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Perception and attitude of pastoralists on livestock-wildlife interactions around Awash National Park, Ethiopia: implication for biodiversity conservation

Yihew Biru^{1*}, Zewdu K. Tessema² and Mengistu Urge²

Abstract

Introduction: Pastoral livestock share grazing areas and watering points with wildlife around the protected areas in Eastern Africa. This causes a high degree of livestock-wildlife interactions, leading to conflicts between the local community and park staff. Thus, understanding the perception and attitude of local people towards livestock-wildlife interaction is very crucial to optimize both livestock production and biodiversity conservation in protected areas. This paper presents the perception and attitude of local community towards livestock-wildlife interactions around Awash National Park (ANP), Ethiopia.

Methods: Interview to 180 randomly selected households, representing Afar, Ittu, and Kereyu ethnic groups living around ANP, was conducted from August to December 2015 using a semi-structured questionnaire. Data on community attitude towards wildlife, livestock production systems, and its constraints were collected through focus group- and key informant discussions. We used ordinal logistic regression model to analyze community attitude towards wildlife conservation.

Results: Respondents ranked feed shortage (0.38), lack of water (0.32), and climate change (0.30) as the major constraints of livestock production around ANP. A high degree of conflict (79%; $\chi^2 = 24.09$; $df = 2$; $P = 0.000$) between the local community and park was recorded.

About 73% of the households would be ready to live in harmony with the park. However, 85% of park staff considered the community as a threat, due to high livestock grazing pressure and illegal park resource use. Overall, community attitude towards wildlife significantly varied ($\chi^2 = 46.28$; $df = 4$; $P = 0.00$) particularly due to educational level ($\chi^2 = 15.96$; $df = 6$; $P = 0.014$), income source ($\chi^2 = 16.77$; $df = 2$; $P = 0.00$), and distance of household from ANP ($\chi^2 = 20.51$; $df = 4$; $P = 0.00$). The logistic regression model revealed that ethnic group, education, benefit obtained, and conflict with the park were significantly associated with attitude towards wildlife ($\chi^2_{15} = 76.62$; $df = 16$; $P = 0.000$).

Conclusions: Majority of respondents showed positive attitude towards wildlife, implying a better chance to mobilize the community for conservation activities in the park. Thus, expansion of formal and adult education as well as livelihood diversification strategies that could benefit the pastoral community would help to improve community attitude towards wildlife so that both wildlife conservation and livestock production can be optimized around ANP.

Keywords: Biodiversity conservation, Conflict, Livestock production, Pastoral community, Protected areas

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Introduction

The wide agro-ecological zones and a range of environmental conditions have made Ethiopia to be one of the biodiversity rich countries in the world, both in large wild mammalian populations and livestock species (Tefera 2011; EBI 2014). For such ecological and geographic variability reasons, the country remains suitable for livestock farming as well as wildlife-related tourism activities (EBI 2014). The country owns the largest livestock population in Africa (CSA 2013), and this sector contributes significant share to the national growth domestic product (GDP) of the country. According to Metaferia et al. (2011), the livestock sector alone is contributing up to 16.5% of the GDP to the country. Likewise, contributions of livestock to cash income of the smallholders accounts for up to 87% and the livelihood of pastoral communities in the arid and semi-arid areas of Ethiopia is dependent upon livestock and livestock products (Behnke 2010). Ethiopia has so far established several protected areas, which cover about 16.4% of the total area of the country (Tessema et al. 2010). These protected areas play significant roles in biodiversity conservation, recreation, eco-tourism, and employment. The economic values of some of the protected areas are estimated at about 1.5 billion USD per annum (EBI 2014). However, the status of protected areas in Ethiopia is reported to be very poor, resulting to the loss of biodiversity and incomes related to wildlife conservation activities. Accordingly, a number of endemic wild animals, birds, trees, and herbaceous plants are currently endangered or critically endangered (Tefera 2011; Tinsae et al. 2012; EBI 2014).

It is common that pastoral livestock and wildlife live along side by side in East African semi-arid rangelands, where they exhibit a high degree of spatial and temporal overlaps or co-existences (Sitters et al. 2009; du Toit 2011). During such interactions, competition of livestock with wild grazers for pasture and water, predation of livestock by large carnivores, and transmission of zoonotic diseases between domestic and wild animals occur (Dejene et al. 2016). According to previous studies (Prins 2000; Georgiadis et al. 2007), competition for scarce grazing and water resources causes conflicts between pastoralists and wildlife managers, since pastoralists and agro-pastoralists migrate into the vicinity of national parks and protected areas during prolonged drought periods in semi-arid rangelands of Eastern Africa.

Extensive pastoral herding based on communal grazing system is the main lifestyle of the pastoral communities around Awash National Park (ANP) (Abule et al. 2005; Tessema et al. 2011). Livestock of the pastoral and agro-pastoral communities share resources with wildlife in and around ANP as commonly observed in other conservation areas of Africa and elsewhere in the world.

Accordingly, the livestock-wildlife interactions around ANP require due attention at local level so that both the livestock and the wildlife sector could play considerable roles in the local communities in particular and in the national income at large (Tefera 2011). The impact of such interactions on wildlife conservation and livestock productivity can be evaluated by understanding the perception and attitude of local community as they could indicate how the pastoral community manages their livestock and coexists with wildlife during drought periods (Fulton et al. 1996). Moreover, the perception of local communities regarding the importance of wildlife and the ways in which wildlife needs to be managed, how local communities are affected by wildlife, and how this influence has an effect on wildlife management programs (Decker et al. 2001) needs to be understood. Some of the factors that would affect the perception and attitude of local community towards livestock-wildlife interactions include livelihood style, benefit obtained, level of interaction with wildlife, economic status, variation between ethnic groups, level of education, and others (Mehta and Heinen 2001; Allendorf et al. 2006; Arjunan et al. 2006; Szell and Hallett 2013).

Most studies on perceptions and attitudes about livestock-wildlife interface areas give more emphasis to wildlife conservation goals and strategies (Decker et al. 2001; Kumessa and Bekele 2014; Acha and Temesgen 2015) than the challenges of livestock-wildlife interactions on local livestock producers bordering protected areas. However, studying the challenges in the livestock-wildlife interface will address main concerns of the pastoral production systems and at the same time major problems of wildlife management in the area, which helps to design management tools that mitigate problems of both the livestock and the wildlife sector.

The relationship between the wildlife authorities and local communities results in the community to develop certain behavior (perceptions and attitudes) concerning wildlife conservation, where the behavior can be explained in a positive or negative way (Baloi 2016). As defined by Barber and Legge (1976), perception is "about receiving, selecting, acquiring, transforming and organizing the information supplied by our senses." "Accordingly, perception may influence the ways in which human understand the world and make decisions" (Vithessonthi 2005). Correspondingly, attitude is defined as "dispositions or tendencies to respond with some degree of favorableness, or not, to a psychological object, the psychological object being any discernable aspect of an individual's world, including an object, a person, an issue or a behaviour" (Fishbein and Ajzen, 2010). Attitude can also be defined as "a tendency expressed by evaluating a particular entity with some degree of favour or disfavor" (Eagly and Chaiken 1993).

However, information about the perceptions and attitudes of the pastoral community and wildlife experts towards wildlife-livestock interactions, and impact of such interaction on livestock production and wildlife conservation around ANP is lacking. In this present study, we focus on the problems of both livestock production and wildlife conservation around ANP. This will help to fill the information gap towards livestock-wildlife interaction in Ethiopia and elsewhere in the world.

Therefore, the objective of the study was to evaluate the perception and attitude of pastoral communities towards livestock-wildlife interactions, and to highlight implications on livestock production and wildlife conservation around ANP. We studied how living at different distances to the park, level of interactions with wildlife, primary source of income, benefit obtained from the park, economic status of the community, difference in ethnic groups, and level of education affect the perception and attitude of pastoral communities towards livestock-wildlife interactions around ANP in Ethiopia. The theory of reasoned action (TRA) described by Ajzen and Fishbein (1980) was used to establish the connection between attitude and conservation.

