E-ISSN: 2347-5129
P-ISSN: 2394-0506
(ICV-Poland) Impact Value: 5.62
(GIF) Impact Factor: 0.549
IJFAS 2020; 8(4): 343-350

www.fisheriesjournal.com
Received: 14-04-2020
Accepted: 30-05-2020

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Determinates of farmers participation decision on fishing in Lume district, east Showa zone, Oromia national regional state, Ethiopia

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Abstract
In Ethiopia fishing practiced in most freshwater bodies which is a potential strategy for enhancing food security, employment and provide as source of income. This study was aim to analyze determinants of farmer's participation decision on fishing in Lume District. The study adopted the cross-sectional research design and mixed research approach. Multi-stages and simple random sampling techniques were used to select 374 sampled households. Data were collected from both primary and secondary data source. Structured questionnaire survey key informant interviews, and focused group discussions were used as method of data collection. The collected data were analyzed using descriptive statistics and inferential statistical tools by STATA V.13 software. The Binary logistic regression model revealed that, participation in fishing is significantly and positively influenced by sex of household, family size, access to fishing material, and the educational status of household heads, while age, land size, livestock holding and distance from household residence to lake Koka have a negative influence. So, the study suggested that special attention should be given by regional government, district livestock and fisher office, research center and non-governmental organization to improve farm household participation in fishing with sustainable resource management.

Keywords: Determinants, Ethiopia, fishing, households, logit, Lume, participation

1. Introduction

1.1 Background and Justification

Ethiopia is known as the water tower of Eastern Africa, which provides about 86% of the Nile water (i.e., the sum of Blue Nile (59%), Sobat/Baro-Akobo (14%), and Tekeze (13%) [30], for rural and semi-urban households, mainly the unemployed. These rivers and other water resources of the country are considered as huge potential sources of fish and employment opportunities. The water bodies are cover a total surface area of 13,637 km^2 with a total production potential of 94,541tons annually [31], while the fishery sector in the country is far below its potential [19]. Trough out the country capture fishery resources were seen as the quintessential "common pool" (open to all) resources [17].

In fishing activities two famous adages which is "Fishermen are the poorest of the poor" and "Fishing is the activity of last resort". However, fishing is not only necessarily for the poorest households in rural areas [8]. When the sector recognized and supported with adequate strategies and policy it can actually play a significant role in overall rural economy development [15]. According to Ethiopia Ministry of Agriculture [23] the fisheries subsector is one of the potential intervention areas to achieve the objective of enhancing food security, employment and provide as source of income to improve the livelihood of rural people in a sustainable manner.

In Lume district Lake Koka fisheries have been developing over the past decades and the lake was part of the major lakes considered by the Lake Fisheries Development Project (LFDP) in 1990s [21]. It has a huge fish potential to produce 1194 tons per year [4]. It is a freshwater body where the commercial fishery is focused that used many rural households as main income source [12]. The Lake is dominated by commercially important consumable fish species; such as Nile tilapia (*Oreochromis niloticus*), Common carp (*Cyprinus carpio*) and Catfish (Clarias *gariepinus*) [32]. It is an open and easy accessible resource which is the most important lakes to all adjacent districts for 15,000 local people who have been directly relying on the lake [28].

Study conducted in Tanzania also emphasis on Economic Determinants for Households Involvement in fishing activities [18]. On the assessment, in variable testing the study use only the demographic factors with access to credit, non-farm access and organization participation. Ojulu [26], also stress on analysis determinants of volume of fish production in fisheries in Adobo District Southern Gambella Regional State. Further study conducted by Abebe and Hossein [1] at North-Ethiopia around Takeze Lake on the determinants factors for fishing household to participate in fishing activities. However, the assessment was not include the important variable access to fishing material with marital status and farmer's extension contact.

