International Journal of Research in Agriculture, Biology & Environment (IJAGRI)

E-ISSN : 2582-6107

DOI: 10.47504/IJAGRI.2024.5.2

Volume 5(2) 2024
July-Sep -2024

Assessments of Conflicts Over Natural Resource Use and Their Handling in Babile Elephant Sanctuary, Eastern Ethiopia

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ABSTRACT

The focus of this study aims to assess the conflicts over natural resource uses and its management in Babile Elephant Sanctuary, Eastern Ethiopia. A simple random sampling method was used to gather data from sampled households. A total of 152 households were selected from three Peasant Associations (Erer Ebada, Agdora, and Dendema) of three districts (Babile, Fedis, and Babile Dendema) due to their proximity and the intensity of resource utilization in the sanctuary. A questionnaire survey, key informant interview, focus group discussion, field observation, and secondary data sources were used to generate the required data. Both qualitative and quantitative analysis approaches were employed to analyze the data. The result showed that, except for wildlife risk on humans and public participation in the sanctuary's management, all other factors were statistically significant at (P<0.050). From the overall respondents, about 44.1%, 42.1%, and 40.1% of the respondents replied lack of resources; poverty, and drought respectively were the driving factors. Among the respondents in each kebeles 79.5%, 58.3%, and 5.6% of the residents in Dendema, Agidora, and Erer Ebada kebeles respectively replied demographic change as a cause. The residents' reliance on the resource varies. For example, 55.9%, 52.6%, and 46.7% of the respondents depended on grazing land, water resources, and farming, respectively, and conflicted with the sanctuary. Based on research results, the following inference is drawn; the current resource use conflict can be mitigated through boundary re-demarcation of the sanctuary and creation of alternative means of community livelihoods in collaboration with the concerned stakeholders along with law enforcement and community engagements.

Key Words: Babile Elephant Sanctuary, Ethiopia, Management of Natural resources, Use conflict.

1. INTRODUCTION

1.1. Background and Justification

Natural resources conflict deals with the use of wildlife, forests, land, and other natural resources in most societies and exists extreme pressure on the resources (Wassie Simachew, 2020). This conflict may emerge over ownership claims, legal entitlements to use, legitimate decision-making, and distribution of resource revenues and other distribution of benefits and burdens (Gümplová, 2021). Poverty, climate change, population pressure, governance of land resources, competition over scarce resources, and awareness creation are the drivers of the conflict (Bergius *et al*., 2020; Muok *et al*., 2021). Natural resource use conflict has an adverse impact and leads to land and environmental degradation and loss of biodiversity. Hence, managing conflict for sustainable management is mandatory. Communities use different ways of resolving the resource use conflict. However, effective prevention and management of conflict require the skills of policymakers and tools to solve the problems (Zahoor *et al*., 2022). Across Africa, national conservation policies have limited the local use of Protected Areas, which triggered local grievances and ultimately constrained the development, conservation, and achievement of the conservation goals (Tranter *et al*., 2022). The interest of local people in the resource use in Protected Areas does not match with that of the Protected

Areas managers. The difference in interest in natural resource use creates conflicts. For instance, the exclusion of the communities from the protected areas using trained rangers might causes displeasure. Hence, the community's illegal activities rather minimized through conservation education programs by providing training for them (Mkonyi, 2021). Like other countries, Ethiopia has established more than 74 protected areas, which comprise national parks, wildlife sanctuaries, wildlife reserves, Biosphere reserves, community conservation, and controlled hunting areas (Rabira *et al*., 2015). In most of the protected areas, conflict over resource use is common. Babile Elephant Sanctuary (BES) is administered by the Ethiopian Wildlife Conservation Authority (EWCA). The sanctuary was mainly established to protect the only known ecologically distinct isolated Elephant population of the subspecies *Loxodonta africana Orleans* (Uttama and Sintayehu, cited in Taye Lemma *et al*., 2023). Although this unique mammal species needs special conservation, its range has declined due to agricultural, grazing, and settlement encroachments. As a result, elephants' home range has shrunk by 65.5% since 1976 (Yirmed Demeke, 2006). However, considering the size, BES is still the largest sanctuary in Ethiopia with a total area of 6982 km^2. This study was conducted since there has been little information is available on the resource use conflicts. Thus, this study was important to examine and propose appropriate measures to the resource use conflict and its management.

