FACTORS INFLUENCING AWARENESS OF FOREST BENEFITS AND ATTITUDES TOWARDS CONSERVATION IN KIPINI DIVISION OF TANA DELTA DISTRICT, KENYA

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Abstract
Many benefits can be derived from forest conservation initiatives. Yet incidences of forest destruction by local communities are very common. This study examined the awareness of forest benefits and attitudes of households towards conservation of forests. The Zero Truncated Poisson model was used to assess the factors affecting awareness of forest benefits. Descriptive and factor analysis methods were used to assess the attitudes of local communities towards forest conservation. Data on forest use, rules and regulations of product harvesting, awareness of forest benefits, attitudes on forest conservation and household socio-economic characteristics was collected from 150 households in Kipini Division of Tana Delta District, Kenya. A pre-tested questionnaire was administered to each of the households through personal interviews. The division had three types of forest management regimes i.e. Kenya Forest Service (KFS), community and private conservancy. The results showed that households had average level of awareness of both direct and indirect forest benefits with means of 12, 11 and 9 for KFS, community and private conservancy, respectively. The model results showed that income, gender, farm size and management regimes influence awareness of forest benefits. Though education did not affect awareness of the number of forest benefits, Wald test results for education combined with income had statistically significant effect ($p<0.05$). Descriptive results indicated that the Likert scale mean score of the respondents was 54, 10, 56 and 34% of the respondents had scores above, on the borderline and below the Likert scale mean score respectively. Respondents with scores on the borderline and below the mean were deemed to have negative attitudes towards conservation and were grouped together. Thus only 10% of the respondents had a positive attitude. Hence it was concluded that the local community has negative attitude towards conservation of forests. Factor analysis produced five factors that accounted for 75.2% of the total explained variance. The first factor was education and knowledge of conservation which accounted for 28.7% of the total explained variance. The other factors were interaction and application of knowledge (15.7%), social and economic commitment (11.4%), personal initiative (10.8%) and consultation & goal achievement (8.4%). These results imply that forest conservation can be enhanced by creating awareness of direct and indirect benefits of conservation by use of easy to understand approaches. Formal education raises awareness of benefits of conserving the environment while the informal education can greatly change households' attitude towards forest conservation.

Key words: Forest benefits, awareness, attitudes, conservation

1.0 Introduction

Forest resource utilization poses a major challenge to the delicate balance between complex-fragile ecosystems and economic activities in many developing countries. Forests in such economies are major sources of livelihood for the rural communities who depend on forest resources for fuel wood, construction material and livestock grazing, among others. The extraction of biomass in the form of forest products like timber, fuel wood and fodder alters wildlife habitat and constitutes one of the most important threats to forests and wildlife (Shaanker *et al.*, 2004). At the same time, increase in populations of communities surrounding forests increases demand for forest resources which in turn leads to increase in degradation. Other factors associated with the increase in forest degradation broadly include demographic, economic, institutional and technological factors (Rishi, 2003; Shanker *et al*. 2004; Dolisca *et al.*, 2007).

In Kenya, the use of forest products, human settlement in forests and the subsequent farming activities has been rising over time. From 1990 to 2010, the rate of deforestation in the country was estimated at 0.3% per annum (KNBS, 2010). This has accelerated extraction of forest resources and resulted in destruction of the once pristine environments. Degradation of forests has in turn interfered with wildlife habitats and led to loss of species of different trees and wildlife (Owino *et al.*, 2008). It has also contributed to climate change, and has been associated with food shortages resulting from reduced rainfall (Peh *et al.*, 2005). Currently, Kenya is facing major challenges in forest conservation.

A number of strategies are being used to address the degradation of forests and other resources. These include focusing on products and services required locally and globally and strengthening local institutions by improving on the efficiency and accountability on public sector, transparency in market institutions and an informal sector that provide increased livelihood opportunities for the poor. At the same time, many policies and scientific approaches to forest management have been proposed. The ecosystem approach is currently the most widely used concept in environmental management. It is defined as 'a strategy for the integrated management of land, water and living resources that promote conservation and sustainable use in an equitable way' (UNEP, 1992). This approach has considerably changed the management of forests from the initial state-led management to the involvement of more stakeholders. It is a community-based forest management approach (McDaniel 2003; Olsson *et al.*, 2004; Rishi, 2007) which is gaining acceptance among other management regimes in Kenya.

