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Assessment of the knowledge level of fishers and fish farmers in Lagos State, Nigeria

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ABSTRACT The study assessed the knowledge level of fisheries operators in Nigeria. It specifically examined the socio–economic characteristics, information sources and potential occupational and environmental challenges of respondents. Ten fishing communities with prevalence fish farming and artisanal fisheries were used. Data were collected from 240 respondents using structured interview schedule. Responses were summarised with percentage while Chi –square, correlation and t–test showed relationship among variables. Results showed that the mean age of fishers and fish farmers was 53 and 42 years, respectively. Both fishers and fish farmers had low knowledge level in fishing activities ($t = 3.978$), no extension contacts and source information from colleagues. Inadequate finance and water pollution were common challenges to both operators. A significant relationship at $p< 0.05$ was recorded between the knowledge level and age ($r = 0.26$), number of dependants ($r = 0.306$) for fishers and years of formal education ($r = 0.358$) for fish farmers. Conclusively, present low knowledge level of fisheries operators hampers sufficiency in fish production in Lagos, Nigeria.

Keywords: Assessment, Knowledge level, Fishers, Fish farmers

Introduction

Millions of people depend on fisheries for a living in Nigeria and undoubtedly, it is a source of employment of many (FAO, 2010). Majority of these people are small – scale, artisanal fishers eking out a living from coastal and in-shore resources (Chandrika Sharma, 2004). Fish plays an important role in the diet of the people of developing nations. It is a very rich source of animal protein. Fisheries and other related activities has been a major contributor to economic sustenance and stable food production in countries blessed with large coastal lines and other large water bodies like Nigeria over the years. Nwafili and Tianxiang (2007) reported that out of the estimated 120 million people in Nigeria in 2000, about one percent engages in fishing and over 24 million Nigerians depend on fisheries for their livelihood yet Nigeria imports over 600,000 metric tonnes of fish annually (Central Bank of Nigeria {CBN}, 2007). Nigeria has a land area of 923,768km^2 with a continental shelf area of 47,934km^2 and a length of coast line of 853km. It also has a vast network of inland waters like rivers, flood plains,

natural and manmade lakes and reservoirs (Shimang, 2005). The inland water mass was estimated to be about 12.5 million hectares of inland waters capable of producing 512,000 metric tonnes of fish annually (Shimang, 2005). Therefore Nigeria has a high potential to develop fishery to absorb a substantial fraction of its fish production deficit, with two main sub-sectors contributing to her fish production capacity. They are artisanal fisheries (Capture fisheries) and fish farming (Aquaculture). Artisanal fisheries in Nigeria constitute the most significant fishery sector, contributing over 85% of total fish production in the country (Alarape and Sololu, 2009). The most important goal of artisanal fishing is domestic consumption, as it is often an important source of inexpensive and accessible protein in poor coastal areas. It is characterized by low output—input ratio, low capital input with intensive labour using traditional fishing gears.

Fish farming, a branch of aquaculture is defined as the raising of fish for personal use or profit (FAO, 1988). Voluntary Service Overseas (2002) describes fish farming as the rearing of fish in a controlled volume of water. However, when fish is raised in a pool of water in an enclosure, it is called fishpond. CBN (2007) reported that fish output increased by 5.8 per cent to 635,200 tonnes in 2007 from 600,600 tonnes in 2006. The production through aquaculture also increased from 68,300 tonnes to 76,300 tonnes during the same period. However, the annual production level was much lower than the national demand of 1.5 million tonnes. This deficit was said to be partly augmented by massive importation of frozen fish of about 740,000 tonnes valued at 594.4 million US dollars which is certainly a big draw-down on scarce foreign exchange. Already Lagos State Government is working towards self sufficiency in fish production through aquaculture. According to Commissioner for Agriculture and Cooperatives in the state, 'aquaculture has a potential of producing 2.5 million tonnes of fish annually if fully harnessed', a figure that can comfortably address the fish need of Nigerians. Unfortunately, aquaculture production was only 85,087 tonnes in the State in 2007 despite its enormous water resources. To meet the fish consumption demands of Nigerians, the state government had established fish replenishment stations at various points in the lagoon. The project involved raising of various species of economic fish fingerlings and deliberately dropping them into the lagoon and oceans to sustain natural fish production and reduce fish importation and to meet fish demand. The project was started at Baiyeku, Igbogbo/Baiyeku Local Council Development Areas.