2. MATERIALS AND METHODS

2.1. Description of the Study Area

Babile Elephant Sanctuary (BES) is located in the eastern part of the country, about 560 km from Addis Ababa, a capital city between Oromia and Somali Regional States (Figure 1). It is situated between latitudes $8^0$22'30"-9^0 00'30" N and longitudes 42º01'10"- 43º05'50"E (Figure 1). The topographic elevations also range between 850 and 1,785 m.a.s.l (Yirmed Demeke, cited in Taye Lemma *et al.,* 2023). The agro-climate zone of BES encompasses two main categories (i.e., Kola- characteristic arid climate and weyna dega-characteristic middle altitude climate). The sanctuary has an average yearly temperature of 15.89 ^oC, with maximum and minimum temperatures of 24.02 ^oC and 7.76 ^oC, respectively (Taye Lemma *et al*., 2023). The mean monthly maximum and minimum temperatures are 31.38 ^oC and 2.75 ^oC, respectively (Taye Lemma *et al*., 2023). The hottest months are between February and May, while the coldest are from October to January (Taye Lemma *et al.,* 2023). The sanctuary has two wet seasons, with a total yearly distribution of rainfall ranging from March to May (short rain season) and June to October (long rain season). The mean monthly rainfall is 45.53mm, with significant fluctuations ranging from 60.32 mm to 734.51 mm/yr on an average of 397.41 mm (Source: NMSA data from 2000 to 2022; Cited in Taye Lemma *et al*., 2023). The BES is a semi-arid region with a rich biodiversity, including a variety of crops, animals, and plants (Tadele Mirkena *et al*., 2018). In the area, various types of crops were produced by rain-fed agriculture and irrigation (in some places). For instance, the plant species (*Catha edulis*) was locally named"Chat" and local fattening of oxen was popular and used as a major income in the study areas (Taye Lemma and Girma Mengesha, 2021). The sanctuary is home to several species of mammals, snakes, lizards, and other smaller animals and invertebrates (Yirmed Demeke *et al*., Cited in Taye Lemma *et al*., 2023). Birds are more common than other animal species, with about 191 bird species identified (Mihret Ewnetu *et al*., 2006). In general, the semi-arid environment of Eastern Ethiopia supports a high diversity of wildlife species, including mammals, birds, and reptiles.

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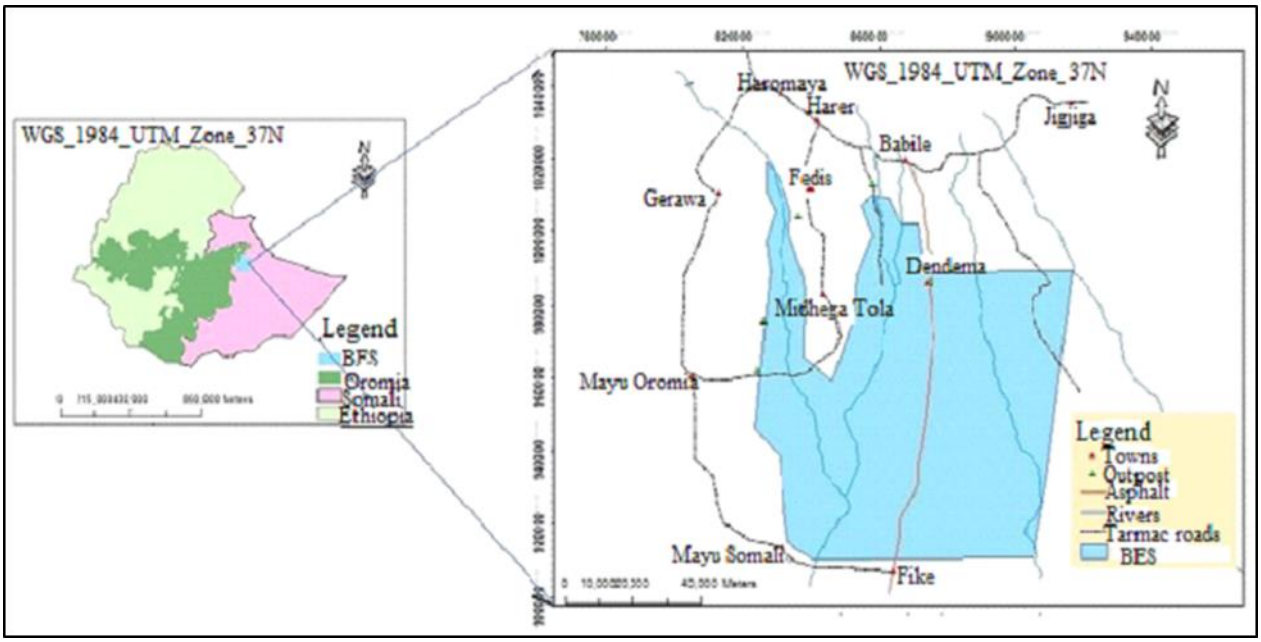