Forests in Kenya fall under various management approaches with different legal status. In Tana Delta, forests are managed under three different regimes. The Kenya Forest Service (KFS) is responsible for managing the mangroves and the tropical forests outside the private conservancy. The local community is responsible for the

management of forests that fall under trust land, but outside the private conservancy. Lastly, the Kipini Wildlife and Botanical Conservancy manage forests under the conservancy. These different management regimes have set rules governing forest resource extraction and forest use.

The Lower Tana River Forest complex in Kipini Division plays many important roles in the ecosystem. It provides direct benefits to communities around it and acts as a habitat for various plant and animal species. The forest is home to numerous plants and animal species. It hosts approximately 350 bird species; endangered marine turtles; two endangered primates such as Tana River Red Colobus and the Crested Mangabey monkey; hippopotamus; elephants and the Nile crocodile. The forest patches are endowed with mangrove and tropical forests especially along the river. The forests are therefore important to Kenya because they comprise lowland evergreen riverine tropical forest types which are rare in Kenya and even in Africa, due to its biodiversity (Karere *et al*, 2004 and Owino *et al*, 2008). The forest is not continuous but has several parts with one main block in Kipini Location and several other forest pockets of different sizes in Kilelengwani and Ozi locations. Some of the tourist attractions offered by the forest include birdlife, mollusks, crustacea and crocodiles. However, despite its significance, the Lower Tana River Forest complex currently faces serious threat.

Settlement into the forest has increased significantly in the last one decade owing to a number of factors (Okello, 2011). New settlers clear the forest to make way for farming. At the same time the felling of trees for timber, building material, fuelwood and charcoal has increased with the increase in demand for these products (Muoria *et al*., 2002; Luke, 2005, Owino *et al* 2008). The problem is that the resultant conflict in land use between agriculture and forestry, and the increased extraction of tree products have complicated the conservation of the Lower Tana River Forest complex. Expectations are that households would conserve forests if they are aware of the benefits of doing so. In particular, awareness of the direct and indirect benefits of conserving the forests will affect how households utilize the forests. The general attitude of the community towards conservation seems to be low due to the observed persistent clearance of forests (Okello, 2011) and felling of trees (Owino *et al* 2008). Ultimately, household attitudes are expected to influence how the forests are utilized. Indeed past studies (Sekhar, 2003 and Arjunan *et al.*, 2006) have found a link between attitudes and natural resources conservation. Hence the objective of this study was to determine the factors affecting household forest benefits awareness as well as the attitudes of households towards conservation.

In the study area, markets for some of the forest products do not exist and/ or are imperfect; and if they exist, are characterized by high transaction costs. Consider a farm household that makes production and consumption decisions jointly (de Janvry *et al*, 1991), i.e., whose decisions are non-separable. This means that the

household's decisions about production (use of inputs, choice of activities and desired level of production) are affected by the consumption decisions/characteristics (consumer preferences, location and demographic composition). Under these conditions, the household maximizes the utility from consumption of home produced, market and leisure goods subject to a production function and a set of constraints.

Thus, the household's utility maximization problem can be expressed in a utility function as:

$$\mathrm{MaxU} = \mathrm{U}(\mathrm{C_a}, \mathrm{C_m}, \mathrm{T_q} - \mathrm{M_i}, \mathrm{H_h}$$

(1)

Where; C_a = consumption of home-produced goods,

C_m= consumption of market goods,

T_q = total time available to the household,

M_i = time spent on household production and off-farm wage earning (household labour supply) and

H_h = household characteristics

Subject to production constraint (Equation2), household's income constraint (Equation 3), household total time constraint (Equation 4), market constraint (Equation 5) and environment constraint (Equation 6) are expressed as:

$$Q = f(K, J, A)$$

(2)

$$P_m C_m = P_a(f(K, J, A) - C_a) - wJ + wM_i + Y$$

(3)

$$\mathrm{T_a} = \mathrm{L_h} + \mathrm{M_i}$$

(4)

$$\mathrm{L_h} - \mathrm{M_i} \geq 0$$

(5)

$$\mathrm{C_a} - \mathrm{Q} \geq 0$$

(6)

Where;

Q = the home output of both agricultural crops and forest products with f (.) being assumed to be increasing and concave in all its arguments

J = labour

K =capital

A = other exogenous factors that affect production including property rights, local and national policy and technology among others

P_m = price of market goods,

P_a = market price of home-produced goods,

w = wage rate and
Y= exogenous household income from non-wage and non-farm sources

