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Research Article

Human-Wild Animals Conflict in and around Amba Forest, Ezha District, Gurage Zone, Southern Ethiopia

Demelash Sime,[1] **Zemedkun Siraj**,[1] **Ashenafi Teklemariam**,[1] **and Belete Tilahun**[1,2]

[1]*Department of Biology, College of Natural and Computational Sciences, Wolkite University, P.O. Box 07, Wolkite, Ethiopia*
[2]*Department of Wildlife and Ecotourism Management, College of Agriculture and NRM, Wolkite University, P.O. Box 07, Wolkite, Ethiopia*

Correspondence should be addressed to Demelash Sime; demelashsime@gmail.com

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The conflicts between humans and wild animals with the same resources are common but seldom reported in Ethiopia. This study was carried out to assess the causes, impacts, and mitigation strategies of the local communities with human-wild animal conflict (HWC) in and around Amba forest of Ezha District, Gurage Zone, Ethiopia: implications for wildlife conservation. Cross-sectional study design was applied, and data were collected from November 2019 to July 2020 through a semistructured questionnaire, focus group discussion (FGD), and field observation. A total of 53 respondents were randomly selected. The data were analyzed using SPSS software, and the results were presented using tables, graphs, charts, and text. The study result revealed that human-wild animal conflict exists, and it was seriously occurring at various places, time, and seasons. *Papio anubis, Potamochoerus larvatus, Cercopithecus aethiops, Hystrix cristata,* and *Crocuta crocuta* were the main conflicting wild animals, respectively. Abundance of wild animals, presence of forest, crop raiding, expansion of agriculture, and livestock predation were the main causes of conflict in the study area. There was a statistically significant relation between conflict and the cause of conflict ($\chi^2_{(5)} = 17.075$, $p = 0.004$). Psychological and economic impacts were the main impacts encountered. Most of the respondents (86.8%) had applied conflict mitigation strategies, but it was ineffective, although the trend of conflict was increasing. Many of the respondents (41.5%) had a negative attitude toward wild animals, but 58.5% encouraged wild animals' conservation. HWC had increasing trends of conflict, and thus, a negative attitude was developed by the communities on wild animal coexistence and conservation. Therefore, awareness creation, training, and promoting coexistence mechanisms between humans and wild animals are necessary in the study area.

1. Introduction

Historically, there have been strong negative interactions between humans and wildlife that become causes of the noticeable problem referred to as human-wildlife conflict (HWC) and consequently are converted into aspects of wildlife management throughout the world and currently a difficult challenge for conservationists of the Earth [1]. HWC is a universal phenomenon in both developed and developing countries [2]; however, it is further practiced within several developing countries [3]. Presently, HWC is more prevalent, and the issues of conservation actions are highly associated. HWC and wildlife conservation issue comprises a variety of features and species, starting from grain-eating rodents [4] to man-eating tigers [5]. Hence, it is rising like a considerable wildlife management issue [6] for the reason that its effect is very severe. As it is evidently recognized, HWC occurs while wildlife requirements overlie with human needs and goals and has costs for both humans and wildlife [7]. The conflict can also exist as the requirements and wildlife behaviors harmfully impact the goals of human beings [8] and affect the free movement of wildlife and vice versa. For that reason, human-wildlife conflict can be expected and measured in all communities where both humans and wildlife commonly exist and share the same habitat [9]. The depletion of natural habitats that provide support to wildlife can also cause a conflict problem.

Globally, HWC is an extremely increasing problem, which occurs in any geographical region or climatic conditions and is common in all areas where wildlife and humans coexist and limited resources are shared [10]. In the same way, HWC is also common in Africa in all areas where wildlife and human populations coexist and have limited resources, and the condition is getting not as good as it costs individual safety and loss of economy in urban areas [9]. The fundamental causes of the problem are the growth of human population and settlements encroaching into formerly uninhabited areas in both number and intensity [11]. As a consequence, HWC accuses wildlife and humans of long-term conservation goals, threatening livelihoods and communities that provide support to biodiversity conservation [6], and species involved in the conflict are more prone to extinction [12] and result in several resource damage in various ways.

Conservation biologists of the world face the most important challenges from human-wildlife conflict for wildlife management goals [13]. It is the most repeated problem in countryside areas where most people depend on farming, animals, goods, and agriculture for their livelihood and returns [14]. It is more vulnerable in developing countries like Ethiopia when compared to developed countries because livestock and agriculture are an important part of rural livelihoods [11,15]. According to [16–18], reports are few regardless of whether the conflicts are severe in Ethiopia. In this regard, conservationists and practitioners recommend that local participation and support for a conservation project are necessary for its success and sustainability. The distinguished resource damage caused by wildlife near forest habitats and around the protected areas could be an opportunity or a threat [19].

The conflict between humans and wildlife ranks among the main threats to biodiversity conservation and has become frequent and severe in diverse sections of Ethiopia [20]. In different conservation areas of Ethiopia, the competition between local people and wild animals was frequently reported as it was stated in [21,22]. However, the environment and magnitude of the difficulty differ from place to place based on the increase in human population rate and shortage of significant natural resources, especially grazing and farmland [22]. Countryside communities with a shortage of livelihood prospects are regularly the hardest stroke for conflicts with wildlife [1]. Rural communities with restricted livelihood chances are repeatedly the hardest stroke by conflicts with wildlife [1]. Without mitigating HWC, the results are further impoverishment of the poor, reduced local support for conservation, and increased retaliatory killing of wildlife causing increased vulnerability of wildlife populations [1]. Practical and durable management of wildlife and its habitats desires the understanding of the ecological and socioeconomical perspectives of human-wildlife conflict [23]. The problem of conflict between humans and wildlife can be considered the most important fear to the food security and income of many rural households. In the current study area, there was no previous study on human-wild animals conflict, and the challenge was relevant from socioeconomic and conservation point of view.

Accepting the factors connected with conflicts and where they are expected to happen is significant for conservation and conflict [24]. Therefore, the main objective of the present study was to study the causes, impacts, and mitigation strategies of the local communities with human-wild animal conflict in and around Amba forest of Ezha District, Gurage Zone, Ethiopia: implications for wildlife conservation.

2. Materials and Methods

2.1. Description of the Study Area. Gurage Zone, which is part of the Southern Nations Nationalities and People's Region (SNNPR), is located in the southwest part of Ethiopia. The zone is bounded by Hadiya, Kembata, Alaba, and Tembaro zones in the south, Yem special woreda in the southwest, and the Oromia Regional state in the northwest and east [25]. The zone is divided into 13 woredas, but currently 16 woredas and two city administrations, Welkite and Butajira. The total population in the zone was 1,279,646, of whom 622,078 were males and 657,568 were females [26]. The majority of the people (95%) live in rural areas engaged in agriculture [27]. The remaining 5% live in urban areas [25], cited in [27]. This study was carried out in and around Amba forest, located in Ezha District of Gurage Zone (Figure 1). The forest (Figure 2) comprises various fauna and flora resources. The local communities had various interactions and interferences with the forest and its resources.

