RESEARCH PAPER

Determinants for Households' Dependency on Natural Resources of Arsi Mountain National Park: a Case of Chilalo-Galema Block, Ethiopia

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Abstract

For sustainable environmental management, protected areas should improve the socioeconomic living conditions of local communities in addition to their envisioned goal for biodiversity conservation. The main objective of this study was to assess the determinants of households' dependency on natural resources of Arsi Mountain National Park. In order to address the major objective of the study, data were collected from 128 sample respondents through survey instrument, two focus group discussion and eight in depth interview. Determinants for households' dependency on natural resources of the block were analyzed by using binary logistic regression analysis model. Qualitative data were analyzed alongside quantitative data. The finding of the study revealed that adjacent households were highly dependent on natural resources derived from Chilalo-Galema block. That means, on average 55% of their annual income were derived from Chilalo-Galema block. Land holding size, age, household size, proximity to the local market and proximity to the block significantly determined their dependency. At the end, the study recommends that command and control approach of natural resources conservation (fortress conservation) will promote park- people conflict or it affects both resources users and natural resources itself; hence, managers of the park must employ a proactive approach and work with local people through addressing their socioeconomic concern.

Keywords: Determinants, Dependency; Natural Resources; Park-Management, Ethiopia.

Introduction

Protected areas such as parks and wildlife sanctuaries are areas of land especially dedicated to the protection and maintenance of biological diversity and of natural and associated cultural resources and managed through legal or other effective means (McNeely and Harrison1994).They are considered as a cornerstone for biodiversity conservation and means of reducing environmental degradation.

Deforestation is the major factor for losing endemic animals and natural resources. To conserve these endemic animals and natural resources, different countries implemented policies or programs that serve to conserve nature. In most cases, the management approach implemented to conserve nature excluded local people from areas that they have previously used to gather resources such as fuel wood, material for shelter and farming, fodder and non-timber forest products. Wells and McShane (2004) indicated that long-term survival of protected area is not assured without recognizing local peoples' dependency on natural resources of the protected area.

In Ethiopia, majorities of parks and wildlife sanctuaries were protected by eviction and exclusion of local people from areas that they have previously used to gather resources s such as fuel wood, material for shelter and farming, fodder and non-timber forest products (Abiyot 2009; Asebe 2012; Bayissa 2013). As a result both the protected area and the livelihood of local people have been in a great crisis. For sustainable environmental management, it is expected that protected areas should improve the socio-economic living conditions of local people in addition to their envisioned goal for biodiversity conservation. This is because; natural resources within the protected areas are source of livelihood for adjacent households (Cullen 2007). However, in most cases management approach implemented to conserve natural resources within protected area excludes local people by overlooking their socio-economic living conditions and conservationist mainly focus on conserving/protecting biodiversity within protected area. Similarly, Arsi Mountain Park which contains four blocks is being managed by the Ethiopian Wolf Conservation Program (EWCP). The major aim of EWCP is conserving wolves and their Afro alpine ecosystem. The management process of Arsi Mountain National park started by eviction and exclusion of local people. This situation created a great crisis both on local people and the park.

Maintaining the sustainability of protected area like Arsi Mountain National park requires understanding the attributes of local people around the park and their dependency on natural resources. This in turn helps to provide alternative means of livelihood and/or implement natural resources management approach that embrace local people's concern in management process. Therefore, this study aimed to attract the attention of park managers of the study area to review their management strategies and reshape it to be consistent with local people's socio-economic living condition. Furthermore, disclosing contributing factors for household's dependency on natural resources of the park could serve as important input for knowing on which parts of household characteristics need to be worked on so as to reduce their dependency.

Worldwide various researches revealed that the socio-economic factors are determinant for depending on natural resources of the park. For example Gunatilake (1998) in Siral lank, Cavendish (2000) in Zimbabwe, Adhikariet al (2004) in Nepal, Masozera and Alavalapti (2004) in Rwanda and Cullen (2007) in Indo pacific island indicated that, adjacent households' socio economic living condition is a major factor for their being highly reliant on natural resources of protected area and became detrimental to effectively manage the protected area. However, the socio economic living condition of households around protected area is varying from context to context and when we come to see these from Ethiopian context, there is no (little) consideration is given.

Majority of Ethiopian literatures confined in studying the management system of protected area. For instance, Asebe (2012) studied how the local community and the state perceived

conservation process differently. Abiyot (2009) found that the major reason for resettlement of Guji Oromo is embedded in conservation ideology, perception of mode of life of the Guji and local political contexts. Solomon et al (2014) indicated that Awash national park is being deteriorated due to expansion of grass and farm land. All of the above studies (Abiyot 2009; Asebe 2012; Solomon et al (2014) did not look at households' dependency on natural resources of the park; and the contributing factors for their dependency. Therefore, the current study aimed to fill in the knowledge gap in existing literatures through mainly focusing on determinants for households' dependency on natural resources of Arsi Mountain National park.