The TRA is one of the well recognized psychological theories commonly used in attitudinal research (Bragagnolo et al. 2016). The theory assumes a hierarchical framework where “behaviour is influenced by behavioral intent, which is influenced by both attitude and subjective norms (perceived social pressure for a particular behavior).” As personal attitude towards the behavior depends on the person’s positive or negative evaluation of performing the behavior, subjective norm is the individual’s assessment of social pressure on him/her to perform or not perform a particular behavior. Therefore, attitudes are used to predict individual or group’s intentions to behave in a particular manner (Fulton et al. 1996), for example to stand towards or against wildlife conservation.

Methods

Description of the study area

The study was conducted around Awash National Park (ANP: 9°20’N, 40°20’E, located 225 km east of Addis Ababa, the capital of Ethiopia (Fig. 1), at an altitude between 740 and 1820 m asl (Abule et al. 2005; Tessema et al. 2011). The park, established in 1966, covers about

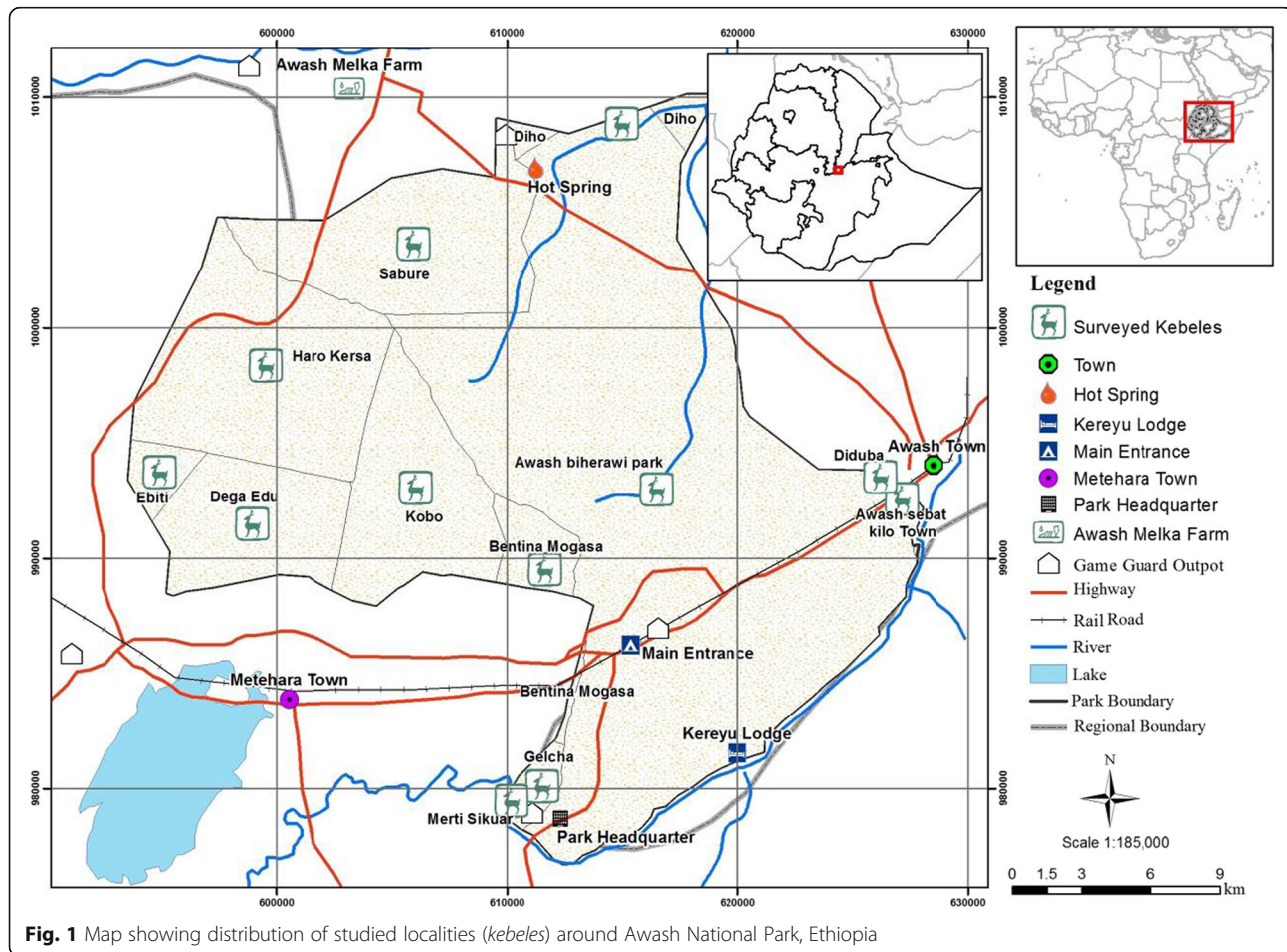


Fig. 1 Map showing distribution of studied localities (kebeles) around Awash National Park, Ethiopia

598 km², which is characterized by semi-arid rangeland ecosystem. The mean annual rainfall of ANP was 512 mm, ranging between 277 and 653 mm (Tessema et al. 2011), and was highly variable among the years. Its main rainy season is from July to September, with a second short rainy season from February to April. The mean daily minimum and maximum temperatures are 18 and 34 °C, respectively (Tessema et al. 2012).

There are several permanent water sources around ANP, which include Awash River with its tributaries (Kesem and Kebena Rivers), Lake Beseka, and the hot springs located at different parts of the park (Tinsae et al. 2012). The vegetation is dominated by grasses, shrubs, and *Acacia* woodland that are well adapted to periods of long drought (Abule et al. 2005; Sebebe and Friis 2009). The park is one of the most important conservation areas in the lowlands of Ethiopia. It supports diverse wildlife resources, including 81 species of mammals, 453 species of birds, and 43 species of reptiles (Zerga 2015). Livestock production is the main livelihood strategy around ANP by both pastoral and agro-pastoral communities (Daniel 2011; Beyene 2012; Zerga 2015). In most cases, large herds of livestock are observed grazing together with wild herbivores in the park. Thus, considerable grassland areas of ANP are now converted into bush land or bare ground due to continuous heavy grazing by livestock of the surrounding communities (Abule et al. 2007; Tessema et al. 2016).

Survey design and data collection

The study was conducted in two districts around ANP: Awash Fentale district, representing Afar region, and Kereyu Fentale district, representing Oromia region in Ethiopia. Stratified sampling procedure was used to select rural villages (*kebeles*) according to Belay et al. (2012). The criteria used to select sampling *kebeles* were relative distance from the park, interaction with wildlife, livestock production system, and representativeness of ethnic groups living around the park (i.e., Afar, Ittu, and Kereyu). Accordingly, nine rural *kebeles*, namely: Benti, Degahedu, and Fateledi (representing Ittu ethnic group), Debiti, Gelcha, and Ilala (representing Kereyu ethnic group), and Deho, Dudub, and Sabure (representing Afar ethnic group) were selected. The first six *kebeles* represent Kereyu Fentale district, and the last three represent the Awash Fentale district. Mean distances of each *kebele* from the park were calculated using ArcView GIS (v3.2) and scored as far (>15 km), close (10–15 km), or very close (<10 km).

Group discussion

In the first place, we tried to generate a general overview of how the pastoral community surrounding ANP lives/coexists with wildlife and the park. We conducted group

discussions using local languages in each of the nine *kebeles* with the help of appropriate translators. The size of group discussants varied from 5 to 12 individuals with an average of 7 participants per *kebele*; hence, a total of 62 individuals (51 men and 11 women) from the nine selected *kebeles* were involved. Moreover, 16 individuals (14 men and 2 women) from the ANP staff participated in focus group discussions (FGD). Open-ended questions on conservation history of the park, pastoral community views regarding the importance of wildlife conservation, history of resource use conflict with the park, and community-park relations were all discussed in local languages. Informations gathered at this point were organized and used during the key informant discussions.

