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Valuation of Natural Insurance Demand for Non-Timber Forest Products in South Nandi, Kenya

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Abstract

Non-timber forest products (NTFPs) contribute significant economic benefits to rural households in developing countries. This paper examines the insurance value of the demand for NTFPs in South Nandi, Kenya. Some studies have described natural insurance role of forest products; however, substantial knowledge gaps exist on insurance valuation of forest goods and this paper intends to show that natural insurance is a normal economic good. To analyse the estimates of insurance demand for forest goods, a sample of 224 households were selected within a four km radius from South Nandi forest. A contingent market and multiple regression techniques were used to identify the determinants of the natural insurance values. Results reveal that majority (55%) of the respondents are willing to contribute extra money, above the normal maximum willingness to pay (WTP) amounts for improved forest products management, as guarantee for future availability of NTFPs. On average the option value of NTFPs is Sh. 2,538 per annum, indicating the insurance premium the residents are willing to pay for continued supply of NTFPs. The main factors that influence option demand for NTFPs are education and number of children per household head. The paper recommends that the poor be allocated with tradable pasture permits to cushion them in the face of income and consumption shocks. Forest protective policies that are too restrictive to forest access compromise its natural insurance provision and negatively impact on the welfare of economically vulnerable households. Hence, policy planners and decision makers should incorporate natural insurance policies in forest management.

Keywords: valuation, natural insurance, non-timber forest products, willingness to pay, option value

INTRODUCTION

In developing countries forest products are important sources of livelihoods for forest-adjacent households (Dolisca et al., 2007; Das, 2010; Mutenje et al., 2011) and hence, the tropical forests are under increasing pressure to provide production and environmental benefits. Non-timber forest products contribute significant economic benefits to rural households in developing countries in three major ways: first, they provide domestic subsistence and consumption requirements (Vedeld et al., 2007; Heubach et al., 2011) for increased disposable income to the household; second, they serve as insurance premium in times of economic hardships (Paumgarten et al., 2009); third, NTFPs contribute to direct monetary benefits through sales (Shackleton et al., 2004). Poor people often depend heavily on the productivity and environmental services of natural resource ecosystems for as much as 30 to 50% of total incomes (The World Bank, 2004). Forest-fringe households use forest portfolio of activities in constructing income diversification programs to insure against some unexpected or/and expected needs. These self-insurance strategies range from emergency food sources to financial stop-gaps (McSweeney, 2005), as these households have low income, and therefore constantly face income and consumption risks. Generally, when households are faced with idiosyncratic and covariate shocks they devise coping mechanisms to protect consumption (Fisher and Shivey, 2005) and maintain disposable incomes. Various studies (for example, Gody et al., 1998; Pattanayak and Sills, 2001; McSweeney, 2004; Takasaki et al., 2004; McSweeney, 2005; Takasaki, 2011) have found out that natural insurance is particularly important to forest fringe households due to high levels of environmental, agricultural and market uncertainties; lack of formal insurance alternatives; unavailability of productive income opportunities; and remoteness of the area. The empirical evidence of self-insurance role of forest resources provides proof of the multiple - and often unappreciated - values of forest resources to the rural poor (McSweeney, 2005) to cope with adverse income and consumption shocks. Hence, there is need to devise policies that incorporate natural insurance in forest management.

Ever since the concept of natural insurance was given much attention among economists in the 1980s (Takasaki, 2011), the total economic value of natural resources like the forest has been defined as an aggregate of use and non-use values which include direct, indirect, option, bequest, and existence values (Amirnejad et al., 2006; Mamo et al., 2007: Babulo et al., 2009). Option value, also referred to as natural insurance, can be defined as individual's (or household's) willingness to pay to guarantee the continued availability of the environmental service for future consumption (Perman et al., 2003; Turpie et al. 2003) in a contingent market. The principal idea underlying contingent valuation technique is that people have preferences for environmental goods and these preferences are hidden, but are capable of translating into monetary units (Sumukwo et al., 2012). Several empirical studies (for example Cavendish, 2000; Shackleton et al., 2007; Vedeld et al., 2007; Kamanga et al., 2009; Paumgarten et al., 2009; Babulo et al., 2009) have described natural insurance or safety-net effects of non-timber forest products (NTFPs) in terms of economic stress like drought, financial difficulties or depressed agricultural output prices in which households exist and function. These studies point out that NTFPs also supplements for primary income and sometimes sold in response to loss of other income sources. However, most of these studies have focused on the supply and consumption of non-timber forest products.

