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RESEARCH ARTICLE

Local Communities' Interactions with Wildlife in the Ebo Forest Reserve, Littoral Region, Cameroon

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Abstract

Understanding how local communities interact with wildlife is essential for designing effective conservation strategies in biodiversity-rich but vulnerable ecosystems. This study investigates the nature of human–wildlife interactions in the Ebo Forest Reserve, Littoral Region, Cameroon, a critical habitat for threatened species including primates and large mammals. Using a combination of household surveys and focus group discussions, community knowledge, perceptions, and attitudes toward wildlife, as well as the socio-economic drivers influencing these interactions were assessed. Results reveal that local communities possess extensive traditional ecological knowledge about wildlife species and their habitats, yet their interactions are shaped by subsistence needs, cultural practices, and increasing anthropogenic pressures such as hunting, logging, and agricultural expansion. While some community members express positive attitudes toward conservation, others highlight conflicts arising from crop raiding, livestock predation, and restricted access to forest resources. These findings underscore the dual role of communities as both stewards and exploiters of biodiversity. The study concludes that fostering community-based conservation initiatives, integrating local knowledge into management plans, and addressing livelihood concerns are crucial for promoting coexistence between people and wildlife in the Ebo Forest Reserve. By highlighting the socio-ecological dynamics of human–wildlife interactions, this research contributes to broader discussions on sustainable conservation in tropical forest landscapes.

Keywords: Ebo Forest Reserve, Local Communities, Human–Wildlife Interactions, Traditional Ecological Knowledge, Anthropogenic Pressures, Community-Based Conservation.

1. Introduction

Human–wildlife interactions are increasingly recognized as one of the most pressing challenges in conservation biology worldwide. Rapid human population growth, urbanization, agricultural expansion, and climate change have intensified encounters between people and wildlife, often resulting in conflict, biodiversity loss, and ecosystem degradation (IPBES, 2019; Hockings, Gaston, & Mumby, 2020). Globally, these interactions manifest in diverse forms, ranging from crop raiding and livestock predation to retaliatory killings and illegal hunting (Zimmermann, McQuinn, & Macdonald, 2017). At the same time, local communities play a dual role as both stewards and exploiters of biodiversity. Their traditional ecological knowledge, cultural practices, and subsistence needs shape attitudes toward wildlife and influence conservation outcomes (Bennett et al., 2015). Research emphasizes that sustainable solutions must integrate community perspectives into conservation planning, highlighting the importance of participatory approaches and rights-based frameworks

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(Burton et al., 2015). The global discourse on human–wildlife coexistence underscores the need for balancing ecological integrity with human well-being. This requires adaptive management strategies that recognize the socio-ecological dimensions of wildlife conservation and empower local communities to actively participate in protecting biodiversity (IPBES, 2019; Hockings et al., 2020).

Africa is home to some of the world's most diverse and iconic wildlife, yet human–wildlife interactions across the continent are increasingly shaped by rapid population growth, agricultural expansion, and unsustainable resource use. These pressures have led to widespread conflicts, including crop raiding by elephants, livestock predation by carnivores, and hunting of primates and ungulates (Maisels et al., 2013; Bennett et al., 2015). Such conflicts not only threaten biodiversity but also undermine food security and rural livelihoods. Studies across West and Central Africa highlight that local communities often depend on wildlife for subsistence, cultural practices, and income, while simultaneously experiencing negative impacts from wildlife presence (N'Goran et al., 2010; Assui et al., 2022). Conservationists argue that community-based approaches are essential for reconciling these competing interests, emphasizing participatory management, traditional ecological knowledge, and livelihood support as pathways to coexistence (Burton et al., 2015; N'Goran et al., 2021). The decline of large mammals such as forest elephants and great apes underscores the urgency of integrating human dimensions into conservation planning. Without addressing the socio-economic realities of local communities, conservation efforts risk failure, particularly in regions where dependence on natural resources remains high (Chuo et al., 2026b and Zimmermann, McQuinn, & Macdonald, 2017).

Cameroon is one of Central Africa's most biologically diverse countries, hosting a wide range of ecosystems from coastal mangroves to montane forests. However, human–wildlife interactions have become a major conservation challenge nationally, particularly around protected areas (Chuo et al. 2017a, Tsi et al., 2020 and Tangie et al., 2018). Crop raiding by elephants, hunting of primates, and habitat degradation due to logging and agricultural expansion are recurrent issues (Chuo et al., 2017b, Foguekem et al., 2010; Nzooh Dongmo et al., 2016). National strategies emphasize the importance of integrating local communities into conservation planning. The Ministry of Forests and Wildlife (MINFOF) has developed policies such as the *National Strategy for Wildlife Conservation* and the *National Biodiversity Strategy and Action Plan (NBSAP II)*, which highlight community participation as a cornerstone of sustainable management (MINFOF, 2012; MINFOF, 2015). The establishment of Douala-Edéa National Park in 2018 further reflects Cameroon's commitment to biodiversity protection, though challenges remain in balancing conservation goals with local livelihoods (MINFOF, 2018a; MINFOF, 2018b). Research across Cameroon shows that local perceptions and attitudes toward wildlife vary depending on socio-economic conditions, cultural values, and the degree of conflict experienced (Tsi et al., 2019 and Chuo et al., 2026b). For example, studies in Lobéké and Mbam-Djerem National Parks reveal that poaching and human–wildlife conflict undermine conservation efforts unless communities are actively engaged in management (Ngembou, Tsi, & Nguepkap, 2020; Nzooh Dongmo et al., 2016). These findings underscore the need for participatory approaches that recognize both the ecological importance of wildlife and the socio-economic realities of rural populations (Chuo and Tsi, 2018).