Figure 1. Map of Babile Elephant Sanctuary

2.2. Methods

2.2.1.Sampling Design and Households Size Determination

The study involved reconnaissance surveys, discussions with local experts, and field observation to identify the natural resource use conflict and its handling in the study area. The conducted surveys included questionnaires and face-to-face interviews. Respondents were selected based on a random sampling technique. The survey included interviews, participant observations, and the use of archive data to understand the natural resource use conflict and its handling. Three districts (Babile-Oromia, Fedis, and Babile-Somale district) were chosen based on proximity to the sanctuary. From these three districts, 3 "Kebeles" (divisions within a district) were selected based on prevalent occurrences of conflict incidents (e.g., Human Elephant Conflict-HEC). Key Informants (KIs), Focus Group Discussants (FGDs), and Households (HHs) were chosen from the "Kebeles" near the sanctuary. Five Key informants (KIs) in each Peasant Association (PeA) were selected to provide reliable sources of information, including professionals, community leaders, local government officials, or others with first-hand experience of the community. They were also selected based on their participation in their "kebeles" leadership during different seasons and their knowledge of the people in their corresponding sites. The Key informants helped classify farmers into socio-economic status, using criteria such as land owners, the number of cattle, annual crop production amount, and type/standard of housing. The gathered information focused on the natural resource use conflict and its handling in 3 PeAs. 18 Focus Group Discussants were selected from three districts, each consisting of 6 individuals. Data collection methods included field visits, interviews, and questionnaires. Primary data was collected through field visits, interviews, and questionnaires, while secondary data was from archive data and the BES of Wildlife Office. Purposive sampling was employed to select representative districts and PeAs to obtain targeted information on the number of households (HHs), land use issues, and security. Based on this, three districts and three kebeles were selected, one kebele from each district. Hence, Ererebada PeA from Babile district (Oromia Region), Agidora PeA from Fedis district, and Dendema PeA from Babile Dendema district (Somali Region) were selected. The total population of each PeA is taken from the Federal Democcratic Republic of Ethiopia/Central Statistical Service data focusing on human population numbers (CSS, 2021). The population was 8,851, 6856, and 7853 in Ererebada, Agidora, and Dandama, respectively. The total household size in each PeA is determined using the formula developed by

DOI: 10.47504/IJAGRI.2024.5.2

(Kothari, 2004). According to the formula, the calculated number of sampled households was 72, 36, and 44 in Ererebada, Agidora, and Dandama, respectively.

$$n = \frac{Z^2pqN}{e^2(N-1)+ Z^2pq}$$

Where;
N = the total no. of households in the three kebeles
n= the sample size;
p = 0.1(proportion of the population to be included in the sample, i.e.10%)
q = non-occurrence of event which is equal to (1- 0.1), i.e. 0.9
e= Margin of error / sampling error, which is considered as 95% or 5%
z =the value that specifies the level of confidence at 0.05 is 1.96

Based on the calculated result, the total sample size was 152HHs. Among these: 72HHs were from Ererebada, 36HHs from Agidora, and 44HHs from Dendema PeAs were selected and calculated based on their proportion of the total HHs the PeAs have.

3. DATA ANALYSIS

Descriptive and quantitative statistics examined the natural resource use conflict and its management. A questionnaire survey was gathered on communities' perceptions of managing the conflict, driving forces for resource use conflict, community conflict, community interest in resource uses, and perceptions of wildlife laws and sanctuary boundaries. Comprehensive data based on people's views and attitudes was summarized and evaluated using descriptive statistics. R software version 23 was used to determine or analyze the data on the frequency of reported natural resource use conflicts and their management in the BES. Results were also analyzed using tables, charts, and pictures.