Dependent and independent variables of the study

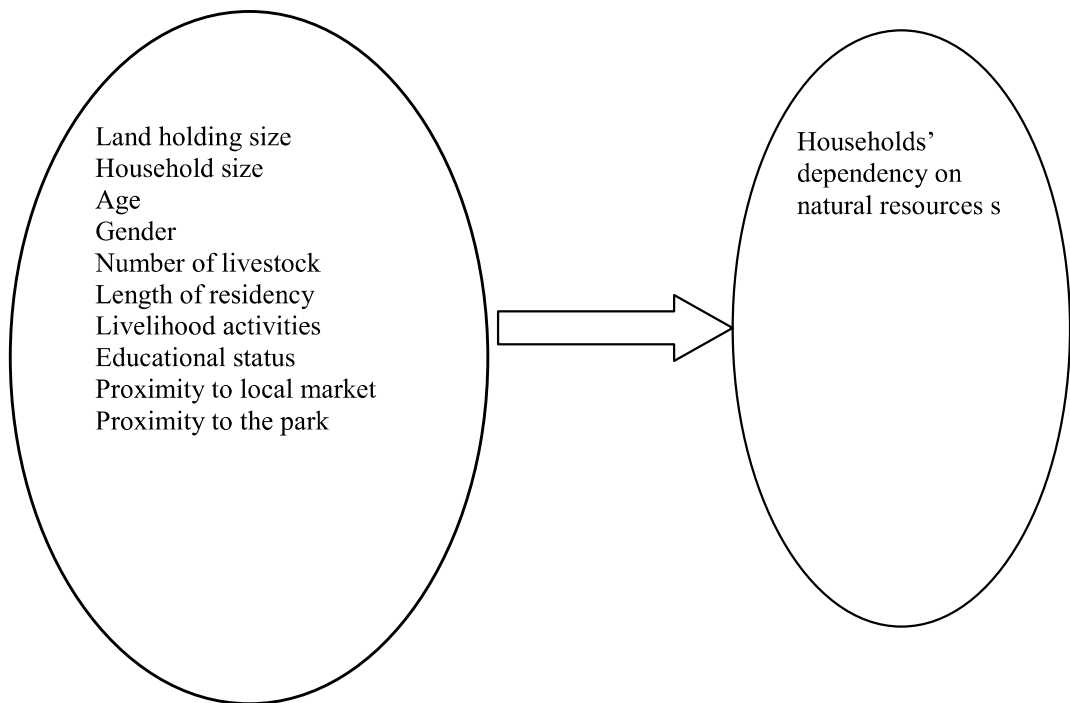Independent variables   Dependent variable

Land holding size
Household size
Age
Gender
Number of livestock
Length of residency
Livelihood activities
Educational status
Proximity to local market
Proximity to the park

Households' dependency on natural resources s

Figure1.diagrammatical presentation of the relationship between independent and dependent variables

Operationalization and measurement of key variables

Table 1 below shows the identification of variables from concepts, indicators of the variable and level at which indicates are measured.

Concepts	Variables	Indicators	Level of measurement
Socio economic status	Land holding size	Absolute value of land under the control of the household in hectare	Scale
	Number of livestock	Total number of livestock owned by the household	Scale
	Length of residency	Number of years a person lived in the area	Scale
	Livelihood activities	Livelihood activities practiced by households	Nominal
	Proximity to the block	Time spent to reach to park	Scale
	Proximity to the local market	Time spent to reach to local market	Scale
	Age	Length of year that one has been alive	Scale
	Household size	Number of people living in one home	Scale
	Educational status	Level of education attained	Scale
Dependency	Level of dependency on natural resources derived from Chilalo-Galama block	The extent of relying on natural resources derived from Chilalo-Galama block for earning income	Ordinal High/low

Materials and methods

Overview of the study area

Arsi zone is one of the zones that are found in Oromia national regional state in Ethiopia and located in the southeastern part of the country. It is bordered on the south by Bale zone, on the south west by West Arsi zone, on the North West by East Shewa zone, on the north by Afar region and on the east by West Harage zone. The administrative center of this zone is Asella. Arsi Mountain National Park is located in Arsi zone. The park is bounded with 14 woredas and 70kebeles of the Zone. The total area was

931km2 having different area coverage, unique ecology, climate, wildlife and plant species. The physical setting of Arsi Mountain National Park is Mountainous with plateaus, hills, canyons, undulating scenery and flat surface. The park is composed of 4 blocks. These are: DeraDilfekar, Chilalo-Galema, Kaka, and Honkolo blocks (**www.oromiaforest.g ov.et**). Chilalo-Galema block was selected for this study. The rationale behind selecting this block is that, it is the widest block from the rest and thus, large number of household lives adjacent to it. This block is bounded by nine woredas

and 45 kebeles. The total area of the block is about 792 km2. The center of the block is about 200 km from Addis Ababa and 40 km from Asella (zonal town) in south east direction. The block endowed with various vegetables such as *Giant lobelia, Hygiena abyssinica, Podocarpus falcatus, Juniperus procera, Hypericum* etc. There are also more than 40 highland wild mammals and various birds. Moreover, the afro alpine ecosystem regulates water flow from the highland and this regulation supply many downstream users.

