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HUMAN - WILDLIFE CONFLICT INVOLVING ETHIOPIAN WOLF (*Canis simensis*) AND GELADA BABOON (*Theropithicus gelada*) IN AND AROUND GUASSA COMMUNITY COMSERVATION AREA, NORTH SHOA, ETHIOPIA

A Thesis Presented to the School of Graduate Studies in Partial Fulfillment of the Requirements for the Degree of Master of Science in Biology (Dry land Biodiversity Stream)

By

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ABSTRACT

*A study on human - wildlife conflict involving Ethiopian wolf (*Canis simensis*) and gelada baboon (*Theropithecus gelada*) in and around Guassa Community Conservation Area was conducted from September, 2009 to May, 2010. The objective of this study was to fill information gap on human wildlife conflict and attitude of local people towards wildlife in the country. Data on human wildlife interaction were collected based on the direct interview questionnaire, by direct observation on crop damage by gelada baboon, focus group discussion and by collection of faecal dropping sample of Ethiopian wolf and gelada baboon. The collected data were analysed using descriptive statistics, chi-square test and one way ANOVA. The analysed data showed that 44.4% of the respondents faced both the problems of crop damage and livestock predation, 10.8% faced crop damage, 36% faced predation and the rest 8.8% of the respondents didn't face any conflict by wildlife. The average annual crop loss due to gelada baboon per house hold was 0.63 ± 0.05 quintal. Villages differed significantly ($F_{6, 243} = 49.75, P < 0.001$) in terms of annual crop loss by gelada baboon. There was severing conflict between gelada baboon and local people in Yegora, Defergie, Alfa and Tebab, but no conflict in Tarete, Ferkuta and Agancht. A total of $2652m^2$ crop farm was raided and trampled during the time of observation. Only 16.8% of the respondents reported the depredation of sheep by Ethiopian wolf. Villages not differed significantly ($\chi^2 = 2.32, df = 6, P > 0.05$) in the response of depredation of sheep by Ethiopian wolf. From the faecal dropping analysis, only 1.1% showed sheep prey. The average sheep loss per house hold in the last five years was 0.20 ± 0.03 . 88.8%, 6.4% and 4.8% of the respondents had positive, negative and neutral attitude towards wildlife, respectively. 63.6% of the respondents had positive attitude whereas 28% had negative attitude towards gelada baboon. The attitudes of the respondents towards the gelada baboon was negatively correlated with crop damage ($r = -0.31, P < 0.001$). 88.4% of the respondents had positive attitude towards Ethiopian wolf. Villages not differed significantly ($\chi^2 = 9.815, df = 12, P > 0.05$) in their attitude towards Ethiopian wolf.*

Key words: *Attitude, Ethiopian wolf, Gelada baboon, Guassa Community Conservation Area, Human - Wildlife Conflict.*

1. INTRODUCTION

Ethiopia is one of the most physically and biologically diverse countries in the world with sizeable endemism (Leykun Abune, 2000). It comprises highland massives surrounded by arid lowlands which contain various wildlife and wildlife habitats ranging from alpine moorlands to lowland savannas and arid lands, and extensive wetlands (Yalden, 1983). Its past geological history; unique topography and wide ranging climate have made home for diverse biological resources and numerous endemic species of flora and fauna (Hillman, 1993; Yalden and Largen, 1992). The area of Ethiopia is roughly over 1,023,050km² (Jacobs and Schloeder, 2001) and has a great variation in altitude ranging from the depressions in the Dalol of Afar (116m bsl) to the mountain tops of Ras Dashen in the north (4620m asl) (Shibru Tedla, 1995; Tesfaye Hundessa, 1997). The differences in altitude have resulted in a wide variation in climate (rainfall, humidity, temperature and wind). Ethiopia is also notable for containing 50% the Afro tropical region's land above 2000m asl (Yalden, 1983).

The known number of vertebrate species and the endemics (in brackets) in Ethiopia are: mammals 277 (31); birds 861 (16); reptiles 201 (9); amphibians 63 (24); and fishes 150 (40) (Hillman, 1993; Yalden and Largen, 1992). There are between 6500 and 7000 higher plant species, out of which about 12% are endemic to Ethiopia (Tewolde Berhan Gebre Egziabher, 1991).

Using vegetation as the main distinguishing factor, there are 10 broadly recognized ecosystems in Ethiopia, which include Afro-alpine and sub afro-alpine ecosystems (3200 - 4620m) asl, Montane grassland ecosystems (1500 - 3200m) asl, Dry evergreen montane forest and Evergreen scrub ecosystems (1500 - 3200m) asl, Moist montane forest ecosystems (800 - 2500m) asl, *Acacia - Commiphora* woodland ecosystem (900 - 1900m) asl, *Combretum - Terminalia* woodland ecosystem (500 - 1900m) asl, Lowland tropical forest ecosystem (450 - 800m) asl, Desert and semi-desert scrubland ecosystems (>500m) asl, Wetland ecosystems and Aquatic ecosystems (Zerihun Woldu, 1999).

Ethiopia has the largest extent of afro-alpine and sub afro-alpine habitats in Africa. These ecosystems are characterized by the most eye - catching giant herb, lobelia (*Lobelia rhynchopetalum*), the evergreen tree heather (*Erica arborea*) and shrubby and herbaceous everlasting flowers (*Helichrysum* spp.). There is a rich grass and herb flora including endemic succulents belonging to the family *Crassulaceae*. The endemic wild mammals in this ecosystem include walia ibex (*Capra ibex walia*) (Linnaeus, 1758), mountain nyala (*Tragelaphus buxtoni*), starck's hare (*Lupus starcki*), Ethiopian wolf (*Canis simiensis*) (Rüppell, 1835), and gelada baboon (*Theropithecus gelada*) (Rüppell, 1835). The giant mole rat (*Tachyoryctes macrocephalus*) is also a characteristic species of these ecosystems. Endemic birds found in these ecosystems include spot-breasted plover (*Vannellus melocephalus*), Ankober serin (*Serinus ankoberensis*) and other important birds include chough (*Pyrrhocorax graculus*), lammergeyer (*Gypaetus barbatus*) and golden eagle (*Aquila chrysaetos*) (IBC, 2007).

In Ethiopia, there are 15 National Parks, 3 Sanctuaries, 8 Wildlife Reserves, 24 Controlled Hunting Areas, 58 Forest Priority Areas and seven World Heritage Convention Sites (IBC, 2007). National Parks and other strict nature reserves cover 193,600 km² or 16.5% of Ethiopia's land area, and include nearly all the major habitat-types found in the country. However, only Awash and Simien Mountains National Parks have been formally gazetted and legally recognized (IBC, 2007). In the central highlands of Ethiopia, there are no officially protected areas, but there is a community where natural resources are protected for its sustainable use and for benefits of the entire community. The community living near the Guassa area of Menz has been managing their natural resources in a sustainable way for at least the last 400years. The Menz community has managed the Guassa area for a wide range of purposes and has benefited from their sustainable management (Zealelem Tefera, 2001).

Guassa area is one of the high altitude afro-alpine communities in the central highlands of Ethiopia, which comprises afro-alpine vegetation, home of endemic mammals and birds. The trend in the conservation status of Ethiopia's biodiversity is in decline as a result of a number of threats. The major threats to the biodiversity of the country are unsustainable

utilization of natural resources (over-exploitation), deforestation, conversion of natural vegetation to farmland, forest fires, land degradation, habitat loss and fragmentation, extensive replacement of farmer's/local varieties/breeds by improved ones, invasive species, illegal trafficking of domestic and wild animals, poaching, wetland destruction, climate change and human - wildlife conflict. Of these, expansion of subsistence agriculture, overgrazing, habitat fragmentation, wildlife disease and human - wildlife conflict are the major threats in Guassa Community Conservation Area.

Due to such threats, the present study focuses on human - wildlife conflict involving Ethiopian wolf and gelada baboon in and around Guassa Community Conservation Area. Data were collected by using questionnaire survey, focus group discussion, faecal analysis and direct observation on crop damage by gelada baboon.

2. LITERATURE REVIEW

2.1. The Ethiopian Wolf (*Canis simensis*)

The Ethiopian wolf is the most endangered canid in the world, with a total world population estimated at around 500 individuals surviving in mountain tops above 3000m asl (Sillero-Zubiri and Marino, 2008). The Ethiopian wolf is also known as the Simien fox, Simien jackal or the Abyssinian wolf. Throughout Ethiopia, the Ethiopian wolf is called by different names. In the Amharic speaking area of the Simien Mountains and Guassa-Menz, it is called *Key Kebero* or *Kebero*; in the Wollo area, it is called *Seren*; and in Gojam, it is called *Walge*. In the southeast of the country, in Arsi and Bale Mountains, among the Oromifa speakers, it is usually called *Jedella Ferda* but in few localities in the same area it is called *Arouaye* (Zealelem Tefera, 2001).

2.1.1. Taxonomy

The Ethiopian wolf belongs to the Kingdom: *Animalia*, Phylum: *Chordata*, Class: *Mammalia*, Order: *Carnivora*, Family: *Canidae*, Genus: *Canis* and species: *simensis*. It is one of the four canid species in Africa, the others being *C. aureus*, *C. mesomelas*, *C. adustus* and *Lycaon pictus* (Zealelem Tefera, 2001). *Canis simensis* is the most distinct species in the Genus *Canis* and closely related with the side - stripped jackal (*C. adustus*) and *Dusicyon* spp. (Clutton-Brock *et al.*, 1976). Based on the phylogenetic analysis using mitochondrial DNA sequence *C. simensis* is more closely related to the gray wolf (*C. lupus*) and the coyote (*C. latrans*) (Gottelli *et al.*, 1994). The species may have evolved from a gray wolf like ancestor as recently as 100,000 years ago (Gottelli *et al.*, 2004). There are two subspecies, namely *C. s. simensis* and *C. s. ceteronii* which are found in north-west and south-east of the Rift Valley, respectively (Yalden *et al.*, 1980).

2.1.2. Morphology

The Ethiopian wolf is a medium sized canid with a reddish coat, distinctive white markings, long legs and an elongated muzzle (Sillero-Zubiri and Marino, 2004). The males

are significantly larger than females in body mass (Table 1). The face, ears and upper parts of the muzzle are red, while the throat, chest and under parts are white. Palate, gums and naked borders of the lips are entirely black. Ears are broad, pointed and directed forward. The contrast of white markings against the red coat increases with age and social rank in both sexes, the female's coat is generally paler than the male's. The long, slender legs are reddish outside, with whitish inner (Fig. 1).

There is a short rufous - coloured stripe down the back of the tail, becoming a black stripe leading to a thick brush of black - tipped guard hairs. The skull is very flat in profile, with only a shallow angle between frontals and nasals. The teeth are small and widely spread, especially the premolars. The dental formula is I3/3 C1/1 P4/4 M2/3 and a total of 42 teeth (Sillero-Zubiri and Gottelli, 1994). Table 1 shows body measurements of the Ethiopian wolf.

Table 1. Body measurement of the Ethiopian wolf (Sillero-Zubiri and Gottelli, 1994)

HB	male	963mm (928 – 1012) n=18
	Female	919mm (841 – 960) n=8
T	Male	311mm (290 – 396) n=18
	Female	287mm (270 – 297) n=8
HF	Male	199mm (193 – 209) n=18
	Female	187mm (178 – 198) n=8
E	Male	108mm (100 – 119) n=18
	Female	104 mm (95 – 110) n=8
WT	Male	16.2Kg (14.2 – 19.3) n=18
	Female	12.8Kg (11.2 – 14.2) n=8

(**Key:** HB = head and body measurement, T = tail length, HF = hind foot, E = ear, WT = weight)



Figure 1. A male Ethiopian wolf (*Canis simensis*) (Photo: Zelealem Tefera, 2001)

2.1.3. Distribution and Population

The Ethiopian wolf is restricted to seven isolated mountain ranges of the Ethiopian highlands at altitudes of 3000 - 4500m asl (Marino, 2003; Gottelli and Sillero-Zubiri, 1992). According to Marino (2003), Ethiopian wolf populations occur north of the Rift Valley in the Simien Mountains, Mount Guna, North Wollo, South Wollo, Guassa-Menz and south-east of the Rift Valley in the Arsi and Bale Mountains (Fig. 2).

The Bale Mountain is the largest area of Ethiopian wolf habitat and contain up to half of the global total population of the species. Arsi, Guassa - Menz, Wollo, and Simien Mountains provide refuges for further smaller populations that made up the remainder of the global population (Deresse Dejene, 2003). The estimated population of the Ethiopian wolf was 250, 80, 50, 35, 40, and 25 in the Bale Mountains, Arsi, Simiens (Simien Mountains and Mount Guna), North Wollo, South Wollo and Guassa-Menz, respectively

(Marino *et al.*, 1999). Currently the population trend is decreasing (Sillero-Zubiri and Marino, 2008).

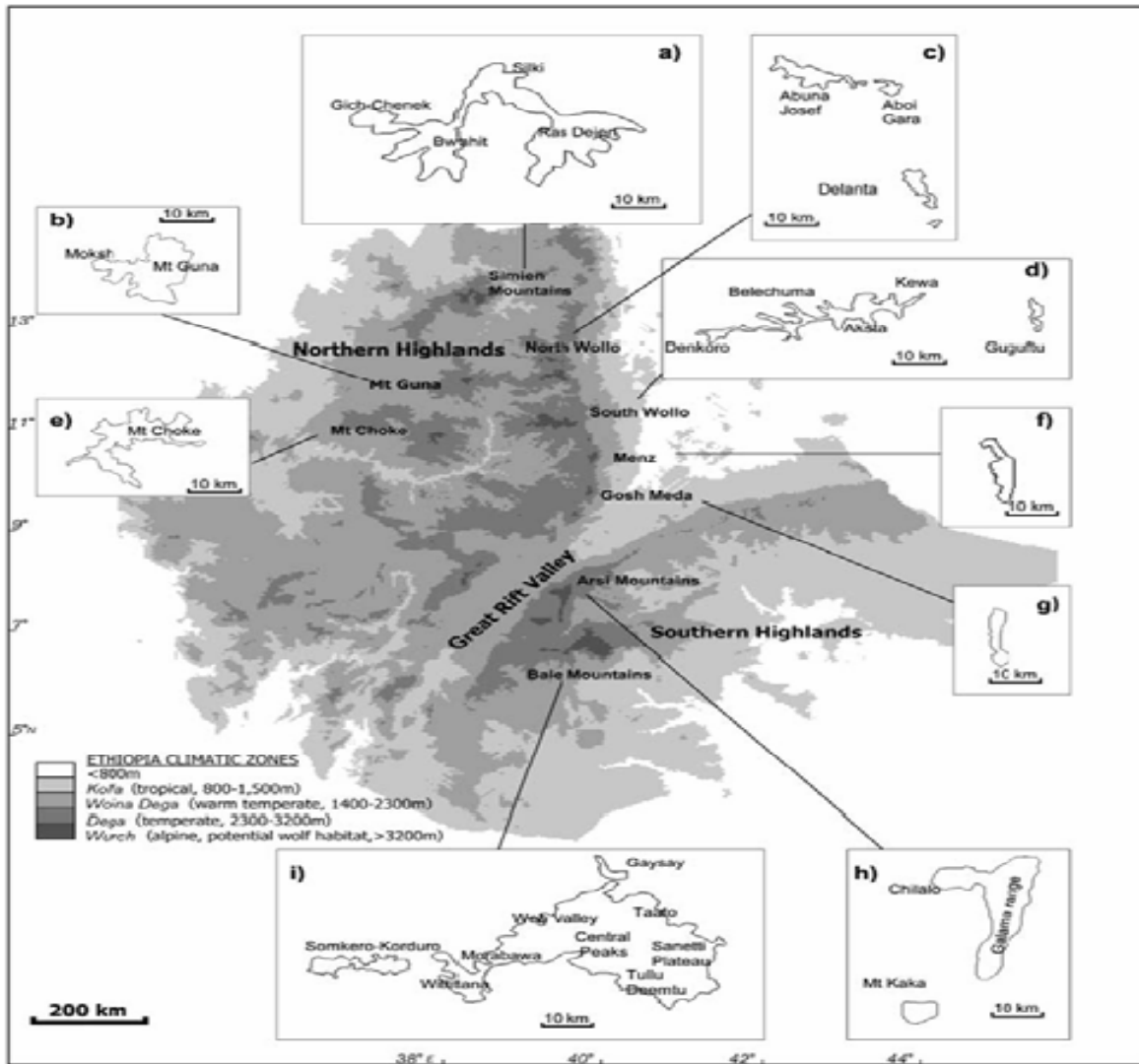


Figure 2. Map of Ethiopia with distribution of Ethiopian wolf (Source: Marino, 2003)

2.1.4. Feeding Ecology and Behaviour

The Ethiopian wolf feeds almost exclusively up on diurnal small mammals of the high altitude afro-alpine grassland community (Sillero-Zubiri, 1994; Sillero-Zubiri and Gottelli, 1995a, b). In the Bale Mountains, it feeds primarily on giant mole rat (*Tachoryctes macrocephalus*), Blick’s grass rat (*Arvicanthis blicki*), and the black - clawed brush -

furred rat (*Lophuromys melanonyx*) (Sillero-Zubiri and Gottelli, 1995b). Other food items include rock hyrax (*Procavia capensis*), young of common duiker (*Sylvicapra grimmia*), reedbuck (*Redunca redunca*) and mountain nyala (*Tragelaphus buxtoni*) (Sillero-Zubiri and Gottelli, 1995b; Malcolm, 1997; Sillero-Zubiri, 1994). The density of Ethiopian wolf is positively correlated with density of rodent prey and negatively with vegetation height (Sillero-Zubiri and Gottelli 1995a).

Ethiopian wolf live in separate and cohesive social packs that communally share and defend an exclusive territory. In optimal habitat, packs consisted of 3-13 adults, containing 3-8 related adult males, 1-3 adult females, 1-6 yearlings and 1-6 pups (Sillero-Zubiri and Gottelli, 1995b). Ethiopian wolf come together for social greetings and border patrols at dawn, noon and evenings and rest together at night. The packs break up to forage individually in the morning and early afternoon. It sleeps in the open, curled up, with their nose beneath their tail.

During the breeding season, only pups and nursing females use the den. Scent marking of territory boundaries via urine posts, scratching, faeces and vocalizations are common and functions in advertizing and maintaining territories (Sillero-Zubiri, 1994). Territory marking trips are regularly carried out by the whole pack, including the sub-adults and juveniles but more often only adults of both sexes take part, led by one of the dominant pair, usually the female. Aggressive interactions with neighbouring packs are common. Packs are highly vocal and interactions always end with the smaller group fleeing from the larger. Home range overlap and aggressive encounters between packs are highest during the mating season (Sillero-Zubiri, 1994).