The Ebo Forest Reserve, located in the Littoral Region of Cameroon, is one of the country's most biologically rich yet vulnerable landscapes. It harbors globally important species such as the Nigeria-Cameroon chimpanzee (*Pan troglodytes ellioti*), gorillas (*Gorilla gorilla diehli*), forest elephants (*Loxodonta africana cyclotis*), and several endemic primates (Ghislain et al., 2020; Maisels et al., 2013). Despite its ecological significance, the reserve remains under intense anthropogenic pressure from logging, hunting, and agricultural expansion (Ngaba, 2015; Ngembou, Tsi, & Nguepkap, 2020). Local communities living around the Ebo Forest depend heavily on its resources for subsistence, medicine, and cultural practices. Their interactions with wildlife are complex, reflecting both stewardship and exploitation. On one hand, traditional ecological knowledge contributes to species identification and habitat management; on the other, hunting and crop raiding create conflicts that undermine conservation efforts (Chuo, et al., 2026a; Chuo et al, 2026b). Recent studies emphasize that understanding community knowledge, perceptions, and attitudes is critical for designing effective conservation strategies. Participatory approaches that integrate local voices into management plans are seen as essential for promoting coexistence and ensuring the long-term survival of wildlife in the Ebo Forest Reserve (Effila, Chenje, & Ngomin, 2014; Fonkwo, Tsi, & Njukeng, 2023).

2. Material and Methods

2.1 Location of the Study Site

The Ebo Forest Reserve is located in the Littoral Region of Cameroon, approximately 100 km northeast of Douala. Covering an estimated 2067.78 km². Geographically, it is situated between latitudes 4º5′3.54″ and 4º31′11.19,″ and longitudes 10º5′38.92″ and 10º38′28.11,″ and (WWF, 2003). The area is marked by two main season namely the wet and the dry season. The monthly mean temperature ranges between 26° to 28°C with the monthly peaks of 28.3° to 28.1°C from December to April. Average annual precipitations ranges between 2496mm to 2950mm with the wettest months between July and October. It is located on a sedimentary formation of probably cretaceous basement that rest on a Precambrian layer and composed of rocks like sandstone, siltstones and clay. The topography of the study area is undulating with gentle to moderate slopes of 100-500m to steep slopes of up to 1400m above sea level. A network of streams flows through the Forest and empties into the Makombe, Nkam, and the Rivers which are the main tributaries of the Wouri and Dibamba Rivers (Nkwatoh *et al.,* 2019). The reserve is part of the Congo Basin forest ecosystem, one of the most important biodiversity hotspots in the world (Ghislain et al., 2020). The forest is characterized by dense evergreen and semi-deciduous vegetation, interspersed with river systems and swampy areas that provide critical habitats for diverse wildlife species. Ecologically, the Ebo Forest is home to several endangered and endemic species**,** including the Nigeria-Cameroon chimpanzee (*Pan troglodytes ellioti*), western gorilla (*Gorilla gorilla diehli*), forest elephants (*Loxodonta africana cyclotis*), and numerous diurnal primates (Abwe et al., 2021 and Maisels et al., 2013)**.** The forest also supports rich avifauna and plant diversity, making it a priority area for conservation. Socio-economically, the reserve is surrounded by rural communities whose livelihoods depend heavily on forest resources. Local people engage in subsistence farming, hunting, fishing, and the collection of non-timber forest products.

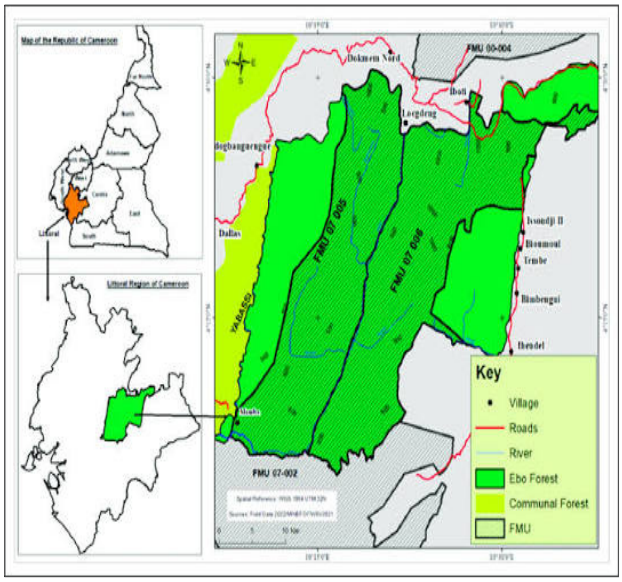

Figure 1. *A Map showing the study site (Nkwatoh et al., 2019).*

2.2 Data Collection

To assess local communities' interactions with wildlife in the Ebo Forest Reserve, socio-economic surveys were conducted to evaluate human impacts and perceptions toward wildlife. Prior to the main survey, a preliminary assessment was carried out to identify villages most exposed to human–wildlife conflicts. In each community, the village head was consulted, and the objectives of the research were explained. The village head then introduced the research team to trusted individuals who could provide reliable information. This preliminary survey was conducted during market hours (5:00–7:00 a.m.), as markets close soon after due to the early arrival of buyers and sellers from PK14 (Douala) to Yingui the day before market days. This timing ensured access to community members while clarifying whether human–wildlife conflicts existed in the Ebo Forest Reserve and identifying villages most affected. Respondents were interviewed using photographs of animal species found in the forest to facilitate recognition and discussion.

Based on the preliminary findings, a stratified random sampling technique was applied to select five villages—Iboti, Mossé, Locndeng, Ndockmem-Nord, and Ndem—from the northern part of the forest. Selection was guided by proximity to the forest edge and reported conflict history (Vouffo Nguimdo et

al., 2026). The target population included household heads, subsistence farmers, hunters, and traditional authorities (Banen and other indigenous groups). Before each interview, participants were reminded that there were no right or wrong answers, and that all information collected would remain anonymous and confidential. This approach ensured openness and reliability in the responses.

