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# Drivers of illegal hunting in and around Altash national Park, northwest Ethiopia

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**Abstract**
Illegal hunting remains a threat to the wildlife of most protected areas in Ethiopia, including Altash national park. To address this problem, reliable site-specific information on why people illegally hunt wildlife is crucial. The aim of this study was to assess drivers of illegal hunting in and around Altash national park. One hundred seventy six households were selected through stratified random sampling from nine villages situated within 10 km of the park boundary and surveyed by using questionnaire composed of both open and closed ended questions. Besides, interviews with nine key informants selected through respondent driven technique, and three focused group discussions comprising 7-10 individuals were conducted for this study. The study was employed binary logistic regression model by using SPSS version 20. The model result indicates that illegal hunting involvement is more likely in households who have gun access, small farmland, low annual income, bushmeat preference, traditional practice attached to wildlife products, conflict with the park office, positive perception on social prestige of being a hunter, and are native to the study area. Since hunting is a prohibited practice in the study area, respondents are unlikely to respond openly to questions related to it and thus the factors may not cover the full range of household characteristics involved in illegal hunting behavior. To this end, further study is needed to assess the complete range of factors through methods that can guarantee anonymity of respondents. However, wildlife policy makers and managers should consider these factors when designing interventions to illegal hunting problem in the study area.

**Keywords:** reliable, Wildlife, households, individuals

## Introduction
Protected area management is still in its infant stage in Ethiopia. Most of the protected areas exist on paper only (Anteneh and Sebsibe, 2011) [3], and are not successful mainly due to marginalization of protected areas from the society, and vice versa, poor understanding of the benefits (existing and potential) from them at all levels of Ethiopian society (Aramde *et al*., 2012) [4]. Hence, the number and populations of the country are reduced to a fraction of what they were in the past; those previously abundant species are now locally extinct or gravely threatened. Species that are traditionally viewed as common are also showing dramatic falls (Melaku, 2011) [26] almost everywhere in the country even in most protected areas due to habitat loss and hunting pressure (Vreugdenhil *et al*., 2012) [34].

The recently established protected areas (Alatish and Kafta-humera National Parks) have to be regarded as a timely measure to protect the drastic decline of wildlife in the Northwestern part of Ethiopia (Heckel *et al.*, 2007) [18]. Wildlife in Altash National Park are severely depleted as they suffer from water scarcity (Girma and Afework, 2008) [12] and illegal hunting pressure from the local community and the border crossing pastoralists commonly called Felata (Girma and Afework, 2008 [12]; PaDPA, 2009; Hailu, 2011) [16]. Given that small size of wildlife population in a particular area, species are highly susceptible to local and global extinction through illegal hunting (Melaku, 2011) [26] which is likely to increase as human population increases in that area (Lindsey *et al*., 2012 [22] and Masanja, 2014) [25]. If so, Altash National Park is at a state losing its most valuable wildlife species like *Loxodonta africana, Panthera leo, Panthera pradus* and many others in near future through illegal hunting (Hailu, 2011) [16] as the human population adjacent to the park area increases.

To shield the wild animals from extirpation and to maintain and enhance the potential of the park for wildlife based tourism development, appropriate conservation strategy must be put in place in response to illegal hunting. This, however, requires proper understanding and identification of the underlying factors of illegal hunting activity. Yet information on factors of illegal hunting in communities adjacent to Altash National Park is lacking and not still documented based on study largely due to remoteness and inaccessibility of the area and partly less concern to the issue. Therefore, this study was conducted to fill the gap by identifying major drivers of illegal hunting activity in and around Altash National Park.

## Materials and Methods
### The Study Area
The study was conducted in nine villages adjacent to Altish National Park (ALNP). Delineated in 1941 during Emperor Haile Selassie regime as priority forest area, Alatish was upgraded into a National Park in 2006 by Amhara regional council regulation act No 38/2005. The park is located in between $11^0$ 47' - $12^0$ 21' N latitude and $35^0$ 16' - $35^0$ 47' E longitude in northwestern lowland part of Ethiopia (PaDPA, 2009). The park has a variety of fauna and flora. In its wildlife, ALNP is the home for 37 mammalian species including the endangered and rare species like African elephant (*Loxodonata africana)*, Leopared (*Panthera pardus),* lion (*Panthera leo)* and also the lower risk but conservation dependant species (*Tragelaphus imberbis* and

*Tragelaphus strepsiceros)*, 204 bird species, 23 rodent species, 6 insectivore species as well as 7 types of reptiles and amphibians. There are also 130 plant species of which 84 tree and shrub species, 29 herbs and about 17 grass species in Alatish National Park (PaDPA, 2009). Covering 2665 km$^2$ area of land area, Altish shares boundaries with Sudan (Dinder National Park), Benshangul Gumuz National Regional State, and six peasant associations of Quara district administration (Fig.2). About 39% of the district population is living in peasant associations of the district adjacent to the Park. The communities surrounding the Park are mainly dependant on agriculture and some related activities (PaDPA, 2009).