In the study area, fishing household's farmers have not fully utilize from the sector which has huge potential to improve the living standards of their family. Despite the economic importance of fishing at the household and national level, a few of farmers was participated with a little attention on sustainable fishing. Consequently, this study was conducted to provide the current information which enables to design and implement different strategies to promote the participation of farm households in fish production with sustainable fishing. Hence, the objective of this study was to analyze determinates of farmers participation decision on fishing in Lume district.

2. Materials and Methods

2.1 Description of the study area

Lume district is located at Longitude between 39°0'0'' to 39°20'0'' East and 8°50'0'' to 8°30'0'' North latitude. The district is bordered on the south by the Koko Lake, on the west by Ada'a Chukala, on the North West by Gimbichu, on the north by the Amhara Region, and on the east by Adama. It is 74km farm from Addis Ababa at south-east direction. The study was conducted in three rural Kebele of Koka Negawo, Derar Dembela and Dungugi Bekele. The district has a total of 14576 rural households (12171 male and 2405 female) (Lume District Livestock Development and Fishery Office, 2020).

The district line on the altitudes is 1604 m.a.s.l. The area have average annual rain fall 500mm-1200mm, and about 18 °C and 28 °C are the maximum and the minimum temperature. The district is characterized by subsistence mixed farming system in which both crops and livestock were kept together. Cereals crops widely produced in the area include teff, wheat and maize are the major crops grown that used for home consumption and domestic market. Annual crops are predominant and rain-fed agriculture is mainly practiced using animal power. Moreover, vegetables and root crops like, onions, potato, tomato, green pepper and cabbage were produced through irrigation system.

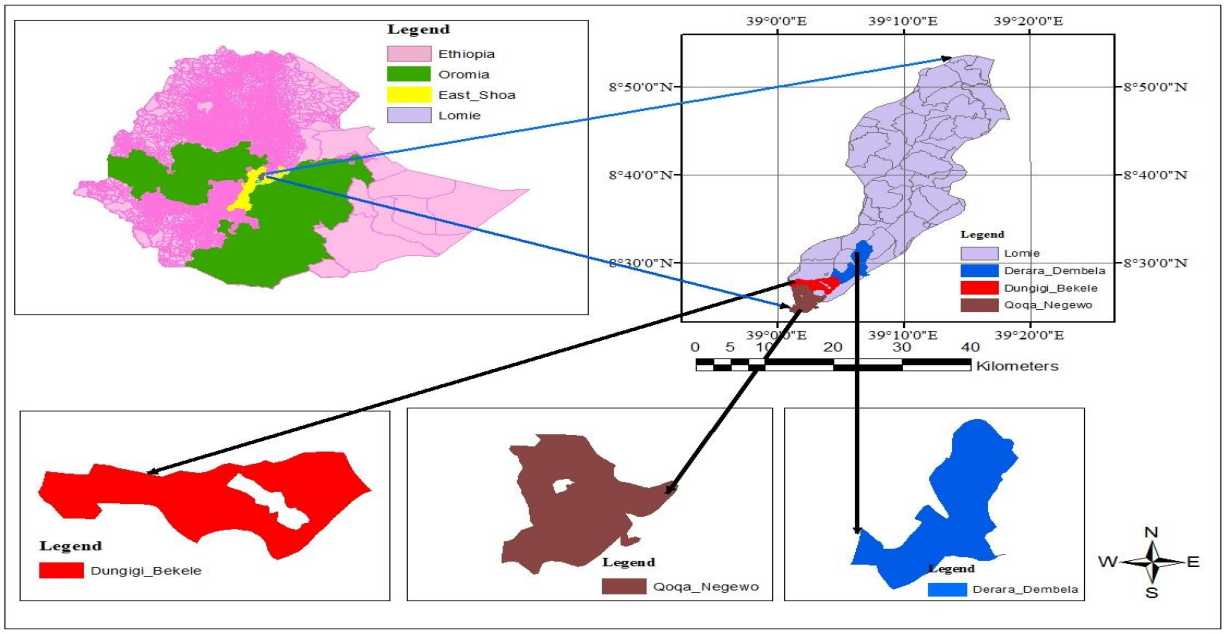

Fig 1: Map of the study area

2.2 Research Approach and Design

This study was used the mixed method research approach which is interpretive approach (qualitative) and positivism approach (quantitative). As research design, the cross-sectional research design was employed that allows data to be collected at a single point in time from a sample to represent a large population.

