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DETERMINANTS OF RISK MANAGEMENT STRATEGIES IN ARTISANAL FISH PRODUCTION IN LAGOS STATE, NIGERIA

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ABSTRACT

This study focused on the factors that determine risk management strategies in artisanal fish production in Lagos state. The study appraised the artisanal fish production on profitability, risk involved, and risk management strategies in the study area. Purposive sampling was used in selection of 150artisanal fish farmers from the overall registered fish farmers as the sample for the study. Data obtained were analyzed using Descriptive analysis, Gross margin analysis and Tobit regression model. The result showed that the average age of the artisanal fish farmer in the study area was 38years, majority of them were men and married. The mean household size of the respondents was 6 members. The result also revealed that most of the fisher men were educatedwith7 years as the mean years of education. The gross margin and profit analysis further revealed that fishing was a profitable venture in the study area. Tobit estimate shows that sex, marital status, household size, educational status and membership in social groups were significant factors determining risk management strategy adopted by fish farmers in the area.

KEYWORDS: Artisanal Fisheries, Risk Management, Tobit Model, Lagos State

INTRODUCTION/PROBLEM STATEMENT

Fish and its product are the major source of livelihood for entire artisanal coastal and inland sectors. A total of 700,000 fishermen (500,000 coastal and 200,000 inland) are recorded as primary producers. For such a well-integrated industry, total employment could be five –fold. Fish industry sector provide employment for about 100,000 Nigerians in various fields, such as management, engineering, vessel operation, distribution, processing and marketing (FAO, 2008). Fish is a food of excellent nutritional value, and it makes a very significant contribution to the diet of fish-consuming communities in both the developed and developing world.

Proximate analysis of fish shows that on a fresh-weight basis, fish contains about 18-20% of protein. It is important for growth and development of the body, maintenance and repair worn out tissues and for production of enzymes and hormones required for body processes, FAT content of fish varies depending on the species as well as the season but, in general, fish have less fat than red meats. Fat from fatty fish species contain the polyunsaturated fatty acids which are essential for proper growth of children and are not associated with the occurrence of cardiovascular diseases such as coronary heart disease. Vitamins in fish are rich particularly vitamin A and D from fatty acid species, as well as thiamin, riboflavin and niacin (vitamin $B_{1,}$ $B_{2,}$ and $B_{3).}$ Vitamin A is required for normal vision, for bone growth and reduced mortality in children under five. Vitamin D is crucial for bone growth since and vitamin C for healing of wounds. Minerals (e.g., iron, calcium, zinc, phosphorus) are important in normal functioning of the body system (Chilima, 1997).

The demand for fish is estimated at 1.55millions tones. From this estimated demand, domestic production caters for 511,000 tons and the remaining goes to importation and aquaculture. Nigeria is one of the largest importers of fish with official records indicating an average of 560,000 tons annually. This was estimated at N30 billion ($400 USD million) in 2002 (President Forum, 2005). Currently, due to increasing demand for protein and fish in particular, the Nigeria fishing industry is in a dynamic state. There is over-capitalization in the industrial fleet, over fishing of the coaster resources, declining catch, both in quantity and quality, environmental degradation seriously impeding the productivity of the artisanal sector, and declining efficiency due to lack of technical innovation (FAO, 1998).

The contribution of fisheries to the Nigeria economy is significant in terms of employment, national food security enterprise development, income and foreign exchange earnings. Two thirds of the world's six billion people live within 40 miles of ocean and over one billion people depend on ocean fish as the main source of animal protein source (FAO, 1998). The rapidly growing population of the coaster areas is a major reason for the ever-growing effort to increase fish production to meet demand. The FAO estimates that about 36 million people were full-time employed in the primary capture fisheries and aquaculture production sectors in 1998 (FAO, 1998). Nigeria is endowed with a lot of resources including fisheries that has contributed immensely to the nutritional needs, economic growth and development of the nation. Fish production in Nigeria can be either by capture fisheries, Artisanal fish farming or by importation.

