

PUBLIC PARTICIPATION AS SOCIO-INCENTIVE TOOL IN THE CONSERVATION OF FOREST: INSIGHTS FROM UASIN GISHU COUNTY, KENYA

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Article History

Received: 15.06.2023

Accepted: 21.06.2023

Published: 04.07.2023

Abstract: Community participation is an emerging socio-incentive tool needed to be inculcated in resource management; however, the influencing effect for households to participate is understudied. Therefore, this study sought to determine possible influencing level of participation in forests resources management, and to examine determinants that either support or constraints participation. Structured questionnaire was administered to 234 rural households in Uasin Gishu County, Kenya, while multi-stage and systematic random sampling was employed as sampling procedure. Expressed WTP values from hypothetical market scenarios on either presence or inexistence of participation were used to determine its influence, while determinants of public participation were analysed using OLS regression model. Additionally, Logit model was used to analyse the probability of influence of each selected variable in this study. Results showed that participation is an incentive that could contribute to about 60% of WTP value for the management of forests. Again, OLS regression results revealed that variable of education level ($t = 1.052$, $p < 0.1$) and households income ($t = 0.2.694$, $p < 0.05$) supports participation, and variable of family size ($t = -0.121$, $p < 0.01$) impedes participation, while their probability to influence was at 55.7%, 57.0% and 49.3%, respectively. These findings point the need to contextualise education level, income and family size of the population when formulating participation policies and programs by the forests conservation authorities. However, significance of random factor ($t = 27.094$, $p < 0.001$), with its probability to influence at 73.0%, explains existence of unobserved variables that influences participation suggest the need for further investigation on variables beyond the scope of this study. The implication of this finding informs resource managers to identify and adopt an implementation mechanism that considers critical demographic factors that enhances forests conservation to sustain forests stock flow of consumable products to the communities.

Keywords: Determinants, Demographic Factors, Resource Management, Influencing level, Socio-incentive Tool, OLS regression Model.

INTRODUCTION

Forests provide freely the consumable commodities to the communities that live adjacent and far beyond (Abdullah et al., 2015; Caputo et al., 2016 and Langat et al., 2016). Literature portrays that rural homes, especially in developing economies, are largely dependent on forests resources in particular from free provisions of consumable commodities and regulative service (Langat et al., 2016). Apart from free provisions of tangible forests consumptive commodities, other forest function that are intangible include the regulative service of biophysical landscape component includes influence of rainfall pattern that facilitate agricultural productivity (Abdullah et al., 2015 and Caputo et al., 2016). Again, forests are a catalyst for positive externality in job creation both for

communities living adjacent and those that live far and beyond by providing raw material for industrial process (KEFRI, 2018). While reliance on forests product by adjacent communities, especially when faced with financial uncertainties as a result of unpredictable adverse climatic episodes defines forests as a natural insurance (Aznar-Sanchez et al., 2018 and KEFRI, 2018). Thus, forests remain an incredibly a livelihood source to human globally, however, most of forests consumptive commodities exhibit non-excludability characteristics (Abdullah et al., 2015; Caputo et al., 2016 and Aznar-Sanchez et al., 2018). Since forests services exhibit Samuelsson goods characteristics, then its productivity ought to be government role as described by public good theory (Keleman 2016). However, the dwindling forests cover which consequently impedes biophysical functions that result into

reduced stock flow of consumable forests commodities to the ever increasing population globally, and/or reduced ecological functions, needs rethinking in terms of production in scale, protection and conservation.