Key informant interviews

Key informant selection was based on the information provided from local administrators and the park management, most of the participants was elderly people who have a good knowledge of community-park relation histories of the area. A checklist of open-ended questions related with whether ANP is beneficial to community or not, benefits obtained, community resource use requirements from ANP, involvement in park activities, status of human-wildlife conflict, and the current conservation status, as well as future fate of the park were raised during the key informant interviews. A total of 30 key informants (three households per *kebele* and three experienced wildlife experts) were included during the study.

Questionnaire survey

A structured and semi-structured questionnaire interview was conducted among sample pastoral and agro-pastoral households from the nine selected *kebeles* surrounding ANP. In addition to socioeconomic and demographic information, the interview was designed to collect data related to major constraints of livestock production, level of livestock-wildlife interactions, major problems the local community faced due to wildlife, incidence of conflict with wildlife staff, and readiness to live in harmony with the park. A total of 180 household heads, 20 per *kebele*, were selected using a simple random sampling method. In addition, 20 randomly selected ANP staff members were also included in the questionnaire interview. Prior to the formal survey, a pilot survey was conducted on the first 2 weeks of August 2015 to identify target communities and for pre-testing the questionnaire to ensure that all questions were clear for the enumerators before the actual data collection. The formal survey was conducted from September to December 2015. Individual interview and FGD were held by the researcher with the help of appropriate local community scouts and development agents to

translate the English language questionnaire into local languages.

At the end of each interview, the researcher scored each respondent according to the interviewees overall attitudes to wildlife. These attitude scores, from 1 (negative) to 3 (positive), were based on a combination of households reported yes or no of conflict with wildlife, their reported strategy to protect problem-making wild animals, reported frequency whether ANP benefit the community and the types of benefit obtained, earlier experience in park management issues, reported relation with, and willingness to live in harmony with the park. In addition, qualitative information per individual respondent was gathered while interviewing in order to minimize biasness in scoring attitudes.

Data analysis

Factors affecting attitude towards livestock-wildlife interactions around ANP were investigated using ordinal logistic regression models, with an ordered categorical dependent variable, in this case attitude scores, with 3 being the highest and 1 the lowest (Hosmer and Lemeshow 2000). On the global model, all explanatory variables listed in Table 1 were used and finally the optimum model is presented from the global model in

which very few independent variables having collinearity problems were omitted (Table 4), by calculating the variance inflation factors (VIFs), where (VIFs <5) implies absence of collinearity. To make sure whether the optimum model best explained the data, goodness of fit test statistics using pseudo R^2 , Akaike Information Criteria (AIC), and Bayesian Information Criteria (BIC) were used, while measures of association were checked through likelihood ratio (Campbell-Smith et al. 2010).

The model for the ordinary logistic regression: $Y_{ij} = F(\text{Distance}_i, \text{Sex}_i, \text{Ethnic}_i, \text{Education}_i, \text{Benefit}_i, \dots, \text{Interaction}_i)$, where Y_{ij} is the attitude towards livestock-wildlife interaction outcomes of household “ i ,” measured by the independent variable “ j ,” $i = 1, 2, 3, \dots, 180$ households, $j = 1$ (distance of household from park headquarter), 2 (sex of household), 3 (age range), 4 (family size), 5 (ethnic group of household), 6 (education level), 7 (primary source of income), 8 (total livestock holding), 9 (livestock production system), 10 (livestock grazing area), 11 (interaction with wildlife), 12 (ANP benefit community or not), 13 (livestock cause problem to the park or wildlife), 14 (conflict with wildlife), 15 (participation experience in park management), 16 (relation with park staff), 17 (conflict with park staff), 18 (want to live in harmony with the park); Ethnic_i (ethnic group, from household i ,

Table 1 Description of independent variables used in ordinal logistic regression model

| Independent variables | Description of variables | Value label |
|-----------------------------------|--|---|
| Age range | CV; age range of households | 1 = 20–40; 2 = 41–60; 3 = >60 |
| Sex | BV; sex of household | 1 = female; 2 = male |
| Family size | Continues variable; number of individuals in the household | |
| Ethnic group | CV; ethnic group of the household | 1 = Afar; 2 = Ittu; 3 = Kereyu |
| Education | CV; educational status of household | 1 = elementary school; 2 = high school, 3 = illiterate, and 4 = able to read and write. |
| Primary source of income | BV; primary source of income to household | 1 = crop production; 2 = livestock production |
| TLU | Continues variable; total livestock holding | |
| Distance | CV; distance of household from park head quarter | 1 = far; 2 = close; 3 = very close |
| Private grazing | BV; presence/absence of private grazing land | 1 = yes; 2 = no |
| Communal grazing | BV; presence/absence of private grazing land | 1 = yes; 2 = no |
| Awash National Park (ANP) grazing | BV; presence/absence of grazing in the park | 1 = yes; 2 = no |
| Interaction with wildlife | CV; level of interaction with wildlife | 1 = low; 2 = high, 3 = very high |
| Any benefit from ANP | BV; presence/absence of benefit from the park | 1 = yes; 2 = no |
| Wildlife problem | BV; presence/absence of problem from wildlife | 1 = yes; 2 = no |
| Problem type | CV; type of problem due to wildlife | 1 = crop damage; 2 = livestock predation; 3 = disease transmission |
| Relation | BV; relation of household to the park | 1 = positive; 2 = negative |
| Livestock problem | BV; presence/absence of problem on wildlife due to livestock | 1 = yes; 2 = no |
| Conflict | BV; presence/absence of conflict with the park | 1 = yes; 2 = no |
| Management park | BV; presence/absence of experience in park management | 1 = yes; 2 = no |
| Harmony | BV; want to live in harmony with the park/not | 1 = yes; 2 = no |

CV categorical variable, BV binary variable

in dependent variable j); Education _{i} (education status, from household i , in dependent variable j); Benefit _{i} (benefit of ANP, from household i , in dependent variable j); Distance _{i} (distance from park headquarter, from household i , in dependent variable j); Interaction _{i} (livestock-wildlife interaction level, from household i , in dependent variable j).

In addition to the regression analysis, factors associated with both livestock production and wildlife conservation were analyzed by cross-tabulations, Pearson's χ^2 test, F tests, and *Post-hoc* mean separation using SPSS v 20. Data related to constraints of livestock production in the area, which needs multiple responses (overall ranking) such as feed shortage, lack of water, climate change, months of feed shortage, and major wild animals involved in livestock predation, were analyzed using a rank index method (Kosgey 2004; Musa et al. 2006), according to the formula: the sum of an individual reason divided by the sum of overall reasons (for instance 3 for rank 1 + 2 for rank 2 + 1 for rank 3). All statistical analyses were declared significant at $P \leq 0.05$.