Research approach

In this study the researcher employed both quantitative and qualitative research approaches (triangulation). "Triangulation is primarily a way of assuring the validity of research results through the use of different methods and approaches" (Yeraswork 2010:66). Besides, it has also additional advantage of allowing the researcher to cover different aspects of her/his research objectives or research questions by employing different sources, data and research methods (Yeraswork 2010:66). Therefore, the rationale of triangulating data sources and methods in this study was primarily to address various aspects of research objectives of the study. In addition, it allows the researcher to substantiate quantitative data with qualitative one as each of them has their own pitfall.

Sampling Design and Sample Size Determination

Both probability and non-probability sampling techniques were employed for selecting respondents. From probability sampling techniques, multistage random sampling which allows the selection of sample at different stage was utilized. Accordingly, the first stage of the sampling constituted random sampling of one woreda (shirka) out of nine woredas that surrounded Chilalo- Galema block. At the second stage, three kebeles (Gademsa, Aria and lebu) were randomly selected out of eight kebeles of shirka woreda that bounded the block. The selected woreda and kebeles are limited to one and three respectively due to time and financial constraints. Then, at the last stage, sample household heads from each kebeles were selected using simple random sampling technique. To do so, a list of household heads (sampling frame) was obtained from each kebele offices. The household heads contacted were husband except for female headed households. However, in the absence of household heads (i.e both male and female), the younger member of the household was contacted. Household heads were preferred over other members of their household with the assumption that they know better about issues under investigation.

Before doing this, the researcher calculated the sample size by using the online sample size calculator http://www.raosoft.com/samplesize.hpml. Then, the sample size for 1559 household heads becomes 128. Since each kebeles has different number of household head (Gademsa=390 household heads, lebu=692 household heads and Aria=477 household heads), proportional allocation to size (PAS) formula was used to select appropriate number of sample from each kebeles. Based on PAS, the total study subject (128) was distributed to each kebeles using the following formula.

$$nk = \frac{n \cdot Nk}{N},$$

Where;

nk: is the required sample size from each *kebeles*

n is the total sample size (128)

Nk is the total household heads in each kebeles (Gademsa=390 household heads, lebu=692 household heads and Aria=477 household heads).

N is total number of households (1559).

Therefore, when applying this formula for each *kebeles*, required sample size from Gademsa, lebu and Aria*kebeles* is 32, 57 and 39 household heads respectively.

Additionally, from non- probability sampling technique purposive and snow ball sampling were employed. Focus group discussants and in

depth interviewees were selected by using snow ball sampling technique since they are individuals who evicted due to demarcation and conservation process. Accordingly, two focus group discussions and six in depth interview participants were selected through snow ball sampling technique. In most cases, FGD and in depth interview is conducted with people who directly related with the issues under investigation. Hence, individuals who evicted due to demarcation and conservation process of the block are the people who directly affected by the process. Since they are evicted from their previous place, it is difficult to access them; thus snow ball sampling technique was used to select them. Two Key informants (one from government officials and the other from EWCP office) were purposively selected. The key informants were purposively selected on the basis of the position they hold and knowledge they have about the issues under investigation.

Data collection instruments

Data concerning socio-economic features of the household heads, type of natural resources utilized from Chilalo-Galema block and households' dependency on natural resources of the block were collected through structured questionnaire. The questionnaire generally has two parts. The first part of the questionnaire asked the socio-economic characteristics of the respondents. The second part contains question related to households' dependency on natural resources s of the block. The survey team consisted of the researcher and three enumerators. The enumerators were first degree holds and have good experience in data collection from the rural setting. The researcher as well as the enumerators was fluent in local language (Afan Oromo). Furthermore all assistant were given adequate orientation by the researcher concerning ways of approaching the respondents and informed consent of the respondents. The administration of Survey instrument was undertaken through face- to face interview since majority of respondents were unable to read and write.

In depth interview was held with sample respondents. This data collection method is used to generate in-depth information about issues under investigation. Totally, six in depth interview were undertaken. FGDs were held to generate qualitative data to supplement and substantiate data obtained from survey instrument. Accordingly, two focus group discussions were held with households of the study area. Each focus group discussion was containing 8 members of discussants. The distinction of FGD was based on gender with the assumption that gathering homogenous people will make them free to discuss their concern without any social or cultural barrier especially for female discussant. Both of the focus group discussions were held in local language (Afan Oromo) and were facilitated by the researcher herself.

Method of data entry and analysis

In order to analyze quantitative data, the collected data were cleaned, coded and entered into Statistical Package for Social Science (SPSS) for analysis. The descriptive analyses involved use of frequencies, percentage and mean distribution. Besides, tables and charts were employed for data presentation.

In addition, in order to know determinants of households' level of dependency on natural resources of the block, binary logistic regression analysis were employed. This is because the outcome variable was dichotomous (either low level of dependency or high level of dependency) rather than continuous assuming the usual multiple regression models for the probability of households' level of dependency could lead to predict values of the probability outside interval (0, 1).

