Factors Influencing Involvement of Local Communities in the Fishing Industry in Lake Victoria, Tanzania: From Production to Marketing

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Abstract

A large number of local communities surrounding Lake Victoria in Mara, Kagera and Mwanza regions in Tanzania earn their living from fishing industry. The industry is based on various types of fishes but Nile perch and sardines are the most predominant species. Through sample size of 432 respondents, selected randomly from those regions, factors influencing involvement of local communities in the fishing industry have been identified. The identifications are based on descriptive statistics and logistic regression models. The results on fishing production show that several factors influence positively involvement in fishing industry. Among them are ability to fish and significant ($p<0.10$), household size and significant ($p<0.05$). Those influencing negatively are also several. This includes number of dependants in the household and significant ($p<0.10$). Factors influencing involvement of fish processors are many. This includes household size and significant ($p<0.10$) while negatively is age of household head and significant ($p<0.10$). Similarly, factors influencing marketing are long list. Influencing positively is household size and significant ($p<0.01$). Negatively are number of dependants and age of household head and significant at 0.01 and 0.05 levels respectively. It is concluded that socio-economic factors such as abilities, sensitisation through education, transportation (distance from the beach to nearest town), gender and household size, district and tribe be considered in depth as they influence involvement of local communities in the fishing industry. Along side these factors, it is recommended to know the effect of involving local communities in the industry, especially on the management of the lake Victoria through using policy, regulations and laws.

Keywords: fish production, processing, marketing, ability, socio-economics

Introduction

Local communities around Lake Victoria in Mara, Kagera and Mwanza regions, Tanzania are involved in fish production, processing and marketing due to the fact that fish industry plays important role on their living. According to FAO (1989) cited by Bwathondi (2000), in between 1987 and 1989, about 37-39% of Tanzania's total consumption of animal protein was derived from Lake Victoria's (LV) fish. That was equivalent to 50% of total fish supply in Tanzania. Furthermore, fishing industry created employment to about 13,172, 5,192 and 1,700 fishermen/women in production in Mwanza, Mara and Kagera regions in 1994 respectively (URT, 1997, 1998a 1998b). In addition, reliable supply of fish enabled construction of several fish fillet processing industries in those regions. In 1997, Mwanza and Mara had 7 and 1 industries respectively.

Despite the important role of fishing industry, the returns are not sufficient. This is evidenced by poor livelihood experienced by communities relying on fish industry. For instance, fishermen live in grass-thatched houses, which are not hygienically recommended and malnutrition is still prevalent (Onyango, 1999). The levels of incomes for most of fish dealer's are very low (LVEMP, 2000). The employment opportunities are decreasing over time (Jansen, 1997). The causal reasons of these deficiencies are many.

Among them is ineffective involvement of local communities in the fishing industry.
From 1990s, involvement of local communities in the fishing industry has changed from traditional and subsistence level to an industry, characterized by a high level of commercialisation at both production and distribution (Jansen, 1997, Geheb, 1999). These changes have displaced local fisher folk and have reduced their capability to efficiently participate in the industry.

In order to increase capability of fish men and women, it is necessary to promote their involvement in the fishing industry. This is because participation generates effective returns on investment. For example, in 1998, the involvement of communities through district councils of Sengerema, Missungwi and Mwanza City council facilitated greatly the reduction of destructive fishing work (URT, 1999)..

As such, the objective of this paper is to identify factors influencing involvement of local communities in the fishing industry. It is expected that the highlighted factors will help local communities and policy makers, researchers and law enforcers to manage the lake by using established fishing policies, regulations and laws effectively. In all these aspects, it is assumed welfare of local communities will be raised through attaining their benefits and reward in the fishing industry.

Methodology

Research areas and selection procedure
The research covered Mara, Kagera and Mwanza regions. In these regions, districts were selected using simple random sampling. Geita, Mwanza and Magu districts were selected from Mwanza region. Bukoba and Biharamulo districts were selected from Kagera region while Bunda and Tarime were selected from Mara region. The criteria was to select 2 districts per region but Mwanza had 3 three districts because it has more districts along the lake as compared to other regions.