Presently, fish production by artisanal fishers dominates fish production in Nigeria. Output of the fishing industry is very important economically, although less than 50% of total supply is produced locally, it accounted for 1.71% of the 38.7% contributed by agriculture to GNP in 1997 (FAO, 2008). And in the year 2001-2003, average fish production was 502, 932 tons, average fish imports and exports in the same period were 664,174 tons and 6989 tons respectively. This resulted in an average per capita supply of 8.5kg/year in those years. In 2008, the global recorded returns for fish farming is totaled 33.8 million tons worth about $US 60 billion (FAO, 2008).

Artisanal fishery in Nigeria is made up of largely traditional fisher men whose main activity is to catch fishes for commercial purpose or home consumption while most of them engage in fish farming on fulltime basis others engaged in preservation, distribution, processing and marketing of fish caught. Fishermen in this sector often live in isolated coastal areas, with housing totally lacking the social amenities like piped borne water, electricity, effective sanitation, education, medical services among others. Production in artisanal fisheries is achieved through individuals or by small groups efforts with the use of labour intensive gears. Also, artisanal fishers operate from carved out wooden canoes that are often unmotorized (Coates, 2000). Most of the artisanal fishery settlements are found in remote areas; cut off from infrastructure, they can only be reached by trekking and by boats. This may constitute a source of risk to those that knows little or nothing about swimming.

Risk is an inevitable part of life and most certainly of farming life. Risk bearing is one important aspect of production which most producers seem to ignore but risk bearing is almost synonymous to decision making and it is as important as other factors considered in production, a situation in which the resolution of uncertainty will affect the well-being of the firm or decision maker. According to Fleisher (1990), risk involves the chance of gain or loss. Literarily risk is defined as the possibility of meeting danger or harm. Also, it is defined as probability of loss or gain. Agricultural risk is associated with negative outcomes that come from imperfectly predictable, biological, climate and price variables (Hardwood *et al*., 1999). Fishing decisions are taken in an environment of risk since fishermen are not sure of weather

conditions, government policies, price instability or changes in technology; hence, it becomes difficult for them to predict the future. It is in view that this study aims at identifying the sources of risks involved in artisanal fishing activities, identify the various strategies employed in managing risks, analyze the profitability of fish farming practice and determine the factors influencing risk management strategies in the study area.

LITERATURE REVIEW

Risk Environment and Artisanal Fish Production

Risk in fish farming is not only of concern to the individual farmer, it is also of important to society as a whole, as risk averse behavior of farmers can lead to an allocation of farm resources which is not efficient, resulting in a sub – optimal overall allocation of resources and consequently lower welfare. Therefore, in order to withstand adverse outcome and to avoid jeopardizing the existence of an enterprise as the base for income generation, risk has to be managed effectively with the capacity of the individual, business or group (Hardaker*et al*., 1997).

Fish production is affected by factors such as capital, unpredictable weather, fisheries management and fishing operation etc. Major factors affecting artisanal fish production are: environmental factor (i.e change in climate), market price fluctuation due majorly to the fall in price of other protein source (e.g meat). The rate of fish production is declining in all continents except South America. A number of reasons for this trend have been recognized, including the fact that land-based aquaculture must increasingly compete for land, water and feed resources with other agricultural sectors and those parts of the sector are reliant on marine fishery-based resources (fishmeal). These factors influence the economic feasibility and competitiveness of aquaculture with respect to the other animal protein production sectors (De silva, 2001).

Artisanal fish production and marketing in Nigeria encounters various risk ranging from bad weather, inadequate boat construction standard, inadequate communication, and lack of accessible shelter etc. (ILO, 2000). Some of these risks have to be more explicitly taken into account than others. If the potential losses are big, more attention has to be paid to the choice among available alternatives, as the differences between the various outcomes maybe significant. Therefore, risk confronting artisanal fish farmers includes, Asset risk, Institutional risk, Production risk, financial risk, Market / price risk, Environmental risk, Personal and health risk.

Asset risk includes theft, loss or damage of fishing vessels, equipment, gear and other agricultural assets for production. It also includes destruction of aquaculture installations and fishermen's house which are normally built around the water as a result of natural or man-made disaster. Loss of left over fish due to inadequate preservation methods is part of assets risk. Institutional risk on the other hand is an important source of uncertainty. It is generated by unexpected changes in regulation that influence fishermen's activities. It is the risk associated with changes in the policy framework (agricultural and government policy) regulation, financial services which intervene with production and or marketing decisions and in the end affect the financial result of the fish production.