4. RESULT AND DISCUSSION

4.1. Community Awareness and Resources Dependency

There was a significant difference between the respondents of the study area in their awareness about the sanctuary ($p < 0.05$). 100% of the respondents in both Dendema and Agidora and 91.7% Erer ebada PeAs have the knowledge of boundary of the sanctuary. Whereas, 89(58.6%) HHs did not understand the wildlife laws (Table 1a). The result indicated that the respondents had high interest of utilizing the sanctuary resources ($p < 0.050$) in each PeAs. Among the total respondents 108 (71.1%) of the households have an interest to get sustainable income from the sanctuary. On the other hand, from the total respondents 53(35%) and 11(7.2%) were interested in getting pasture land for their livestock and exploiting forest resources for different purposes respectively (Table 1b).

Table 1a. Perception of the Community Regarding the Sanctuary Boundary and Wildlife Laws

Variables		Number of Households in each Peasant Association				p-value
		Dendema (44HHs)	Agidora (36HHs)	Erer ebada (72HHs)	Total HHs (152HHs)	
Sanctuary boundary knowledge	Yes	44(100.0%)a	36(100.0%)[ab]	66 (91.7%)b	146(96.0%)	0.031
	No	0(0.0%)a	0(0.0%)[ab]	6(8.3%) b	6(3.9%)	
Knowledge of the wildlife laws and regulation	Yes	19(43.2%)	16(44.4%)	28(38.9%)	63(41.4%)	
	No	25(56.8%)	20(55.6%)	44(61.1%)	89(58.6%)	0.826

DOI: 10.47504/IJAGRI.2024.5.2

Note: The numbers of HHs (frequency) and its percentage (%) were desiginated in the outside and inside parenthesis, respectively; Different superscripts letter denote in PeAs categories indicate significant difference between each other.

Table 1b. Communities' Interest in the Resource use and Management

Variables	Number of Households in each Peasant Association				p-value
	Dendema	Agidora	Erer ebada	Total HHs	
Sustainable income	38(86.4%)a	36(100.0%)b	34(47.2%)c	108(71.1%)	0.000
Getting grazing land	24(54.5%)	14(39%)	15(20.8%)	53(35%)	0.010
Extraction of forest	2(4.5%)	0(0.0%)	9(12.5%)	11(7.2%)	0.013
Protecting wildlife	43(97.7%)a	33(91.7%)a	24(33.3%)b	100(65.8%)	0.000
Participate in management practice	17(38.6)a	28(77.8)b	12(16.7)c	57(37.5)	0.000
Sharing the benefit	14(31.8)ab	13(36.1)b	12(16.7)a	39(25.7)	.050

The result revealed that a lack of community awareness concerning the rules and regulations of sanctuary conservation was observed (Table 1a). Similarly, Mogomotsi *et al*.(2020) and Gulte *et al.* (2023) were reported that, a lack of understanding of conservation issues and involvement of the local community in the decision-making processes might be significant determinants of negative attitudes towards protected areas. The communities in and around the sanctuary are dependent on the resources for grazing, water, farming, fuel wood collections, settlements, and associated livelihoods (Table 1b). In contrast, the sanctuary has been working towards protecting the wildlife and their natural habitat. The interest in the resource use by the community and protection for nature conservation caused serious conflict that has intensified over time, the conflict required integrated and community conservation strategies that could benefit both the wildlife and the locals. Local people's engagement in protected areas has contributed to resource use as the management process. Similarly findings by Dawson *et al*.(2023) indicated that, local people increase their participation in council meetings,design and management, and also has to access benefeit to local resources. Generally, Local people mainstream the role, not simply participation, and use it as a major contribution to varied material resource use (Dawson *et al*., 2023).

4.2.Causes of resource use conflict between Communities and the Sanctuary

The result in the Table 2 showed that there was no significant difference (at $p > 0.05$) occurred between causes of conflicts in wildlife risks and lack of community participation on the conservation works in the sanctuary in each PeAs. Whereas, the results showed that restricted resources use access and illegal harvest of forest products under competition of natural resources indicated a significant differences among Peasant Associations (PeAs).