In Africa, fish production increased at an annual percentage rate of 12.1 per cent between 1984 and 1995 (FAO, 1997). Also, there is an increase of 5.9 per cent of people engaged in fish farming (World review of fisheries, 2012). The increments might have been connected to favourable attitude of farmers in many African countries who enthusiastically adopted fish farming as major economic enterprise. However, in most cases, the amount of fish produced was very low, particularly when compared with the quantities of fish caught from lakes and rivers (CTA, 2001; Ayoola, 2010). The CTA report of 2001 further highlighted some of the reasons for lack of success in African countries. These include technical problem, such as poor species, inadequate cash or materials for fish farming inputs and political and/or economic instability. These challenges were corroborated by World review of fisheries (2012). When fish farmers do not have enough funds and the technical know-how to practice fish culture as recommended for better production, they often employed traditional practices, which consequently resulted in poor yield.

Fisheries and Poverty

The Food and Agricultural Organization (2005) estimated that there are some 5.8 million

fishers earning less than one US$1/day globally and a further 17.3 million in upstream and downstream activities such as fish processing, trade and boat building. Fishers are the small scale artisanal fishermen that catch fishes from the wild. They are usually subsistence in production. Fish farmers on the other hand are people that raise fishes in a controlled pool of water. The profile of poverty in fishing communities changes from place to place, but there are certain commonalities in the way it plays out. Fishing communities are usually overcrowded and sub–standard living conditions, low level of education and lack of access to services like school and health care and infrastructure such as roads or markets (FAO, 2007). Access to fishing grounds may or may not be secure, and alternative employment opportunities are few. Poor land tenure is also a problem; many fishers do not have the rights to the properties where they live. Poverty in fishing communities poses serious risks. In addition to human costs, sound fisheries management suffers (FAO, 2007). The organization recommended that the right of poor fishermen to harvest and manage local fish stocks need to be strengthened in order to fight poverty and reduce over exploitation of threatened coastal and inland fisheries. This generalized understanding of the economic poverty of fishers in the developing world captures some of the situation of small scale fishers, but misses both the fact that they may earn more than their peers in their communities and that their poverty is multidimensional and related to variety of stressors including HIV/AIDS, political marginalization and poor access to central services and healthcare (FAO, 2005). Small-scale fisheries, and especially inland fisheries, have often been marginalized and poorly recognized in terms of contribution to food security and poverty reduction (FAO, 2003). The poverty level observed among the fisher folks is likely to be as a result of low scale of operations as well as degradation of fishing resources together with other stressors as opined by the FAO (2005). It is important to note that fisheries operators would produce within the limit of their knowledge.

Knowledge is a social construct (Freire, 2011). It is also information that changes something or somebody. This is either by becoming ground for actions, or by making an individual (or an institution) capable of different or more effective action (Davenport and Prusak, 1998). Acquisition of knowledge begins with the process of receiving or acquiring new information. This is usually done through visual, aural, and tactile signals that a person receives through his or her senses. One of the primary components of knowledge acquisition is that people are born without knowledge and that it is gained during a person's lifetime (Wiesen, 2013). If man is empty of knowledge at birth, it means that knowledge is acquired in the world. Davenport and Prusak (1998) discussed knowledge from technical dimension, he sees it as a kind of informal and skills often captured in the term 'know – how'. For example a fisherman develops wealth of experience after many years of fishing experience. So also a fish farmer, who might be a civil servant, may construct a fishpond at his/ her backyard. Since he or she was not born with the knowledge of fish farming, the knowledge must be acquired from either experience or training. Thus a knowledge process was developed by Nonaka and Takenuchi in 1995 that data develops into information and information develops into knowledge and this develops into wisdom.