Supply-side analyses are generally descriptive in nature and offer limited applications to policy, but this paper goes further to propose the application of demand-side valuation of insurance effects of NTFPs. There is scanty literature, to the knowledge of the authors, which analyses the demand for natural insurance of forest products in Kenya. Hence, due to this limited literature on insurance valuation of forest goods this study attempts to bridge knowledge. It is important that planners and decision makers incorporate natural insurance policies in forest management strategies as an instrument of harmonizing economic needs of adjacent communities and environmental conservation. Hence, forest protective policies that do not incorporate natural insurance provision of these resources can inhibit economic stress-coping capacity of vulnerable households. The main limitation of this research is that option values obtained are based on respondent perceptions which can be extremely subjective. The other weakness is that it uses contingent market, which has internal biases, instead of real market valuation.

The overall objective of this paper is to examine the demand for natural insurance function of non-timber forest products in South Nandi of western Kenya. The specific objectives are: to examine the natural insurance role of non-timber forest products among the adjacent households; to estimate the option value of non-timber forest products and finally, to evaluate the factors affecting demand for NTFPs as natural insurance premium.

MATERIALS AND METHODS

Theoretical Model

Theoretical and empirical findings demonstrate that local commons like forests provide natural insurance especially among the poor and vulnerable as coping strategies (for example Pattanayak et al., 2001; Fisher and Shivey, 2005; McSweeney, 2005; Takasaki, 2011). This paper examines rural household dependency on South Nandi forest for natural insurance and the monetary valuation of this forest function. The model postulates that to the household future benefits of forest functions (or the future costs of their degradation) are uncertain and not fully captured by established markets (Chambers et al., 1994). Hence, with uncertainty of future conservation and effects of changes in economic development priories, the forest assumes an option value. Contingent valuation techniques have also been used to assess option and existence values of natural resources (Kula, 1994; Turpie et al., 2003; Amirnejad et al., 2006; Völker et al., 2010). This involved obtaining the monetary natural insurance value (option value) of NTFPs as the household extra willingness to pay for the improved provision of forest products to guarantee continued availability of the resources in the future (Perman et al., 2003; Mcsweeney, 2005; Völker et al., 2010).

In attempting to maximize utility through use of forest products as safety net, households are constrained by socio-economic factors like regular income, age, sex, and distance from the forest. We bundle these variables and derive total utility function:

$$U_{ij} = \alpha + f(f_e, S_{ec}) + \varepsilon \quad (1)$$

Where:

α = is constant term in which each utility is assumed to be a linear function of:

f_e = is willingness to pay to continue enjoying provision for forest products like livestock fodder, beekeeping, medicinal plants, firewood etc in the contingent market.

S_{ec} = is socio-economic characteristics such as household income, age, education level, land size, occupation, sex etc, and

ε is the random component (or term)

According to economic theory the total maximum utility of the variables should be equal to the total maximum stated preference values by the households for the provision of the forest products. Hence,

U_{ij} = Maximum WTP_{ij} = Insurance value of NTFPs

The maximum WTP value indicates the total price households are willing to place on the continued provision of NTFPs and express its option demand.

Description of the Study Area

The study was conducted among Kenya's rural households living adjacent to South Nandi Forest Reserve in Nandi County. South Nandi forest, located about 320 km west of Nairobi, is among Kenya's few remaining tropical forests and is an extension of the Kakamega forest. The South Nandi forest of about 18,000 hectares was designated a national forest reserve in 1936 as part of the government's forest conservation efforts and is surrounded by a densely populated agricultural landscape with over 301 inhabitants per km^2 (District Statistics). The dominant livelihood sources in the area are rain-fed crop production, forest-related activities and animal husbandry.

The main agriculture activities being tea growing, maize, beans, potatoes, horticultural crops, fruit trees, bananas, Irish potatoes, sugarcane, pyrethrum and beans production. Livestock husbandry in the region ranges from cattle over medium-sized livestock (cows, goats, sheep) to poultry (chicken, guinea fowls). Forest-related activities include extraction of firewood, building materials and non-timber forest products like livestock fodder, medicinal plants, and edible fruits. Other income sources are wage earnings, and business activities, both formal and informal. It is estimated that over 60% of the region's household incomes are from the agriculture sector (Republic of Kenya, 2009).