Questionnaires were administered to households to assess the frequency of crop raiding, the associated economic losses, local attitudes toward conservation, and the methods used to prevent animals from damaging crops. To select households, a snowball sampling method was employed: each respondent referred the research team to another potential respondent until the targeted number of households was reached. Both open-ended and closed-ended questionnaires were administered across five villages, covering a total of 91 households: 25 in Iboti, 15 in Mossé, 26 in Locndeng, 21 in Ndockmem-Nord, and 4 in Ndem. The number of households selected per village was proportional to the human population density in each area. In addition to household surveys, focus group discussions (FGDs) were conducted with youth, women, hunters, and farmers, as well as with community associations such as *Club des Amis des Gorilles* and *Club des Amis des Chimpanzés*. These discussions explored community-led mitigation strategies (Abwe & Morgan, 2012; Mfossa et al., 2025). Semi-structured interviews were also conducted with local hunters and traditional chiefs to gather local ecological knowledge (LEK) on wildlife movement patterns. Furthermore, a purposive sampling technique was applied to select key informants such as forest rangers, NGO leaders, and traditional authorities. These informants provided insights into the presence of animals on farmland and the responses of local communities to human–wildlife conflicts.

To facilitate data collection, a research team of three persons was organized. The principal investigator was responsible for interviewing respondents, recording responses, and taking GPS coordinates. A research assistant, employed and trained for the study, supported data collection and took photographs. A local guide, selected by the village chief, accompanied the team throughout the villages. The guide was fluent in local dialects and assisted with translation when necessary, particularly for respondents who could not speak French or English. Questionnaires were administered daily at 2:00 p.m., since local residents typically worked on their farms from morning until noon and were only available afterward. Questionnaires were produced in both English and French to accommodate the bilingual population surrounding the Ebo Forest Reserve. As in Tsi et al. (2020), a GPS track log was used to avoid interviewing the same household twice and to ensure a representative survey. Field notes were taken systematically, and feedback from respondents was also recorded.

2.3 Statistical Analysis

After our data collection, the coded data was decoded and later entered in to Microsoft excel 2013 to produce tables or chats and later transferred to R software version 4.2.2 where Descriptive and Inferential statistics were performed. Descriptive Statistics were applied in which frequencies and percentages were used to summarize socio-economic activities, crop types raided, wildlife species involved, preventive methods, reporting practices, and conservation attitudes. Means and standard deviations were calculated for continuous variables such as years of residence, years of activity, and financial losses. Comparative analysis across Villages, was applied using non-parametric tests (e.g., Kruskal–Wallis) were applied to assess differences in crop damage and financial losses among villages. Post-hoc pairwise comparisons (Wilcoxon rank-sum tests) were conducted to identify specific village differences.

For crop type analysis, losses were compared between cash crops and food crops using non-parametric tests (Wilcoxon rank-sum), to determine whether financial damages differed significantly by crop category. For seasonal and growth stage analysis, proportional distributions were analyzed to identify seasonal peaks of crop raiding (rainy vs. dry season) and vulnerability at different crop growth stages (seedling, young, mature, all stages). Looking at the preventive methods and reporting practices, frequencies and percentages were used to evaluate the number and types of preventive methods employed by households. Reporting behavior to administrative authorities was analyzed by proportion, with further breakdown of which services were informed and how they responded. Looking at the conservation attitudes, awareness of wildlife laws and support for conservation were assessed using descriptive statistics, highlighting community perceptions and livelihood-related concerns.

3. Results

3.1 Demographic and Socio-Economic Characteristics of Households in the Study Area

This section presents information on the sex, age, marital status, educational level, and socio-economic activities of households surveyed in the study area.

To better understand human–wildlife conflict, the age and sex of respondents were recorded from the 91 households interviewed across the five villages: Iboti, Mossé, Loendeng, Ndockmem-Nord, and Ndem. Table 1 provides the sex–age distribution of individuals surveyed in these villages.

Table 1. *Sex–Age distribution of individuals surveyed in the five villages*

	Villages																			
	1				2				3				4				5			
	sex																			
Age	M	%	F	%	M	%	F	%	M	%	F	%	M	%	F	%	M	%	F	%
19-28	4	16	1	4	1	6.7	2	13.3	0	0	4	15.5	0	0	0	0	0	0	0	0
29-38	4	16	2	8	2	13.3	1	6.7	4	15.4	3	11.5	2	9.5	2	9.5	0	0	0	0
39-48	2	8	2	8	2	13.3	0	0	2	7.7	1	3.8	1	4.8	3	14.3	0	0	0	0
49-58	3	12	2	8	2	13.3	0	0	5	19.2	1	3.8	6	28.6	2	9.5	0	0	3	75
59-68	3	12	1	4	0	0	2	13.3	6	23.1	0	0	4	19.0	1	4.8	0	0	1	25
69-78	1	4	0	0	2	13.3	1	6.7	0	0	0	0	0	0	0	0	0	0	0	0
Total	17	68	8	32	9	59.9	6	40	17	65.4	9	34.6	13	61.9	8	38.1	0	0	4	100

M = Male, F = Female 1= Iboti, 2 = Mossé, 3 = Loendeng, 4 = Ndockmem-Nord, 5 = Ndem,

In general, males (61.5%, n = 56) represented the majority of respondents compared to females (38.5%, n = 35). With respect to age classes, most individuals in Iboti fell within the ranges of 19–28 and 29–38 years, whereas in the other villages the dominant age class was 49–58 years. The mean ages of respondents per village were: Iboti (44.27 ± 15.75), Mossé (46.07 ± 18.85), Loendeng (43.31 ± 14.39), Ndockmem-Nord (49.71 ± 10.38), and Ndem (56.75 ± 2.87). Regarding marital status, among the 56 male respondents, 40 were married (71.4%), 5 were widowers (8.9%), and 11 were single (19.6%). Of the 35 female respondents, 23 were married (65.7%), 3 were widows (8.6%), and 9 were single (25.7%). Overall, the largest age group among respondents was 49–59 years (n = 24), followed by 29–39 years (n = 20), while the smallest group was 69–79 years (n = 4). Respondents' educational levels were categorized as primary, secondary, tertiary, or none. Table 2 presents the distribution of educational attainment among respondents in the five villages.