2.3 Sampling Procedure and Sample Size

A multi-stage random sampling technique was applied to draw representative samples for this study. In the first step, Koka Negawo, Derar Dembela and Dungugi Bekele kebeles were selected purposively. In the second step, households in the three Kebele were stratified in to fishing and non-fishing households. Finally, a total of 374 sample households (172 from fishing households which are 50 responds from Koka Nagawo, 53 from Derar Denbela and 69 from Dungugi Bekele Kebele) and (202 from non-fishing households which are 24 repents from Koka Nagawo, 61 from Derar Denbela and 117 from Dungugi Bekele Kebele) were drawn using a simple random sampling methods from stratified households.

From total household of the district, the sample size for generating primary data was determine using a formula developed by Kothari [20] that determine as:

$$n = \frac{Z^2.p.q.N}{e^2(N-1)+Z^2.p.q}$$ Where, n= sample size

z= the value of standard variant at a given confidence level

(z=1.96 at 95% level of precision)
p= sample proportion (0.5) q= 1-p (1-0.5=0.5) e = acceptable error (5%)

N=Total household (14,576)
Then, sample size will be reduced by:

$$n = \frac{1.96^2(0.5)(0.5)(14{,}576)}{0.05^2(14{,}576-1)+1.96^2(0.5)(0.5)} = 374$$

2.4 Types data and Method of data collection

This study was used both primary and secondary data source which are quantitative and qualitative in nature. Primary data were collected from sampled households. Secondary data were obtained from secondary source by review of different relevant secondary sources; Lime district Livestock Development and Fishery office, and other published literature data, and unpublished technical report with relevant to the study. For this study data were collected through a structured survey questionnaire was employed to produce quantitative cross-sectional primary data on demographic, socioeconomic and institutional variables through interview by the researcher and well-trained enumerators. Additionally, the qualitative data were collected through 6 key informant interviewers and three focus group discussions.

3. Methods of data analysis

The study was analyzed using both qualitative and quantitative data analysis methods using STATA 13 Version. The information collected through verbal discussions (key informants and focused group discussion) were carefully recorded on note book and systematically grouped and narrated their response based on their similarities. Descriptive statistics such as percentage, frequency, mean, and standard deviation were employed. Advanced descriptive statistics such as, t-test and chi-square test were employed to measure the statistical mean difference and association between fishing and non-fishing households for continuous and categorical variables respectively. For analyzing participation decision in fishing the data were analyzed through econometric model Binary logistic regression (logit).

This due that, the dependent variable is a dummy (1 if household participate in fishing, 0 if not) and the explanatory variables to be included in the study are of both categorical and continuous variables in nature. Belay [7] also pointed out that, a binary logistic distribution (logit) has got advantages over others model in in the analysis of dichotomous outcome variable in that it is extremely flexible and used from mathematical point of view and results in a meaningful interpretation. Binary logistic regression assumes P(Y=1) is the probability of event occurring which describes the relationship between dependent variable and set of independent variables. According to Maddala [22], the logit model can be used without any change even with unequal sampling rates. Logit is the natural logarithm of the odds ratio. The logit model is specified as follows:

$$P_i = E(Y=1/X_i) = \frac{1}{1+e^{-(\beta 0+\beta 1 X 1)}} \quad \ldots\ldots\ldots\ldots\ldots (1)$$

Equation (1) can be expressed by: $P_i = \frac{1}{1+e^{-Z_i}}$ …….. (2)

Where; $Z_i=\beta_0+\beta_1 X_i$
If Pi is the probability of being participate in fishing and the probability of non-fishing household 1- Pi, which is expressed as follows: $1-P_i = \frac{1}{1+e^{Z_i}}$ ……..… (3)

