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Crops and Avifauna: Ecological Interactions, Agricultural Impacts, and Conservation Perspectives

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Abstract:

Birds play a crucial role in agricultural ecosystems, acting as pollinators, pest controllers, seed dispersers, and sometimes crop predators. In India, where agriculture forms the backbone of the economy, understanding the relationship between crops and avifauna is essential for sustainable farming. This review synthesizes Indian studies to explore the dual impact of birds on agriculture and vice versa. It highlights beneficial interactions, potential conflicts, ecological services, and implications for conservation and agricultural policies. The paper concludes with recommendations for integrating bird conservation into agroecosystem management strategies.

Key words – Avifauna, Agricultural crops, Interactions, Conservation

Introduction –

Agriculture and biodiversity are intricately linked, particularly in India where diverse agroecological zones support a wide variety of flora and fauna. Birds, as mobile and ecologically diverse organisms, interact with crops in numerous ways. These interactions range from mutualistic (e.g., pest control and pollination) to antagonistic (e.g., crop depredation). Understanding these interrelationships is crucial for promoting agroecological practices that benefit both agriculture and avian biodiversity (Sundar & Subramanya, 2010; Sekercioglu, 2006; Ali & Ripley, 1987).

Role of Birds in Agriculture –

Pest Control –

Birds act as natural pest controllers by preying on insects and rodents that damage crops. In Indian farmlands, species such as the Black Drongo (*Dicrurus macrocercus*), Indian Roller (*Coracias benghalensis*), and various species of bee-eaters (Meropidae) are known to feed on agricultural pests (Dhindsa & Saini, 1994; Joshi & Guleria, 2006). Studies in Punjab and Haryana have shown that the presence of insectivorous birds significantly reduces the population of harmful pests, thereby minimizing the need for chemical pesticides (Joshi et al., 2006; Yadav et al., 2010).

Pollination and Seed Dispersal –

Although less common than insects, certain birds contribute to crop pollination. Sunbirds (Nectariniidae) are important pollinators for crops like papaya and guava. Frugivorous birds like bulbuls (Pycnonotidae) and barbets (Megalaimidae) play a significant role in seed dispersal, helping in the regeneration of trees around agricultural landscapes (Kumar et al., 2002; Maheswaran, 2007). Their role is increasingly being recognized in orchard systems and agroforestry projects (Negi & Gokhale, 2010).

Nutrient Cycling and Soil Fertility –

Bird droppings enrich the soil with nitrogen and phosphorus, contributing to soil fertility. This is particularly evident in fields near roosting or nesting sites of colonial birds such as egrets and herons (Kler et al., 2010). Studies have also shown that avian-mediated nutrient cycling supports microbial activity and crop productivity (Verma & Sagar, 2008). These natural inputs help reduce the dependency on synthetic fertilizers, offering a more sustainable solution for farmers (Sinha et al., 2014).

Negative Interactions: Birds as Crop Pests –

Certain bird species are considered pests by Indian farmers due to their tendency to feed on grains, fruits, and vegetables. The Rose-ringed Parakeet (*Psittacula krameri*) is notorious for damaging crops such as sunflower, maize, and guava. Similarly, the Baya Weaver (*Ploceus philippinus*) and Jungle Crow (*Corvus macrorhynchos*) are reported to raid paddy and wheat fields (Rao et al., 2002; Bhardwaj et al., 2012).

These conflicts often lead to retaliatory actions from farmers, including bird scaring, habitat destruction, and, in extreme cases, poisoning. However, recent studies have suggested that perceived damage by birds is often exaggerated and may not always warrant lethal control methods (Sundar, 2006; Islam & Rahmani, 2004; Saini et al., 2000). Integrated management strategies and proper damage assessment studies are essential (Gopi & Pandav, 2009).