Sample size
The sampling size was calculated using formula formerly adopted by Casley and Kumar (1988) and refined by Colman (1999). The formula is shown below.

$$N = [(Z * C) / X]^2 \quad (1)$$

Where

N= required sample size,

Z= the value of (Z - score of standardized normal distribution) the confidence level (preferred %) required in covering the population per beach.

C= the coefficient variation of the measured variable (calculated through dividing standard deviation by mean and then multiply by 100).

X= the required level of precision in percentages (taken from various empirical documents)

By substitution (equation 1)
When confidence level is 95%, Z = 1.96 (2- tail), C= 13%, X= 6 %
Finally, N= $[(1.96 * 13) / 6]^2$ = 18.034 respondents per beach. The estimate was rounded to 18.

On observation, the maximum interviewed respondents reached up to 18 but minimal dropped to 15 per beach and this was considered as a fair representative. The numbers of respondents per region are as shown in Table 1 and by districts are depicted in Table 2. Table I reveals that over two fifth of respondents came from Mwanza region and this is because the region possesses more districts as compared to other remaining regions. The total number of respondents was 432. District wise, the highest number of respondents came from Magu (70) and lowest from Biharamulo (56) (Table 2).

Table 1: Total number of respondents by region

No	Region	Total respondents	%		
1	Mwanza	191	44.21		
2	Mara	126	29.17		
3	Kagera		26.62	**Total**	**432**
		Source: Research survey 2000/01			
		115			

Table 2: Total respondents by districts

Regions	**No**	**Districts**	**Respondents**	**%**
	1	Tarime	59	13.7
Mara	2	Bunda	67	15.5
	1	Magu	70	16.2
Mwanza	2	Mwanza	59	13.7
	3	Geita	62	14.4
	1	Biharamulo	56	13.0
Bukoba	2	Bukoba	59	13.7
Total	**7**		**432**	**100**

Source: Research survey 2000/01

Tools for data analysis
The collected data have been analysed using descriptive statistics, logistic regression models, linear regression and correlation method. These were preferred because they are efficient and enable interpretation of socio-economic data precisely.

(i) **The descriptive statistics**. This comprises of frequencies, cross tabulation and percentages. The tool is affirmative for general comparison of different variables or variation of events. It is widely used in computation of various categories and shows easy interpretation of the results. It is suitable in this study because it helps to distinguish the groups.

(ii) **Correlation analysis**. The method shows relationship between two different variables. The correlation may be negative or positive. The tool is useful as it

helps to verify whether relationship between two variables exists, as well as indicating the magnitude of the correlation. Low correlation means poor relationship and vice versa. Its modes of operation are simplified below. However, applied in few cases in this content.

$$Y = \sum_{i=1}^{n} \beta X_n \qquad (2)$$

Where

Y= dependent variable
X_n= nth independent variable
β= coefficient of the variable X

(iii) **Simple linear regression model**. The model tests strengths of explanatory factors on the dependent variable. It is useful because its products show the implications of the system. The frame of the model is shown below but used only in specific areas.

$$Z = b + \sum_{i=1}^{n} eK + f \qquad (3)$$

where

Z= dependent variable,
K= independent variables,
b= constant term,
f= error term,
e = regression coefficient of variables K

(iv) **Logistic regression model**. This model operates as linear regression but differs on the value of dependent variable. Its dependent variable must be in binary values (either 1 or 0) (Gujarati, 1995). The values are obtainable on two ways, either transforming the old dependent variable values into new codes or may be they are in binary terms. It uses the principle of probability. Its design is as shown down.

$$prob\ [P(1-P)] = m + \sum_{i=1}^{n} d_n R_n + w \qquad (4)$$

Where

P= probability of participating in fishing industry (production, processing and trading)
R= independent variables (continuous or binary ones), m= constant term, w= error term, d= regression coefficient of independent variables.