Data ⟶ Information ⟶ Knowledge ⟶ Wisdom

Experience is also very important in this process since it plays a vital role in the transformation of data to wisdom. When knowledge is put into practice it develops into experience and experience matures into wisdom. Thus the process can be reshaped to

Data ⟶ Information ⟶ Knowledge + practice ⟶ Experience ⟶ Wisdom

Since it is not possible to have the process at the same rate in all fisheries operator, then the concept of level of knowledge will come to play. Knowledge, experience and wisdom in an operation will influence success in the operation. For example, when knowledge in fishing is practiced for long period of time, it culminates into experience and fishing experience over a period of time culminates into wisdom. A fisherman with wisdom in fishing will know the right time and the required skills for fishing, thus he would be a successful fisherman. Knowledge itself is a continuum which may be high, medium or low in different operators of an enterprise. Knowledge in an enterprise results into income when the enterprise is able to solve people's problems through service.

Statement of the research problem

Lagos State, in Nigeria is a state with a lot of fishery potentials in the areas of artisanal and fish farming. The percentage population of the state that are involved in fisheries is about 8.3%. More than 20% of land in the state is occupied with water. With the fisheries resources in the state, it should provide enough fish for the entire population in the country (Williams, et al., 2012). CBN (2007) reported that Nigeria imports over 600,000 tonnes of fish annually. If a state in the country has the potential to produce enough fish for the populace and still import, then the knowledge and capability of fishery operators, fishers and fish farmers needs to be examined. This study therefore assesses the knowledge level of the fishery operators with a view to achieving self sufficiency in fish production.

Objectives of the study

The objectives of the study are to:

a. examine the socio-economic characteristics of the operators of both practices,
b. determine the knowledge level of the operators on the job,
c. examine the information sources available to both operators, and identify some potential occupational and environmental challenges associated with both practices in the state.

Hypotheses of the study

i There is no significant relationship between the socio-economic characteristics of artisanal fishermen and fish farmers and their knowledge level in fisheries operation
ii. There is no significant difference between the knowledge level of artisanal fishermen and fish farmers.

Research Methodology

The study was carried out in Lagos State, Nigeria. The state lies to the south-western part of Nigeria and has boundaries with Ogun State both in the north and east. It is bordered on the west by the Republic of Benin and in the south, stretches for 180 km. along the coast of the Atlantic Ocean. It therefore has 22.5 per cent of Nigeria's coastline and occupies an area of 3,577 sq. km. landmass with about 786.94 sq. km. (22%) of it being lagoons and creeks in Lagos, Ikorodu, Badagry and Epe (Lagos state diary, 2012). Sixty five per cent of Nigeria's

commercial activities are carried out in the state, while over 85 per cent of the imported fish and other fishery products are discharged in Lagos. The state is endowed with marine, brackish and fresh water ecological zones with varying species that provide productive fishing opportunity for fishermen.

Sample and sampling techniques

The study area selected was based on the availability of artisanal and fish farming activities. Multistage sampling technique was used to select respondents for the study. The first stage involved purposive selection of five Local Government Areas (LGAs), namely Ikeja, Epe, Ikorodu, Ketu and Lagos Island, where fishing activities were prominent in the five main agricultural zones in the state. The second stage also involved purposive selection of ten communities, two from each LGA based on the prevalence of both artisanal fishery and fish farming activities. Snowballing technique was used at the third stage to select twelve respondents each from artisanal fishermen and fish farmers. A total of two hundred and forty (240) respondents were selected for the study. Pre tested and structured interview schedule was used to elicit information from the respondents.