2.2. Study Design, Periods, Sample Size Determination, Sampling Methods, and Study Population. To conduct this study, a cross-sectional study design involving qualitative and quantitative data was conducted from November 2019 G.C. to July 2020 G.C. A total of 53 study participants/households (from four Kebeles Woyiradebane, 21 (39.6%), Yesiray, 15 (28.3%), Agena, 9 (17%), and Gedeb, 8 (15.1%)) were involved in this study based on the total population size of the study area and areas close to the forest. In the study area, more than 2400 population and 450 households were found. However, the households located around the forest and facing the conflict were 128. The sample size was determined purposively, and a simple random sampling technique was used to involve respondents from the source population, community members who were living close to and around Amba forest in the district.

2.3. Data Collection Methods and Analysis. Semistructure questionnaires with appropriate variables pertaining to human-wild animal conflict causes, impacts, and mitigation strategies used by the local community in the study area as well as background information of respondents were included to collect data via interviewing [29]. Field observation using a preprepared data collection sheet was used to collect data concerning conflict causes, types of impacts, wildlife causing conflict, identifying species of wildlife, and so on. Focus group discussion (FGD) among selected key informants was conducted to supplement the information obtained using other methods of data collection [29]. Prior to

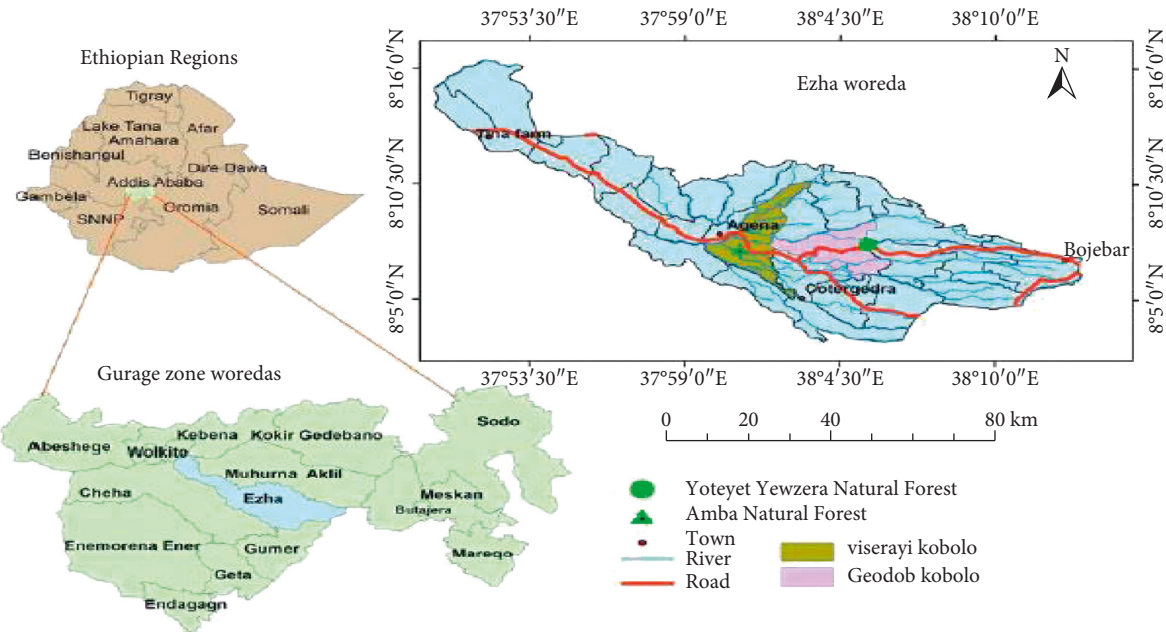

Figure 1: Map of Amba forest (study area) [28].

Figure 2: Amba forest (study area) (photo by authors).

actual data collection, there was a preliminary survey in the study area to collect relevant information about the study area. The data were analyzed using SPSS software in which one-way ANOVA was used to compare the response mean variation among the causes; types of conflicting wild animals, impact difference, and mitigation strategy differences were analyzed. Chi-square ($\chi 2$) was used to analyze the response difference of respondents regarding their academic status, age, crops grown and damaged, and other relevant variables for this analysis. Additionally, descriptive statistics were used to analyze the mean, frequency, and percentage of quantitative data. In all cases, a 95% level of significance was considered for the difference to be observed. The obtained analysis results were presented using tables, graphs, charts, and text.

3. Results and Discussion

3.1. Demographic Characteristics of Study Participants. In this study, 64.2% of the respondents were males, and 41.5% had an age group of 31–40 years. Of the respondents, 39.7% had a primary education level (Table 1). The education status of the respondents had a statistically significant relation ($\chi^2_{(4)} = 18.98,\ p < 0.001$).

Most of the respondents (71.7%) were married, and 67.9% had children, of whom 28.3% had 2 to 3 children, while 5.7% had 6 to 7 children per family (Table 1). Moreover, 67.9% were farmers, or agriculture was their type of occupation. This implies that the highest proportion of the respondents was farmers who possess land and perform agricultural activities, so they encountered the conflict.

3.2. Presence of Conflict in the Study Area. All respondents (100%) replied with the presence of conflict between humans and wild animals in the study area (Figure 3).

This was also confirmed by all focus group discussion discussants. This implies that human-wild animal conflict is a serious issue in the study area and influences the livelihood of the local communities and the survival of wild animals. As stated in [2], human-wildlife conflict is a common phenomenon in both developing and developed countries. Moreover, according to [3], HWC exists in different forms all over the world and is more experienced in developing countries, and it has been in existence as long as humans have existed and wild animals and people have shared the same landscapes and resources [30]. HWC occurs when wildlife requirements overlap with those of human populations, having costs for both residents and wild animals [7]. It exists when the needs and behavior of wildlife impact negatively the goals of human beings [8]. As the human population increases and settlements encroach into previously uninhabited areas, HWC is increasing in both number and intensity [11]. It was also in line with the study results of [31], in which the majority of respondents (56%) reported the existence of HWC manifested through both crop damage and livestock predation.

3.3. Occurrence of HWC Time and Severity of Conflict. As the results of this study revealed, the conflict between humans and wild animals occurs dominantly during the time within

Table 1: Demographic characteristics of study participants.