The Lagrangian (L) equation for this optimization problem is given by:

$$L = U(C_a, C_m, T_a - M_i; H_h) + \lambda[P_a\{f(K, J, A) - C_a\} - wJ + wM_i) + I - P_m C_m] + \gamma[C_a - Q] + \theta[J - M_i] \quad (7)$$

The first order necessary conditions;

$$\partial L / \partial C^a = \lambda(P_a - \frac{\gamma}{\lambda}) = \lambda P_a - \gamma = 0 \quad (8)$$

$$\partial L / \partial T^j = \lambda(w - \frac{\theta}{\lambda}) = \lambda w - \theta = 0 \quad (9)$$

$$Pa\, \partial f / \partial L = w - \frac{\theta}{\lambda} = 0 \quad (10)$$

In equation 8, the first order necessary conditions shows that the price (Pa) is a function of γ while in equation 9 , the first order necessary conditions shows that wage rate (w) is dependent on θ. This implies that as long as the market environment constraints are binding, market prices (Pa and w) cannot guide household decision-making because their market price is zero or very low in value. Instead the household is guided by shadow prices (shown in parentheses in Equations 8 and 9). Equation 10 also shows that the value of the marginal product of labour is not equal to the market wage rate. Shadow prices reflect the true opportunity cost and benefits. Households will respond to them rather than market prices while making utility-maximizing choices (de Janvry *et al.*, 1991). It is the sign of γ/λ and θ/λ that determine the size of shadow prices and the relevant wage which would vary by household depending on whether a household is self-sufficient, net seller or net buyer of a produce or labour (Sadoulet *et al.*, 1995). These variations in prices and wages are caused by transaction costs in buying and selling, household preferences, production technology and access to employment opportunities. They are therefore included in the production function due to their influence on decision making in this case being maximizing utility of resource use.

Imperfections in the market here imply missing labor or credit markets. Rural labor markets are not completely developed. Although some labor transactions occur, the marginal value product of labor deviates from the market wage, implying that production and consumption decisions are non-separable. The marginal value product of labor is equated to a shadow wage that depends on household

characteristics (household size and years of formal education of the household head) and other utility-related variables (collection time, distances to the forest and accessibility of the forest products). This framework was used to analyze the factors influencing forest benefits awareness and attitudes towards conservation.

2.1 Materials and Methods

2.1 Study Area and Data Collection

Data was collected from households in Kipini Division of Tana Delta District. The division has three locations namely Kipini, Ozi and Kilelengwani. Each location is further divided into two sub-locations. Each sub-location has several villages of varying household populations. Data were collected from each of the households through personal interviews using a pre-tested questionnaire. The household head or spouse was selected for interview in each case. The data collected included forest product use, rules and regulations of product harvesting, awareness of forest benefits, attitudes on forest conservation and household socio-economic characteristics

2.2 Study Population and Sampling

Multi-stage sampling technique was used to select a representative sample from the population for interviews. First, Kipini, Ozi and Kilelengwani locations were purposively selected. This was because each location represented a different forest management regime. A list of all villages in each location was then obtained with the help of the local administrators. The villages were clustered into two categories based on proximity to the forest. Random sampling method was used to sample villages within the clusters. Six villages selected were close to the forest (distance of 0-5km) while the other four villages were far from the forest (distance 6-10km). A total of ten villages out of seventy villages were selected. Another list of all households in the selected villages was developed. Then random sampling procedure was used to select cases for the study.

The population sizes of each of the locations were used to arrive at the number of households interviewed in each location. Hence the study sampled the respondents from the locations using population proportions. The division statistics based on the 2009 census estimates showed that Kipini Location had approximately 4000 households while Kilelengwani Location had approximately 2500 households and Ozi location had approximately 400 households. Due to research budget constraint, the study targeted to interview 150 respondents/ households. Therefore, proportionate sampling procedure resulted in 72 households in Kipini Location, 48 households in Kilelengwani Location and 30 households in Ozi Location by the time the household survey was completed.

2.3 Model Specification: Forest Benefits awareness

In order to assess the number of forest products/services that the households were aware of, an exhaustive list of both direct and indirect benefits was drawn. A total of 18 benefits were identified. The respondents were then asked whether or not they knew each of the listed benefits and the total number of benefits known tallied. Hence the dependent variable is the number of forest benefits/services the household indicated it was aware of. The expected response therefore ranged from zero to eighteen.