2.1.5. Threats and Conservation Status

The continuous loss of habitat due to high altitude subsistence agriculture represents the major threat (Marino, 2003). Over grazing of highland pastures by domestic livestock, proposed development of commercial sheep farms and roads, conflicts over livestock losses, disease specially rabies, road kills and shooting (Marino, 2003), hybridization with

domestic dogs (Gottelli *et al.*, 1994) are the main threats. The Ethiopian wolf is more restricted now than in the past (Yalden *et al.*, 1980) and considered as the rarest canid in the world. According to Marino (2003) there are seven persistent isolated populations for the conservation of Ethiopian wolf currently in Simien and Bale Mountain National Park, in Arsi hunting blocks, Denkoro forest in South Wollo and in Guassa area (Fig. 2).

2.2. The Gelada Baboon (*Theropithecus gelada*)

The gelada baboon is the only living member of the once wide spread genus *Theropithecus* and is only found in the highlands of Ethiopia. Gelada baboon was first discovered by the German explorer and naturalist Rüppell in 1835 (Crook, 1966). The gelada baboon is limited to the steep escarpments and gorges that border the eastern side of the central highlands and the North-western highlands of Ethiopia (Zealelem Tefera, 2001). Gelada baboons do not have close relations with the typical baboons of the genus *Papio*, but they have certain similarities in terms of ecological adaptation in morphology and behaviour as part of convergent evolution (Crook, 1966).

2.2.1. Taxonomy

The gelada baboon belongs to the Kingdom: *Animalia*, Phylum: *Chordata*, Class: *Mammalia*, Order: *Primates*, Family: *Cercopithecidae*, Subfamily: *Cercopithecinae*, Tribe: *Papionini*, Genus: *Theropithecus* and Species: *gelada*. Gelada baboon is a species of old world monkeys but several recent fossil relatives are known, some of them are large-bodied: *Theropithecus brumpti* and *Theropithecus darti* (Hughes *et al.*, 2008). Two subspecies have been described: *Theropithecus gelada gelada* and *Theropithecus gelada obscurus* (Groves, 2005). Recent genetic work has shown that the eastern subspecies has been wrongly assumed to be *Theropithecus gelada obscures* (Gurja Belay and Mori, 2006). This name should apply to the animals found in the central and southern parts of the range of the western form (south of Lake Tana and east of the Takkaze River). The north western part of the range (north of Lake Tana and west of the Takkaze River) of the

western form is the nominate subspecies *Theropithecus gelada gelada*. The eastern form thus represents an undescribed subspecies (Gurja Belay and Mori, 2006).

2.2.2. Morphology

Theropithecus gelada can be physically distinguished from other baboons by the bright patch of skin on its chest. The patch is hourglass-shaped on males, bright red and surrounded by white hair on female. In males, the fur is yellow-brown dorsally, with a long



Fig. 3: Male (A) and female (B) gelada baboon (Photo: Anonymous, 2009)

cape of darker hair and dark greyish brown ventrally. There is a prominent tuft of pale whiskers on each cheek. Female lacks a cape and the fur is yellow brown dorsally and dark greyish brown ventrally. The eyelids are very pale, contrasting with the dark facial skin. Males have much larger canine teeth than females (Hughes *et al.*, 2008).

In both sexes, there is a large, hourglass-shaped patch of red skin on the chest. There is also pronounced sexual dimorphism in body size. The head and body length is 28.5 inch (71.5 cm) for males and 23 inch (57.5 cm) for females; tail length is also 19 inch (48.0 cm) for males and 15 inch (37.0 cm) for females. The body mass on average is 19 kg for males

and 11.7 kg for females. The male gelada's tail is about as long as the body and densely tufted at the tip (Gippoliti and Hunter, 2008).

2.2.3. Distribution and Population

The species *Theropithecus gelada* is restricted to high grassland escarpments in the deep gorges of the central Ethiopian plateau, in Tigray, North Gonder, North Wollo, and North Shoa between 1,800 and 4,400 m asl. The Blue Nile Gorge and the upper Wabe Shebelle valley (east of the Bale massif) mark the western and south eastern boundaries of the range, respectively. There are possibly three subspecies: *T. gelada gelada* and *T. gelada obscurus* that occur in the north of Gonder, Tigray, North Wollo, North Shoa, and West of the Rift Valley, while an undescribed subspecies is found along the Wabi-Shebelle River in the Arsi massif, East of the Rift Valley. *T. g. gelada* is found north of Lake Tana and west of the Takkazze River, while *T. g. obscurus* is found south of Lake Tana and east of Takkazze River. Gelada baboon is native and has limited range in the northern and central highlands of Ethiopia (Gippoliti and Hunter, 2008).

The gelada baboon is found only in the Ethiopian highlands, with large populations in the Simien Mountains. An aerial survey of the central Ethiopian highlands yielded an estimate of 440,000 for the total population. Surveys in a number of areas give overall densities varying between 15 and 60/km², although densities of individuals within home ranges commonly exceed 70/km². The population trend shows a decrease (Gippoliti and Hunter, 2008).

2.2.4. Feeding Ecology and Behaviour

Gelada baboon feeds mainly on the flat margins of high grass plateaus, known locally as high Wurch or Puna grassland steppe, with *Agrostis* and *Festuca* grasses and giant *Lobelia* groves. Geladas primarily feed on grass blades. In addition, during dry seasons when there is heavy overgrazing by livestock, or when gelada bands are very concentrated, subterranean stems and rhizomes are also excavated (Hiller, 2000). Fruits and invertebrates

are eaten opportunistically, and cereal crops may be taken where agriculture encroaches onto the geladas' habitat.

Gelada bands consist of 30 - 260 individuals, making up 2 - 30 one male group. According to Dunbar (1993), the largest band recorded contained 325 - 350 individuals. Bands keep within 2 km of the escarpment edges, where they retreat at night or if alarmed. As a result, ranges are linear, encompassing as little as 1-3 km² for a band's core area. Steep cliffs provide sleeping roosts. Geladas are poor tree climbers and are almost entirely terrestrial, spending 99% of their time on the ground. This is partly a consequence of its extreme dietary specialization as a grazer. The gelada social system consists of a hierarchy of social groupings. The basic group is the reproductive unit or harem (Kawai *et al.*, 1983). Units of the gelada baboon are made up of one fully adult male, females ranging from 1-10 and their offspring. In the reproductive units, a strong social bond is shared by all of the females. The bond between the females is established because of high relatedness among them. The units forage together, sleep together and groom each other. Grooming entails simply picking through each other's fur. This is not only a friendly and peaceful occupation, but serves also to establish bonds between various members of a harem. It also develops strong relationship in the hierarchy, between male, female, older and young members (Last, 1982).

2.2.5. Threats and Conservation Status

The overall range of the gelada is being eroded as a result of agricultural expansion due to the increasing human population densities on the central highlands. Deforestation and soil erosion are serious problems throughout the area. Grazing pressure is intense and competition from domestic livestock has forced the gelada to remain on the less productive gorge slopes in some areas. Gelada densities are considerably lower in heavily populated areas than in undisturbed habitats. Geladas are also shot as crop pests, and have been trapped as laboratory animals in the past. Adult male numbers may have been reduced as a result of selective shooting for their mane (to be made into ceremonial costumes used by the Oromo people). A few gelada bands range in the Simien Mountains National Park (the

only area of gelada habitat which is currently formally protected). In addition there are proposals for a new Blue Nile Gorges National Park and Indeltu (Shebelle) Gorges Reserve that would protect larger numbers (Gippoliti and Hunter, 2008).

2.3. Human - Wildlife Conflict

Human - wildlife conflict has been in existence for as long as humans have existed and wild animals and people have shared the same landscapes and resources. Human - wildlife conflict or negative interaction between people and wildlife has recently become one of the fundamental aspects of wildlife management as it represents the most widespread and complex challenge currently being faced by conservationists around the world. It arises mainly because of the loss, degradation and fragmentation of habitats through human activities such as, logging, animal husbandry, agricultural expansion and developmental projects (Fernando *et al.*, 2005). As habitat gets fragmented, the length of edge for 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 behavioural needs (Sukumar, 1990).

Human - wildlife conflict is increasing across Africa (Madden, 2004). As human populations and demands for land increase throughout the continent, human - wildlife conflict will continue to increase (Browne and Jonker, 2008). Human - wildlife conflict occurs when wildlife requirements overlap with those of human populations, creating costs both to people and wild animals. It is a serious obstacle to wildlife conservation worldwide and is becoming more prevalent as human populations increase, development expands, the global climate changes and other human and environmental factors put people and wildlife in greater direct competition for a shrinking resource base.

Human - wildlife conflict has been the cause of serious damage to both humans and wild animals for years (Raini, 2009). It occurs as a result of occurrence of both parties in close proximity. The conflict usually starts when wild animals consume resources meant for

human consumption: crops by herbivores and livestock by carnivores (Kissui, 2008). In addition, wild animals that have massive body size like elephants, rhinos, and hippos cause structural damage to fences, electric posts and water pipes as they raid within settlement areas. In addition, such large animals could cause significant damage to crops by trampling (Dudley *et al.*, 2008). Generally, a wide range of species with the principal culprits being insects such as locusts and caterpillars; birds such as seed-eaters and fruit-eaters; primates such as baboons and vervet monkeys; rodents such as rats, mice, springhares and porcupines; ungulates such as antelope, bush pig, elephant, hippo, buffalo and zebra; large carnivores such as lions, leopards, hyenas, wild dogs and wolves; small carnivores like genets, servals and mongooses; and the crocodiles are responsible for conflict (Hill, 2000; O'Connell-Rodwell *et al.*, 2000).

Human - wildlife conflict also occurs when humans encroach into wildlife habitats in search of resources, particularly grazing land for their livestock or when new settlements are established around wildlife habitats (Siex and Strhsaker, 1999; Michalski *et al.*, 2006). Proximity of wild animal populations to subsistence producers has long been recognized to encourage human - wildlife conflict around the world, with primates, ungulates, and elephants all presenting problems for local producers across Africa (Madhusudan, 2003). At the same time, proximity to conservation areas can result in farm losses through livestock predation (Wang and Macdonald, 2006). These situations have become more common as the conservation enclosures have multiplied in the last decade, with new reserves being typically smaller, more fragmented, and closer to historic human populations (Treves and Karanth, 2003). Although the costs of human - wildlife conflict to people are clear, their differential effect on large and small landholders and households closer to reserves or protected areas is not fully known (Chhangani *et al.*, 2008). More generally, the relationship between raiding by specific wildlife species and the relative success or failure of conservation missions for specific species remains understudied. Although it is possible to anticipate that the most marginal households and communities are victims of human - animal conflict, it may be the case that larger landholders and those who benefit themselves of forest resources are more vulnerable. In broad sense, primary

causes of human - wildlife conflicts are demographic, economic, institutional and technological (UNEP, 1995).

2.3.1. Human - Carnivore Conflict

The members of the mammalian order Carnivora number around 226 species, almost all of which are predators (Treves and Karanths, 2003) and its numbers are declining worldwide, largely due to conflict with humans (Rodriguez, 2008). As a group, carnivores exert a profound influence on biological communities via predation and interspecific competition (Treves and Karanths, 2003). Human - carnivore conflicts pose an urgent challenge worldwide because these conflicts often pit human communities against carnivores and other human who seek to preserve or restore wildlife populations (Bangs *et al.*, 1998; Torres *et al.*, 1996).

Human - carnivore conflict arises for several reasons (Michalski *et al.*, 2006). For instance, carnivores' protein - rich diet, large home ranges draw them in to recurrent competition with humans that have similar needs, most of them inhabit areas close to the human habitations and many large carnivore species are specialized for ungulate predation (Polisar, 2000). Due to their large home ranges and diverse habitats, conservation of large carnivores is a challenging practice (Mech, 1995).

Conflict with humans is a major issue in large carnivore conservation (Jackson and Nowell, 1996). Conflict can have multiple implications ranging from fear evoked by the presence of the carnivore to fatal attacks on humans (Loe and Roskaft, 2004). Such conflict is seen with tigers in Indonesia and India (Nyhus and Tilson, 2004) and lions in Africa and India (Patterson *et al.*, 2004; Saberwal *et al.*, 1994). Even in the absence of attacks on humans, livestock depredation by carnivores can slow down the livelihoods of people and affect their economic condition (Ogada *et al.*, 2003). Human - carnivore conflict in terms of livestock depredation is perhaps more common and is seen in several reported cases across the world like pumas and jaguars in Brazil (Zimmermann *et al.*, 2005), wolves and bears in North America and Europe (Jackson and Nowell, 1996;

Kaczensky, 1999), lynx in Norway (Odden *et al.*, 2002), lions, wild dogs and leopards in Africa (Patterson *et al.*, 2004; Romanach *et al.*, 2007), leopards and tigers in Asia (Wang and Macdonald, 2006).

2.3.2. Human - Herbivore Conflict

Human and wild animals have been in conflict because agricultural crops generally offer a rich food source for wild animals as well as for people. Large wild herbivores compete for pasture resources with livestock and can act as reservoirs of livestock diseases. As a result, humans have extirpated many native animal species from agricultural areas, either directly or indirectly through modifications in habitat availability or structure resulting from land use changes. As human populations have expanded in developing countries they have caused loss in biodiversity and species extinctions (Gordon, 2009). Wildlife damage to agricultural crops is a serious concern affecting much of the world today (O'Connell-Rodwell *et al.*, 2000; Singleton *et al.*, 2005).

The encroachment of wild habitats by subsistence farmers in Africa as a result of increased population is on the increase and this calls for concern. Crop raiding by wild animals is one of the major causes of human - wildlife conflict. Crop raiding can be simply defined as wild animals moving from their natural habitat onto agricultural land to feed on the produce that humans grow for their own consumption (Ojo *et al.*, 2010). Crop damage affects farmers directly through loss of their primary food and cash resources and indirectly through a variety of social costs such as costs for school and hospital. Due to these losses, rural people express their fear or even interfere with development projects that deal with wildlife conservation (Hill, 2000).

2.3.3. Human - Primate Conflict

Primates are one of the most frequently cited crop pests (Naughton-Treves, 1998; Hill, 2000), so primates and humans are always in potential conflict over crops. The genera *Macaca*, *Papio* and *Cercopithecus* particularly baboons and vervet monkeys are one of the

most serious crop raiders because of their intelligence, adaptability, wide dietary range, complex social organization, aggression etc (Sillero-Zubiri and Switzer, 2001). In most primate range countries, the major threats to populations are due to the extensive conversion of primate habitat into areas of human use for agriculture, forestry and plantations, trapping for the biomedical trade, the effects of the bush meat trade and disease (Walsh *et al.*, 2003).

The significant problem relates to primates that are provisioned by people, when people seek contact with monkeys. The monkeys develop a taste for human foods, lose their fear of humans and then become proactive and aggressive in seeking human foods. This conflict is particularly interesting in that it arises from a positive desire to contact monkeys and then people discover that the contact poses risks from bites, theft of non-provisioned food or more general health issues such as exposure to simian viruses (Else, 1991). In contrast to situations of direct conflict over livelihoods, which produce negative perceptions of primates, here positive attitudes are responsible for the creation of a pest primate problem. Inadvertent opportunities for kitchen theft, garbage raiding or from intentional human provisioning may result in population increases, exacerbating the existing problems and the monkeys are then at risk of culling or complete removal (Fa and Lind, 1996).

A more general conservation issue for primate populations relates to the potential for indirect conflict between primates and livestock that forage on similar resources. Where people increase stocking rates in relation to natural vegetation availability, to enhance returns of meat, milk and other animal products, primates may be squeezed out or suffer reduced reproductive rates by the far more effective off take of human - managed livestock movements through the area. While the human herders may not have a perception of monkeys as pests, the indirect competition can drive monkeys into habitats, such as forests or plantations (Ciani *et al.*, 2001), where they cause significant damage and become pests.

2.4. Attitude of Local People towards Wildlife

2.4.1. Attitude towards Carnivores

Carnivores often are hated by people (Mech, 1970). Uneducated adults holding negative perception towards carnivores like jaguars and pumas could be changed through educational programs. Rather, the attitude of local people towards wild carnivores would more likely undergo a positive change if they could obtain economic profit by getting enrolled in activities involving conservation of wild carnivores, such as ecotourism.

Most wildlife conservation efforts fail to consider peoples' perception towards a species and to communicate the benefits that come from protecting species, including values, such as cultural, moral, aesthetical and recreational (Kellert, 1985). When a species is appreciated as a symbol of wilderness, this aesthetic value may be enough to establish positive attitudes towards the species, whether it is considered to have other values or not (Mech, 1970). The livestock predation impact needs to be considered with regard to local perceptions about carnivores, given that it can potentially affect local attitudes towards predators. Human attitude towards carnivores tend to be shaped by understanding of a particular species, as well as by past and present interactions with that species (Kellert *et al.*, 1996). Where large carnivores prey upon livestock, local people often hold negative attitudes for wildlife, as reported for snow leopards (*Panthera uncia*) (Oli *et al.*, 1994) and wolves (*Canis lupus*) (Lenihan, 1996).

Wild carnivores commonly generate negative attitudes among rural residents in many regions of the world where they prey upon domestic animals (Oli *et al.*, 1994; Mech, 1995; Lenihan, 1996). Predators such as jaguars and pumas are blamed for monetary losses due to livestock depredation (Crawshaw, 1995; Mazzolli *et al.*, 2002). Oli *et al.* (1994) reported that most local residents living in or adjacent to the snow leopard habitat wanted the species to be eradicated to stop livestock damage. Livestock is often killed by predators living close to farmland and pastures (Patterson *et al.*, 2004). Livelihoods can be severely affected by such depredation and generating negative attitudes (Woodroffe and Ginsberg, 1998; Hussain, 2003).

2.4.1.1. Attitude towards Ethiopian wolf

According to Sillero-Zubiri and Macdonald (1997) the attitude of local people towards Ethiopian wolf vary from indifferent to negative, always in direct relation to their need for farming and grazing land. Conflict is likely where there are shepherds and in some areas Ethiopian wolves have been accused of taking small stock (Deresse Dejene, 2003) and leads negative attitude towards it. Small number of people in Menz, north Shoa, suggested that wolves are tolerated, although they are perceived as killers of small livestock (Sillero-Zubiri, 1995). According to Messele Yihune (2006) most residents in and around Simien Mountain National Park have positive attitude towards Ethiopian wolf because many residents considered that the Ethiopian wolf is an endemic species and important source of income. Generally with the exception of rare attacks by children, people were indifferent to wolves (Deresse Dejene, 2003).

