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# Human-Wildlife Conflict: The Case of Arjo Dhidhessa Sugar Factory and Its Surrounding, Western Ethiopia

**Girma Gizachew[1]* and Gutema Jira[2]**

[1]Department of Natural Resource Management, Jimma University, Jimma, Ethiopia
[2] Department of Biology, Wollega University, Nekemte, Ethiopia

*E-mail: kennaa20047@gmail.com

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**Abstract**: Human-wildlife conflict (HWC) occurs in various forms throughout the world, with a greater influence in developing countries. This is due to fast increasing human populations and increased subsistence agriculture, which reduces wildlife habitat and increases human-wildlife interactions. Wild animals fight for resources with humans in the Arjo Dhidhesa Sugar Factory in Western Ethiopia, and they are in conflict with each other. As a result, this research was carried out to determine the reasons of HWC, as well as the mammals responsible for them. From August 2017 to March 2018, researchers utilized questioner and interview approaches to examine community perceptions toward wildlife and overall cthe result showed that a total of 99.034 sugarcane stalk damage events were registered in all three sample sites both during the dry and wet seasons. Wildlife consumed 46,468 sugarcane stalks during the rainy season, while 52,566 stalks were consumed during the dry season, with the documented damage event varying greatly from site to site. Hippopotamus, Anubis baboon, Warthog, Bush pig, and Buffalo were the most affected by HWC, with agricultural loss occurring throughout both wet and dry seasons. During the wet season, Hippopotamus 16,133 stalks per ha were the most damaged, followed by Anubis baboon 12,484 stalks per ha. Buffalo 5,083 and Bush pig 3,931 stalk per ha did the least damage, placing fourth and fifth, respectively. During dry seasons, Anubis baboon caused the most sugarcane stalk damage (16, 898 stalks per hectare), followed by hippopotamus (16,533 stalks per ha). During both the wet ($t = 4.08$, $DF = 4$, $P< 0.05$) and dry seasons ($t =3.73$, $DF = 4$, $P< 0.05$), there was a significant difference in the damages caused by mentioned fauna. According to the findings, about 67.9% and 25.2 % of all respondents said that HWC expressed itself in crop destruction and livestock predation, respectively. Habitat damage, agricultural development, a lack of feed, and a rise in the population of wild animals are among the explanations cited by respondents. Some of the key crop raider mitigation strategies revealed in this study that were adopted by the investment community and local communities include hanging dead animal parts, habitat disturbance, keeping animals alive by tying them to the side of field, and mass murdering wildlife. These practices are one of the main causes of the extinction of wildlife, making conservation even more challenging. There are currently many human activities in the field of science, which has resulted in many HWCs. As a result, investment decisions should be made based on strong and viable domain choices both commercial and environmental, as well as promoting natural tourism as a viable option for education and conservation education.

**Keywords:** Crop raiding; Human wildlife conflict; Riverian forest disturbance.

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## INTRODUCTION

Human-wildlife conflicts (HWC) are a widespread occurrence around the world, especially in locations where humans and wild animals have similar needs (Radhakrishna, 2017; Torres *et al*., 2018). The most typical causes of such conflicts are resource rivalry between humans and wildlife, which leads in conflict along the protected area's border. This has significant consequences for human economic, cultural, and environmental well-being, as well as wildlife conservation (Amy and Hazzah, 2016; Seoraj-Pillai & Pillay, 2017). As a result of expanding human populations, loss of natural habitat, and other factors, it is becoming a growing concern that affects human lives, livelihoods, and wildlife existence all over the world (Edet *et al.*, 2019). On the other side, increasing wildlife populations as a result of effective conservation programs has exacerbated conflicts in some areas (Ozkazanc *et al*., 2019; Kilicoglu *et al*., 2021). Furthermore, other factors such as poor land-use planning and flawed development policies (Amaja *et al*., 2016) as well as natural factors such as droughts, bushfires, climatic changes, and other unpredictable natural hazards can contribute to a decrease in suitable habitats and intensify the occurrence and extent of such conflict (Ertugrul *et al*., 2019; Varol *et al*.,2021).

Ethiopia is a large country with a wide variety of biodiversity (Tefera, 2011). Ethiopia has been experiencing significant population growth, investment in forested areas, deforestation, and the pouring of wetlands on farmland, and the use of forest edges in various fields for many years. In addition, its vegetation has been cut down for a variety of reasons, including pressure on natural resources, reducing important wildlife habitats, eliminating migration routes, and increasing the chances of encounters and potential conflicts between wildlife farmers and wildlife (Demeke & Afework, 2013). Crops and fields have reportedly been destroyed by large animals in Ethiopia. Many herbivores and mammals are known to cause serious damage to agricultural crops in various parts of the country (Demeke & Afework, 2013). The factory management has listed a number of large mammals that suffer from plant damage in the Arjo-Dhidhesa Sugar Industry research area. In addition, reports from local people have confirmed that the violence is serious, damaging human health and wildlife conservation activities in the area.