Households' natural resources dependency variable transformed into dichotomous as high and low level of dependency using 0.5 incomes as a cut-off point. Therefore, it is appropriate to use binary logistic regression analysis in which the expected value is the probability that the variables take the value one (high level of dependency on natural resources of the park). Qualitative data collected through interview and focus group discussion were presented and analyzed alongside quantitative data gathered through survey.

Conceptual Model of the Study

The functional form of binary logistic regression model is specified as follows

(Gujarati, 2004; Landau & Crc, 2004).

$$P_i = E(Y = 1/X_i) = \frac{1}{1 + e^{-(\beta_o + \beta_i X_i)}} \qquad (1)$$

For ease of exposition, (1) is written as:-

$$P_i = \frac{1}{1 + e^{-Z_i}} \quad …………. (2)$$

The probability that a high dependency is expressed by (2) while, the probability for low dependency is expressed by:-

$$1 - P_i = \frac{1}{1 - e^{Z_i}} \quad ……… … ….(3)$$

Therefore we can write:-

$$\frac{P_i}{1 - P_i} = \frac{1 + e^{Z_i}}{1 + e^{-Z_i}} \qquad (4)$$

Now, $\dfrac{y_i}{1 + y_i}$ is simply the odd ratio in favor of high dependency; the ratio of the probability that high dependency to the probability of low dependency. Finally, taking the natural log of equation (4) we obtain:-

$$L_i = \ln\left[\frac{P_1}{1-P}\right] = Z_i = \beta_o + \beta_1 X_1 + \beta_2 X_2 + … + \beta_n X_n \quad^{…} (5)$$

Where   Pi = is a probability of dependency ranges from 0 to 1

   Zi = is a function of "n" explanatory variables (x) which is also expressed as:-

$$Z_i = \beta_o + \beta_1 X_1 + \beta_2 X_2 + … + \beta_n X_n …… . (6)$$

ß0 is an intercept
ß1, ß2 ------ ßn are slopes of the equation in the model
Li = is log of the odds ratio, which is not only linear in Xi but also linear in the parameters.
Xi = is vector of relevant Socio-economic characteristics
If the disturbance term (Ui) is introduced, the logistic regression model becomes:

$$Z_i = \beta_o + \beta_1 X_1 + \beta_2 X_2 + … + \beta_n X_n + U_i$$
……………………………………………(7)

Result and discussion

Table 2.Socio-economic profile of sample household heads

Variable	Categories	n (sample size)	Percent (%)
Gender	Female Male	29 99	22.7% 77.3%
Age	>50yearsold <50 years old	67 61	52.3% 47.7%
Educational status	Can't read and write Primary Secondary Certificate and above	76 22 21 9	59.4% 17.2% 16.4% 7%
Household size	>7members < 7 members	65 63	51% 49%
Length of residence	>30years < 30 years	81 47	63.3% 36.7%

Number of livestock	>30livestock	70	54.7%
	< 30livestock	58	45.3%
Landholding size	<0.75 hectare	79	61.7
	>0.75 hectare	49	38.3
Proximity to block time taken)	< 30 minute	68	53.1
	>30 minute	60	46.9
Proximity to market time taken)	< 30 minute	70	54.7%
	>30 minute	58	45.3%
Livelihood activities	Farming (crop production and animal husbandry)	128	100%

Types of natural resources utilized from chilalo-galema block

Data obtained from in-depth interview revealed that before restriction imposed, natural resources utilized from Chilalo-Galema block were source of livelihood for many households residing around it. They used to utilize various natural resources like fodder, land for farming, fuel wood, honey etc. Especially, since the land of Chilalo-Galema is fertile, it is mainly used to cultivate vegetable like carrot, cabbage, potato, onion, endive etc. which were mostly needed by local vegetable traders. Hence, households around it used to earn more income from these livelihood activities.

Table 3 below shows, multiple responses on natural resources utilized from Chilalo-Galema block before restriction.

Type of natural resources s used to utilized from Chilalo Galema block	n (sample size)	Percent
Fuel wood	53	41.4%
Land for farming	81	63.3%
Charcoal	24	18.8%
Fodder	128	100%
Thyme plant	43	33.6%
Honey	13	10.2%
Total	342	267.2%

*Multiple responses

As observed in table 3 above, 100% sample households used to utilize fodder from Chilalo-Galema block before restriction, followed by land for farming (63.3%), fuel wood (41.4%), thyme (33.6%), charcoal (18.8%) and honey (10.2%) respectively. From this it is clear that majority of households in the study area had mostly been using Chilalo-Galema block for fodder, cultivation (land for farming) and fuel wood.

Data collected from in depth interview augmented this finding (i.e. survey). Data obtained from in-depth interview revealed that people around Chilalo-Galema block used to utilize fodder in two terms: one, households who were very proximate to the area used to utilize it on daily basis while those who were

distant used to utilize two months per year (during summer season). Besides, since there was no other source of energy used for household consumption, household who lives adjacent to Chilalo-Galema used to collect fuel wood on daily basis.

