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Econometric Analysis of Local Community's Perception Towards Protected Area Management: The Case of Borena-Saynt National Park - Amhara Regional State, Ethiopia

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Abstract

This study tried to examine econometric analysis of local community's perception towards protected area management in the case of Borena Sayint National Park. Specifically, the study aims to estimate the direct economic value of natural forest, response on the indirect and option values and econometric analysis of local community's perception and/or attitude measured based on use value index. The research was conducted in Borena and Mehal Saynt Woredas with severe deforestation and biodiversity loss. Cross sectional research design and stratified-random sampling method were used, following agroclimatic zonation technique. Primary and secondary data were collected from various sources. Data was gathered from a gross total of 396 respondents. Household survey with 360 interviewees using questionnaire, key informants interview with 21 using checklist and, focus group discussion with 15 target individuals using guiding questions. Secondary data obtained from published and unpublished materials, i.e. books, journals and reports, were used. Analysis was performed using analytical tools, descriptive and order logistic regression econometric model in particular. Descriptive analyses tell us to understand the rank of community priorities of the direct, indirect and option benefits. From the direct benefits, honey, livestock, job opportunity, wood, farm tools, housing poles, tourism, timber, hunted meat, medicine, biodiversity, fruit, coffee

orderly have been listed from the highest to lowest local community benefits. Similarly, common pole, biodiversity, water source, community heritage, medicine, robbery, wood fuel, carbon sequestration, tourism, livestock feed are orderly selected as their highest to lowest benefits among direct and option benefits. Hence, Local community prefers indirect benefit of park than direct benefits. The econometric analysis of local community's perceptions towards protected area management of the natural forest, '**Denkoro-Chaqa**' in English means "**Deaf-Forest**". Information obtained from order logistic regression (Ologit) based on response rate of households to infer the intrinsic value showed consistency between perception, selective socioeconomic and location variables. This implies that education, marriage, old-age and location-2 as most important factors that respondents agreed with significant degree, and hence the most constructive idea to enhance local community`s perception in view of major conservation plans. Reputedly, family base awareness creation with formal and informal education, and other media should be done in core area, buffer zone, transitional zone areas of conservation of natural forest along with take full advantage of local community benefits.

Keywords: econometric analysis, local community perception, protected forest, Borena-Saynt National Park

Introduction

1.1. Background of the Study

The government of Ethiopia has given courtesy for enhancing environmental value in wide-ranging by launching the campaign of green fingerprint. The environmental issue has been noticeably described in the country's constitution as government shall struggle to ensure that all citizens in the country live in healthy environment, people have full right to participate on the design of environmental activities, government and citizens shall have the obligation to protect environmental damages (Ethiopian Wildlife Conservation Authority, 2014). However, Borena Sayint National Park has been prolonging devastated by degradation and deforestation area for decades even though the park was legally protected (established). Some research were conducted related research to identify the problem of the parks. Among them, lack of community participation had been one of the bottlenecks that protected areas have been faced (Amogne, 2014). Borena Sayint National Park is the hub of water spring and one of the greatest sources of Abay River and the lively hood of millions of local people but nobody gives attention as such. Furthermore, there have not been consistent approaches of conservation practices all over the country's national parks e.g. the Semien Mountain has design strategy such as the establishment of a zoning scheme, with different levels of restricted access for community grazing in core zone, limited

use zone, and multiple use zones (Lakew et al., 2007) but such strategy has not been designed in Borena-Saynt National Park of Ethiopia. Nevertheless, the economic dimension of the park has not been addressed by previous researchers. There are many critiques that Ethiopia has lost natural forests (and inhabited biodiversity) which cannot be determined by the amount of forest in market value but it has rather non market values. The effect of deforestation is not easily reversible because many species would be lost. Different measures have been taken for different problematic areas (Nyongesa et al., 2016; PaDPA, 2006). Scrutiny of the social, economic, and environmental aspects of local community will be the prominent findings for the sustainable development of the natural resources on national parks. Hence, understanding the local community's attitude and perception will have significant impact on preserving Borena Sayint National Park. Likert scale is the paramount measurement to analyze the perception and attitude test of the local community's household in particular. Certainly, it can measure the level of household agreement responses to understand their perception and attitude on natural resource conservation (Guthiga, 2008).