Production risk includes loss of catch, production failure and existence fish disease. Variability in outcome that is expected might pose risk to ability of achieving financial goals. Also, adoption of new management production technique such as using of modernized canoe and other fishing implement causes increase in producer's liability risk. Hardaker*et al* (1997) defined production risk as the risk that comes from the unpredictable nature of weather and uncertainty about the performance of livestock and this also apply to fish production.

Price/market risk arise as a result of volatility of input and output price in fish production. It relate to changes in the prices of outputs and inputs as well as increases in interest rate. Prices of commodity like fish are extremely volatile; output price variability originates from both endogenous and exogenous market shocks (Harderker*et al*., 2004). It is the risk of falling output or raising input price e.g increase in price of fishing equipments as well as general price level of goods (inflation). It gives rise as a result of decrease in price of other proteineous food that can be use as substitute for fish (e.g. meat and cheese). So also, artisanal fisheries are also characterized substantial price uncertainty that involves timing a boat's return to the port to sell the harvest and prevent deterioration of the fish due to lack of preservation facilities on board. This decision of where and how long to fish are intricately related and lead to variation in exposure to financial risk.

Personal and health risk includes accidents and death at the sea and job- related death or injury. Also, illness as result of contaminated water due to discharge of toxic chemicals into the water bodies and sinking or capsizing of fishing vessels which result in loss of life and properties. According to Clucas (2001), fishing activities that takes place at night is believed to catch more fish than during the day because fishes comes more to the surface area and it will be easy to make a better catch. This also poses the fishermen to danger and this is another risk to fishermen.

Financial risk arise from uncertainty about product price, imperfection in information about resource abundance and location, dynamic changes in both prices, and abundance, the evolution of fishing regulation (Smith and Wilen, 2005). This can be summarized as the problems involved in acquisition of capital by fishermen to enhance production. It includes rising cost of capital, exchange rate risk, insufficient liquidity and loss of equity. The various risks are interrelated. For example, the institutional risk of a change in government regulation has an influence on price risk. Likewise, imposing environmental and government restriction policy has an impact on yield risk. Risks of all categories have effect on the income of the artisanal fish farmer. Therefore, farmer has to consider the best alternative in production.

Environmental risk can be as a result of weather condition such as rainfall, turbulent waves on the sea or human induced the discharge of waste chemicals into the water bodies. Bad weather such as sudden gales, major storms are significant causes of small boat accidents often resulting in capsizing, grounding, becoming lost and collisions. Where weather warning systems and radio communication with fishermen at sea are poor or non-existent, casualties due to bad weather are more frequent. Risk associated with discharge or waste industrial product is common in urban area due to existence of large number of industry and manifest in the disturbance of ecosystem principally pollution of water which leads to death of fish and result decline in catch by the fishermen(Konstapel *et al.,* 1995). Weather and Climate variability affects all the factors influencing artisanal fish income, it is the impact on yield (production risk) that is most recognized by artisanal fishermen. The principal evidence of climate change has been rising temperature, erratic rainfall pattern, and increase in severity of droughts and floods which have caused high losses in agricultural production (Workgroup, 2007).

Management strategies of Risk in Artisanal Fishery

In discussing how to design risk management policies, it is useful to understand strategies and mechanisms used by fish farmer to manage risks. Strategies include distinguishing between formal risk management and informal risk management mechanism. Informal strategies are identified as arrangement that involve individual or groups while formal arrangements are market-based (World Bank, 2001). The first phase in risk management is designing strategies to cope with risks. These generally are long range plans that should hold over a period of years and over a range of uncertain events.

Financial risk can be controlled by the provision of fund and fishing gears and other inputs used for fishing at a subsidized rate by government. Expansion of agricultural loan portfolios with better access to credit and/or opportunity to borrow at better terms by farmers also serve as a way of managing the risks involved in financial aspect of production (Mark, 2000). Financial risk can be managed by farmer's ability to determine amount of capital from each source bearing in mind the consequences of using the various sources of capital. Another way of managing financial risk is by obtaining fund from banks and financial institutions are also liable to risk. Arman and Park (1998) categorized these risks into three namely: default risk, liquidity risk and interest rate risk. The major one which seems to concern agriculture is default risk. In order to overcome this (default risk), farmers need to become more judicious users of borrowed funds while banks should be more keen in analyzing credit worthiness of potential clients (Ajetunmobi and Binuomote, 2007).