2.4.2. Attitude towards Herbivores

Large mammalian herbivores cause crop loss near protected areas in many parts of Africa and Asia. The extent of damage is almost insignificant when it is considered at the global level as compared to the damage caused by invertebrates and rodents. However, in areas where large numbers of animals occur, the whole crop field may be lost in a single night (Naughton-Treves, 1997).

Among the common agricultural pests like primates, rodents, birds and insects the damage caused by elephants is often far greater (Hoare, 2000). This is because elephant raids are unpredictable and can cause more damage per raid. Almost all countries in Africa including Ethiopia reported problems with elephant crop raiding (Yirmed Demeke, 1997). Local people living in and around protected areas, who are unable to control the crop losses caused by wild herbivores, are likely to develop negative attitude and those who get benefit from the wildlife develop positive attitude towards pest herbivores.

2.4.3. Attitude towards Primates

One fundamental influence on perceptions of local people towards primates is the general cultural attitude. Levels of tolerance, acceptance and even demand for interactions vary with cultural context (Biquand *et al.*, 1992; Gautier and Biquand, 1994). Cultural perceptions towards primates vary enormously and have shifted over time. Historically, primates were sacred as guardians of human settlements, as spirits of ancestors, or as an embodiment of sexuality, wisdom and fortune in some areas. In some societies, monkeys may even be incorporated into the kinship or cosmological belief system (Cormier, 2002). Monkeys and apes are kept as pets, sharing household areas and food, acting as surrogate infants or dolls or exploited for their entertainment value. This may be a converse of the human companion animal relationship (Serpell, 1981).

Crop losses due to primates were considered acceptable or normal within general crop yields. Perceptions of the significance of the primate problem might rank relatively low in the general context of pests. The relative suggestions that even minor losses can assume a major perceptual importance when farmers become engaged in a market economy. Primates are pests in a huge variety of contexts in fields, tourist lodges, reserves, roadsides, temples, or towns. One key issue is increasing competition between primates and humans with the spread of agriculture and human activity into areas that previously sustained primates. There is little quantitative work on the socio-economics of pest primates, and the importance of loss of subsistence as opposed to cash crops is unknown, either in terms of the economics of the losses or in relation to changing perceptions. However, primates dominate amongst pests that damage crops, particularly around African and Asian reserves, being responsible for over 70% of the damage events and 50% of the area of farms damaged (Naughton-Treves, 1998).

Almost all primate families have been identified as crop-raiders, although species differ in their ability to cope with encroaching human settlement. Rainfall, season, crop variety and characteristics, food availability, distance from forest, nearest farm or village, and farm protection methods will have an impact on raiding (Biquand *et al.*, 1992; Hill, 1998;

Naughton-Treves, 1998). The raiding frequency and intensity influence the attitude of local people towards primates.

Local peoples' perception of conflict does not always correspond to reality; in some cases negative impact is only perceived and may result from confusing ecological factors by socio-economic variables (Siex and Struhsaker, 1999). Generally, negative attitudes are functions of degree of contact with primates as pests, and to a lesser extent with the risks perceived to result from direct primate - human contacts. Brief contact with monkeys in the absence of crop damage tends to promote positive attitudes (King and Lee, 1987; Knight, 1999), while even minimal experience of raiding leads to an attribution of blame that may greatly outweigh the extent of the damage (Hill, 2000; Chalise, 2000; Chalise and Johnson, 2001; Naughton-Treves, 1997). It should be noted that societal expectations like myth, religious belief, economic or political contexts establish initial principles for how humans are expected to behave towards monkeys. The subsequent experience of those people with monkeys is thus layered on a series of beliefs and expectations to produce perceptions of monkeys.

2.4.4. Attitude towards other Animals

Local people use the local fauna for different purposes like for medicine and food. The direct use of animals suggests that there might be little awareness regarding the negative consequences for animals. The most common attitude of people towards animals is the utilitarian one, with little consideration of the consequences. In South Africa, for example, some species of reptiles are more intensively used by traditional healers (Smart *et al.*, 2005). Birds can be important for seed dispersal, biological control of pests and aesthetic values; which led to positive attitude towards some bird species. Concerning snakes, the majority of local people showed low knowledge in believing that most snakes are non-poisonous, so local peoples perceived snakes as being dangerous animals (Lopez-del-Toro *et al.*, 2009).

For non - flying mammals, attitudes were in general indifferent. However, the perception of local people has been positive towards those species used as food and negative towards those species that cause some level of damage. Negative attitudes also revealed towards rodents that damage crops. In Indonesia and India costs associated with wildlife have a negative impact on local perceptions, while the benefits have positive effects (Shekhar, 2007).

The negative perceptions towards bats are possibly linked to the damage that these animals may cause to livestock, for example, vampire bats. However, the damage or benefit obtained from a group of animals is not the only factor shaping the attitude of local people. For example, some bird species can cause damage to their crops, and yet their attitudes towards birds in general were overwhelmingly positive (Lopez-del-Toro *et al.*, 2009). According to Kaltenborn *et al.*, (2006), animals that cause higher levels of damage are disliked, and when the damage is small or moderate, the attitudes of people are more positive. Thus, in the case of bats, and to some extent also in the case of snakes and others, many of the negative perceptions and attitudes can probably be attributed to lack of knowledge, and the prevalence of culturally inherited beliefs. Generally, the attitude and perceptions of local people are positive for birds, intermediate for non-flying mammals, and lower for snakes, rodents, pest insects and bats (Lopez-del-Toro *et al.*, 2009).

3. OBJECTIVES

3.1. General objective

- The general objective of this research was to assess the status of human - wildlife conflict involving the Ethiopian wolf and gelada baboon in and around the Guassa Community Conservation Area and suggest solutions.

3.2. Specific objectives

- To determine human impact on wildlife.
- To reveal the impact of wildlife on the local people and livestock and vice versa.
- To document the nature and intensity of damages due to human - wildlife conflict in the local economy.
- To explore major causes giving rise to human - wildlife conflict
- To assess the agricultural crop losses caused by wildlife
- To show the degree of conflict

4. DESCRIPTION OF THE STUDY AREA

4.1. Climate

In Guassa area, the climate varies according to altitudinal gradients and the size of the mountain block. The weather at Guassa is often unpredictable, with days characterized by some combination of sun, fog, rain or wind while nights tend to be cold. Temperature at Guassa fluctuates widely over the course of almost any single day, invoking the old adage about African alpine ecosystems “summer every day, winter every night.”

The high altitude of the area means that mild day and cold night temperatures are common place with day time temperature rising up to 26⁰C in the driest months and night temperatures dropping to below zero. The diurnal temperature variation is lower in the wet season with a day time of 12⁰C and night time of 3⁰C (Zealelem Tefera, 2001). Due to the absence of data specific to Guassa area, the data are taken from the nearby Mehal Meda (3000m asl) town. From the ten years data (2000 - 2009) the mean monthly minimum temperature ranges from 5.28⁰C to 8.66⁰C while the maximum temperature ranges from 16.64⁰C to 20.03⁰C (Fig. 4). The mean monthly minimum temperature was 5.28⁰C, recorded in November and the maximum was 20.03⁰C, recorded in June. This means that the coldest month is November and the hottest month of the year is June.

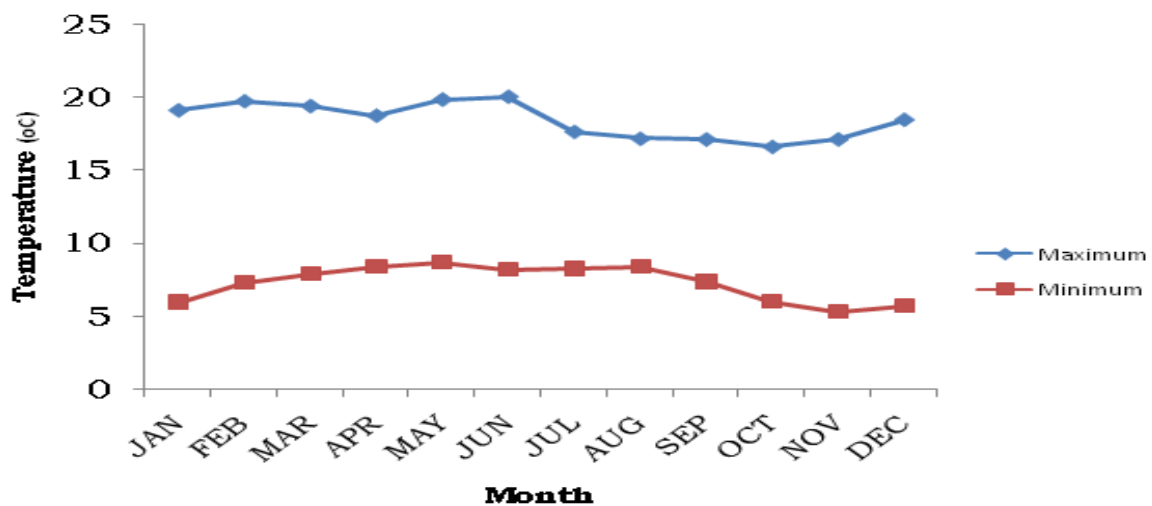


Figure 4. Monthly average maximum and minimum temperature in Mehal Meda (2000 - 2009).

The Guassa area receives its rain from the Equatorial Westerlies and Indian Ocean air stream at different time of the year. Rainfall in Guassa is characterized by one main rainy season (*Keremt* or *Meher*) between June and September and minor rainy season (*Bega* or *Belg*) in February to April (Zealelem Tefera, 2001). The annual rainfall ranges from 767mm to 1045mm with the mean annual rainfall of 896mm (Fig. 5).

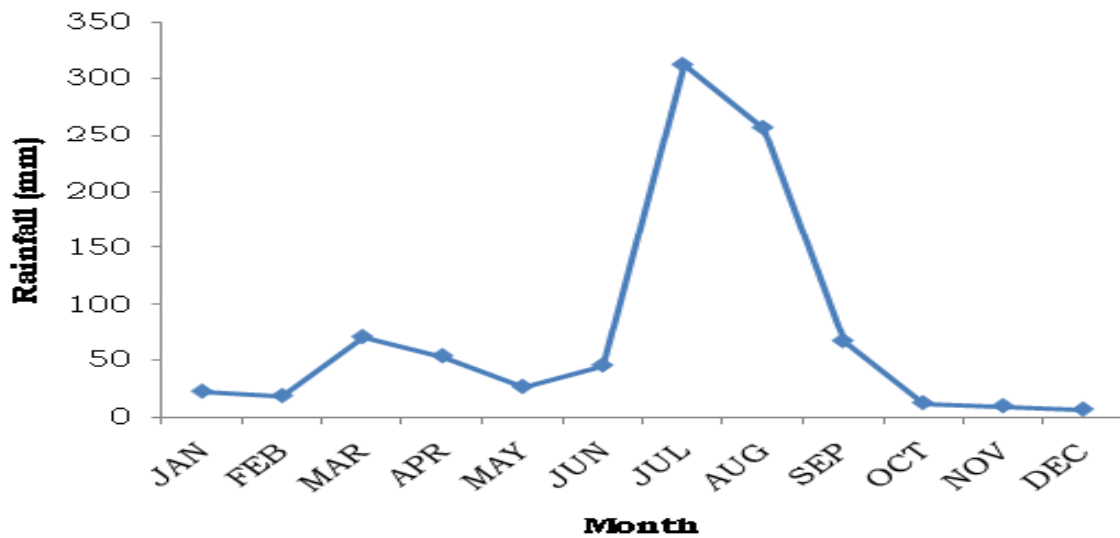


Figure 5. Monthly average rainfall in Mehal Meda (2000-2009).

The relative humidity is highest in the wet season and lowest in the dry season. The annual relative humidity ranges between 55.18% and 80.90% (Fig. 6).

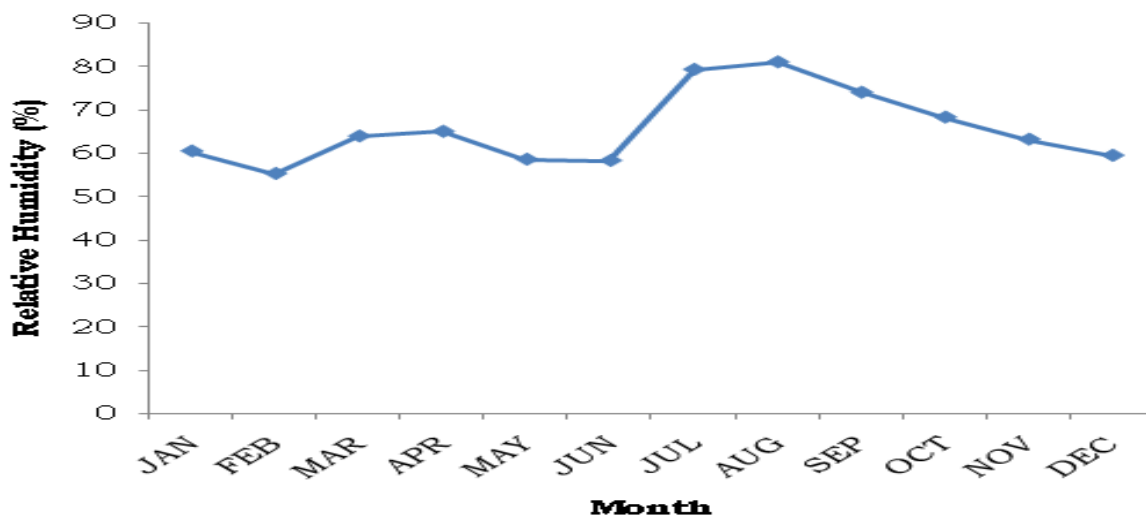


Figure 6. Monthly average relative humidity in Mehal Meda (1997- 2007).

4.2. Topography and Hydrology

The topography of Guassa area is bounded by a steep escarpment of the Rift Valley in the east and low-lying agricultural areas of Menz in the west. The escarpment of the eastern side of the Guassa area forms a continuous north-south wall, with cliffs over 1km long. This cliff provided the area with spectacular scenic beauty and stunning views across the Yifat and Great Rift Valley up to the Awash River in the Afar (Zealelem Tefera, 2001; Zealelem Tefera and Leader-Williams, 2005). The Guassa area is a water catchment area for many streams and rivers draining into the low-lying areas of North Shoa. It provides water to two major river systems, namely the Abbay to the west and the Awash to the east. Twenty six small and medium sized rivers start from the Guassa area flowing to the west and east sides of the mountain block (Zealelem Tefera, 2001). The Guassa area comprises hills and valleys interspersed with swamps and open areas of montane and alpine grassland. These provide water holding capacity and also limit runoff in the rainy season, thus providing flow all year round.

4.3. Soil

The central highland's soil is characterized by two principal types, originating from the disintegration of volcanic substrates intermingled with sand and limestone. These comprise: black clay soil (Vertisol) and reddish-brown heavy loam (Red) soil. The former type appears on flat plateau and in the bottoms of valley slopes and well drained areas. Generally the soil of the Guassa area is deep and humic. However, on higher ground, the soil is shallow and highly mineralized (Zealelem Tefera, 2001).

4.4. Biodiversity, Threats and Conservation

By regulating the exploitation of the area, the ancient "Qero" system has protected the unique and diverse flora and fauna of the area. The Guassa area harbours several endemic species of flora and fauna associated with the Afro-alpine ecosystem (Zealelem Tefera, 2001).

The vegetation of the Guassa area is characterised by high altitude Afro-alpine communities, within which different habitat types predominate, comprising: *Euryops-*

Alchemilla shrubland, *Festuca* grassland, *Helichrysum-Fesutca* grassland, *Erica* moorland, *Euryops-festuca* grassland and Swamp grassland. The area derives its name from the so called “Guassa grass”, which comprises four species of *Festuca* namely, *F. abyssinica*, *F. simensis*, *F. richardii* and *F. macrophylla* highly valued by the local community. The other common plant species are: *Euryops pinifolius*, *Alchemila abyssinica*, *Echinops steudneri*, *Swertia erythraeae*, *Lobelia rhynchopetalum*, *Helichrysum splendidum*, *Erica arboria*, *Carex monistachia* and others (Zealelem Tefera, 2001).

According to Zealelem Tefera (2001) there are 111 bird species in Guassa area of Menz. The area harbours 12% of the 861 species of birds recorded in Ethiopia. Out of 111 species 14 are endemic and accounts for 48.3% of the endemic birds of Ethiopia. The Guassa area is also home to the world’s largest concentration of the globally endangered Ankober serin (*Serinus ankoberensis*) and the spot-breasted plover (*Vannellus melocephalus*). The protection of the area is therefore paramount for resident endemic birds as well as for migratory species of birds wintering in the highlands of Ethiopia. Five other bird species found in the area are listed as near-threatened and two species as vulnerable (Zealelem Tefera, 2001).

Endemic mammal species exist in the Guassa area that include the endemic Ethiopian wolf (*Canis simensis*), gelada baboon (*Theropethicus gelada*) and Abyssinian hare (*Lepus starcki*). Other large mammal species in the Guassa include: leopard (*Felis pardus*), grey duiker (*Sylvicapra grimmia*), klipspringer (*Oreotragus oreotragus*), common jackals (*Canis aureus*), spotted hyena (*Crocuta crocuta*), civet (*Viverra civeta*), honey badger (*Mellivora capensis*), Egyptian mongooses (*Herpestes ichneumon*) and serval cat (*Felis serval*). A variety of small rodents like porcupine (*Hystrix cristata*), common mole rat (*Tachyoryctes splendens*), the unstriped grass rat (*Arvicanthis abyssinicus*), the harsh-furred rat (*Lophuromys flavopunctatus*), the Abyssinian meadow rat (*Stenocephalemus grisecauda*) and the groove-toothed rat (*Otomys typus*) and shrews like *Crocidura thalia* and *Crocidura baileyi* survive in the area. Among the mammal species recorded in the Guassa area, seven species are endemic to Ethiopia which accounts to 22.6% of the endemic mammal fauna of the country (Zealelem Tefera, 2001).

Due to the low ambient temperature at Guassa area, few reptiles and amphibians are recorded. Two snakes; Abyssinian slug-eater (*Duberria lutrix*) and side-striped grass snake (*Psammophylax* spp.). Two toad species; *Bufo kerinyagae* and *Ptychadena* spp. are the known amphibians recorded for the area. A skink (*Mabuya megalura*) also occurs in the area (Zealelem Tefera, 2001).