Results

Household livelihood and livestock production

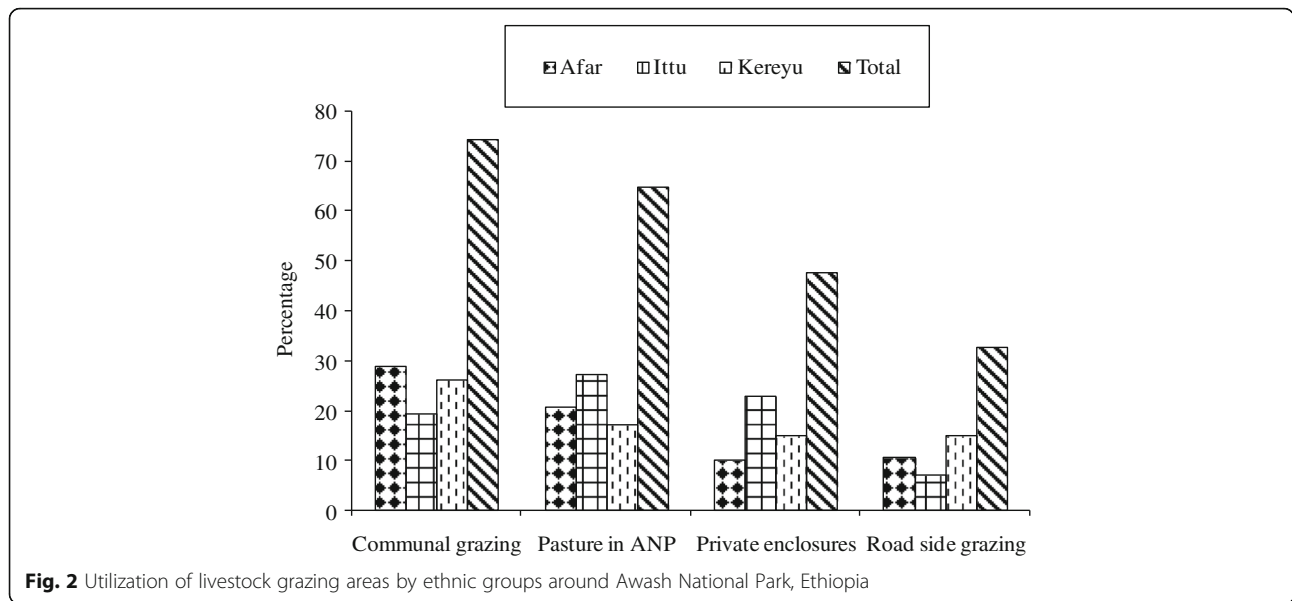
Livestock production was the primary source of livelihood (69%) ($\chi^2 = 56.19$; $df = 2$; $P = 0.00$) compared to crop production (Table 2). Moreover, 100% of the Afar

and 70% of Kereyu households were involved in livestock production as the main source of income indicating importance of livestock production in the area. However, crop farming was significantly ($F = 40.17$; $df = 2$; $P = 0.00$) practiced by the Ittu ethnic groups. Additionally, very few pity trades and formal employment in government offices were also reported as part of livelihoods of local communities around ANP.

The average livestock holding was 13.1 ± 1.8 tropical livestock unit (TLU); a higher mean TLU (19.2 ; $F = 68.47$; $df = 2$; $P = 0.00$) was recorded for Afar households, followed by the Kereyu (12.6), and the Ittu ethnic groups (Table 2). Almost all respondents indicated that the livestock population had been decreasing from time to time due to feed shortage (ranking index = 0.38), followed by lack of water (ranking index = 0.32), and climate change (ranking index = 0.30). Moreover, the livestock holding nature shifted towards browsers (camel and goats) than grazers (cattle and sheep) as reported by most key informants. According to the multiple responses of households, communally owned grazing lands, pasture in ANP, and small private owned grazing enclosures were the important areas used for livestock grazing with an overall percentage of 74, 65, and 48, respectively, in addition to road side grazing 32% (Fig. 2). Utilization of grazing areas significantly varied ($\chi^2 = 11.01$; $df = 2$; $P = 0.004$) between ethnic groups during our study.

Table 2 Characteristics of respondent households, educational level, sources of income, and level of livestock-wildlife interaction around Awash National Park, Ethiopia

| Variable | | | | Overall (n = 180) |
|--------------------------------------|-----------|--------|------|-------------------|
| Ethnic group | Ittu | Kereyu | Afar | |
| Number of respondents | 60 | 60 | 60 | 180 |
| Male | 53 | 50 | 44 | 147 |
| Female | 7 | 10 | 16 | 33 |
| Mean household age | 39 | 38.2 | 34.2 | 37.1 ± 0.8 |
| Mean household family size | 6.9 | 6.3 | 5.5 | 6.2 ± 0.2 |
| Educational status | | | | |
| Illiterate | 45 | 48 | 36 | 129 |
| Elementary school | 8 | 3 | 5 | 16 |
| High school | 4 | 8 | 13 | 25 |
| Read and write | 3 | 1 | 6 | 10 |
| Primary source of income (%) | | | | |
| Both crop and livestock production | 63.3 | 30 | 0 | 31.1 |
| Livestock production | 36.7 | 70 | 100 | 68.9 |
| Mean livestock holding per household | 7.6 | 12.6 | 19.2 | 13.1 ± 1.8 |
| Mean attitude to wildlife | 1.65 | 1.82 | 2.5 | 1.99 ± 0.06 |
| Interaction with wildlife | Very high | High | High | |
| Mean distance to the park | 2.33 | 2 | 1.33 | 1.89 ± 0.07 |
| Mean relation to park | 1.75 | 1.82 | 1.93 | 1.83 ± 0.02 |



According to the key informants, grazing land preference was dependent upon feed availability and accessibility in the study areas.

All respondents confirmed the presence of feed shortage in their locality. Critical feed shortage was particularly observed during the months of February, March, April, and May with a ranking index of 0.13, 0.17, 0.23, and 0.26, respectively. However, most informants during focus group discussions confirmed that feed shortage was a major problem affecting the productivity of livestock almost throughout the year. Moreover, decline in the productivity of grazing lands and grazing land encroachment with other land-use types were found as critical reasons for the shortage of feed resources. According to key informant discussions, shortage of rain fall, increased human population, and shifting mode of life from pastoral to agro-pastoral production resulted in shrinkage of grazing fields. Pastoralists practiced migration to different areas (0.32), migration to ANP (0.23), and storing feed resources (0.20) as strategies to cope with feed shortage. However, key informants underlined that the stored feed was mainly supplied by both governmental and non-governmental organizations during critical periods of drought as coping strategies.

Perceptions and attitudes towards livestock-wildlife interactions

About 71% of all respondents showed positive attitude towards wildlife in and around ANP. However, Afar ethnic groups showed significantly positive attitude to wildlife ($\chi^2 = 46.28$; $df = 4$; $P = 0.00$) compared with Kereyu and Ittu groups (Table 3). Similarly, significant variation was observed among ethnic groups regarding the benefit of the park ($\chi^2 = 8.49$; $df = 2$; $P = 0.014$). About 85% of

the Afar respondents claimed that ANP is beneficial, compared to 63% for Ittu. The Afar ethnic groups had positive attitude towards ANP, since they considered the park as a source of feed and water during critical dry seasons (45%) and construction material (32%; Fig. 3) and its contribution to the national income through eco-tourism (13%). However, national income (51%) and source of feed and water during critical dry season (20%) were reasons to have positive attitude to the park among Ittu households. Moreover, key informants in all ethnic groups viewed wildlife as part of their lives and are ready to participate in conservation activities of the park. However, most informants want more benefit from the park, like better employment opportunities, more benefit from eco-tourism, and development of drinking water and irrigation projects in addition to dry season pasture requirements. Discussions with the park staff also revealed that the surrounding communities are not as such benefited from the park. However, few associations are getting some benefits from tourist as local guide and selling of traditional handicrafts.

Moreover, attitude to wildlife was significantly affected by education level ($\chi^2 = 15.96$; $df = 6$; $P = 0.014$), primary source of income ($\chi^2 = 16.77$; $df = 2$; $P = 0.00$), and

Table 3 Frequency of attitudes towards wildlife by ethnic groups around Awash National Park (ANP), Ethiopia, ($n = 180$) on a scale, where 1 = negative, 2 = neutral, and 3 = positive

| Ethnic group | Frequency of attitudes to wildlife | | | Mean attitude |
|--------------|------------------------------------|----|----|---------------|
| | 1 | 2 | 3 | |
| Afar | 0 | 30 | 30 | 2.5 |
| Ittu | 31 | 19 | 10 | 1.65 |
| Kereyu | 22 | 21 | 11 | 1.82 |

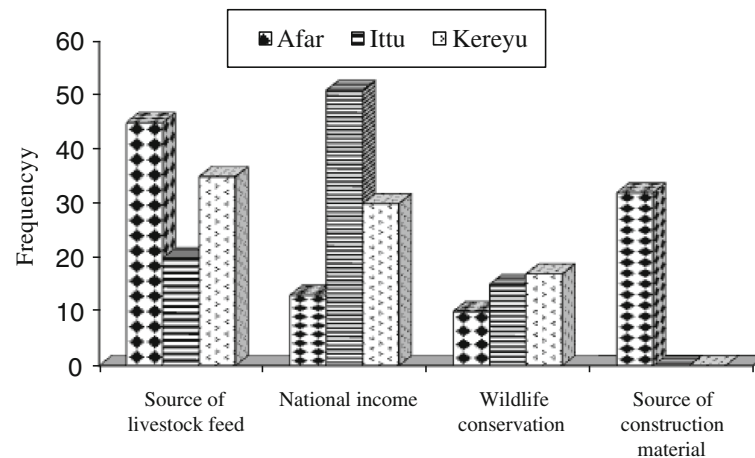


Fig. 3 Response of households between three ethnic groups (Afar, Ittu, and Kereyu) about the distribution of assumed benefits around Awash National Park, Ethiopia ($n = 180$)

distance of household to the park headquarter ($\chi^2 = 20.51$; $df = 4$; $P = 0.00$). However, the response did not differ among the ages ($\chi^2 = 13.00$; $df = 8$; $P = 0.112$) and the level of household interaction with wildlife ($\chi^2 = 7.82$; $df = 4$; $P = 0.098$).