Results and discussions

Factors influencing fish producers

Descriptive statistics show 35 out of total 194 respondents replied that they had ability to fish while 159 or 82.0% had no ability to fish. Although small proportion of fish producers had ability to fish, logistic model finds that FABILITY (Fish Production Ability)was significant ($p<0.10$) factor which influences involvement in fish production. The finding is correct since ability shows various issues like experiences, skill and capability. Another factor was HHSIZE (Household Size), which influenced positively the involvement of local communities in fish production and significant ($p<0.05$). In a sample of 416 respondents, the mean of household size was 7.50 where by minimum was 1 and maximum was 45 people. Household size being significant is a rational behaviour since large households are able to provide necessary labour force. Although factor was DISBCH (Distance from Beach to nearest town), as it influenced involvement in fish production, it was insignificant factor. Survey in 376 respondents, found that average distance was 25 Km. The furthest distance was 123 km and the shortest being 1 km (Table 22). Rationally, the shorter distance from the beach would be expected to influence more involvement in fish production than far distance from the beach. This is because transport costs and marketing problems are easily controlled.

On the other side, factors such as RESTB (Respondent Tribe), DPDNOS (Dependants numbers), RESAGE (Respondent Age), EDLEVEL (Education Level), and DISTNM (District Name) decrease the community involvement in fish production. The tribe decreases and significant at 0.05 levels. Despite the significance of the tribe, its correlation coefficient is not appealing, as it has approximately 0.2259. Proportionally, Sukuma are majority in the survey area, followed by Haya, and third is Jita (Table 23). Regardless of tribe significances, some tribes may have more experiences in fishing activity than the others. This experience may be traced from their ancestors or family. For example, fish dealers who have been devoted in fishing production for long years would automatically be more acquainted than a colleague who is knowledgeable for short period.

The next factor is the dependant numbers in the household (DPDNOS), which is significant at 0.10 levels. Its correlation coefficient is 0.2228 and generally low. Survey found that average number of dependants in the household was 6. The minimum was 1 and maximum was 44.

The role of education in fishing production has been minimum. This was due to the fact that over 80% of total respondents (N=431) possessed educational level not more than standard seven. In this case, about 12.3% had finished form four levels. Due to this shortfall, Levinger and Drahman (1980) study observed that less educated people lack confidence in their ability to perform any activity. Education cannot be ignored. As Nanai (1993) argues that education may promote community participation in development projects. She considers education as the basic factor for participation in community development activities. Surprisingly, in the present study educational level neither influence community participation nor correlates with fishing aspect. The correlation coefficient of education level and fishing industry was found to be zero (R=0),

which means there are no correlations between participation in fishing and education level. education level and district location are insignificant.

Survey of 432 respondents found that average age of communities involved in fishing industry is about 35 years. The minimal was 17 and maximum 79 years. It reflects the sensibility of fish production, which employs reasonable age of labour forces in the community. Similarly, Nanai (1993) found that the role of youths in community participation was more important than the elders. The low standard error of mean (0.48) explains that the calculated mean is a fair central tendency of the distribution. Results of logistic regression model for involvement of local community in fish production is as below.

Variable	B	S.E.	Wald	df	Sig	R
RESAGE	-0.1151	0.0806	2.0391	1	0.1533	-.0222
RESTB	-0.4850	0.1973	6.0433	1	0.0140**	-.2259
EDLEVEL	-1.0559	0.8454	1.5599	1	0.2117	.0000
HHSIZE	1.6174	0.6072	7.0952	1	0.0077**	.2536
DISBCH	0.0554	0.0348	2.5286	1	0.1118	.0817
FABILITY	2.2264	1.3091	2.8924	1	0.0890*	.1061
DPDNOS	-1.0887	0.4470	5.9328	1	0.0149**	-.2228
DISTNM	-0.8242	0.5138	2.5731	1	0.1087	-.0850
Constant	8.0606	4.4353	3.3028	1	.0692	

Note: Statistical significance of regression coefficients is as follows: **=p<0.05, *=p<0.10

Source: Research survey 2000/01

Where, B= regression coefficient, S.E= standard error, Wald = measuring t- test, sig = significance levels, R= coefficient of correlation

The summary of the model is shown as follows.

Involvement in fishing industry (producers)= 8.0606 - 0.1151RESAGE -.4850 RESTB - 1.0559EDLEVEL + 1.6174HHSIZE + 0.0554DISBCH +2.2264 FABILITY -1.0887DPDNOS - 0.8242 DISTNM

Factors influencing fish processors

Out of total respondents (N-83), 68.7 or 57 respondents replied that they use smoking for processing fish while 12% or 10 respondents use salting or sun drying and 19.3% or 19 respondents use frying. Experience shows that low-income fishers practice smoking method. Given that they lack capital, possibility of adopting modern techniques is very merge and therefore involvement in fishing processing is based on capital.