Gender/sex	Male			Female		Total
N	34			19		53
%	64.2			35.8		100
Marital status	Single		Married	Divorced		Total
N	15		38	0		53
%	28.3		71.7	0		100
Age category	21–30	31–40	41–50	Above 51		Total
N	17	22	11	3		53
%	32.1	41.5	20.7	5.7		100
Education status	Degree	Diploma	9–12	1–8	Uneducated	Total
N	4	4	13	21	11	53
%	7.5	7.5	24.6	39.7	20.7	100
Occupation	Agriculture	Trade	No job	Private	Government	Total
N	36	6	4	3	4	53
%	67.9	11.4	7.5	5.7	7.5	100
Family size	No children	2–3	4–5	6–7	8–9	Total
N	17	15	14	3	4	53
%	32.1	28.3	26.4	5.7	7.5	100

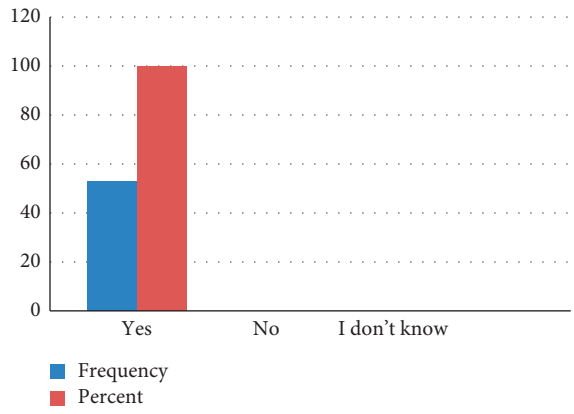

Figure 3: Presence of HWC in the study area.

a day (77.4%), but the conflict becomes severe during the day time dawn or early in the morning (84.9%), followed by night time (77.4%) within a day (Table 2). However, conflict occurs the least during day time noon (22.6%), and the severity of conflict was the least during day time dusk (69.8% (Table 2). The time of HWC had a statistically significant relation to the time of a day ($\chi^2_{(5)} = 58.77$, $p < 0.001$). The ANOVA result also showed that there was a statistically significant mean difference among the respondents' responses regarding the time of conflict (F (5, 48) = 3.69, $p = 0.007$). The severity of conflict during the time of a day had a statistically significant relation to the particular time of a day ($\chi^2_{(5)} = 15.038$, $p = 0.010$). However, the ANOVA result showed that there was no statistically significant mean difference among the respondents' responses concerning the severity of conflict (F (5, 48) = 1.580, $p = 0.184$). This implies that the conflict occurs during all times of the day, but there was an association with certain times of the day. The preferred time of conflict occurrence is related to the suitability for wild animals to look for food, while humans in the area may not actively prevent wild animals during that time of the day.

3.4. Seasons and Places of Conflict. As the respondents replied, conflicts between humans and wild animals occurred during all seasons, but the most conflict season was December to February (96.2%), whereas the least serious conflict season was from June to August (66%) (Table 3). There was a statistically significant relation between conflict between humans and wild animals and season of a year ($\chi^2_{(3)} = 32.358$, $p < 0.001$). The ANOVA result also showed that there was a statistically significant mean response difference concerning the season of conflict (F (5, 48) = 4.007, $p = 0.004$).

The result in Table 3 implies that there was conflict in all seasons, but there was variation in terms of the different seasons. The communities in the study area encounter the conflict via a year. This then costs a lot for both humans and wild animals in the area. This study result was in agreement with the study results of [11], which noted that season, variety and characteristics of crops, food availability, distance from the park, and farm protection methods will have impacts on crop raiding and depredation of domestic animals by wildlife. It was also in line with the study results of [27] in Midre-Kebid Abo Monastry, Gurage Zone, Southwest Ethiopia.

Concerning places of conflict, the conflict between humans and wild animals occurs mostly around home and garden areas (84.9%), followed by on farmland (75.5%), whereas conflict occurs the least on grazing land (22.6%) (Table 4). There was a statistically significant relation between conflict and place of conflict ($\chi^2_{(5)} = 55.57$, $p < 0.001$). This result implies that the wild animals move to home, garden, and farmland areas, and thus, conflict occurs with humans since these areas are not common habitats for wild animals. However, depletion of food supply in the wild forces wildlife to switch to crops and livestock as their food source [32]. Thus, the wild animals move around homes, gardens, and farmland areas so that conflict arises. Conflict occurs in various areas in the study area. This means the possibility of encountering conflict was high. As wildlife

Table 2: Time of conflict occurrence and severity between humans and wild animals.

Time categories	Conflict occurrence response		Conflict severity time response	
	N (=53)	Percentage (%)	N (=53)	Percentage (%)
DTD (5:30–7:00 AM)	15	28.3	45	84.9
DTM (7:00–12:00 AM)	15	28.3	39	75.5
DTN (12:00–3:00 PM)	12	22.6	41	73.6
DTDK (4:00–7:00 PM)	17	32.1	40	69.8
NT (7:00 PM–5:00 AM)	13	24.5	37	77.4
ALT (24 hours of a day.)	41	77.4		

DTD = day time dawn, DTM = day time morning, DTN = day time noon, DTDK = day time dusk, NT = night time, ALT = all time, N = frequency of response, and % = percent of response.

Table 3: Ranking seasons of conflict between humans and wild animals.

Seasons	Ranks (response frequency)				Number (total = 53)	Percentage (%)
	1	2	3	4		
September–November	15	10	17	1	43	81.1
December–February	29	16	6	0	51	96.2
March–May	7	17	10	2	36	67.9
June–August	0	0	2	33	35	66

Table 4: Places of occurrence of conflict between humans and wild animals.

Place of conflict	Ranks (response frequency)							Number (total)	Percentage (%)
	1	2	3	4	5	6	7		
1. Around home and garden	30	10	4	1	0	0	0	45	84.9
2. On farmland	12	19	7	0	0	2	0	40	75.5
3. Around forest	4	7	4	10	1	0	0	26	49.1
4. Adjacent to forest	2	1	1	5	2	4	0	15	28.3
5. Inside forest	3	1	4	2	4	0	0	14	26.4
6. On grazing land	0	2	8	0	1	0	1	12	22.6
7. Everywhere	5	0	1	0	1	2	9	18	34

habitat becomes increasingly fragmented and wildlife gets confined into smaller pockets of suitable habitat, humans and wildlife are increasingly coming into contact and in conflict with each other [24, 33].