Ninety percent of the respondents perceived that wildlife caused problems with significant variations among ethnic groups ($\chi^2 = 13.29$; $df = 2$; $P = 0.001$); as a result, they avoid both wild herbivores and carnivores. However, most group discussants told that disease transmissions were also problems in the study areas. According to informants (community and wildlife staff), ticks and tick-borne diseases (TBDs) and intestinal parasites were the two common diseases observed on livestock-wildlife interface areas. Lack of compensation for the economic loss due to problem-making animals was also the other reason to develop negative attitude towards wildlife according to most key informants. Our study indicated that crop damage and livestock predation together (53%), followed by livestock predation (41%), and crop damage (6%) were the major problems caused by wild animals. Lion (ranking index = 0.4), leopard (0.27), and hyena (0.16) were the three most important carnivores causing livestock predation. Moreover, jackal and wild dogs were also reported by group discussants. At the same time, the majority of crop damage was caused by warthog (39%) and porcupine (32%), while the remaining 29% was done by baboons, monkey, and bushbuck. Overnight mass protection of farms (42%) and sometimes shooting (34%) were used to control problem-making animals, and the remaining 24% of the respondents do not have successful control measures.

About 53% of the respondents had positive relations with the park; however, community-park relations significantly varied ($\chi^2 = 7.44$; $df = 2$; $P = 0.024$) among the ethnic groups studied. Nearly 60% of the households

confirmed that livestock entrance to the park influenced wildlife populations, where competition for pasture (69%) and habitat destruction (31%) were reported as negative aspects. Most wildlife staff discussants reported parasite and disease transmission as additional problem of livestock-wildlife interactions. There was a high incidence of conflict (79%) between the community and park staff, with significant variations ($\chi^2 = 24.09$; $df = 2$; $P = 0.000$) among the communities studied. Moreover, informants from the park indicated that higher conflicts were common with households living very close to the park. The primary cause of conflict was livestock grazing restrictions and illegal resource exploitation within the park. Similarly, key informants both from the community and park staff reported that the level of conflict has been increasing than previous periods. Nevertheless, 77% of the respondents are ready to live in harmony with the park.

Factors determining perception and attitude towards wildlife

Ordinal logistic regression analyses revealed that the overall result was significant ($\chi^2 = 76.62$; $df = 16$; $P = 0.000$) indicating that the independent variables (Table 4) influenced community attitude towards livestock-wildlife interactions. However, only four variables: ethnic group, education, benefits obtained, and conflict with the park, were significantly associated with community attitudes towards wildlife (Table 4). Positive attitudes towards wildlife conservation were significantly more common among Afar ethnic groups ($P = 0.008$), better educated households ($P = 0.010$), and those who gained some benefit from ANP ($P = 0.033$). However, households who had suffered conflict with park showed significantly negative attitude to wildlife ($P = 0.041$). In contrast, most of the variables including sex, age, family size, distance

Table 4 Variables included in the optimum ordinal regression model for Afar, Ittu, and Kereyu ethnic groups around Awash National Park (ANP), Ethiopia ($n = 180$)

| Independent variables | Coef. (Std. Err.) | Negative attitude dy/dx (Std. Err.) | Positive attitude dy/dx (Std. Err.) |
|-------------------------------------|-------------------|--|--|
| Distance (3 = reference) | | | |
| 1 | 0.4731(0.51) | -0.0830(0.09) | 0.0786(0.08) |
| 2 | -0.0204(0.50) | 0.0036(0.09) | -0.0033(0.08) |
| Ethnic group (3 = reference) | | | |
| 1 | 1.3182(0.51)** | -0.2074(0.07)*** | 0.2413(0.10)** |
| 2 | -0.4974(0.54) | 0.0923(0.10) | -0.0774(0.08) |
| Education (4 = reference) | | | |
| 1 | -0.6310(0.68) | 0.1252(0.15) | -0.0898(0.08) |
| 2 | 1.7568(0.97)* | -0.1952(0.06)*** | 0.3864(0.23)* |
| 3 | -0.0852(0.57) | 0.0150(0.10) | -0.0140(0.10) |
| Primary income source | | | |
| TLU/household | 0.3395(0.42) | -0.0604(0.07) | 0.0556(0.06) |
| Private grazing (y) | 0.0090(0.00) | -0.0016(0.00) | 0.0015(0.00) |
| Communal grazing (y) | -0.5272(0.39) | 0.0936(0.07) | -0.0864(0.06) |
| Grazing in ANP (y) | -1.0321 (0.55)* | 0.1478(0.06)** | -0.2033(0.12)* |
| Any benefit from ANP (y) | 0.4334(0.39) | -0.0814(0.08) | 0.0667(0.06) |
| Livestock cause problem to park (y) | 0.7961(0.37)** | -0.1536(0.08)** | 0.1178(0.05)** |
| Experience on park management (y) | 0.6266(0.52) | -0.1241(0.11) | 0.0894(0.06) |
| Conflict with the park (y) | 0.6388(0.49) | -0.0990(0.07) | 0.1189(0.10) |
| Conflict with the park (y) | -1.0278(0.50)** | 0.1500(0.05)** | -0.1999 (0.11)* |

Number of obs. = 180

LR χ^2 (16) = 76.62Prob > χ^2 = 0.000

Log likelihood = -156.34

Pseudo R^2 = 0.197

y yes

* $P < 0.1$, ** $P < 0.05$, *** $P < 0.01$

of household from park headquarter, primary source of income, livestock holding, livestock grazing area preferences, interactions with wildlife, and experience in park management were not significant to predict community attitudes.

The ordinal logit model showed that when keeping all independent variables constant, Afar households were significantly associated ($P < 0.05$) with positive attitudes to wildlife compared with Ittu and Kereyu ethnic groups (Table 4). High school education was significantly negatively correlated ($P < 0.001$) with negative attitudes. As the educational level of respondent improved to high school level by one unit, the probability to have a negative attitude to wildlife would decrease by 19.5%. Again, benefit received was significantly positively correlated ($P < 0.05$) with positive attitudes among the local communities (Table 4). Therefore, improving the benefits obtained from the park will generally improve the attitude of the community towards wildlife and conservation, when keeping all the other explanatory variables constant. The regression model also showed that conflict incidences were significantly negatively associated ($P <$

0.05) with community attitudes towards wildlife, implying that higher degree of conflict will decrease attitudes towards wildlife, when keeping other factors constant.