Environmental risk management is designed to solve environmental hazards and safety problems. Environmental risk can best be managed by government regulation. There is need for legislation against all forms of obnoxious fishing methods such as the use of chemicals in fishing. There is need to emphasis that law enforcement agents must ensure the enforcement of such law. This can be done by restriction of industry from discharging waste chemicals into the water bodies to reduce death of fish, infection of disease and increase catch of fishermen. Environmental risk influenced by nature can also be controlled by improved weather forecasting and early warning systems to reduce fatalities due to flood and wind storms (Workgroup, 2007).

Price risk affects the economy as a whole hence in order to manage it, the demand and supply of fish must be considered. The higher the demand for fish the higher the price and vice-versa. One way producers have traditionally managed price variability is by entering into pre-harvested agreements that set a specific price for future delivery. This arrangement is known as forward contracts, allow producers to lock in a certain price, thus reducing risk but also foregoing the possible benefits of positive price deviations. In specific markets, and for specific products, these kinds of arrangements have evolved into futures contracts, traded on regulations exchanges on the basis of specific trading rules and for specific standardized products. This reduces some of the risks associated with forward contracting (for example, default). A further evolution in hedging opportunities for agricultural producers has been the development of price option that represent a price guarantee that allows producers to benefits from a floor price while also from the possibility of taking advantage of positive price changes. With price options, agents pay a premium to purchase a contract that gives them the right (but not the obligation) to sell futures contracts at a specified price. Price options for commodities are regularly traded in over-the-counter markets. Futures and options contracts can be effective price risk management tools. They are also important price discovery devices and market trend indicators (Dercon, 2002).

For agricultural producers in developing countries, access to future and options contracts is producers in developing countries; access to futures contracts is probably the exception rather than the rule. However, futures and options markets in developed countries represent important price discovery references for international commodity markets and indirect access to these exchange-traded instruments may be granted through the intermediation of collective action by producer groups such as fish farmer cooperatives or national authorities (World Bank, 2001).

The relationship between assets and production explains the poverty cycle and the difficulty the poor have in improving their livelihoods. A household's portfolio of assets influences their risk attitude and their ability to respond to risk. Assets determine the types of activities that can be undertaken. More productive activities are typically influencing

greater risk, so how assets are utilized will impact productivity as a function of both expected income and variability of household income. At household level, agricultural risk management instruments reduce the variability of household incomes. The expectation is that by reducing risk and uncertainty, households will be able to accumulate assets and undertake more productive investments (Siegel, 2005). Lastly, insurance is a formal mechanism used to share production risk. It is an appropriate risk management solution for independent risks though; agricultural insurance is often characterized by high administrative costs (Siegel, 2005). Also, best way to manage asset risk is by insuring all the assets.

METHODOLOGY

The Study Area and Data Collection

This study was carried out in Lagos state. Lagos state is the smallest state in Nigeria, with an area of 356,861 hectares of which 75,755 hectares are wetlands, yet it has the highest population, which is five % of the national estimate. The state has a population of 17 million out of a national estimate of 150 million. The United Nation, (UN) estimates that the present growth rate of Lagos state will be third largest mega city the world by year 2015 after Tokyo in Japan and Bombay in India (Wikipedia, 2009). Lagos state is among the richest states in Nigeria, the center of excellence whose residents' primary occupation includes; Banking, Fishing, Port services, Industrial management, Tie and dye, Stock broking, Insurance services, Project management etc. Apart from the local fishermen, migrants from Ghana and Togo also reside and participate in the fishing industry in the study area. These migrants specialized in canoe (boat) engine repair and maintenance.

A multi stage sampling technique was used to select artisanal fishermen from the study area. The first stage involves the random selection of two local government areas (LGAs) where artisanal fishing activities is most prominent. Secondly, five major fishing communities were selected from each of these LGAs. The fishing communities selected from Badagry LGA include Topoidale, Aklakunma, Yekotomeh, Igbogbele and Ganyingbo while Majidun, Ebute-iga, Owode-ilaje, Igbogbo, and Owode-ibesewere also selected from Ikorodu LGA. Lastly, fifteen fishermen were selected from each fishing community in both LGAs and this gives a total of 150 respondents. Primary data were collected with the use of a structured questionnaire. Information collected includes socio-economic characteristics, sources of risk, and management strategies adopted by fishing households.