Most of the Dhidhessa region was once covered with forests, but is now shrinking due to increased agriculture and investment in forested areas. This situation disrupted wildlife habitats, forced wildlife to communicate with humans, and created a major conflict between humans and animals. These wild animals can cause great harm to crops. On the other hand, non-scientific measures to control plant invasion can have serious impacts on the wildlife community, especially endangered and endangered species, and can lead to the extinction of wildlife in the area. Over time, this heralds an ecosystem cascade and can have a significant impact on the sustainability of agricultural investment. Despite these wide-ranging economic and environmental impacts of human-wildlife conflict, site-specific could be a practical and acceptable strategy to ensure the sustainability of this agricultural investment. No scientific research has been done to find a solution. Therefore, the purpose of this study is to identify the main triggers for harvest robbery and to identify the animal species most relevant to human wildlife conflicts and the appropriate wildlife conflict resolution strategies in the case of

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Arjo Dhidhesa. It was to identify the relevant economic losses that would be useful Sugar Factory and its surroundings, western Ethiopia.

## METHODS

### 2.1. Description of the study area

Current research has been done in Arjo-Dhidhesa Valley Sugar Estate. The factory is located in Arjo-Dhidessa Valley occurring land areas in East Wollega, Illubabor, Buno Bedele and Jimma Administrative Zones of Oromia National Regional State within geographic boundaries of $8^0$33' to $8^0$42' N latitude and $36^0$21' to $36^0$34' E longitude (Figure.1). The area experiences an average altitude of 1,350 meter above sea level. The rainfall in the Dhidhesa catchment is uni-modal type and mostly the rainfall reaches peak between Junes to September period with virtual dry from November through February. The five wettest months cover 63 percent of the total annual rainfall. The dry season, from November to February (four months) has a total rainfall of about 7% of the mean annual rainfall. In Dhidhesa catchment, an area where a marked rainfall increase with elevation, receives heavier annual quantities than most of the catchments in the Abbay basin. The temperature of the sub basin is 20ºC in December to 25ºC in March (NMA, 2017).

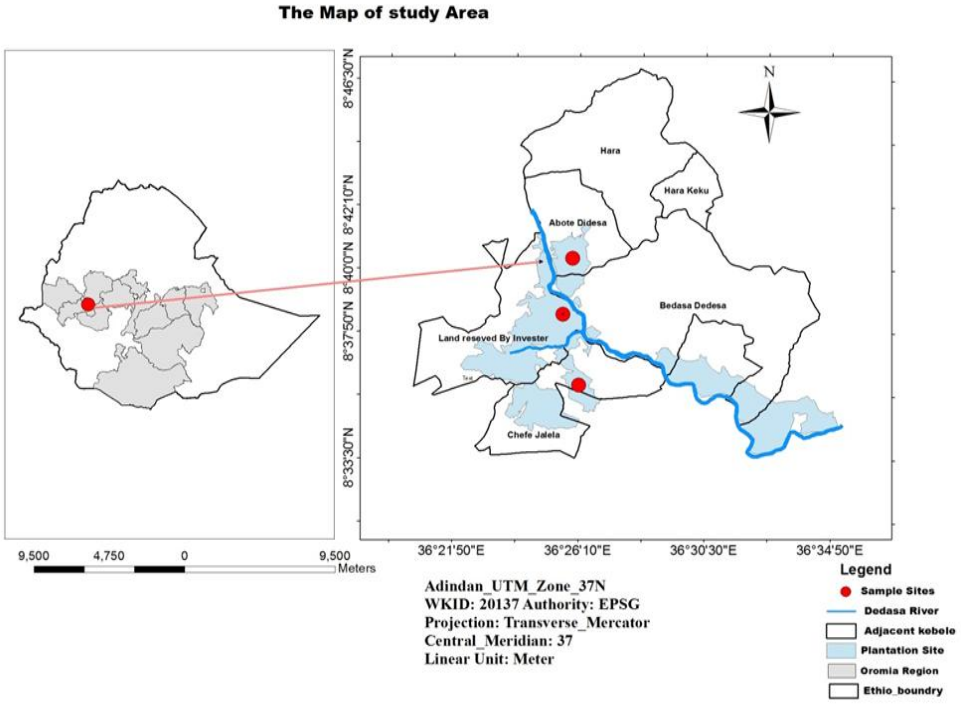


**Figure 1.** Map of the study area

In addition, there is a strip of riverine forest along the banks of Dhidhesa and its tributaries; the forest belt is mostly very narrow extending for not more than 50m from riverbanks. The woodland vegetation mostly consists of broad-leaved deciduous trees with the ground flora dominated by tall grasses (*Hyparrhenia* spp.), growing up to a

height of 3m. The main types of trees in this genus are *Combretum molle, Terminalia brownii, Piliostigma thonningii, Stereospermum kunthianum, Syzygium guineense, Cordia africana and Entada abyssinica.* Other characteristic trees and shrubs include *Acacia* sp., *Ficus* sp., *Fagaropsis angolensis*, *Grewia bicolor*, *Maytenus* sp., *Rhus* sp. (Geremew *et al*., 1998). However, currently the plantation area of the Project is currently about 4,000 hectares which is threatening the existence of Riverian forest biodiversity resources.

### 2.2. Methodology

During the present study, we used field equipment such as digital camera, GPS, field guide book, data sheets, tape recorder and oral interview. Therefore, based on the topography of Arjo Dhidhesa Sugarcane Plantation, three sample areas were randomly selected to assess sugarcane damage and to identify crop raiding mammals. So sample area was covers about 1000 hectares and a total 20 line transects with 1 km in length by 0.5 km width were randomly allocated within the three sample fields to assess sugarcane damage. These transects were walked during every season both in wet and dry season and every plant damaged, types of animals that caused the damage recorded.