Empirical Design, Sampling Method and Data Collection

An original survey design was constructed to solicit participants' responses on household forest resource use and the contingent valuation of non-timber forest products in South Nandi area of Kenya. A pre-testing of the survey instrument was conducted among 40 randomly selected households prior to implementation of the survey and then the questions were adjusted accordingly. The findings of the discussion groups assisted in the development of draft questionnaire that was used in the pilot survey. The pre-test was conducted in order to uncover any challenges in interpretation of the questions and results used in identifying the bid vector that must be included in the final development of the contingent valuation questionnaire. A structured questionnaire survey was used in twenty-four villages adjacent to the South Nandi forest. The selection of the villages was based on their proximity to the forest, from information provided by chiefs of the six locations on the periphery of the forest. The villages are, on average, within four kilometres radius of the forest edge.

Considering the cost and time for research enumeration this study used the formula below in selecting the number of respondents as the representative sample size,

$$n = \frac{NC^2}{C^2 + (N-1)e^2} \quad (2)$$

Where $n =$ Sample Size, N is Population Size, C is Coefficient of Variation (30%), e is Standard error of 2%.

Using 2009 national census survey data to list all households in the study area and the above formula, a total of 224 households was chosen representing 16% of the household population of the selected villages in South Nandi. In order to provide every household within the research area equal chance of being interviewed sampling was done in two levels: multi-stage stratified sampling and systematic random sampling.

Survey Instruments and Procedures

In this study questionnaire survey was the main instrument for the collection of household data. Some of the socio-economic characteristics are household income level, farmland size, age of the respondent, proximity of forest from homestead, sex of the respondent, educational level of the respondent, main occupation, number of livestock owned and household size. Socioeconomic data was used to verify the authenticity of the responses of the interviewees to the questions. The questions on income level, land size and distance to the forest were structured to encourage confidence in responding to the questions because some people take such issues as sensitive to be revealed. During the survey the age and sex of household members were recorded differently in order to verify the authenticity of the responses of the interviewees. This is to minimize mistakes during the survey exercise on the enumeration of household members.

Contingent Valuation Market

In eliciting the willingness to pay values in the CVM survey a hypothetical market scenario was described. The hypothetical scenario was based on annual contributions to a trust fund proposed to finance the improvement in provision of forest goods and services. The impacts of the improved provision of the forest goods were explained. The respondents were informed that to increase the flow of environmental services from the forest some experts have argued for the establishment of an independently managed Trust Fund to finance the management of the Nandi Forest and that all the community stakeholders were expected to contribute to and influence the management of the Fund. There was a unanimous agreement among the respondents that the proposed project was important for sustainable production and management of forest resources. In order to estimate the monetary option

value of NTFPs the respondents were asked to state their extra willingness to contribute money above the normal maximum WTP amounts to guarantee continued availability of the resources for future consumption.

Logistic Regression of Option Demand (Natural Insurance) of NTFPs

The option demand data for assessing the natural insurance value of NTFPs was obtained through contingent market. This involved obtaining the monetary option value of NTFPs as the household extra willingness to pay for the improved provision of forest products to guarantee continued availability of the resources in the future (Perman et al., 2003; Mcsweeney, 2005; Völker et al., 2010). A logit regression model was used to determine the factors affecting option demand for NTFPs as expressed in extra WTP in the contingent market scenario. The independent variables were age of household head, formal education levels, number of own children, farmland size, information on forest products, number of cattle in forest and use forest as source of income (a binary variable). The dependent variable is option value responses gauged in an ordered scale score in which respondents reporting "yes" received one on the variable (and coded 1) and "no" zero (coded 0) on an acceptance or rejection point scale of the explanatory variables.

A logit regression was then performed with the choice variable. The basic logit probability of 'yes' or 'no' responses were estimated in the form of a logistic function:

$$Z = \beta_0 + \beta_1\chi_1 + \beta_2\chi_2 \ldots \beta_n\chi_n + \mu_i \quad (3)$$

Where:

Z is the log of Yes response divided by the probability of No response.

β_0 to β_n are the coefficients of the parameters of the explanatory variables.

χ_1 to χ_2 represents independent variables.

μ_i is the stochastic term.

Thus, the functional form of the model is,

Log NTFPs = Z (4)

Where;

$$\text{Log NTFPs} = \frac{P}{1-P}$$

and

P = probability of independent variable influencing the insurance demand of NTFPs

NTFP = odds of demand (i.e. a Yes or No response logit prediction) for non-timber products.