In turn, studies in some other areas have now been attested that community's perception and attitude (voluntariness) for conservation of natural forests with significant contribution. To this end, no studies have been conducted on perception and attitude of local community with econometric model. This together with the lack to a-full-fledge scale analysis on the determinants of Local community's perception and attitude towards *protecting national park of Borena-Saynt National Park, Amhara Region, Ethiopia for conservation works in protected areas; as yet, there have not been a-steppingstone research attempt, and hence, difficult to ensure sustainable park development and effective conservation activities in core, buffer and transitional areas. This study was, consequently, contributed to fill information gaps in terms of local community's perception and attitude level in the Borena-Saynt National Park of Ethiopia.*

1.2. Objectives of the Study

The general objective of the study was to examine econometric analysis of local community's perception towards protected area management in the case of Borena Sayint National Park. Specifically, the study aims to estimate the direct economic value of natural forest, response on the indirect and option values and, econometric analysis of local community's perception and/or attitude measured based on use value index.

2. Research Methodology

2.1. Research Design

In this study, cross-sectional research design was used, because it attempts to investigate the relationship between variables at a point in time. The survey work held depending on the characteristics of the population, sample, the type of question,

the response rate, the cost and time. The research applied a-stratified proportional sampling method by random technique. This was made after identifying the target Woredas. Based on the criterion of adjacent to the natural forest and conservation practice, 11 kebeles in the study area were stratified in to three. According to Borena-Saynt National Park (2017) reported that Jelesa, Anferfra, Dega hawi, Dega-Dibi, and Janiberu as one stratum. The assumption was that people who are living in these areas have better conservational practices and they have still lived friendly with remnant natural forest. The second stratum was kebeles PAs who have medium conservational practices. These are Kotet, Abu and Miskabe. The third stratum was Wozedi, Samagn, Libanos, and Chirkose. These kebeles were chosen with the prior consent that previous researchers had already mentioned as critical sites where deforestation and land degradation been more severe compared to other strata in the park. Likewise, by using second stage sampling selection techniques, all kebeles found adjacent to the natural forest were included from two Woredas. Because, Kebeles found adjacent to the natural forest (Denkoro Chaka), have direct and significant effects on long term natural forest protection. Therefore, nearby kebeles Chirkose, Anferfra, Jelesa, Dega hawi, Dega dibi, Abu, janaberu and Mskabea are found in Borena Woreda, whereas Kotet, Samagn and Wozedi found in Mehal Saynt Woreda.

2.2. Sampling Method and Technique

The study takes one representative Kebele from each stratum with simple random lottery system. Janiberu, Kotet and Wozedi kebeles were selected among three strata. Thus, sampling frame can be easily established. The sample frame represents all the household head in three randomized selected kebeles. Households head were listed from three Kebeles before with drawl the respondents' lottery to satisfy randomization. After the registration of household head as the sample frame, the study uses formula to minimize sampling errors. Thus, it takes the standardize formula of Yemane (1967) to satisfy the sample size determination.

$$n = \frac{N}{1+N(e)2} \ ,$$

Where n=number of households to be studied N=Total household in Woreda, e=Margin of error (5%). Sample selection of the particular respondent also was equal chance by randomization techniques.$n = \frac{3518}{1+3518(.05)^2} = 360$. Hence, the study collected data from 360 respondents and three schemes of Wozedi, Kotet, and Janiberu Kebeles based on the above formula and each scheme's population proportionality.

2.3. Data Sources

Primary data: The face to face data collection was executed by these enumerators. Interviewer bias and resource expensiveness were expected and it was minimized (Carson, 2000). Subsequently, three data enumerators were recruited from the Woreda to each of the kebeles. The selected enumerators were initially trained on the

necessary skill and approach. Mode of data collection was held in Amharic language that was appropriating for the local people and enumerators. Besides, focus group discussion was another qualitative method of data collection which was used in this study. One focus group discussion was held from three kebeles with selected participants.