In order to obtain the whole number of damaged plants in the collected fields, the number of damaged plants was calculated during transect each time the damage occurred, and then calculated according to the method of (Admassu, 2007). In addition, damaged sugarcane crops per hectare were subdivided into rainy and dry seasons and compared to the actual number of sugarcane stems per hectare. Similarly, the four districts were specially selected based on information collected during the initial study to assess conflicts between human wildlife in the study area. Data collection was done during the dry and rainy seasons. The wet season included August 2017 to September 2017 and dry season study included December 2017 to January 2018. These studies were employ four different sorts of data collection methodologies. In addition to primary data, household interview, focus group discussion, key informant interview, and direct observation. Secondary data from the internet and written papers were used to gather information about the Human wildlife conflicts in the study area.

The Statistical Package for Social Science (SPSS) software version 20 was used to analyze all of the data gathered. The data was coded and interpreted to make SPSS analysis easier. Descriptive statistics were utilized to describe respondents' socioeconomic information, which was a significant determinant element in the perspective and attitude of the local inhabitants in the research region.

## RESULTS AND DISCUSSION

### 3.1 Background of the respondents

During the present study, data of human-wildlife conflict was collected by direct observation of damage in sampled areas and with the use of questioners as well as conducting interviews with appropriate respondents. Accordingly, the analysis of respondent background indicated that about (65.6%) of the respondents were males and (34.4%) were females. Farmers for the administered questionnaire survey were in the maturity age and also they had an experience in agricultural activities and challenged with crop raiding activities. From the finding most respondents were above 35 years old

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were (48.6%).While (6.9%) were between 18-24 years old. Regarding educational background of the respondents only (35.5%) did not attain any level of education. While (5%) and (2.3%) obtained diploma and degree respectively. Taking into consideration the marital statuses of the respondent, (66.1%) were married. While (10.6%) and (9.2%) were widowed and single respectively (see Table 1).

**Table 1.** Characteristics of the respondents

| Back ground | | Number respondent | Percentage (%) |
|---|---|---|---|
| Sex | Male | 143 | 65.6 |
| | Female | 75 | 34.4 |
| Age | 18-24 | 15 | 6.9 |
| | 25-29 | 40 | 18.3 |
| | 30-34 | 57 | 26.1 |
| | >35 | 106 | 48.6 |
| Education Level of respondents | No formal education | 78 | 35.8 |
| | Primary | 83 | 38.1 |
| | Secondary | 41 | 18.8 |
| | Diploma | 11 | 5 |
| | Degree | 5 | 2.3 |
| Marital status | Single | 20 | 9.2 |
| | Married | 144 | 66.1 |
| | Divorced | 31 | 14.2 |
| | Widowed | 23 | 10.6 |

### 3.2. Household activity and social interaction with resource use

The analysis of the livelihood of the local community confirmed that most of them (71.6%) were depending on mixed farming system such as, crop production and animal rearing as the main economic activities. The remaining 19.3% were depending only on crop production and 6% depends on livestock rearing (Figure. 2). The present study is in line with finding of (Amaja, 2014) who reported that the major economic activities of income depends on crop farming and animal rearing in Gera district, Western Ethiopia.

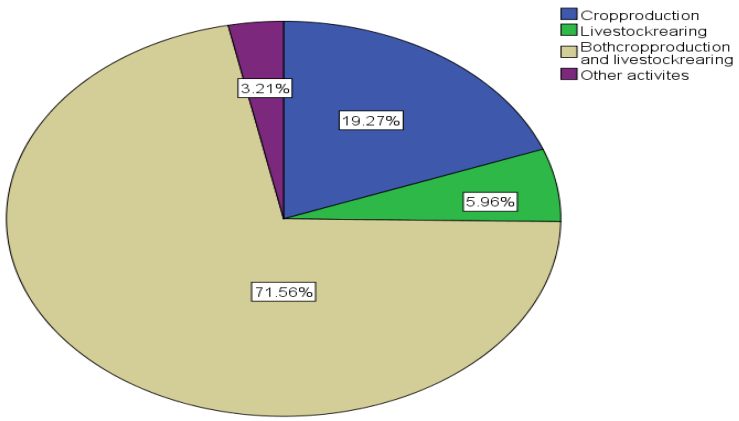


**Figure 2.** Livelihood activity of the respondents

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### 3.3. Sugarcane damage

In the research area, a total of 99,034% damage incidents were documented during the course of the year at all three sample locations (both in wet and dry season). However, an examination of damaged crops in different seasons revealed that sugarcane was consumed more during the dry season than during the rainy season, accounting for 24.3 % and 21.5 % respectively (Table 2). This is because, aside from the plantation fields, there are few resources available in the surrounding area during the dry season. During the dry season, wild animals do not have access to alternative food sources such as grasses, leaves, fruit seeds, and other plants. The results of the present study agree with Admassu, (2007) in Wonji Shoa and Hill (1997) who reported greater damage to sugarcane during the dry season than during the rainy season.