DOI: 10.47504/IJAGRI.2024.5.2

Table 2. Causes of resource use conflict between community and BES

S/N	Variables (Causes of conflicts)	Number of Households in each Peasant Association				
		Dendema (44HHs)	Agidora (36HHs)	Erer Ebada (72HHs)	Total (152HHs)	P-Value
1	Restricted resource use	24(54.5%)a	31(86.1%)b	14(19.4%)c	69(45.4%)	0.000
2	Wildlife risks	2(4.5%)	0(0.0%)	3(4.2%)	5(3.3%)	0.446
3	Lack of benefits	4(9.1%)a	1(2.8%)a	31(43.1)%b	36(23.7%)	0.000
4	Lack of participation	12(27.3%)	9(25.0%)	14(19.%4)	35(23.0%)	0.592
5	Competition over natural l resources	39(88.6%)a	33(91.7) %a	27(37.5%)b	99(65.1%)	0.000
6	lack of awareness	20(45.5%)a	8(22.2%)b	11(15.3%)b	39(25.7%)	0.001
7	Poaching	13(29.5%)a	11(30.6%)a	5(6.9%)b	29(19.1%)	0.001

The result indicated that limited resources, lack of benefit and participation, poaching, and lack of awareness were the causes of resource use conflicts between communities and the sanctuary (Table 2). Similarly, findings by Mekonen (2020) showed that human-wildlife conflicts in Ethiopian protected areas were prevalent, and local communities that do not earn enough benefit from wildlife resources might increase the cause of resource use. Therefore, prioritizing the causes of the resource used in conflict in the sanctuary is used to allocating the financial resources for handling the situation. Similarly, Mandić (2023) reported that understanding conservation conflicts in resource use and local biodiversity threats is used for the effective allocation of financial resources for protected areas and communities to handle the conflict.

4.3.The major driving forces for resource use conflict

As shown in the Figure 2 below, drought, population pressure, poverty and scarcity of resource are among the most driving factors. From the total households, the most top driving forces of resources use conflict in the sanctuary were scarcity of resources (44.1%) followed by poverty (42.1%) (Figure 2).

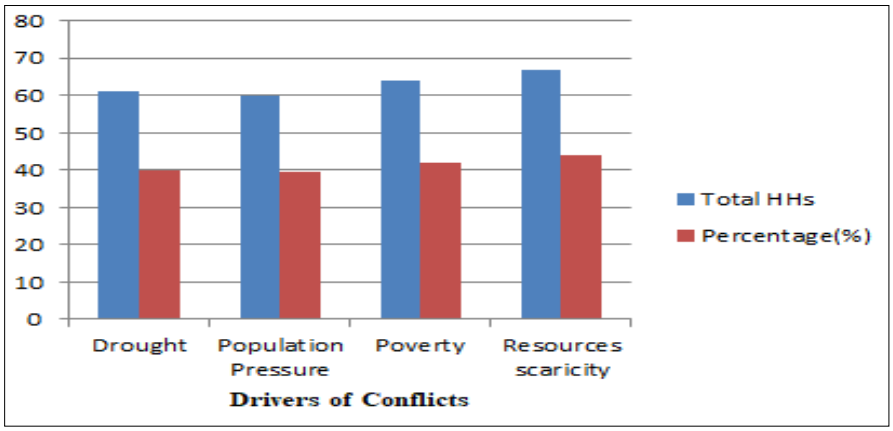

Figure 2. Major drivers forces for conflicting the BES Resources

DOI: 10.47504/IJAGRI.2024.5.2

The result revealed that the human population increase in and around BES intensified the expansion of human activity and encroachment. In developing countries, in general, there is an ever-increasing exploitation of resources resulting from the rapidly expanding human population (Wang and Azam, 2024). The findings of this study provided evidence and supplementary information on the drivers of the resource use conflict between the sanctuary and the community. As shown in (Figure 2), poverty (food insecurity, economic problems & famine), recurrent drought, human population pressure, and scarcity of resources (land, water, forest) were identified as causes (driving forces) of resource use conflicts between the local community and the sanctuary. Population growth has a double effect, simultaneously expanding the population and reducing the supply of resources such as land, water, and forest. Poor people often destroy their environment to survive, not because they are ignorant but because it directly or indirectly influences the quality (Ogbewe and Ayodele, 2023). Likewise, the result revealed that the majority of the communities around the Babile Elephant sanctuary are living under poor and medium wealth status leading to dependency on available limited resources and over-exploitation.

