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Introduction

Throughout agricultural history, a common method of pest control has been hunting and habitat destruction of troublesome wildlife¹. This is problematic for species conducting ecosystem services, such as birds. Farmer's perceptions of birds can impact management strategies and alter their disposition towards cooperation with conservation plans². Determining the causes of conflict and devising an approach to resolve animosity towards avian pests is a starting point towards cooperation. Focusing on the developing nations heavily impacted by conflict, the crops, and the species often involved with conflict could initiate further research regarding pressures on bird pests and their impact on farmers. The social, cultural, and religious factors influencing management strategies should be considered in human-avian conflict studies.

Pest management is an important topic within the scientific community and beyond. The study highlights the shortcomings in research of socio-cultural influences on pest management in developing nations. This analysis will be applied when evaluating management issues with the Hispaniolan Woodpecker in organic cacao farms in the Dominican Republic.



Fig 1. Factors deemed important in pest management decisions.

Methods

We searched 12 databases available through SUNY ESF, and used 21 search terms. Reference lists of accepted articles and regional reports were reviewed for additional suitable articles. We only selected peer-reviewed articles that included: (a) a methodology section; (b) a World Bank-ranked developing nation; (c) involved food crops (excluding timber and corn); (d) were species-specific; and (e) were published after 1970. Twenty-five articles were accepted for analysis. We recorded information on the following variables: the species involved, crop, country, intensity of crop depredation, and type of management. The intensity of crop depredation was measured as low, medium, or high. Species benefits were noted.

Chi-squared tests for independence tested for relationships between depredation intensity, crop type, and species. However, species specific analysis could not be conducted due to insufficient data. Descriptive statistics were conducted for other variables. Any mention of cultural, social, or religious influence on management or conflict was noted. IUCN status of all species was acquired to determine conservation concerns for pest species.

Ploceus cucullatus
(Village Weaver)⁶



Quelea quelea
(Red Billed Quelea)⁷



Myiopsitta monachus (Monk Parakeet)⁸



Fig 2. The most common methods of bird management in our study.

Goals and Hypotheses

This study sought to analyze the multidimensional conservation quandary of human-avian interactions in an agricultural setting. Therefore, our major goals were:

- ❖ Conduct a quantitative synthesis of articles related to human-avian conflict in agriculture systems.
- ❖ Find the shortcomings in scientific articles relating the social and cultural influences on the management of birds
- ❖ Find potential relationships between bird species, crops, country, and intensity of crop depredation

We hypothesized that the intensity of depredation by pest birds would vary based on the species. We also hypothesized that hunting would be the primary management technique implemented in these developing nations due to government firearm distribution, access to environmental education, and cultural influences^{3,4,5}. Furthermore, we suspected that many of these articles would ignore the social and cultural influences that impact management.

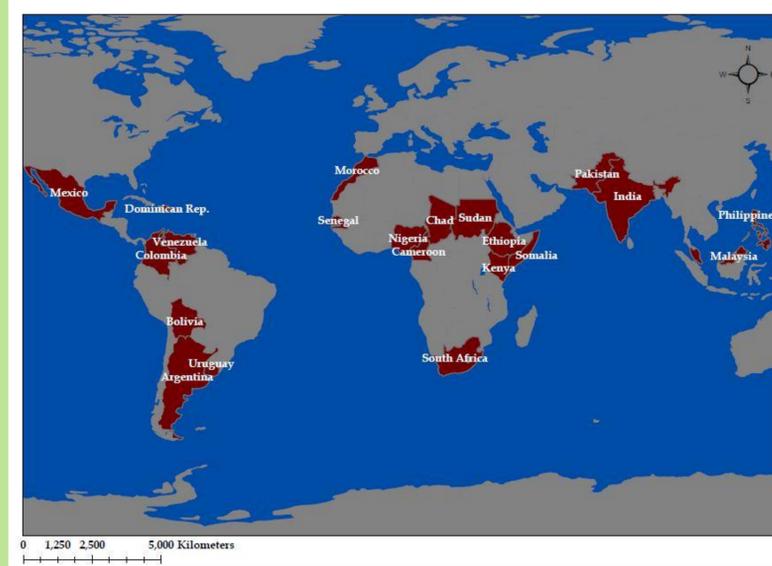


Fig 3. Countries represented in selected articles (N=25).

