Park with People Conservation Strategy: Local Residents Willingness to pay and Expected Net losses in Ethiopia

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Abstract

Local residents' willingness to pay and expected net loss as a result of park with people conservation strategy of the Semien Mountain National Park (SMNP) were analyzed using Heckman two stages econometric estimation procedure. The model results showed that age, degradation of farm plots, use of improved technologies, livestock ownership, cultivable land owned, perception of land degradation and land tenure security were found to be important in determining the farmers' willingness to pay for the conservation of the national park. In addition, training on soil and water conservation, land degradation, satisfaction with conflict resolution and distance from the district's town, use of improved technologies and income from tourist related activities were important determinants of intensity of labor contribution. On the other hand, being male household head, existence of plots with in the park boundary, age of the household head, number of oxen owned, distance from the district's town and willingness of a household to pay for the conservation of the national park were found to relate significantly to expected net loss. The consideration of these factors would be useful to the successful and sustainable implementation of the conservation strategy.

Key words: Park with people; Willingness to pay and Expected net loss; Semein National Park

1. Introduction

The overexploitation of natural resources in protected areas such as national parks is of worldwide concern nowadays. This is particularly severe in less developed countries as there are considerable numbers of people that live in and around parks depending on park resources for their livelihood. For instance, it is estimated that in South America, 86% of the parks have people living in them (Amend and Amend, 1993). Also, in India about 1.6 million people are said to live in parks (Kothari et al., 1989). Polices and strategies followed by most countries in the management of national parks are rooted in two approaches viz. the approach that advocates national parks to be devoid of people (Kellert, 1986) and the approach that accepts the local peoples' rights to live and use park resources (Harmon, 1991), the Park with People Conservation Strategy. Parks and reserve areas contain important resources such as forests, water, fertile land, grazing land, grasses, minerals and wildlife. In addition, they provide cultural, aesthetic and spiritual values to the local residents. While most conservation strategies of protected areas reflect national and international priorities, local people express their frustrations with such impositions arguing that people should be considered first (Hackle, 1993). Thus, the claims made by local residents on the right to use park resources on which their ancestors had depended, on the one hand and the continuous degradation of the resources and the need to conserve them, on the other hand could lead to conflicts between local people and government.

A growing body of literature shows that the use of developed countries approach to park management where parks are supposed to be devoid of people has resulted in adverse effects on food security and livelihood of people living in and around protected areas in developing countries (Kothari et al., 1989; West and

Brenchin, 1991; Ghimire, 1994). As the conservation of park resources could entail both costs and benefits to local residents, there is also an understanding that to be successful, park conservation strategies should address rural poverty and specific needs of the residents (IUCN, 1980). The understanding of the benefits and costs associated with park with people conservation strategy is important for policies aimed at conserving such protected areas. However, most empirical studies on valuation of national park resources analyzed outsiders (visitors) willingness to pay for park services such as viewing wildlife (Barnes, 1995; Navrud and Mungatana, 1991; Hadker et al., 1997; Cicia and Scarp, 2000). Very few studies analyzed local people willingness to pay for the conservation of national parks world wide (John et al., 1996; Hammitt et al., 2001). Also, studies that considered welfare losses that local people would incur as a result of park conservation efforts and their willingness to accept compensation for such losses are limited (e.g. Shyamsundar and Kramer, 1996).

In this study, we analyze the determinants of the residents (farmers) willingness to pay for the conservation of the Semien National Park (SMNP) and household level expected net welfare losses associated with the park with people conservation strategy. The next section describes the study area followed by the discussion of the valuation technique used in the third section. The analytical model used in the study is presented in the third section. The results of the study are discussed in the fourth section and the last section concludes the paper.

2. The study area

The Semien Mountain National Park (SMNP) is located in the Amhara National Regional State, North Gondar Zone, 850 kms North of Addis Ababa. There

are 19 District councils and 732 Kebele Administrations in North Gondar Zone (BoFED, 2004). The SMNP lies in three Districts of the zone; Namely Debark, Adiarkay and Janamora that cover 5.15%, 47.8% and 47.15% of the area, respectively. SMNP is known for its rich biodiversity where unique botanical and zoological combinations of species have been able to resist human interference because of the extreme topography and altitudinal range. It is a place where the highest mountain in Ethiopia, Ras Dashen, with an altitude of 4620 meters above sea level is located. Among the species that are found in the area that worth mentioning are the Waliya Ibex (*Capra ibex walie*), the Semien Fox (*Canis simensis simensis*) endemic to Ethiopia, Gelada baboon (*Theropithecus gelada*), bird species like white-collared pigeon (*Columbia albitorques*), Abyssinian Long-claw (*Macronyx flavicollis*) and Abyssinian cat bird (*Parophasma galiner*). More than 170 bird species also live in the park of which four are endemic to Ethiopia. There are also more than 70 species of butterfly and more than 27 species of aquatic invertebrates living in the park (Hurni, 1986; Nievergelt et al., 1998; Endalkachew, 1999) and more than 522 flora species (Puff and Sileshi, 2000). However, the rich biodiversity and natural resources of the park are being degraded from time to time due to human encroachment. In order to protect the park resources from further degradation, the latest option sought by the government is to adopt park with people conservation strategy. This study is based on data collected from 96 randomly selected sample households that reside in and around the national park.