Furthermore, human population growth and the associated increase in rates of resource use, habitat modification, and fragmentation are forcing wildlife to live in increasing proximity to humans [34]. The highest intensity of conflict tends to occur where humans live adjacent to protected areas [35]. When humans live adjacent to larger wildlife habitats and increasingly alter their habitat, conflict between humans and wildlife may occur [36].

3.5. Wild Animals Conflicting with Humans and Causes of Conflict. There are different wild animals conflicting with humans in the study area. Regarding wild animals conflicting with humans, respondents responded that *Papio anubis* (90.6%) were the most conflicting wild animal, followed by *Potamochoerus larvatus* (71.7%) and *Chlorocebus aethiops* (69.8%), respectively (Table 5). Leopards, foxes, various birds, and other wild animals were the least conflicting animals in the study area (Table 5). During FGD, the same conflicting wild animals were listed in the study area. There was a statistically significant relation between species of wild animals causing conflict and humans in the study area ($\chi^2_{(8)} = 28$, $p < 0.001$). However, there was no statistically significant mean response difference among the respondents concerning the species of wild animals causing conflict (F (8, 45) = 0.680, p = 0.707). However, there was a statistically significant relation between species of wild animals causing conflict and humans in the study area with particular kebeles ($\chi^2_{(3)} = 22.804$, p = 0.004). The mean response of the respondents also showed that there was a statistically significant difference among the kebeles regarding the types of animal species causing conflict with humans ((F (3, 50) = 3.807, p = 0.016).

This study result implies that there were various but some commonly conflicting wild animals in the study area. Because of this, the communities and wild animals were experiencing the negative consequences of the conflict. According to [4], HWC is one of the most widespread issues in conservation, encompassing a considerable diversity of situations and species, from grain-eating rodents to man-eating tigers [5]. It is emerging as a significant wildlife management issue [6]. It was also in line with the study results of [30], who did a study on human-wildlife conflict in Choke Mountain, in which most (71%) of the respondents identified five wild animals as problematic that caused crop damage and livestock predation, namely, *Papio anubis*,

Table 5: Wild animals conflicting with humans in the study area.

Wild animals (species)	Ranks (response frequency)						Number (total = 53)	Percentage (%)
	1	2	3	4	5	6		
1. *Papio anubis*	46	2	0	0	0	0	48	90.6
2. *Potamochoerus larvatus*	0	17	11	6	4	0	38	71.7
3. *Cercopithecus aethiops*	3	18	7	5	3	1	37	69.8
4. *Hystrix cristata*	0	6	11	9	0	2	28	52.8
5. *Crocuta crocuta*	0	0	10	8	4	4	26	49.1
Others (leopard, fox, and birds)	0	0	0	3	9	5	17	32.1

Crocuta crocuta, *Potamochoerus larvatus*, *Hystrix cristata*, and *Canis aureus*. As the study results of [27] revealed, *Chlorocebus aethiops* and *Papio anubis* were the main conflicting wild animals in Midre-Kebid Abo Monastry, Gurage Zone, Ethiopia. Furthermore, it was also in line with the study results of [18] on the assessment of HWC in and around Gemshat Forest Area, Wollo, Amhara Region, Ethiopia. The same result was obtained with the study results of [1] regarding conflicting wild animals in Wondo Genet district, Ethiopia.

With reference to the causes of conflict, abundance of wild animals (100%) and the presence of forest in the area (100%) were the first agreed causes of HWC in the study area (Table 6). Moreover, FGD discussants mentioned similar hierarchical conflict causes in the study area. There was a statistically significant relation between conflict and the cause of conflict ($\chi^2_{(5)} = 17.075$, $p = 0.004$). However, there was no statistically significant mean response difference among respondents concerning causes of conflict (F (5, 48) = 0.55, $p = 0.737$) and among the kebeles (F (3, 50) = 1.295, $p = 0.287$).

This study's results implied that various causes of conflict were present, but there was a difference in terms of the ranks of the causes. To reduce the conflict, focusing on the top causes may be relevant. This finding was in line with the study results of [31] and also in agreement with the study results of [27], in which abundance of wild population and resource competition were the main causes of conflict in Midre-Kebid Abo Monastry, Gurage Zone, Southwest Ethiopia. This study result was also in agreement with the study results of [18], in which expansion of subsistence farming accounts for the highest percent cause of conflict (53.6%), followed by increased population of wild animals and expansion of subsistence farming (34.8%). According to [37], HWC arises mainly because of the loss, degradation, and fragmentation of habitats through human activities such as logging, animal husbandry, agricultural expansion, and developmental projects. As the habitat gets fragmented, the boundary at the interface between humans and wildlife increases, while the animal populations become compressed in insular refuges. Consequently, it leads to greater contact and conflict with humans as wild animals seek to fulfill their nutritional, ecological, and behavioral needs [23]. The damage to human interests caused by contact with such animals can include loss of life or injury, threats to economic security, reduced food security, and livelihood opportunities.

3.6. Major Crops Grown and Parts and Stages of Crops Damaged by Wild Animals. As this study revealed, *Ensete ventricosum* (81.1%; 88.7%) and *Solanum tuberosum* (77.4%; 79.2%) were the first and second major crops grown and damaged by wild animals, while *Eragrostis teff* (9.4%) was the least grown and damaged crop in the study area (Table 7). Different fruits (avocado, apple, papaya, banana, and mango) and vegetables (cabbage, carrot, and onions) were also grown in the study area, and these were also damaged by wild animals. Crops like coffee, khat, and others are also grown and damaged by wild animals. They grow crops mostly once a year (66.7%). There was no statistically significant mean response difference concerning crops grown (F (3, 50) = 0.279, $p = 0.840$) and damaged (F (3, 50) = 0.258, $p = 0.855$) in the study area.

As this result implies (Table 7), the major crops were similarly damaged by wild animals in the study area. This situation may intensify the conflict issue. It also implies that the conflicting wild animals were making the communities' difficulty of selecting and cultivation certain crops from others. This finding was in line with the study results of [27] in Midre-Kebid Abo Monastry, Gurage Zone, Ethiopia, and also in line with the study results of [18], where the same crops were grown and damaged by wild animals except Ensete crop which is not commonly found in northern Ethiopia (Gemshat Forest Area, Wollo, Amhara Region).

Relating to the parts of crops damaged by wild animals, wild animals damaged mostly seeds of crops grown in the study area (71.7%), followed by stem (50.9%), but flowers of the crops were damaged to the least (28.3%) (Table 8). Moreover, different parts of crops were affected by wild animals. This means that the conflicting wild animals had a preference for certain parts of a crop based on the nature of the crop and the feeding behavior of the animal. This again means that communities are involved in protecting the crops, parts, and stages. There was a statistically significant relation between conflict and parts of crops damaged ($\chi^2_{(5)} = 13$, $p = 0.023$), and there was also a statistically significant mean response difference among the respondents regarding parts of crops damaged by wild animals (F (3, 50) = 0.258, $p = 0.855$).