The number of forest benefits known by the household is a count dependent variable and can therefore be analyzed using count data models. Count variable models are typically analyzed using either Poisson or negative binomial regression (Kirui, 2011). However, when data precludes zero responses, like in the current case, the strict application of Poisson and negative binomial regression is inappropriate (Hilbe, 2007; Long, 1997). Zero-Truncated Poisson (ZTP) or the Zero-Truncated Negative Binomial (ZTNB) models is therefore recommended. Poisson or negative binomial probability distributions that exclude zero do not sum to one hence the need for an adjustment (truncation) to the underlying distributions upon which their respective log-likelihood functions is based.

Following Cameron and Trivedi (1998) the zero-truncated Poisson distribution is defined by a probability distribution function (conditional upon y>0) as:

$$P\left\langle y_i \middle| y_i \succ 0; x\right) = \frac{P\left\langle y_i \middle| x\right)}{P\left\langle y_i \succ 0 \middle| x\right)} = \frac{\mu^{y_i} \exp(-\mu)}{y_i!(1-\exp(\mu))}, y_i = 1,2,...$$

(11)

Greene (2003) and Hilbe (1998) show that the log-likelihood (LL) transformation for the above zero-truncated Poisson probability distribution is given by:

$$LL(\mu; x) = y_i \log(\mu) - \mu - \log\Gamma\left(y_i + 1\right) - \log\left(1 - \left(e^{-\mu}\right)\right)$$

(12)

Where: y_i= random response variable corresponding to the number of benefits known to respondent (i)

x =covariate vectors

μ =mean of corresponding Poisson distribution

Following Greene (2003), the above log likelihood expression is parameterized in terms of the linear predictor *x*. That is, $\mu = e^{x\beta}$ hence, for the above zero truncated Poisson:

$$LL(\beta; x) = y_i x\beta - e^{x\beta} - \log \Gamma\left(y_i + 1\right) - \log\left(1 - e^{(-e)}\right)x\beta))$$

(13)

Where: y=random response variable (number of benefits known to respondent)

x =vector of explanatory variables

μ =mean

β =linear predictor of random response variable

Differentiation of the above function provides the basis for calculating the robust score

$$y - \exp(x\beta) - \frac{\exp(x\beta)\exp(-\exp(x\beta))}{1 - \exp(-\exp(x\beta))}$$

(14)

Based on the above equation, the derived implicit functional form of the estimated zero truncated Poisson model estimated in this study is:

Number of forest benefits(y) =f (lnage, gender, household size, education, lnincome, lndistance to main road, group membership, regime) +e.

(15)

The data collected was used to obtain the following model variables:

Age - is a continuous variable and was measured in years. It was expected to have effect on knowledge though the direction of influence may not be determined *a priori* because of the effect of other factors. The older one gets, the more knowledgeable they are expected to be on issues surrounding them. However, education and exposure may also affect the level of knowledge despite how young or old an individual may be. Its direction of influence was therefore not determined *a priori*. The range in age was large therefore to allow for meaningful comparisons we linearized by using the natural logarithm.

Gender of household head: this is a dummy variable measured as 1=male, 0=female. Men are generally expected to be more knowledgeable about their surroundings than their female counterparts. However, findings may vary depending on how long they have been in a place and whether they have been in an area for longer periods.

Household size: this variable refers to the number of members in a given household. Information can be obtained from various sources and may be availed through different household members. Therefore households with more than one member may have more chances of getting more information especially when they are involved in different activities within and outside a given locality. It is expected that household size will have a positive effect on awareness. Children are also known to provide information on what they may have heard from their interactions through

playgroups or school interactions as such the more the members the greater the likelihood of more benefits being known.

Education of the household head: this is a human capital variable and was measured in terms of the number of years of formal education. Consistent with previous studies, the value of a resource is a function of what one knows about it (Smith and Kaoru, 1990). Education level is expected to have a positive relationship with the awareness of forest benefits. It is expected that respondents with more years of education would be aware of many of the forest goods and services provided by the natural resources around them. Through education respondents would know and be able to understand better the ecological functions.

Income: this variable forms part of the financial capital owned by a household from all possible income generation sources that they were engaged in including remittances. It was measured as total income earned from various sources in a year between July 2010 and June 2011. Income was hypothesized to positively influence awareness of forest goods and services.

Distance to main road: this was a continuous variable measured in kilometers. The accessibility of an area is determined by the kind of infrastructure available. Areas that are remote are not easily accessible with information as such it was expected that those residing far from the division headquarters accessible by road may not have much information about benefits of forests and conservation. This variable was linearized by using natural logarithm.