Secondary Data Sources: The major secondary sources of data were utilized during the study. These are books and periodicals, articles which are related to challenges of park managements, seminar papers, conference proceedings, previous research works of Master's thesis and PhD dissertations as well as socioeconomic and park related studies, including relevant documents and project reports from different institutions.

2.4. Data Collection

Procedures: Probability sampling procedures provide survey with straight forward way to generalize from the responses of alternative small number of to much larger population (Mitchel and Carson, 1988). Initially, based on the nature of this study, two stage sampling was applied to determine the study area. Hence, as natural forest Denkoro Chaka is found in Borena and Mehal Saynt. Therefore, the Woredas were grouped in two subgroups. Borena and Mehal Saynt Wordas were grouped in first sub group and Saynt Woreda only in another second sub group because availability and non-availability of the natural forest is the criteria of grouping the first stage sampling. Hence, the study selected the first sub group Borena and Mehal Saynt Woreda with first stage sampling among three Woredas.

The data were also collected from focus group discussion. Questioners in the form of structured and semi structured in group discussion. Focus group discussion was held on some purposively selected groups including Kebele, Woredas, and Park administrators.

2.5. Data Analysis

Data analysis was conducted in the following various methods and techniques. On top, descriptive statistical methods, SPSS Ver. 16, were used to analyses frequency distribution pattern of respondents in the study area. Random choice method was also applied to analyses the determinants of households in view of local community's perception and attitude, conservation practices and willingness to pay for natural forest.

The study used econometric models to explain the contribution and willingness to pay for local community for natural forest conservation. Study was applying ordered logistic regression, multinomial logistic regression, and bivariate probit model. The study correspondingly categorizes the dependent variable (attitude and perception score) in to five Likert scale in order to explain the attitude of the community regard to willingness to pay money and labour vehicles for meaning full policy implication

with respect to independent variables such as sex, education, age, marital status and location of the study. Since the response of respondents is arranged in order (strongly disagree, disagree, neutral, agree, and strongly agree). Therefore, Ologit explained the preferences and attitudes of local community towards forest restoration or conservation while the Mlogit model is expected to examine forest conservation practices of household heads. Since the main goal of the study is explaining the willingness to pay money and labour vehicles so that bivariate probit mode is analyzed and by command of Stata 14 that can explain the result of double bounded dichotomous model.

3. Result and Discussion

3.1. Demographic Characteristics of Respondents

Demographic characteristics of the variables were analyzed based on their socio economic impacts. Out of proposed respondents randomly selected respondents 98% (352) were collected and the rest of 2% (8) were included from contingency questionnaires. Of the total respondents 299 (83%) and 61 (17%) were male and female household heads respectively. Of the total sample size 30% is found in location 2 of Borena Woreda and some of the basic variables evaluated as follow.

The working age consists of the population group between 15-64 years old. The total working age is 2.93 (58.6%) of the total household. Of the total working age group 1.453 (49.6%) is male whereas 1.48 (50.5%) is female. The productive age group is highly helpful for the country's economic development such a conservation practices. This data is estimated to be approached the national survey estimation. Inter-censual Population Survey (ICPS) revealed that the population belonging to the working age category has reached 55.4% of the total national population of the country (CSA, 2012). Therefore, the total respondents of the working age groups are found proportional to the national statistics. Since the age has its own significant impact on the most part of this natural forest conservation.

Similarly, CSA (2013) population projection indicates 88.3% illiterate rural population is found to the age of 65^{+}. But, the total illiterate population size is reported in Ethiopia (41%) and Amhara (45%). However, the study indicates of 360 (37%, 35% 18%, 9%, 0.5%) in that order of not read and write, grade 1-4, 5-8, 9-10 and 11-12. However, the sample size of the study indicates that the illiteracy rate is lower than both the nation (Ethiopia) and the Amhara Region but it has a proximate result to the national data. However, the illiterate percentage of above 64 ages in the study is 93.5%. It is greater than the country's average (88%). Education is one factor unless we use properly.

The following box plot graph shows the status of education in the study area with age, sex and gender compositions.