3. Valuation Method

In this study, CVM was used to elicit the willingness of the farmers to pay (WTP) for the conservation of the SMNP resources. A double bounded dichotomous

choice elicitation format with open ended questions was used in the questionnaire used for the survey. Before setting the bid values, discussion was made with five farmer groups on their willingness to pay for the conservation of the park. All farmers were only willing to contribute labour for the conservation of the park not cash. Based on the results of the discussion 12, 16, 22 and 26 man days of labour contribution were set as starting bid values. This was done to overcome starting point bias.

On the other hand, the expected net loss (in Birr) was calculated by taking detailed annual expected benefit and costs of a households that could result from the implementation of the park with people conservation strategy.

4. The analytical model

The maximum amount that a household is willing to pay could be determined by using CVM where a farmer is asked the maximum amount that he/she is willing to pay for the conservation of the park resources to avoid the welfare losses as a result of further degradation of the park resources. The amount that the farmers is willing to pay (WTP_i) is however limited in its range taking a value of 0 if the household is not willing to pay for the conservation of the park resources and continuous positive values otherwise. Heckman two stage econometric estimation procedure (Heckman, 1979) was suggested as one of the ways to overcome self-selection bias that might arise in modeling such variables. In the first stage of this model the probability of the willingness to pay decision of the households using a probit model as:

$$WTP_i = \begin{cases} 1, & if \quad WTP_i^* > 0 \\ 0, & if \quad WTP_i^* \leq 0 \end{cases} \qquad (1)$$

Where, $WTP_i^* = \beta' X_i + \varepsilon_i$ is a latent variable that is not observed.

X_i represents the socio-economic, institutional and agro ecological characteristics of the farmer and ε_i is the random error term

The second stage estimation involves the use of OLS that is specified as follows:

$$IWT_i = \alpha' W_i + \alpha_\lambda \lambda(\beta' X_i) + v_i \quad (2)$$

Where, IWT_i is the amount (intensity) of payment by the i^{th} household, W_i is the socio-economic, institutional and agro ecological characteristics of the i^{th} household, α_i represent parameters of the model, $\alpha_\lambda = \rho\sigma_\varepsilon$ and ε_i & $v_i \sim$ bivariate normal $(0, 0, \rho, \sigma)$

On the other hand, the implementation of the park with people conservation strategy may also put restrictions on the use of the park resources leading to welfare losses by the households. Thus, the expected net loss (ENL) that the farmers would incur can be expressed as a function of the characteristics of the household (M_i) and parameters (δ_i). In this case, a variant of Heckman two-stage econometric estimation procedure (treatment effect model) is more appropriate. While, the probit (selection) model remains as above, the expected net loss equation is regressed against its determinants including the willingness to pay variable. This is specified as follows:

$$ENL_i = \delta' M_i + \theta' WTP_i + \alpha_\lambda \lambda(\beta' X_i) + u_i \quad (3)$$

Where, θ_i is a parameter to be estimated and u_i is the error term

Table 1 Variables and their measurement

Variable	Code	Type of variable	Measurement
Willingness to pay for the Conservation of the Park	WTP	Dummy	1 if the farmer is willing to pay and 0 otherwise
Intensity of payment	IWT	Continuous	Amount of payment the farmers is willing to make in man-days
Expected net loss	ENL	Continuous	The total amount of expected net loss in Birr.
Age of the household head	AGE	Continues	Measured years
Sex of the household head	SEX	Dummy	1 if male 0 otherwise
Dependency ratio	DR	Continues	ratio
Contact with extension agent	CWEA	Dummy	1 for those that have extension contact and 0 otherwise
Training on soil and water conservation	TSCA	dummy	1 if trained and 0 otherwise
Observation of plot degradation	DEGRA	dummy	1 if plots are degraded and 0 otherwise
Plots within park boundary	PINPB	dummy	1 if the farmer has plot(s) in the park and 0 otherwise
Application of different technologies	APDT	dummy	1 if the farmer has applied and 0 otherwise
Satisfaction with conflict resolution	SWCR	dummy	1 if the farmer is satisfied and 0 otherwise
Total family size	TFSIZE	Continuous	Number of family members
Total income from tourist related activities	TRI	Continuous	Amount of income in Birr from tourist related activities during 2005
Total cultivable land	TOCUBLA	Continuous	Amount of cultivable land owned in hectares
Perception of general environmental deterioration	POSEPIYE	dummy	1 if perceived the problem and 0 otherwise
Distance from Debark town	DFDT	Continuous	Distance from Debark in kilometers
Tropical livestock unit	TLU	Continuous	Total livestock measured in tropical livestock unit
Number of oxen	NOXEN	Continuous	Total number of oxen that a household possess
Tenure security	EXFHLH	Dummy	1 if the farmer feels secure and 0 otherwise

