use of pig-proof barriers for crop protection and elimination or population control strategies in affected areas also needs to be experimented. Villagers should avoid cultivating crops which are highly susceptible to damage near forests and should try changing cropping patterns by growing other cash crops.

Under the given socioeconomic and political framework, one way to mitigate human–wild pig conflicts is to minimize the ill effects of socio-ecological conditions. Education and awareness programs on the ecology and behaviour of wild pigs and on mitigation strategies should be initiated for villagers in affected areas. In the fragmented and degraded forest areas, habitat protection should be carried out to sustain the existing wild pig population. Discouraging payment of compensation for human casualties in protected areas, and research on ecology and management of wild pigs is necessary.

**Acknowledgments:** We thank the Director, Wildlife Institute of India and Chief Wildlife Wardens of Madhya Pradesh, Uttar Pradesh, Himachal Pradesh, Uttarakhand, and Rajasthan state forest departments for their help and cooperation in conducting the study. I also thank Prof. Andras Nahlik, University of West Hungary, Sopron for his help and support that enabled my participation in the 7th International Symposium on Wild Boar. We also thank Mr. Panna Lal of WII for his help in the map preparation. Finally we thank all villagers and victims and their families for their cooperation during the fieldwork.

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