RESULTS AND DISCUSSION

Socio-Economic Characteristics of the Respondents

In this study, after eliminating missing or inconsistent answers to valuation questions 224 (98%) responses were considered valid representative sample for South Nandi households' population. Table1 reports the descriptive statistics of the main socio-economic characteristics of the households. The sex distribution of the samples was 63% females and 37% males. The age ranged between 25 years to 56 years and above. All the respondents are farmers and most (68%) of them have primary education and below. This clearly reflects the limitations of household education levels have on income opportunities available to them; which mean that NTFP incomes become attractive application for natural insurance premium. The Table 1 below summarizes the descriptive characteristics of the households.

Table 1: Descriptive statistics of socio-economic characteristics of the households

Variable		Percent
Gender:	Female	63
	Male	37
Age:	25 Years and below	6
	26-40	30
	41-55	37
	56 and above	28
Occupation:	Formal employment	6
	Business man/woman	24
	Farmer	100
	Casual Work	16
Education:	No formal schooling	18
	Primary school	50
	Secondary school	23
	College and above	9
Size of household:	Age 0 – 16:	**49**
	Males	(51)
	Females	(49)
	Age 17 and above:	**51**
	Males	(52)
	Females	(48)
Land size distribution (in acres):	0.1 – 2.4	(46)
	2.5 – 9	(48)
	10 and above	(6)

The average distance of the forest from homesteads is 2.2 kilometres, with the population density increasing with decreasing distance from the forest edge. The Pearson correlation coefficient between the homesteads' proximity to the forest and both livestock pasture use and firewood collection (most extracted NTFPs) is -0.8. This indicates that as the distance from the forest increases households reduce the use of forest pasture for grazing livestock and also the extraction of firewood. Opportunity costs for extracting forest resources reduces with reduced distance to the forest edge. Since the average land size among the households sampled is 3.9 acres (equivalent to 1.6 hectares), supporting 94% of residents that have unreliable income puts pressure on them to look to the forest for supplementing the meager earnings like ad hoc sell of firewood and herbs. During the off-season period of December to March more households depend on the forest for animal pasture, wild-fruits, water and vegetables. Tropical forests generally help rural households adapt

to climate variability (Fisher et al., 2010; Shackleton et al., 2007; Kamanga et al., 2009).

Normal Household Income Activities

Generally, the people of South Nandi are typically farmers obtaining most of their income from agricultural and livestock production. Tea farming is the most (62%) predominantly crop growing activity earning an average of Sh.82, 416 per annum. However, since over 54% of the tea farmers earn below the average amounts the huge income inequalities among households give incentives to the poorer sectors of society to engage forest products for income improvement (as observed also by Illukpitiya et al, 2010; Sumukwo, 2013). Also low opportunity cost of time and abundant domestic labour among poorer households increase their propensity to extract forest resources to meet domestic subsistence and consumption requirements. Most (98%) of the households depends on maize production as source of income. Farmers in this area sell raw maize whose producer prices extremely fluctuate from an average of between Sh. 70,000 to Sh. 15,000 per acre in three months. The extreme price fluctuations of maize imply that farmers have to increase investments in milk production and livestock sells to stabilize domestic incomes. This leads to increased demand for forest pasture and medicinal plants for treating the livestock.

Majority (73%) of the respondents keep livestock for insurance purposes. Cattle, as an investment, are driven into the forest for many months for the purpose of sale (22%) and to assist meet future household obligations like school fees payments, emergency financial demands such as hospital bills and debts. As more people send children to school and with reduced disposable domestic incomes due to rising consumer prices households would increase the number of livestock in the forest to serve as insurance premium. Concomitantly, Babulo et al. (2009) and Vedeld et al. (2007) observes that forest income in many developing countries acts as insurance in periods of unpredictable economic shocks, that is unexpected income shortfalls or cash needs. The Table 2 shows household responses on the purpose of livestock keeping and the feeding methods.

Table 2: Livestock Purpose and Feeding Methods

Household Livestock owned:	**Feeding Methods** (%)				**Purpose** (%)		
(Number)	A	B	C	D	I	II	III
Cattle (969):	2	15	47	59	99	22	73
Sheep (95):	0	54	31	16	79	62	36
Goats (36):	0	22	11	28	67	47	58

Notes: A is Zero Grazing; B is Tethering; C is Free Range; D is Forest Pasture

I is Sale; II is Consumption; III is Insurance

Since 86% of the rural poor in South Nandi depend on forests for their livelihoods, the forest products cannot be underestimated and any policy changes that affect access to the forest products will have a significant impact in household incomes. Majority (77%) of the households have had increased income in the last ten years from several income portfolio strategies. The households (14%) who did not depend on the forest at all had the following reasons for not engaging in forest products for livelihood improvement: there is lack of accessibility to the forest from household homesteads, some had enough resources especially land, arbitrary arrests by forest guards, past loss of property like cows and honey made others consider forest incomes as risk investments, and the uncertainty about government official policy on these resources especially when contradictory statement are given by top government leaders breeding fear.