Table 2. *Educational level of respondents in the five villages*

Educational level	Frequency	Percentages
Primary	30	33.0
Secondry	10	11.0
Tertiary	5	5.5
None	46	50.5
Total	91	100

From Table 2, the majority of surveyed individuals had no formal education (50.5%, n = 46), while only 5.5% (n = 5) had attained higher education. Questionnaires were also administered to assess respondents' day-to-day activities. Results revealed that agriculture was the most commonly practiced activity among local people across the different villages in the study area. Figure 2 illustrates the distribution of respondents according to their primary socio-economic activities.

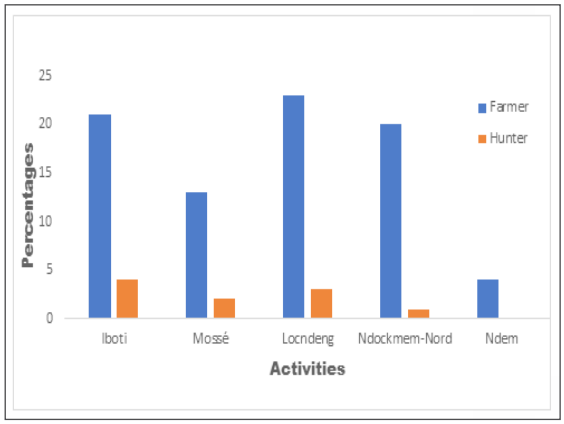

Figure 2. *Distribution of the respondants based on their socio activities.*

3.2 Socio-Economic Activities and Years of Residence

Figure 2 presents the distribution of respondents based on their socio-economic activities. The majority of respondents were engaged in farming (89%, $N = 81$), while a minority practiced hunting (11%, $N = 10$). Specifically, in Iboti, 21 respondents were farmers and 4 were hunters; in Mossé, 13 were farmers and 2 hunters; in Loendeng, 23 were farmers and 3 hunters; in Ndockmem-Nord, 20 were farmers and 1 hunter; and in Ndem, all 4 respondents were farmers with no hunters recorded. With respect to residence history, the mean number of years respondents had lived in each village was: Iboti (22.48 ± 20.96), Mossé (46.07 ± 21.51), Loendeng (29.54 ± 14.05), Ndockmem-Nord (28.57 ± 22.02), and Ndem (56.75 ± 2.87). Regarding the number of years respondents had practiced their primary activity, the mean values were: Iboti (17.00 ± 15.76), Mossé (21.73 ± 17.56), Loendeng (15.35 ± 14.05), Ndockmem-Nord (21.19 ± 15.90), and Ndem (39.50 ± 15.04).

3.3 Types of Crop Raiding by Animal Species

Information obtained from respondents revealed that crop raiding, killing of domestic animals, and destruction of property were the major forms of human–wildlife conflict in the study area. This section identifies the types of crops raided, the animal species responsible, and the human actions taken in response to crop raiding. Survey questions were designed to determine which crops were most affected by wildlife. Results showed that up to 13 different crops were reported as being raided: cassava, maize, cocoyam, potatoes, peas, plums, groundnuts, yams, plantain, egusi, pineapple, cocoa, and pear. Figure 3 illustrates the distribution of crop raiding incidents by wildlife species across the surveyed villages.

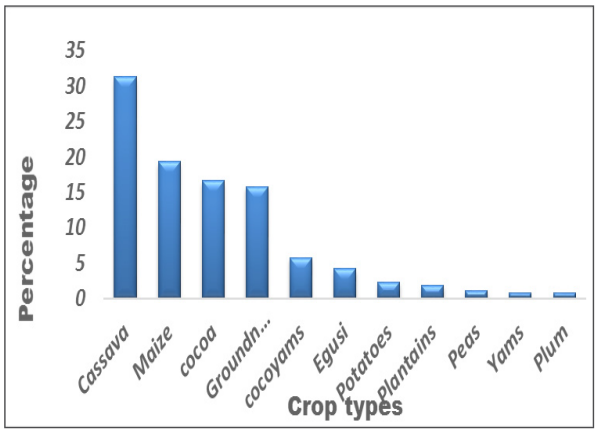

Figure 3. *illustrates the types of crop raiding reported in the study area*

From figure 3, cassava was identified as the most frequently raided crop (31.3%, $N = 81$), followed by maize (19.3%, $N = 50$). Plums were the least affected, with only 0.8% ($N = 2$) of respondents reporting damage.

3.4 Wildlife Species Involved in Crop Raiding

Questionnaires were also administered to identify the wildlife species responsible for crop damage. Results revealed that up to 17 species were implicated in crop raiding. These included: Antelopes (duiker, bushbuck), grasscutters, primates (chimpanzee, potto bush baby), porcupines, rat moles, snakes, squirrels, elephants, wild boars, insects, tiger cats, grey parrots, african civets, partridges and hedgehogs. Figure 4 shows the distribution of wildlife species involved in crop destruction across the surveyed villages.

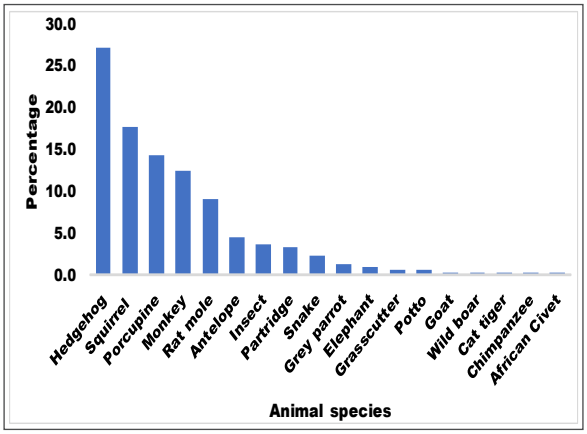

Figure 4. *Wildlife species most frequently implicated in crop destruction.*

From figure 4, illustrates the wildlife species most frequently implicated in crop destruction. Hedgehogs (27.1%, $N = 83$), squirrels (17.6%, $N = 54$), porcupines (14.4%, $N = 44$), and monkeys (12.4%, $N = 38$) were the leading species reported, while the African civet was the least implicated (0.3%, $N = 1$).