Therefore, this can be written as

$$\frac{P_i}{1+P_i} = \frac{1+e^{Z_i}}{1+e^{-Z_i}} = e^{Z_i} \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Therefore;

$\frac{P_i}{(1+p_i)}$ *is* the odds-ratio (the ratio of the probability that an individual would choose an alternative).
Pi is the probability of being participate in fishing ranging from 0 to 1

Taking natural logarithms of $\frac{P_i}{(1+p_i)} = e^{Z_i}$

$Li=Ln\left(\frac{P_i}{1+p_i}\right) = Z_i = \beta_0+\beta_1 X_1+\ldots\ldots+\beta_K X_K+\mu_i$

Where; $Z_i = \beta_0+\beta_1 X_1+\beta_2 X_2 \ldots\ldots\ldots\ldots\ldots \beta_K X_K$

Zi is a function of k-explanatory variables β_0 = is the intercept or constant term
Xi = ith explanatory variable K = represents number of explanatory variables
X_K= Total number of independent variables (X_K =13) X1–Xk = All explanatory variables

Table 1: Variables definition with hypothesized expected effect

Explanatory Variables	Type and definitions	Measurement	Expected sign
Sex	Dummy, sex of the HH	1 if male and 0 female	+
Age	Continuous, age of household	Year	-
Education	Continuous, education level in year of formal schooling	Year	-
Maritalstat	Categorical, marital status	1 if married and 0 unmarried	-
Family	Continuous, household size	Adult equivalent ration	+
Land	Continuous, total land size of household	Hectare	-
Livestock	Continuous, livestock holding	Tropical livestock unit	-
Off/Nonfarm	Dummy, access to off/non-farm activities	1 if access and 0 if not	-
Distanwater	Continuous, minutes of walking to water body	Minute	-
Distamarket	Continuous, minutes of walking to the nearest market	Minute	-
Extension	Continuous, frequency of extension agents' contact with HH	Number of visits by DA/year	+
Credit	Dummy, access to credit	1 if access and 0 if not	-
Material	Dummy, access to fishing materials	1 if access and 0 if not	+

3.1 Result and Discussion

3.1.1 Summary of descriptive Statistics for categorical variables

Related to Sex of household, about 84.9% and 76.7% of sampled respondents were male-headed households for fishing and non-fishing households respectively; while only 15.1% were female-headed households participated in fish production. As χ2-test confirmed that sex of the respondents were statistically significance difference among participant and non-participant at 5% level of significant (Table 2). This implies that both fishing and non-fishing households were male dominated which was Male domination is higher in fishing households. This domination of male-headed household in the study area is due to the reason that, fishing activity is mainly done during night time and early morning, time that is not suitable for women and the activity need much energy. This finding is in line with Shetimma *et al.* [29] and Salau *et al.* [27] who indicated that fishing is mainly undertaken by male group.

In terms of marital status, about 80.2% of fishing household and 79.7% of non-fishing sample households were married. Only 21.3% and 19.8% of household were unmarried for non-fishing and fishing household, respectively which is statistically insignificance difference between the two groups. The result obtained hear seems there was no difference in marital status among fishing and non-fishing household in the study area. Under the same result description, about 25.6% and 16.8% of fishing and non-fishing households were witnessed as fishing materials are accessible in the district. From this data result more fishing households were positively confirmed under this variable that non-fishing households. This variable was statistically significant among participant and non-participant at 5% level of significant (Table 2). In line with this Davis [14] point out that fishing gear has been an important to increase participation in fishing and income of households.

From sampled household, only 17.33% and 11.63% of non-fishing household and fishing household had access to credit service, respectively from formal (Saving and cooperatives institute) and informal sources (Iqub and relatives). Related with access to off/non-fame activities, only 24.6% of sample households were positively responded. Based on the χ2-test both variables access to off/non-farm and credit was no had a significance difference between fishing and non-fishing households.