**Table 2.** Sugar cane damage identified during wet and dry season

| | | Wet season | Dry season |
|---|---|---|---|
| Sample site | Sugar cane stalk count | Sugar cane Damage stalk count | Sugar cane Damage stalk count |
| 1 | 74,195 | 28,129 | 29,731 |
| 2 | 71,882 | 11,129 | 11,936 |
| 3 | 70,000 | 7,210 | 10,899 |
| Total | 216,077 | 46,468 (21.5%) | 52,566 (24.3%) |

Damage incidents, on the other hand, differed considerably from site to site during the wet and dry seasons ($t=16.24$, $df=1$, $p<0.05$) (Table 2). When the registered damage events were compared, the sample site with the least distance from the forest edge, proximity to natural forest, buffer zone, and Dhidhesa River had the largest damage event. The sample site three, which was far coming from the woods, had the fewest damage incidents. Damage event analysis reveals a negative link between the frequency of damage events and the research area's distance from the forest border. As the distance of study area from forest edge decreased damage event registered was high and vise verse. The findings of this study correspond with those of Hill (2000) and Fungo (2011), who found that farms closest to the forest edge were more vulnerable to crop losses than farms farther away from the forest.

### 3.4. Wild animals involved in crop damage

The results of the questionnaire survey and the analysis of data collected from sampled sites were the same. The species that were found to be harming crops were the same ones that were reported in the questionnaire survey and formal interview. There were five different species found. Hippopotamus (*Hippopotamus amphibius*), Anubis baboon (*Papio Anubis*), warthog (*Phacochoerus africanus*), Bush pig (*Potamochaerus*

*larvatus*), and Buffalo (*Syncerus caffer*) were among the animals that caused crop damage in the Arjo Dhidhesa Sugarcane Plantation during both the wet and dry seasons. However, comparison of loss of sugar cane in the Arjo Dhidhesa Sugar Factory indicated that the highest sugarcane stalk damage was caused by Hippopotamus (24.4%) followed by Anubis baboon (17.3%) and Warthog (12.3%). While the least damage was caused by Buffalo (7.06%) and Bush pig (5.5%) ranking fourth and fifth, respectively during wet season. Whereas, Anubis baboon (30.3%) caused the highest sugarcane stalk damage followed by Hippopotamus (29.6%), Warthog (19.4%) and Bush pig (8.4%) during dry seasons, respectively (Table.3). There was significant difference among the damages caused by wildlife both during the wet ($t = 4.08$, $DF= 4$, $P< 0.05$) and dry season ($t =3.73$, $DF = 4$, $P < 0.05$).

**Table 3.** Wild animals involved in sugar cane damage/ha during wet and dry season

| Average sugar cane stalk count/ha | | | Sugar cane Damage stalk count/ha | | Sugar cane damage percent/ha | |
|---|---|---|---|---|---|---|
| Species | Wet | Dry | Wet | Dry | Wet | Dry |
| Hippopotamus | 72,025 | 55,805 | 16133 | 16533 | 22.4 | 29.6 |
| Warthog | 72,025 | 55,805 | 8837 | 10837 | 12.3 | 19.4 |
| Bush Pig | 72,025 | 55,805 | 3931 | 4681 | 5.5 | 8.4 |
| Anubis Baboon | 72,025 | 55,805 | 12484 | 16898 | 17.3 | 30.3 |
| Buffalo | 72,025 | 55,805 | 5083 | 3617 | 7.06 | 6.48 |

The higher sugar cane plantation damage by hippopotamus during the present study attributed to its behavior. Similarly, the analysis plantation of sugarcane damage during wet season (22.4%) was highly caused by hippopotamus when compared with that other wildlife in the research area (Table 3). Hippopotamus usually damages the sugarcane by grazing on the young shoots of the cane and also by trampling and destroying certain areas of the field. Besides, the Hippopotamus is fond of sugarcane plantations; it has no other foraging sites near the vicinity. This was confirmed by direct observation in the morning and late in the afternoon during the entire data collection period, presence of hoof marks and faecal droppings in the fields (Figure 3).

This result was greater than the result reported by Admassu (2007) 2.8% and 3.4% during the wet and dry season respectively in Wonji Shoa and also the work done by Vercamen and Mason (1993), showed that about 8.9% of maize was damaged by hippopotamus during the wet season. These was because of original habitat of the hippopotamus has been modified for sugarcane plantation and also hippopotamus population is relatively abundant as compared to other wildlife in the study area. Due to encroachment of their habitats, animals in the area moved to the plantation fields to get space food and other resources (Figure 4).