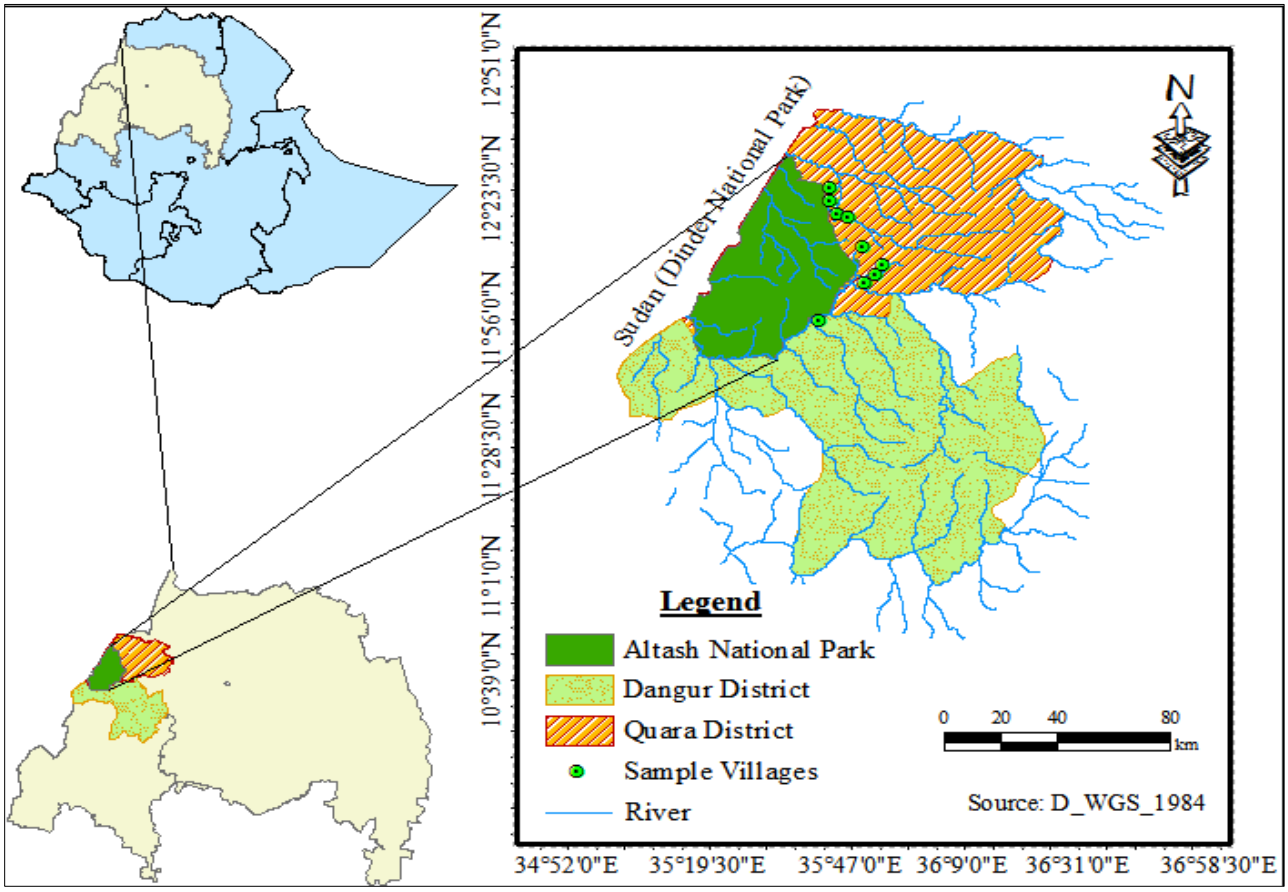


**Fig 1:** Map of Altash National Park and the study villages

**Sampling Design and Sample Size Determination**

Multi-stage stratified random sampling was used to select the sample households from villages situated within 10km of Altash National Park (ALNP) boundary. First, all villages situated within 10 km of the park boundary were taken purposively in all except the western direction of the park boundary where Dinder National Park of Sudan is located, and no village existed. The main criteria why the study villages needed to be situated within 10 km of the park boundary was the assumption that people in close proximity to protected areas might tend to have more involvement in illegal hunting (Wilfred and MacColl, 2010) [35] and are also more aware of about this issue than those from far areas (Nuno *et al*., 2013) [30]. Second, all villages were stratified based on the ethnic group of the dwellers. Indeed, three village strata were formed namely Agew, Amhara and Gumuz. Then, the sample villages were randomly selected through picking of numbers from a hat that corresponded to the list of villages under each stratum. Finally, the sample households were randomly selected from each village by picking of numbers from a hat that corresponded to the households from each of the study village register. To determine the sample size, the following rule of thumb was employed (Green, 1991) [13]: $N \geq 50 + 8m$; where, N= simple size and 'm' is the number of explanatory variables of the study (13 explanatory variables in this case) identified as determinants of illegal hunting activity. According to the formula, the sample size of this study was fixed to be 176 households. Finally, the sample size was proportionally distributed to each study village.