The survey finding indicated that, 53.1% of sample respondents used to visit Chilalo-Galema on daily basis, where as 46.9% of them used to visit two months per year. From this we can conclude that majority of household around Chilalo-Galema used to visit Chilalo-Galema on daily basis. These shows, most of activities undertaken by the adjacent households were related with natural resources derived from Chilalo-Galema block. Data from FGD indicated that, households adjacent to the block perform all most all of their activities in the Chilalo-Galema block i.e. they farm, graze their livestock, collect fuel wood for their meal etc. in block. Therefore, their visit to the block has a great relation with the benefit they gained from the area.

Households' level of dependency on natural resources of Chilalo-galema block

Households' level of dependency on natural resources of Chilalo-Galema block was determined by calculating ratio of annual income derived from natural resources of Chilalo-Galema block to the total annual income of the households. In this study 0.5 of the ration income is considered as the cut- off value. Therefore, households' whose income from natural resources of Chilalo-Galema block accounts to 0.5 and lower in their total income are considered less dependent and the rest are considered as highly dependent on natural resources of the block.

As observed on figure 2, 54.69% of sample household heads were highly dependent on natural resources of the block while 45.31% were low dependent. On the other hand, 54.69% of the sample household heads derive more than 50% of their total annual income from natural resources of Chilalo-Galema block before restriction. The average annual income

derived from natural resources of Chilalo-Galema block was 55%. From this, it is evident that the majority of households around Chilalo-Galema derive their major annual income from natural resources of the block.
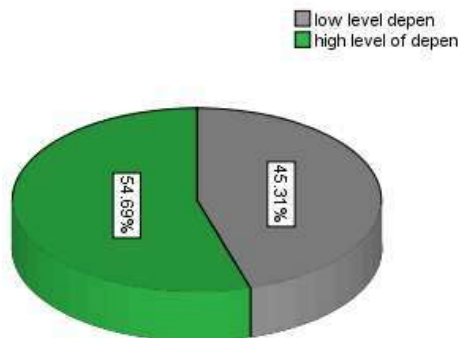

Figure 2. Pia chart for household's level of dependency on natural resources s of Chilalo-Galema block

Evidence collected from in depth interview augmented this finding (i.e. survey). Data obtained from in-depth interview participants revealed that, before restriction imposed, Chilalo-Galema was source of livelihood for many households residing around it. They used to utilize various natural resources s like fodder, land for farming, fuel wood, honey, thyme etc. Especially, since Chilalo-Galema's land is fertile, it is mainly used to cultivate vegetable like carrot, cabbage, potato, endive, onion etc which were mostly needed by local vegetable traders. Hence, households around it used to earn more income from these livelihood activities. Regarding income households used to gain from natural resources of Chilalo-Galema block, a 60 years old male interviewee from Aria Kebele indicated that:-

In our area, there are many vegetable traders who buy our farm products and supply it to Adama and Addis Ababa. Although there is fluctuation of price from year to year, on the minimum, one tore of carrot was sold for 1000 birr, 'goomani fe'a farda tokko' litrarly one pack of horse cabbage was sold for50 birr and one dibe of potato and beet root were sold for 500

and 300 birr respectively. Since the land of Chilalo Galema is fertile, I used to cultivate these vegetables in large volume and my households' major income was gained from this livelihood activity. For example, last year I sold 15 'tore' of carrot, 5 dibe of potato and 3 'dibe' of beet root and I gained around 18,400 birr. Besides, I used to sell cabbage on daily basis; hence I was able to provide things needed for my household without any problem.

Similarly, a 50 years old female interviewee from Lebukebele indicated her views as follows

ChilaloGalama was my factory. Although my husband died three years ago, I used to cultivate vegetable in my garden and raise sheep without any problem. Since the vegetable traders paid me good price, I used to earn better income. For example last year I sold 20 'tore' of carrot and 10 dibe of potato. In addition, I used to sell cabbage on daily basis.

Additionally, a 37 years old female from Lebukebele indicated as follows:-

We (self and her household) used to cultivate vegetables in large volume since vegetable traders took our products in good price. If you saw my garden last year, you would be surprised. There was no empty space without vegetables; I had been selling cabbage on daily basis and I did not ask my husband for money to buy things needed for household consumption. Besides, we (self and her household) used to take sheep from far way households for share (rebi local language). Thus, we had been gaining more income from vegetable cultivation and sell of sheep.

Generally, from the above quotes we can understand that, natural resources derived from Chilalo- Galema block was the main source of income for surrounding households. As the participants of in depth interview explained in their quotes, the fertile nature of Chilalo-Galema land and the presence of vegetable traders who took their farm product in good prices highly encouraged households to undertake this livelihood activities as their major source of income.

To sum up on natural resources use and dependency, the result of this study supports the findings from many other studies. In particular, the study supports the notion that many rural population are highly dependent up on natural resources for their livelihood Gunatilake (1998); Cavendish (1999), Cavendish (2000); Fisher (2004); Masozera and Alavalapati (2004); Cullen (2007); Sapkota and Oden (2008); and Bwalya (2011).