This data is nearly to the national survey estimate. Inter-censual Population Survey (ICPS) revealed that the population belonging to the working age category has reached 55.4% of the total national population of the country (CSA, 2012). This may leads to be as curse unless positive perception and attitude will be imposed. On contrary, this demographic data will leads to the opportunity of protecting natural forest. It is a matter of the management of the golden opportunity of the human resources to achieve the goal of sustainable national park development.

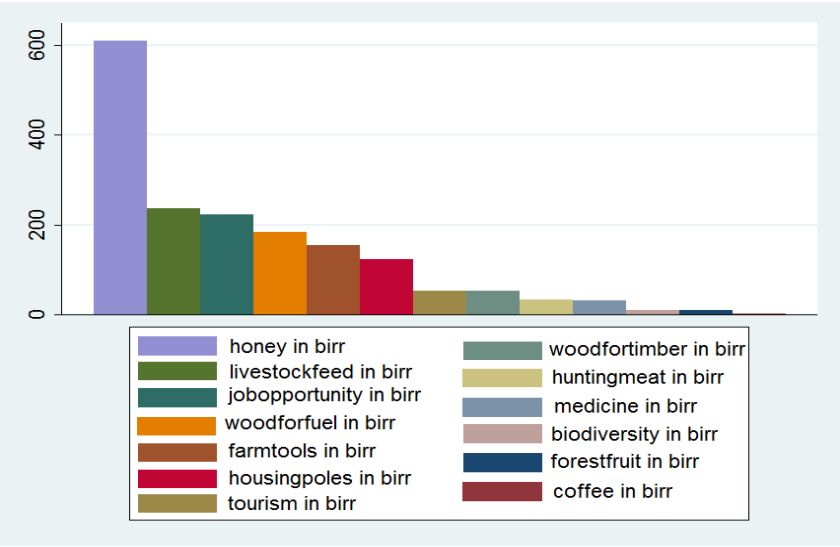
3.2 Descriptive analyses of Economic Value of the Natural Forest Resources

Indirect use, direct use and option values are the major economic value of the natural resources. In the study area local community identified medicine, wood for fuel, livestock feed, tourism revenue are direct economical values and theft and robbery, common pole and community heritage are indirect and option value by adjusting Likert scale responses. Similarly, Carbon sequestration, biodiversity, water and rain, reducing ecological degradation are the indirect economic benefits. However, understanding the economic value and benefits of the local community's increases, the probability to protect national forest conservation also increases in general.

3.2.1 Direct Economic Value of Natural Forest

Local communities explain the direct, indirect and option values in different perspective. Respondents responded that forest honey, livestock feed, Job opportunity, wood for fuel, farm tools, housing poles ,tourism, wood for timber, hunting meat, medicine, forest fruit and forest coffee are sources of income from the highest to the lowest rank. This leads to increase the probability of develop positive perception and attitude towards protecting the national park.

Figure 1: The direct benefits of natural forest with the highest graph to lowest rank



This graph shows the average direct economic values of natural forest ranking by local community.

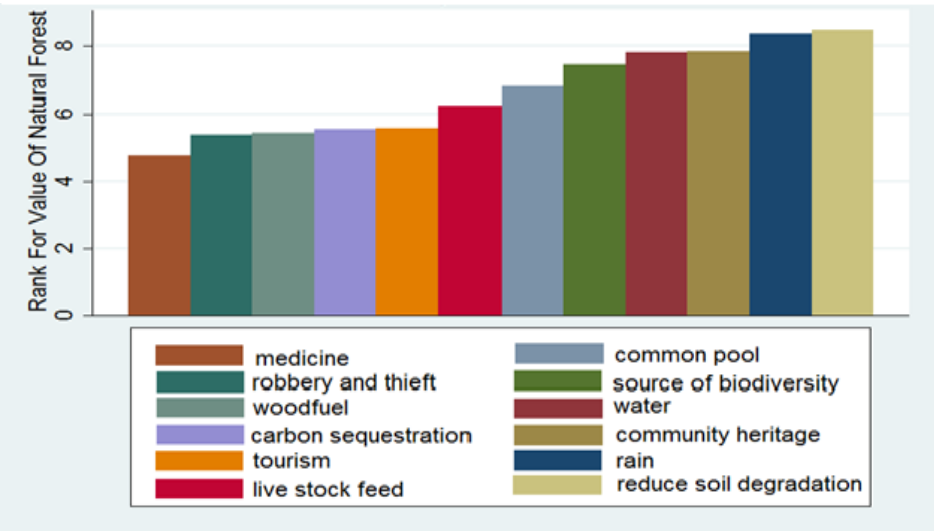
The above data indicate that among the direct benefits, honey, livestock, job opportunity, wood, farm tools, housing poles, tourism, timber, hunted meat, medicine, biodiversity, fruit, and coffee have been orderly listed from the highest to lowest local community benefits.