Results

- ❖ Of the 65 species included in the articles, the most common were *Quelea quelea* (11.8%), *Ploceus cucullatus* (6.36%), and *Myiopsitta monachus* (3.64%) (Fig. 5).
- ❖ Two species, *Grus antigone* and *Lonchura oryzivora*, were listed as Vulnerable, and *Limosa limosa* was listed at Near Threatened.
- ❖ Of the 13 management strategies recorded the most common were hunting (16.7%), poisoning (16.7%), scaring (16.7%), chemical repellents (13.3%), and audio deterrents (10.0%) (Fig. 2 Fig. 4).
- ❖ Rice was the most represented crop (35.7%), but other crops included sorghum (25.4%) and wheat (11.9%).
- ❖ The chi-squared test for independence for the crop vs intensity had no statistical significance ($p=0.05$).
- ❖ The study involved 21 countries (Fig. 3) with the majority in Africa (47.6%)
- ❖ Of the 25 articles, 6 included a survey, and only two article highlighted farmer's perspectives and society having an impact on the management of pest species.
- ❖ Four themes were identified to categorize articles (Fig. 6).

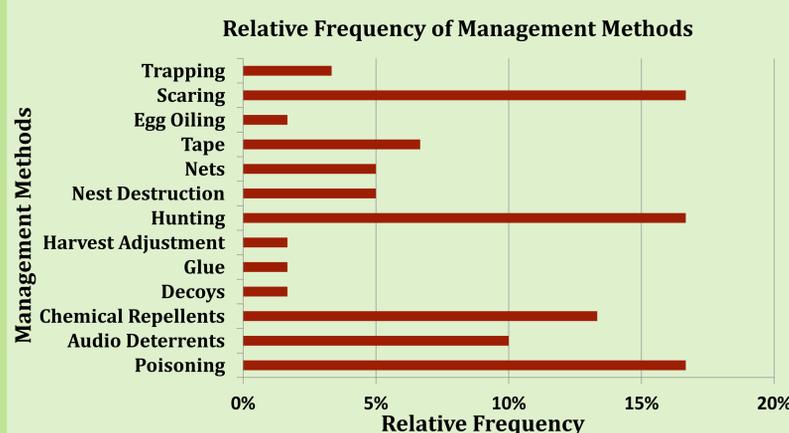


Fig 4. Relative frequencies of management methods mentioned in the study.

Distribution of themes

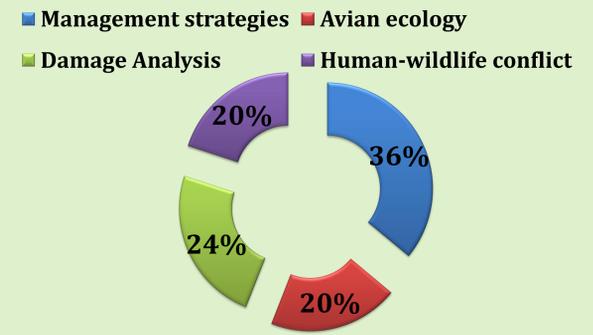


Fig 6. Articles were categorized by themes related to their content.

Discussion

Based on our analysis, we identified the following:

- ❖ Few articles addressed frequency and intensity of management practices, since most focused on economic impacts of avian crop damage .
- ❖ Most articles did not mention any land management information or the scale of farms.
- ❖ There was limited data on socio-demographic variables of study groups or populations within many studies.
- ❖ Few articles discussed conservation implications for native or endemic managed pest species.
- ❖ Regional culture and religion as related to management practices was not discussed in most articles.
- ❖ Although attitudes towards birds impact farmer management decisions⁹, articles sincerely lacked any insight into this topic.

Research Gaps

- ❖ The discrepancies between actual loss and perceived loss.
- ❖ The fundamental drivers of lethal management choices.
- ❖ The degree of influence of attitude, religion, culture and social pressures on management choices.
- ❖ The degree of influence attitude towards pests on cooperation with conservation.
- ❖ The ecosystem services provided by avian pest species.

Conclusion

Studies suggest that farmers experiencing damage from avian species may be hesitant to implement conservation plans for any bird species¹⁰. Therefore, we recommend that avian pest management research should be integrative and incorporate variables deemed important for conservation planning. Future studies should consider: religious beliefs, traditional knowledge, local laws, culture, societal pressure, level of farmer education, and other socio-demographic factors when analyzing bird management practices.

Acknowledgements

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