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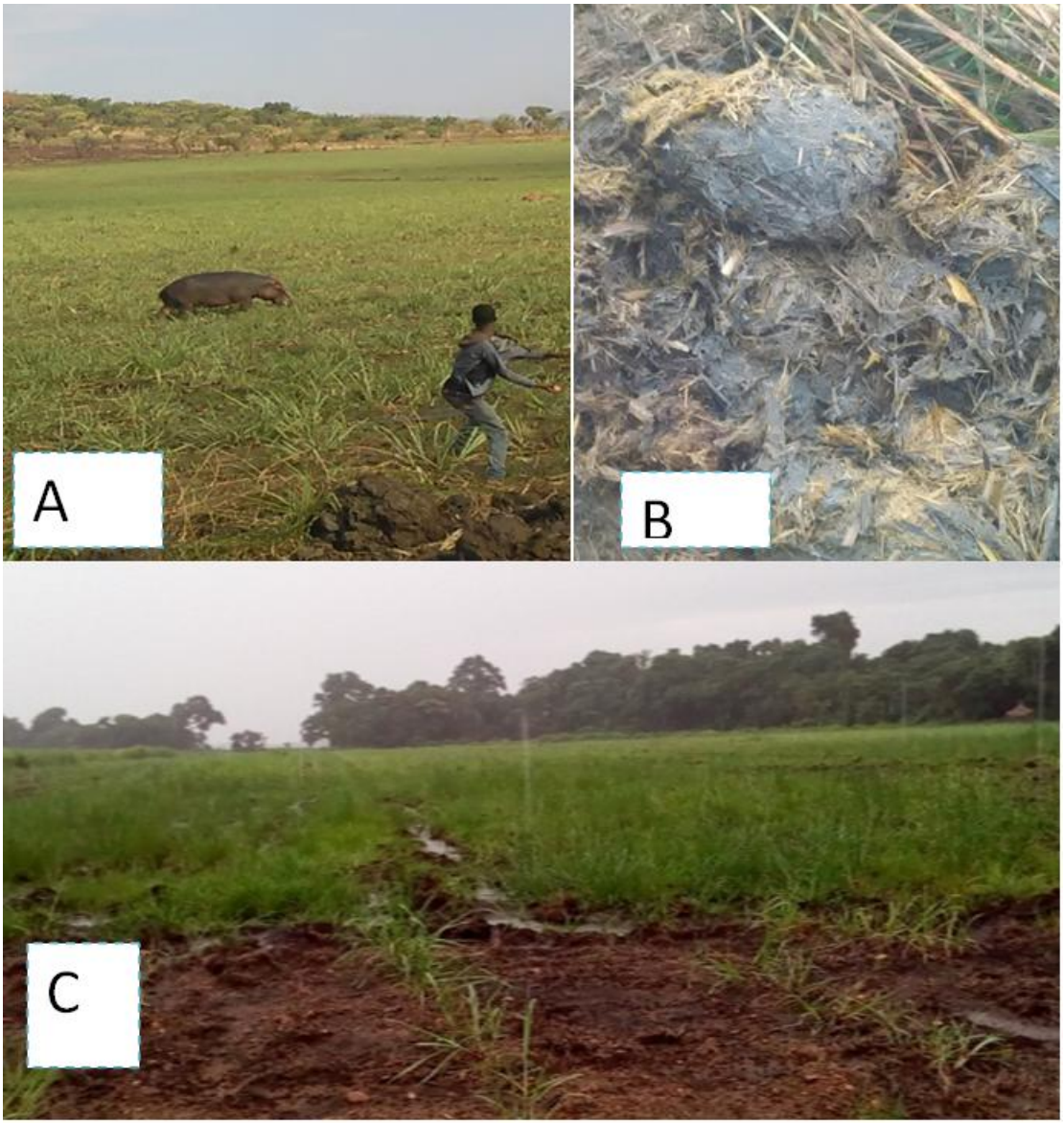


**Figure 3.** Sugarcane stalk grazing (A), faecal dropping (B) and destroying (C) damaged by hippopotamus (photo: Girma Gizachew, 2018)

In the current study, however, Anubis baboon crop damage was 17 % and 30.3 % during the wet and dry seasons, respectively, and was also the largest damage event seen during the dry season when compared to other species (Table 3). Because of the animal's social organization and intelligence, it recognizes the lack of cane guards and rushes into the plantation fields, establishing several groups in various directions (Figure 4). Anubis baboons have a high injury incidence because of their social arrangement. Similarly, the present result agrees with (Naughton-Treves *et al*., (1998) who reported that in Uganda primates are dominant pest and responsible for over 70% of the damage events and the damage was attributed to their intelligence, adaptability, wide dietary range, complex social organization and manipulative abilities. The present

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result was greater than the result reported by Belay Worku, (2016) who reported that 15.78 % crop damage by Anubis baboon during the wet season in Gida Ayana district, Western Ethiopia. The result of these study showed that there was a strong conflict between these animals and the Sugar Factory and local community. Because of irrigation plantation in the study area green all year round, population of these Anubis baboon might temporarily migrate from the surrounding forest to the area to search for food and as well as, the plantation fields are very near to Dhidhesa River where there are plenty of tree which support Anubis baboon by providing shelter to escape from the cane guards which was in line with Hill (2000) reported that farms located within 300 meter of a forested boundary probably are exposed more to crop raiding by primate.