Discussion

Livestock production opportunities and threats

Livestock production was the primary source of income for 69% of the households, which confirms the importance of pastoral production system in the area studied (Daniel 2011; Beyene 2012). Similar to earlier studies conducted around ANP (Zeray 2008; Beyene 2012; Tilahun et al. 2016), higher livestock holdings was reported in Afar households (19.2 ± 2.2), followed by Kereyu (12.6 ± 2.7), and Ittu (7.6 ± 1.9). The lower mean TLU in Ittu might be related with the strict sedentary agropastoral mode of life than the pastoral Afar and Kereyu ethnic groups (Beyene 2012; Gebeyehu et al. 2016). However, herd size per household declined through time (Zeray 2008; Tilahun et al. 2016), due to feed shortage, lack of water, and climate change. Our result also showed that livestock owners are keeping more browser species than grazers due to shortage of quality pasture.

Similar shift in livestock holdings was also reported among Somali pastoral areas in Eastern Ethiopia (Kassahun et al. 2008).

Recurrent drought is influencing livestock production in the study area, which is in agreement with previous findings (Kassahun et al. 2008; Tilahun et al. 2016) in pastoral area of the country. Drought affects pasture availability in rangelands (Kassahun et al. 2008; Gezahegn et al. 2015), and this is reflected on livestock production and productivity around ANP, thus affecting pastoral livelihoods and food insecurity. To manage problems of feed shortage on rangelands, livestock herders usually trespass to the park boundary (Tinsae et al. 2012; Dejene et al. 2014), which influence conservation activities of the park. In order to minimize the risks associated with drought, different livelihood diversification strategies have been implemented among pastoral communities around ANP (Beyene 2012; Dejene et al. 2014; Abdi et al. 2015). Among the strategies, crop production can be mentioned; however, it is highly influenced by shortage of rainfall in the area. Accordingly, the development of irrigation agriculture was initiated (Beyene 2012; Abdi et al. 2015), as it is important to improve livelihood of poor livestock herders with little modifications on their mode of life (Torres and Momsen 2004). Expansion of irrigation projects increase crop productivity (Abdi et al. 2015) and also crop residues as livestock feeds. Meanwhile, livestock owners can also produce improved pasture along with cereal crops on their plots, which can improve local feed availability. This can reduce livestock grazing pressure on the park and potentially reduce resource use conflict between the local community and the park. However, households still require legal right to use pasture from the park at least during dry seasons and prolonged drought periods.

Perception and attitude towards livestock-wildlife interactions

About 71% of the local community around ANP showed positive attitude to wildlife, which is lower than the findings by Tessema et al. (2010) and Yosef (2015) in different protected areas of Ethiopia which is about 75 and 80%, respectively. Such difference in attitude might be related with the benefit obtained and socioeconomic differences among the studied communities. Among the respondents, Afar households showed relatively more positive attitude (2.5) to wildlife as well as to the park. Better positive attitude by Afar ethnic group might be related with the long socio-cultural relations established with the park (Tessema et al. 2010). Moreover, location advantage might also contribute to better relation to park and wildlife among Afar households, since two of the surveyed *kebeles* (Deho and Sabure) are located at the northern part of the park commonly known as “File

Wuha” site named after the presence of permanent hot springs. Around File Wuha areas, the community collects palm tree branches as source of construction material, accesses good pasture, and gets water from hot springs for their animals (Tinsae et al. 2012). The degree to which communities exploit resources was reported to influence their attitude to the park and wildlife in general (Tessema et al. 2010; Kumessa and Bekele 2013; Szell and Hallett 2013; Yosef 2015). Since File Wuha site is located far from the park headquarter (39 km), the control by wildlife rangers is very low and this might also add the lesser conflict record between Afar households and park staff.

Lower positive attitudes to wildlife (mean attitude score 1.65) and higher incidence of conflict with the park in Ittu compared with Afar ethnic groups (2.5) might be due to their sedentary agro-pastoral mode of life (Beyene 2012; Gebeyehu et al. 2016). Being sedentary, they usually trek their livestock to wildlife core areas (Fig. 2), where there is strict monitoring by wildlife rangers, which results in a higher degree of conflict. Higher conflict situations result in the development of negative attitude towards wildlife by the surrounding pastoral communities since they assume that the cause of the conflict is the presence of wildlife in the park (Kumessa and Bekele 2013; Kumessa and Bekele 2014). Similarly, two *kebeles* (Fateledi and Benti) were located very close to the park headquarter where the community has higher level of interaction with wildlife and park staff, potentially increasing conflict incidences (Kumessa and Bekele 2013). Similar results were also reported by Yosef (2015) in Bale Mountains National Park, where households very close to park experienced higher conflict rate than those located far distance to the park. Local communities located very close to protected areas, with higher degree of resource use restrictions by wildlife authorities, were observed to develop negative attitude towards conservation activities compared to those who settled far (Shibia 2010).

Higher degree of conflict with wildlife (90%), due to crop damage and livestock predation, was recorded in this study, which is in agreement with previous studies in different conservation areas of the country (Tessema et al. 2010; Kumessa and Bekele 2013; Yosef 2015; Acha and Temesgen 2015). As indicated by Anthony (2007) and Shibia (2010), crop and livestock losses due to wildlife have resulted in the development of negative attitude by local communities towards Kruger National Park in South Africa and Marsabit National Reserve Kenya, respectively. There was no report of compensation by households who suffer wildlife damages, which might contribute to the lower positive attitude in our study. According to Groom and Harris (2008), receiving compensation was significantly associated with attitudes

towards wildlife among communities around Amboseli National Park, Kenya. While compensation payments were observed to support conservation programs by maintaining positive attitudes, absence or unsatisfactory compensations resulted in conflict with conservation authorities and hence negatively affected biodiversity conservation (Ferraro and Kiss 2002; Lepp and Holland 2006; Wang et al. 2006; Chaminuka et al. 2012; Pechacek et al. 2013; Baloi 2016). In addition to recurrent drought, ticks and TBDs and internal parasites were reported to hinder livestock production around ANP, which is in line with the findings by Maleko et al. (2012) in livestock-wildlife interface areas around Arusha National Park, Tanzania. The higher livestock-wildlife interactions in present study allow livestock of different species to share pasture and dwellings with wild fauna, and this might play a role in parasite and disease transmissions.

Factors determining perceptions and attitudes towards wildlife

Presence of community education, minimizing incidence of conflict, and sharing benefit from the park were enough to improve community attitude towards wildlife. Similar to previous studies in Tanzania (Kideghesho et al. 2007), southern African countries (Snyman 2014), Romania (Szell and Hallett 2013), Nepal (Carter et al. 2014), and around Abijata-Shalla Lakes National Park, Ethiopia (Kumessa and Bekele 2014), formal education did play a significant role in predicting attitude towards wildlife and its conservation around ANP in our study. According to Anthony (2007) and Shibia (2010), those households with low formal education were observed to have negative attitude to wildlife conservation, while those with better educational status showed positive attitudes (Vodouh  et al. 2010). The current study showed that households who attained secondary education showed lower negative attitudes than households with elementary school and no formal education groups, as they might be familiar with conservation concepts in the curriculum. It is obvious that formal education helps to better improve the perception and understanding of households to conservation benefits than the non-educated groups (Vodouh  et al. 2010). Accordingly, improving the educational status of the young's and expansion of adult education will be helpful to improve community attitude towards wildlife around ANP.

The current finding showed that the higher the conflict between community and park staff, the lower the attitude (Table 4), and conversely, the better benefits obtained, the more positive the attitudes to wildlife. Our result is in agreement with previous findings (Kideghesho et al. 2007; Groom and Harris 2008; Shibia 2010; Chaminuka et al. 2012; Kumessa and Bekele 2013; Yosef 2015) in different protected areas of Africa, in three

protected areas in Burma (Allendorf et al. 2006), and in Retezat National Park Romania (Szell and Hallett 2013). According to Holmes (2003) and Carter et al. (2014), behavioral resource exploitation patterns and socioeconomic and cultural variations were observed to influence local people's attitude towards wildlife. Therefore, such behavioral, socioeconomic, and cultural diversity might contribute to the observed attitude differences towards wildlife among Afar, Kereyu, and Ittu ethnic groups around ANP in our study. The better positive attitude towards wildlife by Afar households than the ethnic groups might also be related with the development of positive behavior towards wildlife according to the theory of reasoned action (Ajzen and Fishbein 1980). Positive community attitude to wildlife and to the park was linked with its importance as a source of national income, as a source of dry season feed to livestock, and for ecological reasons. However, park employment mostly cited benefit that the local community wants to get next to dry season livestock grazing requirements. Therefore, creating more job opportunities through ecotourism and other wildlife-related activities (Tessema et al. 2010; Vodouh  et al. 2010; Dejene et al. 2014) would reduce conflict incidences, which in turn helps to improve community attitude towards wildlife in the protected areas.