5. Results and discussion

Out of the total sample households surveyed, 67.3 % were willing to pay for the conservation of the SMNP by contributing labour. The mean willingness to pay of the farmers for the conservation of the park was found to be 24 man-days labour per annum.

The estimated results of the econometric models are presented in table 2. Age (AGE) of the household head was found to have a negative and significant influence on the probability of the willingness to pay of the farmers for the conservation of SMNP. This might be due to the fact that at old age people might have short future planning horizons as a result of which they might be less willing to pay for the conservation of resources that give benefits after some time. Also, the results of the expected net loss equation showed that age of the household head was negatively related to the expected net loss of the farmers. This might be because of the fact that aged household heads might have had enough resources such as farm lands that make them less dependent on other park resources for their livelihood. In addition, observation of land degradation on farm plots (DEGRAD) was negatively and significantly related to both the probability of the willingness to pay of the households and intensity of labor contribution. Farmers that own degraded farm plots may be more interested in encroaching the park in search of new and virgin farm lands as a result of which the probability of their willingness to pay would be low and their expected net loss would be higher. On the other hand, the use of improved technologies (ADPT) is positively and significantly related to both the probability of the willingness to pay and intensity of labor contribution. The use of improve technologies will generate extra income to the households increasing the probability

of their willingness to pay and intensity of labor contribution. Also, Tropical livestock unit (TLU) owned has been found to relate to the probability of the households willingness to pay positively and significantly. Further more, total cultivable land size (TOCUBLLA) owned was positively and significantly related to the probability of the willingness to pay of the farmers. It might be expected that household heads with large plot sizes might have lower incentives to encroach the park in search of farmlands than those farmers with relatively small cultivable land holding. Also, the farmers' perception of overall natural resource degradation in the area (POSEPIYE) was found to relate positively and significantly to the probability of the willingness to pay of the households.

Also, the model results showed that land tenure security (EXFHLH) positively and significantly affected the probability of the willingness to pay of the farmers. This may be because those household heads that are comfortable with the present land tenure system feel more secure about their land ownership that makes them more willing to pay for the conservation of the national park. On the other hand, the existing system of resolving conflict with the local community (SWCR) had negative and significant influence on the amount of labor that a household is willing to contribute. The restrictions placed by the park management such as fencing, imposing fines and snatching hand tools to deter encroachment problem had deepened conflict between the local people and the park management. Also, participation in soil and water conservation training (TSCA) is negatively and significantly related to the amount of labor that a farmer is willing to contribute for conservation of the national park. The possible reason for this might be targeting problem related to farmers' selection for such trainings. Farmers are usually paid daily allowances for taking part in such trainings. Furthermore, the result of the econometric model showed that

distance from the District town (DFDT) had negative and significant effect on both the amount of labor that the household is willing to contribute for the conservation of the national park and expected net loss. Those households that reside near Debark town have access to different benefits (e.g. employment opportunities) that make them contribute more labor than those farmers at distant locations. On the other hand, the main reason for the negative relationship between the distance from the town and expected net loss would be because of the fact that those households that are far from Debark town have relatively larger land holding sizes than those farmers near the town and also the farmers' plots with in the park boundary are smaller compared to those farmers living near the town making them less losers if the park with people conservation strategy is adopted. The results of the model also showed that income from tourist related activities (TRI) is positively and significantly related to the intensity of labor contribution of the farmers. This is because income from such sources obviously would contribute to the improved welfare of the households that would motivate them to contribute more labor.

Being male household head (Sex) was found to have a positive and significant influence on the expected net loss. This indicates that male household heads have high expected sacrifices and are highly dependent on the park resources than their female counterparts. Moreover, existence of farming plots with in the national park boundary (PINPB) influenced the expected net loss of the households positively and significantly. It is obvious that households that have farm plots inside the park boundary would expect to be deprived of their right to use the plots if the conservation strategy is implemented. Number of oxen (NOXEN) owned by a household was found to be negatively and significantly related to the expected net loss. The possible explanation for this could be that those households that have more

number of oxen are able to have more crop produce making them less dependent on the park resources for their livelihood as a result of which their expected net loss became less. Finally, the results of the model showed that willingness to pay decision of the households for the conservation of the SMNP (WTP) was found to relate to expected net loss negatively and significantly. This result may show that farmers that are willing to pay for the conservation of the park are those that expect to lose less from the implementation of the park with people conservation strategy.