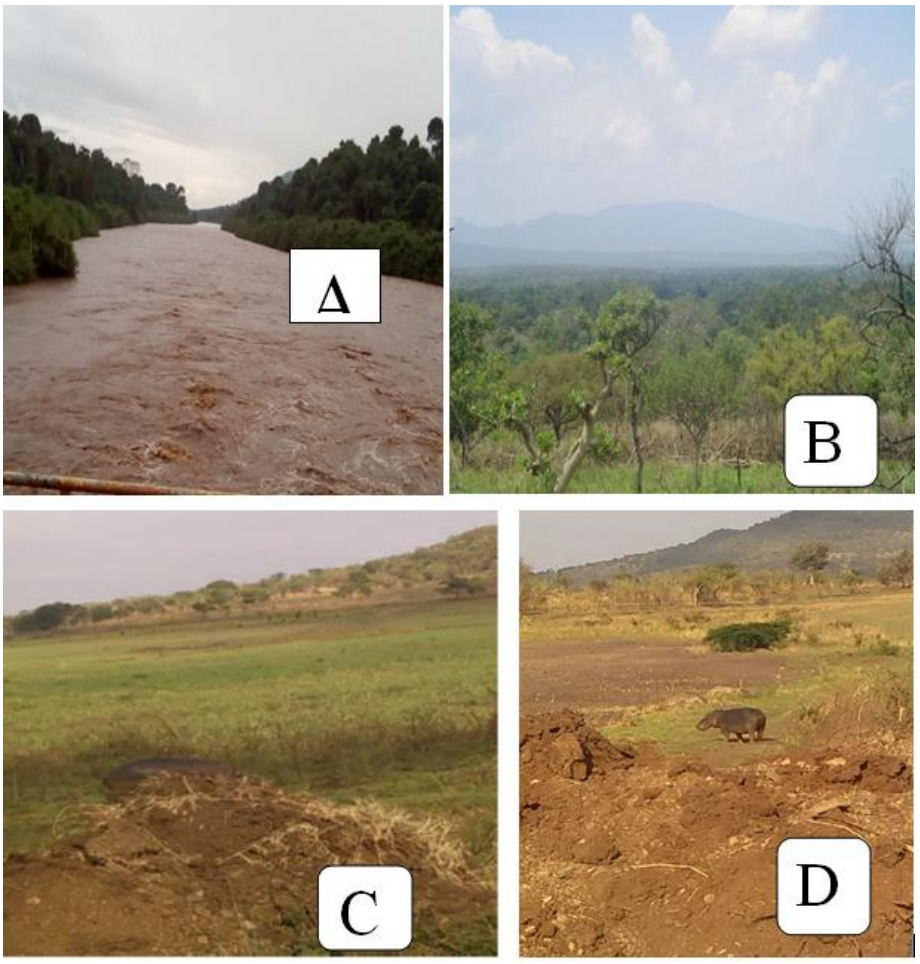


**Figure 4.** Habitat disturbances by Sugar Factory (A and B) and subsistence agriculture (C and D) (photo: Girma Gizachew, 2018)

Crop losses caused by wild animals can be considerable, both in terms of direct financial loss and indirect costs associated with crop protection and replanting following damage (Nyirenda *et al*., 2013). The Arjo Dhidhesa Sugarcane Plantation Department was observed spending a significant amount of money on cane guards to avoid sugarcane damage both during the day and at night in the current research region. The Department also spends money, time, and effort to transplant sugarcane plants that have

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been severely damaged and transformed, particularly in areas where cane plants have been completely destroyed by Warthogs and replaced by weeds and grasses (Figure 5). This was confirmed by direct observation in the sugarcane plantation fields where the cane guards were on duty and through information obtained from Sugarcane Plantation Department Office documents, as well as from monthly reported documents of section heads. The documents emphasize damage caused by different animals and request to employ additional cane guards to minimize the problem.

**Figure 5.** Sugarcane changed to weeds due to warthog ( photo: Girma Gizachew, 2018)

On the basis of samples taken for direct observation, a total of 45.8% which means 21.5% and 24.3% per ha of sugarcane was damaged by wild animals during the wet and dry seasons respectively. The present study agreed with finding of (Yonas *et al.*, 2010) who reported that loss estimation was from 26.4% to 94.4% in maize and cereal crops in central and northern highlands of Ethiopia. In contrast, Admassu, (2007) recorded agricultural losses of 10.2 percent and 11.8 percent during the wet and dry seasons in Wonji Shoa and Amaja, (2014) and Belay Worku, (2016) reported crop losses of 26.9% and 33.28 percent in Gera and Gida Ayana districts, Western Ethiopia, respectively. As a result, wild animals in the research area have suffered economic losses. Based on firsthand observations, it was estimated that 76,700kg of sugar cane was lost throughout the study period in the sampled area. Girmay & Teshome (2017) observed that 30,000 kg of crop output was wasted per year in Eastern Tigray, Northern Ethiopia. Because the native habitat of the animals was destroyed by human activity in the current research location, the animals' natural nutrition was lost in the area. As a result, animals migrate to agriculture in quest of food, causing destruction. This finding corroborated the findings of (Kasso & Bekele, 2014), who found that habitat degradation and fragmentation were the primary causes of human-primate conflict in Indonesia. Impact Environmental assessment (EIA) is a method or tool for predicting and analyzing the negative and positive environmental and social the ramifications of a planned development, according to Federal Democratic Republic of Ethiopia decree No 299/2002. However, in the current study region, there was a lack of EIA that allowed Agro-biodiversity within a refuge of these effect biodiversity, ecosystem, rare or endangered species, or flora/fauna of commercial or scientific significance.

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### 3.5. Causes of human wildlife conflict in the study area

Respondents were also asked about the causes of human-wildlife conflict during the current survey, and the majority of them said habitat damage and loss (33.9 %) was a key concern in the study area. Despite the fact that the majority of respondents (28.4%) believe that agricultural expansion is good for the economy (Figure 6). The reason of the wildlife conflict, according to official Sugar Factory consulting specialists, local governments, and local communities, was population growth, which resulted in deforestation due to increased demand for food, farms, and other natural products. Due to improper site selection of investment in forest area, expansion of subsistence agriculture along forest edge, and proximity to natural forest, this has resulted in contraction of wildlife ranges and changes in composition as well as habitat structure. Increasing livestock and human population pressure, along with poor land use site selection, has resulted in significant habitat degradation and a drastic fall in wildlife numbers (Figure 4). Increased habitat disturbance was found to be the source of human-wildlife conflict in Uganda, according to José line, (2010) and Edward & Frank, (2012). Human primate conflict in Indonesia is mostly caused by habitat degradation and fragmentation, according to Jones (2012).