Conclusions

The results of the present study indicated that livestock sector is still the pillar to household income around ANP. However, livestock production is constrained by a number of environmental and human factors, e.g., feed shortage, recurrent drought, and degradation of rangelands. Such problems derive the pastoral communities to utilize the park resources which are meant for wildlife conservation, resulting in a conflict with park staff. Resource competition, habitat destruction, and fear of disease transmission were the major problems reported on livestock-wildlife interface areas of the park. Majority of respondents show negative attitude to wildlife because of the economic losses due to livestock predation and crop damage. However, they still believe that wildlife generates income to the country through tourism. It was also observed that Afar households, those with better educational background, and households who get some benefit from the park showed positive attitude, while higher conflict situations were negatively correlated with attitudes to wildlife. Therefore, expansion of formal and adult education especially for those ethnic groups showing lower attitude towards wildlife will help to improve their attitudes. In line with formal education, wildlife conservation education and the benefit gained after conservation activities should be addressed to all ethnic groups surrounding the park. Moreover, attention should

be given to the households settled very close to and having higher resource use conflict with the park, and there should be a means whereby the community either uses the pasture at the periphery of the park or collect through cut-and-carry system during long dry seasons and drought periods. At the same time, inclusion of compensation and benefit sharing mechanisms in future wildlife management plan of the park could have a paramount importance. In general, protection of this park has a bright future since most of the households are willing to work with the park. As a result, it will be an important opportunity to all the stakeholders to design and implement community based wildlife management approaches that at least should address the basic issues of the pastoral communities.

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Authors' contributions

YB designed and conducted the research, analyzed and interpreted the results, and written the manuscript. TZK and MU initiated the idea and edited the manuscript. All authors revised the manuscript and read and approved the final version.

Competing interests

The authors declare that they have no competing interests.

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References

- Abdi E, Girma T, Fekadu B (2015) The impact of Boset-Fentalle irrigation on the income of agro-pastoralist in Fentalle district, Ethiopia. *Int J Agric Res Innov Technol* 5(2):44–50
- Abule E, Snyman HA, Smit GN (2005) Comparisons of pastoralists perceptions about rangeland resource utilisation in the Middle Awash Valley of Ethiopia. *J Environ Manag* 75:21–35
- Abule E, Snyman HA, Smit GN (2007) Rangeland evaluation in the Middle Awash Valley of Ethiopia: I. Herbaceous vegetation cover. *J Arid Environ* 70:253–271
- Acha A, Temesgen M (2015) Approaches to human-wildlife conflict management in and around Chebera-Churchura National Park, Southern Ethiopia. *Asian J Conserv Biol* 4(2):136–142
- Ajzen I, Fishbein M (1980) Understanding attitudes and predicting social behavior: attitudes, intentions, and perceived behavioral control. Prentice Hall, Englewood Cliffs, NJ
- Allendorf TD, Swe KK, Oo T, Htut Y, Aung M, Allendorf K, Hayek L, Leimgruber P, Wemmer C (2006) Community attitudes toward three protected areas in Upper Myanmar (Burma). *Environ Conserv* 33(4):344–352
- Anthony B (2007) The dual nature of parks: attitudes of neighbouring communities towards Kruger National Park, South Africa. *Environ Conserv* 34(3):236–245
- Arjunan M, Holmes C, Puyravaud JP, Davidar P (2006) Do developmental initiatives influence local attitudes toward conservation? A case study from the Kalakad-Mundanthurai Tiger Reserve, India. *J Environ Manag* 79:188–197
- Baloi VA (2016) Community perceptions and attitudes towards integrated wildlife/livestock land-uses: the case of greater-Giyani rural communities. University of Limpopo, Limpopo province. MSc Thesis. Faculty of Science and Agriculture, p 85
- Barber PJ, Legge D (1976) Perception and information. *Essential psychology series*, (a 4), London: Methuen, p 143
- Behnke R (2010) The contribution of livestock to the economies of IGAD member states: study findings, application of the methodology in Ethiopia and recommendations for further work, IGAD LIP Working Paper No 02–10. Odessa Centre, IGAD Livestock Policy Initiative. Great Wolford, UK
- Belay S, Amsalu A, Abebe E (2012) Awash National Park, Ethiopia: use policy, ethnic conflict and sustainable resources conservation in the context of decentralization. *Afr J of Ecol* 51:122–129.
- Beyene S (2012) Livelihood diversification among the pastoral and agro-pastoral groups in the Upper Awash Valley, Ethiopia. *Hum Ecol* 39(3):241–253
- Bragagnolo C, Malhado ACM, Jepson P, Ladle RJ (2016) Modelling local attitudes to protected areas in developing countries, review. *Conserv Soc* 14(3):163–182
- Campbell-Smith G, Simanjorang HVP, Leader-Williams N, Linkie M (2010) Local attitudes and perceptions toward crop-raiding by Orangutans (*Pongo abelii*) and other non-human primates in Northern Sumatra, Indonesia. *Am J Primatol* 71:1–11
- Carter NH, Riley SJ, Shortridge A, Shrestha BK, Liu J (2014) Spatial assessment of attitudes toward Tigers in Nepal. *Ambio* 43:125–137
- Chaminuka P, Mccrindle CME, Udo HMJ (2012) Cattle farming at the wildlife/livestock interface: assessment of costs and benefits adjacent to Kruger National Park, South Africa. *Soc Nat Resour* 25:235–250
- CSA, Central Statistical Agency (2013) Agricultural sample survey, 2012/13. In: Volume II: Report on Livestock and livestock characteristics (Private peasant holdings). Statistical Bulletin 570. Federal Democratic Republic of Ethiopia, Addis Ababa
- Daniel A (2011) Challenges and opportunities for the establishment of community based ecotourism in the Awash National Park Area, master thesis. College of Development Studies, Addis Ababa University, Ethiopia
- Decker DJ, Brown TL, Sicmer WF (2001) Evolution of people-wildlife relations. In: Decker DJ, Brown TL, Siemer WL (ed) *Human dimensions of wildlife management in north America*. The Wildlife Society, Bethesda MD
- Dejene SW, Seyoum H, Ready RU (2014) ecotourism potential and its role for sustainable development and livelihood in Awash National Park, Ethiopia. *Int J Sci Res* 3(12):792–796
- Dejene SW, Heitkönig IMA, Prins HHT, Fitsum A, Daniel A, Zelalem E, Tessema ZK, de Boer WF (2016) Risk factors for bovine tuberculosis (bTB) in cattle in Ethiopia. *PLoS One* 11(7):e0159083. doi:10.1371/journal.pone.0159083
- Du Toit J (2011) Coexisting with cattle. *Science* 333:710–1711
- Eagly AH, Chaiken S (1993) *The Psychology of Attitudes*. Harcourt Brace Jovanovich College Publishers, the University of Michigan, p 794
- EBI, Ethiopian Biodiversity Institute (2014) Government of the Federal Democratic Republic of Ethiopia. In: Ethiopia's Fifth National Report to the Convention on Biological Diversity Ethiopian Biodiversity Institute. May, 2014 Addis Ababa, Ethiopia
- Ferraro PJ, Kiss A (2002) Direct payments to conserve biodiversity. *Science* 298: 1718–1719
- Fishbein M, Ajzen I (2010) *Predicting and changing behaviour: the reasoned action approach* psychology press. Taylor and Francis, New York, p 518
- Fulton D, Manfredi M, Lipscomb J (1996) Wildlife value orientations: a conceptual and measurement approach. *Hum Dimens Wildl* 1:24–47
- Gebeyehu G, Beche D, Feyisa K (2016) Indigenous utilization and management of useful plants in and around Awash National Park, Ethiopia. *J Plant Biol Soil Health* 3(1):12
- Georgiadis NJ, Ihwagi F, Olwero JGN, Romanáč SS (2007) Savanna herbivore dynamics in a livestock-dominated landscape. II: Ecological, conservation, and management implications of predator restoration. *Biol Conserv* 137:473–483
- Gezahegn A, Birhanu H, Nuru S (2015) Participatory assessment of major animal health constraints to sheep export from Afar Pastoral Production System. *Glob Veterinaria* 15(1):48–56
- Groom R, Harris S (2008) Conservation on community lands: the importance of equitable revenue sharing. *Environ Conserv* 35(3):242–251