**Data Collection Methods**

The principal data of this study were collected through household survey in nine sample villages, within 10 km of ALNP boundary. Of the villages covered five (Girara, Omedla, Meglib, Bayiwa and Ayibeza), three (Bermil, Derehasen, Bambahoo) and one (Ayigele) were occupied by Gumuz, Amhara and Agew ethnic groups, respectively. Indeed, all ethnic groups of the area were fully represented in the sample of the study.

The draft household survey questions were pre-tested on a pilot sample of 18 local people from the three ethnic groups, which are not included in the main survey, and the survey questions were amended accordingly. The main questionnaire interviews were carried out from March to April 2015, which covered 176 randomly selected sample households. The heads of the sample households were targeted as respondents to the survey questions.

In case of their absence, other permanent resident male adult (≥18 years) member of the household was allowed to took part in the interview. In absence of a suitable respondent, adjacent household was surveyed instead.

The interview was conducted at respondent's homestead by interviewers selected from the respective ethnic groups and had no any connection to the park office. This was done because the more familiarity of interviewers with survey respondents, the more respondents trust to the interviewer and the higher the response rate and accuracy will be for sensitive questions asked through direct questioning method (Olayiwola *et al*., 2012) [31]. In designing survey questionnaires, sensitive questions (questions related to illegal hunting activity) were put at the end of the survey questionnaires. This was done to take advantage of any trust that developed over the course of the interview before answering the sensitive questions (Gavin *et al*., 2010) [11]. In addition, interviewers were given training on how to fill out forms and how to approach respondents with sensitive questions. The survey questions were close-ended and open-ended and covered socioeconomic and demographic information such as age, sex, education level, income and source of income, assets owned, ethnic group, household size, farm size, resident status. Moreover, the questions encompassed on household's involvement in illegal hunting, reasons for hunting, methods of hunting, most hunted species, bushmeat preference, damage posed by wildlife, traditional and cultural practice with wildlife products, conflict history of a household with the park office.

A key informant interviews were conducted to support and triangulate data collected through the household survey. This was done with 8 key informants of which two purposively selected park rangers whereas the rest were villagers selected through snowball sampling technique, the first key informant refers the second and the second refers the third and so on (Heckathorn,1997) [17]. The reason for this was the assumption that no one knows better about villagers other than those living nearby. Each key informant was approached one day in advance before interviews to establish rapport.

One focus group discussion with 7-10 men participants was conducted in each ethnic group (stratum) to consolidate information collected by the other methods. The reason that a single focus group discussion members need to be similar in ethnic group was to avoid the impacts of too heterogeneity group on the contribution of each participants (Masadeh, 2012) [24] while heterogeneity of a group was kept during selection of individuals within ethnic group.

Secondary data were gathered from published and unpublished documents that were considered relevant to the study. The study was incorporated the wildlife Law-enforcement records (2011-2014) of the park office. Only the last four years law-enforcement records of the park office were taken for the reason that the park office was extremely understaffed and with little/no patrol before 2011.

**Variables and hypotheses**

A research data set includes at least one dependent and one or more independent variables. The dependent variable is an outcome variable expected to change or be influenced by the variation in the independent (Elliott *et al*, 2006) [10]. For this study, illegal hunting involvement was considered as the dependent variable. Illegal hunting defines killing of any wild animals by violating wildlife law of the country whereas illegal hunting involvement (IHI) stands for either a given household participated in illegal hunting activity during the 12 months prior to the survey period or not. For simplicity of analysis, the variable was coded 1 if at least one member of that household involved in illegal hunting during the 12 months prior to the survey period in the study area otherwise 0. Based on extensive literature review and experience, the following independent variables were hypothesized for this study.

Residence status (RESID) refers to whether a given sample household is immigrant or native to the study area. For the aim of analysis, immigrant household was coded by 0 whereas the native was coded by 1. The native households were expected to have more involvement in illegal hunting activity than immigrants in the study area.

Age of household head (AGE) defines how old is a sample household head/respondent in years. Age matters with wildlife benefits and their associated costs where older respondents' are more likely to have been adversely affected by the wild animal damages and restriction in their use associated with the park establishment than younger respondents. This could push them to illegal hunting activity. Hence, respondents' age was expected to correlate positively with illegal hunting involvement.

Household Size (SIZE) refers to the number of family members in a given household. The existence of large number of family members could affect the food security status of the household. Large number of family increases the demand for food supply and need additional food and income source like illegal hunting. According to Mfunda and Roskaf (2010) [27], illegal hunting is mostly done to fulfill protein needs and demands for income to meet household's basic needs. In light of this, household size was expected to positively correlate with illegal hunting involvement.