METHOD OF DATA ANALYSIS

Data were analysed using descriptive statistics, Gross Margin (GM) analysis and Tobit Model. Descriptive statistics used include frequency tables, mean and percentages. Gross margin analysis is computed as given below

GM = TR - TVC

Where

GM = Gross margin

TR = Total revenue

TVC = Total variable cost

NR = TR – TC

NR = Net return

TR = Total revenue

TC = Total cost

Therefore,

Gross margin per fish farmer = Gross margin / No of fish farmers.

Net return per fish farmer = Net return / No of fish farmers.

Tobit Model

The Tobit regression model, a hybrid of the discrete and continuous dependent variable, was used to determine the effect of the explanatory variables (demographic and socio-economic characteristics) on the risk management strategies employed by the fishermen. The model according to Omonona (2001) is expressed as:

$$Y_i^* = \beta X_i + e_i$$

$$Y_i^* = 0, \text{ if } Y_i = 0$$

$$Y_i^* = Y_i \text{ if } 0 < Y_i \leq 1$$

Where Y_i^* is the limited dependent variable, which represents the fishermen's risk management strategies indices.

Y_i is the observed dependent (censored) variable presenting the risk management strategies adopted

X_i is the vector of explanatory variables,

β is the vector of unknown parameters,

e_i is a disturbance term assumed to be independent and normally distributed with zero mean and constant variance σ; and

i = 1, 2, ……..*n* (*n* is the number of observations = 150)

The independent variables specified as determinants of the risk management strategies were defined as follows:

X_1 - Income (₦)

X_2 - age (years)

X_3 - sex (male=1, 0, otherwise)

X_4 - marital status (married=1, 0, otherwise)

X_5 - household size (actual number)

X_6 - years spent in school (years)

X_7 - social group membership (member=1, 0, otherwise)

X_8 - years of fishing experience (years)

RESULTS AND DISCUSSIONS

Respondents Socio-economic Characteristics

The socio-economic characteristics of the fish farmers are presented in Table 1. The fish farmers between age 31 and 40 years accounted for the highest %age i.e. 26.7 %. While the lowest %age of 10.6 % represent fish farmers that are ≤ 30years and above 45 years. The average age of the farmer in the study area is 38 years. This is an indication that they are in their active age hence, agile to undertake any risk that may accrue from their fishing activities. While70.7% of the fish farmers are male, 62.7% of them are married. The average household size of the respondents is 6 members. The fish farmers that have between 6 to 10households members accounted for 66.6% of the respondents. Only about 4% of them have above 10 household members. The mean years of education is about 8 years while about 24% of the fishermen have no formal education. This implies that fish farmers in the area are educated and therefore are aware of the need to manage risk in fishing activities. Majority of the respondents (77.7%) belong to professional fishermen's group which is of great help to them in their area of profession. The average years of experience is 18years while majority of them fish along the coast (65%). According to the Table, 68% of them fund their business based on personal savings while 45% are on loan acquisition from other financial sources different from cooperative, an indication that fish farming activities is self-financed.

Table 1: Distribution of Respondents Based on Socio-economic Characteristics

Age (Years)	Frequency	Percentage	Mean+Std. Deviation
Age			
≤ 30	16	10.6	38.32±5.490
31 – 35	40	26.7	
36 – 40	40	26.7	
41 – 45	38	25.4	
46 – 50	16	10.6	
Sex			
Male	106	70.7	
Female	44	29.3	
Marital Status			
Single	18	12.0	
Married	94	62.7	
Divorced	16	10.6	
Widowed	22	14.7	
Household Size			
≤ 5	44	29.4	6.61±2.105
6 – 10	100	66.6	
> 10	6	4.0	
Years Spent in School (Years)			
0	36	24.0	7.64±5.127
1 - 6	30	20.0	
7 - 12	70	46.7	
Above 12	14	9.3	
Membership in Social Group			
None member	34	22.7	
Member	116	77.3	
***Types of Association**			
On the One Group	50	33.3	
Ejalonibu	44	29.4	
Fishermen association	50	33.3	