Despite forests being an important biophysical livelihood source to humans especially for adjacent community, however, its existence faces monumental threat from overutilization for short term gains by forests resource consumers, and unprecedented degradation from anthropogenic activities (Abdullah et al., 2015; Caputo et al., 2016 and KEFRI, 2018). Consequently, continuous degradation of forests resources from anthropogenic activities and annihilation of forest land puts community survival at perilous state, especially to households that largely depend on forests as livelihood source (Langat et al., 2016). Although studies show the existence of several forests conservation strategies (Pandey et al., 2016; Aznar-Sanchez et al., 2018 and Luswaga & Nuppenau, 2020), however, degradation menace from anthropogenic activities still persist, signalling weakness of the existing conservation strategies (Langat et al., 2016). Presences of numerous conservation strategies that are traditionally being used to promote forests conservation is explained in the studies of (Abdullah et al., 2015; KEFRI, 2018 and Luswaga & Nuppenau, 2020). These existing conservation approaches can be distinctively categorized into two main strategies. Firstly, are conservation approaches that relies largely on mechanism of law enforcement, and secondly, the use conservation incentive such as payment for environmental services and/or self-governance by community i.e. public participation processes (Aznar-Sanchez et al., 2018 and Luswaga & Nuppenau, 2020). The use of incentives in forests conservation at the micro unit level of the society could incentives resource supplier to upscale conservation stewardship resources than the use of law enforcement (Abdullah et al., 2015). As explained in the studies of (Abdullah et al. 2015 and Hein et al., 2018) that, the use of law enforcers bears immense budgetary constraints to the government through provision of remuneration, breed conflict between law enforcers and community, and create bureaucracies that contribute to government failure (Hein et al., 2018). In a way, inefficiency in using enforcements strategies points out the existence of gap as defined in public good theory where production of forests commodities is the role for government. Therefore, mixed forests conservation strategies that involve government role and private sector in policy formulation and decision making is suggested to be a viable option that would guarantee forests resources sustainability (Hein et al., 2018).

From growing body of research, public participation is acknowledged as an emerging incentive tool in forests conservation, though its use is still rudimentary (KEFRI, 2018; Lund, 2018 and Luswaga & Nuppenau, 2020). Public participation is on the raise in terms of promotion by policy makers and resource managers as a strategy that enhances equitable utilization of resources, and shared decision making down to micro unit level in the society (Lund, 2018). Further, recognition of public participation as an important socio-economic incentive tool at micro level for community forests conservation realm has been buttressed as part of the regulative framework in various developed and developing economies (Bruña-García & Marey-Pérez, 2014; KEFRI, 2018 and Luswaga & Nuppenau, 2020). Remarkably, the regulatory framework in Kenya that promotes community involvement in forests conservation decision making has been in

place since 2005, which was further enhanced by the new decentralization governance under the new supreme law promulgated in 2010 (GOK, 2010). The underlying assumption is premised on the fact that the adjacent communities to the forests are the immediate beneficiaries; hence, posses the required incentives (Bruña-García & Marey-Pérez, 2014). Although community participation is staked to be an incentive that motivates the resource provider to upscale their forests conservation stewardship, however, the conservation measure that result when communities at micro level are engaged in conservation decision making remains uncertain (Mutune & Lund, 2016 and Luswaga & Nuppenau, 2020).

That notwithstanding, community participation varies in context as suggest by studies of (Bruña-García & Marey-Pérez, 2014), which suggest to be influenced differently by deterministic factors (Musyoki et al., 2016; Mutune & Lund, 2016 and Waruingi, 2021). That's, these studies brings different interpretive meanings and diverse figurative sense, which creates knowledge that informs the need for in-depth studies. As pointed by (Abdullah et al., 2015 and Langat et al., 2016) that consumptiveness of forests resources by the communities that live adjacent and that live far beyond, portrays different consumptive characteristics. Owed to heterogeneity in consumptiveness of natural resources by households, there is blurred distinction from literature that demonstrates the probable impact of public participation. For instance, the study by (Mbeche et al., 2021) on the use of binary measure of yes or no to indicate the public participation measure by households as an expression to join conservation program, revealed to be too abstract to distinguish in a figurative sense the impact of public participation process. That's, assessing the level of community engagement in decision making in conservation realm as binary choice can conceal the complex nature in quantitative forms. Similarly, study by (Zheng & Holzer, 2013) analysed impact level of public participation using score range between 0 to 1 on global use of E-participation in government policies and program that include natural resource management. The result from the study showed an average score of the popularity rating was below 0.5 on the use of E-participation, however, the study failed to define a comparative figure of the accrued benefits of "before" and "after" when community were engaged in decision making. Again, studies by (UN E-Government Survey, 2010 and Democracy Index, 2012) used indexes, which emanated from scores, as a measure of public participation levels. In particular, democracy index measure, which define the level of democratization the country has, is based on five thematic areas; electoral process and pluralism, civil liberties, governance space, political participation level, and space of political culture in resource management (Democracy Index, 2012).

