GPJ

GHANA POLICY JOURNAL

Volume 3

August 2009

Editorial 4

Articles

Eugenia Amporfu: The Gap Between the Health Status of Rural and Urban. Women in Ghana: A Case Study of Patients at a Mission Hospital in the Ashanti Region 6

Vijay Bhasin: Determinants of Technical Efficiency of Women Entrepreneurs in the Food Processing Enterprises in Cape Coast 24

Godwin Kofi Vondolia: Do Ghanaian Farmers have Preferences for the National Biodiversity Strategy?: A Case Study of Farmers Living Around the Kakum National Park in the Central Region 48

Kwabena A. Anaman and Charity Osei-Amponsah: Determinants of the Output of the Manufacturing Industry in Ghana from 1974 to 2006 69

Ernest K. Awanta: Students' Views of Mathematics : A Survey of Some Ghanaian Schools 90

Mohammed Sulemana: Understanding the Causes and Impacts of Conflicts in the Northern Region of Ghana 110

Notes to Contributors 140

A Publication of The Institute of Economic Affairs, Accra, Ghana

IEA Ghana

DO GHANAIAN FARMERS HAVE PREFERENCES FOR THE NATIONAL BIODIVERSITY STRATEGY? A CASE STUDY OF FARMERS LIVING AROUND THE KAKUM NATIONAL PARK IN THE CENTRAL REGION*

by

Godwin Kofi Vondolia [1]

ABSTRACT

Natural capital constitutes about 20% of Gross Domestic Product (GDP) in developing countries. However, international environmental agreements require these countries to conserve these resources irrespective of immediate human preferences. The present study uses contingent valuation method to assess the preferences of Ghanaian farmers for the Kakum National Park, a microcosm of the National Biodiversity Strategy. The results demonstrate that Ghanaian farmers have strong preferences for the National Biodiversity Strategy. These preferences largely reflect losses households incurred in the form of destruction of crops and property. The findings of this study support the use of distributional weights in evaluating the National Biodiversity Strategy and biodiversity conservation programmes. It is shown that local residents can be partners in biodiversity conservation in developing countries if their preferences are integrated into the design of the National Biodiversity Strategies.

Keywords: biodiversity, contingent valuation, National Biodiversity Strategy, national parks, revealed preference, Tobit regression analysis, welfare.

[1]PhD Candidate, Department of Economics, University of Gothenburg, Gothenburg, Sweden. The author's two email addresses are as follows: *kofi.vondolia@economics.gu.se* **and** *gkvond@yahoo.com*

***This paper was accepted for publication in September 2008.**

1. INTRODUCTION

Natural capital remains the main stay of economies of developing countries. It constitutes about 20% of the Gross Domestic Product (GDP) of these countries (see World Bank, 2006). Natural resources are a major source of revenues to the governments of these countries. These resources also prrovide different forms of livelihood to the citizens. The livelihood of 90 percent of 1.2 billion poor people depend on forest resources (Baird, 2001). Angelsen and Wunder (2003) indicate that forest products serve as specialised, diversified and coping strategies for these households. Natural and environmental resources are particularly important to the poor since the poor have a high rate of time preference (Holden *et al.*, 1998) and live in biomass-based subsistence economies (Dasgupta and Mäler, 1994).

In 1987, the World Commission on Environment and Development (WCED) in conjunction with international environmental agreements re-emphasised sustainable development to the development discourse. The premise of the WCED is that poor people overuse environmental resources whereas the degradation of the environmental further impoverishes them. Therefore, at the 1992 Earth Summit, governments of the world agreed on a new agenda for sustainable development. This agenda is the Convention on Biological Diversity (CBD) which calls on governments to establish protected areas and manage them in support of conservation, sustainable use and equitable distribution of benefits. The CBD was construed to mean a *de facto* establishment of national parks. These conservation efforts were successful in terms of the number of protected areas established and national and international agreements and conventions ratified that deal with environmental conservation.

In many developing countries, there is a dilemma with regards to protection of biodiversity. Whereas there are legitimate reasons for the establishment of protected areas, there are also cogent arguments for permitting the consumptive use of these natural resources. Thus, despite the investments in the provision of alternative income-generating activities to local communities through promotion of ecotourism and decentralisation of conservation decision-making and Integrated Conservation and Development Projects (ICDPs), the rate of environmental degradation remains a challenge of conservation. Conflicts between management of protected areas and local communities are common features of biodiversity conservation. For example, illegal hunting occurs in 77% of the total protected areas in Venezuela and 66% of the protected areas in Venezuela have shown significant loss of vegetation and biodiversity (Romero, 1992). The perceptions of resource users towards conservation policies can be a major determinant of their success. Research shows that an individual's perceptions of the legitimacy and fairness of regulations are crucial for compliance (refer to Tyler, 1990; Kuperan

and Sutinen, 1994). This suggests that sustainable development has environmental, economic and social dimensions (Munasinghe, 1994).

International Environmental Agreements (IEAs), for example, CBD require compliance at the national and local levels. Ghana is a signatory of CBD and about 16% of the total land area of Ghana has been designated for ecosystems conservation in the form of forest reserves, national parks, and wildlife reserves (Government of Ghana, 2002). A major challenge of environmental conservation programmes especially in developing countries is how to garner local support and build legitimate regulatory institutions that can design conservation policies which are acceptable to all stakeholders. Preferences of local residents and resource users remain an important but elusive input into such conservation policies.