Agricultural Practices and Their Impact on Birds –

Intensification and Monocultures –

The shift from traditional mixed cropping to monocultures has reduced habitat heterogeneity, adversely affecting bird diversity. The Green Revolution, while increasing food production, led to increased pesticide use and habitat degradation, resulting in a decline in insectivorous and ground-nesting birds (Sengupta et al., 2015; Sinha et al., 2014; Subramanya, 1995).

Organic Farming and Agroforestry –

Conversely, organic farming and agroforestry practices support higher bird diversity. A study conducted in Kerala showed that organic farms had significantly higher avian diversity compared to conventional farms (Nameer et al., 2017). Similar findings have been reported from Uttarakhand and Himachal Pradesh, where agroforestry plots hosted a richer bird community (Negi & Gokhale, 2010). The retention of native trees and shrubs in these systems offers food and nesting resources for birds (Trivedi et al., 2012).

Seasonal Cropping and Fallow Lands –

Seasonal variation in cropping patterns creates temporary habitats for migratory and resident birds. Fallow lands between cropping cycles serve as important foraging grounds for species such as the Indian Peafowl (*Pavo cristatus*) and Lapwings (*Vanellus spp.*) (Sundar & Kittur, 2013; Ali & Ripley, 1987). The presence of wetlands and water bodies within the farming landscape enhances habitat quality for waterbirds (Gopi & Pandav, 2009).

Case Studies from Indian States –

Punjab and Haryana –

These intensively farmed states have reported both beneficial and detrimental roles of birds. While insectivorous birds help control pests in wheat and paddy fields, parakeets and crows are major concerns for fruit and cereal crops (Dhindsa & Saini, 1994; Saini et al., 2000). The use of artificial bird perches and farmer awareness programs has shown some success in mitigating crop damage (Yadav et al., 2010).

Karnataka –

In the wetlands and agricultural mosaics of Karnataka, wading birds and waterfowl thrive in paddy fields and irrigation canals. These birds contribute to pest control but also face threats from pesticide exposure (Subramanya, 1995; Gopi & Pandav, 2009). Integrated wetland-agriculture systems can potentially serve as biodiversity hotspots (Sundar & Kittur, 2013).

Uttar Pradesh –

Agricultural landscapes of the Indo-Gangetic plain support a variety of bird species. Studies have noted the importance of field margins and hedgerows in maintaining bird diversity in sugarcane and wheat-growing areas (Sundar et al., 2007; Trivedi et al., 2012). Conservation efforts in the Sarus Crane habitats exemplify how farming and biodiversity goals can align (Sundar, 2006).

Conservation and Policy Implications –
Promoting Bird-Friendly Farming –

Encouraging bird-friendly practices such as reduced pesticide use, maintaining hedgerows, and preserving water bodies can enhance both crop yield and biodiversity. Farmer awareness programs and community-led conservation efforts can play a vital role (Gaston et al., 2003; Kumar et al., 2002). The integration of biodiversity goals in agricultural extension services should be prioritized.

Integrated Pest Management (IPM) –

Integrating birds into IPM strategies can reduce chemical dependence and promote sustainable agriculture. Artificial perches have been used successfully in Indian farms to attract insectivorous birds for pest control (Rao et al., 2002; Yadav et al., 2010). Additionally, planting insect-attracting crops alongside main crops can increase bird activity and reduce pest populations.

Research and Monitoring –

There is a need for long-term monitoring and research on crop-bird interactions. Citizen science initiatives like eBird India and the Asian Waterbird Census have helped fill some data gaps but more focused studies are needed (Praveen et al., 2019). Monitoring bird population trends in different cropping systems can help guide sustainable agricultural practices (Sundar & Subramanya, 2010).

Conclusion –

The interrelation between crops and birds in India is complex and context-dependent. While birds offer numerous ecological services that benefit agriculture, they can also be perceived as threats under certain conditions. A balanced, science-based approach that recognizes the ecological importance of birds while addressing farmer concerns is crucial for sustainable agriculture and biodiversity conservation. Strengthening agroecological practices and aligning them with conservation strategies offers a promising path toward resilient farming systems.

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