Measurement of variables

The dependent variable was the knowledge level of operators of artisanal fishery and fish farming activities. Respondents were asked to answer relevant questions that gave information on their knowledge about the operations of artisanal and management practices of fish farming in the state. These questions were scored appropriately (correct answers scored 1 point while incorrect scored 0 point) and added together. The mean knowledge score and standard deviation for artisanal fishermen and fish farmers was calculated and later used to categorize respondents' knowledge level into high, moderate and low. In the calculation of knowledge level, mean $\pm$ standard deviation was used. The result of the mean + standard deviation was categorized as high knowledge level while mean – standard deviation was categorized as low knowledge level. Those scores that fall between the high and low knowledge levels were categorized as moderate knowledge level. Independent variables like the socio – economic e.g. age, sex, income, household size etc. were recorded directly as provided by the respondents. Data were summarized with frequency and percentage, mean and standard deviation while inferential statistics like Chi square, correlation and t – test were used to show relationships among variables.

Results and discussion

Socio-economic characteristics of respondents

Results in Table 1 show that 6.7 per cent of fishers were between the age category of 20 and 30 years, those between age of 31 and 40 years were only 5 per cent, majority (66.6%) were between 41 and 60 years. About 22 per cent were above 61 years. The mean age of fishers was 52.5$\pm$12.8 years. About 12 per cent of fish farmers were between the age category of 20 and 30 years, while those within the age category of 31 and 40 years was 16.9 per cent. About 51 per cent was between the age of 41 and 50 years. Also 20.3 per cent were above 51 years. The mean age of fish farmers was 42$\pm$7.9. This result is in agreement with Adesoji (2009) who reported that the mean age of fish farmers in Osun State was 47 years. This im-

plies that younger ones from the population are joining the fish farmers more than the fishers. The finding showed that fish farmers were much younger than the fishers. The results in the table also revealed that 53.3 per cent of fishers were of the Christian faith while 23 per cent were of the Islamic faithful. Only 5 per cent were practicing traditional faithful. For fish farmers 76.3 per cent of them belonged to Christian religion, while 23.7 per cent practiced Islam. The study showed that all the respondents belonged to a religion and that the practice of artisanal fishery or fish farming did not have any religious affiliation. Male sex was found to be more involved in both artisanal and fish farming. Only 22 per cent of female sex was found in both cases. Artisanal fishers had more family size than the fish farmers. The mean family size of the fishers was 6 ±2 while that of the fish farmers was 5±1. Fishers had 45 per cent of them with family size between 6 and 10, while in the case of fish farmers majority (79.6%) had family size between 0 and 5. Those with size between 6 and 10 were 20.4 per cent. The table further revealed that majority (91.5%) of fish farmers spent between 11 and 20 years in formal institutions of learning, while those who spent between 5 and 10 years were only 6.8 per cent. Consequently, higher percentage (93.2%) of them had education up to tertiary level. This was followed by 6.8 per cent who had education to secondary school level. Also majority (73.3%) of fishermen spent less than 11 years in formal institution of learning while 26.2 per cent of fishermen spent between 11 and 20 years in formal educational institutions. Consequently, 73.3 per cent of the fishermen had education up to secondary school level. The mean years spent was 8.47±2.85 and 14.7±2.63 years for artisanal fishermen and fish farmers, respectively. The finding shows that fish farmers were more educated than the fishers. This finding was in support of Akinbile (2003) who reported that majority of fish farmers in Lagos state were literate. It is important to note that education at formal institutions of learning would influence knowledge acquisition and display of knowledge when it comes to practical issues and real life situations.

Membership of fish association

Membership of professional bodies is an advantage for a professional to get information to improve their operations. Results in Table 2 in the appendix shows that majority (86.7%) of the fishers did not belong to any fishery association while 13.3 per cent belonged to a fish association.

Agricultural extension contact

Agricultural extension contact is an avenue for fishery operators whether literate or non literate to be educated on simple innovations of improving their life style through their fisheries operations. This type of education improves their knowledge level in the operations.