The main purpose of this study is to investigate the preferences of Ghanaian farmers for National Biodiversity Strategy based on a case study of farmers living around the Kakum National Park in the Central Region of Ghana. Ghana is divided into 10 politically-administrative regions with the Central Region one of the 10 regions. Kakum National Park is framed as a microcosm of the National Biodiversity Strategy. Therefore, the present study aims at: (1) assessing the willingness to pay (WTP) of farmers for use and non–use values for the conservation of Kakum National Park; (2) using debriefing questions to assess the perceptions of the farmers with regards to conservation of Kakum National Park and (3) proposing policy measures to design conservation policies. The remainder of the paper is organised as follows: The next section presents further literature review on the topic while the third section provides the theoretical basis of the study. The methodology and results are presented in the fourth and fifth sections respectively. The sixth section contains the conclusions and policy implications of the paper.

2. LITERATURE REVIEW

The application of stated preference in environmental decision-making in developing countries is quite common. For example, Kramer (1993) presents an evaluation of Mantadia National Park in Madasgacar. Kramer (1993) combines the opportunity cost approach with contingent valuation method (CVM) to estimate the economic impacts of the park to local villagers. Under the opportunity cost approach, the mean value of losses to households for establishing the Mantadia National Park was estimated at $91 per household per year. However, an average household requires $108 worth of rice per year as a compensation to trade the use of the Mantadia National Park. The establishment of Mantadia National Park represents potential Pareto improvement in resource allocation since the aggregate net benefits of the park are positive. Muchapondwa (2003) uses CVM to assess the Communal Areas Management Programme for Indigenous People (CAMPFIRE) in

Zimbabwe. Among the main conclusions of the study, the local communities do not support the CAMPFIRE project and imposing it on them amounts to failure of collective action. Typically, the local communities view the CAMPFIRE as a public "bad" and thus adequate economic incentives need to be provided as a measure to enhance the support for the project. Holden and Shiferaw (2002) present a case study on Ethiopia by investigating the farm households' interest, willingness to pay and ability to pay to sustain land productivity. These studies on conservation of biodiversity quantify the benefits and costs of these national policies. The main assumption is that preferences of these households are homogeneous and are reflected in these national programmes. The main point of departure of the present study is that many conservation programmes are paternalistic and may not reflect the preferences of resource users.

The studies conducted on Kakum National Park provide inconsistent evidence. Oppong *et al.* (1996) indicate that the majority of the sampled people living around the Park support the establishment of Kakum National Park since the establishment of the park generates bequest values among the local residents. However Dei (1996) foresees simmering discontent among local people and suggests the promotion of agro-tourism as a means of compensating the local people. Speculations on the reasons for the inconsistent evidence can produce a tall list. However, these may include methodological differences and sampling frame. Whereas Oppong *et al.* (1996) dwell on the benefits, Dei (1996) dwells on the costs of the establishment of the park. These are plausible reasons for the inconsistent evidence. It has been found that local people used to harvest products from the park prior to the establishment of the park (Agyare, 1996; Dei, 1996; Oppong *et al.,* 1996; Abane *et al.,* 1999). Agyare (1996) concluded that at the time of establishing the park, the local people expected improvement in infrastructure and economic conditions in communities around the park; and as a result traditional authorities were cooperative. Oppong *et al.* (1996) and Abane *et al.* (1999) conclude that the local people feel the rainfall pattern has improved after the establishment of the park. Destruction of farm produce by elephants from the park is common in the Kakum Conservation Area which includes the Kakum National Park. Azika (1994) estimates that farmers lost at least 50% of their crop produce. Dickinson (1998) computes the total elephant raids into farmers' crop farms for 1997 to be 1,100 which affected about 550 farmers in the Kakum Conservation Area.

The present study seeks to use open-ended CVM to estimate preferences for the establishment of the Kakum National Park. According to Alvarez-Farizo *et al.* (1999) there are three important reasons for the estimation of bid curves using the open-ended CVM. First, it can be used as a test of theoretical validity, which involves checking whether the signs of explanatory variables conform to *a priori* or theoretical expectations. Secondly, bid curves serve as a test of discriminant validity to assess the explanatory power of independent variables and finally, bid

curves serve as a means of benefit transfer. Despite the usefulness of CVM, it does not have universal support which culminated the establishment of the Blue Ribbon Panel in the United States to establish its usefulness and limitations. Among the guidelines stipulated by the Arrow *et al.* (1993), a policy relevant contingent valuation (CV) study should pass the scope test.

In many instances, the market system cannot be relied upon for accurate values for environmental amenities. As a result, hypothetical market has to be constructed so as to infer the economic values of these environmental amenities. The present study applies CVM to estimate open-ended bid curve for indigenous people for the Kakum National Park in Ghana. The results of the study are used for theoretical and discriminant validity. The motives of indigenous people for making a positive bid are also assessed.

3. THEORETICAL MODEL

Environmental valuation in economic theory is important since markets for environmental services like carbon sequestration cannot provide reliable values for these services. Thus the value of these environmental services must be inferred from indirect means. According to Danchev (2003) individual consumers have vague appreciation for biodiversity although they are aware of the fact that there is something serious about it especially if its existence is threatened. However, if this problem is carefully explained to the consumers, they may change their attitudes to the biodiversity depending on their value system. They may be willing to support the conservation of biodiversity depending on their value system.

There are several reasons for households to support biodiversity conservation. These reasons are reflected in the total economic values (TEVs) of biodiversity conservation (refer to Pearce and Moran, 1994 for details). These reasons are linked to the option value, existence value, bequest value and use values of the environmental resources. We assume that consumers are rational; however, their preferences differ because preferences depend on a set of economic and non-economic characteristics which are reflected in their motivation to support the conservation of biodiversity. The total economic value of protected areas can be divided in two broad categories: use and non-use values. The use values include direct values, indirect ecological function use values, and option use values. The direct use values are the contribution that environmental assets make to current consumption and production. Examples of direct use values are food, biomass, recreation, health and spiritual services derived from the environmental assets. The biological functional services provided by the environment to support current production and consumption constitute the indirect ecological function use values. Examples comprise ecological functions such as carbon sequestration; flood control, storm protection and waste sink. The option value is the premium that

consumers are willing to pay for currently-unutilised environmental assets to avoid the risk of not having it in the future, within the lifetimes of these consumers. The existence values reflect the satisfaction of knowing that an environmental asset exists, although there is no intention of using it. The desire to conserve environmental assets for the benefit of future generations constitutes the bequest value.