3.5 Human Actions against Wildlife Species

Responses from questionnaires revealed that 93.4% of respondents acknowledged killing animals responsible for crop damage, whereas 6.6% reported that they did not. The primary methods used to kill or capture these animals were trapping, hunting, and poisoning. Trapping was the most common method (76.8%, $N = 86$), followed by hunting (20.5%, $N = 23$), and poisoning (2.7%, $N = 3$). When asked about the reasons for wildlife intrusion, *94.5% (*N = 86) of respondents stated that animals entered farms in search of food, while *5.5% (*N = 5) believed the animals were searching for water.

3.6 Wildlife Actions against Humans and Their Properties

Most respondents (95%, $n = 86$) reported that wild animals do not attack humans or their properties, while a minority (5%, $n = 4$) stated that they do. Among those who reported attacks, the impacts included the killing of domestic animals (50%, $n = 2$) and the destruction of homes (50%, $n = 2$). In terms of conflict zones, farms, villages, and rivers were identified as the main areas where human–wildlife interactions occur. The majority of respondents (96%, $n = 87$) indicated that farms were the primary zone of conflict. A smaller proportion (3%, $n = 3$) reported villages as the main conflict zone, while only one respondent (1%, $n = 1$) identified rivers as the major area of conflict.

3.7 Evaluation of Damages Incurred by Farmers Due to Crop Raiding

From the questionnaires, respondents were asked to estimate the quantity of crops lost over the past five years. The total financial loss from crop damage in the study area was 58,876,662.5 FCFA. The mean loss per household was 226,448.70 ± 464,431.02 FCFA. The mean financial loss varied across villages, with the highest recorded in Ndockmem-Nord (315,299.1 ± 499,164.74 FCFA), followed by Loendeng (248,881.9 ± 431,992.84 FCFA), Iboti (223,258.8 ± 589,605.70 FCFA), Mossé (127,813.8 ± 205,257.76 FCFA), and Ndem (54,875.0 ± 205,257.76 FCFA). Statistical analysis confirmed significant variation among villages (Kruskal–Wallis chi-squared = 10.029, df = 4, $p = 0.039$). Pairwise Wilcoxon rank-sum tests showed that losses in Ndockmem-Nord were significantly greater than in Iboti ($p = 0.016$), Mossé ($p = 0.030$), and Ndem ($p = 0.033$). Losses were further categorized into cash crops and food crops. Damage to cash crops amounted to 31,553,375 FCFA, while food crop losses totaled 27,323,287.5 FCFA. The mean loss for cash crops (643,946.4 ± 654,967.5 FCFA) was significantly higher than that for food crops (129,494.3 ± 343,301.9 FCFA) (Wilcoxon rank-sum test: $W = 8349.5$, $p = 1.978 \times 10^{-11}$). Additionally, respondents reported the killing of two domestic fowls, resulting in a total loss of 10,000 FCFA.

3.8 Periods of Conflict and Plant Growth Stages

The majority of respondents reported that crop raiding occurred most frequently during the rainy season (72.5%, $N = 66$). Both seasons combined (rainy and dry) accounted for 25.3% ($N = 23$), while the dry season alone was least affected (2.2%, $N = 2$). In terms of specific months, May–August was identified as the period most affected by crop damage (45.1%, $N = 41$). Other reported periods included April–July, April–September, March–April, May–June, and June–July, each accounting for 1.1% of responses. Respondents also noted that the same crop could attract different animal species, and the manner of destruction varied depending on the species involved. Regarding the growth stage of crops, 44% ($N = 40$) reported that crops were destroyed at all stages, 41.8% ($N = 38$) at the mature stage, 12.1% ($N = 11$) at the young stage, and 2.2% ($N = 2$) at the seedling stage. Table 3 presents the distribution of crop damage frequency according to the developmental stages of the affected crops.

Table 3. *Distribution of crop damage frequency according to the developmental stages of the affected crops.*

Stage of development of crops	No	Percentage
Seedlings	2	2.2
Young	11	12.1
Mature	38	41.8
All states	40	44.0

3.9 Preventive Methods Used by Local Communities against Human–Wildlife Conflict

The local population employed a variety of preventive methods to deter wildlife species from entering their farms. As shown in Table 4, the most commonly used methods were traps (49.5%) and chemicals (16.5%). Less frequently reported methods included guarding (1.1%), bell ringing (1.1%), and the use of hunting dogs (1.1%).

Table 4. *Methods used by local communities for wildlife prevention around farms*

Methods	No	Percentage
Traps	45	49.5
Chemical	15	16.5
Craft	2	2.2
Drums	2	2.2
Guarding	1	1.1
Clear boundries	2	2.2
Hunting	11	12.1
bell ringing	1	1.1
Hunting Dog	1	1.1
Boundries	2	2.2
None	9	9.9

Variation in preventive methods across villages, analysis of the number of preventive methods used by respondents revealed that more than half (54.9%, $N = 50$) relied on a single method, while 31.9% ($N = 29$) employed two methods. A smaller proportion (9.9%, $N = 9$) reported using no preventive measures, and only 3.3% ($N = 3$) adopted three methods simultaneously to deter wildlife. The techniques used varied across villages. As shown in Figure 5, traps were employed at a very high frequency in Iboti, Mossé, Loendeng, and Ndockmem-Nord, whereas respondents in Ndem reported not using any mitigation methods. The use of chemicals was the second most common technique, particularly in Iboti and Loendeng, but was less frequent in Mossé and Ndockmem-Nord. Scarecrows were reported only in Iboti and Ndockmem-Nord.