Determinants of households' level of dependency on natural resources the block

In order to know the impact of explanatory (independent) variables on dependent variable, binary logistic regression were employed. This is because the dependent variable is binary (high level of dependency and low level of dependency). Accordingly, a total of 128 cases were included in logistic regression analysis model without any missing values.

The analysis began with assessing unadjusted relationship between outcome (dependent) variable i.e. households' level of dependency on natural resources of the block, and each potential predictor variables singly. Then, adjusted relationship was conducted for potential confounding effects. From unadjusted binary logistic regression analysis result, only variables that have p value less than 0.2 were transformed to adjusted binary logistic regression analysis. On tables four and five, both unadjusted and adjusted binary logistic regression analysis were presented sequentially and results from adjusted binary logistic regression were used for interpretation.

Table 4: Unadjusted binary logistic regression output showing predictor variables associated with households' level of dependency on natural resources s utilized from Chilalo-Galema block

Variable	Categories	Level of dependency		COR (95%CI	p-value
		High	low		
Gender	Female	17	12	1.230 (0.532-2.842)	0.629
	Male (RC)	53	46		
Age	>50yearsold	55	12	14.056(5.983-33.022)	
	<50 years old (RC)	15	46		0.000
Educational status	Can't read and write	43	33	2.606(0.606-11.202)	0.513
	Primary	11	11	2(0.396-10.090)	0.198
	Secondary	13	8	3.250 (0.629-16.789)	0.401
	Certificate and above(RC)	3	6		0.159
Household size	>7members	45	20	8.654 (3.865-19.377)	0.000
	< 7 members(RC)	13	50		
Length of residence	>30years	39	42	0.479 (0.228-1.009)	0.053
	< 30 years(RC)	31	16		
Number of livestock	>30livestock	60	10	28.800 (11.081-74.854)	0.000
	< 30livestock(RC)	10	48		
Landholding size	<0.75 hectare	61	18	15.062(6.160-36.825)	0.000
	>0.75 hectare (RC)	9	40		
Proximity to block time taken)	< 30 minute	58	10	23.200(9.225-58.346)	0.000
	>30 minute (RC)	12	48		
Proximity to market time taken)	< 30 minute	57	13	15.178 (6.407-35.954)	0.000
	>30 minute (RC)	13	45		

As shown on table 4, from nine variables that entered singly in logistic regression model, gender, educational status and length of residency were found insignificant in predicting households' level dependency on natural resources of Chilalo-Galema block since their p value were greater than 0.05, even without adjusting their effect. The cutoff point used for inclusion in adjusted binary regression analysis model was 0.2. Hence, the valid variables when tested individually- age (p value =0.000 and COR=14.056), household size (p value=0.000

and COR=8.654), landholding size (p value=0.000 and COR=15.062), proximity to the block (p value=0.000 and COR=23.200), proximity to the local market (p value= 0.000 and COR=15.178) and length of residency(p value=0.053 and COR=0.479) were entered into adjusted binary regression model. While gender and educational status were excluded since their p value was greater than the cutoff point used for inclusion in adjusted binary regression analysis model.

Furthermore, although number of livestock owned has p- value less than the cutoff point used for inclusion, it was dropped from the adjusted regression model due to multicollinearity problem. Multicollinearity among explanatory variables was seriously tested prior to run adjusted binary logistic regression. Number of livestock owned found to be highly correlated to land holding size. Although it was preferred than landholding size to determine households level of dependency on natural resources of Chilalo-Galema block, it drastically reduced the significance and magnitude of household size variable. Thus, it was dropped from the adjusted binary logistic regression model to avoid muticollinearity.

Table 5.adjusted binary logistic regression output showing predictor variables associated with household's level of dependency on natural resources s of Chilalo-Galema block

Variable	Categories	Level of dependency		AOR (95%CI)	p-value
		High	low		
Age	>50yearsold <50 years old (RC	55 15	12 46	10.437(2.565-42.463)	0.001
Household size	>7members <7 members(RC)	45 13	20 50	7.473(1.792-31.164	0.006
Length of residence	>30years < 30 years (RC)	39 31	42 16	0.354(0.088-1.418)	0.142
Landholding size	<0.75 hectare >0.75 hectare (RC)	61 9	18 40	9.746(2.224-42.701)	0.003
Proximity to block	< 30 minute >30 minute(RC)	58 12	10 48	13.852 (2.993-64.111)	0.001
Proximity to market	< 30 minute >30 minute (RC)	57 13	13 45	5.453(1.322-22.496)	0.019

As it can be observed on table 5, one variable (i.e. length of residence) which is also insignificant in unadjusted logistic regression analysis became again statistically insignificant (p-value >0.05) in predicting households' level of dependency on natural resources derived from Chilalo-Galema block when it entered to adjusted logistic regression analysis. In the following subsection each independent variables are presented in relation to the outcome variable (dependent variable).