3.2.2. Response on the indirect and option values

Analyzing the understanding enhancement economic value of local community, the probability to develop positive perception and attitude towards protecting natural forest. Based on descriptive analyses respondent's opinion indicates that indirect use and option uses have better economical values than direct uses of the economic benefits.

The following bar graph shows the contrasted economic value of respondents among the indirect and option values.

Figure 3: indirect and option economic benefits' response graph from the lowest to highest



The above graph describes as common pole, biodiversity, water source, community heritage, medicine, robbery, wood fuel, carbon sequestration, tourism, livestock feed are orderly selected as their highest to lowest benefits among direct and option benefits. Hence, Local community prefers indirect benefit of park than direct benefits.

3.3 Econometric analysis of local community's Perception and Attitude

Brant Test of Parallel Regression Assumption was tested in the study. A significant test statistic provides evidence that the parallel regression assumption has been violated on it. But, we can deal with violation of parallel line assumption as one of the best way. Therefore, do nothing and use ordered logistic regression because the practical implications of violating this assumption are minimal (Afees, 2016). Furthermore, analyzing attitude and perception of household head, Likert scale is the best measurement. Certainly, it can measure the level of household agreement responses to understand their perception and attitude on natural resource conservation (Guthiga, 2008).

Hence, the study categorizes the dependent variable (attitude and perception score) in to five Likert scale in order to explain willingness to pay money and labor vehicles for meaning full policy implication with respect to independent variables such as sex, education, age, marital status and location of the study. Since the response of respondents is arranged in order (strongly disagree, disagree, neutral, agree, and strongly agree), the study uses order logistic regression. Since it is ordinal, it doesn't need base category among dependent variables so that the study explains the agreement level of household head and estimates perception and attitude of the local community at large towards Borena Sayint National Park natural forest conservation.

Table 9: Shows the marginal effect of perception and attitude after ordered logistic regression

Variables	Strongly disagree		Disagree		Neutral		Agree		Strongly agree	
	dy/dx	P>|z|	dy/dx	P>|z|	dy/dx	P>|z|	dy/dx	P>|z|	dy/dx	P>|z|
Sex	0.002	0.72	0.016	0.73	0.006	0.74	-0.015	0.73	-0.009	0.74
Education	-0.005	0.0***	-0.047	0.0***	-0.018	0.01***	0.043	0.0***	0.026	0.0***
Age	-0.001	0.0***	-0.013	0.0***	-0.005	0.0***	0.012	0.0***	0.007	0.0***
Married	-0.016	0.08*	-0.134	0.02**	-0.028	0.01***	0.119	0.02**	0.058	0.0***
Location-2	-0.005	0.05**	-0.052	0.03**	-0.020	0.08*	0.048	0.03**	0.029	0.04**
TLU	0.000	0.73	0.003	0.72	0.001	0.72	-0.003	0.72	-0.001	0.72
Y=	0.01733476		0.22794277		0.27416063		0.37615819		0.10440364	

Note: ***, ** and *significant at 1% and 5%, 10 % level, respectively.

Lcation2 indicates household heads lived in Borena Woreda of the study site otherwise Mehal Sayint Woreda. As the above table indicates among those who strongly disagree, disagree, neutral, agree and strongly agree cover the predicted power of 1.7% 22.8%, 27%, and 37.6% and 10.4% respectively. It is approaching with

the results of satisfied (44%), neutral (23%) dissatisfied (12%) and other no respondent (25%) in the last study (Hua Yang et al, 2015). Explanatory variable age, education, married status, location-2 are significant at 1%, 1%, 10% and 5%, respectively but have expected negative sign when we go to strongly disagree. Except married variable, other significant variables are the same result on its significant and sign with the study of (Hua Yang et al., 2015).