Results in Table 2 indicated that majority (85%) of the fishers reported that they had no agricultural extension contact in their artisanal fishery operations. Also 69.5 per cent of fish farmers claimed they had no agricultural extension contact. This is also in support of Adesoji (2009) and Akinbile (2003) who found a low extension contact with fish farmers in Osun, and Lagos states, respectively. All (100%) of those that were visited by extension agents indicated that they were visited once a while. The low contact of agricultural extension agents may be due to poor funding of agricultural extension in the state. The results further showed that 46.7 per cent of fishers had information on their artisanal activities from colleagues while 38.3 per cent sourced information from relatives and friends. In case of fish farmers 38 per cent sourced information about fish farming from colleagues while 27.1 per cent sourced

information from relatives and friends. Only 3.4 per cent claimed they sourced information from internet, while others sourced information from print and electronic media.

Occupational and environmental challenges

Results in Table 3 revealed that 16.7 per cent of fishers experienced high post harvest losses while majority (83.3%) did not. This indicates that post harvest losses were not a major occupational challenge to artisanal fishery operations. This might be due to the fact that high percentage of the fishes caught was sold at the site and the remaining consumed. The table also revealed that 28.3 per cent of the fishers experienced poor and inefficient fishing gears and vessels while majority (71.7%) did not. The fishers might be contented by all that they were using. About 42 per cent of the fishers were of the opinion that inadequate capital was an occupational challenge while 58.3 per cent did not see it as a major occupational challenge to artisanal fishery operations. When the fishers had no means of expanding their scope of operations they would be contented with all they had. More than average (55%) indicated that poor fishery management and inadequate government policies were occupational challenge while 45.0 per cent did not.

Results in Table 3 (in appendix xx) showed that majority (85%) of the fishers indicated that limited access to better market was not a major occupational challenge. Fishers were selling their catches at the site of operations, thus they could not experience marketing problems. However, 50.0 per cent of the fishers were of the opinion that poor handling facilities were an occupational challenge. In addition, a lower percentage (36.7%) of the fishers indicated poor infrastructure as an occupational challenge. But all (100%) the fishers indicated tide and harsh water current as major occupational and environmental challenges to artisanal fishery operations. Also all (100%) of the fishers indicated high cost of fishing materials and spare parts as a major occupational challenge to artisanal fishery.

Results in Table 4 (in the appendix) showed that high percentage (71.2%) of fish farmers indicated land acquisition and policies as an occupational challenge while 28.8 per cent did not see it as an occupational challenge. Also 52.5 per cent of fish farmers indicated lack of extension services as an occupational challenge and 61.0 per cent of fish farmers indicated that poaching and stealing was not a major occupational challenge. But majority (78.0%) of fish farmers reported that pond pollution posed an environmental challenge while 22.0 per cent did not see it as a major challenge to fish farming activities. Pond pollution may be due to poor waste disposal mechanism which may be found in densely populated areas. Overstocking was reported by 86.4 per cent of fish farmers as a major occupational challenge while only 32.2 per cent reported climate change as occupational and environmental challenge. Climate change may result in over flooding or water stress in fishponds. The table also revealed that few (15.3%) of fish farmers indicated limited market as a major occupational challenge. But majority did not. However, majority (94.9%) of fish farmers indicated that cost of inputs was a major occupational challenge and high percentage (67.8%) indicated that loans and subsidy were not available to them to improve their fish farming activities.

Knowledge level of artisanal fishery respondents

The mean knowledge score for the 120 fishers was 30.40 with standard deviation of 1.68. Categorising the knowledge into levels using mean $\pm$ standard deviation gave: ≥ 32 = High knowledge level; 30-31 = Moderate knowledge level; ≤ 29 = Low knowledge level. Results in Table 5 (in the appendix) showed that 48 per cent of the respondents had moderate knowl-