Environment related group membership: is a social capital variable and was measured as a dummy variable (1= group member, 0= Otherwise). For purposes of this study the group membership was a variable that took into consideration those groups that have a component of environment related concerns or activities such as tree planting or trainings on conservation (e.g. use of improved charcoal burner), establishing the traditional hotpot baskets and use of modern hives. Thus it was expected that this variable will have a positive effect on awareness of benefits. Presence of programs and organizations focusing on agriculture and natural resources management has been found to increase awareness and probability of enacting natural resources management bylaws (Nkonya *et al*, 2008).

Regime: is a categorical variable that refers to forest management regime/ system being applied. The study categorized the management system into private, KFS and community. The private management was located in the farthest distance from the division headquarters and households were spatially distributed in that area. The effect of regimes was expected to be mixed given the distances that relay the possibility of information accessibility.

2.4 Attitude towards forest conservation

A combination of descriptive (percentages and mean scores) and inferential statistics was used to examine household's attitudes towards conservation. In order to assess households' attitude towards forests conservation, respondents were asked a series of questions that cover different aspects relating to forest conservation. These were in Likert scale format with the scale ranging from strongly disagree and strongly agree (i.e. on a scale of 1 for strongly disagree to 5 for strongly agree) (Shibia, 2010; Dolisca *et al*, 2007; Rishi, 2007). Points were added from each statement and divided by the highest sum to calculate a score. Then descriptive statistics were used to describe respondents' attitude towards forest conservation

On the other hand, factor analysis (Dolisca *et al*, 2007) was used to identify latent dimensions underlying the different variables (derived from each statement scores) that measured respondents' attitudes towards conservation. Responses to twelve five-point Likert-type scale items were subjected to a principal component factor analysis with Varimax rotation. The objective was to obtain fewer dimensions that reflected the relationships among these inter-related variables. An Eigen-value greater than one rule was applied in identifying the number of factors. The variables that had large loadings on the same factors were grouped together. Factor loadings value of 0.50 and above is normally considered good and significant (Tabachnick and Fidell, 2001). The factors were subjected to the Kaiser-Meyer-Oklin and Bartlett's test (KMO and Bartlett's test) to determine the sampling adequacy. According to the test, samples that score above 0.7 are considered reliable for policy-related decision-making while those below 0.7 are considered unreliable. The above procedures were adopted for this study and used to discuss the attitude towards forest conservation.

3.0 Results and Discussions

3.1 Results of the Socio-Economic Characteristics of Respondents

Table 1 shows that age of the respondents ranged from 20 to 100 years, with the mean age of 44 years and the mean household size of four members. The overall mean of fuel wood head-loads collected was 178 per year. Community management regime had the highest mean of 309 head-loads/year whereas KFS had the lowest mean of 112 head-loads/year. Mean years of formal education was 6.8. Of the interviewed households, 117 (78 percent) were males while 33 (22 percent) were females. Mobile phones were owned by 78 respondents (52 percent).

Distance to the main road was on average, 23.8 kilometers indicating that most households were located in the interior. The mean number of forest benefits known to respondents was about 11 (Table 1). Of the 150 respondents, 125 (83.3%) were practicing farming as their main occupation. Results also showed that 72 (48%) of the respondents belonged to a group(s) that engage in conservation activities. Household mean income per annum was KES. 21814.06. The respondents in the KFS

regime had the highest incomes compared to those from the community and Private/ Conservancy regime.

Table 1: Summary statistics of variables used in the Poisson regressions Model

	Private		Kenya Forest Service		Community		Overall	
Variable	**Mean**	**Std. Dev**	**Mean**	**Std. Dev**	**Mean**	**Std. Dev**	**Mean**	**Std. Dev**
Gender of household head (1=male 0=female)	0.8	0.38	0.7	0.44	0.8	0.4	0.8	0.42
Age of household head (years)	44	11.75	45.1	11.21	41.1	17.65	44	12.71
Household size (count)	4.3	2.15	3.9	1.98	3.7	2.66	4	2.17
Forest benefits known (count)	8.8	3	12.3	5	9.9	5	10.7	5
Group membership (1=Yes, 0=No)	0.6	0.5	0.4	0.5	0.3	0.49	0.5	0.5
Group members with farm forest (count)	0.48	0.5	0.29	0.46	0.19	0.4	0.34	0.48
Total annual income of household ('000 KES)	27.1	34.0	22.4	33.2	9.5	13.0	21.8	31.5
Total land size (acres)	7.9	4.78	9.6	4.1	5.8	3.63	8.3	4.47