This study aims at defining a possible influencing level when involvement of households' as micro unit level in the society in decision making to conserve forests via foregone income. Again, understanding the deterministic factors that influence households' decision making in forests conservation is of essence. That's, understanding specific parameter estimators allows the formulation of robust policies and development of sound conservation programs by policy makers and resources managers. Therefore, based on knowledge gap in understanding the influencing variables of households on public participation, this study analyses various demographic variables that are either support or impede rural

Theory and Conceptual Framework

Consumer theory postulates the rational decision making in regard to scarce resource use by micro unit in a society. Past studies of (Bhahtacharya, 2015 and Barbier et al., 2016) explain the significant of resource price in depicting consumptive behaviour of resource user. Consumer behaviour under consumer theory explains underlying factors that influence the price shift of the commodities demanded in the market (Wichmann et al., 2016). In context to this study, the price contribution variance arising from individual and collective community engagement to conserve natural resources could explain consumer behaviour. However, a challenge may arise in pricing of forests provisions because they exhibit non-market and/or non-excludability characteristics. Despite this pricing challenge, however, environmental economics have adopted the use of hypothetical market by formulating a market scenario that could reveal the price of ecosystem services by utilising expressed willingness to pay (WTP) and/or willingness to accept compensation (WAC) valuation approach. Therefore, the concepts of using expressed willingness to pay (WTP) in this study was to reveal households' forests conservation aspiration in figurative perspective, which is derived from consumer theory, was appropriate.

The use of expressed conservation price value (WTP) was to reflect the altruistic act in forests conservation activities by resource suppliers. The act of defining conservation value using utilities can be defined in Hicksian compensation variation equation function as;

$$EV = U^1(WTP, Q) - U^0(WTP, Q) \quad (1)$$

Whereby; $U^1(WTP, Q)$ and $U^0(WTP, Q)$ defines households' utility functions. The superscript 0 and 1 indicates a situation "before" and "after" households were engaged in public participation process, and U is the utility in the respective situation. The difference in the utility functions of "before" and "after" in equation (1) illustrates the Hicksian equation function, which defines the threshold impacted of the participatory approach in forests conservation at micro unit level of the society. Therefore, when expected environmental quality from envisaged participatory conservation approaches by community is disregarded, then, the Hicksian equation function can be rewritten as;

$$Public\ Participation\ Measure\ (PPM) = U^1(WTP) - U^0(WTP) \quad (2)$$

Juxtaposing the definition of the utility function to that public participation in Hicksian equation, both EV and PPM values defines the maximum amount of price a resource provider is willing to pay in a situation that public participation process is introduced and/or practiced at community conservation project and programs. It can also be interpreted to mean impact threshold from public participation process in forests conservation projects and programs. Therefore, this study interprets the PPM value as a benefit gained from engagement of community public participation in forests conservation activities for sustainable forests stock flow and/or environmental quality (Q) for intra and inters generation equity.

Nonetheless, participation in forests resources governance is assumed to be influenced by arrays of socio-

economic factors (Mutune & Lund, 2016 and Waruingi, 2021). A wide body of literature portrays that demographic characteristic of resources user may impede and/or incentivize the opportunities of participation in forests conservation programs. For instance, the cost of community participation may take the form of monetary contribution (Adhikari et al., 2014). In particular, constrains of time, and high demands from low income rural homes impedes community participation in forests conservation activities (Yego et al., 2021). Therefore, to determine the influence of each socio-economic factor, inferential tests using OLS regression model on PPM as dependent variable in this study was done. The selected independent variable in this study includes; age, family size, education level, households' income, land size and distances from homestead to the edge of the public forests, while dependent variable was the marginal increase of expressed WTP from two scenarios of inexistence and existence of community participation.

METHODOLOGY

This section describes the study site in terms of geographical position, demographic characteristics and main socio-economic activities carried out by the population. Again, the section highlights the conceptual theory, data collection procedures and measurement strategies.