The Guassa area is rich in biodiversity and contains several endemic and threatened species of flora and fauna, including the second largest remaining population of Ethiopian wolf, and the largest population remaining outside a formally protected area (Zealelem Tefera *et al.*, 2005). The major threats to the Guassa area resources are expansion of subsistence agriculture, over grazing, habitat fragmentation, human - wildlife conflict and wildlife disease (Zealelem Tefera, 2001).

4.5. Land - Use Pattern

The natural resource management system of the Guassa area (known as the Qero system) started in the 17th Century and given that it still persists, makes it one of the oldest conservation areas in sub-Saharan Africa (Zealelem Tefera, 2001). Currently, the Guassa area is managed by the community for grazing land, firewood collection and the cutting of Guassa grass for various purposes such as thatching, household and farming materials like ropes and whips. The use of these resources was restricted to a limited period of time (Zealelem Tefera, 2001). The Guassa area is currently managed by farmers' association and Guassa conservation council elected from nine user farmers' associations. Out of the 20 farmers associations or Kebeles that are found in Menz Gera Mider District, only nine farmers association namely Kewula (02), Gedenbo (03), Kuledaha (04), Alfa-Medir (05), Chare (06), Tesfomentier (014), Gragne (015), Dargegne (016) and Yedi (020) used the resources of Guassa. While 05, 06, 016 and 020 are Guassa adjacent kebeles (Fig. 7). The Guassa area is found in the four adjacent Kebeles'. The right to use the resources of the Guassa area depend on the prevailing land rights and tenure system.

4.6. Population and Economy

The total population of Menz Gera Medir Woreda (District) is 102,420 of which 49,956 and 52,464 are males and females respectively (FDREPCC, 2008). From these 11,049 live in urban and the rest 91,371 live in rural area. The population is predominantly Amhara and their language is Amharic. 99.5% of the population is Orthodox Christianity and the rest are Protestant and Muslim religion followers.

The dominant economic activity of the Menz people is farming which involves crop production and livestock husbandry. The area is well known in barley production in two farming seasons called *belg* and *meher*. *Belg* crop production contributes about 60% to the annual production and the rest 40% of the annual crop production from the *meher*. The Menz area is also known in sheep and cattle rearing which are highly valued for their meat and wool production and are important commercial activities for the farmers. The Guassa area is critical natural resource for the adjacent people of Menz, which provides various essential ecosystem goods and services such as fodder, fuel, building materials, household and farm implements. The area is also important for the livelihood of local communities who harvest Guassa (*Festuca*) grass. The harvest and subsequent sale of the *Festuca* grass in nearby market for thatching represents an essential source of income to the local community, particularly during hardship periods serving as cash crop to cope up with severe drought seasons (Zealelem Tefera, 2001).

5. METHODS AND MATERIALS

5.1. Location

Guassa Community Conservation Area is one of the smallest afro-alpine ranges in the central highlands of Ethiopia (between 10⁰ 15' - 10⁰ 27'N and 39⁰ 45' - 39⁰ 49'E) (Fig. 7). The area is locally known as Guassa by Menz people. Politically the Guassa area is found in the Amhara Regional State within North Shoa Zone and in Menz Gera Medir District (Woreda). Mehal Meda is the capital of the Woreda and is 17km far apart from the Guassa area in the west. The area is 265 km by road north-east of Addis Ababa and 135km north of Debre Birhan, the capital of North Shoa Zonal Administration. The total area of the Guassa is 111km², and its altitude ranges from 3200 to 3700m asl (Zeleelem Tefera, 2001).

5.2. Data Collection

Data were collected from seven Guassa adjacent villages between November, 2009 and May, 2010. The data were collected from the study site by questionnaire survey of households, faecal analysis, direct observation on crop damage by gelada baboon and focus group discussions.

5.2.1. Questionnaire survey

In the seven studied villages, a total of 250 (82 females and 168 males) respondents participated in the interview using questionnaire in the following composition:

- Yegora 39 (10 females and 29 males)
- Defergie 35 (14 females and 21 males)
- Alfa 32 (8 females and 24 males)
- Tarete 35 (11 females and 24 males)
- Frekuta 40 (14 females and 26 males)
- Agancht 37 (15 females and 22 males)
- Tebab 32 (10 females and 22 males)

Villages like Yegora, Alfa and Ferkuta are located in the Alfa-Medir farmers association (05 Kebele), Defergie and Tarete located in the Yedi (020) Kebele, Agancht located in the Chare (06) Kebele and Tebab located in the Dargegne (016) Kebele (Fig. 7).

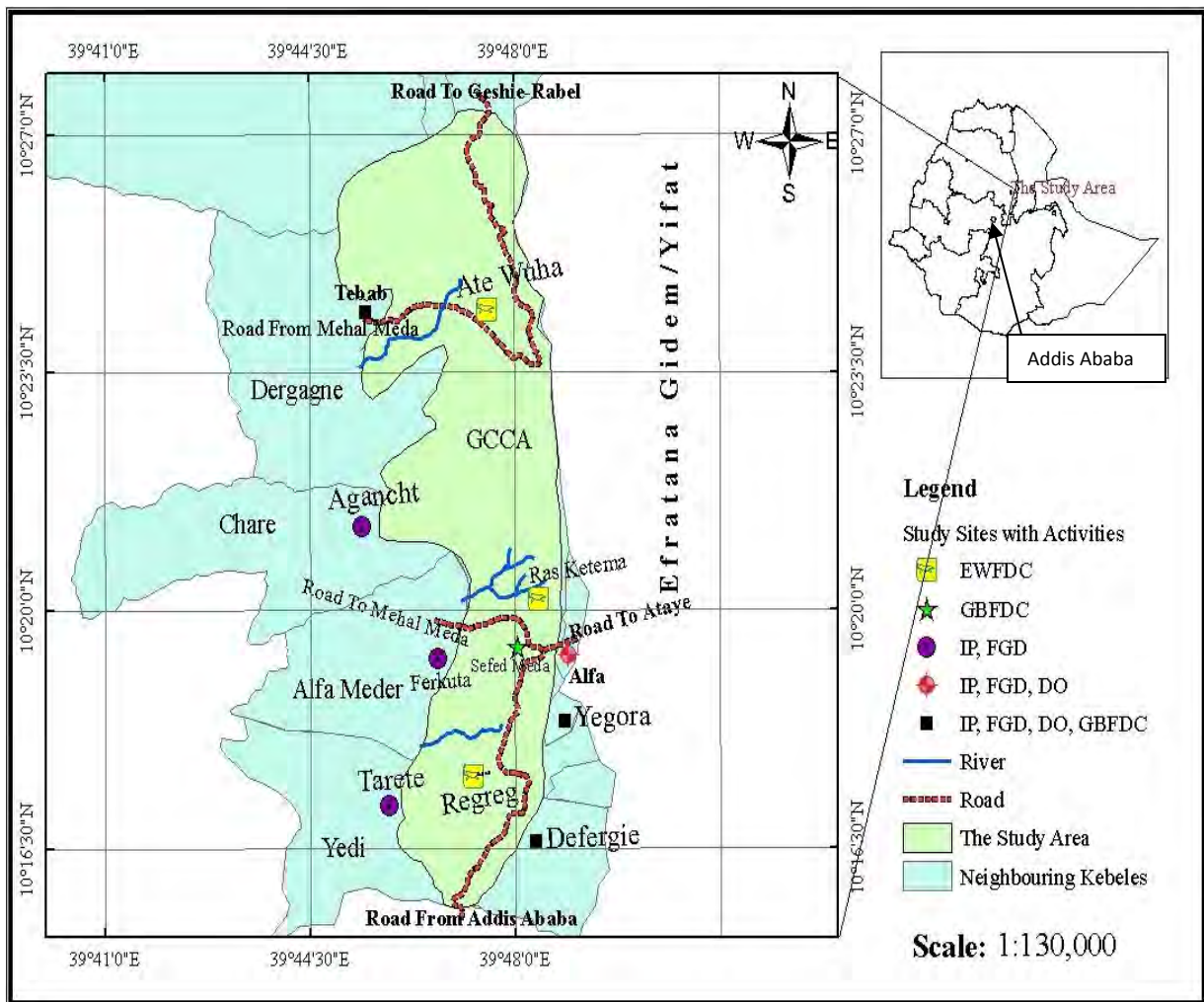


Figure 7. Map of the study area with adjacent Kebele (farmer’s association).

(Key: **GCCA** = Guassa Community Conservation Area, **EWFDC** = Ethiopian Wolf Faecal Dropping Sample Collection Sites, **GBFDC** = Gelada Baboon Faecal Dropping Sample Collection Sites, **IP** = Interviewed Person, **FGD** = Focus Group Discussion, **DO** = Direct Observation Sites).

The questionnaire was designed mainly to check whether there is a human - wildlife conflict or not in and around Guassa Community Conservation Area and also designed to ask for information such as the general socio - economic status of the community, issues of human - wildlife conflict currently being faced in each villages, extent of damage to wildlife and humans, economic implications of the damage, attitude of local people in relation to human - wildlife conflict. The questionnaires contain both open and close ended questions to get information about wildlife and their problems in the study area (see appendix I).

5.2.2. Faecal Analysis

A total of 88 and 107 faecal dropping samples of the Ethiopian wolf and gelada baboon were collected, respectively. The faecal dropping samples of the Ethiopian wolf were collected from three sites namely, Regreg, Ras Ketema, and Ate Wuha to check whether there is sheep depredation by Ethiopian wolf or not. Regreg is located between Yegera, Defergie and Tarete villages, and livestock grazing sites of these villages (Fig. 7). The gelada baboon faecal dropping samples were also collected from four sites; Yegora, Defergie, Sefed Meda and Tebab (Fig. 7) to check whether there are local crop seeds or not in the faecal dropping samples.

During the time of faecal collection the age of samples was categorized into fresh, recent and old (Breuer, 2005). Area, location, date of collection, age of faeces, time of collection, altitude of the collection site and position were also recorded. According to Breuer (2005) identification of carnivore faeces was carried out based on shape, colour, ingested hair, diameter and odour.

The faecal samples of the Ethiopian wolf were grounded in a mortar after sun dried, and then washed in a sieve (1mm) using hot water to separate hairs, bones, teeth and other prey components from other organic material. Then the separated hairs were washed in acetone, dehydrated by ethanol and dried on filter paper. Hair was analyzed macroscopically by considering form, length and color (Breuer, 2005).

The faecal samples of gelada baboon were analyzed macroscopically to determine the presence or absence of locally abundant seeds in the study area. The presence and absence of cereal crop seeds was designated by (+) and (-) respectively. It is not possible to accurately measure the proportion of plant species eaten in faecal analyses (Remis, *et al.*, 2001).

5.2.3. Direct Observation on Crop Damage by Gelada baboon

Four farmland sites; namely, Yegora, Defergie, Alfa and Tebab were randomly selected to observe the crop damage by gelada baboon and to compare the result with the response given by the local people. Four grids (one grid on each site) were constructed and each grid was further classified into five cells (Mesele Yihune, 2006). Each grid covers 2 ha where as each cell covers an area of 0.4 ha. Each grid was visited five times at three days interval and recorded crops that were eaten by gelada baboon. For each cell, the type of crop grown, area of damaged portion, part of plant eaten and crop species eaten were recorded (Naughton-Treves, 1997).

5.2.4. Focus Group Discussion and Key Informants

Focus group discussion and key informant methods were used to reinforce questionnaire data (Tewodros Kumssa, 2006). Seven pre-designed open-ended questions were used for gathering information (see Appendix 5). Information was collected on how local communities perceive wildlife, how they access and use the Guassa Community Conservation Area (*Festuca* grass, Fire wood), the co-existence of wildlife and communities and as a whole how both local communities and wildlife benefited from the conserved area. Seven focus group discussions in each study site were conducted and the group size in each discussion site varied from 10 in Tebeb to 18 in Yegora village. Participants were invited to discuss issues according to their convenience. The information collected from group discussion and key informants was summarized using a text analysis method, and is presented in a description fashion.

5.3. Data Analysis

Statistical Package for Social Science (SPSS) version 17 was used to analyze the data. The questionnaire was coded and run to SPSS. Data were analyzed using descriptive statistics and responses compared using chi-square test and one-way ANOVA. Post hoc Tukey and LSD test were used to identify the real difference after a one-way ANOVA test. Correlation was used to determine the relationship between the different variables.

6. RESULT

6.1. Questionnaire Survey

6.1.1. Demographics

The total number of respondents were 250. Out of these 168 (67.2%) were male and 82 (32.8%) were females (Fig. 8). The number of males was significantly higher than females ($\chi^2 = 29.58$, $df = 1$, $P < 0.001$). The majority (66.8%) of the respondents' age ranged from 31 to 60 years old, while 7.2% and 9.6% of the respondents' were less than 20 and older than 60 years, respectively (Fig. 9). There was no significant age difference ($F_{1\ 248} = 0.015$, $P > 0.05$) between the male and female respondents. Out of the total respondents, most (82.8%) were married and the rest 10%, 2.8% and 4.4% were single, divorced and widowed, respectively (Fig. 10).

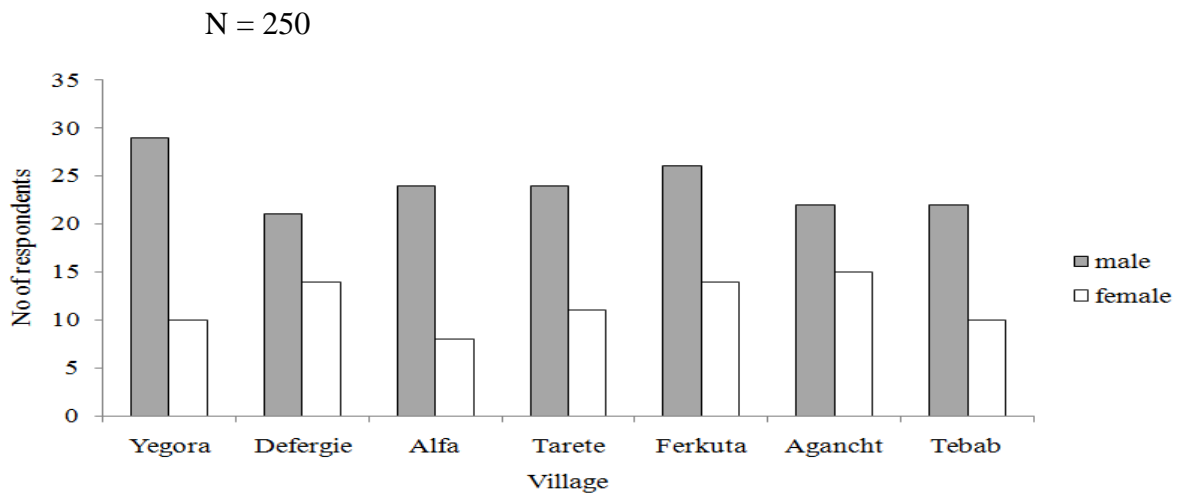


Figure 8. Number of respondents in each village.

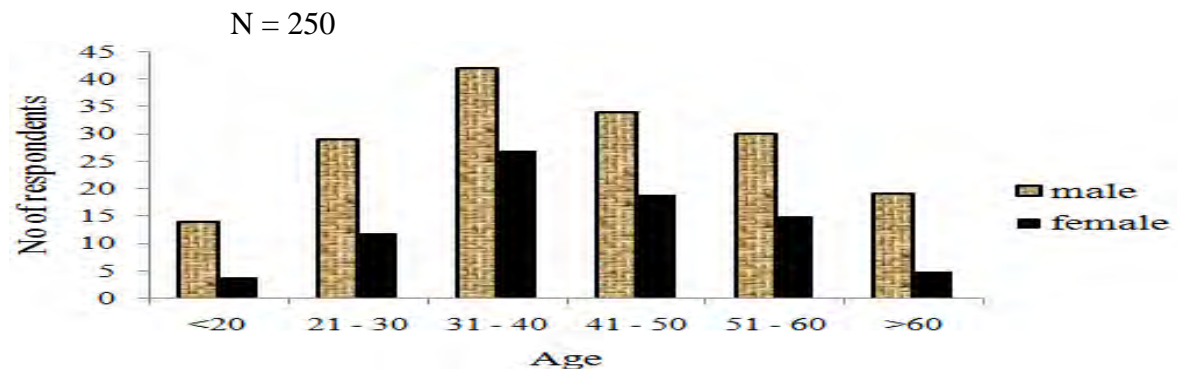


Figure 9. Age class of the respondents.

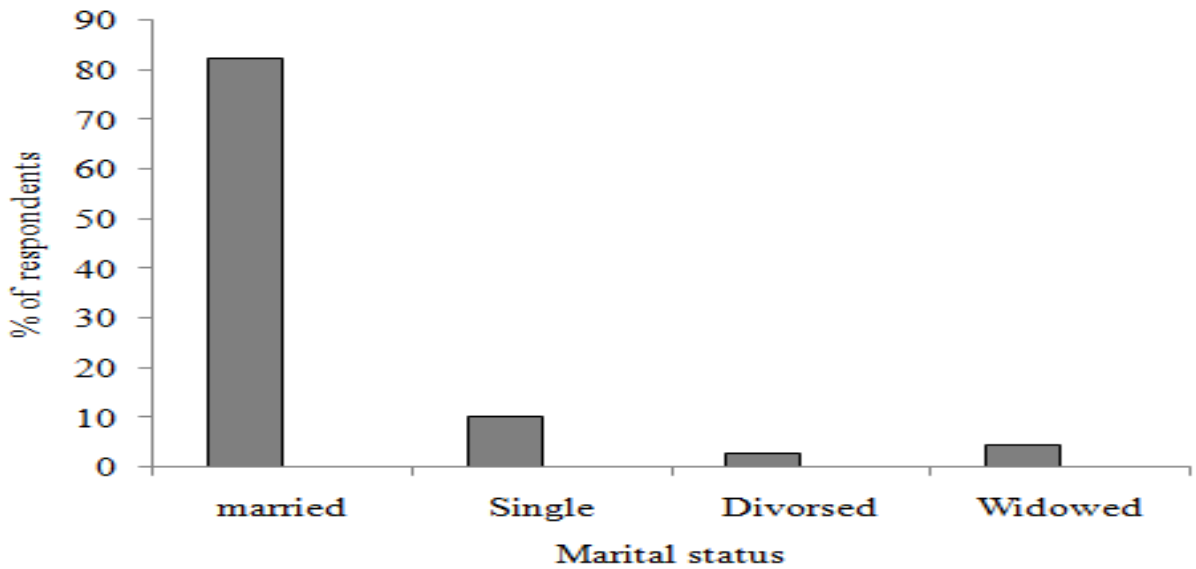


Figure 10. Marital status of the respondents.