Concerning stages of crops damaged by wild animals, wild animals damage the mature stage of crops mostly (83%), followed by all stages of crops without stage selection (30.2%) (Table 8). There was no a statistically significant relation between conflict and the stage of crops damaged ($\chi^2_{(4)} = 5.208$, $p = 0.267$), but there was a statistically

Table 6: Cause of human-wild animals conflict.

Causes of human-wild animal conflict (HWC)	Ranks (response frequency)									*N*	%
	1	2	3	4	5	6	7	8	6		
1. Abundance of wild animals	7	16	12	4	2	6	1	5	0	53	100
2. Presence of forest	18	7	7	4	3	4	5	0	0	53	100
3. Crop raiding	19	8	3	9	8	3	2	0	0	52	98.1
4. Resource destruction	0	3	8	5	4	10	11	4	0	45	84.9
5. Human injury	0	6	7	9	9	5	7	0	0	43	81.1
6. Forest wood collection	1	8	1	4	1	6	4	14	0	39	73.6
7. Human and domestic animals interference	2	4	0	1	2	3	6	11	8	37	69.8
8. Agriculture expansion	6	2	5	0	4	1	0	9	7	34	64.2
9. Livestock predation	0	5	6	12	5	3	3	0	0	34	64.2

Table 7: Crops grown and damaged in the study area by wild animals.

Crops (species)	Crops grown in the area		Crops damaged by wild animals	
	Number (=53)	Percentage (%)	Number (=53)	Percentage (%)
1. *Ensete ventricosum*	43	81.1	47	88.77
2. *Solanum tuberosum*	41	77.4	42	79.2
3. *Hordeum vulgare*	32	60.4	34	64.2
4. *Triticum* spp.	31	58.5	32	60.4
5. *Zea mays*	13	24.5	14	26.4
6. *Vicia faba*	10	18.9	10	18.9
7. *Pisum sativum*	8	15.1	8	15.1
8. *Eragrostis teff*	5	9.4	5	9.4

Table 8: Parts and stages of crops damaged by wild animals.

Parts of crops damaged	Response (frequency)		Stages of crop damaged	Response (frequency)	
	N (=53)	Percentage		N (=53)	Percentage
1. Roots	26	49.1	Mature	44	83
2. Stem	27	50.9	Flowering	12	22.6
3. Leaves	19	35.8	Vegetative	5	9.4
4. Flowers	15	28.3	Seedling	14	26.4
5. Fruits	16	30.2	All stages	16	30.2
6. Seeds	38	71.7			

significant mean response difference concerning parts of crops damaged by wild animals (F (5, 48) = 2.924, p = 0.022). This means that the various stages of crops were damaged by wild animals, but there was a stage preference to attack the crops. This also means that the community must protect the various stages of the crops. This implies deprivation of time for other private or social activities and impacting many aspects of life of the community.

Pertaining to livestock attack and predation by wild animals, the majority of respondents (96.2%) explained the existence of livestock attack and predation by wild animals, whereas 3.8% explained that there was no livestock attack and predation by wild animals. As this study revealed, baboons mainly attack goats, followed by poultry and sheep, respectively, but their attack and predation were on sheep, goats, and poultries in the study area (100%) (Table 9). However, foxes had no attack and predation on goats, but sheep and poultry were in the least proportion (9.4%).

This implied that the wild animals attack and damage not only crops but also domestic animals in the study area. This by itself negatively affects the economic activities and the difficulty of rearing domestic animals in the area. Livestock predation follows seasonal patterns [38], and studies at Waza National Park in Cameroon [39] and Tsavo National Park in Kenya [40] revealed predation of domestic animals by wild animals. This study result was also in line with the study results of [27] in Southwest Ethiopia. This study result was in line with the study results of [18], in which baboons, hyenas, and leopards predated many domestic animals by a year. Trends of livestock predation had increasing trends, as indicated in the study result of [18].

Anubis baboons killed the largest number of domestic animals in the last two years, followed by spotted hyenas (Table 9). Totally, 179 animals have been killed in the last two years. This implies that great economic loss occurred due to livestock predation in addition to crop loss in the study area.

3.7. Impact and Types of Conflict Impact. Among the respondents, 90.6% believed that the conflict had an impact on the area, family, or individuals (Figure 4). There was a statistically significant relation between impact of conflict

Table 9: Livestock attacks and predation by wild animals.

Wild animals	Response to domestic animals attacked by wild animals			$N = 53$	Percentage (%)	Number of domestic animals killed by wild animals in the past 2 years			No. of domestic animals killed
	Sheep	Goat	Poultry			Sheep	Goat	Poultry	
Baboons	10	27	16	53	100	18	39	41	98
Hyena	8	7	0	15	28.3	20	15	0	35
Leopard	3	0	3	6	11.3	2	2	0	4
Fox	3	0	2	5	9.4	2	5	10	17
Genet	0	0	8	8	15.1	0	0	25	25
Total	24	34	29			42	61	76	179

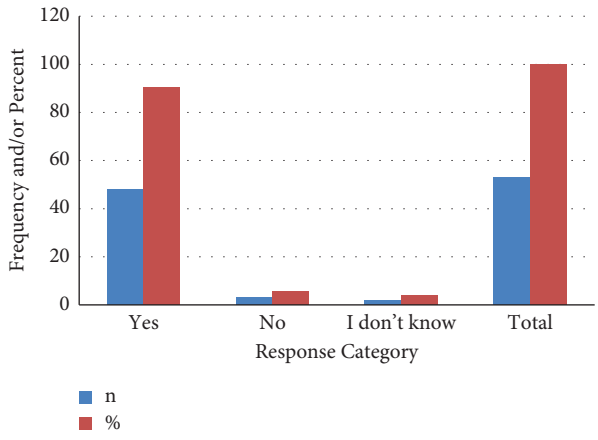

Figure 4: Impact of conflict.

and conflict ($\chi^2_{(2)} = 78.151$, $p < 0.001$), but there was no statistically significant mean response concerning the presence of conflict impact (F (3, 50) = 1.185, $p = 0.326$). This implies that the majority of the respondents considered that the conflict had an impact on their various aspects of life.