The total economic value of biodiversity to a household is an important input in the household's utility function given as follows in (1):

$$W_i = W\left(x_1, x_2\right) (1)$$

where W is utility, x_1 is a composite good and x_2 is value of biodiversity to the household reflected by the total economic value discussed earlier. The household maximises utility subject to the budget constraint specified as follows in (2):

$$\sum_{i=1}^{2} p_i x_i = M \ (2)$$

where p_i denotes the price of good x_i and M is the total household income. The household maximises the utility subject to the budget constraint. It is easy to derive the indirect utility function by substituting the uncompensated demand functions into the direct utility function. The indirect utility function can be specified as follows in (3):

$$\Psi_i = \psi\left(p_1, p_2, M\right) (3)$$

The indirect utility function prior to the implementation of the National Biodiversity Strategy (NBS) is given as follows in (4):

$$\Psi_i^0 = \psi\left(p_1, p_2, M^0\right) (4)$$

The implementation of the NBS affects the income of the household. The new indirect utility function is given as follows in (5):

$$\Psi_i^1 = \psi\left(p_1, p_2, M^1\right) (5)$$

The household's welfare estimate for the implementation of the National Biodiversity Strategy is given in (6):

$$\psi\left(p_1, p_2, M^0\right) = \psi\left(p_1, p_2, M^1 - WTP\right) (6)$$

where WTP is the willingness to pay for implementation of the National Biodiversity Strategy.

The bid curve may then be specified as:

$$WTP_i = \beta' X + \varepsilon \ (7)$$

where $\beta`$ is vector of parameters, X is a vector of explanatory variables, and ε is the stochastic disturbance term which is assumed to be independently, identically distributed.

There are two problems with the above formulation. Firstly, in many CVM studies, respondents report 'zero bids' which might be attributed to genuine 'zero bids', 'protest bids' and 'do not know' responses. Secondly, some of the explanatory variables may suffer from significant missing information due to the sensitive nature of those variables. The first problem generates *self-selection* problems. The second problem also results in the estimation of bid curves with unrepresentative sample from the population, another source of sample selection bias. The effects of the sample selection bias are that the stochastic disturbance term will be non-random and consequently the estimated parameters will be biased.

Heckman (1979) suggest an econometric procedure for solving the sample selection problem. The procedure involves the identification of a latent variable $z*$ that captures whether or not an individual gives a valid WTP response. The latent variable is revealed by an indicator variable z_i that takes on the value of 1 if $p_i > 0$ and the value of 0 otherwise. This means that $z_i* > 0$ if $z_i = 1$ and p is observed. Alternatively, $z_i* = 0$ if $z_i = 0$ and p is not observed. This latent variable may be determined by a set of explanatory variables. We specify this latent variable as:

$$z_i* = \alpha`Z + u \quad (8)$$

where Z denotes the vector of explanatory variables of latent variable. The Inverse Mill's Ratio (IMR) is derived from the latent variable regression, is given as:

$$\lambda_j = \phi(-\alpha`Z_j) / \left[1 - \Phi(\alpha`Z_j)\right] \quad (9)$$

where $\phi(.)$ is the standard normal density function and $\Phi(.)$ is the standard normal cumulative density function. The IMR is then added as an additional explanatory variable in the structural equation which is modified to be:

$$WTP_j = \beta`X + \gamma\lambda + \varepsilon* \quad (10)$$

where γ is the covariance between the two stochastic disturbance terms.

However, the Heckman model has found limited use in empirical CVM studies. The main arguments raised by Alvarez-Farizo *et al.* (1999) is that WTP is censored and negatively skewed. These problems might lead to misleading parameters if Ordinary Least Squares (OLS) estimation method is used. In order to solve this problem, many empirical studies (see Alvarez-Farizo *et al.*, 1999) use an econometric procedure proposed by Tobin (1958). The main argument is that the explanatory variables might influence both the probability of limit response and the

size of non-limit response. Typically, the explanatory variables might influence the probability of making a positive bid and at the same time influencing the amount of bid. Generating another latent variable, p_i^* underlying p, we may present the argument formally as:

$$p_i^* = \beta`X + \varepsilon \quad (11)$$

Let L_i represent the lower limit of WTP of zero; and if $p_i^* \leq L_i$, then $p_i = L_i$, and the observation is censored at the lower limit. Alternatively, if $p_i^* \geq L_i$ then $p_i = p_i^* (= \beta`X + \varepsilon)$, and p_i is observed. The expected value of p is given as:

$$E(p) = \Pr ob(p > 0) * E(p / p > 0) \quad (12)$$

where the first term on the RHS is the probability of that p is positive, and the second term is the expected value of p given that p is a positive value. Realigning the expected value of p with the notation used in the regression, we can specify the expected value of p as:

$$E(p) = \Phi(\beta`X / \sigma_\varepsilon) * (\beta`X / \sigma_\varepsilon + \sigma_\varepsilon \lambda_\varepsilon) \quad (13)$$

with $\lambda_\varepsilon = \phi(\beta`X / \sigma_\varepsilon) / \Phi\left[\beta`X / \sigma_\varepsilon\right]$ and σ_ε is a scale parameter.