Role of Non-Timber Forest Products as Natural Insurance Premium

This study shows that 80% of the respondents depend on the South Nandi forest for reducing household income or consumption risk during times of economic stress, like famines, retrenchment or death of household head, unprecedented rise in foods prices, periods between crop harvests and emergencies. When respondents were asked to enumerate the ways in which NTFPs support the household during difficult times most (89%) of them are supported by more than one method. This means that forest resources cushions the households adjacent to the forest ecosystem when livelihoods are threatened and also help rural peoples survive in periods of uncertainty (as noted by Illukpitiya et al., 2010; Shackleton et al., 2007).

The respondents supported by more than one way during difficult times combined the various means with extraction of medical plants, wild fruits and water. Medicinal plants are used by 67% of the households as natural insurance premium. Livestock pasture and mushroom collection support 58% and 17% of the respondents respectively. Sell of these resources like honey and cattle in times of financial stress to meet household needs supports 63% of the respondents. Water for human/animal consumption during these stressful moments assists 56% of the residents. Hence, the households turn to forest resources and even sell these resources to supplement incomes during financial deficits as a result of increased scarcity of arable land and economic stress from changing market conditions for agricultural produce. Medicinal plants are very helpful in treating livestock during disease outbreaks. These results are corroborated by studies of MCsweeney (2005), Baland et al. (2005), Shackleton et al. (2007), Babulo et al. (2009) and Kamanga et al. (2009). Table 3

shows the ways different NTFPs support households during difficult times.

Table 3: Option Demand for Non-Timber Forest Products

Insurance role of NTFPs	Percentage Households Supported
Livestock Pasture	58
Wild fruits	19
Mushroom	17
Medicinal Plants	67
Sell of Resources	63
Water	56

To test the insurance effect of NTFPs among local households a Pearson Correlation (0.408, $p<0.01$) showed a positive relationship between the role of NTFPs as a way of cushioning households from consumption risks/and uncertainty and option demand for forest goods. This means that the Nandi South forest assume an option value to the residents which if not included in management strategies would lead to current inefficient extraction of forest goods.

Grazing of cattle in the forest is not only a full time business opportunity in the area but also serves as subsistence coping strategy especially to the poorer sector of society. There are two types of farmers grazing livestock in the forest: First, those that graze in the forest during the day and bring back the cattle into the homestead in the evening. This group uses the forest resources as an absorber of effects of current uncertainties in coping insurance. Some of these livestock grazers use the forest pasture only during dry seasons.

Second, those that buys young bulls and cows, particularly the local traditional breeds which are more resistant to sicknesses and diseases, and take into the forest to graze and live on their own in the wild for long periods of time. These cattle stay in the forest until they are ready for sale in the local or far away markets, often directly from the forest. This category of users is those who invest livestock in the forest as a business venture, as risk insurance. Income effect of natural insurance implies that households increase cattle into the forest as an investment wealth accumulation strategy and also as an 'education policy' insurance plan. The fact that the residents are sufficiently informed about the poor enforcement for forest services, the local elite have capitalized on it to use the forest as a capital accumulation investment (Personal Comm. 2011). In a Pearson correlation tests, income from livestock was positively correlated (0.208, $p<0.05$) with sell of medicinal plants, indicating that the farmers not only use herbal medicines to treat their livestock but they do sell to supplement incomes preferably to buy formal chemist drugs in case of more serious outbreaks of livestock diseases and sicknesses. Hence, as observed by Takasaki (2011), forest resources not only provide self-insurance but also mutual insurance services especially to the poor.

Vegetable and honey incomes are not significantly correlated with pasture income (0.123 and -0.104 respectively at 0.05 level) while negatively correlated with fish and firewood sells. Hence, households are not likely to sell vegetables and honey NTFPs because in the event of income deficits or shocks they would sell the livestock in the forest or farm produce. On other hand, increased income from investing livestock in forest reduces the probability of selling fish and firewood, possibly because it is associated with the poor in society. It may also because of poor demand for forest fuel wood.