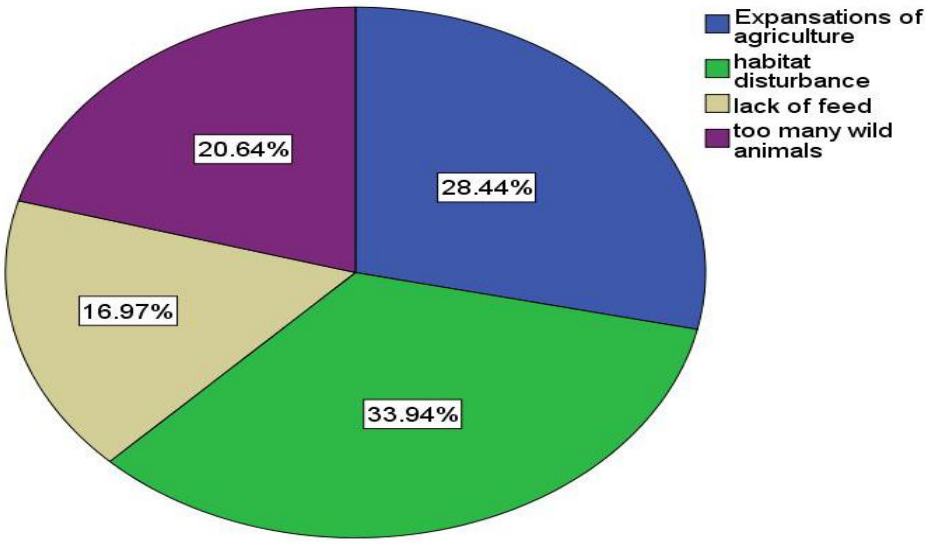


**Figure 6.** Causes of human wildlife conflict in the study area

### 3.6. Impacts of sugarcane plantation farming on human wildlife conflict

Field observation and interviews with local residents confirmed that the location and extent of the Sugar Factory and the irrigation dam construction affected core habitats that support a range of wildlife species during the current study. In addition, migratory corridors for shift grazing, seasonal habitat use, and waterways were disrupted in the research area, resulting in confrontations such as injuries and fatalities of both farm guards and wildlife species. While clearing of natural forests for sugarcane farm preparation, a lots of slow running animals like Anubis baboon (*Papio anubis*), hippopotamus (*Hippopotamus amphibious*), Leopard (*Panthera pardus*) and have caused significant destruction on the Dhidhesa ecosystem as well as becoming a

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challenge to sustainability of the farming investment already launched in the area (Figure 6).

The extent of land under both irrigation and rain fed agriculture increased significantly while riverine vegetation and perennial swamps decreased significantly as well. From the result obtained in this study, human activities led to loss of wildlife dispersal areas through land use changes, agricultural expansion and settlement. The situation has led to increase in resource competition mainly for water and food resources, blockage of wildlife dispersal areas and especially those that have large home ranges (hippopotamus and Buffalo). An unwelcome consequence of these Increased human-animal conflicts have resulted from changes in land use and land cover within wildlife dispersal regions, which has the potential to result in wildlife extinction and a significant socioeconomic crisis. Such conflicts are thought to prevent children from attending school, increase labor requirements, and reduce the company's and the surrounding community's income. Agriculture was a key driver of forest loss in the areas surrounding Budongo forest in Uganda, according to Mwavu & Witkowski (2008).They recorded major land cover conversion were from forests/woodlands to sugarcane plantations, settlement and shifting cultivation. Kioko & Okello (2010) also indicated that agricultural expansion has been associated with deforestation in Asia, Africa and Latin America.


**Figure 6.** Animal massacre (A, B, &C) in Dhidhesa Basin (photo:Girma Gizachew)

### 3.7. Community mitigation strategies to deter crop raiding animals

In the present study, both the local community and investment community were employed different strategies to deter crop raiders. Among these, some of the frequently

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observed once during field survey were guarding, trench, wood smocking, hanging dead animals at corner, mass killing and keeping animal alive being tied to the side of farmland. In addition, because of hippopotamus damage to sugarcane plantation and other crops nearby Dhidhesa River, humans kill or chase wild animals by digging, cutting, sealing by stones and smocking their natural habitat. These methods are among the main cause to the extinction of wild animals and become the worst to wildlife conservation efforts (Figure 7).