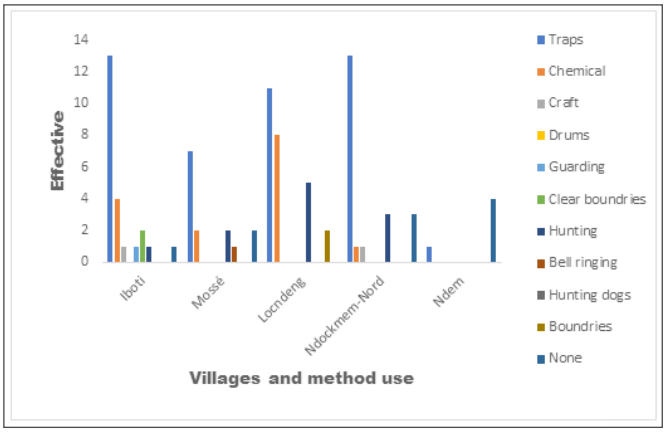

Figure 5. *Techniques used by local people in different villages to prevent wildlife intrusion.*

Figure 5 illustrates the techniques used by local people in different villages to prevent wildlife intrusion. In addition to preventive measures, questionnaires were designed to assess the proportion of respondents who reported human–wildlife conflicts to administrative authorities. Table 5 shows the distribution of villages reporting crop raiding incidents to administrative authorities and able 6 provides the breakdown of respondents per village who informed specific authorities about HWC.

Table 5. *Distribution of villages reporting crop raiding incidents to administrative authorities.*

Villages	YES		NO	
	effective	Percentage	Effective	Percentage
Iboti	9	36.0	16	64.0
Mossé	3	20.0	12	80.0

Loendeng	14	53.8	12	46.2
Ndokmem-Nord	10	47.6	11	52.4
Ndem	1	25.5	3	75.0

In general, the proportion of surveyed respondents who reported crop raiding incidents to administrative authorities (N = 37; 40.7%) was significantly lower than those who did not report to any administrative unit (N = 54; 59.3%).

Table 6. *Distribution of villages according to the responses of administrative authorities to crop raiding incidents.*

Villages	Agricultural service		Other services	
	Effective	Percentage	Effective	Percentage
Iboti	3	8.6	5	14.3
Mossé	1	2.9	1	2.9
Loendeng	8	22.9	6	17.1
Ndokmem-Nord	9	25.7	1	2.9
Ndem	1	2.9	0	0.0

Among the 40.7% of respondents who reported crop raiding incidents to administrative authorities (N=37), the majority (62.9%) informed agricultural services, while 37.1% reported to other services such as EFP, CAG, D.O, WWF, and cocoa buyers (see Table 6). The reactions of these administrative authorities varied considerably. Most authorities (94.1%, N = 32) did not provide support to farmers. A small proportion (6.3%, N = 2) offered some form of assistance: one authority provided tools (N = 1), while another gave repeated promises without concrete action (N = 1).

3.10 Local Perceptions and Attitudes toward Wildlife Conservation

To assess respondents' awareness and attitudes toward wildlife conservation, it was found that 98% acknowledged being aware of laws protecting wildlife, particularly endangered species, while only 2% did not respond to the question. When asked about their willingness to support wildlife conservation within the park, 54% expressed support, whereas 46% opposed the idea, citing concerns such as crop raiding and the need for additional farmland.

4. Discussion

4.1 Types of Crop Raiding and Animal Species Involved

This study identified three major forms of human–wildlife conflict in the Ebo Forest, located in the Nkam Division of the Littoral Region of Cameroon. Respondents reported crop raiding, killing of domestic animals, and destruction of property as the main types of conflict. Among these, crop raiding was overwhelmingly the most frequent (95.6%), while killing of domestic animals and property destruction were each reported at 3.2% (Gemeda & Meles, 2018; Kitampui et al., 2021; Abiud, 2009; Weladji & Tchamba, 2003; Kouao et al., 2018). Unlike findings from other countries, where wildlife attacks on humans have been documented and sometimes resulted in fatalities (FAO, 2014), interviews in this study revealed no cases of human loss.

Respondents reported up to 13 different crops affected by raiding. The destruction of these crops has serious implications for food security, as staples such as cassava, maize, cocoa, groundnut, cocoyam, egusi, potatoes, plantain, peas, and plums serve as the principal sources of nutrition and income. Cassava, maize, and cocoa were identified as the most severely damaged crops. These findings differ from those of Bobo (2021), Weladji & Tchamba (2003), and Tangie et al. (2018), who reported different crop preferences in their respective study areas. The variation may be explained by differences in ecological conditions, wildlife species present, and farming practices. Importantly, the surveyed population in Ebo Forest consisted mostly of married men and women with family responsibilities, whose livelihoods depend heavily on agriculture. This demographic profile underscores the vulnerability of households to crop raiding and highlights the socio-economic importance of mitigating HWC in the region.

A total of 17 wildlife species were reported to be involved in crop raiding. Among these, hedgehogs, squirrels, porcupines, and monkeys were the most frequently implicated in crop destruction, while species such as wild boar, tiger cats, chimpanzees, and African civets were reported less often. These findings differ from those of Marchal & Hill (2009), who noted that 94.9% of respondents in their study identified wildlife as a major cause of crop damage, with squirrels, porcupines, pigs, deer, elephants, and primates being the most destructive. According to

Nahonyo (2001), agricultural losses due to wildlife are generally higher in Africa than elsewhere, with an average of about 40% of planted crops lost.