3.4 Option Value of Forest Products

The survey results shows that over half of the respondents (55%) are willing to contribute extra money, above the normal maximum WTP amounts for improved forest products management, as guarantee for future availability of NTFPs. Of these 37% gave bid amounts higher than maximum WTP amounts indicating that they valued more the future availability of the forest products than their current flows. In other words, unexpected future income shortfalls or cash needs cause households to value more the future benefits of the resource. On average the option value of NTFPs is Sh. 2,538 per annum indicating that the residents' option demand, which is an insurance premium to guarantee continued supply of NTFPs. The total extra contribution is 40% above the maximum WTP amount. The findings are in agreement with that of Cavendish (2000) which reported a 40% of total environmental income was utilized to fill gaps in times of income shortages. Takasaki et al. (2004) found that Peruvian farmers reported 22% of households as utilizing the forest resources as an insurance mechanism. Hence, the forest resources provide informal and self-enforcing consumption insurance for the South Nandi rural economy and people are WTP above the normal willingness to pay amounts to secure the NTFPs for future consumption.

3.5 Factors influencing Option Demand for NTFPs using CVM

A logit regression procedure was used to analyze the probability of household option demand as expressed in WTP to guarantee availability of NTFPs for future consumption (Willis, 1989; Chambers et al., 1994; Perman et al., 2003) in the contingent market. In the analysis the household socioeconomic and demographic factors were regressed on the WTP for an option to consume the forest goods in the future (Table 4). Results demonstrated that the more the children and the better the education, the higher is the households' option values. This means that forest products, especially livestock grazing and beekeeping are invested to cushion in times of adversity,

particularly expected high fees payments among households with many children. Like in Völker et al. (2010) and Fisher et al. (2010), the results indicated that the educated used the forest resources to spread investments and reduce consumption risks in the future.

Household farmland size (a measure of income) had a negative effect on option values, indicating that increased land size reduces the probability of option demand. Households with bigger land size would invest more in farming but small-holder farmers would opt to invest in forest products as an income diversification strategy. Age was negatively related with extra WTP and the probable reason is that the elderly are not likely to contribute extra amounts as guarantee for future NFTPs use because of their low income elasticity and increased dependency on own children for upkeep. Willis (1989) found that age and income had negative effect on WTP for option value of wildlife conservation in Britain. Fisher and Shivey, (2005) also had age negatively affecting option value of NTFPs. But Fisher et al. (2010) found that increase in age of the household head more likely increased reliance on forests for shock coping. MCsweeney (2005) and Völker et al. (2010) showed that land wealth strongly determine the use of forest resources as safety nets for the rural economy. Baland et al. (2005) demonstrated that low income dwellers generally depend on forest products to provide informal and self-enforcing consumption insurance for the very poor. Table 4 illustrates the determinants of insurance demand in Nandi.

Table 4: Logistic Regression Results of the Option Demand

Variable	Coefficient	Standard Error	Significant
Age	-0.282	0.201	0.160
Education	0.903	0.224	0.000
Own Children	0.236	0.078	0.002
Use forest Income	1.620	0.694	0.020
Land Size	-0.003	0.041	0.941
Forest Information	0.166	0.139	0.233
Cattle in Forest	-0.094	0.08	0.253
Constant	-6.930	1.610	0. 00

The more the cattle grazing in the forest a household has the less likely the option demand for NTFPs. Although this relationship was not significant, it however shows that the households would rather diversify investments in other areas than depend on the forest ecosystem. Those who use the forest as means of improving income were more likely to pay an insurance premium for NTFPs, indicating their need for continued supply of these resources. In conclusion, the Nandi forest resources function as natural insurance scheme and stress-coping strategy for vulnerable households.

Policy Implications

Forest resources provide coping, and risk insurance to the poor, and the educated respectively (see Ellis, 1998 for the difference between household coping and risk strategies). Study results show that the main factors that positively influence option demand for NTFPs are education and number of children of household head. Findings show that there is a high probability of households to use forest products if there was an expected future financial obligation like fees payment (sort of 'education policy insurance plan') and real or perceived threat to livelihoods. Due to poor enforcement of user fees payments and no maximum limit to the cattle allowed in forest, the local elite have capitalized on this to use the forest as a capital accumulation investment. Therefore it is important that planners and decision makers incorporate natural insurance policies in forest management. Most importantly, the local elite should be discriminated against by introducing a private endowment system where the poor alone are allocated transferable pasture rights so that those who cannot or not able to use the forest resource can sell to others within the group. Since the product is a function of private endowments, the transferable property rights ensure equity distribution. This policy serves to; one, reduce forest induced wealth competition with its resultant consequences for forest biodiversity destruction. Two, stop spiraling income inequalities and encourage bridging of the gaps by motivating the poor to participate. Three, improves productivity and availability of pasture for future use. This is because intensive grazing in the forest not only leads to decreased fodder productivity but in the long-term cause soil erosion (Croitoru, 2007). Four, provide means of subsistence and fall-back in times of distress especially climatic variability to the poor (Fisher et al., 2010). Hence, forest protective policies that are too restrictive may compromise the natural insurance provision of these resources and inhibit economic stress-coping capacity of vulnerable households.