Donald and Moffitt (1980) propose a two-stage procedure for decomposing the effect of the explanatory variable on the dependent variable. The two stages involve the impact on the probability of being above the limit and the impact on the dependent variable if it is already above the limit. Mathematically, this is given as:

$$\partial E(p) / \partial X_k = \left[\Phi(\beta`X / \sigma_\varepsilon)\right] * \left[\partial E(p^*) / \partial X_k\right] + E(p^*) * \partial\left[\Phi(\beta`X / \sigma_\varepsilon\right] / \partial X_k \quad (14)$$

where $E(p^*)$ is the expected value of p conditional on being above the limit.

In terms of WTP, the two effects have an important interpretation. The first effect is the probability of bidding a positive WTP and the second effect is the impact on the amount WTP conditional on the positive WTP was made in the first place. The above Tobit model could now be extended to capture the sample selection. The expected value of the Tobit model with selection is given as:

$$E(p \mid z = 1) = \Pr ob(p > 0, z = 1) * E(p \mid p > 0, z = 1) \quad (15)$$

where z is an indicator variable taking the value of 1 if p is observed and takes the value of 0 if otherwise. The probability that $p > 0$ and $z = 1$ is given as:

$$\Pr ob(p > 0, z = 1) = \Phi_2(\beta`X / \sigma_\varepsilon, \alpha`Z, \rho) \quad (16)$$

where Φ_2 is the bivariate normal probability distribution and ρ is the covariance between the error terms. The expected value of p given that $p > o$ and $z = 1$ is:

$$E(p \mid p > 0, z = 1) = \beta`X + E(\varepsilon \mid \varepsilon > -\beta`X, \mu > -\alpha`Z) \quad (17)$$

The corresponding Tobin-like expression for the selected sample is the multiplication of the above two equations; and this is provided as:

$$E(p \mid z = 1) = \Phi_2(\beta`X) + \sigma_\varepsilon \left[\phi(h)\Phi\left[\delta(k - \rho h)\right] + \rho\phi(k)\Phi\left[\delta(h - \rho k)\right]\right] \quad (18)$$

where $h = -\beta`X / \sigma_\varepsilon$; $k = \alpha`Z$; and $\delta = -1/(1-\rho^2)^{-2}$.

Unlike the Heckman two-stage procedure, the selection and the structural equations can be estimated by the method of maximum likelihood (Greene, 2003). Within this framework, internal and external scope in WTP can be tested. In the internal scope test, respondents respond to two different environmental amenities. Then, bivariate probit model is used to test for the sensitivity to scope. For the external scope test (split-sample scope test), the sample of respondents is split into two and these groups vote on two separate environmental amenities and the WTPs are regressed on the bid amounts.

3.1. Suggested Hypotheses for the Study Based on the Theoretical Model

The following expectations are offered based on economic theory. *A priori* we expect the effect of household size to be unclear in response to both the WTP and the bid since arguments can run in both directions. The frequency of crop raiding by elephants as well as whether the farmer has ever suffered from crop raiding by elephants is expected to enhance the chances of making a positive bid and the size of the actual bid. The extent of destruction of crops and property through elephant raiding suffered in the previous year, captured by a willingness-to-accept (WTA) compensation is expected to be positively related to the probability of making a positive bid and the amount of bid made. The scope of the environmental amenity upon which the bid is made is expected to improve the chances of making a positive bid and the amount of bid made. The educational attainment of the household head is expected to improve the chances of the household making a positive bid as well the amount of the bid. The respondents who support the proposed Kakum Conservation Plan should be more willing to finance the implementation of the plan. The effect of the gender of the householder is not clear with regards to making a positive bid and amount of bid. The chances of making a positive bid as well as the actual bid made is expected to improve if at least one of the household members is employed at the Kakum National Park. The longer the respondents stay in the communities adjacent to the Kakum National Park, the more likely he/she will be willing to make a positive bid and the greater the amount they should be willing to pay so as to improve the conservation of the park.

4. METHODOLOGY

The data for this paper are derived from a household survey conducted by the author during the summer holidays of 2003. The National Oceanic and Atmospheric Administration (NOAA) Panel (Arrow *et al.,* 1993) has recommended steps that should be followed so as to enhance the reliability and validity of the policy recommendations of CV studies. Among the guidelines recommended by the NOAA Panel are that CVM should have a high response rate, pass the scope test, it should be a discrete choice, in-person interview should be adopted and pre-testing of the survey instrument is also encouraged. Much effort was made to follow the stipulated guidelines of the NOAA Panel in undertaking the study. The interviewers were carefully chosen and were involved in the administration of questionnaires so they required little training with regards to the administration of the contingent valuation questionnaire. They also understood the local language. Respondents were also adequately informed that the research work was being conducted by a university for research purpose and thus the research work had nothing to do with the formulation of government policy. These steps were undertaken to minimise *sponsor-bias*. The respondents were also assured of their anonymity. The survey instrument was pre-tested after which the necessary corrective measures were taken. Data were also entered into a computer at the end of each day of field interviews. It was therefore convenient to seek clarification from the enumerators with regards to illogical responses and illegible handwriting. Personal interviews were used to gather the data.

The population of the study was the inhabitants of communities surrounding Kakum National Park. The questionnaire was administered to households in some selected communities surrounding the Kakum National Park (KNP). In total, two hundred (200) households were interviewed. The communities, with the number of respondents coming from each community as indicated in the bracket, are as follows: Antwikwa (10), Masomago/Seidukrom (31), Abrafo (28), Kruwa/Obengkrom (39), Mfoum (30), Bobi (10), Abaka-Nkwanta (15), Afeaso (13), Tawiah-Nkwanta (14) and Wawase (10). In each community, some households were purposively selected to reflect different locations as 'start addresses' around which on the average of three (3) households were interviewed depending on the subjective determination of the size of each community. Efforts were made to ensure that every part of each community was represented. Surrounding villages and cottages were also included. This sampling method was adopted because there was no reliable census data for the construction of objective sampling frame.

