

Understanding elephant crop raiding behaviour: Interrelations with land use patterns, crop characteristics, and social structure of male elephants

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The Human–elephant conflict (HEC) is a major conservation challenge in Sri Lanka, driven largely by agricultural expansion into natural habitats, leading to frequent crop raiding. Crop raiding leads to economic losses, threats to farmer safety, negative community attitudes, and results in many elephants being injured or killed each year. Understanding the spatial, ecological, and behavioral drivers is essential to developing effective mitigation strategies. This study examines how landscape features, crop characteristics, and male elephant grouping behaviour influence crop-raiding behavior in Wasgamuwa, Sri Lanka. Between 2018 and 2019, 491 crop-raiding incidents were recorded across 27 Grama Niladhari Divisions (GNDs) in Wasgamuwa. To investigate the factors influencing elephant crop-raiding behavior, a global generalized linear mixed model (GLMM) was constructed using binary crop-raiding data, comparing actual incidents against randomly selected control fields without damage. The model included five spatial variables (distance to electric fence and protected area, other refuge areas, man-made lakes, and home gardens), along with crop type, crop growth stage, and raider group structure (single males vs. male groups). The model was validated, and Akaike Information Criterion (AIC) was used to select the most parsimonious model. The model results revealed that crop raiding was not influenced by proximity to the protected area. However, fields located closer to refuge areas, tanks, and electric fences were associated with a higher risk of raiding. Further, fields situated farther from home gardens were more vulnerable to raids. Crop types strongly influenced raiding likelihood, with paddy fields and home gardens among the most raided, particularly during crop maturity stages. Solitary males primarily raided home gardens, while male groups were more likely to raid paddy fields. These findings highlight the complex interplay of spatial factors, crop characteristics, and the grouping behavior of male elephants in shaping crop-raiding patterns. Effective mitigation requires integrated landscape management and crop protection strategies tailored to field types, crop stages, and the distinct behavior. Such approaches are crucial for fostering coexistence in human-dominated landscapes.

Keywords: *Human–elephant conflict, crop raiding, landscape features, crop characteristics, male elephants*