Main occupation of household head (1=Farming 0=others)	0.9	0.32	0.8	0.41	0.8	0.37	0.8	0.37
Distance from forest (km)	3.3	2.06	4	2.37	1.9	0.58	3.4	2.17
Use forest products (1=Yes, 0=No)	0.5	0.5	0.4	0.49	1	0.2	0.5	0.5
Distance to the market (km)	13.6	6.65	8.3	5.97	1.5	0.51	9	7.03
Distance to main road (km)	28.7	5.18	18.9	5.05	27.3	1.51	23.8	6.62
Education (years)	6.2	4.21	7.8	3.84	5.4	4.26	6.8	4.14
Quantity of fuel wood head-loads collected per annum ('00 count)	2.04	3.14	1.12	4.12	3.09	3.66	1.78	3.77
Land under trees (acres)	1.1	1.38	1.4	1.51	1	1.21	1.2	1.42
Own mobile phone	0.5	0.5	0.6	0.49	0.3	0.49	0.5	0.5

(1=Yes,
0=No)

There were significant differences in number of forest benefits known to respondents, distance to the main road and market and ownership of land. When comparisons were made between different regimes, significant differences were observed in farm sizes, distance to the main road, the forest and the market, years of education and land ownership among respondents in the conservancy/reserve regime and those from the KFS regime. Significant differences were also observed when the respondents from the community regime and the conservancy regime were compared.

Figure 1 presents the results of analysis of awareness of forest products and services. The benefits households were aware of ranged from 1 to 18. Awareness was highest in the KFS regime (mean=12 benefits) and lowest in the Private/ Conservancy (mean=9 benefits). This is probably because the division offices where majority of educational programmes are carried out were closer to the KFS regime.

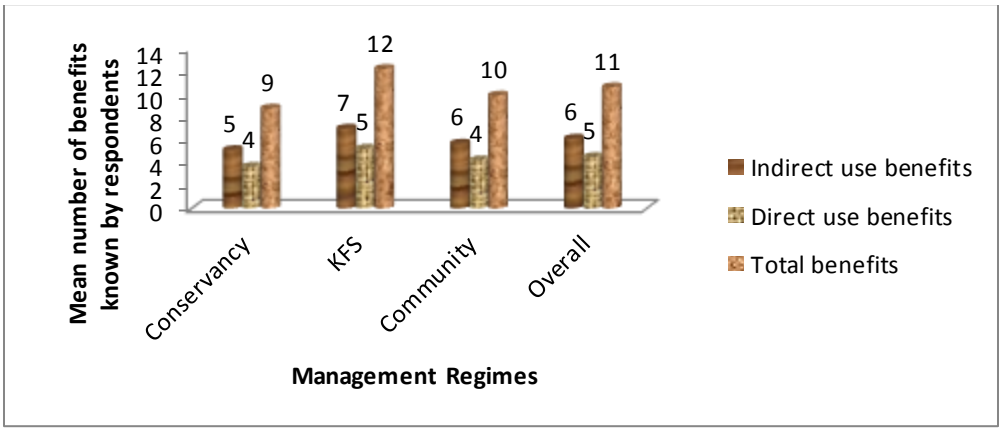

Figure 1: Forest benefits (direct and indirect use) known by respondents

3.2 Results of factors influencing awareness of forest benefits

Result of the Zero truncated Poisson regression model shows estimated factors influencing awareness of forest benefits are shown in Table 2. The results indicate that education does not affect the expected number of forest benefits a household is aware of. This may be due to low education level as shown in the descriptive statistics. It however shows that income has a significant effect on the expected number of benefits known to a household. The results of Wald test (combined effect of education and income) however found education and income have a joint statistically significant effect on the expected number of forests benefits the household was aware of.