Logistic regression model found that household size (HHSIZE), distance from beach to nearest town (DISBCH) and processing ability (PROABL) are factors that influence positively involvement of local communities in fish processing. Household size was significant ($p<0.10$) but has a minimal correlation coefficient (0.1465). Distances from beach to nearest town and processing ability are insignificant and have no correlation with fish processing.

Respondent age (RESAGE) influences negatively and significant ($p<0.10$). Respondent tribe (RESTB) influences negatively but insignificant. Educational level (EDLEVEL) influences negatively and insignificant, number of dependents (DPDNOS) influences negatively and significant ($p<0.10$) and district name (DISTNM) influence negatively and significant ($p<0.10$). Fish processing model is illustrated below.

Variable	B		S.E		Wald	df	Sig		R
RESAGE	-.2159		.1286		2.8201	1	.0931*		-.1428
RESTB -.3617		.3326		1.1827	1	.2768		.0000	
EDLEVEL	-.4670		1.0600		.1941	1	.6595		.0000
HHSIZE 4.9201	2.9075		2.8635	1	.0906*		.1465		
DISBCH	.0062		.0431		.0206	1	.8859		.0000
DPDNOS	-3.9352	2.3405		2.8271	1	.0927*		-.1434	
DISTNM	-2.3455	1.2366		3.5977	1	.0579*		-.1993	
PROABL	1.6588		1.3114		1.6000	1	.2059		.0000
Constant 13.9173	8.5473		2.6512	1	.1035				

Note: Statistical significance of coefficient regression, *=p<0.10

The equation of the model is expressed below and dependent variable. = INVO= involvement in fish processing.

INVO=13.9173 -.2159RESAGE-.3617RESTB- .4670EDLEVEL + 4.9201 HHSIZE + .0062 DISBCH -3.9352 DPDNOS -2.3455 DISTNM +1.6588 PROABL

Factors influencing fish market

Description statistics show that three fifth (60.8%) of total respondents (148) were fishmongers. Most of fishmongers were local communities who operated in low-income business. They operate in small-scale levels, as they cannot compete with non-fishmongers who manage large-scale basis.

Moreover, 53% of total respondents (83) sold fish directly to local consumers. Non-local consumers were factory agents, other regions and market outside Tanzania. They accounted for 47% of total respondents. Breakdown, 6.8% of all respondents are factory traders who are in export market. They are specializing on Nile perch *Lates niloticus* while small fishmongers are left with sardines (R*astrineobola argentea).* The Nile perch is potential as far it has a wide market internally and externally (Gibbon, 1997). The market is advanced such that local sellers left with narrow opportunity to survive. This is because they are unable to compete with exporting companies for the fish production and marketing (Mitullah, 1996; Jansen, 1996; Gibbon, 1997).

For instance, managerial capabilities (Hisrich, 1986) or reactive to market signals (Binks and Vale, 1990) are important skill which is associated with knowledge. As such, local communities participate at low level because they lack basic enterprises.

The factors that influenced positively the involvement of local communities in fish market include RESSEX (Respondent Sex) but not significant. MSTATUS (Marital Status) and not significant. Others are DISBCH (Distance from Beach to nearest town) but not significant. HHSIZE (Household Size) and significant (p<0. 01).

Factors influencing participation but negatively include age, tribe, educational level, number of dependants and district location. In these factors, number of dependants and district location were more significant on reducing the participation in fish trading (P<0.01). Age RESAGE (Respondent Age) was also significant (p< 0.05) but educational level was insignificant. It was not normal as education was not supporting participation in fish trading.

The equation of the model is expressed below.
Involvement in fish trading = -7.0201 RESAGE-.1553 RESTB-.3080 EDLEVEL + .9234 HHSIZE + .0176 DISBCH -.6045 DPDNOS-.5846 DISTNM + 7.1853 RESSEX + 6.1698 MSTATUS.
Dependent Variable is INVO, which means involvement in fish trading. INVO takes the value of 1 if a respondent is involved in the fish trade, 0 if he/she is not involved.
The result of the model is as follows.