An increasing one class in education has on average, the probability to decreased strongly disagreement by 0.5% for natural forest conservation and protection. Likewise, as age increases by one year the attitude and perception of household on average has the probability to reduce strongly disagreement on conservation practices by 0.1%. Being married household head has the probability to reduce strongly disagreement on average decreased by 1.6% for natural forest conservation and protection. Households that live in location-2 also has on average the probability to decrease strongly disagreement by 0.5%. This indicates that educated, old aged, married and location-2 households have the probability to become committed for natural forest conservation 'Denkoro-Chaqa' and protection in the study area than their counter parts.

On the disagreement option, household age, education, married status, location 2 are also statistically significant at 1%, 1%, 5% and 5% and have expected negative sign respectively. An increasing one class in education has the probability to decrease disagreement by 4.7% on natural forest conservation and protection. Similarly, as age increases by one year the attitude and perception of household on average has the probability to reduce disagreement on conservation practices by 1.3%. Being married household head has the probability to reduce disagreement on natural forest conservation by 13.4%. Households that lived in location-2 also has the probability to reduce disagree by 5.2%. This indicates that household head becomes educated, aged married and household lived in (location-2) have the probability to become committed for natural forest conservation and protection in Borena Saint National Park.

On the no option or neutral responses, household age, education, married status, and location-2 are significant at 1%, 1%, 1% and 10% have also negative expected sign respectively. An increasing one class in education on average has the probability to decrease neutral response on natural forest conservation by 1.8%. Meaning, as age increases by one year the attitude and perception of household on average has the probability of reducing neutral responses on conservation practices by 0.5%. Being married household head has the probability to reduce neutral respondents from natural forest conservation and protection decreased by 2.8%. Households that lived in location-2 also have the probability to reduce neutral attitudes on average by 2%.

Household ages, education, marital status, location-2 were significant at 1%, 1%, 5% and 5% with positive sign respectively when we go to agree responses. An increasing one class in education on average has the probability to increase agree on natural

forest conservation and protection by 4.3 %. On similar way, as age increases by one year the attitude and perception of household on conservation and protection of natural forest on average has the probability to increase agreement by 1.2%. Being married household head has on average the probability to increasing agreement on natural forest conservation is increased by 11.9%. Other things being constant, households that lived in location-2 also on average have the probability to increase agreement on natural forest conservation and protection by 4.8%. This indicates that educated, aged, married and location-2 household heads have the probability to become committed for natural forest conservation and protection in the study area.

The attitude and perception test, household age, education, marriage, household lives in location-2 are statistically significant at 1%, 1%, 1% and 5% and positive expected sign when we go to strongly agree. An increasing one class in education has on average the probability more likely to increase strongly agreed by 2.6% on natural forest conservation and protection. The implication is that as age increases by one year the attitude and perception of household on average has the probability to increase strongly agree on natural forest conservation and protection by 0.7%. Being married household head has on average the probability to increase strongly agreement on natural forest conservation is 5.8%. Households that lived in location-2 also has the probability to increase strongly agreed by 2.9% on natural forest conservation and protection. This also indicates educated, aged, married households and location-2 have on average the probability to more likely to become committed for natural forest conservation and protection meant to Borena-Saynt National Park.

This finding is similar to Ratsimbazaf (2012) that the old respondents and the more educated people were generally more aware about the ecosystem function of the forest and were concerned about the consequences of completely clearing the forest and they have strong positive perception and attitude towards natural forest conservation. This study is also consistent with other studies where male household head, aged and educated household head has the probability more likely to increase agree and strongly agree for natural forest conservation at 7%, 303 % 0.5%, respectively (Lepetu, and Oladele, 2009). Therefore, the policy implication is very clear on education, sex and age treatment. Other study also shared the result and the significant of formal education and its role to change the attitude and perception was central tools for highlighting central policy focus areas for natural resource conservation (Snyman, 2014).