6. Conclusion

SMNP is one of world wide recognized parks in Ethiopia. However, due to human interference, the natural resource base of the park has been over exploited and is facing severe degradation problems. At present, the regional government is considering the implementation of park with people conservation strategy to overcome the problem. The findings of this research showed that conservation strategies of the resources of the park that target younger households, the promotion of technologies that increase plot level productivity and the implementation of projects that could improve the welfare status of the households would increase the likelihood of the willingness of the farmers to pay for the conservation of the park resources. On the other hand, keeping livestock that are more productive and project intervention that could substitute the function of livestock and increasing the awareness of the farmers on consequences of degradation will have vital roles in enhancing the willingness of the households to pay for conservation of the national park. Further more, policies that would improve the land tenure security status of the households would enhance the probability of the willingness of the households to pay for the conservation of the park.

On the other hand, identifying and training those farmers that are interested in the conservation of the park resources not the daily allowances provided would increase the labor contribution of the households. Furthermore, technologies that would improve the fertility status of farm plots and the use of new technologies that would improve the income of the households should be given emphasis to make the households contribute more labor. Also, strategies that would make income from tourism to trickle down to the community would help to increase the labor contribution of the farmers for the conservation of the park. The park management should improve the existing conflict resolution mechanism with the local residents by adopting participatory and consensus based conflict resolution methods, permitting environmental friendly activities, teaching the farmers about the environment and acknowledging the traditional conflict resolution mechanisms.

Furthermore, strategies that would help the male headed households to increase their income or compensate them for the losses incurred would contribute to the success of the implementation of the park with people conservation strategy. Similarly, projects that are aimed at generating alternative income sources to the community should be implemented by giving more emphasis to those households living near Debark town and communities residing around the park boundary. Also, those households with less number of oxen and that are younger should be given priority in project intervention. Finally, those households that are willing to contribute (pay) for the conservation of the national park are those that would incur less cost as a result of the implementation of the park with people conservation strategy. Thus, intensification and expansion of tourist related activities, using tourism income for local development, permitting environmental friendly activities like grazing, apiculture, poultry farming, implementing projects that can reduce the dependence of

the local people on the park resources such as expansion of modern or energy saver cooking and heating technologies, substituting woody agricultural implements by implements made from other materials, developing nursery sites on individual or community basis for fuel wood and house construction materials and checking the number of wildlife population that attack field crops and domestic animals would result in successful implementation of the strategy.

Table 2. Results of the Heckman Two Stage Econometric Model

Variable	Coefficient (WTP)	Coefficient (IWT)	Coefficient (ENL)
Constant	-0.553 ***	47.121***	252.62***
	(2.722)	(3.126)	(3.409)
AGE	-0.035*	-0.177	14.016*
	(-1.95)	(-0.796)	(1.698)
CWEA	-0.125	-	-167.6
	(0.183)		(0.64)
DEGRA	-0.561***	-12.418***	-7.10
	(-3.287)	(-3.33)	(0.318)
PINPB	-0.321	5.278	344.33*
	(-0.271)	(1.259)	(1.685)
APDT	0.969**	44.54***	-
	(2.028)	(4.046)	
TFSIZE	-0.063	-	-
	(-0.585)		
TLU	0.157**	-	-
	(2.235)		
TRI	0.377E-03	0.2685E-01***	-
	(-0.5184)	(2.623)	
TOCUBLLA	0.364*	6.345	115.24
	(1.689)	(0.245)	(-0.45)
POSEPIYE	1.229*	0.491	-
	(1.695)	(0.132)	
DFDT	0.016	-0.192*	-9.188*
	(1.221)	(-1.698)	(-1.912)
NPRI	0.242E-03	-	-
	(0.498)		
EXFHLH	0.796**	-	-
	(2.328)		
DR	-	-20.577	-769.18
		(-1.415)	(-1.62)
SEX	-	1.567	836.88**
		(0.061)	(2.107)
SWRC		-18.10**	
		(-1.998)	
TSCA	-	-9.679*	13.970
		(-1.70)	(0.071)
NOXEN	-	-	-299.28**
			(-2.372)
WTP	-	-	-134.46***
			(-3.045)
λ	-	0.081	273.27
		(0.686)	(0.097)
Log-likelihood function	-35.09	-431.41	-779.59

Values in parenthesis are t-ratios

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