According to Mitchell and Carson (1989), the CVM should provide a realistic scenario to the respondents. In order to assess the economic value of KNP, a change in environmental quality in the form of a new conservation plan was designed for KNP. The new conservation plan comprised: (1) planting more trees, (2) fencing KNP, (3) employment of more personnel and (4) expansion of the size of KNP. Through this plan, elephants and other animals would be prevented from moving outside the park. Thus the losses local residents incurred like destruction of crops and livestock by animals from KNP would be reduced. Moreover, endangered species like the Diana monkey (*Cercopithecus diana)* in the park would be better protected.

The Kakum Conservation Plan had four key components. Respondents were asked to vote on these four components of the Plan that the respondents wanted. Their responses were then used to construct the scope of the Kakum Conservation Plan acceptable to them and this formed the basis for which the bid was based. This was also used as an explanatory variable in the regression analysis. According to the scope test, a bid for a composite good should be higher than a bid for a subset of the good. Thus we expect that as the scope of the environmental amenity increases, the amount of bid made should also increase. After the vote on the scope of the environmental amenity, the respondents were introduced to the WTP question and the description of the payment vehicle. The WTP question is as follows:

The Kakum Conservation Plan described above can be implemented only if a fund like Kakum Preservation Fund is available. The fund would be used to buy equipment to fence the park; and employ more personnel for protection of animals and plants in KNP. Suppose Kakum Preservation Fund is established; and the fund is administered by the Government of Ghana. A representative of the fund will collect the same amount from each household in the village annually. The Government and tourists will also contribute to the fund. Moreover, you are guaranteed that the fund will only be used for improving the conservation of KNP.

After this statement, the WTP of the respondents was solicited and the motives of those who were not willing to pay to conserve KNP were explored. For those willing to pay, the payment vehicle was further explained to them. Since ability to pay was vital to obtain realistic bids, the payment vehicle was presented conservatively to reflect this. The description of the payment vehicle reads:

Before you answer the question, I would like you to reflect on the fact that you have a limited income. So after making this payment, you must still buy food, clothing and shelter among other things. Note that you are contributing towards the conservation of KNP alone but not for other services like garbage collection among others. The extent to which this fund can improve KNP depends on the amount that you and others contribute to this fund.

Respondents were also allowed to suggest alternative payment vehicle that they preferred and their WTPs under the alternative payment vehicle were elicited. The payment vehicles suggested by the respondents included taxes and voluntary contributions among others. The two payment vehicles provided almost the same level of WTP. The amount the respondents were willingness to pay was stated in cedi, the currency of Ghana. The value was converted to the United States dollar using the prevailing exchange rate of 8,500 cedis to one United States dollar.

A dummy variable was included in the analysis to capture education. The dummy variable took the value of one when the respondents had at least secondary school education and zero otherwise. In order to correct for the selection bias that might result from selection of only the respondents who made a positive bid, the inverse Mill's ratio was obtained from the probit estimation and introduced as a regressor variable in the selection equation. The result of the analysis indicated that there was a selection bias in the sample used in the estimation of the bid curve. The use of the inverse Mill's ratio corrected for the selection bias in the selection equation.

Although efforts were made to ensure reliability and validity of bids, some weaknesses were inevitable. One major problem with the data collection was that since the communities had been subjected to several interviews from different research workers particularly, with regards to assessment of crop-raiding without compensation, there were a few cases of resistance to our survey from the respondents. However, they became more willing to participate in our study when it was emphasised to them that the problems facing the Park and their livelihoods had to be looked at from several directions for more durable solutions to be found. Also, the communities were chosen purposively, that is, the research focused on the communities that shared boundaries with the Kakum National Park. Since the questionnaires were administered during the major farming season in Ghana, some farmers could not be met in the house. However, since the farms were not far from the communities, these farmers were tracked to answer the questions. It must also be acknowledged that some important variables were omitted. For example, it was not possible to get income data from the respondents since the economy being studied was predominantly subsistence.

In the preliminary regression analysis, dummy variables were introduced to suppress community differences that might influence the bid. For example, crop raiding by elephants might be very intensive in some communities so these communities might be very eager to finding a solution to the problem and hence members of these communities might provide higher bids. But these dummy variables were not statistically significant; and were therefore dropped in subsequent estimations. A dummy variable was also introduced to capture interviewer bias.

5. RESULTS

5.1. Introduction

The results of the analysis indicated that households supported the improvement in the conservation of the Kakum National Park. Among the 200 respondents sampled, about 97% supported measures that would improve upon the conservation of the Park. The few respondents who did not support the proposed Kakum Conservation Plan were of the view that it was the responsibility of Government of Ghana to conserve forests on their behalf. About 57% of the respondents were willing to pay to conserve the Kakum National Park through contribution to the Kakum Preservation Fund (KPF). About 30% of the respondents who were not willing to pay could be attributed to protest behaviour. This was inferred from the debriefing questions administered. However most of the respondents who were not willing to pay into the fund could be attributed to genuine 'zero bid'. The annual mean WTP per household under our proposed payment vehicle (which involved direct collection of monies from households) was US$2.68 while it was US$2.71 under the respondent's preferred payment vehicle. However, after correcting for the protest behaviour by deleting those responses which indicated protest response, the average annual WTP per household was US$3.83 and US$3.93 respectively for the two payment vehicles respectively.