Most (59.6%) interviewed respondents were illiterate, 10% had informal education, 28% had primary education, 1.6% had secondary education and none of them had beyond secondary level education (Fig. 11). There was significant difference ($\chi^2 = 198.416$, $df = 3$, $P < 0.001$) in educational status among respondents. Most (44.4%) respondents had 4 - 6 family size. On the other hand, 24% and 0.8% of the respondents had 1 - 3 and more than 10 families, respectively (Fig. 12).

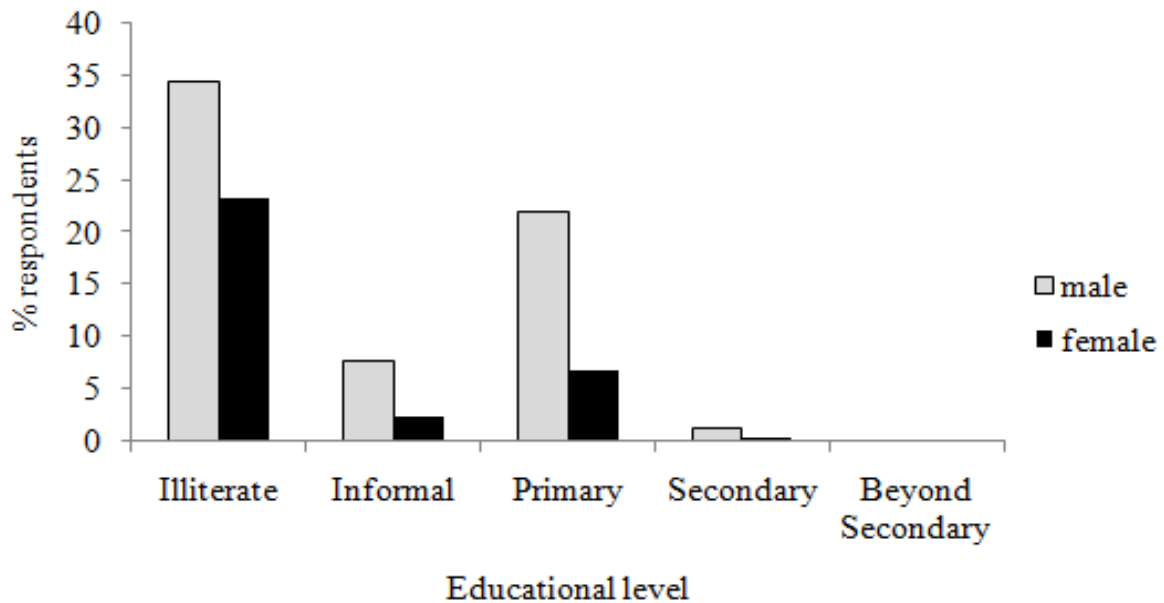


Figure 11. Educational level of the respondents.

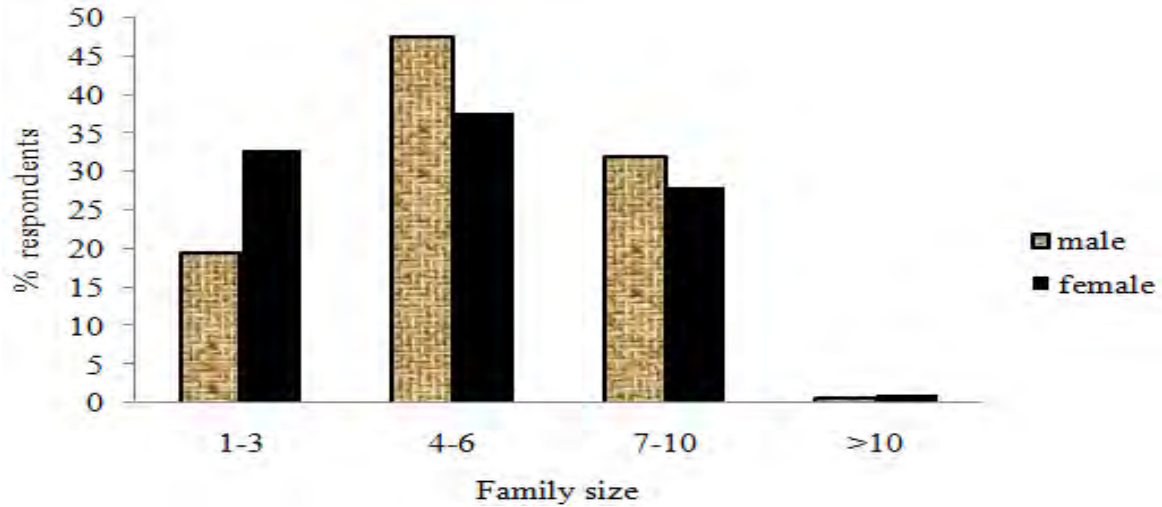


Figure 12. Percentage of respondents' family size.

Of the total respondents, 44% lived between 1 and 3 km and 43.2% lived very close (<1 km) to the boundary of the study area. 12.8% of the respondents live more than 3 km away from the boundary of the study area (Fig. 13). Generally 88.2% of the respondents live adjacent to the area. Villages differed significantly ($\chi^2 = 341.43$, $df = 12$, $P < 0.001$) in terms of distance from the border of the area among respondents. None of the respondents live inside the Guassa area.

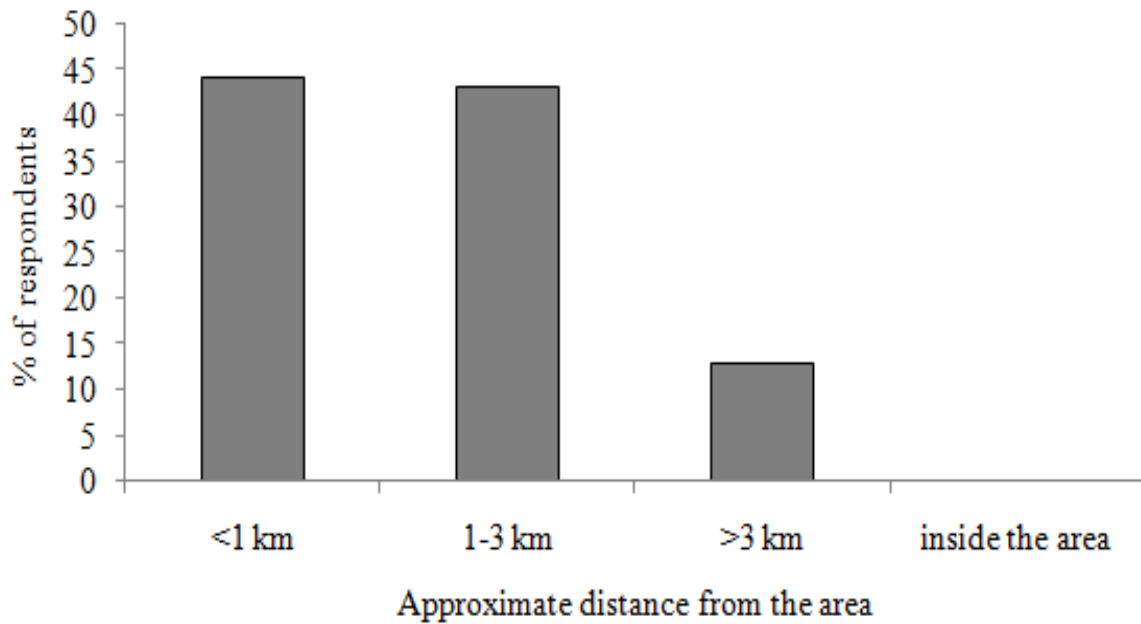


Figure 13. Residence of respondents distance from the boarder of study area.

The mean size of farmland in the study area was 0.96 ± 0.029 ha. Farmland holdings differed across all villages ($F_{6,243} = 4.138$, $P < 0.01$). Using Tukey test, the mean farmland differed significantly when Defergie compared with Firkuta ($P < 0.05$) and Agancht ($P < 0.001$). In addition, when Agancht compared with Tebab showed a significant difference ($P < 0.05$). Thus, Defergie contained the largest where as Agancht contained the least size of farmland holdings per household (Fig. 14).

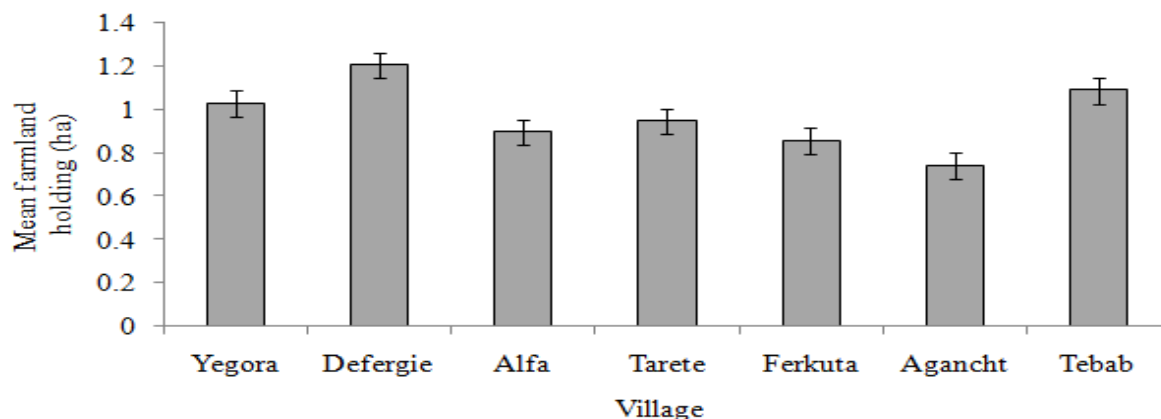


Figure 14. Mean \pm SE of farmland holding per household among respondents.

The average grazing land holding in the study area was 0.0114 ± 0.002 ha. There was no significant difference in grazing land holdings across villages ($F_{6,243} = 1.963$, $P > 0.05$). But by using LSD test, villages differed significantly when Ferkuta was compared with Yegora ($P < 0.05$), Defergie ($P < 0.01$), Agancht ($P < 0.05$) and Tebab ($P < 0.05$) (Fig. 15).

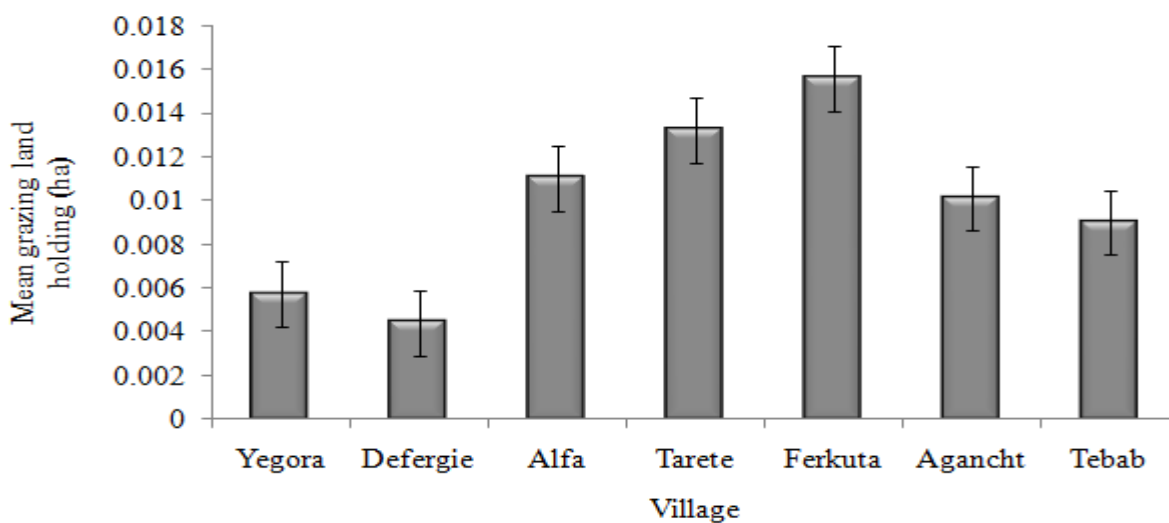


Figure 15. Mean \pm SE of grazing land holding per household among respondents.

6.1.2. Livelihood activities and resource utilization

The major livelihood activity of the people living adjacent to the Guassa Community Conservation Area is subsistence agriculture, which include both crop farming and livestock rearing. There was a significant difference ($F_{6, 243} = 3.326$, $P < 0.05$) among villages of livelihood activities. Most (88.8%) of the respondents depend on crop farming and livestock rearing and few (4.4%) depend on only crop farming. On the other hand (0.8%) and (6%) of the respondents depend on only livestock rearing and other income source, respectively (Table 2).

Table 2. Percentage of respondents' livelihood activities among different villages.

Village	n (250)	Crop farming only (%)	Livestock rearing only (%)	Both crop farming & livestock rearing (%)	Other (%)
Yegora	39	12.8	0.0	87.2	0.0
Defergie	35	5.7	0.0	94.3	0.0
Alfa	32	3.1	0.0	96.9	0.0
Tarete	35	2.9	0.0	91.4	5.7
Ferkuta	40	0.0	0.0	92.5	7.5
Agancht	37	0.0	5.4	75.7	18.9
Tebab	32	6.3	0.0	84.4	9.4
Mean		4.4	0.8	88.8	6.0

Almost all respondents in the study area reared livestock besides farming. The major livestock reared by the local communities are cattle, sheep, goat and pack animals which include donkey, horse, and mule. Sheep were the dominant livestock not only in the study area but also in most highlands of Ethiopia. The mean number of cattle, sheep, goat and pack animals in the study area per household was 2.78 ± 0.12 , 6.7 ± 0.38 , 2.69 ± 0.20 and 1.16 ± 0.07 , respectively. Most (88.8%), (86%), (72%) and (68.8%) of the respondents had cattle, sheep, goat and pack animals, respectively (Fig. 16). Villages differed in the

number of cattle ($F_{6, 243} = 4.026$, $P < 0.01$), goat ($F_{6, 243} = 11.214$, $P < 0.001$) and pack animals ($F_{6, 243} = 2.629$, $P < 0.05$). In the contrary, villages were not different ($F_{6, 243} = 1.483$, $P > 0.05$) in terms of the number of sheep (Fig. 16). Tukey test showed that there was a significant difference in mean holding of cattle between Alfa and Agancht ($P < 0.05$). Tukey test also showed that villages differed significantly when Yegora compared with Defergie ($P < 0.05$) and Ferkuta ($P < 0.05$) and also Defergie compared with Tarete ($P < 0.001$), Ferkuta ($P < 0.001$) and Agancht ($P < 0.001$) in the mean holdings of goat per house hold (Fig. 16).

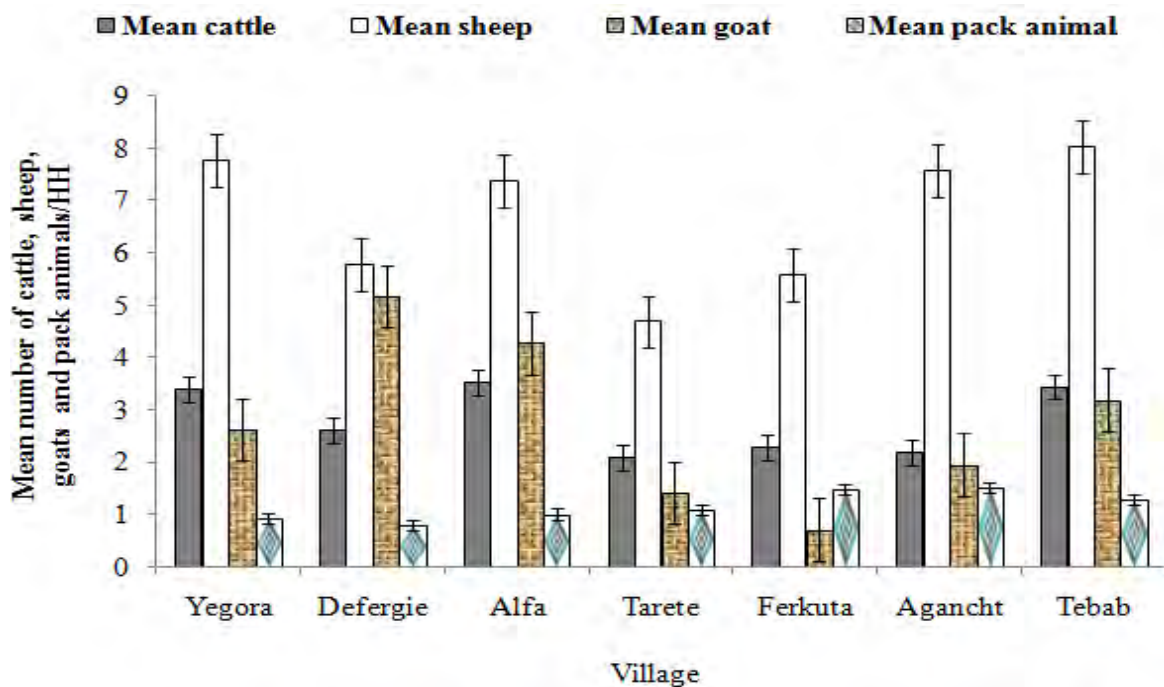


Figure 16. Mean \pm SE of cattle, sheep, goat and pack animals per household among respondents.

The mean crop production per household was 6.05 ± 0.23 quintal in the year 2009. Villages differed significantly ($F_{6, 243} = 6.511$, $P < 0.001$) in annual crop production among respondents per household (Fig. 17). Tukey test showed that there was a significant difference when Yegora compared with Defergie ($P < 0.05$), Alfa ($P < 0.05$), Tarete ($P < 0.001$), Ferkuta ($P < 0.05$), and Agancht ($P < 0.001$). There was also a significant difference between Agancht and Tebab ($P < 0.05$). Therefore the mean annual crop production in Yegora was the highest, whereas Agancht was the lowest (Fig.17).

