



Managing Higher Vertebrate Pest Problem in Indian Agriculture: Time to Rethink

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Indian agriculture is facing growing challenge from the higher vertebrate pests as they cause widespread damage to agricultural crops and thereby affect the food security of the country. Crop raiding by different wild animals particularly, Monkeys (*Macaca* sp.); Hanuman langur (*Presbytis entellus*), Elephant (*Elephas maximus*), Blue bull (*Boselaphus tragocamelus*), Sambar deer (*Cervus unicolor*), Black buck (*Antelope cervicapra*), Chinkara (*Gazellaga zellabennetti*), Wild boar (*Sus scrofa*), peacock/parakeets, porcupine (*Hystrix indica*) etc. has been widely reported from all over the country (Agrawal *et al.*, 2016). Wild boars and nilgai are responsible for large scale crop damages annually in some states like Bihar, Rajasthan, and Uttar Pradesh (Manral *et al.*, 2016). Despite having tremendous impact on agricultural productivity and rural livelihoods, their management is still constraint by legal, socio-cultural, weak institutional coordination, and a lack of effective, science-based interventions. This article highlights the current management strategies, identifies the critical constraints and presents the acceptable solutions.

The Problem

Indian agriculture faces a significant challenge from higher vertebrate pests. Agricultural crops and fruit orchards are often raided by mammals and birds that cause widespread damage and threaten the food security. The major pest species involved in crop raiding are wild ungulates, primates, rodents, granivorous and frugivorous birds in various agro-ecological zones across the country. The farm areas which form fringes with protected forests, national parks, and wildlife corridors, are more vulnerable, as the proximity of wildlife and farmland leads to frequent crop raiding (Anwar *et al.*, 2015; Manral *et al.*, 2016). Among all the crop-raider ungulates, wild boar, Asiatic elephant are most studied and is known to cause large scale damage to crops across their range in India (Gubbi, 2012). The extent of damage to various crops caused by wild boar varies from 15-40%, nilgai to the extent of 10-30%, elephants, 20-50%, rhesus macaque, 10-30%, black buck, 5-15%, gaur, 5-10%, rodents up to 15%, and birds 9% (Reddy and Charoo, 2016; Chauhan *et al.*, 1990). In urban-fringe and peri-urban agricultural landscapes, Rhesus macaques and peafowl, are responsible for major damage to fruits, vegetables, and grains. Despite their ecological and cultural importance, the higher vertebrate pests have become a major agronomical concern, particularly for small and marginal farmers who lack the resources for protection or recovery. This conflict is further

aggravated due to proliferation of the human population, enhanced efforts to accelerate productivity from conventional croplands and the conversion of marginal lands into agricultural areas, which push the human settlements into wildlife habitats.

Existing Management Practices

The various management practices in vogue are mostly preventive and are meant to check the entry of wild herbivores into the agricultural fields. These practices involve traditional techniques, acoustic deterrents, physical barriers, vegetative barriers, various types of fencings, chemical deterrents, scare devices and community watch mechanisms (Baishya *et al.*, 2025). The other practices such as controlled killing, compensation for crop loss, translocation, or sterilization etc requires government interventions under Wildlife Protection Act (WPA) but their implementation is very sporadic, requires extensive paper work and time (MoEFCC, 2016; Reddy *et al.*, 2017).

Key Constraints

It is very difficult to implement various management means against higher vertebrate pests in India, as it is riddled with a lot of constraints. First and foremost are legal and policy barriers, the Wild Life Protection Act provide protection to several vertebrate pest species (Nilgai, wild baor, monkey, elephants, peacock, porcupine etc.), which restrict direct control of these pests. If the direct control of these pests has to be carried out under the provision of the act, it requires cumbersome permissions from authorities like the Chief Wildlife Warden for actions such as culling, capture, or relocation, often resulting in delays that compromise timely interventions (Sekhar, 1998). The religious sentiments of the denizens of the country further complicate the management of these animals. Several communities in many religions revere many such animals, making population control socially sensitive and politically challenging (Chhangani and Mohnot, 2004). Technology paralysis is another constraint, lack of species specific economically viable management measures, the ability of pest species to adapt to the traditional methods like scarecrows or noise devices etc., limits farmers' adoptive capacity. Lack of coordination among various aligned institution, such as, Ministry of Environment,