Gun Ownership (GUN) refers whether the household own gun or not during the 12 months prior to the survey period. It was considered as a dummy variable and takes one if the household owns gun otherwise zero. Since gun is the most profitable tool to hunt large wild animals, its availability matters a household to engage in illegal hunting. Therefore, a household who own a gun was expected to engage more in illegal hunting activity than the one who have no gun.

Cultivated land size (LAND) stands for the total cultivated land area of a household measured in hectare. As the size of the farmland increases the likelihood of the household to be food secure is very high; as result less dependent on wildlife resources for protein supply. Therefore, cultivated land size and illegal hunting involvement of a household were expected to correlate negatively

Livestock holding (TLUH) refers to the total number of livestock holding of a household measured in tropical livestock units (TLU). Households with more livestock may face livestock depravation from wildlife that motivates them to kill wild animals as revenge or to protect further depredation of livestock (Mfunda and Roskaf, 2010) [27]. Therefore, possession of livestock is expected to have a positive impact on household's illegal hunting involvement.

Annual income (INCOME) is the total income of a household earned from different income sources except the income from illegal hunting practice in a given year. A household with higher annual income is in better position for affording the cost of protein and other needs than households who have lower annual

income without addition of income from illegal hunting. Previous study conducted by Wilfred and MacColl (2010) [35] reported that income and illegal hunting of a household are negatively associated. Similarly, result was expected from this study.

Conflict history (CONF) is a dummy variable, one represents households who had history of conflict with the park office, and zero otherwise. Conflict history of a household with conservation department can matter illegal hunting involvement of the household. Local people may retaliate against conservation authorities by illegally killing wildlife under protection; facilitating external poachers in their illegal activities; or refusing to be involved with or support conservation programs when they feel that the needs or values of wildlife are given priority over their own needs (Madden, 2008) [23]. Similarly, Knapp (2012) [21] stated that opposition to conservation authority is one of the reasons that people engaged in illegal hunting activity. By taking this in to account, households who have faced conflict of interest with the park were expected to have more illegal hunting involvement.

Meat Preference (MEATP) is a dummy variable and takes one if the household head prefers bushmeat to domestic animal meat and zero otherwise. People prefer bushmeat for reasons of taste and medicine and hence involve in hunting to acquire bushmeat (Ceppi and Nielsen, 2014) [8]. So a household was expected to engage more likely in illegal hunting if its head preferred bushmeat. Attitude on hunting (AP) was considered as a dummy variable taking a value 1 if the respondent has positive attitude on hunting for social prestige and zero otherwise. According to Hailu (2011) [16], the one who kills big wild animals like elephant, lion, buffalo, giraffe, etc traditionally considered as a hero in communities adjacent to Altash National Park. Thus, a household was expected to engage more likely in illegal hunting as long as the respondent is positive to hunting for gaining social prestige.

**Traditional practice attached to wildlife products (TPW):** a variable stands for whether a given household has traditional practice related to any of wildlife products or not. This variable takes on the value one if the respondent explains at least one traditional practice or belief attached to wild animal products (meat, skin, horn, hair, feather etc.) zero otherwise. As stated in Olupot *et al* (2009) [32], local unfounded beliefs about medicinal and supernatural values of wildlife lead to illegal hunting activity. The study was expected that household who experience such practice are more likely to involve in illegal hunting

**Ethnic group (ETHNIC):** stands for the ethnic background that a given household belongs. In the study area, there are three ethnic groups, namely Agew, Amhara and Gumuz. This categorical variable takes on value 2 if the respondent /household head is the member of Amhara, one if the respondent /household head is the member of Agew and takes zero if the respondent /household head is the member of Gumz ethnic group.

Education level (EDUC) is a categorical variable that takes zero if a household head was uneducated, one if he/she had primary level education and two if he/she had at least high school education at the time of interviewing.

**Table 1:** Summary of the variables of the study

| Variable Code | Type | Measurement |
|---|---|---|
| IHI | categorical | 1 if the household involved in illegal hunting ;0 otherwise |
| RESID | Categorical | 1 if the household is native; 0 otherwise |
| ETHNIC | Categorical | 2 if Amhara, 1 if Agew; 0 if Gumuz |
| GUN | Dummy | 1 if the household have gun;0 otherwise |
| TPW | Dummy | 1if traditional practice attached to wildlife products; 0 otherwise |
| AGE | Continuous | Age of respondents in years |
| LAND | Continuous | Total cultivated area of the household in ha |
| MEATP | Dummy | 1 if respondent prefer bush-meat meat ;0 otherwise |
| TLUH | Continuous | Total livestock measured in tropical livestock unit |
| CONF | Dummy | 1 if the household faced conflict with park office; 0 otherwise |
| AP | Dummy | 1 if positive for social prestige from hunting; 0 otherwise |
| SIZE | Continuous | Total household member in numbers |
| INCOME | Continuous | Annual income of household in Ethiopian birr |
| EDUC | Categorical | 2 if attain at least secondary, 1 if primary school; 0 otherwise |