The distribution of conflict was relatively constant for some species throughout the year. However, May, June, July, and August emerged as peak months for crop destruction, particularly by hedgehogs, squirrels, porcupines, and occasionally monkeys. These months correspond to the maturity and harvest period of key cash crops (e.g., plantain, cocoa) and food crops (e.g., maize, egusi, cassava, cocoyams), making farms especially vulnerable. By contrast, the months of January, February, April, September, October, November, and December recorded lower levels of damage, largely because fewer crops were cultivated and most cash crops had already been harvested. Notably, from late April to May, insect damage was particularly high in Mossé and Loendeng, targeting cash crops such as cocoa and food crops like egusi. Insects attacked cocoa leaves, pods, and sometimes entire trees. This observation is consistent with findings by Tangie et al. (2018) in the Mount Cameroon National Park, where insect infestations were also reported as a significant contributor to crop losses.

According to respondents, farmlands, villages, and rivers were identified as the main conflict zones in the study area. Among these, farmlands were reported as the primary zone of conflict. Wildlife intrusion into farms was largely driven by the search for food and water. This can be explained by the fact that the carrying capacity of their natural habitats has been exceeded, resulting in insufficient resources and forcing animals to move into agricultural lands.

During these incursions, humans employed various methods to capture or deter wildlife, including guns, traps, and poisons. Another important factor influencing wildlife intrusion was the type of crops cultivated, as certain crops attract specific species. This result consist with those of Chuo et at., in their work in the Kimbi-Fungom National Park and Kom-Wum forest Reserve. For example: Cassava was frequently damaged by hedgehogs and porcupines. Cocoa was targeted by monkeys, squirrels, and insects. This demonstrates that both ecological pressures and crop types play a significant role in shaping human–wildlife conflict dynamics in the region.

4.2 Evaluation of the Cost of Human–Wildlife Conflict (Severity of Damage)

The analysis revealed that cassava, maize, and cocoa were the crops most frequently destroyed by wildlife, with cassava and cocoa incurring the greatest economic losses. The monetary cost of crop damage varied significantly among villages. Ndem recorded the highest financial loss, followed by Iboti, Ndockmem-Nord, and Locndeng. These differences can be explained by variations in crop prices across villages: the farther a village is from the central town, the lower the crop prices, largely due to poor road conditions that limit market access.

Among the three other villages, Iboti experienced the greatest losses, attributed to both the type of crops cultivated and the number of bags destroyed per unit area. For example: In Iboti, 14.8 bags of crops and 150 bunches of plantains were destroyed across 3.88 ha. In Ndockmem-Nord, 13.25 bags were lost over 1.42 ha. In Locndeng, 9.2 bags were destroyed over 1.50 ha. Overall, a total of 9.92 ha of farmland was damaged in the Ebo Forest, resulting in the destruction of 60.45 bags (100 kg each) and 150 bunches of plantains, with a combined monetary loss of 3,136,825 FCFA. In some cases, individual farmers lost up to one million FCFA in a single season, forcing them to engage in secondary activities such as hunting to meet household needs. It is important to note that the evaluation of HWC costs was conducted in four of the five sampled villages. In one village, data collection was not possible due to security concerns: the absence of a trusted guide and the chief's reluctance to assign someone else for fear of potential harm prevented fieldwork in that location.

4.3 Conflict Areas and Periods of Occurrence

In the study area, farmlands, villages, and rivers were identified as conflict zones, with farmlands being the most affected. Interestingly, Ndem had the fewest conflict zones but recorded the highest financial losses compared to other villages. This is explained by the proximity of Ndem's farmlands to the forest reserve, which increases the likelihood of wildlife intrusion. The limited number of conflict zones reported in Ndem (only four farmlands evaluated) reflects sampling constraints rather than reduced exposure. These findings align with Chuo et al., 20217b and Tsi et al. (2020), who noted that villages closer to forest boundaries are more vulnerable to wildlife damage than those located farther away.

Crop damage was most frequent during the rainy season, particularly when crops were approaching maturity. This differs from Tangie et al. (2018), who reported different seasonal patterns. The ripening of crops creates favorable conditions for wildlife feeding. For example: Monkeys often attack cocoa at maturity.

Hedgehogs target maize, groundnuts, and cassava when they are mature. Significant proportions of farmland were devastated during these peak periods. In contrast, crop damage during the dry season was mainly observed in fields located along permanent watercourses, where crops such as groundnuts are cultivated. The fertile soils in these areas encourage continuous farming activities, particularly with crops like banana/plantain, cocoa, and cocoyams, which remain vulnerable year-round. The same crop may attract different animal species, but the manner and timing of destruction vary by species. Each animal has particular feeding behaviors that target crops at specific stages of development. For example: Hedgehogs damage mature crops, typically at night. Monkeys attack cocoa during the day, as primates are diurnal and rest at night like humans. Squirrels feed both during the day and at night, attacking both young and mature cocoa pods. Their damage occurs frequently—often daily or weekly. This pattern can be explained by their feeding strategy: when a field is surrounded by crops they prefer, squirrels consume those available, then move to nearby farms, returning after a short interval (often a week) once new food is accessible. Chuo et al., 2017a shown that these species-specific behaviors highlight the complexity of human–wildlife conflict, as crop vulnerability depends not only on the type of crop but also on the feeding ecology and activity patterns of the animals involved.

4.4 Preventive Methods Used by Local Communities against Human–Wildlife Conflict

Trapping and the use of chemicals (such as insecticides) were identified as the preferred strategies for minimizing crop losses caused by wildlife. However, these methods proved largely ineffective in preventing damage. This finding contrasts with studies by Nkel (2020), Boukeng (2015), and Weladji & Tchamba (2003), who reported that guarding and sound-based deterrents were originally developed to prevent elephant incursions but later adapted to reduce conflicts with a wider range of species. Efio et al. (2022) similarly observed in Benin that farmers attempted to manage crop raiding through measures such as guarding. Yet, the heavy toll of crop damage and the limited effectiveness of these measures highlighted the vulnerability of households living near protected areas. In cases where farmers succeeded in reducing conflict, they typically employed multiple methods simultaneously, including hunting (e.g., killing monkeys). In Locndeng, hunting emerged as the third most commonly used method, particularly among farmers whose cocoa plantations were located near the forest boundary. Gender dynamics also influenced preventive strategies: married women benefited from their husbands placing traps around farmlands, whereas widows lacked such support, leaving their farms more exposed to wildlife incursions and making them disproportionately vulnerable to crop damage.