Table 1:Contd.,			
Fish seller association	64	42.6	
Fishing Experience (Yr)			
≤ 10	15	10.0	18.21±5.290
11 – 20	95	63.3	
21 – 30	40	26.7	
Sec. Occupation			
None	10	6.7	
Transport service	16	10.6	
Private business	48	32.0	
Artisan	34	22.7	
Farming	42	28.0	
Total	150	100.0	
***Fishing Location**			
Along the coast	9865.3		
Inside the sea	7650.7		
***Benefit from Group**			
Financial assistance	11274.7		
Installmentpatmt input	8657.3		
Assistance during loss	8254.7		
***Sources of Fund**			
Personal	102 68.0		
Borrowed	4630.7		
Loan	6845.3		
Cooperative	4154.7		

Source: Field survey 2014

**Multiple response*

General Information on Fishing and Fishing Activities

Training Received on Fishing Activities

Table 2 shows the training respondents received on their fishing activities in the study area. Majority (72%) of the respondents claim to received training on differs fishing methods. About 50.7% of them received training on fishing gear processing methods, while 62.6% of them received training on fishing gear maintenance. Only33.3% of them received training on canoe construction. This shows that majority of the fishermen had undergone training on their fishing activities. Considering the sources of training received by the fishermen.29.3% of the fishermen received training from their group i.e fish farmer's association, while the least of them (18.7%) received training from extension officers of the state ADP. Almost all the fishermen received training once or twice in a year on fishing activities i.e., 38.7% and 34.7% respectively. Only those that got their training on the job had training as often as they embark on fishing activities (26.7%). Training in artisanal fishing activities is very highly important putting into consideration the risk involve in this activities as it may claim loss and render many widowed, father/motherless and hence have a permanent damage on an individual's life.

Table 2: Distribution of Respondent According to the Training Received

Variable	*Frequency	Percentage
***Training**		
Fishing Method	108	72.0
Fishing Gear Processing	7	50.7
Fishing Gear Maintenance	94	62.6
Outboard Engine Maintenance	86	57.3
Canoe Construction	50	33.3

Source of Training		
None	40	26.7
Fish Farmer's Association	44	29.3
Extension Officer	28	18.7
Non – Governmental Organization	38	25.3
Number of Training		
None	40	26.7
Once	58	38.7
Twice	52	34.7

Source: Field survey, 2014
*Multiple response

Preservation Methods Used in Artisanal Activities

Table 3 reveals the various methods the respondents use to preserve the fish caught before selling and the period of storing each catch before disposal. About 25.3% of the respondents preserve their catch through salting and drying, while only 15.3% of the fish farmers claimed to preserve their catch by frying them before selling/consumption, 68 % which is represent the majority interest of the fishermen claimed to preserve the fishes by smoking. However, 28% of the respondents claimed that they dispose their fishes as soon as they have them. Others sell within 20hrs of catchi.e. 34.7% either fresh or in preserved form. Nonetheless, others who disposes theirs in about 3days accounted for the least of the fishermen (12%).

Table 3: Distribution of the Respondents on How They Store Their Fish before Selling

Storing Activities	Frequency	Percentage
***Method of Storage**		
Salting and Drying	38	25.3
Smoking	102	68.0
Frying	23	15.3
Refrigerating	8254.7	
Time (Hour)		
≤ 1	42	28.0
2 – 10	10	6.7
11 – 20	4228.0	28.0
21 – 30	3825.4	25.4
31 – 40	6	4.0
41 – 50	12	8.0

Source: Field survey, 2014.
*Multiple response

Risk Involve and Management Practices

Table 4 shows the various sources of risk encountered by the respondents on their fishing activities. About 78 and 76% of the respondents claim to encounter risk through theft and illness respectively while, 73.3% of the respondents claimed they experienced heavy storm, 48% of the respondents experienced sea pirate attack, 40% of them experienced boats capsize, while 57.3 and 53.3%of the fishermen experienced boat engine breakdown and drowning respectively. Also, economic risk such as market failure and price fluctuation accounted for 70 and 80% or the total risk encountered in artisanal fishing activities in the study area. This shows that there is high degree of risk in artisanal fishing activities.