edge level in artisanal fishery operations and management practices, while 26 per cent had high knowledge level and an equal percentage (26%) had low knowledge level in artisanal fishery operations and management practices. Likewise the mean knowledge score for all fish farmer respondents was 28.74 with standard deviation of 3.27. In the categorisation the knowledge into levels, using mean $\pm$ standard deviation gave: ≥ 32 = High knowledge level; 27-31 = Moderate knowledge level; ≤ 26 = Low knowledge level. Results in Table 5 (in the appendix) showed that 15 per cent of the respondents' fish farmers had high knowledge level of fish farming operations and management practices, while 71 per cent had moderate knowledge level and 14 per cent had low knowledge level in fish farming management practices and operations. The low knowledge level of fish farmers may be due to the fact that most of the fish farmers are practicing based on their interest. Some of them might go into the practice because of influence from friends, neighbour etc. and not because they acquire skills from formal educational institutions or from training.

Hypothesis 1
There is no significant relationship between the knowledge level of fish farmers and their socio-economic characteristics such as sex, age, religion, family size, number of dependents, educational level, level of involvement and number of years spent in formal institution.

Results in Table 6 (in the appendix) showed that sex had a highly significant association with the knowledge level of fish farming activities ($\chi^2 = 18.45$; $p = 0.000$). Religion also had a significant association with the knowledge level of fish farmers ($\chi^2 = 16.28$; $p = 0.000$). The fact that none of the religion practiced by the farmers was averse to fish farming activities may account for this relationship. Results in table 6 further revealed that level of education of fish farmers had a significant association with the knowledge level in fish farming activities ($\chi^2 = 59.52$; $p \leq 0.000$). Studies have shown that increase in knowledge is enhanced by literacy level of an individual thus, this relationship. Also sex had a significant association with the knowledge level of artisanal fishers ($\chi^2 = 29.40$; $p = 0.000$). This may be due to a larger percentage of male fishers. Religion ($\chi^2 = 18.90$) and level of education ($\chi^2 = 27.30$) were also significantly associated with the knowledge level of the fishers at $p = 0.000$.
Results in Table 7 showed the correlation analysis between selected socio-economic characteristics of respondents' fishers and their knowledge level.

The data showed a positive and significant relationship between number of dependent ($r = 0.306$; $p \leq 0.05$) and the knowledge level of artisanal fishermen. This implies that the larger the number of dependents of fishermen, the higher the knowledge level of the fishers on artisanal fishery operations and management practices. This showed that a fisherman is encouraged to learn more about artisanal fishery operations and management practices to foster improved production and income in order to sufficiently cater for his increasing number of dependents. Results also showed a negative and significant relationship between the age of respondents ($r = -0.266$; $p \leq 0.05$) and the knowledge level of fishers. This implies that increase in age of respondents tends to lower the knowledge level of fishers on artisanal fishery operations and management practices. This means that younger fisher had more knowledge of artisanal fishery operations and management practices than the older ones. The older fishermen might be contented while young ones would want to look for more information to improve on their production level.

Results in Table 8 (in the appendix) revealed the correlation analysis between selected socio-economic characteristics of fish farmers and their knowledge level in fish farming op-

erations and management practices. The results showed a positive and significant relationship between number of years spent in formal institutions ($r = 0.358$; $p \leq 0.01$) and knowledge level of fish farmers. This implied that the higher the number of years spent in formal institutions, the higher the knowledge level of fish farmers in fish farming operations and management practices. This showed that formal institutions provide veritable tool for improvement of knowledge level of fish farmers in various fish farming operations and management practices.

Hypothesis 2
There is no significant difference in the knowledge level of fishers and fish farmers in Lagos State.

Results in Table 9 showed that there was no significant difference in the knowledge level of fishers in artisanal fishery operations and the knowledge level of fish farmers in fish farming operations and management practices in Lagos state. This is in agreement with results shown in Tables 5 which indicates that majority of the artisanal fishers and fish farmers in the state had a moderate knowledge level of their operations, respectively.