4.5 Local Perceptions and Institutional Responses

The perceptions of local people toward wildlife species revealed a mix of practical and cultural interpretations. Villagers often expressed frustration, noting that despite the preventive measures they employed, animals still managed to enter their farms. Some even suggested that "these animals could only be people's totems or sent by someone who envies another's crops." Chuo et al., (2018) reported that such beliefs highlight the intersection of ecological realities with traditional cultural explanations of conflict. Despite numerous studies conducted in Cameroon and the publication of various co-management strategies, human–wildlife conflict remains a considerable and unresolved challenge, particularly for communities living around protected areas. Since the Ebo Forest is not yet formally designated as a reserve and lacks a conservator, most villagers who reported incidents directed their concerns to agricultural services or NGOs such as EFRP and WWF, as well as to organizations like CAG, cocoa buyers, the D.O., and political parties. Institutional responses were generally weak. Most authorities did not provide meaningful support. The EFRP offered limited assistance by supplying chemicals such as fungicides and insecticides for a short period. They also introduced agricultural services to help farmers diversify into crops such as cabbages, beans, leeks, and potatoes. However, only vegetables proved successful in the local soils, while other crops failed to thrive.

Between 1960 and 1962, local populations in the study area were exposed to war in their hometowns, which led to migration and the formation of smaller communities such as Iboti, Mossé, and others. Respondents recalled that during this period they faced serious problems, including crop damage, destruction of property, and occasional human fatalities. Letters were sent to governmental authorities requesting assistance, but no compensation or intervention was provided. This lack of response left a lasting sense of bitterness among indigenous populations toward the government. In the surveyed villages, many respondents admitted being unaware of the procedures

to follow after experiencing wildlife-related damage. Those who did report incidents to administrative units often received dismissive responses, such as: *"Animals are like humans; they need protection, not harm."* Farmers interpreted this as meaning they were essentially cultivating food for wildlife rather than for themselves. Some even suggested that the government should provide financial support to enable them to grow crops specifically to feed wildlife, so that when animals entered their farms, they would no longer feel compelled to complain.

5. Conclusion

This study highlights the complexity and severity of human–wildlife conflict (HWC) in the Ebo Forest, Cameroon. The findings reveal that crop raiding is the most prevalent form of conflict, with cassava, maize, and cocoa being the most affected crops. Wildlife species such as hedgehogs, squirrels, porcupines, and monkeys were identified as the main culprits, with their feeding behaviors varying by crop type, growth stage, and season.

The economic impact of HWC is considerable, with households incurring substantial financial losses that threaten both food security and livelihoods. Losses were unevenly distributed across villages, with those located closer to forest boundaries experiencing greater damage. Preventive measures such as trapping, chemicals, and hunting were widely used but proved largely ineffective, leaving farmers vulnerable. Institutional responses were weak, with limited support from administrative authorities and NGOs, further exacerbating local frustrations.

Despite high awareness of wildlife protection laws, community attitudes toward conservation remain divided. While some support conservation initiatives, others oppose them due to the direct livelihood pressures caused by crop raiding and land scarcity. Historical experiences of neglect and lack of compensation have also shaped negative perceptions of government involvement.

Overall, the study underscores the urgent need for integrated conflict-mitigation strategies that combine effective preventive methods, stronger institutional support, and community-based approaches. Addressing HWC in the Ebo Forest requires balancing biodiversity conservation with the socio-economic needs of local populations, ensuring that conservation efforts do not come at the expense of rural livelihoods.

Recommendations

- *Strengthen preventive methods*

Promote the use of integrated deterrent strategies (e.g., guarding, sound devices, fencing, and crop diversification) rather than reliance on traps and chemicals, which are often ineffective.

Encourage community training on sustainable, non-lethal methods to reduce crop raiding.

- *Promote community-based management*

Involve local communities in designing and implementing conflict-mitigation strategies.

Strengthen farmer cooperatives to improve collective bargaining power and access to resources.

- *Diversify livelihoods*

Support alternative income-generating activities (e.g., beekeeping, small livestock rearing, vegetable gardening) to reduce dependence on vulnerable cash crops.

Provide training and micro-finance opportunities to encourage adoption of diversified farming systems.

Strengthen conservation awareness

Conduct sensitization campaigns to improve understanding of wildlife laws and the ecological importance of species.

Integrate traditional beliefs and local knowledge into conservation education to foster community acceptance.

- *Research and monitoring*

Establish long-term monitoring programs to track crop losses, wildlife behavior, and seasonal patterns of conflict.

Encourage collaboration between researchers, NGOs, and government agencies to generate evidence-based solutions.

Perspectives

- Ecological balance**:** The expansion of farmlands into for rest boundaries highlights the need for improved land-use planning, buffer zones, and habitat restoration to reduce wildlife intrusion.
- Research and innovation**:** Long-term monitoring, ecological studies, and the testing of innovative deterrent methods are essential to generate evidence-based solutions tailored to local realities.

Author Contributions

Mvo Denis Chuo: Supervision, conceptualization, methodology, data collection and analysis, preparation of the initial and final versions of the manuscript. Lekomo Tcheunou Merveille Dallya:

Conceptualization, methodology, data collection, drafting and revision of the manuscript. All authors approved the final version of the manuscript for publication.

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Data Availability

The datasets generated and analyzed during the present study are available from the corresponding author upon reasonable request.

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