**Data Analysis**

Several studies (Nasi *et al*, 2008 [29]; Aiyadurai, 2011; Lindsey *et al*, 2012) [22] indicated that illegal hunting involvement of a given household is influenced by a set of factors. Involvement in illegal hunting (the dependent variable of this study), on the other hand, has a nature of binary response (Yes or no). Therefore, a model that approximates the mathematical relationships between the explanatory and dependent variable is required to come up with feasible and relevant outcomes. To this aim, logistic model has been selected because it is an extremely flexible and easily used function and provides meaningful interpretation (Gujarati, 2004) [15].

$$\mathbf{P_i} = \frac{\mathbf{1}}{\mathbf{1} + \mathbf{e}^{-\mathbf{z_i}}}$$

Where, $P_i$ = probability of the $i^{th}$ household engaged in illegal hunting activity; $Z_i$ = a function of 'm' explanatory variables ($X_i$), and expressed as:

$$Z_i = \beta_\circ + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_m X_m$$

Where, $\beta_\circ$ = the intercept; $\beta_1, \beta_2 \ldots \beta_m$ = the slope parameters in the model,

**Result and Discussion**

**Characteristics of Respondents**

The sample comprised about 70% native and 30% of immigrant respondents. The majority of the respondents were in the age

group of 36 - 45 years old (43.5%), and a few belonged to younger age groups of 18-25 years old (4.5%). The majority (91%) of the respondents never attended school, 3% of them secondary school education and above, while some (6%) attended primary education. The average family size of the total sample households was five persons with standard deviation of 1.89 persons. However, there was a slight variation in average family size between the three ethnic groups: 4.6 for Amhara, 4.7 for Agew, and 5.8 for Gumuz sample households. The ethnic representation was more skewed to Amhara (51.70%) followed by Gumuz (34.10%) and Agew (14.20%) ethnic group. This is partly due to the study design, where only villages within 10 km of Altash National Park boundary were included, but largely size of Amhara ethnic group in the study area.

**Factors of Illegal Hunting Involvement**

In the binary logistic regression model, nine variables were significant in determining illegal hunting involvement of households in the study area. Of these variables, residence status (residence), total cultivated land size (TCLH), total livestock unit (TLU), annual income (INCOME), conflict history (CONF) and attitude on hunting (ATTITUDE) were significant at 5% significance level whereas gun ownership (GUN), meat preference (MEAT) traditional practice attached to wildlife products (PRACTICE) were significant at 1% significance level (Table 2). The odds ratio (exp (B)) value of RESIDENCE indicates that when one moves from immigrant to native household the odds ratio gets 14.593 times as large. This means, keeping the other variables fixed, the native households are 14.593 times more likely to engage in illegal hunting as compared with non-native households. This finding agrees with the finding by Hill (2002) and Nuno *et al*. (2013) [30] in Tanzania, which state that households who stayed longer in an area are more likely to engage in illegal hunting than those relatively stayed shorter period. However, the result contradicts with the finding by Mfunda & Roskaft (2010) [27]. This can be inferred that households living long period near wildlife area may experience a variety of damage from wild animals and thus create negative attitude towards wild animals that motivates them to involve in illegal hunting.

**Table 2:** Determinants of involvement in illegal hunting

| Variables | B | Std. | Wald | df | Sig. | Exp(B) |
|---|---|---|---|---|---|---|
| Residh | 2.681 | 1.425 | 3.538 | 1 | .060** | 14.593 |
| Ager | -.028 | .037 | .587 | 1 | .445 | .972 |
| H size | -.250 | .202 | 1.532 | 1 | .216 | .779 |
| Gunh | 3.139 | .925 | 11.508 | 1 | .001*** | 23.084 |
| Land | -.305 | .120 | 6.472 | 1 | .011** | .737 |
| Tluh | .149 | .074 | 4.129 | 1 | .042** | 1.161 |
| Incomeh | -.091 | .039 | 5.483 | 1 | .019** | .913 |
| Confh | 1.743 | .837 | 4.340 | 1 | .037** | 5.717 |
| Meatp | 2.901 | 1.014 | 8.179 | 1 | .004*** | 18.197 |
| Arhsp | 2.394 | .943 | 6.446 | 1 | .011** | 10.952 |
| Htpw | 2.335 | .850 | 7.553 | 1 | .006*** | 10.334 |
| Ethnich | | | 3.029 | 2 | .220 | |
| Gumuz [a] | ------ | ----- | ----- | ---- | ---- | ----- |
| Agew | -.687 | .901 | .580 | 1 | .446 | .503 |
| Amhara | -1.868 | 1.082 | 2.979 | 1 | .084 | .154 |
| Educh | | | 2.197 | 2 | .333 | |
| Uneducated [a] | ----- | ----- | ----- | ---- | ---- | ---- |
| Primary level | -.372 | .991 | .141 | 1 | .707 | .689 |
| ≥ High school | -3.200 | 2.197 | 2.121 | 1 | .145 | .041 |
| CONSTANT | .415 | 2.269 | .033 | 1 | .855 | 1.514 |
| Number of observations = 176 Nagelkerke $R^2$ = 0.598 | | | | | | |
| Correctly predicted (count $R^2$) = 88.64 % Pearson's Chi-Square = 82.41 | | | | | | |