Description of the study area

This study was done in the rural areas of Uasin Gishu County, Kenya. The geographical location of the study area lies between the latitude and longitude between $0^{\circ} 30'$ and $0^{\circ} 55'$ North and $34^{\circ} 50'$ and $35^{\circ} 37'$ East, respectively (KEFRI, 2018). The low forests cover of about 7%, high level of forests resource dependency, high degradation of already low and/or diminishing public forests from anthropogenic activities informed the selection of the study. Again, ownership of large tracks of land by individual households in the study area, which has potential to support communal agro forests adoption in private lands also motivates the selecting of Uasin Gishu county as a study area. The landscape of the study area is characterized by quasi undulating topography with most areas being flat, which necessitate land mechanization (NEMA, 2013). Therefore, the major economic activities in the study area are mixed farming, especially dairy and crop farming (NEMA, 2013). Again, the soil types of Oxisols on hill slopes and Luvisols at bottoms of the hills influence households' agricultural activities (KEFRI, 2018). The rainfall pattern depicts bimodal type with unclear distinction of rainfall distribution between the two seasons, which supports agricultural productivity in the study area (NEMA, 2013). The study area is regarded as dependable watershed areas for Lake Victoria basin areas. Since water provisions to downstream water users is dependent on the level of forests cover, which forests provides regulatory services as underground water reservoirs (KFS, 2015), however, low and diminishing forests cover in the study area puts water users at downstream areas into perilous state. The permanent rivers, which majority forms wetlands, include Moiben, Little Nzoia, Sergoit, Ellengerine, Endorota, Sosiani and Kipkaren (KFS, 2015). Therefore, motivating rural homes to adopt community conservation through participatory approach, could improve forests resource provision to the adjacent and far living population, and also reduce public forests resources dependency.

Samples Size and Sampling Procedure

This study used multi-stage approach in identifying the sample units during data collection. The clustered administrative units to

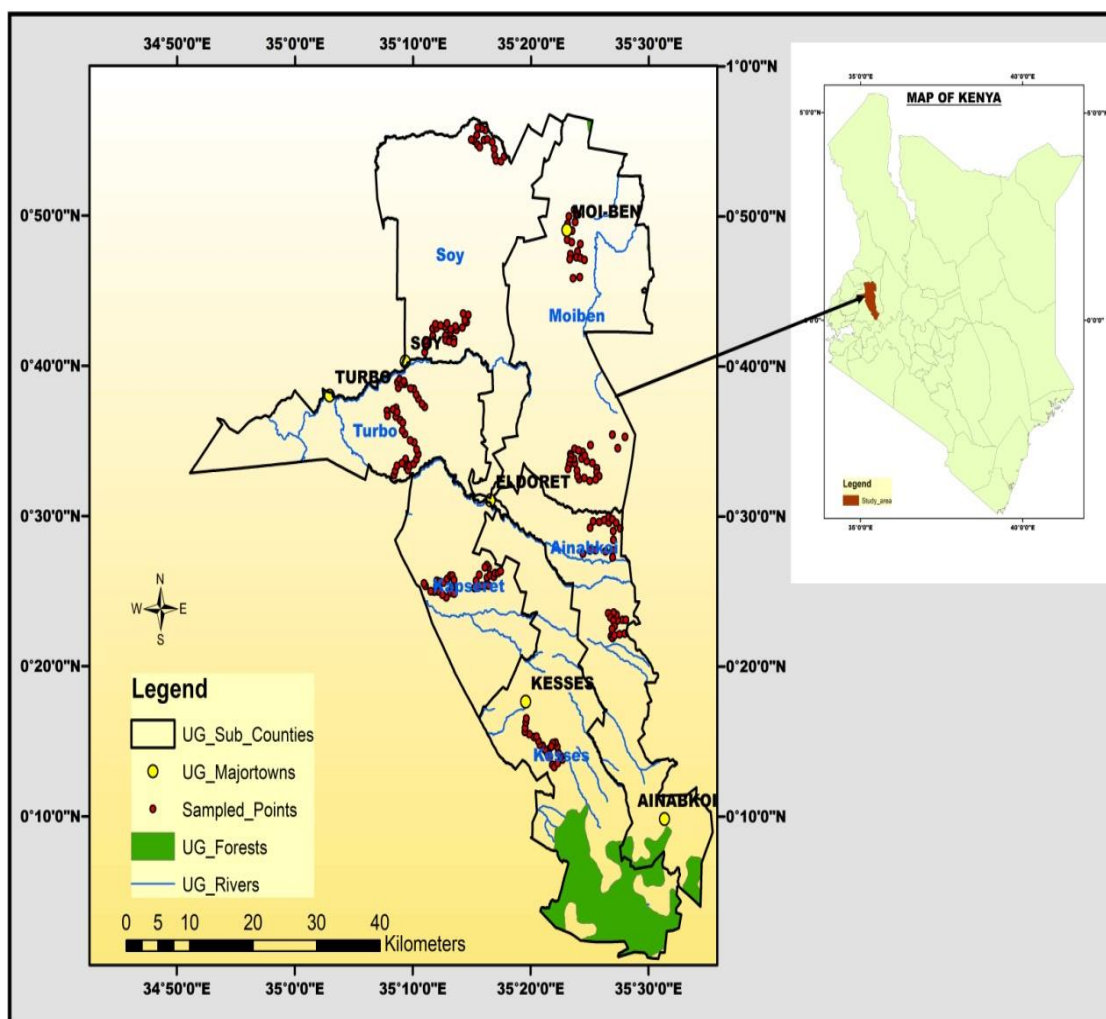
allow identification of sample units in multi-stage sampling procedure were from sub-county administration units down to location level. The location level was the lowest administration unit identified in this study. The exclusion criteria used were the locations that had major urban areas. From identified sample units, systematic random sampling was employed in selecting households for interview, whereby right hand rule approach was employed. To achieve randomness, the first households from reference point such as road junction, church or school gate as starting point was identified for interview, while subsequent respondents for interviews were selected from every fifth households on the right hand of the selected route (Fig. 1).