- Holmes CM (2003) The influence of protected area outreach on conservation attitudes and resource use patterns: a case study from western Tanzania. *Oryx* 37(3):305–315
- Hosmer DW, Lemeshow S (2000) Interpretation of the Fitted Logistic Regression Model. In Shewhart WA, Wilks SS (eds.) *Applied Logistic Regression*, 2nd edn. Wiley, Hoboken
- Kassahun A, Snyman HA, Smit GN (2008) Impact of rangeland degradation on the pastoral production systems, livelihoods and perceptions of the Somali pastoralists in Eastern Ethiopia. *J Arid Environ* 72:1265–1281
- Kideghesho JR, Roskaft E, Kaltenborn BP (2007) Factors influencing conservation attitudes of local people in Western Serengeti, Tanzania. *Biodivers Conserv* 16(7):2213–2230
- Kosgey IS (2004) Breeding objectives and breeding strategies for small ruminants in the Tropics, Dissertation. Wageningen University, The Netherlands
- Kumessa T, Bekele A (2013) Human-wildlife conflict in Senkele Swayne's Hartebeest Sanctuary, Ethiopia. *J Exp Biol Agric Sci* 1(1):33–38
- Kumessa T, Bekele A (2014) Attitude and perceptions of local residents toward the protected area of Abijata-Shalla Lakes National Park (ASLNP), Ethiopia. *J Ecosyst Ecograp* 4(1):138. doi:10.4172/2157-7625.1000138
- Lepp A, Holland S (2006) A comparison of attitudes towards state led conservation and community based conservation in the village of Bigodi, Uganda. *Soc Nat Resour* 19:609–623
- Maleko DD, Mbassa GN, Maanga WF, Sisy ES (2012) Impacts of wildlife-livestock interactions in and around Arusha National Park, Tanzania. *Curr Res J Biol Sci* 4(4):471–476
- Mehta JN, Heinen JT (2001) Does community-based conservation shape favorable attitudes among locals? An empirical study from Nepal. *Environ Manag* 28:165–177
- Metaferia F, Cherenet T, Gelan A, Abnet F, Tesfay A, Ali JA, Gulilat W (2011) A review to improve estimation of livestock contribution to the national GDP. Ministry of Finance and Economic Development and Ministry of Agriculture. Addis Ababa, Ethiopia
- Musa LMA, Peters KJ, Ahmed MKA (2006) On farm characterization of Butana and Kenana cattle breed production systems in Sudan. *Livestock Res Rural Dev* 18(177): Retrieved April 5, 2017, from <http://www.lrrd.org/lrrd18/12/musa18177.htm>
- Pechacek P, Li G, Li J, Wang W, Wu X, Xu J (2013) Compensation payments for downsides generated by protected areas. *Ambio* 42:90–99
- Prins HHT (2000) Competition between livestock and wildlife in Africa. In: Prins HHT, Grootenhuys JG, Dolan TT (eds) *Wildlife conservation by sustainable use*. Kluwer, Boston MA
- Sebsebe D, Friis I (2009) Natural vegetation of the Flora area. In: Hedberg I, Friis I, Persson E (eds). *Flora of Ethiopia and Eritrea*. Vol. 8. General Part and Index to National Herbarium, Biology Department, Science Faculty, Addis Ababa University, Addis Ababa and Department of Systematic Botany, Uppsala University, Uppsala, Sweden
- Shibia MG (2010) Determinants of attitudes and perceptions on resource use and management of Marsabit National Reserve, Kenya. *J Hum Ecol* 30(1):55–62
- Sitters J, Heitnig IMA, Holmgren M, Ojwang GSO (2009) Herded cattle and wild grazers partition water but share forage resources during dry years in East African savannas. *Biol Conserv* 142:738–750
- Snyman S (2014) Assessment of the main factors impacting community members' attitudes towards tourism and protected areas in six southern African countries. *Koedoe* 56(2):1–12
- Szell AB, Hallett LF (2013) Attitudes and perceptions of local residents and tourists toward the protected area of Retezat National Park, Romania. *Int J Hum Soc Sci* 3(4):18–34
- Tefera M (2011) Wildlife in Ethiopia: Endemic large mammals. *World J Zool* 6(2):108–116
- Tessema ME, Lillieholm RJ, Ashenafi ZT, Leader-Williams N (2010) Community attitudes towards wildlife and protected areas in Ethiopia. *Soc Nat Resour* 23(6):489–506
- Tessema ZK, de Boer WF, Baars RMT, Prins HHT (2011) Changes in vegetation structure, herbaceous biomass and soil nutrients in response to grazing in semi-arid savanna in Ethiopia. *J Arid Environ* 75:662–670
- Tessema ZK, de Boer WF, Baars RMT, Prins HHT (2012) Influence of grazing on soil seed banks determines the restoration potential of aboveground vegetation in a semi-arid savanna of Ethiopia. *Biotropica* 44(2):211–219
- Tessema ZK, de Boer WF, Prins HHT (2016) Changes in grass plant population and temporal in soil seed bank dynamics in a semi-arid savanna: implications for restoration. *J Environ Manag* 182:166–175
- Tilahun M, Angassa A, Abebe A, Mengistu A (2016) Perception and attitude of pastoralists on the use and conservation of rangeland resources in Afar Region, Ethiopia. *Ecol Process* 5(1):18
- Tinsae B, Zemedea A, Sebisibe D (2012) Indigenous knowledge on plant species of material culture (construction, traditional arts & handicrafts) used by the Afar & Oromo Nations in & around the Awash National Park, Ethiopia. *Glob J Hum Soc Sci* 12(11):1–21
- Torres R, Momsen JH (2004) Challenges and potentials for linking tourism and agriculture to achieve pro-poor tourism objectives. *Prog Dev Stud* 4(4):294–318
- Vithessonthi C (2005) A Perception-Based View of the Employee: A Study of Employees' Reactions to Change. PhD Thesis, University of St. Gallen, Graduate School of Business Administration, Economics, Law and Social Sciences (HSG), D-Druck-Spescha, St. Gallen, p 237
- Vodouhè FG, Coulibaly O, Adégbidi A, Sinsin B (2010) Community perception of biodiversity conservation within protected areas in Benin. *Forest Policy Econ* 12:505–512
- Wang SW, Lassoie JP, Curtis PD (2006) Farmer attitudes towards conservation in Jigme Singye Wangchuck National Park, Bhutan. *Environ Conserv* 33(2):148–156
- Yosef M (2015) Attitudes and perceptions of the local people towards benefits and conflicts they get from conservation of the Bale Mountains National Park and Mountain Nyala (*Tragelaphus buxtoni*), Ethiopia. *Int J Biodiv Conserv* 7(1): 28–40
- Zeray Mehari (2008). Invasion of *Prosopis juliflora* (SW.) DC and Rural Livelihoods. The Case of Afar Pastoralists at Middle Awash Area of Ethiopia. MSc. Thesis, Department of International Environmental and Development Studies (Noragric), Norwegian University of Life Sciences (UMB), Oslo, p 67
- Zerga B (2015) Awash National Park: Its degradation status and protection measures. *Palgo J Agric* 2(3):57–66

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