4. Conclusion and Recommendations

4.1. Conclusion

Descriptive analyses tell us to understand the basic relationship of the direct, indirect and option benefits. Similarly, the study focused on the environmental enhancement based on basic explanatory variables. Specifically, the study needs to examine local community‘s perceptions and attitudes towards the protected area of the natural

forest as cornerstone. Hence, households ordered responses were analyzed by ordered logistic regression to understand the local community perception and attitude. Perception and attitude scores has derived from ordered responses of strongly disagree, disagree, neutral, agree, and strongly agree.

The model of order logistic regression (Ologit) basically communicates us the intrinsic value and consistency between perception and attitude of head of household with selective socio economic explanatory variables in the study area. These analyses make ship-shape to respondents to pay attention for the maximum conservation practices in the study area. The result of ordered logistic regression tells us, education, married, and location-2 have building the constructive attitude and perception for major conservation policies such as establishing park, buffer zone, Transitional zone , and conservation of natural forest along with take full advantage of local community benefits. Therefore, local community's perception and attitude are basically determined by socio economic and locations. Hence, the blueprint of natural forest conservation and protection is also determined by the constructive perception and attitude of local community.

Despite the fact that BSP has millions of lively hood impact on the local people but nobody still gives attention as compared to its tremendous advantages. The park is also one of the largest sources of Abay. Geographically, it has sources of water, and the hub of water spring. In addition, it is a source of many tributaries of Abay (Blue Nile) nevertheless nobody still do give attention. Geographically, the low land up to high land weather conditions is found to be agglomerated in one area as identical as the nature of industries. Hence, the unique- tourism characteristics are found and available in this ecology. Similarly, historical and natural, it is the land of the hub of the freedom (either spiritually or physical) is also found to be the eastern and western Abay (Gion). Obviously Abay River is also the means of the lively hood of the people of Ethiopia, Sudan and Egypt at large. Hence, it is a time of demanding for communication, promotion among stake holders' cooperation to bring regional, nationally or internationally integration to protect this unique but unprovoked national park at the source of the water as well.

5. Recommendation

Formal education has great policy implication to bring positive perception and attitude on local communities towards the long term conservation practices in BSNP. Environmental issues should be mainstreamed from the beginning of education cycle. Mainstreaming shall be purposefully done and focused on the rank of highest to the lowest direct, indirect, and option values (benefits) to persuade the local community.

Set up radio programs that can serve a number of communication functions including: experience sharing among stake holders , enabling active listening to find out farmers' preferences, needs, opinions; raising awareness of services, events, or programs; disseminating information and facilitating discussion about the information; hosting

campaigns on behavioural change to long term conservation. It should be installed focused on the programed area.

Conservation needs long term and it is a process of changing human attitude and a transferring of legacies from one generation to another generation. Hence, it should be applied on the basis of local community socio economic interest.

Increasing economic opportunities to increase public awareness for natural forest protection and conservation. This has the probability to develop a through time inheritance value for generations by mainstreaming and capacitating on centre of family institution in order to apply sustainable natural forest conservation as a best strategy.

Natural forest protecting and restoring demands could be consultative and participatory approach because of protection approach may have up raised a potential conflict and pressure on natural forest.

The park development in general should be considered in all core areas, buffer zone and transitional areas. Therefore, founding strong institutions on grass root level to enhance the sustainable protection of the park as they save as a nucleolus of the main park and it should be continuously forming the inter relation among core-buffer- and transitional areas (around park areas to the historical and natural area of East Gojam; East and West Gion) to resolve the problems.

Building trust among local communities; establish equitable utilization of the natural resources among local communities. Fascinated policies should be executed such as compensation, expropriation, carbon trade, tourism, and park economic friendly projects in general for local communities.

Other omitted perception and attitude determinant variables will be further studied. Religion is one of the socio economic factors to determine the perception and attitude of local community. It was not included in this study. Similarly, buffer zone and transitional area of the local community's perception and attitude is very important for sustainable park development. Hence, should be for further studied.

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