Age and households' level of dependence on natural resources of Chilalo-Galema block

As it can be observed in table 5 above, age is a determinant factor (p-value= 0.001) for households' level of dependency on natural resources derived from Chilalo-Galema block. Adjusted odds ratio was 10.437 with (95% CI of 2.565-42.46). This indicates that, respondents who were greater than 50 years old were 10.437 times more likely to depend on natural resources derived from Chilalo-Galema block than reference category-respondents who were less than 50 years old. From this it is evident that old aged people were more dependent than youngsters. This is happened due to the fact that, majority of activities undertaken in the study area was animal husbandry and vegetable cultivation. Hence, in relation to other activities, these activities were less strenuous and old age people can easily perform it. This finding contradicts with findings of Masozera and Alavapati (2004) who found the younger households were highly dependent than the older. It is rather in line with reports of Cavendish (2000) and Alphonse et al (2009) who found the same finding.

Household size and households' level of dependence on natural resources of the block

Household size proved to have statistically significant association with households' level of dependence on natural resources s of Chilalo-Galema block (p-value <0.05). The resulting adjusted odds ratio was 7.473 with (95%CI of 1.792-31.164). This implied that in relation to reference group (respondents' who had less than 7 members of household size); respondents who had greater than 7 members of household size were 7.473 times more likely to depend on natural resources of Chilalo-Galema block. Obviously, non-proportional household size with annual income of a given household causes problems which may force the members to rely on natural resources in their locality. This is in fact, large household size generally require many resources to satisfy their daily needs. Especially, when large household size accompanied by small land holding size and lack of alternative means of livelihood other than farming, relying on natural resources of their locality become the only option. Likewise,

majority of sample households of this study had less than 0.75 hectare of land though their main livelihood strategies was farming (crop production and animal husbandry). At the same time, the average household size was 8 members. Therefore, there was a high tendency to extract natural resources from Chilalo-Galema block so as to satisfy the needs of these household members. This finding is similar with findings of Masozera and Alavalapato (2004); Sapkota and Oden (2008); NahayoAlphonse (2009) who found that having large household size has an association with households' high level of dependency on natural resources of protected area.

Landholding size and households' level of dependency on natural resources of Chilalo- Galema block

Landholding size is classified as less than 0.75 hectare and greater than 0.75 hectare of land and proved to be a determinant factor (p value=0.003) for households' level of dependence on natural resources of Chilalo-Galema block. The adjusted odds ratio were 9.746 with (CI 95%=2.22442.701). This indicated that as compared to households who had greater than 0.75 hectare of land, households who had less than 0.75 hectare of land were 9.746 times more likely to depend on natural resources s derived from Chilalo-Galama block. This is in fact, as farming (crop production and animal husbandry) is the main livelihood activity of the household, land is imperative natural resources for adjacent households. However, as explained in Table 2 more than half of respondents of the study area had less than 0.75 hectare of land holding size; which is small land holding size for a given household from study area' context. Therefore, for the sake of overcoming their livelihood impediment and to meet the basic needs of the household members, households who had small land holding size became highly dependent on natural resources of Chilalo-Galema block.

Proximity to local market and households' level of dependence on natural resources of Chilalo-Galema block

Proximity to the local market of this study was measured by time spent to reach to the local market. Accordingly, it is classified as less than 30 minutes and above 30 minutes. The p-value is 0.019 which indicates as it has statistically significant association with outcome variable. The adjusted odds ratio was 5.453 with (CI 95% of 1.32222.496). This implied that households' who spent less than 30 minutes to reach to the local market were 5.453 times more likely to depend on natural resources derived from Chilalo-Galema block than households' who spent more than 30 minutes. In other words, households' proximate to local market was more dependent than distant households. In support of this idea, data from in depth interview indicated that, the presence of Gebra kirstos market (local market) to their proximity have encouraged adjacent households' to cultivate various vegetables like carrot, cabbage, potato, onion etc. In Gebrakristos (village name), there were vegetable traders who buy various vegetables from the farmers and supply it to Adama and Addis Ababa. The transaction of these vegetable is undertaken on daily basis. As indicated earlier, Chilalo-Galema's land is highly comfortable for production of vegetables since it has fertile soil. On top of this, the distance between Chilalo-Galema and the local market is very small (around 5 Km) (from own observation). Thus, households who were close to the block were also close to the local market. Consequently, their farm production (vegetable) can be sold on daily basis and this encouraged them to cultivate more vegetable. Furthermore, Chilalo-Galema block is also very close to the road that links the two woredas namely shirka and lemuf bilbilo. Hence in addition to proximate to local market, the available infrastructure or physical asset facilitates the exchange process effectively. This finding contradicts with Cullen's (2007), Gunatilake's (1998) and Masozera and Alavalapati's (2004) arguments that indicated people living in isolated areas with limited access to external markets and infrastructure facilities are likely to remain poor and will continue to depend on surrounding natural resources. It rather consistent with findings of Alphonse et al (2009) who found, access to

local market encourage people to extract and sell various natural resources of their locality.