5.2. Results from the Probit Model Regression Analysis

A probit model was used to determine the factors that influenced the respondents' probability of making a positive bid to improve the conservation of Kakum National Park as the first step in the estimation of the selection equation. **The explanation of variables and their units of measurement used in the regression analysis are provided in the Appendix.** The probit model passed the scope test. That is, as the scope of the environmental amenity increased, the probability of respondents making a positive bid also increased. This was because the parameter introduced for the environmental scope (SCOPE) was statistically significant. Also, there was significant interviewer bias, since the dummy variable introduced to capture the interviewer influences (INTERD1) was statistically significant. It was also established that the frequency of destruction (NODEST) was statistically significant implying that the higher the frequency of crop raiding by elephants, the lower the probability of making a positive bid to conserve the Kakum National Park. This reflected the protest behaviour reported earlier. The dummy variable for gender (GENDER) was also statistically significant indicating that male household heads are more likely to make a positive bid as compared to female household heads. The likelihood ratio test statistic was 52.36 at 10 degrees of freedom and was statistically significant. The adjusted McFadden R^2 value was 0.19. This value compared favourably with the reasonable value of 0.15 recommended by Mitchell and Carson (1989). After correcting for protest behaviour, interviewer dummy variable was still significant likewise the frequency of destruction. The scope of

environmental amenity was also significant and had the expected sign. Gender was statistically significant as well. The McFadden R^2 was 0.525. Based on the McFadden R-Square, we could say that the correction for protest behaviour improved upon the explanatory power of the model.

5.3. Results from the Selected Equation Regression Analysis

The conditional bid curve was also estimated with the selection equation. Both the amount that respondents are willing to pay under our suggested payment vehicle (AWTP) and the amount the respondents are willing to pay under their preferred payment vehicle (AWTPOV) were used in the estimation of the selection equation. The two bid curves passed the scope test. The results again underscored the fact the fact there was interviewer bias in the administration of the CV instrument. Most of the parameter estimates had the expected signs and were statistically significant as well. The longer the respondent stayed in the community, the more likely he or she would make a lower bid on condition that he or she made a positive bid in the first place. The number of hours that the householder used to collect non-timber products from the park prior to the establishment of the park positively influenced the conditional bid.

Similarly, the extent of destruction suffered in the previous year due to crop raiding by elephants increased with the amount of bid offered given that the respondent made a positive bid in the first place. Thus, householders that suffered most in the previous year were willing to make a higher positive bid so as to improve the conservation of Kakum National Park. Interestingly, employment of a household member at the Kakum National Park did not have the expected result. It rather had a negative effect on the conditional bid made. Male-headed households on the average made a higher positive bid compared to female-headed households. Educational attainment of the head of the household increased the positive bid given that the household made a positive bid in the first place. Thus the household heads who were more educated were more likely to make higher positive bids to improve upon the conservation of Kakum National Park. The inverse Mill's ratio was statistically significant confirming selection bias in the estimation of the selection equation.

Table 1: Selected Equation Regression Coefficients Incorporating Protest Behaviour

	AWTP		AWTPOV	
Variables	Coefficient	T-ratio	Coefficient	T-ratio
Interd1	-1.4910	-4.7275*	-1.5357	-4.8302*
Yrsta	-0.0197	-2.6346*	-0.0202	-2.6921*
Hrs	0.0559	2.3464*	0.0543	2.2787*
Dest	0.0805	0.2684	0.0790	0.2632
Nodest	-0.0231	-0.6931	-0.0202	-0.6041
WTA	0.0083	3.1613*	0.0017	3.1919*
Hhempl	-0.8312	-2.0180*	-0.8335	-2.0210*
Splan	6.0206	0.0001	6.0380	0.0001
Scope	0.6391	3.9511*	0.6627	4.0631*
Hhsize	-0.0773	-1.9545	-0.0809	-2.0410*
Gender	0.7014	2.4076*	0.7152	2.4479*
Occup	0.3697	0.4644	0.3874	0.4866
Edn12	2.0151	4.4996*	2.1288	4.7280*
IMR	2.7609	4.8455*	2.8181	4.8814*
Constant	-8.1783	-0.0001	-8.2791	-0.0001
Sample Size	200	200		
Log-likelihood fn	-356.2265	-356.9584		
E(Y) at mean	0.2228	0.2056		

* *indicates that the t statistic is statistically significant*

Given the mean values of all the independent variables, the expected value of the dependent value was 0.2228. We computed the conditional probability for each independent variable. The estimated coefficients of the bid curves using the two WTPs (based on the two different payment mechanisms) are presented in Table 1 above. The number of explanatory variables that was statistically significant reduced after correcting for protest behaviour. The dummy variable for the interviewer bias was still significant. The numbers of hours that the household used to harvest non-timber products from the reserve prior to the establishment of the park was still significant. Gender was statistically significant and male-headed households made higher positive bids as compared to female-headed households. The income loss from crop raiding by elephants was also statistically significant and had the expected sign. Educational attainment of the household was statistically significant. Educated household heads offered higher bids given that they made a positive bid in the first place.

There was sample bias due to protest behaviour. The coefficients of the bid curves corrected for protest behaviour are presented in Table 2. With the correction for protest behaviour, the dummy variable which captured whether the respondent supported the plan or not became a constant and was consequently dropped. The study also sought to find out the motives behind the positive bids. The response revealed that 85% of those respondents made a positive bid so as to avoid crop raiding by elephants. Generally, the coefficients of the bid curve (reported in Table 2) possessed the expected signs as suggested by economic theory.