Implications for policy formulation

Age was found to be negative but significantly related to knowledge level of fishers and that the fishers were younger than the fish farmers. It could be deduced that young fishers were not replacing aged ones; therefore young leavers should be trained and empowered on the skills of modern artisanal fisheries.

Both the fishers and the fish farmers should be encouraged to form a viable association, this will be a forum for the government and any other body to meet them and empower them. When the group meets regularly, their needs would be sent to those that can help them. In this wise the occupational and environmental challenges would be cared for.
The knowledge level of both the fishers and the fish farmers were low. This call for regular training and this could be done through the agricultural extension agents. Agricultural extension agency should be active in the dissemination of useful information to fishers and the fish farmers.

Conclusion

The knowledge level of the fisheries operators (fishers and fish farmers) in Lagos state, Nigeria to produce enough fish was inadequate. This might be caused by high level of illiteracy and inadequate agricultural extension contact thus, low level of production which has led to massive importation of fish into the country to meet the fish demand of the nation. The bulk of fish production in Lagos state was through the fishers. This group of people have low level of education, no training from extension agents and other relevant agency and they were relatively old in age. Because of these disadvantages they were likely to be using trial by error method of production which may be the reason for the low fish production in the state. Fish farmers should complement the production of the fishers; they should be encouraged to produce more by subsidising the production inputs.

Recommendations

Lagos state and the whole country as a whole should endeavour to improve agricultural extension contact of both the fishermen and the fish farmers. Trainings should be regularly arranged for the fisheries operators to enhance their level of knowledge in the enterprise. Nigeria nation should harness the fisheries resources available to them in other to raise their fish production.

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Table 1: Distribution of respondents by socio-economic characteristics of fishers and fish farmers

	FISHERS			FISH FARMERS		
Variables	**Freq n=120**	**%**		**Freq n=120**	**%**	
Sex						
Male	102	85.0		92	78.0	
Female	18	15.0		26	22.0	
Age						
20 –30	16	6.7	x= 52.53	14	11.9	**x=** 42.31
31 – 40	12	5.0	σ = 12.87	20	16.9	σ = 7.89
41 -50	82	35.0		60	50.9	
51- 60	76	31.6		14	20.3	
>60	52	21.7		00	00	
Religion						
Christianity	64	53.3		45	76.3	
Islam	46	38.3		14	23.7	
Traditionalist	10	8.4		59	100.0	
Family size						
0 – 5	62	51.7	x 5.73	62	51.7	
6 -10	54	45.0	σ 2.04	54	45.0	
>10	4	3.4		4	3.3	
Number of dependant						
0-5	104	89.4	x 4.58	92	88.6	**x** 3.46
6-10	10	8.3	σ 2.43	12	11.4	σ 1.86
11-15	4	3.3		16		
Educational level						
Primary	42	35.0		22	18.6	
Secondary	72	60.0		94	79.7	
Tertiary	6	5.0		2	1.7	
Number of years spent in formal education						
5-10	88	73.3	x 8.47	8	6.8	**x** 14.7
11-15	32	26.7	σ 2.85	110	93.2	σ 2.63

Source: Field survey, 2012; x= mean**,** σ = standard deviation.

Table 2: Distribution showing artisanal fishers and fish farmers' membership of associations, extension contact and source of information

	FISHERS		FISH FARMERS	
	Freq	%	Freq	%
Member of fish association				
Yes	16	13.3	36	30.5
No	104	86.7	82	69.5
Extension contact				
Yes	18	15.0	36	30.5
No	102	85.0	82	69.5
How often				
Once/month	18	100.0	36	100.0
Missing	102	0	82	
***Source(s) of information or training on fish farming**				
Extension agent	18	15.0	36	30.6
Friends and relatives	46	38.3	32	27.1
Fish farmers and other organizations	56	46.7	42	38.9
Internet	00	00	4	3.4

Source: Field survey, 2012.
*Multiple responses

Table 3: Distribution of artisanal fishers according to occupational challenges encountered.