Table 2: Zero truncated Poisson regression results of the determinants of awareness of forest benefits

Dependent Variable=number of forest benefits known	Coefficient	P- Value
Log of age	0.06	0.644
Gender	0.18**	0.043
Education level	0.01	0.521
Occupation	-0.04	0.648
Log of household size	0.10	0.152
Log of income	0.04***	0.000
Log of farm size	-0.15***	0.000
Group membership	-0.04	0.465
Log of distance to main road	-0.14	0.357
Regime:		
KFS	0.33***	0.000
Community	0.18*	0.072
Constant	2.15	0.000
Number of observations	150	
Wald chi2(11)	148.34	
Prob> chi2	0.0000	
Pseudo R2	0.1285	

, ** and * denote statistical significance at 10, 5 and 1% confidence levels respectively.*

The joint test yielded a p-value of 0.011. The null hypothesis that education and income jointly do not influence awareness of forest benefits was therefore rejected at 5% level of significance.

Results also showed that gender significantly influenced the number of forest benefits known to respondents. The expected number of benefits known by male respondents was higher by 0.18 relative to the number of benefits known by female respondents.

Households with more farm land were aware of more forest benefits compared to those with less farm land. Land is a capital asset and is often used as an indicator of the wealth status of households. The wealthier a household is, the higher the likelihood of acquiring more information especially where the access to information is limited by resource endowment. In this study, households which were more capital (land size) endowed knew slightly more benefits by 0.15 times relative to those who were less endowed.

The management regime also influenced the expected number of benefits known to respondents. The expected number of benefits known by a respondent in the KFS and the community regimes was higher compared to the respondents in the conservancy/private regime. The expected number of benefits was 0.33 and 0.18 times higher for the KFS and the community regimes, respectively, compared to the conservancy/reserve. Respondents in the community and KFS regimes were much closer to the administrative offices hence to sources of public information.

3.3 Attitude towards forest conservation

The mean score of all respondents was 54.07±10.30. If a respondent scored above the mean score then they were considered to have a positive attitude based on the stated scale range 1-5 with 5 being strongly agree (positive statement). For purposes of statistical analysis respondents with neutral and negative attitudes were grouped together. The finding was that only 10% of the respondents were above the mean score of 54% and hence they had a positive attitude. 56% of the respondents were on the borderline and the rest below the mean score. The results of the analysis of responses to the statement are as shown in Table 3. The results show that 34% of the respondents received some form of education and training on forest conservation and 50% had been educated on fuel wood conservation methods. The communities' time value for conservation activities was low. Results also show that 48% of the respondents attended meetings and were enrolled in groups focusing on environmental conservation as also indicated in Table 1.

Regarding the stakeholder involvement in forest conservation initiatives and management 42% of the respondents knew about the existence of partnerships between the local communities, the KFS and the NGO's working with farmers within the area while 58% were aware of existence of forest surveillance in the community. Almost one-half (45%) of the respondents indicated that consultations among stakeholders on forest related activities was a positive contributor to forest conservation. However, studies conducted in other countries reveal that, where community members and other stakeholders are involved in environment management, the laid down strategies can be achieved given the local area conditions (Rishi, 2007).

Table 3: Attitude towards forest conservation

	Percent of households within the response				
Attitudinal views/Dimensions	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Importance of forest conservation	18	46	2	20	14
Tree nursery management and farm forestry	6	20.7	6	54.7	12.7

Methods of fuel wood conservation	5.3	26.7	8.7	50	9.3
Honey production techniques	11.3	46	5.3	34	3.3
Interaction with forest officers	4	38.7	12.7	36	8.7
Community surveillance	7.3	28.7	6	52.7	5.3
Consultations on forest related activities	3.3	34	6	45.3	11.3
Partnerships with other stakeholders	11.3	36.7	9.3	41.3	1.3
Confidence in future user rights	12.7	23.3	18.7	38	7.3
Interest in knowledge acquisition	2.7	3.3	4	74.7	15.3
General support for conservation activities	1.3	9.3	8.7	66.7	14
Labor and monetary contribution	8	28	10	50.7	3.3

The respondents' personal commitment to forest conservation was also considered in the study. Majority of respondents (75%) expressed their interest in learning about forests conservation. Overall, 67% of the respondents were willing to support efforts to protect the forest and about one-half of the respondents (51%) indicated that they would invest their time and finances in conservation efforts.

Factor analysis produced a solution with five factors that accounted for 75.2% of the total explained variance as shown in Table 4. The Kaiser's overall measure of sampling adequacy obtained was 0.68, which borders on the recommended threshold of 0.7 suggesting that the data was marginally appropriate for factor analysis. Four attitude variables concerning education and knowledge of conservation were loaded on factor 1 with the cross-correlation coefficients of 0.792, 0.808, 0.794 and 0.639. This factor accounted for 28.7% of the total variance and was termed 'education and knowledge of conservation' because these variables involve awareness of conservation practices by local people. Higher scores and positive responses on this factor revealed a general need for promoting education on conservation practices.