Table 4: Distribution of Respondents Based on Risk Encountered in Fish Farming

Source of Risk	*Frequency	Percentage
Heavy storm	110	73.3
Sea pirate attack	72	48.0
Boat capsized	60	40.0
Boat breakdown	86	57.3
Drowning	80	53.3
Flood	70	46.7
Pest and disease outbreak	96	64.0
Market failure	106	70.7
Price fluctuation	120	80.0
Erratic rainfall	104	69.3
Change in government policy	72	48.0
Illness	114	76.0
Theft	118	78.7

Source: Field survey, 2014.
*Multiple response

Risk Management Strategies Practiced by Artisanal Fishermen

Table 5 below shows how risks were managed by the respondents in their fishing activities. The use of anchor as a preventive measure to hold fishing motor in case of heavy storm accounted for the highest frequency representing 80% of the fishermen. Close to this is the health maintenance, 77.3% of the respondents prevent risk through proper health care. It is however interesting to know that spiritual means is one of the measure the fishermen claim to use to prevent risk in their livelihood activities, 64% of them claimed to managed risk by praying in case of any risk occurrence. On the other hand the least method adopted by the respondents is hiring of sea police. Only 38.7% of the respondents hired sea police to scare sea pirate in other to prevent theft. This implies that the fishermen adopted two or more of the management practices.

Table 5also reveals that 69.3% and 54.7% of the respondents got assistance from their association to which they belong and friends and family respectively, to reduce the effect of risk occurrence on fishing activities. While 53.3% of the respondents were relieved through government intervention, 48% of the respondents stored their catch in case of market failure till peak period, 57.3% of them ensure they are treated in hospital in case of sickness so as not to affect their fishing activities.

Lastly, Table 5 further reveals the coping strategies used by the artisanal fishermen during loss. While 46.7% of the respondents reduced their consumption from their catch, 69.3% of them borrowed money to cope during the period of loss, 85.3% sold their asset and 52% of them left fishing activities when loss is enormous. It is worthy to note that none of the respondents claimed to send their children out of school during the period of loss. This is an indication that the fishermen knows the importance of education in the future of their wards

Table 5:Distribution of Risk Management Strategies Adopted by the Respondents

Risk Management Strategies	*Frequency	Percentage
Preventive Measure		
Spiritual Means	96	64.0
Use of Anchor	12080.0	
Hiring of Sea Police	58	38.7
Use of Paddle	84	56.0
Wearing of Life Jacket	8657.3	

Proper Health Care	116	77.3
Proper Monitoring of Asset	86	62.7
Mitigation Strategy		
Assistance from Association	104	69.3
Government Intervention	80	53.3
Storing of Fish	72	48.0
Hospital Treatment	86	57.3
Friend and Family Intervention	82	54.7
Coping Strategy		
Reduce Consumption	70	46.7
Children Out of School	0	0.0
Borrowing of Money	10469.3	
Selling of Assets	128	85.3
Off Fishing Activities	78	52.0

Source: Field survey, 2014.
*Multiple responses

Analysis of Cost and Returns

The result of budgetary analysis indicates that artisanal fishermen in the study area spent an average of ₦14,929.67 on buying engine, ₦18,132.82 on buying of boat, ₦1201.74 on buying of paddle, ₦40,151.26 on buying of net, ₦1734.50 on buying of twine, ₦2427.35 on buying of hook, ₦1832.66 on buying of anchor and ₦4290.33 on buying of basket (see Table 6). It was also revealed that each fish farmer had gross margin return of ₦8.082.94 and ₦7,574.62 net returns from the artisanal fish production in the study area and this implies that artisanal fishermen in the study area makes a reasonable profit from fish production. It can be concluded that artisanal fish farming is a profitable venture in the study area.

Table 6: Budgetary Analysis (Gross Margin and Net Return Analysis in Artisanal Fishing in Lagos State)

Cost and Returns	Mean Value (₦)
Engine Cost	14,929.67
Boat Cost	18,132.82
Paddle Cost	1,201.74
Anchor Cost	1,832.66
Cost of Net	40,151.26
Total Fixed Cost (TFC)	76,248.15
Twine Cost	1,734.50
Hook Cost	2,427.35
Basket Cost	4,290.33
Total Variable Cost (TVC)	8,452.18
Total Cost (TC) (TFC + TVC)	84,700.33
Total Revenue (TR)	1,212,441.15
Gross Margin (TR–TVC)	1,136,193.00
Net Return (TR–TC)	1,018,190.22
Gross Margin Per Fish Farmer	8,082.94
Net Return Per Fish Farmer	7,574.62

Source: Field survey, 2014.