Table 2: Selected Equation Regression Coefficients after Correcting for Protest Behaviour

	AWTP		AWTPOV	
Variables	Coefficient	T-ratio	Coefficient	T-ratio
Interd1	-0.9923	-4.2161	-1.0171	-4.3017*
Yrsta	-0.0097	-1.3850	0.0591	2.6457*
Hrs	0.06038	2.7053*	0.0591	0.2247
Dest	0.0699	0.2359	0.0666	0.2247
Nodest	-0.0163	-0.5490	-0.0126	-0.4254
WTA	0.0016	3.1692*	0.0016	3.1768*
Hhempl	-0.3512	-0.9197	-0.3437	-0.9003
Splan	0.1087	1.0781	0.1276	1.1742
Scope	-0.0208	-0.6205	-0.0225	-0.6669
Hhsize	0.5875	2.3665*	0.5927	2.3864*
Gender	0.5875	2.3665*	0.5927	2.3864*
Occup	0.5170	0.6483	0.5393	0.6762
Edn12	2.2318	4.9718*	2.3337	5.1776*
IMR	1.5000	4.7972*	1.5077	4.8023*
Constant	-0.5780	-0.6291	-0.6246	-0.6797
Sample Size	138	138		
Log-likelihood fn	-364.22189	-365.10089		
E(Y) at mean	3.4890	3.5136		

* *indicates that the t statistic is statistically significant*

6. CONCLUSIONS AND POLICY IMPLICATIONS

The main objective of this study was to assess the preferences for National Biodiversity Strategy which sought to increase the total area devoted to biodiversity conservation to about 16% of total land area of Ghana. This was undertaken through the use of the CVM method dealing with the preservation of the Kakum National Park. Based on the preferences of farmers living around the

Kakum National Park, the study has thrown light on some key policy issues with regards to environmental policy formulation in Ghana. Despite the paternalistic nature of the formulation of the National Biodiversity Strategy, farmers have strong preferences for the National Biodiversity Strategy. To some extent, these preferences for the National Biodiversity Strategy are a reflection of cost of destruction to crop produce and property. Educational attainment plays an important role in biodiversity conservation. Creation of environmental awareness through educational campaigns and sensitisation of the indigenous people should be encouraged. Moreover, since entrance fees at KNP are inefficient for both domestic tourist and international visitors (Navrud and Vondolia, 2005), higher revenue can be generated from higher entrance fees to compensate welfare losses among these households; and to provide income opportunities, employment and empowerment of women in these communities. These measures are crucial for ensuring the sustainability of the National Biodiversity Strategy. The establishment of protected areas imposes extra cost on local communities in addition to taking away their source of livelihood. For example, crop raiding by elephants has been very intensive to the extent that the indigenous people are making a positive bid just to curb this crop raiding.

The study has implications for the welfare evaluation of biodiversity conservation programmes in developing countries. The preferences of farmers remain an important element for success of the National Biodiversity Strategy. It is therefore recommended that higher distributional weights should be put on the impacts of biodiversity programmes among the local communities in the evaluation of National Biodiversity Strategy. The unequal distribution of costs and benefits of the National Biodiversity Strategy is a major factor for conflict between park management and local communities. So biodiversity conservation programmes should be designed in such a way that these extra costs to local communities are minimised. In effect, there should be better communication among conservationists, local people and the government so that the preferences of the local people are used as direct inputs into biodiversity conservation policies.

ACKNOWLEDGEMENTS

I am grateful to Ståle Navrud of the Department of Economics and Resource Management of Norwegian University of Life Sciences, two anonymous referees, and the Editor of the *Ghana Policy Journal*, Dr. Kwabena A. Anaman for constructive comments on this paper. The paper was presented at the 16th EAERE Conference in Gothenburg, Sweden in June 2008. Financial support from Norwegian Educational Loan Fund and NORAGRIC is gratefully acknowledged.

REFERENCES

Abane, A.M., Awusabo-Asare, K. and Kissi, A.K. (1999) "In whose Interest? Individual and Societal Needs in the Creation of Forest Reserves: The Case of Kakum National Park in Ghana", *Bulletin of the Ghana Geographical Association*, 21, pp. 21–30.

Agyare, A.K. (1996) "Socio-economic Perspective of Kakum Conservation Area", in B. Bailey (ed.), *Facing the Storm: Five Years of Research in and Around Kakum National Park, Ghana*, Kakum Conservation Area Research Colloquium, Jan. 9– 2, pp.131- 138.

Alvarez-Farizo, B., Hanley, N., Wright, R.B. and Macmillan, D. (1999) "Estimating the Benefits of Agri-environmental Policy: Econometric Issues in Open-ended Contingent Valuation Studies", *Journal of Environmental Planning and Management*, 42, pp. 23–43.

Angelsen, A. (1997) "The Poverty-Environment Thesis: Was Brundtland Wrong?", *Forum for Development Studies,*1, pp. 135–152.

Angelsen, A. and Wunder, S. (2003) *Exploring the Forest-Poverty Link: Key Concepts, Issues and Research Implications*, Centre for International Forestry Research Occasional Paper No. 40, CIFOR, Jakarta, Indonesia.

Arrow, K. J., Solow, R., Leamer, E., Portney, P., Radner, R. and Schuman, H. (1993) "Report of the NOAA Panel on Contingent Valuation", *Federal Register*, 58, pp. 4601–4614.

Azika, S.K. (1992) *A Study of the Extent of Crop Destruction in Farms Surrounding the Kakum National Park and Assin Attadanso Game Production Reserve by Forest Elephant*", Department of Game and Wildlife, Government of Ghana, Accra, Ghana (unpublished).

Baird, M. (2001) *Remarks*, International Forest Law Enforcement and Governance Conference, Jakarta. June 2001 (unpublished).

Danchev, A. (2003) *Biodiversity Conservation and Contingent Valuation Methods*, Department of Economics, Faith University, Istanbul, Turkey (unpublished).