[a] Reference category Note: ** and *** indicate significant at 5%, and 1% significance level, respectively

The result showed that households who own gun were 23.084 times more likely to engage in illegal hunting than those households who did not own gun. According to Wuver and Attuquayefio (2006) [37] and Gubbi and Linkie (2012) [14], illegal hunting by gun is economically more profitable as it enables to kill medium to large game animals within a short period and with less hunting effort. Given decision made by illegal hunter often involves weighing up of costs and benefits and hunting by gun is profitable (St John *et al*., 2010); households having gun are likely to engage in illegal hunting activity. The study conducted by Wright &Priston (2010) [36] in Cameron concludes that use of gun for hunting contributes to decline of wildlife. In line with the hypothesis, total cultivated land owned by a household had a significant and negative effect on the household's illegal hunting involvement at 1% significant level. The negative sign of the variable coefficient (B) shows the negative relationship between cultivated land size of a household and its illegal hunting involvement. The odds ratio value suggests that as cultivated land increased by one unit (1ha) the odds ratio becomes 0.737 times as small and therefore the households are 0.737 times less likely to engage in illegal hunting. This result is consistent with the finding of Johannesen (2004) [20], which indicated that people cultivating less land in the Serengeti ecosystem are more likely to be involved in illegal hunting. Similar, Nielsen and Jacobsen (2013) reported that people with more cultivated land are more ready to stop illegal

hunting than those holding less cultivated land due to higher opportunity costs of labor on land.

In line with the hypothesis, TLUH was significantly correlated with illegal hunting involvement of households. The odds ratio value associated with this variable indicates that as one unit (1TLU) raises livestock of a household, the odds ratio becomes 1.161 times as large and, therefore, the households is 1.161 times more likely to engage in illegal hunting, keeping other factors constant. This shows the more livestock a household holds the more likely to involve in illegal hunting activity in the study area. This finding is line with the finding of Mfunda and Roskaf (2010) [27] that conclude household with many livestock are more typically involve in illegal hunting.

In consistent with the earlier hypothesis, INCOME was significant and negatively correlated with illegal hunting involvement of the households. The odds ratio result shows that for each one unit (one thousand birr) increase in annual income, the likelihood of the households to engage in illegal hunting decreases by .913, if ceteris paribus. This implies that households who earned lower annual income were more likely to engage in illegal hunting activity than those households who earned higher annual income. The possible explanation is as households have high annual income, they become in better position to afford the cost of their protein and other needs than those households who have less annual income without adding illegal hunting activity as a means of income and/or protein source. This finding confirms to those of past studies (Crookes *et al*., 2007; Olupot *et al*., 2009 [32]; wilferd &MacColl, 2010 [35]; Knapp, 2012) [21] found that income shortfall leads to illegal hunting. Similarly, Campbell *et al* (2001) [7] conclude that illegal hunters are from income poor households.

In line with the earlier expectation, CONF had a significant and positive influence on illegal hunting involvement. Compared with illegal hunting engagement probability of a household that never faced conflict with the park office, the probability of a household that faced conflict was 5.717 times higher than households who were free from such conflict, holding other factors fixed. This is probably due to households' opposition to the action of the park office. This finding is similar to observed relationship between conflict history of local people with park staffs and their illegal hunting involvement as founded by Ashayeri & Newing (2012) [6] in Bamu national park, Fars province, Iran. Similarly, the study conducted by Asebe (2012) [5] in Nech sar National park, Ethiopia, reported that destroying the identity of the park, hunting down Swayne's Hartebeest, is the fascinating strategy of the local people to oppose the actions of the park authorities. The finding further concurs with the observation made by Knapp (2012) [21] who stated that local people hunt wild animals illegally as a means of opposing wildlife conservation authorities.

MEATP, as hypothesized earlier, found significant and positively associated with illegal hunting involvement of the household. Compared with the probability of a household that involve in illegal hunting without bushmeat preference, the probability of household to involve in illegal hunting with bushmeat preference was higher. The households who preferred bushmeat are 18.197 times more likely to engage in illegal hunting activity than those households who did not prefer bushmeat, if the effects of other factors kept aside. The present study agrees with the finding of the study conducted by Schenck *et al*. (2006) [33] in Gabon, Central Africa; which provides evidence that many people hunt wild animals illegally despite availability of alternative sources of protein and income to them due to their bushmeat preference over domestic meat.