CONCLUSIONS AND RECOMMENDATIONS

This study shows that 80% of the respondents depend on the South Nandi forest for reducing household income or consumption risk during times of economic stress, like famines, retrenchment or death of household head, unprecedented rise in foods prices, periods between crop harvests and emergencies. Hence, access to the forest for forest products enhance opportunities of rural households to self-insure from the idiosyncratic and covariate shocks and protect consumption and maintain disposable incomes. Contingent valuation technique was explored in estimating the insurance value of NTFPs. The results reveal that over half of the respondents (55%) are willing to contribute extra money as guarantee for future availability of NTFPs. On average the option value of NTFPs is Sh. 2,538

per annum indicating that the residents' option demand, which is an insurance premium to guarantee continued supply of NTFPs. This means that the Nandi South forest assume an option value to the residents which if not included in management strategies would lead to current inefficient extraction of forest goods. In analyzing determinants of natural insurance, findings demonstrates that the more the children and the better the education, the higher is the households' option values. This indicates that forest products, especially livestock grazing and beekeeping are invested to cushion in times of adversity, particularly expected high fees payments among households with many children. Household farmland size (a local measure of income) had a negative effect on option values, indicating that increased land size reduces the probability of option demand. Households with bigger land size would invest more in farming but small-holder farmers would opt to invest in forest products as an income diversification strategy. Age is negatively related with extra WTP and the probable reason is that the elderly are not likely to contribute extra amounts as guarantee for future NFTPs use because of their low income elasticity and increased dependency on own children for upkeep.

We recommend that the poor can be allocated tradable pasture permits to cushion them in periods of uncertainty and economic stress, and also as means of supplementing primary income when livelihoods are threatened. This can be done by discriminating against the local elite by introducing a private endowment system where the poor are allocated transferable pasture rights so that those who are unable to use the forest resource can sell to others (i.e. transfer user rights) within the group. Since the forest product is a function of private endowments, the transferable property rights ensure equity distribution. The assigned property rights not only ensure optimal NTFPs extraction but also create efficient environmental market for the forest goods. Forest resources also provide coping and risk insurance to the vulnerable households. Since the NTFPs assist households to cope in times of economic adversity, forest protective policies should not be too restrictive so as to compromise the natural insurance provision of these resources to economically vulnerable households and hence, policy planners and decision makers should incorporate natural insurance policies in forest management.

REFERENCES

Amirnejad, H., Khalilian, S., Assareh, M.H., and Ahmadian, M. (2006): Estimating the existence value north forests of Iran by using a contingent valuation method. Ecological Economics 58, 665 – 675.

Babulo, B., Muys, B., Nega, F., Tollens, E., Nyssen, J., Deckers, J., and Mathijs, E. (2009). The economic contribution of forest use to rural livelihoods in Tigray, Northern Ethiopia. Forest policy and Economics 11, 109-117.

Baland, J., and Francois, P. (2005): Commons as Insurance and the Welfare Impact of privatization. Journal of Public Economics 89, 211-231.

Cavendish, W. (2000). Empirical irregularities in the poverty-environment relationship of rural households: evidence from Zimbabwe. World Development. 28, 1979-2003.

Chambers, C.M., Chambers, P.E., and Whitehead, J.C. (1994): Conservation organizations and the option value to preserve: an application to debt-for-nature swaps. Ecological Economics 9, 135-143.

Croitoru, L. (2007). Valuing the non-timber forest products in the Mediterranean region. Ecological Economics 63, 768-775.

Das, N. (2010). Incidence of forest income on reduction of inequality: Evidence from dependent household in Milieu of joint forest management. Ecological Economics 69, 1617-1625.

Dolisca, F., McDaniel, J.M., and Teeter, L.D. (2007). Farmers' perceptions towards forests: A case study from Haiti. Forest Policy and Economics 9, 704-712.

Ellis, F. (1998). Household Strategies and Rural Livelihood Diversification, Journal of Development Studies 35, 1-38.

Fisher, M., and Shively, G. (2005): Can Income Programs Reduce Tropical Forest Pressure? Income Shocks and Forest Use in Malawi. World Development Vol.33, No.7, pp.1115-1128.