In addition, psychological impact (90.6%) was the first main impact the communities were encountering, the impact of wild animals in the study area. Moreover, economic impact was ranked first by most respondents ($n = 44$), but totally, it was the second main impact (88.7%) (Table 10). There was a statistically significant relation between the types of impact of conflict and conflict ($\chi^2_{(2)} = 59.585$, $p < 0.001$), but there was no statistically significant mean response concerning types of conflict impact (F (3, 50) = 1.672, $p = 0.186$).

The results obtained from FGD also supported the above results. This impact result implies that the community in the study area was influenced by human and wild animal conflict impacts and these impacts challenged their lives. They look for solutions to get rid of the impacts or reduce the extent of the impacts. Human-wildlife conflict tends to manifest itself in scenarios where human strategies affect the free movement of wild animals and vice versa. As explained in [9], it can be considered inevitable in all communities where humans and wildlife coexist and share the same habitat. Recently, it has become one of the fundamental aspects of wildlife management as it represents the most widespread and complex challenge currently being faced by

Table 10: Types of human-wild animals' conflict impact encountered.

Impact types	Response to impact type (ranks)				Number (total)	Percentage (%)
	1	2	3	4		
1. Psychological	1	28	15	4	48	90.6
2. Economic	44	3	0	0	47	88.7
3. Social	7	15	11	10	43	81.1
4. Health	0	2	14	21	37	69.8

conservationists around the world [1]. It has a significant social impact which depends on the capacity of a community to support a certain level of conflict [41]. In Africa, it is not restricted to a particular geographical region or climatic condition but is common in all areas where wildlife and human populations coexist and have limited resources [9]. The conflict results in severe impacts on communities in the form of crop depredation, property damage, loss of livestock, human injury, and human killing. The conflict that takes many forms ranges from loss of life or injury to humans and animals, both wild and domesticated, to competition for scarce resources to loss and degradation of habitat and habitat quality [6]. As indicated in [18], the human-wild animal conflict has economic, social, and other impacts.

3.8. Types of Mitigation Strategies Applied and Effectiveness of Methods. Most of the respondents, 46 (86.8%), replied that they had applied wild animal and human conflict reducing methods or conflict mitigation strategies. This result implies that, due to the conflict, the communities in the study area were applying various methods to reduce the impacts of the conflict. They were struggling to solve the problems.

Various mitigation strategies were applied by the respondents to solve the conflict between human and wild animals as the respondents replied (73.6%), while 5.7% did not apply any method to solve the problem. The rest (20.7%) of the respondents did not give any response to this issue, so considered as missing values. However, FGD discussants also mentioned the same list of strategies being exercised in the study area (Table 11). Guarding mitigation strategy is the mostly and commonly applied mitigation strategy for all wild animals, while the poisoning method is the least and only applied for baboons (Table 11). Moreover, respondents replied that numerous mitigation strategies can be applied to

Table 11: Mitigation strategies applied to human and wild animal conflict.

Mitigation strategies	Response to mitigation used for wild animals			
	Baboons	Pigs	Porcupine	Vervet monkeys
1. Team hunting	5	7	1	3
2. Fencing	0	2	13	0
3. Guarding	10	8	11	15
4. Sounding	10	12	6	5
5. Deforestation	9	9	2	3
6. Exposing to natural enemy	7	5	4	5
7. Fire burning	0	2	13	0
8. Smoking	0	0	16	0
9. Gunshot	10	10	0	2
10. Guarding by dog	8	0	0	10
11. Symbol hanging	6	0	5	7
12. Poisoning	2	0	0	0
13. Team journey	8	0	0	0

baboons to reduce the conflicts except methods such as smoking, fencing, and fire burning (Table 11).

The mitigation method applied so far to reduce human and wild animal conflict was effective according to certain respondents (36%), while 40% of the respondents replied that the applied methods were not effective (Figure 5).

This result implies that community in the study area used various methods of conflict impact reducing methods or mitigation strategies for different conflicting wild animals. This also implies that they realized certain behavioral aspects of the conflicting wild animals from experience in the study area, and thus, they tried to use it to avoid the impact of those wild animals. They applied their indigenous knowledge of preventing or reducing human-wild animals' conflict. Communities are essential to better prevent and mitigate human-wildlife conflict in a safe way [42]. For any human-wildlife conflict management strategy to succeed, it must be sustainable and is therefore ideally administered by the local community itself [43]. Moreover, conflict mitigation requires a comprehensive record of crop raiding activity, including patterns of raiding, farmer and raider behavior, crop losses, and the parameters of raiding events [44]. According to the study results of [18], the respondents explained that they had the experience of applying various traditional methods of mitigating conflict to reduce the impact of conflict.

Regarding the trends of the conflict, most of the respondents (88.7%) replied that the conflict situation was becoming serious from time to time, whereas 7.5% of the respondents replied that the conflict situation was not becoming serious from time to time. Furthermore, the remaining respondents (3.8%) did not give any response to this issue. As most of the study participants (95.8%) replied, the trend of conflict was increasing (Figure 6). There was a statistically significant relation between conflict and conflict trends ($\chi^2_{(3)} = 114.623$, $p < 0.001$), but there was no statistically significant mean response difference among respondents concerning trends of conflict (F (3, 50) = 0.842, $p = 0.478$). This implies that appropriate intervention was not taken by the concerned bodies, and the magnitude of the problem was intensified from time to time. It requires

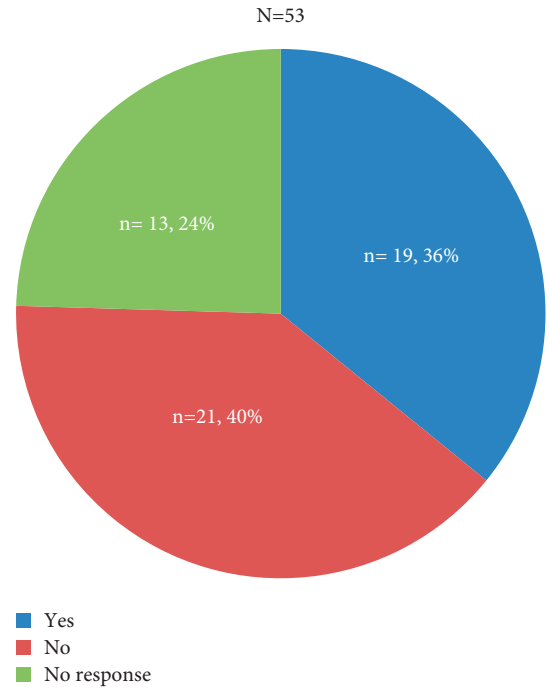

Figure 5: Effectiveness of mitigation methods applied so far.

attention to shift the trends of conflict in the study area via sounding methods of intervention. This study result was in line with the study results of [27]. As [45] explained, with increasing human population and pressure on forest areas, human-wildlife interaction and resultant conflict are also increasing. It occurs when growing human populations overlap with established wildlife territories, increasing the interaction of man and wild animals and thus resulting in increased levels of conflict.