The deemed appropriate sample size that were required for sampling in this study that reflect scientific inference to the entire population was achieved by using the following formula (Kothari, 2004);

$$n = \frac{NC^2}{C^2 + (N-1)e^2} \quad (3)$$

Where; n – Size of the sample; N – Population size; C - Coefficient of variation at (95%), while e is the standard error at 5% level

The targeted population in this study were the rural homes of Uasin Gishu County, while appropriate households as samples which were drawn from sample formula in equation (3) were 224. To gather for the spoiled, unclear and/or incomplete questionnaires, additional of 10 households which represent about 5% of the samples were interviewed to make 234 households. Location was considered as the lowest level of administrative unit in this study, while household was viewed as the basic unit that could manifests public participation in community conservation programs and/or projects.



Information Sought and Measurement Procedures

To determine influence of public participation in community conservation programs and projects, two hypothetical market questions in the structured questionnaire were formulated. The sought information in the first hypothetical market question that was formulated was the expressed WTP value for forests conservation by the respondents. While, the second hypothetical

market question was formulated to tests the influence of public participation in community conservation program and project through democratically elected community leaders. The following are the two distinguishable scenarios of the hypothetical market questions formulated;

Scenario I; From the development initiative of the programme Upscale Tree Planting for Future Generation that I did earlier explained to you with the theme “*Improving Forest Cover and Wellbeing of Future Generation by planting trees in woodlot*” which is aimed at increasing forest cover for improved livelihood for your future generation; if you are asked to contribute some amount of money yearly to a trust fund account (Escrow account) aimed at supporting the tree planting program to households willing to plant trees in woodlot and bequeath instead of allocating land as earlier stated. Here I ask you what is the amount of money that you are willing to contribute yearly to support sustainable forest cover program? (Kshs).....

Scenario II; Details on forest cover programme “*Upscale Tree Planting for Future Generation*” entails yearly contribution of fund to a created trust fund account (escrow account) that will be deposited by individual and/or organisation to support household that will allocates their land for bequeathed trees in woodlot. The committee will be formed to represent diverse stakeholders in the programme with the team formed will be tasked to manage the trust fund contribution and also in making policy decision in regard to the said funds. Since you are the main stakeholders and a beneficiary of the contributed fund in case you allocate land for woodlot, you will be included in the committee through democratic elected representative from your village. Since you will be part of the management of the pooled funds through community representative, then how much money are you willing to contribute on top of what you mention above? (Ksh).....

The differences of expressed WTP values from two formulated hypothetical markets scenarios above, defined the estimated contribution of public participation in forests conservation at micro unit level in the society. To demonstrate the procedure of determining public participation contribution measure from the formulated hypothetical market questions, the following equation function was used;

$$PPM = WTP^1 - WTP^0 \quad (4)$$

Where; PPM represents public participation measure, while WTP^1 and WTP^0 represents a scenarios when community are engaged and the later is when there is no engagement in decision making and management in forests conservation through public participation, respectively.