Forest and Climate Change (MoEFCC), State Forest Departments, and Agriculture Departments leads to poor policy convergence and disjointed implementation (Reddy and Charoo, 2016). The protective gadgets and infrastructure (e.g., solar fencing, trenches) are very costly and delays in disbursement of compensation for crop damage further dis-incentivize proactive measures. Besides, lack of awareness among farmers regarding ecologically safe and effective management practices. Habitat encroachment through deforestation and conversion of marginal land into agricultural areas, push the human settlement into wildlife habitat and thereby escalate the conflict (Sukumar, 2006). Finally, the absence of robust, location-specific pest surveillance systems and crop damage estimation protocols hampers informed decision-making and long-term planning.

To address, these multidimensional constraints a holistic and integrated approach that aligns ecological, social, institutional, and economic dimensions of vertebrate pest management in Indian agriculture is necessary.

The Way Forward

A sustainable and pragmatic approach to higher vertebrate pest management (HVPM) in India demands a multi-pronged framework that integrates policy reforms, community participation, technological innovations, and institutional coordination, while balancing ecological and socio-cultural concerns. At the policy level, there is a dire need to make changes in the ACT to simplify the legal formalities required for the direct control (population reduction, translocation, sterilization etc.) of overabundant and conflict prone species. This requires empowerment of state-level committees to recommend pest status or time-bound vermin declarations of the problem species on the basis of ecology and damage, as practiced in Bihar for wild boar in 2016.

Management strategies, such as habitat diversion, trapping, translocation, sterilization, bio-repellents, solar fencing, and natural deterrents etc., which are not harmful to the pest species, may be promoted to enhance the community acceptance and addressing the religious sentiments. Further, involvement of village council members and religious leaders would be impactful for compliance and

cooperation at local level, as their involvement facilitates the understanding of management of culturally important species (monkeys and nilgai) in better way without any resentment (Sekhar, 1998; Chhangani and Mohnot, 2004).

The use of modern tools such as drones, thermal sensors, and AI-powered mobile applications to monitor wildlife movement may be promoted to provide real-time alerts. These tools can reduce the economic vulnerability of farmers by providing real time vertebrate pests damage assessment data of the crops and thereby settlement of insurance claim and compensation in reduced period of time (Reddy *et al.*, 2021). Integration of various Pest Management methods such as habitat modification, decoy crops, and cropping pattern diversification tailored to agro-ecological zones will be beneficial to minimize wildlife attraction to farms (Barua *et al.*, 2013). There is a dearth of region-specific data on their movement, foraging behavior, seasonal migrations, and population dynamics, particularly near forest-agriculture interfaces and protected areas. This lack of ecological intelligence severely hampers the development on the research front. The development of site-specific and adaptive management strategies is essential, therefore strengthening of data on species-specific crop damage, population dynamics, and behavioral ecology is essential. Long-term ecological studies, pilot trials on reproductive control technologies (e.g., immune-contraceptives for wild boar) and landscape-level interventions can offer crucial insights. Public-private partnerships, including agri-tech startups and NGOs, can bring innovation and scalability to deterrent systems, monitoring platforms, and community outreach models.

There should be a close coordination among Government departments like agriculture, forest, and rural development at the district or state level to plan and implement vertebrate pest management strategies. Subsidies may be offered to the farmers on the on gadgets like bio-acoustic, solar electric fencing, fencing etc. Training as well as awareness programs may be organized on wildlife behavior and non-lethal mitigation strategies.

Conclusion

Managing higher vertebrate pests in Indian agriculture is a serious and complex issue. We

need to move from short-term, reactive measures to proactive, science-based, and community-driven approaches. The sustainable solution to this problem requires legal changes, research that aligns ecological, social, institutional, and economic dimensions of vertebrate pest management, active community participation, and better coordination between departments. If the issue is not address properly, it will be posing threat to farm incomes, food security, and peaceful coexistence with wildlife.

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