Proximity to the block and households' level of dependence on natural resources of Chilalo-Galema block

Just like proximity to the local market, proximity to the block was also measured by the time spent to reach to the block. Thus, it is classified as less than 30 minutes and above 30 minutes and, it is proved to have statistically significant association with outcome variable of the study (p-value <0.05). The adjusted odds ratio was 13.852 with (95% CI of 2.993-64.111). This implied that households who spent less than 30 minutes to reach to the block were 13.852 times more dependent on natural resources derived from Chilalo-Galema block than those who spent greater than 30 minutes. Having survey finding in mind, the researcher undertook in- depth interview with selected informants to know how their proximity to Chilalo-Galema block was helping them. With regard to this, a 40 years old male interviewee from Gademsa kebele indicated that:-

> *Majority of households (including myself) who were living near to Chilalo-Galema used to benefit a lot. Chilalo-Galema were mostly benefiting us through its fodder, land for cultivating various vegetables and fuel wood for household consumption. Since we were very proximate to it, we had been taking sheep from far away households for share (rebi local language). And then, we were raring these sheep and used the income gained from selling sheep to meet our household member's needs.*

In support of this idea the chi square test on the following table revealed that there is statistically significant (X2 =17.666, sig. (2-tailed) = 0.000) relationship between proximity to the block and number of livestock owned by the households.

Table 6.Cross-tabulation of number of livestock owned by respondents proximate to Chilalo-Galama block

			Proximity to Chilalo Galema		Total
			Less than 30 minute	Above 30 minute	
Number of livestock owned by respondents	Above 30	Count	49	21	70
		% within livestock category	70.0%	30.0%	100.0%
	Less than 30	Count	19	39	58
		% within livestock category	32.8%	67.2%	100.0%
Total		Count	68	60	128
		% within livestock category	53.1%	46.9%	100.0%

X2 =17.666, sig. (2-tailed) = 0.000

As observed on the above cross-tabulation (table 6), 53.1% of respondents were reaching to Chilalo-Galema block with less than 30 minutes. Of this, 70% of them had above 30 numbers of livestock while 32.8% of them had less than 30 numbers of livestock. On the other hand, 46.9% of respondents were spending more than 30 minutes to reach to Chilalo-Galema. From this, 30% had above 30 numbers of livestock and 67.2% of them had less than 30 numbers of livestock. From this it is evident that households who were proximate to Chilalo-Galema block had more livestock than distant. This implied that, the easy access of fodder that exists due to very near to the block encourages people to have large number of livestock.

Conclusion

Biodiversity Conservation is crucial for human being. This is because human being especially rural community fulfills its need mainly from natural resources. In addition, endemic animals and plants help to attract various tourists and this in turn help the local community in

various ways. It is indicated that protected areas are expected to improve the socio-economic living conditions of local people in addition to their envisioned goal for biodiversity conservation. Because, natural resources within the protected areas are source of livelihood for adjacent households (Cullen 2007). However, in most cases management approach implemented to conserve natural resources within protected area excludes local people by overlooking their socio-economic living conditions and conservationist mainly gives great emphasis for significance of conserving biodiversity.

The purpose of this study was to examine determinants for households' dependency on natural resources of Arsi Mountain National park. The finding of the study revealed that

adjacent households were highly dependent on natural resources derived from Chilalo-Galema block. That means, on average 55% of their annual income were derived from Chilalo-Galema block. Land holding size, age, household size, proximity to the local market and proximity to the block significantly determined their dependency. Even though the finding of the study indicated the dependency of adjacent households' on natural resources of the park, the Ethiopian Wolf Conservation Program (EWCP) mainly focused on conserving wolves and their Afro alpine ecosystem by overlooking the contribution of the park for local community. This will create hostile relationship between local community and the natural resources of the area and this in turn affects both the resources users as well as the natural resources s of the park.

Recommendation

Management of natural resources including wildlife has both regional and international significance. However, this management cannot be achieved without involvement of adjacent people in the sustainable use of these resources s. Since the livelihood of local people around the protected area is dependent on natural resources within it, excluding or restricting them may affect their livelihood and it also leads to destruction and overexploitation of natural resources itself.

Therefore, in order to maintain the sustainability of protected area which is the envisioned goal of biodiversity conservation, understanding the attributes of local people around the park and their dependency on natural resources is crucial so as to provide alternative means of livelihood and/or implement natural resources management approach that embrace local people's concern in management process. In this regard, the finding of this study may attract the attention of Ethiopian Wolf Conservation Program (EWCP) to review their management strategies and reshape it to be consistent with local people's socio-economic living condition. Furthermore, disclosing contributing factors for household's dependency on natural resources of Chilalo-Galama could serve as important input for knowing on which parts of household

characteristics need to be worked on so as to reduce their dependency. It can also serve similar purpose for other organizations working on conservation to work with the local communities so as to ensure better reciprocal benefits. It can also inform the country's policy on addressing local communities' needs in addition to conservation efforts. Generally, command and control approach of the natural resources conservation (fortress conservation) will only promote   park- people conflict. Hence, managers of the park must embrace a proactive approach and work with local community to address their socio-economic concern.

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