Table 2: Summary of descriptive statistics for categorical variables

Variables	Values	Fishing HH (N=172)		Non-fishing HH (N=202)		χ^2-test
		N	%	N	%	
Sex	Male	146	84.9	155	76.7	3.929**
	Female	26	15.1	47	23.3	
Marital status	Married	138	80.2	159	78.7	0.131
	Unmarried	34	19.8	43	21.3	
Access to fishing material	Yes	44	25.6	34	16.8	4.309**
	No	128	74.4	168	83.2	
Participation in off/non-farm activities	Yes	37	21.51	55	27.22	1.636
	No	135	78.49	147	72.78	
Credit access	Yes	20	11.63	35	17.33	2.405
	No	152	88.37	167	82.67	

** indicate significant at 5% level

3.1.2 Summary of descriptive statistics for continuous variables

Age is the major demographic factor, measured in years, provided evidence on working ages of households. The mean age of the sample household heads were 40.97 and 37.18 years for non-fishing and fishing household, respectively (Table 3). From this figure, fishing household farmers were found to have lower mean age that the non-fishing groups. It was also proved from the t-test that there was a statistically significant difference in the average age between the two groups at 1% level of significance. This clearly indicates that young household heads participated better than older household heads. This means the result shows age have direct relationship with participation in fishing. In line with this, a study made by Abebe and Hossein [1], specify that there was a significance difference between fishing and non-fishing households in terms of age category.

The mean household size of the total sample households was 4.73 persons for fishing and 4.3 persons for non-fishing households. In terms of this household size, fishing households had large sizes than non-fishing household, which is almost sim4ilar with the average national level in Ethiopia of 4.7 persons [13]. The mean difference of the respondent household size in adult equivalent between the fishing and non-fishing household was found to be statistically significant difference at 5% level of significance. This result suggested that availability of high household size is an important factor influencing households' decision to participate in fishing activities.

As educational status the mean year of schooling of fishing and non-fishing respondents were 2.38 years and 2.97 years, respectively. As indicated in the Table 3, t-test result shows that the means of year of schooling of sampled farmers had significant difference among fishing and non-fishing households at 5% level of significance. As observed, the average educational level in year of schooling of fishing households appears lower than those of the non-fishing households.

Table 3: Summary of descriptive statistics for continuous variables

Variables	Fishing HH (N=172)		Non-fishing HH (N=202)		t-test
	Mean	SD	Mean	SD	
Age	37.18	7.56	40.97	11.76	-3.631***
Family size	4.7	2.1	4.3	1.7	2.028**
Educational level	2.38	2.36	2.97	2.81	-2.162**

Extension contact	0.52	0.49	0.63	0.54	-1.316
Land size	1.3	0.54	1.41	0.64	-1.893**
Market distance	26.86	15.68	26.31	11.13	.384
Livestock holding	2.7	2.5	3.64	2.86	-2.345**
Distance from water body	27.47	12.68	39.55	26.30	-5.505***

** and *** indicate significant at 5% and 1% level

Table 3 shows that the mean of landholding of non-fishing and fishing sample households were 1.41 and 1.3 hectares respectively that include all available land for sampled households. The overall average farm size was 1.35 hectares. As indicated in Table 3 t-test result also shows that the mean of household land holding for sampled farmers were significantly different between those two groups at 5% level of significance.

The mean livestock holding for non-fishing and fishing households were 3.64 and 2.7 in TLU respectively with corresponding standard deviation of 2.86 TLU non-fishing and 2.5 TLU for fishing households (Table 3). The t-test result also shows that the mean of household livestock ownership in TLU for sampled farmers were statistically significance difference between fishing and non-fishing households at 5% level of significance. This significant difference due to that, non-fishing household mainly participate in crop production with animal keeping.