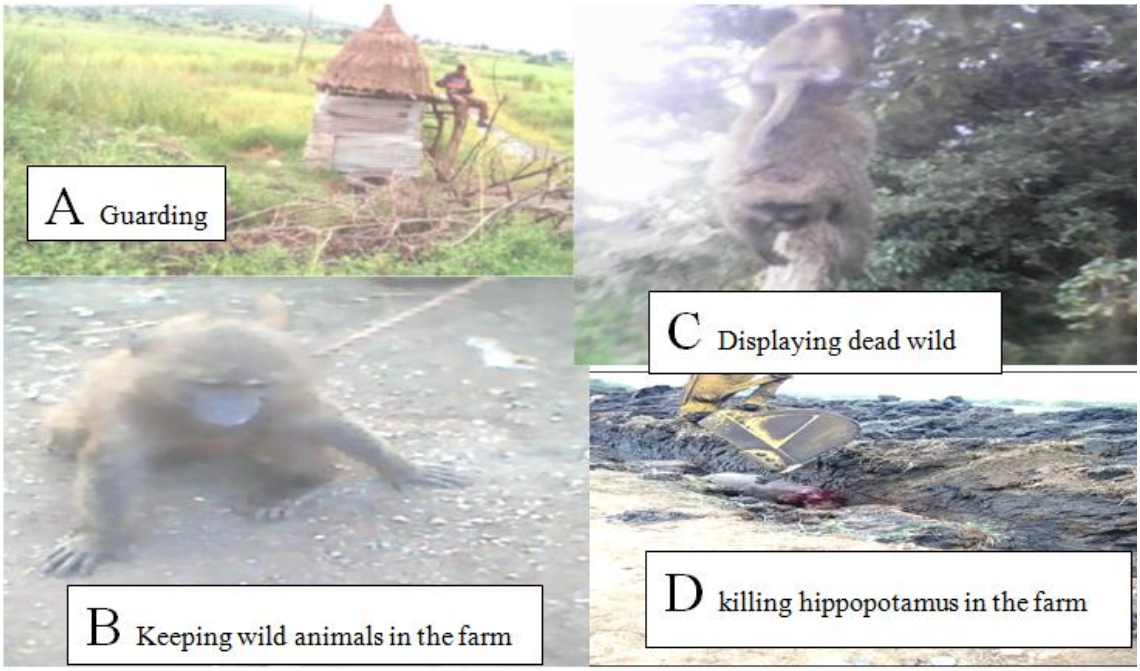


**Figure 7.** Prevention strategies (A, B, C and D) (photo: Girma Gizachew, 2018)

Moreover, during the present study it was observed that the investment community used very thigh (narrow) trench to deter hippopotamus without any out let; then, when animals fail in the trench, they killed savagely hitting on its head repeatedly in couple of happening observed during field data collection. The situation was guilty and immoral; un expected from 21st century farming community. As hippopotamus are aquatic animals, they used to live in Dhidhesa River, but the investment had cleaned the riverine forest to shoreline of river breaking international Environmental law and regulation. When hippopotamus come out of the river, for grazing, it stands within Sugar cane plantation; there was no any means to protect plantation damage. However, because the hippopotamus is an umbrella species in the Dhidhesa ecosystem, its local extinction might have a substantial ecological impact on the Dhidhesa ecosystem and the long-term viability of the Sugar Factory already in place. On the other side, the haphazard methods used to dissuade crop raiding animals may have negative environmental consequences. In Africa, (Ogada *et al*., 2003) reported that species most exposed to conflict are shown to be more prone to extinction are directly linked to human activities, and (Eyebe *et al*., 2012) reported that human-induced mortality affects not only the population viability of some of the most endangered species, but also has broader environmental impacts on ecosystem equilibrium and biodiversity preservation

and also (Bakker *et al*., 2016) who reported that large herbivores function as ecological engineers by changing the nutrient cycle, structure and species composition of vegetation. Beside this, hanging dead animal parts, habitat disturbance, keeping animal alive being tied to the side of farmland and mass killing wildlife by following them were also identified methods to mitigate human wildlife conflict in the present study by the investment community and local communities to protect their crops and livestock from wildlife. This is an indication of those who are responding to the huge gaps in wildlife awareness and wildlife conservation. This result was consistent with Gidey Yirga & Hans Bauer, (2010) who reported that habitat burning, homicide and poisoning were strategies to reduce livestock destruction in Southeast Tigray, Northern Ethiopia, Shemwetta & Kideghesho, (2000) in Tanzania, reports 9 Wildlife is possess to have become extinct in Lake Manyara Parkland due to surround destruction, over-exploitation, the introduction of pollution and rare species and Musyoki, (2014) in Republic of Kenya, UN agency according that showing creature elements were visible barriers that enclosed shouting from numerous sources, throwing objects, loading plastic sheets and distinguishing communities to scale back plant and eutherian injury to life. However, understanding the mutuality between diversity and agricultural production and translating this data into management practices is crucial to make sure the delivery of safe and adequate natural resources to the nations benefiting (Madden, 2008).

## 4. CONCLUSIONS AND RECOMMENDATIONS

Recent analysis has shown that there's a significant conflict between conservation life and also the Arjo-Dhidhesa Sugar industrial plant and its surroundings. Population growth, deforestation, surround destruction, and disturbance in or close to wildlife habitats are a number of the key parts of HWC. Crop invasion, placental destruction, and controlled wildlife are all common HWC problems. The foremost common style of HWC is Plant damage. As a results of this immense loss of sugarcane thanks to invasive crop mammals caused by the failure of the Environmental Impact Assessment that permits for agricultural investment within the shelter of those vital varieties of land conservation.

The unscientific mitigation strategies undertaken by investment community would rather aggravate the conflict and results to extinction of those threatened but Dhidhesa ecosystem that can highly affect the resilience of the ecosystem in general and sustainability of the agro-investment in particular. Therefore, depending on the bases of this information, the following recommendations are proposed for urgent consideration of all stakeholders: Training and awareness creation should be given to local and investment communities to enhance their understanding about the dependency of the functionality of Dhidhesa ecosystem on its umbrella species, the deterioration of which soon affect productivity of the agro-investment already established within the basin. There should be a physically delineated area between the sugarcane plantation fields and Dhidhesa River as well as surrounding natural habitats that serve as refuges to the animals. National and Regional government should introduce appropriate strategies to conserve these wildlife resources of high conservation significance. Urgent collaborative measure should be taken between Arjo Dhidhesa Sugar Factory and

Stakeholder government officials to alleviate animal massacre in Dhidhesa basin of the present study area.

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