4.5 Tobit estimate of the risk management strategies among artisanal fishermen in Ikorodu Local government area of Lagos state

Table 7 presents results of the Tobit regression analysis. The regression parameter and diagnostic statistics were

estimated using the maximum likelihood estimate (MLE) technique. The result shows that the sigma (σ) is 0.11193 with a t-value of 12.431. Hence, sigma is statistically significant at 1% level. In the analysis, five (5) of the eight (8) variable estimated in the model were statistically significant at different level between one % (1%) and ten (10%) level of significance. The result is interpreted thus:

The coefficient of the sex of the farmers is 0.4352 and it is statistically significant at 1% level. This implies that gender issue is an important factor to be considered in artisanal fish farming activities as the result reveals that men are always better risk taker than women which may likely pay off. This however means that men are more likely to choose a better strategy that would manage the risk undertaken than women.

Being married is statistically significant at 10% confidence level. This shows that the marital status of the farmer is a determinant factor in decision strategy taken by the fish farmer in management of risk involved. The married are more likely to choose a better strategy than single because consultation and dialogue with spouse can always be made before choosing any strategy. This also goes with the saying that "two heads are better than one". Marital status is therefore a significant factor in determination of risk management strategy employed in fishing activities in d study area. The coefficient of the household size of the fishermen is 0.0433 and it is statistically significant at 5% level. It shows that a unit increase in the number of household size would lead to a 0.0433 increase in the risk management strategy. This is in line with a –priori expectation that the more the number of people involved in the risk taking decision, the more likelihood of taking a better risk management strategy. This may be due to involvement of some of the household member in risk management decision activity.

Coefficient of educational level of fishermen is 0.0189 and it is statistically significant at 1% level. This result implies that the educated farmers are more likely to choose a better management strategy to minimize the risk involved than non-educated fishermen due to their formal knowledge about the possible outcomes of each decision taken. The coefficient of membership in artisanal fish farmers association is 0.4296 and it is statistically significant at 1% level. This result shows that involvement of fish farming group activities influences decision making in minimizing the risk involved by value of 0.4296. This is due to the fact that the social group involvement would assist the farmer in acquiring the resources required in risk management. Since the social group plays financial and advisory roles, it therefore helps in minimizing the risk involved. Membership in social group is therefore a significant factor in determining the risk management strategy.

Table 7: Result of Tobitregression Analysis

Variables	Coefficient	Standard Error	t-value
Constant	-0.5663***	0.2537	-2.2320
Income	-0.00034	0.0014	-0.0250
Age	0.0061	0.0085	0.7170
Sex	0.4352***	0.0693	6.2800
Marital Status	0.0750*	0.0382	1.9650
Household Size	0.0433**	0.0174	2.4890
Educational level	0.0189***	0.0073	2.5820
Membership in Social Group	0.4295***	0.0766	5.6070
Year of Experience	0.0087	0.0076	-1.1410

Sigma = 0.111931 at 1% level. *** = Significant at 1% level, ** = Significant at 5% level, * = Significant at 10% level.

Source: data analysis, 2014

CONCLUSIONS AND RECOMMENDATIONS

Based on the result of this study, it can be concluded that fish farming activities involves various risk thereby limiting the expansion of the fishing activities. The risks associated with the fishing activity were partly avoidable and majority of them were unavoidable. It can be concluded also that the benefit derived from fishing activities in the study area outweigh the cost and the risk involved. However, fishing activities in Badagry and Ikorodu Local Government Area of Lagos state is a profitable business.

The unemployment problem in the country can be reduced if the government can increase the rate of the subsidy on the cost of fishing inputs required in the production. This will make the business more attractable to numerous unemployed citizens.

- The provision of storage facilities should be made affordable by the government, NGOs and related social group so as to reduce the spoilage of fish during the peak period.
- Proper training should be instituted by the government on various risk reduction techniques and the output of every decision taken.
- Further studies should be undertaken to determine if the result of the fish farming activities in the study area will give the same result in other areas where fishing activities are taken place, giving regards to the socio – economic factors of the area

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