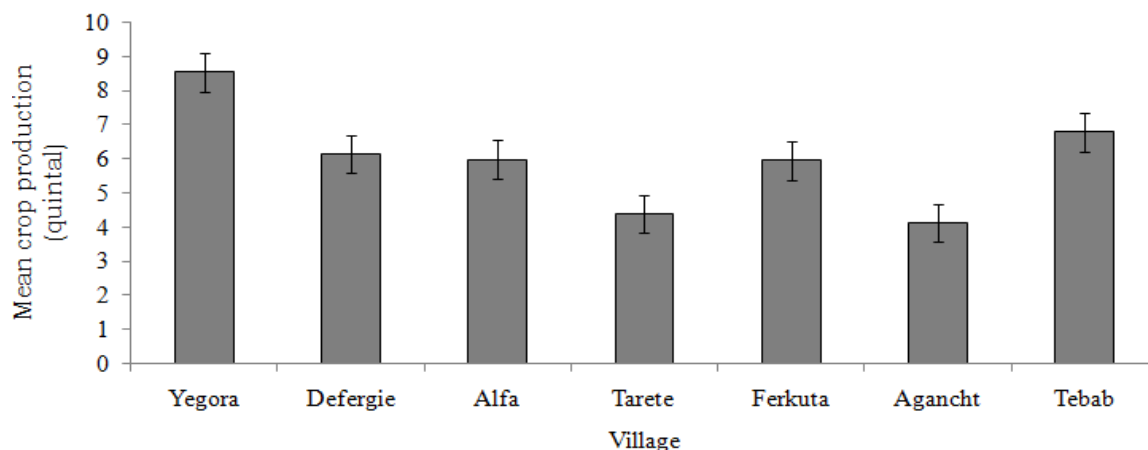


Figure 17. Mean \pm SE of crop production in different villages.

The local communities grazed their livestock mainly around the study area. However, during opening season, all the local communities grazed and used all the resources of Guassa. 47.2% of the respondents grazed their livestock in the study area (Fig. 18), while 52.8% grazed outside the study area. Most (61.5%) of the respondents from Yegora grazed their livestock inside the study area while 85.7% of the respondents from Defergie grazed outside the study area. Villages differed significantly ($F_{6,243} = 3.77$, $P < 0.01$) in livestock grazing in the study area. Tukey test showed significant difference when Defergie compared with Yegora ($P < 0.01$), Alfa ($P < 0.01$), Tebab ($P < 0.05$) and Tarete ($P < 0.05$) in the grazing site among villages (Table 3).

Table 3. Percentage of respondents' site of grazing in different villages.

Village	n (250)	In the study area (%)	Outside the study area (%)
Yegora	39	61.5	38.5
Defergie	35	14.3	85.7
Alfa	32	59.4	40.6
Tarete	35	51.4	48.6
Ferkuta	40	47.5	52.5
Agancht	37	43.2	56.8
Tebab	32	53.1	46.9
Mean		47.2	52.8



Figure 18. Livestock grazing inside the Guassa area.

Out of the total respondents, only 40.8% grazed their livestock for 9 - 12 months per year. Villages differed significantly ($F_{6, 243} = 3.63$, $P < 0.01$) in the duration of grazing (Table 4). Using Tukey test, significant difference was showed only when Defergie compared with Yegora ($P < 0.001$). But by using LSD test, Defergie also showed significant difference when compared with Alfa ($P < 0.05$) and Tebab ($P < 0.05$) (Table 4).

Table 4. Percentage of respondents' duration of grazing among different villages inside the study area.

Village	n (250)	1-3 month (%)	3-6 month (%)	6-9 month (%)	9-12 month (%)	Never grazed (%)
Yegora	39	2.6	12.8	0.0	46.2	38.5
Defergie	35	2.9	0.0	0.0	11.4	85.7
Alfa	32	0.0	0.0	6.3	53.1	40.6
Tarete	35	0.0	0.0	2.9	48.6	48.6
Ferkuta	40	0.0	0.0	5.0	42.5	52.5
Agancht	37	0.0	0.0	0.0	43.2	56.8
Tebab	32	0.0	0.0	12.5	40.6	46.9
Mean		0.8	2.0	3.6	40.8	52.8

The local community living adjacent to Guassa used the area for grazing their livestock, firewood collection and cutting of *Festuca* grass for various purposes such as thatching and making household and farm implements like ropes and whips. Villages not differed significantly ($F_{6, 243} = 2.11, P > 0.05$) in using resource among respondents. But by using LSD test, Tebab showed significant difference when compared with Yegora ($P < 0.01$), Defergie ($P < 0.01$), Alfa ($P < 0.01$), Tarete ($P < 0.05$), Ferkuta ($P < 0.05$) and Agancht ($P < 0.01$). 9.4% of the respondents from Tebab use only firewood and 70.3% of the respondent from Agancht use both *Festuca* grass and firewood. Out of the total respondents 65.2% used *Festuca* grass and firewood (Table 5) (Fig 19). By using Spearman's correlation, resource utilization was negatively correlated with distance from the boundary ($r = -0.12, P > 0.05$), family size ($r = -0.12, P > 0.05$), woodlots ($r = -0.14, P < 0.05$) and grazing land size ($r = -0.08, P > 0.05$).

Table 5. Percentage of resource utilization by the respondents among different villages.

Village	N (250)	Only <i>Festuca</i> grass (%)	Only fire wood (%)	Only grazing livestock (%)	<i>Festuca</i> grass and fire wood (%)	<i>Festuca</i> grass and others (%)	All (%)
Yegora	39	5.1	0.0	0.0	61.5	12.8	20.5
Defergie	35	2.9	0.0	0.0	68.6	5.7	2.9
Alfa	32	0.0	0.0	0.0	81.2	0.0	18.8
Tarete	35	0.0	0.0	0.0	62.9	0.0	37.1
Ferkuta	40	2.5	2.5	0.0	70.0	2.5	22.5
Agancht	37	0.0	0.0	0.0	70.3	0.0	29.7
Tebab	32	0.0	9.4	0.0	40.6	0.0	50.0
Mean		1.6	1.6	0.0	65.2	3.2	28.4



Figure 19. Fire wood collection by local community from Guassa area.

6.1.3. Human - Wildlife Conflict

Out of the total respondents, 44.4% reported both the problem of crop damage and livestock predation, 36% reported only livestock predation, 10.8% reported only crop damaged problem by wildlife and 8.8% reported they did not face any conflict. Problem caused by wildlife differed ($\chi^2 = 159.98$, $df = 18$, $P < 0.001$) among villages. From the respondents 15% and 14.3% from Ferkuta and Tarete reported that they did not face any conflict caused by wildlife, respectively. Most (84.6%) of the respondents from Yegora and 73.9% from Defergie faced problems of both crop damage and livestock predation (Table 6).

Table 6. Percentage of respondents that faced different conflicts by wildlife.

Village	n (250)	No conflict (%)	Crop damage (%)	Livestock predation (%)	Both crop damage & livestock predation (%)
Yegora	39	0.0	7.7	7.7	84.6
Defergie	35	8.6	2.9	14.3	73.9
Alfa	32	3.1	15.6	9.4	71.9
Tarete	35	14.3	5.7	71.4	8.6
Ferkuta	40	15.0	15.0	62.5	7.5
Agancht	37	10.8	16.2	59.5	13.5
Tebab	32	9.4	12.5	21.9	56.3
Mean		8.8	10.8	36.0	44.4

6.1.3.1. Human - Gelada baboon Conflict

Among the respondents, 52.4% reported that there was no crop damaged by gelada baboon and the rest 47.6% reported that gelada baboon damaged crops. There was no crop damage by gelada baboon in Tarete, Ferkuta and Agancht. Villages differed significantly ($F_{6, 243} = 11.064$, $P < 0.001$) in terms of crop loss by gelada baboon (Table 7). Most respondents from Tebab (93.8%), Yegora (84.6%), Defergie (82.9%), and Alfa (84.4%) reported crop damage by gelada baboon (Table 7).

Table 7. Percentage of respondents' crop damage by gelada baboon among villages.

Village	n (250)	Crop damage	No crop damage
Yegora	39	84.6	15.4
Defergie	35	82.9	17.1
Alfa	32	84.4	15.6
Tarete	35	0.0	100.0
Ferkuta	40	0.0	100.0
Agancht	37	0.0	100.0
Tebab	32	93.8	6.3
Mean		47.6	52.4

The average annual crop loss by gelada baboon per house hold was 0.63 ± 0.05 quintal. Villages differed significantly ($F_{6, 243} = 49.75$, $P < 0.001$) in terms of crop loss by gelada baboon per year. Tukey test showed significant difference when Yegora, Defergie, Alfa and Tebab were compared with Tarete ($P < 0.001$), Ferkuta ($P < 0.001$) and Agancht ($P < 0.001$) (Fig. 20).

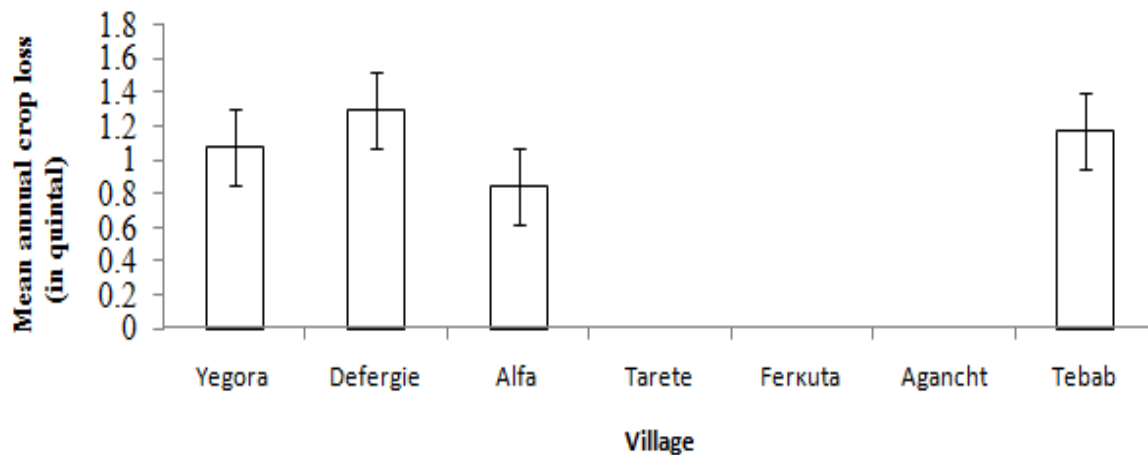


Figure 20. Mean \pm SE crop loss by gelada baboon per household among villages.

Gelada baboons mainly caused damage on barely in the study area because barely was the most common cultivated crop. Among the respondents, 20.0% reported that there was loss of barely only and 27.6% reported the loss of barely and other crops like lentil, bean, wheat and peas (Table 8). On the other hand, 52.4% of the respondents reported that there was no crop damage by gelada baboon. Villages differed significantly ($F_{6, 243} = 60.98$, $P < 0.001$) in terms of type of crop damaged by gelada baboon. 51.3% of the respondents from Yegora and 68.8% from Tebab reported the loss of barely and other crops like lentil, bean, peas and wheat. 45.7% of the respondents from Defergie and 40.6% from Alfa reported loss of barely only. Tukey test showed significant variation when Yegora, Defergie, Alfa and Tebab compared with Tarete ($P < 0.001$), Ferkuta ($P < 0.001$) and Agancht ($P < 0.001$) (Table 8).

Table 8. Percentage and type of crops damaged by gelada baboon among different villages.

Village	n (250)	Barely only (%)	Barely & others (%)	No damage (%)
Yegora	39	33.3	51.3	15.4
Defergie	35	45.7	37.1	17.1
Alfa	32	40.6	43.8	15.6
Tarete	35	0.0	0.0	100.0
Ferkuta	40	0.0	0.0	100.0
Agancht	37	0.0	0.0	100.0
Tebab	32	25.0	68.8	6.3
Mean		24.0	27.6	52.4

The trend in crop damage by gelada baboon among villages differed significantly ($\chi^2 = 230.439$, $df = 6$, $P < 0.001$). All (100%) of the respondents from Yegora, Defergie, Alfa and 81.3% from Tebab reported that there was an increase of crop damaged by gelada baboon from time to time. However, all (100%) of the respondents from Tarete, Ferkuta and Agancht reported unknown. None of the respondents reported decrease in crop damage by gelada (Table 9).

Table 9. Percentage of the trend of crop damage by gelada baboon among respondents.

Village	n (250)	Increased (%)	Decreased (%)	Unknown (%)
Yegora	39	100.0	0.0	0.0
Defergie	35	100.0	0.0	0.0
Alfa	32	100.0	0.0	0.0
Tarete	35	0.0	0.0	100.0
Ferkuta	40	0.0	0.0	100.0
Agancht	37	0.0	0.0	100.0
Tebab	32	81.3	0.0	18.8
Mean		52.8	0.0	47.2

Out of the total respondents, 45.6% reported unknown about the reason of the tendency of crop damage from time to time. Respondents differed significantly ($\chi^2 = 269.232$, $df = 18$, $P < 0.001$) in their reason for the increment of crop damage by gelada baboon. 78.1% of the respondent from Alfa, 64.1% from Yegora and 65.6% from Tebab reported that the reason for the increasing crop damage by gelada baboon were due to the increment of the population of gelada. All respondents from Tarete, Ferkuta and Agancht reported nothing known about the reason for the tendency of crop damage by gelada baboon (Table 10).

Table 10. Reason for the tendency of crop damage by gelada baboon among villages.

Village	n (250)	Increased gelada baboon population (%)	Increased subsistence agriculture (%)	Both (%)	Unknown (%)
Yegora	39	64.1	15.4	20.5	0.0
Defergie	35	37.1	37.1	25.7	0.0
Alfa	32	78.1	12.5	9.4	0.0
Tarete	35	0.0	0.0	0.0	100.0
Ferkuta	40	0.0	0.0	0.0	100.0
Agancht	37	0.0	0.0	0.0	100.0
Tebab	32	65.6	15.6	12.5	6.3
Mean		33.6	11.2	9.6	45.6

Local community in the study area used various methods to minimize crop damage by crop raiders. Some of the methods are guarding (eye watching), chasing, making scarecrow, noisy objects etc. 19.6% of the respondents reported using of watching and chasing. Villages differed significantly ($\chi^2 = 280.821$, $df = 36$, $P < 0.001$) in using the different techniques of crop protection. 45.7% of the respondents from Defergie, 31.3% from Alfa, 40.6% from Tebab and 25.6% from Yegora reported both guarding and chasing by dogs. Respondents from Tarete, Ferkuta, and Agancht reported that there was nothing known about the different techniques of minimizing crop damage because of absence of gelada adjacent to farm lands (Table 11 & Fig. 21).

Table 11. Techniques of crop protection against the gelada baboon

Village	n (250)	Guarding (%)	Chasing (%)	Scarecrow (%)	Guarding & chasing (%)	Chasing & scarecrow (%)	All (%)	Unknown (%)
Yegora	39	25.6	7.7	0.0	25.6	7.7	33.3	0.0
Defergie	35	40.0	2.9	0.0	45.7	0.0	11.4	0.0
Alfa	32	31.3	9.4	3.1	31.3	6.3	18.8	0.0
Tarete	35	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Ferkuta	40	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Agancht	37	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Tebab	32	25.0	15.6	0.0	40.6	0.0	12.5	6.3
Total		16.8	4.8	0.4	19.6	2.0	10.8	45.6



Figure 21. Guarding (A) and scarecrows (B and C) technique used by local people in Guassa area to minimize crop damage by gelada baboon.

The local people in the study area proposed different solutions to minimize crop damage by gelada baboon. 8% of the respondents proposed to displace the gelada baboon to other area while 8.8% of the respondents suggested compensation of the damaged crop by gelada baboon from the government. Half of the respondents did not respond about the solutions. Villages differed significantly ($\chi^2 = 174.29$, $df = 36$, $P < 0.001$) in their suggested proposals to reduce crop damage by gelada baboon. 33.3% of the respondents from Yegora want displacement of gelada baboon to other areas whereas, 28.1% of the respondents from Tebab use different traditional techniques to minimize the damage (Table 12).

Table 12. Respondents suggestions to minimize crop loss by gelada baboon.

Village	n (250)	No response (%)	Kill the gelada (%)	Displace the gelada to other area (%)	Compensation (%)	Use d/t traditional techniques (%)	Minimize the number of gelada (%)	Do not know (%)
Yegora	39	17.9	7.7	33.3	20.5	5.1	10.3	5.1
Defergie	35	31.4	14.3	20.0	14.3	8.6	8.6	2.9
Alfa	32	15.6	3.1	18.8	18.8	18.8	15.6	9.4
Tarete	35	94.3	0.0	0.0	0.0	0.0	0.0	5.7
Ferkuta	40	82.5	0.0	0.0	0.0	0.0	0.0	17.5
Agancht	37	83.8	0.0	0.0	0.0	0.0	0.0	16.2
Tebab	32	15.6	12.5	18.8	9.4	28.1	6.3	9.4
Mean		50.0	5.2	12.8	8.8	8.0	5.6	9.6

6.1.3.2. Human - Ethiopian wolf Conflict

Most (83.2%) of the respondents reported that the Ethiopian wolf did not depredate the sheep whereas, 16.8% of the respondents reported depredation of sheep and goat by Ethiopian wolf. Villages did not differ significantly ($\chi^2 = 2.32$, $df = 6$, $P > 0.05$) in terms of depredation of sheep and goats by Ethiopian wolf. 22.5% of the respondents from Ferkuta reported that there was depredation of sheep by Ethiopian wolf; on the other hand 12.8%

of the respondents from Yegora reported depredation by Ethiopian wolf (Table. 13). The average sheep loss per house hold in the last five years was 0.20 ± 0.03 . Villages did not differ ($\chi^2 = 8.89$, $df = 12$, $P > 0.05$) in sheep loss by Ethiopian wolf (Fig. 22).

Table 13. Sheep depredation by Ethiopian wolf among different villages.

Village	n (250)	Predation (%)	No predation (%)
Yegora	39	12.8	87.2
Defergie	35	14.3	85.7
Alfa	32	15.6	84.4
Tarete	35	14.3	85.7
Ferkuta	40	22.5	77.5
Agancht	37	16.2	83.8
Tebab	32	21.9	78.1
Mean		16.8	83.2

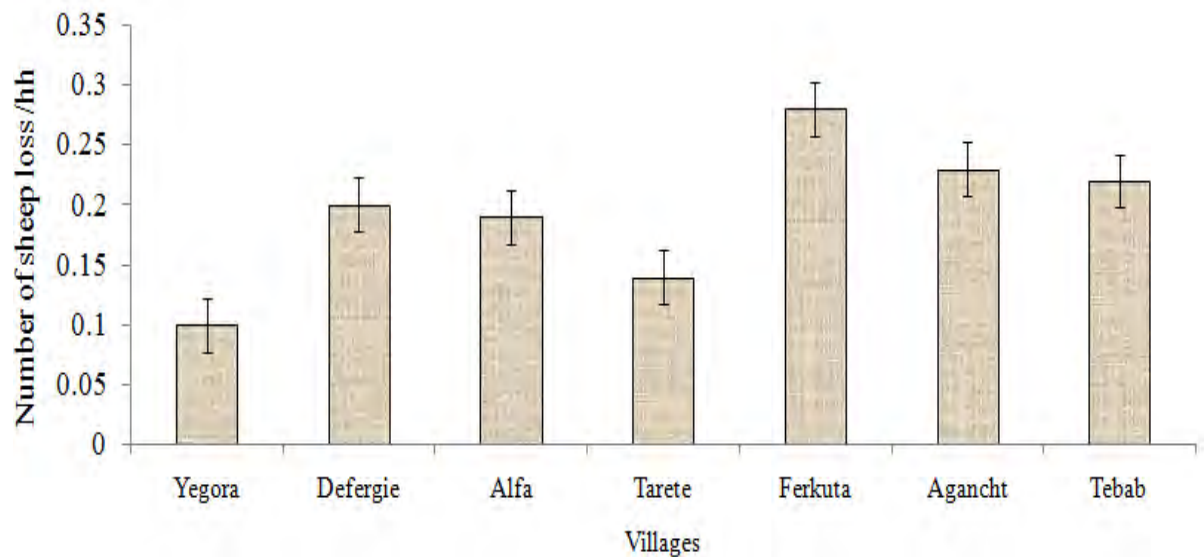


Figure 22. Mean \pm SE sheep depredation per house hold in the last five years.