Regarding to the distance taken to travel from home to the nearest market fishing and non-fishing farmers were travel an average of 26.86 and 26.31 minutes, respectively with corresponding standard deviations of 15.68 and 12.68 minutes. However, according to t-test statistics, distance from the nearest market was not statistically difference with fishing and non-fishing households. This is due to the fact that almost all fishing households sell their harvested fish at fishing area (landing site). In other case non-fishing and fishing were traveling a mean of 39.55 and 27.47 minutes to reach at fishing site from their home area, respectively with corresponding standard deviations of 26.30 and 12.68 minutes (Table 3).

The t-test result indicates that the mean distance from fishing source to the respondents home were found to have statistically significant difference between fishing and non-fishing households at 1% level of significance. This implies that, in terms of time taken to reach fishing source, it has a difference between the two groups. Non-fishing households were travel high minuets than fishing households.

Based on assessment result, the mean extension contact for non-fishing and fishing households were 0.63 and 0.52 which is below once per year. As indicated in the Table 3, t-test result also shows that the mean of extension contact for sampled farmers were not shown statistically significant difference between fishing and non-fishing households. In the study area, the majority of fishing households were out of access to extension service, which show the efficiency and effectiveness of the government extension program in the study area is under question. The weakness of this system has influence on the overall fish production and farmers participation in fishing. Njagi *et al.* [25] indicated that fish farm profitability, productivity programs were failed due to inadequate and poor extension service.

This is consistent with the finding of Ojulu [26], who stated that the majority of fishing households were not able to get advantage of extension linkage and institution contact in Abobo district southern Gambella Regional State of Ethiopia. The author mentioned that less emphases was given to the artisan fisheries by the government and its role was not well known than others activities. Agbebi) [2] also pointed that about 52.2% of respondents participated in fishing have no access of extension service.

3.1.3 Result of binary logistic regression model

To determinate of smallholder farmers participation decision in fishing logistic regression model was used to estimate with thirteen explanatory variables. The output of the binary logit model used showed that eight variables were identified as significant variable out of the thirteen hypothesized variables. These are sex of the household head (SEX), age of the household head (AGE), household size (FAMILY), access to fishing material (MATERIAL), education level (EDUCATION), land size (LAND), total livestock (LIVESTOCK) and distance from water body (DISTANWATER). The Interpretation of logistic regression model for significant explanatory variables were presented and discussed as the following.

Table 4: Binary logistic regression result

Variables	Coef.	Std. Err.	Z	P>|z|	Exp(B)
Sex	0.6639	0.2990	2.22**	0.026	1.942
Maritalstat	0.1749	0.2905	0.60 NS	0.547	1.191
Age	-0.0330	0.0128	-2.57***	0.010	0.967
Family	0.1337	0.0603	2.22**	0.027	1.143
Material	0.6619	0.2833	2.34**	0.019	1.938
Education	0.1032	0.0403	2.56**	0.011	1.109
Extension	-0.1050	0.1538	-0.68 NS	0.495	0.900
Land	-0.3991	0.2044	-1.95*	0.051	0.671
Distamarket	0.0035	0.0086	0.41 NS	0.685	1.003
Livestock	-0.0710	0.0336	-2.11**	0.035	0.931
Nonfarm	-0.1117	0.2770	-0.40 NS	0.687	0.894
Distanwater	-0.0323	0.0072	-4.51***	0.000	0.968
Credit	-0.4396	0.3372	-1.3 NS	0.192	0.644
_cons	1.2977	0.7408	1.75	0.08	3.661
Number of observation	374				
Log pseudolikelihood	-222.62423				
Prob > chi^2	0.0000				

LR chi2 (13)	70.82				
Pseudo R^2	0.1372				

***, ** and * are significant at 1%, 5% and 10% level of probability respectively
NS = non- significant

3.1.4 Sex of the household head (SEX): Sex of the respondents was hypothesized that it has a positive influence on the dependent variable. The result of binary logistic regression model has shown that, as expected sex has positively influence on the farmers' participation decision in fishing at 5% significant level. Odds ratio suggested as other variable remain constant, being a male an increase the probability of participating in fishing activities by the factor of 1.942. This confirm that male headed household is more likely to participate in fishing than female headed household.
According to male age of 35 development agent from Dhungugi Kebele Kebele Mr. Tasew Temsgen stated that, fishing activities are undertake at night and early morning which is not suitable for female groups as they have many homework activities in the household. Additionally, it is challenging for females on manipulating all labor intensive fishing gear on the lake during harvesting time. The finding is in line with many previous research finding that fishing is mainly undertaken by male households [6] [9] [26] [5].