Fisher, M., Chaudhury, M., and MCCusker, B. (2010): Do Forests Help Rural Households Adapt to Climate variability? Evidence from Southern Malawi. World Development Vol. 38, No.9, pp. 1241-1250, 2010.

Godoy, R., Jacobson, M., and Wilkie, D. (1998). Strategies of rain-forest dwellers against misfortune: the Tsimane' Indians of Bolivia. Ethnology, 37 (1), 55 – 69.

Illukpitiya, P., and Yanagida, J.F. (2010). Farming Vs Forests: Trade-off between Agriculture and the Extraction of Non-Timber Forest Products. Ecological Economics 69, 1952-1963.

Kamanga, P., Vedeld, P., and Sjaastad, E. (2009). Forest Incomes and Rural Livelihoods in Chiradzulu District, Malawi. Ecological Economics 69, 613 – 624.

Kula, E. (1994). Economics of Natural Resources, the Environment and Policies. Chapman & Hall, London.

Mamo, G., Sjaastad, E., and Vedeld, P. (2007). Economic Dependence on forest resources: A case from Dendi District, Ethiopia. Forest Policy and Economics 9, 916-927.

McSweeney, K. (2004). Forest product sale as natural insurance: the effects of household characteristics and the nature of shock in Eastern Honduras. Society and Natural Resources, 17 (1), 39 – 56.

McSweeney, K. (2005). Naturance Insurance, Forest Access, and Compounded Misfortune: Forest Resources in Smallholder Coping Strategies Before and After Hurricane Mitch, North-Eastern Honduras. World Development Vol. 33 (9), 1453 – 1471.

Mutenje, M.J., Ortmann, G.F., and Ferrer, S.R.D. (2011). Management of non-timber forestry products extraction: Local institutions, ecological knowledge and market structure in South Eastern Zimbabwe. Ecological Economics 70, 454-461.

Paumgarten, F., and Shackleton, C.M. (2009). Wealth differentiation in household use and trade in non-timber products in South Africa. Ecological Economics 68, 2950-2959.

Pattanayak, S.K., and Sills, E.O. (2001). Do tropical forests provide natural insurance? The microeconomics of non-timber forest product collection in the Brazilian Amazon. Land Economics 77 (4), 595 – 612.

Perman, R., Ma, Y., McGilvray, J., and Common, M – 3rd ed. (2003). Natural Resource and Environmental Economics. Pearson Education Limited. Harlow, England. Pp. 448.

Republic of Kenya (2009). Nandi South District Development Plan 2008-2012.

Shackleton, C.M., Shackleton, S.E., Buiten, E., and Bird, N. (2007). The importance of dry woodlands and forests in rural livelihoods and poverty alleviation in South Africa. Forest Policy and Economics 9, 558-577.

Sumukwo, J., Kiptui, M., and Cheserek, G.J. (2012). Economic Valuation of Improved Solid Waste Management in Eldoret Municipality, Kenya. Journal of Emerging Trends in Economics and Management Science 3 (6), 962-970.

Sumukwo, J. (2013). A Comparative Analysis of Random Utility Model and Contingent Valuation Estimates of Non-Timber Forest Products' Income in South Nandi, Kenya. Ph.D Dissertation. University of Eldoret. Unpublished.

Takasaki, Y., Barham, B.L., and Coomes, O.T. (2004). Risk coping strategies in tropical forests: floods, illnesses, and resource extraction. Environment and Development Economics 9 (2), 2003 – 224.

Takasaki, Y. (2011). Do the commons help augment mutual insurance among the poor? World Development Vol. 39 (3), 429 – 438.

Vedeld, P., Angelsen, A., Bojo, J., Sjaastad, E., and Berg, G.K. (2007). Forest environmental incomes and the rural poor. Forest Policy and Economics 9, 869-879.

The World Bank (2004). Response Growth for the New Millenium, Integrating Society, Ecology, and the Economy. The World Bank. Washington D.C. pp. 141-146.

Turpie, J.K., Heydenrych, B.J., and Lamberth, S.J. (2003). Economic value of terrestrial and marine biodiversity in the Cape Floristic Region: implications for defining effective and socially optimal strategies. Biological Conservation 112, 233-251.

Völker, M., and Waibel, H. (2010). Do rural households extract more forest products in times of crisis? Evidence from the mountainous uplands of Vietnam. Forest Policy and Economics 12, 407-414.

Willis, K.G. (1989). Option Value and Non User Benefits of Wildlife Conservation. Journal of Rural Studies, Vol. 5, No. 3, pp. 245-256.