Among the respondents, 46.9% from Tebab reported that there was an increasing trend of predation and 48.6% of the respondents from Tarete reported a decreasing trend of predation by Ethiopian wolf (Table 14). Villages differed ($\chi^2 = 28.2$, $df = 12$, $P < 0.01$) in the trend of predation by Ethiopian wolf. On the other hand, 26% of the respondents reported that there was an increasing trend of sheep predation by Ethiopian wolf, whereas 32.8% showed decreasing trend. The rest 41.2% of the respondents reported unknown response (Table 14).

Table 14. The trend of predation by Ethiopian wolf among different villages.

Village	n (250)	Increased (%)	Decreased (%)	Unknown (%)
Yegora	39	30.8	25.6	43.6
Defergie	35	17.1	22.9	60.0
Alfa	32	21.9	43.8	34.4
Tarete	35	22.9	48.6	28.6
Ferkuta	40	12.5	42.5	45.0
Agancht	37	32.4	35.1	32.4
Tebab	32	46.9	9.4	43.8
Mean		26.0	32.8	41.2

Most (77.2%) of the respondents had been seen sheep and goats taken by Ethiopian wolf, while 22.8% of the respondents reported there had never been sheep and goat taken by Ethiopian wolf. Villages differed significantly ($\chi^2 = 22.878$, $df = 6$, $P < 0.01$) in the responses of respondents. Most (91.9%) of the respondent from Agancht reported they had seen sheep and goat taken by Ethiopian wolf. 45.7% from Defergie and 37.5% from Tebab reported never seen the Ethiopian wolf taking sheep and goat (Table 15).

Table 15. Percentage of respondents that had seen sheep and goat taken by Ethiopian wolf.

Village	n (250)	Yes (%)	No (%)
Yegora	39	76.9	23.1
Defergie	35	54.3	45.7
Alfa	32	78.1	21.9
Tarete	35	88.6	11.4
Ferkuta	40	85.0	15.0
Agancht	37	91.9	8.1
Tebab	32	62.5	37.5
Mean		77.2	22.8



Figure 23. Depredated lamb by Ethiopian wolf in Tarete (Yedi) villages.

6.1.3.3. Conflict with other Predators

Common jackals, leopards and spotted hyena were the common problematic predators in the study area. Most (73.2%) of the respondents claimed that there was livestock predation

by predators other than Ethiopian wolf, whereas 26.8% of the respondents reported no predation by predators. Villages differed significantly ($\chi^2 = 13.08$, $df = 6$, $P < 0.05$) in livestock predation by predators like common jackal, leopard and spotted hyena.

Out of the total respondents, 43.2% reported livestock predation by common jackal in the last five years whereas 56.8% of the respondents reported no predation of livestock by common jackal. Villages not differed significantly ($\chi^2 = 1.99$, $df = 6$, $P > 0.05$) in depredation of livestock by common jackal (Table 16). Of the total respondents, only 20% reported livestock depredation by leopard. There was significant difference ($\chi^2 = 41.76$, $df = 6$, $P < 0.001$) among villages in response of livestock depredation by leopard. All (100%) of respondents reported that there was no predation of livestock by leopard in Agancht whereas 46.5% from Yegora, 37.1% from Defergie and 28.1% reported sheep loss (Table 17).

Table 16. Depredation of sheep and goat by common jackal among villages.

Village	n (250)	Predation (%)	No predation (%)
Yegora	39	51.3	48.7
Defergie	35	45.7	54.3
Alfa	32	37.5	62.5
Tarete	35	42.9	57.1
Ferkuta	40	42.5	57.5
Agancht	37	43.2	56.8
Tebab	32	37.5	62.5
Mean		43.2	56.8

Table 17. Depredation of sheep and goat by leopard among villages.

Village	n (250)	Predation (%)	No predation (%)
Yegora	39	46.5	53.8
Defergie	35	37.1	62.9
Alfa	32	28.1	71.9
Tarete	35	5.7	94.3
Ferkuta	40	10.0	90.0
Agancht	37	0.0	100.0
Tebab	32	12.5	87.5
Mean		20.0	80.0

Among respondents, 21.6% reported that there was livestock depredation by the spotted hyena in and around Guassa area. Pack animals like donkey, horse and mule were killed by spotted hyena. Villages not differed significantly ($\chi^2 = 8.54$, $df = 6$, $P > 0.05$) in the percentage of livestock predation by spotted hyena (Table 18).

Table 18. Depredation of livestock by spotted hyena among villages.

Village	n (250)	Predation (%)	No predation (%)
Yegora	39	35.9	64.1
Defergie	35	22.9	77.1
Alfa	32	18.8	81.2
Tarete	35	17.1	82.9
Ferkuta	40	15.0	85.0
Agancht	37	27.0	73.0
Tebab	32	12.5	87.5
Mean		21.6	78.4

6.1.4. Human Attitude towards Wildlife

Most respondents in the study area named at least some of the wildlife in their area (Table 19). Respondents who knew more than 7 wildlife had good knowledge, whereas respondents who knew less number of local wildlife had poor knowledge about wildlife. Out of the total respondents, 57.2% could name more than seven wild animals, whereas only 2.4% could name less than three local wild animals (Table 19).

Most (81.1%) of the respondents from Agancht named more than seven wildlife and 2.6% of the respondents from Yegora named less than three wildlife. Villages differed significantly ($F_{6, 243} = 2.327$, $P < 0.05$) in terms of knowledge about wildlife in the study area. By using Tukey test, there was significant difference between Yegora and Defergie ($P < 0.05$) and also between Yegora and Agancht ($P < 0.05$) (Table 19). There was significant difference ($\chi^2 = 14.83$, $df = 2$, $P < 0.01$) among male and female respondents in attitude towards wildlife.

Table 19. Percentage of respondents who named wildlife species among villages.

Village	n (250)	1-3 wildlife	4-7 wildlife	>7wildlife	None
Yegora	39	2.6	61.5	33.3	2.6
Defergie	35	5.7	20	62.9	11.4
Alfa	32	0.0	43.8	56.3	0.0
Tarete	35	2.9	34.3	62.9	0.0
Ferkuta	40	0.0	40.0	60.0	0.0
Agancht	37	5.4	13.5	81.1	0.0
Tebab	32	0.0	50.0	43.8	6.3
Mean		2.4	37.6	57.2	2.8

Most (88.8%) of the respondents had positive attitude towards the conservation of wildlife. But, 6.4% and 4.8% of the respondents had negative and neutral attitude, respectively. There was a significant difference between male and female respondents ($\chi^2 = 29.584$, $df = 1$, $P < 0.001$), between educational status ($\chi^2 = 198.41$, $df = 4$, $P < 0.001$) and between age level ($\chi^2 = 42.224$, $df = 5$, $P < 0.001$) in the conservation attitude towards wildlife. Spearsman correlation coefficient showed that there was negative correlations ($r = -0.073$, $P > 0.05$) between the respondents' resident from the border of Guassa area and the attitude towards the conservation of wildlife (Table 20).

Table 20. Percentage of attitude of respondent towards conservation of wildlife.

Village	n (250)	Positive attitude (%)	Negative attitude (%)	Neutral (%)
Yegora	39	89.7	7.7	2.6
Defergie	35	91.4	8.6	0.0
Alfa	32	90.6	9.4	0.0
Tarete	35	88.6	5.7	5.7
Ferkuta	40	85.0	5.0	10.0
Agancht	37	86.5	2.7	10.8
Tebab	32	90.6	6.3	3.1
Mean		88.8	6.4	4.8

6.1.4.1. Attitude of Local People towards the Gelada Baboon

Most (63.6%) of the respondents had positive attitude towards gelada baboon, whereas 28% and 8.4% of the respondent had negative and neutral attitude, respectively (Table 21). Villages differed significantly ($\chi^2 = 73.816$, $df = 12$, $P < 0.001$) in their attitude towards the gelada baboon. Respondents from Agancht (89.2%), Tarete (88.6%) and Ferkuta (85%) had positive attitude. However, 57.1% of respondents from Defergie, 51.3% from Yegora, and 50% from Alfa had negative attitude towards the gelada baboon (Table 21). On the

other hand, 12.5% from Ferkuta and 10.8% from Agancht had neutral attitude, respectively. The attitudes of the respondents towards the gelada baboon was negatively correlated with crop damage ($r = -0.31$, $P < 0.001$), whereas educational status of the respondents ($r = 0.238$, $P < 0.001$) and Age ($r = 0.147$, $P < 0.05$) was positively correlated.

Table 21. Percentage of attitude of respondents towards gelada baboon among villages.

Village	n (250)	Positive (%)	Negative (%)	Neutral (%)
Yegora	39	41.0	51.3	7.7
Defergie	35	37.1	57.1	5.7
Alfa	32	46.9	50.0	3.1
Tarete	35	88.6	2.9	8.6
Ferkuta	40	85.0	2.5	12.5
Agancht	37	89.2	0.0	10.8
Tebab	32	53.1	37.5	9.4
Mean		63.6	28.0	8.4

6.1.4.2. Attitude of Local People towards the Ethiopian Wolf

Most (88.4%) of the respondents had positive attitude towards Ethiopian wolf. On the other hand 8% and 3.6% of the respondents had neutral and negative attitude, respectively (Table 22). Villages not differed significantly ($\chi^2 = 9.815$, $df = 12$, $P > 0.05$) in their attitude towards Ethiopian wolf. Most respondents from Alfa (96.9%), Defergie (94.3%) and Tebab (90.6%) had positive attitude, whereas 7.7% from Yegora, 5.7% from Tarete and 5.0% from Ferkuta had negative attitude. The attitude of respondents towards Ethiopian wolf from Agancht (13.5%), Ferkuta (12.5%) and Tarete (8.6%) was neutral (Table 22). More generally local people showed positive feeling due to the presence of Ethiopian wolf in Guassa Community Conservation Area. On the contrary, only few respondents feel bad because of livestock predation by Ethiopian wolf.

Table 22. Percentage of attitude of respondents towards Ethiopian wolf among villages.

Village	n (250)	Positive (%)	Negative (%)	Neutral (%)
Yegora	39	87.2	7.7	5.1
Defergie	35	94.3	0.0	5.7
Alfa	32	96.9	0.0	3.1
Tarete	35	85.7	5.7	8.6
Ferkuta	40	82.5	5.0	12.5
Agancht	37	83.8	2.7	13.5
Tebab	32	90.6	3.1	6.3
Mean		88.4	3.6	8.0

6.2. Faecal Analysis

6.2.1. Faecal Dropping Sample Analysis of Ethiopian Wolf

The Ethiopian wolf commonly preys on small mammals and is specialized in rodent hunting. The occurrence of prey differed significantly ($\chi^2 = 158.48$, $df = 2$, $P < 0.001$) in the faecal droppings of Ethiopian wolf. Of the total faecal droppings, 96.6% constituted rodents, 1.1% sheep and the remaining 2.3% constituted sheep, rodents and others. 91.7% from Regereg, 97.2% from Ras Ketema and 100% from Ate Wuha constituted rodent prey. 4.2% from Regereg and 1.1% from Ate Wuha constituted sheep prey. Site of faecal dropping not differed ($F_{2,85} = 1.008$, $P > 0.05$) in occurrence of prey type (Fig. 24).

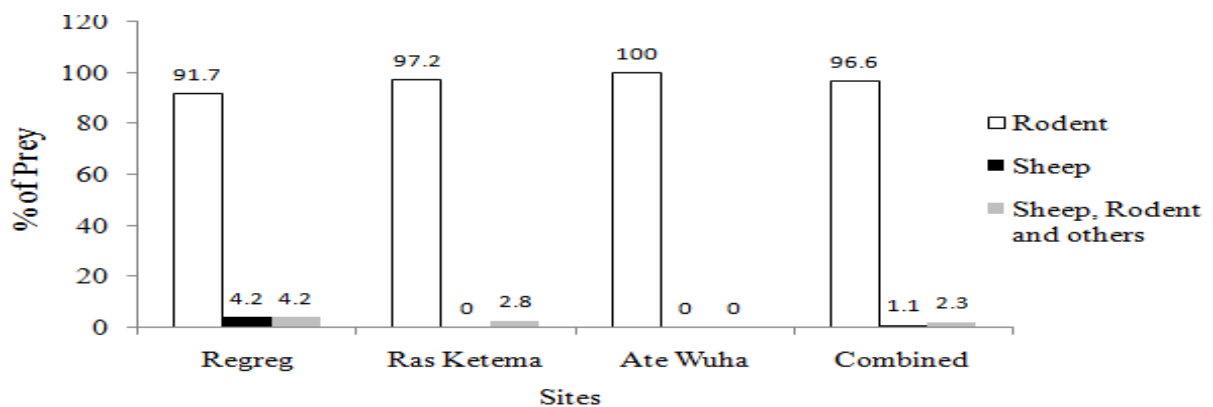


Figure 24. Percentage of prey from the Ethiopian wolf faecal droppings in the three different sites.

6.2.2. Faecal Dropping Sample Analysis of Gelada Baboon

Among the faecal dropping sample, 69.2% and 57.1% from Yegora and Defergie contained barely, respectively whereas, 84.6% from Sefed-Meda contained grass species. The type of crops consumed varied significantly ($\chi^2 = 35.302$, $df = 6$, $P < 0.001$) in different faecal collection sites. Out of the total faecal dropping samples, 39.3% contained barely whereas 44.9% of the sample contained grass species. The remaining contained a mixture of barely, other crops and grasses (Table 23).

Table 23. Percentage of raided crops in four gelada faecal sample collection sites

Site of collection	number of faecal sample collected (107)	Types of crop raided		
		Barely	Barely, grass and other crops	Grass species only
Yegora	26	69.2	11.5	19.2
Defergie	28	57.1	17.9	25.0
Sefed-Meda	26	0.0	15.4	84.6
Tebab	27	29.6	18.5	51.9
Mean		39.3	15.9	44.9

6.3. Direct Observation on Crop Damage by Gelada Baboon.

Based on the data collected from different sites by direct observation large amount of barely field was trampled and raided by crop raiders (Table 24). In the sampled study sites, gelada baboon, rabbit, duiker, klipspringer and rock hyrax were observed but gelada baboon was the main crop raider observed during study time.

A total of 2652 m² crop farm was raided and trampled by gelada baboon during the time of observation. Out of this, 1868 m² barely fields were raided followed by wheat (420 m²) and bean (236 m²). The lowest crop farm size of damage was recorded in peas followed by lentil (Table 24). From the total damage 70.4% were barely followed by wheat (15.83%)

whereas 8.9%, 2.04% and 2.83% were bean, peas and lentil, respectively (Fig. 25). Observation sites differed significantly ($\chi^2 = 22.96$, $df = 12$, $P < 0.05$) in crop type damaged by gelada baboon. Area of crop field damaged not differed significantly ($\chi^2 = 12$, $df = 9$, $P > 0.05$) among observation sites (Table 24).

Table 24. The raided crop fields recorded in four direct observation sites

Site	Area of crop field damaged (m ²)					Total
	Barely	Bean	Peas	Lentil	Wheat	
Yegora	645	66	54	0	43	808
Defergie	433	155	0	0	160	748
Alfa	270	15	0	75	72	432
Tebab	519	0	0	0	145	664
Total	1867	236	54	75	420	2652
Mean±SD	466.75±157.43	59±69.95	13.5±27	18.75±37.5	105±56.44	663±164.9

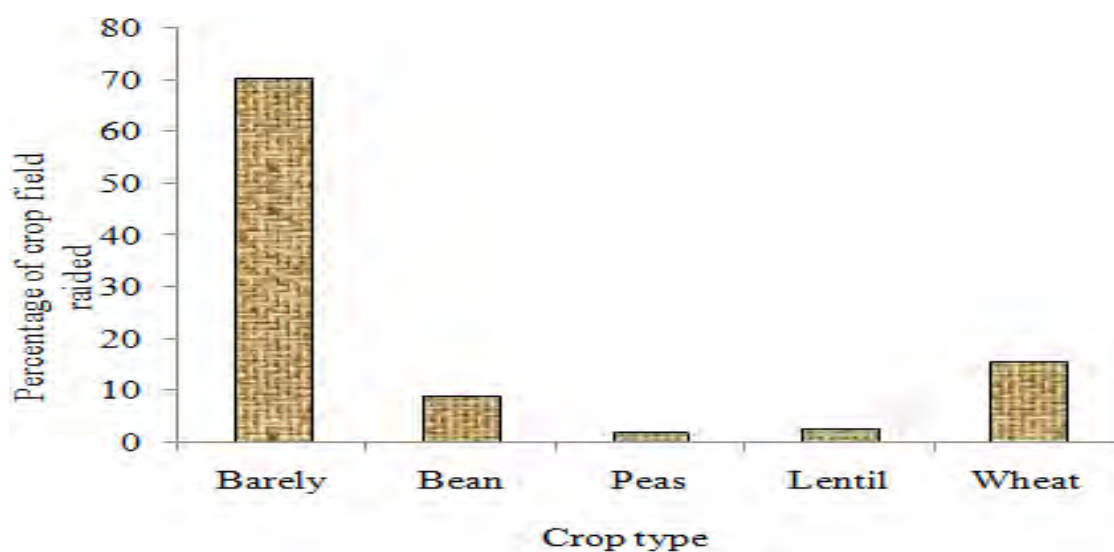


Figure 25. Percentage of crop field raided by gelada baboon

6.4. Focus Group Discussion

The result from the discussion summarizes the views and interest of discussants within each study site. The discussions showed that all the Guassa adjacent communities mainly benefited from Guassa area resources. Most participants from different focus group discussion sites agreed that the resources obtained from the Guassa area were *Festuca* grass for housing purposes, fuel wood collection, water towers, for grazing of livestock during opening and drought season. Most of the discussants stated that “we the nearby communities can’t survive without Guassa area because Guassa is our cloth and bread (*libsachin ina gursachin*)”. Most participants reported that the Guassa area resources benefited the local community but their utilization of the resources was not in a regular manner meaning unsustainable utilization of the resources.