Dasgupta, P. and Mäler, K-G. (1994) *Poverty, Institutions, and the Environmental-Resource Base,* World Bank Environment Paper, No. 9, World Bank, Washington, D.C.

Dei, L.A. (1996) "Agrotourism in Kakum National Park: A New Concept in Participatory Community Development of a National Park", in B. Bailey (ed.), *Facing the Storm: Five Years of Research in and Around Kakum National Park, Ghana,* Kakum Conservation Area Research Colloquium, January 9– 2, pp. 160-166.

Dickinson, B. (1998) *Summary of the Elephant Crop-Raiding Situation around Kakum National Park,* Conservation International-Ghana, Accra, Ghana (unpublished).

Government of Ghana (2002) *National Biodiversity Strategy for Ghana*, Ministry of Environment and Science, Accra, Ghana.

Ghana Statistical Service (2007) *Pattern and Trends of Poverty in Ghana 1991–2006*, Ghana Statistical Service, Accra, Ghana.

Greene, W. H. (2003) *Econometric Analysis Fifth Edition*, Macmillan, New York.

Heckman, J. (1979) "Sample Selection Bias as a Specification Error", *Econometrica,* 47(1), pp. 153–161.

Holden, S. and Shiferaw, B. (2002) "Poverty and Land Degradation: Peasants' Willingness to Pay to Sustain Land Productivity". In C. Barret, F. Place and A.A. Aboud (eds.), *The Adoption of Natural Resource Management Practices: Improving Sustainable Agricultural Production in Sub-Saharan Africa*, CABI Publishing, New York.

Holden, S., Shiferaw, B. and Wik, M. (1998) "Poverty, Market Imperfections, and Time Preference: Of Relevance for Environmental Policy?"*Environment and Development Economics*, 3, pp. 105–130.

Kuperan K. and Sutinen, J. G. (1994) *Compliance with Zoning Regulations in Malaysian Fisheries,* A Paper presented at the 7th Conference of the International Institute of Fisheries Economics and Trade, Taipei, Taiwan, 18 – 21 July.

McDonald, J. F. and Moffitt, R. A. (1980) "The Uses of Tobit Analysis", *Review of Economics and Statistics*, 62 (2), pp. 318- 321.

Mitchell, R. C. and Carson, R.T. (1989) *Using Surveys to Value Public Goods: The Contingent Valuation Method*, Resources for the Future, Washington, D.C.

Muchapondwa, E. (2003) *The Economics of Community-Based Wildlife Conservation in Zimbabwe* , PhD Dissertation, Gothenburg University, Gothenburg.

Navrud, S. and Vondolia, G.K. (2005) "Using Contingent Valuation to Price Ecotourism Sites in Developing Countries", *Tourism*, 15 (2), pp. 115 -125.

Oppong, S.K. (1996) "Socio-economic Impact of the Kakum National Park on the Peripheral Communities", in B. Bailey (ed.), *Facing the Storm: Five Years of Research in and Around Kakum National Park, Ghana, Kakum Conservation Area Research Colloquium*, Jan. 9 – 12, pp. 123 – 130.

Pearce, D. and Moran, D. (1994) *The Economic Value of Biodiversity*, Earthscan Publications Limited, London.

Romero, A. (1994) "Economic Contributions of Venezuelan Protected areas: The Tragedy of the Commons and Perspectives" in: Munasinghe, M. and McNeely, J., (ed.), 1994, *Protected Area Economics and Policy: Linking Conservation and Sustainable Development,* World Bank, Washington, D.C.

Shyamsundar, P. and Kramer, R. (1997) "Biodiversity Conservation – At What Cost? A Study of Households in the Vici nity of Madagascar's Mantadia National Park", *Ambio,* XXVI (3): pp. 180 - 184.

Singh, I., Squire, L. and Strauss, J. (eds.) *Agricultural Household Models: Extensions, Applications and Policy*, World Bank and John Hopkins University Press, Washington, D.C.

Tobin, J. (1958) "Estimation of Relationships for Limited Dependent Variables", *Econometrica*, 26, pp. 24 – 36.

Tyler, R. D. (1990) *Why People Obey the Law*, Yale University Press, New Haven.

World Bank (2006) *Where is the Wealth of Nations? Measuring Capital for the 21st Century*, The World Bank, Washington, D.C.

Appendix: Explanation of Variables and the Units of their Measurement

Variables	Description	Unit of Measurement
WTP	Dummy variable denoting willingness to pay	WTP = 1 if willing to pay and 0 otherwise
AWTP	Bid respondents made	In US$
AWTPOV	Bid made under preferred payment vehicle	In US$
Interd1	Dummy variable denoting terviewer	Interd1 = 1 if Baba and 0 otherwise
Yrsta	Number of years respondent has been living in the community	Years
Hrs	Hours used to collect products from the forest	Hours
Dest	Dummy variable denoting destruction	Dest = 1 if crop destroyed last year and 0 otherwise
Nodest	Number of times experience destruction to crop	Number
WTA	Income lost from destruction in the previous year	US$
Hhempl	Dummy variable denoting whether any member of household is employed at park	Hhempl = 1 if employed and 0 otherwise
Splan	Dummy variable denoting support for the plan	Splan = 1 if support the plan and 0 otherwise
Scope	Number of components of the plan accepted	Number
Hhsize	Household size	Number
Gender	Dummy variable capturing gender of the head of the household	Gender = 1 if respondent is male and 0 otherwise
Occup	Dummy denoting the occupation of the head of the household	Occup = 1 if respondent is farmer and 0 otherwise
Edn12	Dummy variable capturing whether the head had formal education	Edn12 = 1 if the respondent had formal education and 0 otherwise