3.9. Conservation of Wild Animals and Forests Conservation and Its Benefits. Regarding the conservation of wild animals, many respondents (50.9%) replied that the survival of wild animals was not important in the study area, while only 28.4% of the respondents supported the importance of the

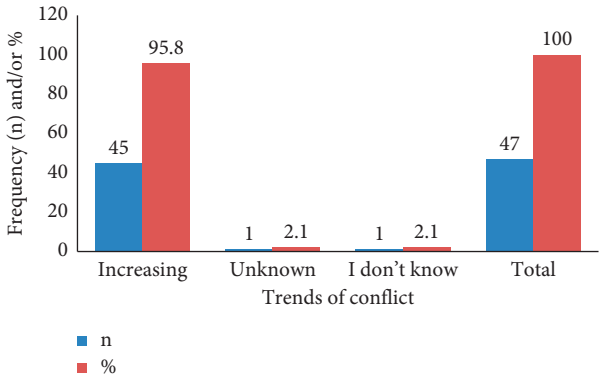

Figure 6: General trends of human-wild animal conflict in the study area.

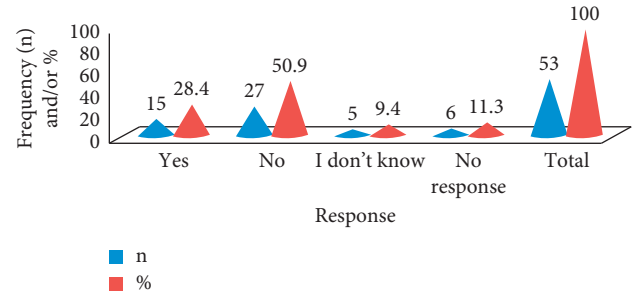

Figure 7: Response to the importance of wild animals' survival in the study area.

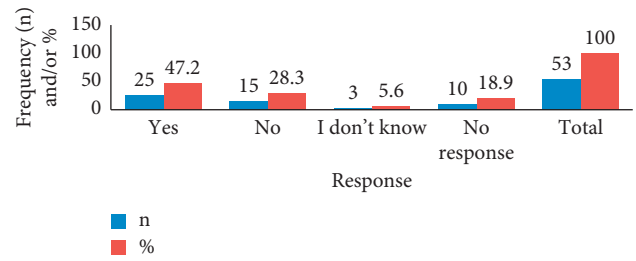

Figure 8: Response of killing of all wild animals to solve the conflict problem.

survival of wild animals in the study area (Figure 7). There was a statistically significant mean response difference among respondents concerning the importance of the survival of conflicting wild animals in the area (F (3, 50) = 2.899, p = 0.045). This implies the respondents had differences in their support of the importance of wild animals in the area. Many of them did not support the survival of wild animals.

Killing all conflicting wild animals was considered a solution to solve the conflict problem by many of the respondents (47.2%), whereas 5.6% of the study participants replied that they did not know whether killing was a solution or not (Figure 8). There was no statistically significant mean response difference among study participants (F (3, 50) = 1.308, p = 0.283) regarding whether killing all conflicting wild animals should be considered as a solution to solve the problem. This implies that many of the study participants agreed that all conflicting wild animals should be killed to avoid the conflict problem. This means that they did not have a positive concern for the conflicting wild animals, and they consider the animals as pests due to the negative conflict consequences they were encountering.

Among the respondents, 60.4% considered that wild animals should be conserved using an appropriate method, while 18.9% of respondents replied that wild animals should not be conserved using appropriate methods (Table 12). There was a statistically significant mean response difference among respondents (F (3, 50) = 7.856, p < 0.001) regarding conserving wild animals using appropriate methods.

This result implies that the respondents concerned with wild animal conservation in the study area were influenced by the conflict impact they were facing. As a result, their support for the survival of wild animals was negative, and even they considered killing all conflicting wild animals as a solution to mitigate the problem. This means that the extent of the problem is high and needs attention. Furthermore, awareness of the issue of conflict management and wild animals' importance was relevant for the community in the study area. However, the community seems to support the conservation of wild animals in appropriate ways in general. Over the past decades, biodiversity conservation has received increasing attention, and protected area coverage has

Table 12: Study response to conserving wild animals using appropriate methods.

Response options	Study participant responses to conserving wild animals using appropriate methods	
	N (total)	Percentage (%)
1. Yes	32	60.4
2. No	10	18.9
3. I do not know	11	20.7
Total	53	100

increased [46], but global biodiversity continues to decline [47]. Conflict between wildlife and humans costs many lives, both human and wildlife, threatens livelihoods, and jeopardizes long-term conservation goals such as securing protected areas and building constituencies in support of biodiversity conservation [6]. Species involved in conflict are more prone to extinction [12] and create a basis for resentment due to undermined welfare of the people through crop damage and livestock predation. If serious solutions to conflicts are not adequate, local support for conservation also declines [48]. Habitat destruction is forcing animals to move through human settlements [48], and habitat loss is one of the greatest obstacles to biodiversity conservation in the tropics.

Concerning the benefits of forest conservation to the respondents, the majority of respondents (96.2%) explained that the forest in the study area was important, while 3.8% replied that they did not know whether the forest was important or not. However, 90.6% of the respondents explained that the forest should be conserved. There was no

statistically significant mean response difference among the respondents (F (3, 50) = 0.171, p = 0.915) regarding the importance of conserving forest in the study area. The importance of forest conservation was related to the benefits of forest to the communities ($\chi^2_{(2)} = 78.151$, $p < 0.001$). Moreover, there was no statistically significant mean response difference among respondents (F (3, 50) = 1.721, p = 0.176) concerning forest conservation activities. This implies that they had a similar view of conserving the forest, and this might be related to the benefits they were obtaining from forests.

In this study, most of the respondents (64.2%) believed that they obtain soil conservation benefits from the forest. This was followed by suitable climate and environment benefits (56.6%), whereas 3.8% of the respondents explained that they got water resources (Table 13).

The response of the respondents implied that the community in the study area had adequate know-how on forest importance and the need to conserve forest. This might be related to the benefits they were obtaining from the forest in the area. This could be used as a good base for further conservation work on forest and natural resources, and thus, it contributes to wild animals' conservation. Formal efforts to involve local communities in natural resource management and promote community-based natural resource management and related approaches in East Africa have been diverse and have included wildlife, forestry, marine, and lake fisheries [49]. East Africa is also characterized by the persistence of long-term community-based resource management systems used by resident communities, such as pastoralists in the Rift Valley of southern Ethiopia [50]. As explained in [6], wildlife-human conflicts are a serious obstacle to wildlife conservation and the livelihoods of people worldwide and are becoming more prevalent as human population increases, development expands, and global climate change and other human and environmental factors put people and wildlife in greater direct competition for a shrinking resource base.