3.1.5 Age of the household head (AGE): As hypothesized age of household head had a negatively and statistically significant influence on households' participation in fishing at 1% significant level. When keeping other variable constant, odds ratio suggested that one year increase in age of household would make the probability to participate in fishing decreases by a factor of 0.967. This entails that as the age of the household head gets older and older, his/her participation in fishing decreases. From my personal observation, in the study area all fishing households were using non-motorized boat that are manipulated manually by hand which need high effort to move on the lake especially when strong wave is emerged.
According to male age of 34 group discussant from non-fishing households Mr. Girma Belahew stated that, performing fishing for aged households are tedious work than the young one. This finding is similar with George *et al*. [16] who conclude that people in the active age are more involved in fishing while the older people may not have enough capital and strength for fish farming. Birara *et al*. [10] also found that, the age of the household head had a negative and statistically significant influence on households' participation in fish production.

3.1.6 Household Size (FAMILY): The household size in adult equivalent was found positive and significant influence on participation decision in fishing at 5% probability level. Holding other variables constant, one unit increase in adult equivalent would cause the probability of the households' participation in fishing increases by the factor of 1.143. The model output is in line with data collected from key informant and focus group discussion.
As male age of 28 development agent from Darar Danbela Kebele Mr. Hussen Jamal approved that, house households with large number of family size need additional income and food than small family size. This can lead to high extraction and began to work on the available resources which produce higher income to satisfy the additional demand and to sustain the life. This study result is in line with Birhanu [11] and Birara *et al*. [10] that household size had a positive and statistically significant effect on households' participation in fish production.

3.1.7 Access to fishing material (MATERIAL): In fishing activities different equipment's (fishing gear) were used and difficult to perform fishing without those materials. The results of the binary logistic regression model show that this variable influence participation decision in fishing positively and significantly at 5% probability level that consistent with a prior expectation. The odds ratio result show that, being more access to fishing material increase the probability of participating in fishing activities by the factor of 1.938; while keeping all other variables constant. This result implies that when the fishing equipment's is easily accessible in the study area non-fishing households has more activated to participate on fishing.
According to male age of 57 group discussant from non-fishing households Mr. Girma Belachow stated that, fishing with access to necessary material allow to utilizing the existing potential and help to improve the status of income gained from fishing. However, as the respondent household confirmed that, due to lack of easily accessible of fishing equipment's (gears) farmers were more exposed to extra cost to fulfill all necessary materials from abroad district market. Due this challenge some of household are fairly suing fishing as main income source and that lead to conclude poor access to fishing material have negatively influence on households' participation in fishing activities. Similar to study finding, with more access to fishing material (gear), they activate to utilize from fishing activities and aid them to generate more revenue [3].

3.1.8 Education Level (Education): Table 4 result show that, educational status had a negative and statistically significant influence on households' participation decision in fishing at 5% level of significance. Keeping the other variables constant, one year increase in year of schooling, would cause the probability of the households' participation in fishing decrease by the factor of 0.909. This implies that, farmers with less education status are more likely to participate in fishing. While, those peoples with higher level of education have lower chance of being involved in fishing activities.
The reason could be that education enables them to utilize any others available opportunity in their locations for the sake of earning income. This is also in line with previous studies conducted by Heavensophy [18] who stated that, education was negatively and statistically significant toward participation in involvement in fishing. But the current finding is in contrary to that of Muchangi [24] educational status had a positive and significant influence on the involvement of fishing.