4.4. Management Problems in the sanctuary

Regarding the management problems of the sanctuary, 7.2% of the respondents replied less responsiveness given to the sanctuary and to the community, the other (7.2%) of the respondents replied there was weak law enforcement, and 17 (11.2%) of respondents replied there was less concern of the community to the sanctuary, 8.6% replied lack of awareness. While, a few respondents (1.3%) with no significance difference ($p>0.05$) replied human encroachment (farming and expansion of settlement) in the sanctuary, 3.3% of the respondents replied the Sanctuary is highly impacted due to poor/weak law enforcement however, 7.9% of the respondents didn't know the problems (Table 3).

Table 3. Respondents perceptions on problems of management practices in BES

S/N	Variables (different attributes)	Number of Households in each Peasant Association				p-value
		Dendema	Agidora	Erer ebada	Total HHs	
1	Less attention linkage	9(20.5%)a	0(0.0%)b	2(2.8%)b	11(7.2%)	0.000
2	Weak law enforcement	7(15.9%)a	4(11.1%)a	0(0.0%)b	11(7.2%)	0.015
3	Less community concern	11(25.0%)a	3(8.3%)ab	3(4.2%)b	17(11.2%)	0.002
4	weak protection to BES	1(2.3%)	0(0.0%)	4(5.6%)	5(3.3%)	0.282
5	Farming/settlement in BES	0(0.0%)	0(0.0%)	2(2.8%)	2(1.3%)	0.324
6	Poor coordination	3(6.8%)	4(11.1%)	2(2.8%)	9(5.9%)	0.214
7	Lack of Awareness	11(25.0%)a	1(2.8%)b	1(1.4%)b	13(8.6%)	0.000
8	Don't have the knowledge	7(15.9%)a	5(13.9%)a	0(0.0%)b	12(7.9%)	0.003

This study revealed different views of local people regarding management problems occurring in the sanctuary. Insufficient government support, weak law enforcement, less concern for the local community, expansion of cultivation, poor coordination, and lack of awareness were the identified management problems (Table 3). Furthermore, there needs to be more resources and budget allocations, lack of infrastructure development (road, water, outposts, power, etc.), expansion of settlement, and poaching are the main challenges of the sanctuary. The growing number of the community increases resource scarcity and degradations further increasing demand for land in the district for food production. This impacted the protected area (BES), threatened sanctuary management in general, and aggravated encroachment into the elephant home range in particular. The management approach with the limited capacity of the sanctuary that does not consider the needs and interests of the local communities living inside and around the sanctuary

DOI: 10.47504/IJAGRI.2024.5.2

might increase conflict. Thus conflict becomes imminent thereby undermining the protection and management of the protected area. Similarly, Job *et al*. (2020) reported that Protected Areas (PAs) and their ability to simultaneously deliver conservation and explicitly consider the well-being of the local community and communication between different interest groups are used to manage the natural resources in the PAs. Due to the management problems of the sanctuary, the prevalence of illegal activities (livestock encroachment, expansion of cultivation and settlements, deforestation, etc.), and human-elephant conflict were increased, and their habitat was also encroached on by farming. Moreover, this was accompanied by a lack of compensation for losses from conflict. Illegal farming and elephant killing are also recognized in Gobele and Erer valleys, in BES core habitats for African elephants. For instance, Taye Lemma and Girma Mengesha (2021) were reported that within five years in BES (b/n 2016-2020), about 19 elephants, 24 livestock, and 22 local peoples have died due to Human Elephant Conflict (HEC). Besides, elephants damaged various irrigation materials, food stores, and crop-raiding was reported (Taye Lemma and Girma Mengesha, 2021). Generally, in BES, poaching for ivory and human-elephant conflict over critical habitats are the most noticeable anthropogenic challenges of the sanctuary contributing to the decline of the elephant population.

4.5. Communities Perception's to Manage the Conflict

Based on the results obtained from the respondents as shown below (Table 5), Community participation, Stakeholders attention and Strong law enforcement were the most suggested to solve the conflicts in the sanctuary. However, the results for re-demarcation, sharing the benefit from the sanctuary and making a fence on boundary line were not significantly different in each PeAs as being viewed problem solving for resource use conflicts in the Babile Elephant Sanctuary (Table 5).