Factor 2 had cross-correlation coefficients of 0.982 and 0.981. Because these variables imply application of acquired knowledge and interaction among stakeholders, factor 2 was then labeled 'interaction and knowledge application and accounted for 15.7% of the total variance. Three attributes (namely, surveillance, partnership and investment) were loaded on Factor 3 with cross-correlation

coefficients of 0.629, 0.879 and 0.540. These attributes focused on social and economic issues. Hence Factor 3 was termed 'social and economic commitment'. It accounted for 11.4% of the total variance.

Table 4: Results of exploratory factor analysis

Factor and item description	Factor loading
Factor 1:Education and knowledge on conservation	
We have been educated on importance of forest conservation	.792
We have received training on tree nursery development and farm forests use	.808
We have been informed on use of fuel conservation methods to conserve forests	.794
We are confident of land-use rights in the long term	.639
Factor 2:Interaction and application of knowledge	
We have changed our honey production techniques to minimize tree species losses	.982
There is consultation regarding forest related activities and forest conservation	.981
Factor 3:Social and economic commitment	
There is surveillance between community and forest guards regarding forest use	.629
There is partnership between the community and other stakeholders on forest conservation	.879
Am willing to invest my resources in terms of time and finances to protect forest destruction	.540
Factor 4:Personal initiative	
Am interested in knowing more about what to do regarding forest conservation	.822
Am willing to support conservation practices that will ensure forest protection	.826
Factor 5:Consultation and goal achievement	
We have interaction with forest guards thus conservation is now achievable	.902

Factor 4 had cross correlation coefficients of 0.822 and 0.826 and these variables were labeled 'personal initiative' and it accounted for 10.8% of the total variance and the fifth factor which represented the achievement of the goal on conservation

had a cross correlation coefficient of 0.902. It was termed 'consultation and goal achievement' and it accounted for 8.4% of the total variance. The cumulative percent of variance for all the factors explained was 75.2.

4.0 Conclusions and Recommendations

This study examined the awareness of forest benefits and attitudes of households towards conservation of forests. Based on the findings, the factors influencing awareness of forest benefits include gender of the household head, amount of land owned by a household, prevailing regime and income of household. Also, the attitude of the community members towards conservation was mostly negative. These conclusions are plausible because most household heads lack knowledge on the importance of forest conservation and also did not regularly attend forest conservation meetings organized by local leaders, NGOs and environmental agencies. Gender was found to have a significant influence on awareness of forest benefits. The majority of the respondents were mainly male by gender. This may have contributed to the statistical significance in awareness. In majority of marginalized communities the women are not usually vocal especially on questions related to family. To reach out to the females who are in such areas, policies that target women participation should be encouraged. The male spouses can be encouraged to attend such forums to allay any fears. Also alternative approaches can be run with men involvement as support and security.

The study found out that income had a significant effect on awareness. Though education on its own did not have effect on awareness of the number of forest benefits, Wald test results for education combined with income had a statistically significant effect. Therefore, the null hypothesis that education and income jointly have no effect on awareness was rejected. The study concluded that income and education of the households significantly impacted on the expected number of forest benefits known by a household. However, the descriptive statistics results indicated that the majority of the respondents have low levels of education which has implications on various fronts including collecting, analyzing and understanding information relating to conservation. The findings on the attitude showed that majority of the respondents had a negative attitude towards conservation (90%). The findings suggest the need for awareness on conservation; desire to know more (75%); willingness to support conservation activities (67%), and labor and financial contributions (51%). Factor analysis produced a solution with five factors that accounted for 75.2% of the total explained variance. The first factor was education and knowledge of conservation that accounted for 28.7% of the total explained variance. The other factors were interaction and application of knowledge (15.7%), social and economic commitment (11.4%), personal initiative (10.8%) and consultation & goal achievement (8.4%). There is need therefore to invest in both formal and informal education of households in the study area. Formal education raises awareness of benefits of conserving the environment while the informal

education can greatly change households' attitude towards forest conservation. Other strategies for educating households on importance of conservation may include environmental awareness campaigns and the provision of seedlings for tree nursery development; using approaches/ models that are easy to understand such as educational tours, introduction of school clubs such as 4K club, model/demonstration farms, and promotional products and training such as energy saving charcoal burners.

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