3.1.9 Land Size (LAND): Landholding measured in hectare, was found to have negative and significant effect at 10% level of significance on the probability to participate in fishing. The odds ratio suggested that, as the land size increase by one hectare, the probability to participate in fishing decrease by the factor of 0.671, when other variable remain constant. According to male age of 39 group discussant from non-fishing households Mr. Temsgen Abera witnessed that, households with larger landholding is more concentrated on

investing on the land with crop production and irrigation activities than participating in fishing. This study result is in line with Abebe and Hossein [1] that revealed owning larger land size negatively affected engagement in fishing and found to be less driven to fishing.

3.1.10 Total Livestock (Livestock): Total livestock ownership in tropical livestock unit was found to have significant and negative effluence at 5% level of significance on the probability to participation in fishing. Holding other variables constant, as the tropical livestock unit increase by one unit, the probability to participate in fishing activity decrease by the factor of 0.931. The implication of the result was that, households with larger livestock holding are spending their time in other farming activities rather than fishing. This study result is in line with Abebe and Hossein [1] found that, having large land size negatively influence participation in fishing.

3.1.11 Distance from Lake (Distanwater): The result also shows that, as estimated, distance from Lake Koka is negatively influenced the participation on fishing at 1% level of significance. As the odds ratio suggested that, as the distance from the farmers' residence to the water source increase by one minute, the probability to participate in fishing decreases by the factor of 0.968 when the other variables kept constant. Farmers with nearer to the main fishing source (Lake Koka) are more likely to participate in fishing than farmers who have far-off. This implies that those who travel long distance to Lake Koka has less chance of being involved in fishing than those who reach in short minute.

According to male age of 45 group discussant from fishing households Mr. Chala Diriba noted that, fishing is done at night time to increase catch per unit of effort for the maximum production level and to reach landing site at early morning during good access for fish marketing. Again all fishing gear especially boat were stay around the shore of lake that easily haul away by theft. As he mentioned if the fishing household residence is so far from the lake, those fishing household have no access to secure those fishing gear (equipment used for fishing) and difficult to undertake fishing activities at conventional time and overtimes. This study result is in line with Birara *et al*. [10] who found out that the distance from the lake difference between participant and non-participant households were negatively and statistically significant at 5% significance level.

4. Conclusion and Recommendation

This study examined determinates of smallholder farmers participation decision on fishing. The descriptive analyses results of T-test and $\chi 2$-test show that, the existence of significant mean difference between fishing and non-fishing households on the majority of explanatory variables. According to logistic regression the probability of households participating in fishing is significantly and positively influenced by sex, family size, fishing material, and year of education; while age, land size, livestock holding and distance from water body which were found to have negative and significant relationship with household probability to participation in fishing.

Based study result, fishing is dominated by male and young group of households. So, there is a need to design new strategies and methods which favor the participation of females and aged groups in fishery sector as the male and young-aged groups do. To make fishing equipment's easily accessible, district fishery office should be arrange small enterprise cooperative group who rely on preparing and making the provision of all necessary fishing materials. In order to make all farmers benefited from Lake Koka, the role of necessary facilities like road and transportation service should be recognized and improved to increase farm households' participation in fish production.

Overall, as fishing is mainly support household with limited resource governmental organization, NGO and any concerned bodies should give special attention and extended support to establishing better fishing condition for fishing households with lake management practice.

5. Acknowledgments

I gratefully acknowledge Oromia Agricultural Research Institute and for giving me the opportunity to conduct this research activities. I am also deeply grateful to Batu Fish and Other Aquatic Life Research Center all staff members for encouraging, assisting and providing all the necessary materials and logistics. Especial thanks goes to Lemma Abera (PhD), Addisu Hailu, Megrssa Endebu, Derribew Hailu, Alemu Lemma and Dawit Hirpho for their unlimited dedication in assisting me in every aspect. I am also deeply thankful to Mr. Amanuel Berhanu and Mrs. Birki Gurmessa for your all-important comments, suggestion and appreciation on this study work. I take the great opportunity to thanks all respondent farmers, Development Agents, Experts and administrative bodies in Lume district.

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