To determine influence of socio-economic variables when public participation engagement is established in forests conservation realm, inferential tests using OLS regression analysis was performed. Socio-economic variables which formed regression model estimators were age, gender, family size, years in formal education, households’ income and distance to the edge of public forests, while public participation measure (ppm) was dependent variable. The information and/or data collected from the rural homes were transformed into natural logarithms to allow ease interpretation of the analysed data. The equation function that illustrate OLS regression model in this study is defined as follows;

$$LnPPM = \beta_0 + \beta_1 LnX_1 + \dots + \beta_n LnX_n + \varepsilon_i \quad (5)$$

Where; $LnPPM$ - natural log of public participation measure value; β_0 - constant value of regression model; $\beta_1 \dots \beta_n$ - coefficient value of the selected socio-economic variables; $LnX_1 \dots LnX_n$ - natural log of the parameter estimators, and ε_i - is the random factor of the model.

However, some of the data collected in this study encompassing dummy variable, which pose difficulty in linear probability to be estimated and/or constrained into intervals that gives a meaningful interpretation. Therefore, to have meaningful interpretation from statistical binary function, maximum log likelihood method with definitive interval scale was used. The logit model, which is one of the Log Likelihood Method, was deemed appropriate in this study for analyzing probability tests. This is because logit model uses the coefficient value to transform binary response into probabilities within a defined interval of 0 and 1. The meaning of the computed logit model value ($P(i)$) of the respective parameter estimator closer to 0 reveals to have lower influence than that with value closer to 1. Therefore, the logit model function used can be specified as follows;

$$P(i) = \frac{1}{1 + e^{-\beta_i X_i}} \quad (6)$$

Where; $P(i)$ – Probability of parameter to influence public participation; β_i – Coefficient of parameter estimators, and X_i – The selected parameter estimators

The selected parameter estimators are postulated to influence community participation in forests conservation programs and projects. Therefore, the significance influences of selected socio-economic variables in regard to public participation in this study was analysed in resonance to the following study themes;

- *Households’ demographic characteristics:* age, family size, gender income and education level has potential to influence households to engage in public participation in community forests program and projects.
- *Nearness of public forests to households’ homestead:* The closer the public forests to the homestead define the demand of forests product to the households and/or community; hence, distance to the forests from homestead has the potential to influence households to participate in community conservation programs and projects.
- *Existence of woodlot in households’ farms:* The presence of woodlot or agro-forests practices in households’ farms defines the satiation effect for respondents’ participation in conservation programs.

Households land size: Land is regarded as capital assets: hence, the larger the land size that households’ own the greater the propensity to influence participation in farming conservation program.

Results and Discussion

Impact of Public Participation in Forests Conservation Activities

Effect of community participation in environmental conservation projects among rural homes in this study was tested using expressed willingness to pay approach by stating the price when community get involve through democratically elected representatives in decision making and when they are no representation. The results in Table 1 show two means of expressed willingness to pay values for forests conservation when community are involve in decision making and when they are not.

Table 1: Table Showing Expressed Conservation Price Using Stated Ecosystem Valuation Approach.

Variables	Frequen cy	Mean Value	S.D
WTP	234	363.25	196.36
WTP when community are involved in decision making	234	583.76	296.32
Marginal increase of WTP in numeric	-	220.51	-
Percentage increase of WTP	-	60.70%	-

Source: Author; n=234; **Note:** Mean Values are presented in Kenya shillings

The findings showed that respondents were willing to increase their conservation contribution to about 60.70% when given a chance in decision making through democratically elected community members. This incremental contribution expressed by respondents could perhaps be manifesting from perceived expectation of benefits flow from enhance management in resources conservation. Studies of (Narayanan, 2015; Cermeno,

2016), pointed out that the truthful platforms that inculcate participation, offers transparency, accountability, and restores self-belonging and esteem to the community, will ultimately enhance resources management. Therefore, involvement of community in decision making is appropriate as depicted by incremental contribution from the study results. It could also mean that participation process is a socio-incentive tool that motivates resources supplier to contribute for the conservation of natural resources. However, result of high standard deviations from expressed WTP values in two hypothetical market scenarios, implies that the existence of inherent and undefined factors that might either support or impede conservation contribution among the respondents.

Determinants of Public Participation in Forests Conservation Activities

Inferential tests statistics using OLS regression model was performed to determine the influence of selected socio-economic variables on households' public participation in forests conservation. The selected socio economic variables in this study were; age of the respondents, the family size, years of respondents in formal education, households' income and households' land size, the distance of homestead to the edge of the public forests and households with existing woodlot in their farm.