In relation to attitudes of community toward wild animals, even though 47.2% of the respondents considered the importance of the coexistence of humans and wild animals in the study area, 39.7% of the respondents did not consider the importance of coexistence of human and wild animals (Table 14). There was a statistically significant relation between supporting the importance of coexistence of humans and wild animals and conflict in the study area ($\chi^2_{(3)} = 29.340$, $p < 0.001$), but there was no statistically significant mean response difference (F (3, 50) = 0.605, p = 0.615) among respondents in supporting coexistence of humans and wild animals in the study area.

Many of the respondents (41.5%) had a negative attitude toward wild animals, while 9.4% had neither positive nor negative attitudes toward wild animals (Figure 9). There was a statistically significant relation between attitude of respondents and the conflict in the study area ($\chi^2_{(3)} = 16.057$, $p < 0.001$). However, there was no statistically significant mean response difference among respondents concerning their attitude toward wild animals (F (3, 50) = 1.942, p = 0.136). This study result was in agreement with the study

Table 13: Benefits of the forest to study participants.

Benefit types gained from forest	Study participants' response	
	N (total)	Percentage (%)
1. Soil conservation	34	64.2
2. Suitable climate and environment	30	56.6
3. Rainfall	22	41.5
4. Firewood collection	10	18.9
5. House construction	4	7.5
6. Food income	7	13.2
7. Water resource	2	3.8
8. Shading	4	7.5
9. Aesthetic value	7	13.2
10. Future tourism	9	17
11. Timber production	4	7.5
12. Habitat for wild animals	10	18.9
13. Medicine	4	7.5
14. Keeping domestic animal	4	7.5

Table 14: Response to importance of coexistence of human and wild animals.

Response options	Study participants' response to importance of coexistence of human and wild animals (HWC)	
	Number (total)	Percentage (%)
1. Yes	25	47.2
2. No	21	39.7
3. I do not know	4	7.5
4. No response	3	5.6
Total	53	100

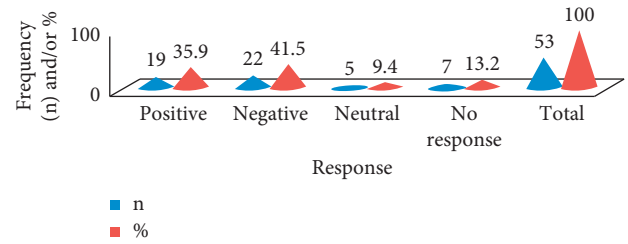

Figure 9: Attitude of study participants toward wild animals.

results of [51], in which 62% of the respondents had a negative attitude to wild animals. The current study result was in contradiction with the study results of [27] in Midre-Kebid Abo Monastry, Gurage Zone, Ethiopia, in which 64.4% of the respondents had a positive attitude about wildlife, that they thought wildlife conservation is important. The difference might be related to the study area, sample size, and extent of conflict impact in the study area.

In this study, 58.5% of respondents explained that they encourage conservation activities on wild animals, whereas 30.2% did not encourage conservation activities. Moreover, 11.3% of the study participants did not give any response to this issue. There was a statistically significant relation between encouraging conservation activities on wild animals and conflict situations ($\chi^2_{(2)} = 17.925$, $p < 0.001$), but there was no statistically significant mean response difference

between respondents ($F(3, 50) = 0.202$, $p = 0.894$) regarding encouraging conservation activities of wild animals.

The finding concerning attitude implied that even though there was support for the importance of coexistence of humans and wild animals, there could be a lot of work to be done to have adequate attitudinal support on the issue. Moreover, many of the respondents had a negative attitude toward wild animals. This might be related to the various impacts they were encountering in the study area. However, a better proportion of the study participants encouraged conservation activities on wild animals. This implies that if more work on awareness and other coexistence methods as well as the value of wild animals is offered, there will be a better change for the community. The conflict between people and wildlife is one of the main threats to the continued survival of many species in different parts of the world and is also a significant threat to local human populations. If serious solutions to conflicts are not adequate, local support for conservation also declines.

4. Conclusions and Recommendations

Human-wild animal conflict exists, and it was becoming serious from time to time occurring in various places, time, and seasons in Amba forest/in the study area. Conflict occurs mostly around home and garden areas, followed by on farmland. The most conflict season was December to February. *Anubis baboon*, *Potamochoerus larvatus, Chlorocebus aethiops*, and *Hystrix cristata* were the most conflicting wild animal, respectively. Abundance of wild animals, presence of forest in the area, crop raiding, expansion of agriculture, and livestock predation were the main causes of HWC in the study area. *Ensete ventricosum* and *Solanum tuberosum* were the first and second major crops grown and damaged by wild animals. Wild animals damage various stages and parts of crops. Psychological impact and economic impacts were the main impacts encountered. Most of the respondents had applied wild animal and human conflict mitigation strategies, but many considered that it was not effective, and the conflict situation was becoming serious from time to time. The trends of the conflict were increasing. Many of the respondents replied that the survival of wild animals was not important in the study area, but almost all respondents explained that the forest in the study area was important and, thus, forest should be conserved. Forest gives them various benefits like soil conservation and suitable climate and environment benefits. About 40% of the respondents did not consider the importance of the coexistence of humans and wild animals, and many of the respondents (41.5%) had a negative attitude toward wild animals, but generally, 58.5% encourage conservation activities on wild animals. This study result showed that HWC was serious and became intensified from time to time with increasing trends of conflict affecting the communities in the study area; thus, a negative attitude was developed by many of the communities on wild animal coexistence and conservation. Thus, attention is relevant to successfully promoting the coexistence of conservation activities in the area. As a recommendation, awareness creation training and ways of promoting coexistence between human and wild animals are necessary in the study area to achieve conservation activities successfully.

Data Availability

The datasets generated and analyzed during the current study are included in the manuscript.

Ethical Approval

The ethical approvals were approved by Wolkite University, Ezha District Administrative Office, Ezha District Agricultural Office, and Ezha District Wildlife and Ecotourism Offices prior to data collection.

Consent

Written consent was gained from the respective kebeles administrators and respondents for making discussions on the objectives of the study before actual data collection processes.

Conflicts of Interest

The authors have declared that there are no conflicts of interest between them.

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