Variable B		S.E.		Wald	df	Sig		R	
RESAGE	-.0696		.0298		5.4692	1	.0194**	-.1416	
RESTB -.1553		.0845		3.3784	1	.0661*		-.0892	
EDLEVEL	-.3080		.3306		.8680	1	.3515		.0000
HHSIZE.9234		.2239		17.00451		.0000***		.2944	
DISBCH	.0176		.0147		1.4306	1	.2317		.0000
DPDNOS	-.6045		.1878		10.36751		.0013***		-.2199
DISTNM	-.5846		.1854		9.9462	1	.0016***		- .2143
RESSEX	7.1853		31.8002	.0511	1	.8212.		.0000	
MSTATUS	6.1698		25.8904	.0568	1	.8116		.0000	
Constant-7.0201	41.0347	.0293	1	.8642					

Note: Statistical significance of regression are ***=p<0.01, **=p<. 05, *=p<0.10
Source: Research survey 2000/01

Regardless of the findings, business is done due to basic motivation. As motivation for business growth cannot be assumed (Levie and Hay, 1998), it is positively correlated with business survival (Bridge *et al*. 1998). It implies fish trade is continuing developing since it gives livelihood to the owner. However, change of economic status of the society is likely to influence trade positively or negatively (Vyakarnam, 1999).

In addition to economic status in the business, other factor may be influencing to successes in trade. For instance, Alila and McCormick (1997) found that collaboration and frequent contact with large firms in the same line of Kenya's tourist businesses lead to faster business growth. Yet, Llewllyn (1994) cited by Kimeme (2001) observes that by behaving as outsiders to the community, some Sri Lankan traders distanced themselves from their customers and this enabled them to control the interaction between their social and business relationships to their economic advantage. Relatively, during the survey in beaches in Mwanza, Mara and Kagera, the same principle was noted as happening. Most of trader's especially factory agents were not cooperating or being closers to sellers. This may be due to some hidden agenda. The agenda is not known but price offered by factory agents was considered low and complain was not addressed by the concern. Who is the concern? The decision makers are to be blamed. Beside that Menkhoff (1994) observed further, that Chinese traders in Singapore deliberately cultivated trust with their trading partners and that trust was the single most frequently mentioned factor in connection with trading success.

Conclusion and recommendations

Conclusions

(i) Significant factors that influence positively the community participation in fish production are ability to fish and household size. However, factors that are significant but influence negatively community participation in fish production include tribe and number of dependents in the household. Educational level does not influence community participation and the reason for this outcome needs more investigation. Nevertheless, one can conclude that the present state of affairs in the fishing community is associated with the low education level among members of the community. It implies that educational level is not a factor that influences much participation in fishing.

(ii) It is concluded that household size, processing ability and distance from beach to nearest town influence greatly community participation in fish processing. The most effective factor is household size, which is significant ($p < 0.10$). The age, dependency numbers and district location are also significant but influence participation inversely. The education level and tribe negatively influence participation, however are not correlated to fish processing.

(iii) Household size, distance from the beach to nearest town, gender, and marital status plays an important role on influencing community participation in fish trading. However, household size is significant ($p<0.05$) while other 3 factors are insignificant. Factors such as age, tribe, educational level, number of dependants and district location do discourage participation and all of them except education are significant

Recommendation

Ability to fish, to process and to market are basic features which promote involvement of local communities in fish industry. This factor must be considered in order to improve fish industry. The consideration may include to provide essential improved facilities such as fishing gears, reliable processing technologies and educating the dealers on how to manage good enterprises. Distance from the beach to nearest town has been identified as the important criteria of involving the communities in the industry. The best way is to improve transport infrastructures, especially roads. Although education is not playing the best role in influencing the communities, it worth to educate the communities on how to be effective by adopting the improved technologies. This could be associated by involving the local communities on managing the lake, modifying the established policies, regulation and laws.

Acknowledgement

We are acknowledging Tanzania Fisheries Research Institute for coordinating effectively production and improvement of this document. Similarly, we are acknowledging LVEMP for overall funding of this important task, which will be used for various purposes.

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