Table 4.11: Statistical Tests of Selected Variables that Influences Public Participation

Variables, ($\ln$).	(β_i)	(P_i)	S.E	t-test	Sig. level	VIF
Constant	0.465					
Age	0.084	52.1%	0.276	0.305	0.760	1.622
Family Size	- .028*	49.3%	0.229	- 0.121	0.054	1.982
Education Level	0.229*	55.7%	0.218	1.052	0.092	1.274
Households' Income	0.281**	57.0%	0.104	2.694	0.008	3.115
Households' Land size	0.036	50.9%	0.116	0.314	0.754	4.520
Distance to the Forest	0.044	51.1%	0.051	0.865	0.388	1.045
Households with Woodlot	0.003	50.1%	0.095	0.027	0.978	2.314
Stochastic variable	0.994***	73.0%	0.037	27.094	0.000	1.000
Adjusted R ²	0.096					
F value	4.328***					

Source: Author; **Note:** n=234; β_i = Coefficient of the Variable; S.E = Standard Error; Sig. level (p-values) are in parenthesis *** p< 0.001, ** p< 0.05 and * p< 0.1; P_i = Logit Model Values in (%); VIF = Variance Inflation Factor.

The results from multi-collinearity test based on Variance Inflation Factor (VIF) analysis of predictor variables in the OLS regression model were below 10, which suggest non-existence of variables dependency and/or co-linearity. Results of ANOVA tests, which explains the level of goodness of fit among selected parameters in OLS regression models showed to be statistically significance at F = 4.328, (p< 0.001) affirms non-existence of dependency among selected predictors as reflected by VIF in the model. Whilst, the result of adjusted R square at 0.096 or 9.6% when converted into

percentages, explains the level or proportion of predictor's variation in the model.

Findings from regression analysis showed diverse significant influence of either positive or negative for households to engage in community participation and/or contribution in forests conservation stewardship. In particular, the variable of family size, which showed to be negative and statistical significance in influencing decision making at (t = - 0.121, p< 0.01), while proportion of probability was at about 49.3% to influence participation. This result implies that large family members impede

household to engage in community conservation programs. That's, the larger the households members tend to have higher exposure to financial shocks, hence, their income vulnerability dissuade their participation. Again, perhaps, their large families demand them to be economical to engage in community undertakings because of high consumptive demand from scarce and dwindling forests resources and/or they have high opportunity costs for conservation activities. This results was concomitant with the studies of (Mbeche et al., 2021).

The selection of years in formal education as variable in this study was to find out whether formal education had bearing in influencing households to engage in community participation in forests conservation programs and activities. From the results, the variable of respondent's education level showed to be positive and statistical significance at ($t = 1.052$, $p < 0.1$) and probability to influence participation was at about 55%, implying that households heads with higher formal education were willing to participate in community programs. This may be explained by the fact that having higher formal education allows individuals to understand the significance of community conservation, and thus his/her participation is appropriate. Findings from other studies of (Rhuweza, 2008 and Mutune & Lund, 2016) showed to be in agreement with this study. Their explanation in regard to positive influence of education level was that social and scientific knowledge gained in formal education spectrum tends to act as motivator for rural homes to upscale forests conservation practices.

Again, study results showed that annual household's income was positively associated at ($t = 2.694$, $p < 0.05$) in influencing rural homes to participate in community forests conservation. While the probability of variable of household's income to influence households to engage in community forests conservation based on logit model analysis was at about 57%. This finding suggest that existence of marginal increase in income is associated with households having income surplus that can be used to meet impromptu households' expenditure, idiosyncratic and/or covariate financial shocks. Also, it could, perhaps, suggest that increase on income allows households to engage in diversification to other livelihood source that include environmental investment. This finding is consistent with studies showing that increasing income to household could provide capital muscle needed for households to have new investment or reinvest (Coulibaly-Lingani et al., 2011 and Tadesse et al., 2017). In addition, inclusion of random factor in analysis in this study, which represent unobserved and/or omitted variables in OLS regression model, the findings showed to be positive and statistical significant at ($t = 27.094$, $p < 0.001$) in influencing households decision making to participate in community forests conservation. This finding suggests the existences of some critical influencing parameters estimators which remain unobserved or were omitted in the model. As such, it creates a knowledge gap that needs indebt investigation by incorporating other parameters estimators that were beyond the scope to this study.