Challenges	**Yes**		**No**	
	Frequency	**%**	**Frequency**	**%**
High post- harvest losses	20	16.7	100	83.3
Poor and inefficient fishing gears and vessels	34	28.3	86	71.7
Inadequate capital	50	41.7	70	58.3
Poor fishery management and policies	66	55.0	54	45.0
Limited access to better market	18	15.0	102	85.0
Poor handling facilities	60	50.0	60	50.0
Poor infrastructure	44	36.7	76	63.5
Tide and harsh water current	120	100.0	0	0
High cost of fishing materials and spare parts	120	100.0	0	0
High cost and scarcity of fuel	120	100.0	0	0

Table 4: Distribution of fish farmers according to occupational challenges encountered

Challenges	Yes		No	
	Frequency	%	Frequency	%
Land acquisition	84	71.2	34	28.8
Lack of extension services	62	52.5	56	47.5
Poaching and stealing	46	39.0	72	61.0
Pond pollution	92	78.0	26	22.0
Overstocking	16	13.6	102	86.4
Climatic changes e.g. flooding	38	32.2	80	67.8
Limited market	18	15.3	100	84.7
Cost of input	112	94.9	4	3.4
Loan availability	80	67.8	38	32.2

Source: Field survey, 2012.

Table 5: Summary of the knowledge level of fish farmers and fishers

	FISH FARMERS		FISHERS	
Knowledge level	Freq	%	Freq	%
High level	18	15.0	32	26.0
Moderate level	84	71.0	56	48.0
Low level	16	14.0	32	26.0
Mean score:	**28.74**	**30.64**		
Standard deviation:	**3.27**	**1.68**		

Table 6: Results of Chi square analysis showing association between sex, religion, educational level and knowledge level of fish farmers and artisanal fishers.

	FISH FARMERS		FISHERS	
Variable	χ^2	**p values**	χ^2	**P value**
Sex	18.45	0.000	29.40	0.000
Religion	16.28	0.000	18.90	0.000
Educational level	59.52	0.000	27.30	0.000

χ^2 = Chi square

p≤ 0.05

Source: Field survey, 2012

Table 7: Summary of correlation analysis showing relationship between selected socio-economic characteristics and knowledge level of artisanal fishers

	Age	**Family size**	**Number of dependents**	**Number of years spent in formal institution**	**Knowledge level (Y)**
Age	1				
Family size	-.708**	1			
Number of dependents	.395**	.649**	1		
Number of years spent in formal institution	-.196	-.176	-.067	1	
Knowledge level (Y)	-.266*	-.019	.306*	-.095	1

***significant at P≤ 0.05 (2 tailed)**

****significant at P≤ 0.01 (2 tailed)**

Source: Field survey, 2012

Table 8: Summary of correlation analysis showing relationship between selected socio-economic characteristics and knowledge level of fish farmers.

	Age	Family size	Number of dependent	Number of years spent in formal institution	Size of ponds (m^2)	Fish farming experience (years)	Knowledge level (Y)
Age	1						
Family size	.378**	1					
Number of dependents	.651**	-.614**	1				
Number of years spent in formal institution	.050	-.279*	.074	1			
Size of ponds (m^2)	.082	.079	-.066	-.093	1		
Fish farming experience	.612**	.540**	.616**	-.144	-.010	1	
Knowledge level (Y)	-.004	-.261	-.217	.358**	-.128	-.224	1

***significant at P≤ 0.05 (2 tailed)**

****significant at P≤ 0.01 (2 tailed)**

Source: Field survey, 2012

Table 9: Result of t- test analysis showing significant difference in the knowledge level of fishers and fish farmers.

	Paired differences					t
	Mean	Std. Deviation	Std. Error Mean	95% confidence interval of the Difference		
				Lower	Upper	
Pair : Knowledge level (fish farmer) (Y) – Knowledge level (artisanal fishermen) (X)	-1.898	3.666	.477	-2.854	-.943	-3.978

Assum sig. level: 0.000

Source: Field survey, 2012