Table 5. Perception's of Communities' to Manage Conflict in the Sanctuary (BES)

S/N	Communitie Perception's (Variables)	Number of Households in each Peasant Association				p-value
		Dendema PeAs	Agidora PeAs	Erer ebada PeAs	Total HHs	
1	Community participation	25(56.8%)^{a}	19(52.8%)^{ab}	25(34.7%)^{b}	69(45.4%)	0.040
2	Stakeholders attention	25(56.8%)^{a}	17(47.2%)^{a}	2(2.8%)^{b}	44(28.9%)	0.000
3	Water for the community	2(4.5%)	0(0.0%)	0(0.0%)	2(1.3%)	0.083
4	Strong law enforcement	16(36.4%)^{a}	14(38.9%)^{a}	10(13.9%)^{b}	40(26.3%)	0.004
5	Stop deforestation	4(9.1%)^{a}	12(33.3%)^{b}	5(6.9%) ^{a}	21(13.8%)	0.001
6	Free from settlement	2(4.5%)^{a}	5(13.9%)^{a}	24(33.3%)^{b}	31(20.4%)	0.001
7	Budget for rehabilitation	5(11.4%)^{a}	1(2.8%)^{ab}	0(0.0%) ^{b}	6(3.9%)	0.009
8	Re-demarcation	0(0.0%)	0(0.0%)	2(2.8%)	2(1.3%)	0.324
9	Making a fence	0(0.0%)	0(0.0%)	3(4.2%)	3(2.0%)	0.183
10	Sharing the benefit	0(0.0%)	0(0.0%)	2(2.8%)	2(1.3%)	0.324

The result revealed that communities' perceptions regarding conservation are different. Low stakeholder involvement & sharing benefits, deforestation, settlement, and low conservation budget from the government and less partners involvement made the conservation activities difficult to manage the resource conflict in the sanctuary (Table 5). Similarly, Abukari & Mwalyosi (2020) reported that managing governance issues and land scarcity issues might trigger the resentment of the nearby local communities and the sanctuary governance of the protected area. However, some residents who know the rules and regulations governing the sanctuary were likely to perceive the sanctuary as supportive of their livelihoods

DOI: 10.47504/IJAGRI.2024.5.2

and community development. Therefore, rules may protect the interest of residents to enhance their livelihoods and develop their communities. Hence, collaborative sanctuary governance is used to represent the local people in governance decisions (Eklund and Kabeza, 2017) and as a result, the resource conflict between the local peoples and the sanctuary might reduce.

5. CONCLUSION

This study revealed that conflicts over the use of natural resources (Forest, land, water) are commonly observed phenomena in the Babile Elephant Sanctuary and this has been a serious challenge that negatively influenced the integrity of the sanctuary. The existing threats and associated challenges are broadly linked to limited institutional capacity, poverty, population growth, lack of alternative livelihoods, unsustainable resource use and lack of ineffective management of the sanctuary. Hence, it can be concluded that improving the institutional capacity, Creating alternative livelihood opportunities, Strengthen law enforcement, Establishing collaborative mechanisms among all stakeholders, Strengthen relationships between the Sanctuary and the community, and re-demarcation are necessary to reduce the over utilization of the resources and to maintain sustainability by managing the available resources.

ACKNOWLEDGEMENT

We would like to thank, the Eastern Harerge Zone districts and Peasant Associations offices of study areas for their valuable assistance in managing the focus group discussants. Besides, we thank the key informants, the focus group discussants, and individuals who assisted during data collection. Our special thanks also go to the staff and scouts of BES supported during data collection. Finally, we thank Sileshi Degefa (Ph.D) and Fanueal Kebede(Ph.D) for supporting this study.

DECLARATION

Abbreviations:BES-**Babile Elephant Sanctuary**, CSS-**Centeral Statistical Service,** FDRE- Federal Democratic Republic of Ethiopia, Households-**HHs**, HEC-Human Elephant Conflict, FGD-**Focous Group Discussion**, NMSA-**National Metrological Service Agency,** PeA-**Peasant Association,** PeAs-**Peasant Associations**, EWCA-**Ethiopian Wildlife Conservation Authorithy.** KI's-**Key Informant's.**

Competing interests: The Authors declares that they have no competing interests

Ethics approval and consent to participate: Not applicable

Consent for publication: Not applicable

Funding: Ethiopia Wildlife Conservation Authority (GEF 6 – UNDP project- under grant number 00103276) and Addis Ababa University for its financial support.

Authors' contribution: Data collection, analysis, preparing the draft paper was contributed by corresponding author while finalizing and approving the whole document was also contributed by co-author/supervisor.

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DOI: 10.47504/IJAGRI.2024.5.2

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DOI: 10.47504/IJAGRI.2024.5.2