Although, other socio economic variables such as age, and variables that depicts culture of utilizing forests resources i.e. households' land size, distance from homestead to the edge of the forest, and total household utilities showed to be non-critical; however, its direction of association remains to be important for consideration in the formulation of public participation policies in community forests conservation. In particular, the variables of age which showed to be insignificant, yet, was positively influencing

public participation, imply that households with elderly heads were most likely to participate in community conservation than youthful household heads. This may be explained that experience gained over years could be significance to influence the households to participate. Similar findings have been observed in the study of (Tadesse et al., 2017). Again, variable of households' land size as households' assets for on-farm income and a site for practising conservation activities such as woodlot adoption or agro-forestry showed to be positively influencing public participation, though, it revealed to be statistically insignificant. This finding suggests that households with large track of land were inclined to participate more. Perhaps, owed to their natural capital base of their land may reflect to have better income; hence, their willingness to participate. Other studies have indicated that the variable land size to have positive influence in households' decision making to participate in community undertakings (Mbeche et al., 2021)

Further, a distance from homestead to the edge of the forests was included to represent demand on consumptive forests resources by households. The finding showed that distance to the edge of the public forest had positive association with the level of community engagement in forest conservation activities. This could suggest that forests resources to rural homes are important economic good that remain to be dependant as livelihood source (Adhikari et al., 2014; Mutune & Lund, 2016 and Musyoki et al., 2016). However, other studies have showed a contradictory finding in regard to the association of distance to the forest and public participation planning (Tadesse et al., 2017). Despite parameter estimator of households with existing woodlot on their farms showed to be non-critical, however, their association was positively influencing public participation. This positive relationship could indicate that the perception of household having woodlot and/or practiced agro-forests in their farms increases the propensity of that household to engage in community participation. This finding gives a contrary perception in regard to satiation effect on natural resources, rather, it bolster the households that are already practising conservation farming to upscale more such as agro-forests or woodlot tree planting

Conclusion and Policy Implication

Community engagement in resource conservation has been taunted as good mechanisms for improving the quality in resource management. However, the proportion and/or measurement level that public participation processes could contribute in forests conservation remain unmeasured. Therefore, this paper contributes to an understanding on the level that public participation could contribute in the management of natural resources, in particular, forests at micro unit level in the society. Also, the paper contributes in the understanding of households' demographic factors that impedes and/or motivate resource supplier to engage in community forests conservation activities. The result revealed that public participation in resources management could motivate households at twofold to engage more and/or improve the existing conservation practices at micro unit and/or as a community. Consistent with other studies, inculcating public participation in natural resource management shows to be an important socio-incentive factor that needs to be considered while formulating policies and conservation programs.

Despite public participation being significant socio-incentive factor in resource management, however, some selected socio-demographics factors in this study revealed to influence

households decision making to engage in community conservation activities and/or programs in various ways and levels. In particular, the result revealed that the age of the household head, years in formal education, households annual income, land size, distance to the edge of the forests and households with existing woodlot in their farm were positively influencing households to engage in community conservation program, while family size showed to have negative influence on participation. Specifically, increasingly numbers in the family, though statistical significant, showed to constraint participation, while educational level and households' annual income were significant in incentivizing participation. However, their level or degree and/or propensity to influence participation differed across all the selected socio-demographic factors in this study. That notwithstanding, the random factor, which represent unobserved and/or omitted variable in this study, showed to strongly influence community decision making to engage in conservation program. The significance of a random variable reveals a Knowledge gap that informs the need for further investigation by incorporating variable(s) that are beyond the scope of this study. This will unearth their implication of the omitted factors that influences participation. These study result point out the need to contextualize the direction and the degree of influence of each variable while formulating policies and conservation programs by policy makers and resource managers. Therefore, incorporating these critical socio-incentive factors could have a far reaching implication to the community such as enhanced management of natural resources, and subsequently, improved ecological outcomes and livelihoods to the households.

Acknowledgment

The author wish to express profound appreciation to all respondents for providing critical information's which facilitated successful completion of this study.

Conflict of interest

The authors declare non existence of competing financial and/or personal interests that could have motivated to influence this study write-up.

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