Figure 26. Focus group discussion with local resident members (A and B) and local militia or scouts (C) in Guassa area

Most discussants considered the local people and livestock affect wildlife in and around the Guassa area through overgrazing, firewood collection, over exploitation of *Festuca*

grass and giving less attention to conservation of other biodiversity from the side of local people. Most discussants described the shortage of private grazing land and decreased farmland holding due to redistribution of lands. This could have increased the pressure on the Guassa area resources for livestock grazing and agricultural expansion local communities encroached in to the area for subsistence agricultural land. Based on this issue, few discussants said that “if the government and other stakeholders support us we are willing and interested to conserve not only the Guassa (*Festuca*) grass but also the wild animals”. Very few discussants had negative attitude towards the Guassa area management system, because these discussants use the resources like firewood and grazing land without any restriction.

Most discussants had positive attitude towards wildlife for its importance to attract tourists, hunting opportunities during drought, enjoyment derived from viewing wildlife and its value for future generation. Almost all discussants had positive attitude towards Ethiopian wolf even if depredated the livestock. But discussants from Yegora, Defergie, Alfa and Tebab held negative attitude towards gelada baboon because of severe crop raiding. On the other hand, discussants from Tarete, Fercuta and Agancht had positive attitude towards the gelada baboon. Almost all discussants agreed and reported that conserving wildlife is important.

7. DISCUSSION

The results of this study showed that wild animals found in and around the Guassa Community Conservation Area potentially cause economic loss due to livestock depredation and crop damage. The gelada baboon in and around the Guassa area caused strong conflict with local communities especially, in Yegora, Defergie, Alfa and Tebab villages. There was also a conflict between local people and Ethiopian Wolf, but not as such a big problem. The data collected from questionnaire showed that there was a conflict with other carnivores like common jackal, leopard and spotted hyena. Herbivores like duikers and klipspringers cause crop damage to lesser extent. Rodents, rock hyrax, rabbit and porcupines also cause crop damage in the study area.

Both crop damage and livestock predation were reported in the study area. Most of the respondents reported that there were problems with wildlife. Almost half of the respondents reported problems of both crop damage and livestock predation while 36% and 10.8% of the respondents faced livestock predation and crop damage, respectively. The conflict arises in the study area from economic losses to agriculture, including loss of livestock through predation and destruction of crops because subsistence agriculture is the major livelihood activities. Similar results were observed from study conducted in Simien Mountain National Park in which 79.1% of the local residents reported conflict with wildlife (Mesele Yihune, 2006) and also over 71% of the local people living adjacent to protected area in Tanzania reported conflict with wildlife (Newmark *et al.*, 1994).

7.1. Human - Gelada Baboon Conflict

Across the globe primates are the most frequently identified crop - raiding animals and come into conflict with humans due to the well - known crop raiding behaviour of many species. Several species of baboons (*Papio* spp.) and vervet monkeys are the most important crop raiders (Sillero-Zubiri and Switzer, 2001). Gelada baboon in Guassa area damaged crops and entered into conflict with local people. Almost half of the respondents reported crop damaged by gelada baboon.

The annual crop damage by gelada baboon per household was 0.63 ± 0.05 quintal. Previous studies (1.17 ± 0.1 quintal per year per household) reported from Simien Mountain National Park (Mesele Yihune, 2006). The largest annual crop damage per household in quintal were recorded from Defergie (1.29 ± 0.11), Tebab (1.17 ± 0.14), Yegora (1.07 ± 0.09) and Alfa (0.84 ± 0.10) because these villages are located close to the cliff which is the habitat of gelada baboon while in Tarete, Ferkuta and Agancht there was no crop damage by gelada baboon because these villages are far apart from the cliff. According to Naughton-Treves (1997) farm lands located at forest edges are exposed to frequent damages to primates.

Gelada baboon mainly raided barely crop because barely was the main cultivated crop in the study area. Three fourth of the respondents reported that gelada baboon damage barely mainly and other crops like lentil, bean, peas and wheat in small quantities. The faecal dropping sample of gelada also confirmed high loss of barely in Yegora (69.2%) and Defergie (57.1%) (Table 23) and this supported the result obtained from questionnaires. The results from the direct observation also confirmed more barely crop damaged per m^2 (Table 24) in villages very close to the cliff. From the results those who live near to the habitat of gelada baboon faced frequent crop loss. This means that the frequency of crop damage by gelada is high in farmland areas near to the cliff (habitat of gelada in the area) as compared to others.

Local residents in the study area used different techniques like guarding, chasing and scarecrow to minimize agricultural crop damage by gelada baboon (Fig. 21 and Table 11). Keeping the livestock properly by shepherd is the main used methods to prevent predation against predators. Similarly, different methods also used by local people to minimize crop damage by wildlife in and around Simien Mountain National Park (Mesele Yihune, 2006), in Uganda around the Kibale National Park (Naughton-Treves, 1997) and in Tanzania by local people living adjacent to the protected areas (Newmark *et al.*, 1994). Sillero-Zubiri and Switzer (2001) also reported that chasing crop raiders, guarding, scarecrows, plastic flags, use of scents, fences, hunting, trapping and poisoning are some of the methods used

in minimizing crop raiding. King and Lee (1987) also reported that the most effective short term prevention methods of crop damage by pest species is guarding together with chasing.

In the area, respondents indicated different suggestions as to how the conflicts should be resolved (Table 12). Very few (8%) of the respondents were interested to displace the gelada baboon from the farmland area to other area especially in the study area and 8.8% of the respondents expected to compensations from the government and donor organizations. Very few respondents want the gelada to be eradicated. Previous study by Sillero-Zubiri and Switzer (2001) reported that traditional techniques are required in order to identifying alternative approaches to preventing crop raiding by primates.

Respondents in the study area also reported serious problems of crop damage by small mammals in all villages, because small mammals like rodents are highly populated in and around Guassa area. Most respondents reported no mechanisms to minimize crop loss by rodents. Klipspringers, duikers and rabbits also damage crops mainly at the time of seedling as reported by respondents but not considered as serious pests.

7.2. Human - Ethiopian Wolf Conflict

This study showed that very few (16.8%) of the respondents reported depredation of sheep by Ethiopian wolf. This is because the Ethiopian wolf constitutes a minor conflict as compared to other predators in the study area and also it feeds largely on rodents. Previous study by Sillero-Zubiri and Gottelli (1995a), the Ethiopian wolf feed almost exclusively upon diurnal small mammals of the high altitude afro alpine grassland community. Similar result (18.3%) reported by Mesele Yihune (2006) in and around Simien Mountain National Park and 14.5% sheep loss in Guassa area also obtained by Zelealem Tefera (2001). The result from Ethiopian wolf faecal dropping sample analysis confirmed little (1.1%) sheep depredation, 2.3% accounted for mixed and the majority (96.6%) accounted for rodent prey (Fig. 24). A previous study from the Simien Mountain National Park showed that the rodent prey accounted for 97.8% from Ethiopian wolf faecal dropping analysis (Mesele Yihune, 2006).

The average sheep loss for the last five years per household was 0.2 ± 0.03 . Few (26%) of the respondents thought there is an increase in predation of sheep by Ethiopian wolf in Guassa area and some (32.8%) of the respondents reported a decreasing trend probably due to a decrease in population of the Ethiopian wolf. Most (77.2%) of the respondents reported that they had seen sheep taken by Ethiopian wolf in and around Guassa area. During the field work, the author had seen lamb taken and killed by Ethiopian wolf (Fig. 23).

Common jackal, leopard and spotted hyena are the most problematic animals for the local community of Guassa area unlike Ethiopian wolf. Nearly half (43.2%) of the respondents reported that sheep and goats were depredated by common jackal. The depredation of sheep and goats by common jackal did not differ among villages because it is found in all human inhabited areas. There was also depredation of livestock by leopard. Respondents from Yegora, Defergie and Alfa reported more depredations of livestock than others because these villages are located near to the habitat of leopard. More depredations of livestock especially pack animals by spotted hyena also reported from Yegora and Defergie. This is possibly because such villages are very near to its habitat.

7.3. Attitude of Local People towards Wildlife

The result showed that most (94.8%) of the respondents had good knowledge and were able to name more than four wildlife in Guassa area. This is because most respondents were very close to the area and more time spend inside the area. Distance of the respondents' village from the Guassa area probably an important factor in the attitude of local people towards wildlife. Similar result reported by Zelealem Tefera (2001) distance of village from Guassa area is important factors about the knowledge of wildlife.

Despite the conflicts and problems encountered, most (88.8%) of the respondents had positive attitude towards the conservation of wildlife, whereas very few (6.4%) of the respondents had negative attitudes due to frequently faced problems by wild animals. Similar results have been reported by Mesele Yihune (2006) and Deresse Dejene (2003).

The conservation attitude of communities living adjacent to protected areas is highly influenced by the problems associated with wildlife (Balakrishnan and Ndhlovu, 1992). Generally, local people who have lost livestock by predators and crop loss by herbivores are more likely to have negative attitude towards the conservation of wildlife. The reverse is true for positive outlook. Even small losses can generate negative attitude towards wildlife in communities with subsistence economy (Oli *et al.*, 1994).

Most respondents in the study area had positive attitude towards gelada baboon (Table 20). Particularly respondents from Tarete (88.6), Aganchit (89.2%) and Ferkuta (85%) had positive outlook. This is because of no agricultural crop damage and these villages were somewhat far apart from the habitats of gelada baboon. On the other hand most respondents from Yegora, Defergie and Alfa had negative attitude because gelada baboons frequently cause crop damage in this areas. This is possibly because the distribution of gelada is mainly limited to the steep escarpment and these villages are close to it. As the crop loss by gelada baboon increases, the attitude towards the animal becomes negative. Generally the direct conflict over livelihoods produces negative perceptions towards animals, while the reverse is true for positive perceptions.

The attitude of local people towards Ethiopian wolf was positive as reported by most (88.4%) respondents because most residents who live close to Guassa area knew the Ethiopian wolf is an endemic animal and generate income for the country. Similar results showed by Zelealem Tefera (2001), Deresse Dejene (2003) and Mesele Yihune (2006), most residents who live close to the habitat of Ethiopian wolf had positive attitude because it has the potential to attract tourists, and generate income in the area. On the other hand, few (3.6%) of the respondents had negative attitude towards Ethiopian wolf because of livestock depredation. Previous study reported by Zelealem Tefera (2001) in Guassa area indicated the negative attitude towards Ethiopian wolf is a sentiment generally motivated by fear of economic loss. And also despite this perception, the Ethiopian wolf constitutes a minor problem as compared to other predators in the study area. This is probably the population of Ethiopian wolf and is small as compared to other predators. Zelealem Tefera (2001) reported the density of Ethiopian wolves in the Guassa area was $0.02 \pm 0.05/\text{Km}^2$.

7.4. Human Impact on Wildlife

Due to increasing human population, encroachment in to the wildlife area increases and more lands adjacent to the wildlife area used for farmland, this creates pressure on wildlife population. The local people harvest firewood from the Guassa area unsustainably. The most commonly collected firewood from Guassa is *Erica* (*Erica arboria*), *Ameja* (*Hypericum revolutem*) and *Cherenfi* (*Euryops piniflius*). Overgrazing also happened in the study area. So fire wood and Guassa grass collectors and shepherds are common and spend more time in Guassa area. These and other activities resulted in disturbance, decrease in abundance and diversity of wildlife due to destruction of habitat and competition on foraging in the area. Similarly, as reported by Zelealem Tefera (2001), livestock from nearby villages stay for longer time, and local community used firewood more frequently in Guassa area. According to Newmark, *et al.* (1994) the major problem facing protected areas today is the increase in human settlement of adjacent lands and the unauthorized harvesting of resources within the protected areas in Africa.

8. CONCLUSION AND RECOMMENDATIONS

A conflict between humans and wildlife has occurred since the dawn of humanity and is an increasing concern in all parts of the world. These conflicts have become more frequent and severe over recent decades as a result of human population growth and activities such as extension of transport routes, deforestation and expansion of agricultural and industrial activities which together have led to increased human encroachment on previously wild and uninhabited areas. As the natural habitat of the wildlife is modified for agriculture, wild animals will not have enough space, food and other resources to survive. As a result, the requirements of wildlife overlap with the people in the area. This leads to severe competition for resources between wild animals and people.

The present study has shown that there is human-wildlife conflict in and around the Guassa Community Conservation Area. The conflict between local community and gelada baboon is more severe, whereas the conflict between the local community and the Ethiopian wolf is insignificant as compared with other predators like common jackal, leopard and spotted hyena. Although there is crop damage and livestock predation, the attitude of most of the local people towards wildlife is positive. Due to increasing human population, encroachment to wildlife ranges and increase in subsistence agriculture, overgrazing and overexploitation of natural resources is rising in Guassa area.

The following recommendations and suggestions are made based on the findings for the sustainable utilization of natural resources and the coexistence of wildlife and local people without conflict:

- ✚ Local residents should receive education on the values of wildlife conservation, the objective of disseminating innovative techniques of reducing crop damage and livestock depredation, conflict resolution, and ways of coexisting to live with wild animals. Education programmes will help to create more positive attitudes towards wildlife conservation in the future.

- ✚ To ensure the continued natural resource conservation, all the local community and stakeholders should participate in protecting the area.
- ✚ Stakeholders should reduce human settlement encroaching in to wildlife habitats and need to relocate agricultural activities out of wildlife ranges.
- ✚ Local people should participate in the process of resolving the existing conflicts in order to foster positive outlook towards wildlife.
- ✚ Local communities should be allowed to plant fodder trees on private land to reduce illegal utilization of natural resources.
- ✚ The problem of overgrazing and other human activities that degrade the natural habitat should be strictly reduced.
- ✚ Crops damaged by wildlife depend on the taste of cereal crop plants. Thus the food habits of the wildlife should be systematically studied and local communities should be encouraged to grow unpalatable crops to wild animals.
- ✚ Guassa Community Conservation Area has great potential for tourism. Investors should be encouraged to open hotels, restaurants and lodges in the area to attract both local and international tourists.

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APPENDIX 1

Questionnaires/interviews for local respondents

1. Code _____
2. Age _____
3. Sex _____
4. Marital status (married, single, divorced, widowed)
5. Educational status (illiterate, informal education, primary, Secondary, beyond secondary education)
6. Family size _____
7. Residence: village _____, Kebele _____, Woreda _____ and
Approximate distance from the boarder of the study area _____
8. The size of farmland _____, Grazing land _____ and
Woodlot _____
9. The type of crop do you grow

10. How much did you get last year? _____
11. The type and number of livestock you have.

Type	no.
1 _____	_____
2 _____	_____
3 _____	_____
4 _____	_____
12. What are your livelihood activities?
 - a. Crop production _____ b. Livestock keeping _____
 - c. Farming and livestock keeping _____ d. Trade _____
 - e. Other (mention) _____

13. Where do they graze? A. in the study area _____

B. outside the study area _____

14. How long do they graze in the study area?

A. 1-3 months _____ C. 6-9 months _____

B. 3-6 months _____ D. 9-12 months _____

15. List the type of resources that you used from the GCCA?

16. List the type of wild animals that you know in the GCCA

17. Do wild animals cause damage to your crops and livestock?

Yes /No?

18. List the main problematic wild animals cause damages your Crops and extent of damage?

No	Animal type	Type of crop damaged	Extent of damage last year
1			
2			
3			

19. At what stage do gelada baboons attack your crops most?

stages	crops				
	bean	barley	wheat	pea	others
Planting					
seedling					
vegetative					
harvesting					

20. What are the different techniques used to control (minimize) the damage caused by gelada baboon.

- i. _____
- ii. _____
- iii. _____

21. How do you minimize the crop damage?

22. What is the tendency of the crop damage from time to time?

- A. increasing (reason) _____
- B. decreasing (reason) _____

23. At what time is the problem of crop damage more severe?

(Specify the month)

24. List the type of wild animals depredates livestock?

25. Has any livestock been killed by Ethiopian wolf in and around

GCCA,

25.1. Within the past 5 years? (Y/N)

Type of livestock_____

Number of livestock _____

25.2. Within the past 1 year? (Y/N)

Type of livestock_____

Number of livestock _____

25.3. Within the past 6 months? (Y/N)

Type of livestock_____

Number of livestock _____

25. 4. The extent of damage increase, decrease or unknown

26. Have you ever seen wolves taking sheep, goat, calves and others

in and around GCCA? (Y/N)

27. Do you feel bad due to the presence of wolves in GCCA? (Y/N).

If you say “yes” why? _____

28. Has any livestock been killed by other predators? (Y/N), if you say “yes”

No.	predator	prey	Number killed with in		
			6 month	1 year	5 year

29. How do you minimize the killing of livestock by the predators?

30. What is your attitude towards Ethiopian wolf and Gelada baboon?

31. Do you think conserving wildlife is important?

APPENDIX 2

Data Collection Sheet for Direct Observation on Crop Damage Caused by Gelada Baboon

Woreda----- Kebele----- Village -----

Distance from the park----- Date of damage/incident-----

Grid number-----

locality	type of crop damaged	field size	Size damaged (m ²)	plant species	parts eaten	relative amount of part eaten

APPENDIX 3

Data Collection Sheet for Gelada Baboon faecal analysis

Area	locality	Altitude	Position	Date of collection	Time of collection	Faeces age	Type of crop eaten

APPENDIX 4

Data Collection Sheet for Ethiopian Wolf faecal dropping analysis

Area	locality	altitude	Position	Date of collection	time of collection	Faeces age	Component of prey eaten	Type of Prey eaten

APPENDIX 5

Focus group discussion Questions

1. Do you think the presence of the Guassa Community Conservation Area (GCCA) close to your area benefited the community?
2. What benefits have been realized up until now?
3. Do you think local people and livestock affect wildlife?
4. How do local community and wildlife in the GCCA could coexist in peace and harmony?
5. What should be the role of the local community and conservationists to ensure success of GCCA project?
6. What is your attitude towards Ethiopian wolf and gelada baboon?
7. What is the importance of conserving wildlife?