In accordance to earlier hypothesis, Attitude found significant and positively associated with illegal hunting involvement of households. The odds ratio value indicates that movement from respondents with negative attitude on value of hunting to gain social prestige to those respondents with positive attitude; the likelihood involving in illegal hunting increased by factor of 10.952. This reveals that households of respondents with positive attitude on value of hunting to gain social prestige are more likely to engage in illegal hunting. Similarly, Nasi *et al*. (2008) [29] pointed that in many cultures, people become a hunter for the aim of gaining respect, achieving manhood or winning a bride. Mosissa (2014) [28] also reported similar finding after conducting a study in Dire Guda community of Wolega, Ethiopia.

The result also revealed positive correlation between PRACTICES and illegal hunting involvement of households, which is consistent with the earlier hypothesis. The households who have any traditional practice attached to wildlife products are 9.833 times more likely to engage in illegal hunting than households who have no such practice. This result is consistent with the finding of Olupot *et al*. (2009) [32], which indicates that use of wild animal body parts for purposes other than food was another factor driving illegal hunting.

**Conclusion and Recomendations**

The finding of this study reveals that illegal hunting in and around Altash National Park drives by a set of factors. Residence status, gun ownership, cultivated land size, livestock ownership, annual income, conflict history with the park office, bushmeat preference and traditional practice attached to wildlife products as well as attitude of the respondents on hunting for social prestige are the significant factors of illegal hunting involvement in the study area. The native households are more likely to engage in illegal hunting activity than households who are not native to the area. In addition, illegal hunting involvement is more likely in households who have gun access, traditional practice attached to wildlife products, smaller farmland and income, more livestock, conflict with the park office, bush meat preference and positive attitude on hunting for gaining social prestige. These factors are more likely an indication to the household of respondents who were more comfortable with replying truthfully to direct questions about illegal hunting involvement of their households. Therefore, further investigation of this behavior through other methods need to be in effect in the study area to have the full range of factors and then to suggest the most appropriate illegal hunting management interventions.

Collaboration with traditional institutions is important to discourage traditional and cultural motivations of illegal hunting. In addition, appropriate land use plan that treats wild animal and livestock in separate situations should be in effect to reduce illegal hunting. However, the strict law enforcement, the current strategy of the park office to stop illegal hunting, does not address traditional and cultural drivers of hunting, and it can even create deep-seated resentment and appears to be a motive for hunting in its own right.

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**Reference**

1. Aiyadurai A. Wildlife hunting and conservation in Northeast India: a need for an interdisciplinary understanding. International Journal of Galliformes Conservation. 2011; 2:61-73.
2. Amhara Regional state Parks Development and Protection Authority. Draft General Management Plan for Alatish National Park, Bahir Dar, Ethiopia, 2009.
3. Anteneh Belayneh, Sebsibe Demissew. Diversity and Population Structure of Woody Species Browsed by Elephants in Babile Elephant Sanctuary, eastern Ethiopia: an implication for conservation. Ee-JRIF. 2011; 3(1):20-32.
4. Aramde Fetene, Tsegaye Bekele.The Contribution of Ecotourism for Sustainable Livelihood Development in the Nech Sar National Park, Ethiopia. International Journal of Environmental Sciences. 2012; 1(1):19-25.
5. Asebe Regassa. Contesting Views on a Protected Area Conservation and Development in Ethiopia. Social sciences. 2012; 1:24-46.
6. Ashayeri S, Newing H. Meat, markets, pleasure and revenge: multiple motivations for hunting in Bamu National Park, Fars province, Iran. Parks. 2012; 18(1):126-133.
7. Campbell K, Nelson V, Loibooki M. Sustainable use of wild land resources, cological, economic and social interaction: An analysis of illegal hunting of wildlife in Serengeti National park, Tanzania. Department for International Development Animal health programand livestock production program, Final technical report, project R7050. Natural resource institute, Chatam, kent, 2012, 56.
8. Ceppi L, Nielsen R. A comparative study on bushmeat consumption patterns in ten tribes in Tanzania. Tropical Conservation Science. 2014; 7(2):272-287.
9. Crookes D, Humphreys D, Masroh F, Tarchie B, Milner-Gulland J. The role of hunting in village livelihoods in the Ashanti region, Ghana. SAJEMS NS. 2019; 10(4):457-469.
10. Elliott A, Hynan L, Reisch J, Smith J. Tools and Issues: Preparing Data for Analysis Using Microsoft Excel. Journal of Investigative Medicine. 2006; 54(6):334-341.
11. Gavin M, Solomon J, Blank S. Measuring and Monitoring Illegal Use of Natural Resources. Conservation Biology. 2010; 24(1):89-100.
12. Girma Mengesha, Afework Bekele. Diversity, distribution and habitat association of large mammals of Alatish, North Gondar, Ethiopia. Acta Zoologica Sinica. 2008; 54(1):20-29.
13. Green S. How Many Subjects does it Take to do A Regression Analysis? Multivariate Behavioral Research. 1991; 26(3):499-510.
14. Gubbi S, Linkie M. Wildlife Hunting Patterns, Techniques,& Profile of Hunters in and around Periyar Tiger Reserve. Journal of the Bombay Natural History Society. 2012; 109(3):165-172.
15. Gujarati. Basic Econometrics. 4th ed. McGraw−Hill, Inc. New York, 2014.
16. Hailu Menale. Potentials and challenges of Alatish and Dinder National Parks (Ethiopia, Sudan) Implementing Transboundary Park cooperation. thesis, University of Klagenfurt, Austria, 2011.
17. Heckathorn D. Respondent-driven sampling: a new approach to the study of hidden populations. Social problems. 1997; 44(2):174-199.
18. Heckel J, Wilhelmi F, Kaariye H, Gizachew Gebeyehu. Preliminary status assessment survey on the critically endangered Tora hartebeest (Alcelaphus buselaphustora) and further wild ungulates in Northwestern Ethiopia. Report to the IUCN/SSC/Antelope Specialist Group, 2007.
19. Hill C, Osborn F, Plumptre A. Human-Wildlife Conflict: Identifying the problem and possible solutions. Albertine Rift Technical Report Series. Wildlife Conservation Society, 2001, 1.
20. Johannesen A. Wildlife conservation policies and incentives to hunt: an empirical analysis of illegal hunting in western Serengeti, Tanzania. Working paper series. 2001; 3:1503-299X.
21. Knapp E. Why poaching pays: a summary of risks and benefits illegal hunters face in Western Serengeti, Tanzania. Tropical Conservation Science. 2012; 5(4):434-445.
22. Lindsey P, Balme G, Becker M, Begg C, Bento C, Bocchino C, et al. Illegal hunting and the bush-meat trade in savanna Africa: drivers, impacts and solutions to address the problem. Panthera/Zoological Society of London/Wildlife Conservation Society report, New York, 2012, 74.
23. Madden F. The Growing Conflict between Humans and Wildlife: Law and Policy as Contributing and Mitigating Factors. Journal of International Wildlife Law & Policy. 2008; 11:189-206.
24. Masadeh M. Focus Group: Reviews and Practices. International Journal of Applied Science and Technology. 2012; 2(10):63-68.
25. Masanja G. Human Population Growth and Wildlife Extinction in Ugalla Ecosystem, Western Tanzania .Journal of Sustainable Development Studies. 2014; 5(2):192-217.
26. Melaku Tefera. Wildlife in Ethiopia: Endemic Large Mammals. World Journal of Zoology. 2011; 6(2):108-116.
27. Mfunda I, Roskaft E. Bushmeat hunting in Serengeti, Tanzania: An important economic activity to local people. International Journal of Biodiversity and Conservation, 2010; 2(9):263-272.
28. Mosissa Geleta. The Indirect Socioeconomic Impact of Illegal Hunting of African buffalo (Syncerus caffer) for Trophy in East Wollega, Ethiopia. American Scientific Research Journal for Engineering, Technology, and Sciences (ASRJETS**). 2014;** 9(1):64-75
29. Nasi R, Brown D, Wilkie D, Bennett E, Tutin C, van Tol G, et al. Conservation and use of wildlife-based resources: the bushmeat crisis. Secretariat of the Convention on Biological Diversity, Montreal, and Center for International Forestry Research (CIFOR), Bogor. Technical Series, 2008; 33:50.
30. Nuno A, Bunnefeld N, Naiman L, Milner-Gulland E. A Novel Approach to Assessing the Prevalence and Drivers of Illegal Bushmeat Hunting in the Serengeti. Conservation Biology. 2013; 00(0):1-11.
31. Olayiwola O, Amahia G, Adewara A. Survey responses across various levels of response predictors in some selected

communities in Oyo town, Oyo state, Nigeria. Elixir Statistics. 2012; 36:3241-3244.
32. Olupot W, Alastair J, McNeilage A, Plumptre A. An Analysis of Socioeconomics of Bushmeat Hunting at Major Hunting Sites in Uganda, WCS Working paper No.38, wildlife conservation society, Kampala, Uganda, 2009.
33. Schenck M, Effa E, Starkey M, Wilkie D, Abernethy K, Telfer P, et al. Why People Eat Bushmeat: Results from Two-Choice, Taste Tests in Gabon, Central Africa. Human Ecology. 2006; 34(3):433-445.
34. Vreugdenhil D, Vreugdenhil A, Tamirat Tilahun, Anteneh Shimelis, Zelealem Tefera. Gap Analysis of the Protected Areas System of Ethiopia, World Institute for Conservation and Environment, USA, 2012.
35. Wilfred P, MacColl A. Income sources and their relation to wildlife poaching in Ugalla ecosystem, Western Tanzania. African Journal of Environmental Science and Technology. 2010; 4(12):886-89
36. Wright J, Priston N. Hunting and trapping in Lebialem Division, Cameroon: bushmeat harvesting practices and human reliance. Endang Species Res 11: 1–12.
**37.** Wuver A, Attuquayefio D.The Impact of Human Activities on Biodiversity Conservation in a Coastal Wetland in Ghana. WAJAE. 2000; 9:1-14