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Evaluation of Attitudinal Risk of Homestead Fish Farmers in Kogi State, Nigeria

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Abstract
The study evaluates attitudinal risk of homestead fish farming in Kogi State, Nigeria. Specific objectives of the study are to describe the socio-economic characteristics of homestead fish farmers, estimate costs and returns associated with homestead farming, examine associated risk and mitigating strategies against risk and to determine the problems affecting homestead fish farming in the study area. A multistage sampling technique was used to select 210 fish farmers. Primary data were used. Descriptive statistics, cost and return concept, factor analysis were used to analyse the data. The results revealed that the mean age was 37.67years, 62.9% were male, and 70.5% of the famers were married. Majority (86.7%) had no extension contact. The total revenue per farm /per annum was ₦495,569.8. The risk associated with fish farming were drought $(x = 3.99)$ *and poor power supply* $(x = 3.97)$ *while the strategies used in mitigating risk were Adequate contact with extension agents* $(x = 4.93)$ *and breeding of improved breed of fingerlings*$(x = 4.89)$*. The major problems were inadequate extension service and high costs of fingerlings with agein value of 0.67 and 0.65 respectively. It was recommended that, there should be adequate extension contact in order to acquaint fish farmers with technical information to increase productivity and livelihood status.*

Keywords: Fingerlings, Risk, Hormones and Vaccines
JEL Classification: D81, Q12

1. Introduction

Fish farming is becoming increasingly popular in Nigeria and it plays a significant role in augmenting protein supply. Fish protein is an essential part of human nutrition because of its biological significance. Therefore, homestead fish production plays an important role in

alleviating the condition of unemployment (Ala and Umar, 2002). As a result of conflicting geometric growth in population with the arithmetic growth in food production, prices of basic food items have gone up by at least 65 percent, and, in some scenarios, above 100 percent because human and material resources available were not fully utilized (Annon, 2008; Akoroda, 2009). It could be observed that lack of good fingerlings and quality feeds were one of the farmers' constraints to produce fishes in large quantity (Akolisa and Okonji, 2005). Nevertheless, the major concerns confronting many aspects of fish production are how to increase quantity and quality of fish production, poor sales of fish and fish products and so deepening poverty level of the people (Kanga, 2009). In the study area, for more than a decade the practice of fish cultivation has been on small-scale with little or no scope for expansion despite readily available market for fish product. Evidence showed that most of the fish farmers in the study area have economic power unlike other enterprises which are less capital intensive, thus creating a bandwagon of farmers with social capital. Several efforts, through interventions aimed at enhancing production of fish, have been put in place by both government and non-governmental organizations, but the results still remain a mirage as active farmers keep complaining of high attendant risks associated with the enterprise. Unlike uncertainty which is beyond farmers' control, risk is a situation that is tied to human error. In view of the above challenges, the objectives of the research were to; examine socio-economic characteristics of homestead fish farmers; estimate costs and returns associated with homestead fish farming; examine risk attitudes and mitigating strategies for homestead fish farming and problems affecting homestead fish farming in the study area.

The global level of fish supply is becoming insufficient as a result of human pressure; hence, food supply including fish is expected to triple to cater for this increase (FAO, 1999). The current fish demand in Nigeria is about 3.21 million tones and the current total production is about 1.2 million tones (FMARD, 2016). Therefore, the present situation calls for serious and urgent action on how to ensure sustainable and sufficient fish production. Transition from scarcity of fish cannot be achieved by only intensive fishing but rather it could be ameliorated by better management of fisheries resources and improved aquaculture practices.

2. Literature Review

2.1 Empirical studies on homestead fish farmers in Nigeria

Nigeria is one of the most popular countries in African with high demand for fish. The fish produced in the country cannot meet up with the current demand resulting in importation due to low yield (Abdulahi, 2012). The results revealed that there was significant association between age, level of education and adoption of new technologies in fish farming in the study area while sex, religion and marital status were not significantly associated with adoption of new technologies in the study area.

Edah *et al* (2011) examined the abundance and possible market characteristics of the Kpata fish market (Old Market) in Lokoja. Fishery products caught were mainly to meet domestic demand especially in Lokoja. Age distribution among fish mongers did not differ significantly ($p > 0.05$) as 63.1% of the fish mongers fell within the economic productive age group (18 to 55 years), less than 30% of the respondents were between the ages of 56 to

70 years and only 4.3% of the respondents fell within the step-down age group (71 to 100 years). Distribution of fish species as observed in the market were majorly fresh water species even though there were traces of brackish and marine fish species.

Yet, Okwuokenye and Ikoyo-Eweto (2016) investigated the socio-economic characteristics of fish farmers in Delta State, Nigeria, and revealed that years of residence in community, age, educational background, farm size, fish farmers membership experience and participation of farmers in groups activities were significant, indicating that they were experienced in the business. Age variation was significantly associated to farmer's behavior in accepting new techniques. According to Abelkwaku *et al.,* (2014), the age of fish farmers in the study was within the age range of 30-50 years which are still agile and active. Education can be formal and informal. However, Onumadu and Osahon (2014), reported that most of the fish farmers were literate and it could serve as an impetus in adopting improved fish technologies. Household size having a negative relationship was linked to increased consumption demand due to large family size. Okwuokenye and Ikoyo-Eweto (2016) described socio-economic characteristics of fish farmers in Delta state, Nigeria. The result revealed that the mean fish farm output and income was 164.60kg and N167,200 ($1,045) respectively. Muhammad and Omotesho (2010) analyzed economics and determinants of fish farming in Kwara and Kogi States. The study used a population size of eighty-eight registered fish farmers in the Kwara and Kogi States. It showed that farmers produced an average of about 76Kg of fish per m2. Net Farm Income to fish farming in the study area was estimated at about N5000 per m2. Emokaro Odetola *et al.* (2015) estimated costs and returns of impact of cooperative society on fish farming commercialization in Lagos State, Nigeria and found that majority (50%) of the cooperative fish farmers used between ₦100,000 to ₦500,000 as initial investment while (56%) of the non-cooperative used the same amount as capital investment.

2.2 Previous Studies on Risk Attitude of Fish Farmers

Price risk: Closely associated with weather and other natural hazards is the risk of fish fluctuations. Casualty risk and property losses due to fire, flood, windstorms, theft, etc., are sources of risk in any business. Casualty losses can generally be covered by insurance; however, income may still be reduced by interruption of normal business activity that often follows a major loss.

Technological, Human/Personal, Institutional, Asset and Financial Risks as well as Risk Attitudes of Fanners: Various types of risk give rise to uncertainty in the mind of farmers regarding their ability to predict future. The degree of uncertainty, the consequences of various possible outcomes and personality of individuals will determine how best to behave under the circumstance and what strategies to adopt to minimize the effects of risks. Risk adverse farmers are the most cautious risk takers, but they do take some risks (Alabama Agric & Mechanical University, 2003). However, previous studies on associated risk and mitigating strategies against risk in homestead fish production, managers have a variety of mechanisms for managing risk. The best method(s) of managing risk depends upon the nature of the risk involved. Four general procedures for managing risk are: Avoidance: Avoidance is the process of structuring the business so that certain types of risk are nonexistent. For example in swine production, there are considerable risks associated with

farrowing operations including disease. Reduction: This is the process of lowering risks associated with the business venture. Consider the following example from the crop production. Diversification: Another common way for producers to reduce risk is to diversify across different enterprises.

3. Methodology

The study was carried out in Kogi State, with a projected population of 4, 850,200 NPC (2018) Located in the North-Central zone of Nigeria. Kogi State occupies a land area of about 32,440.00 km^2 and geographically located at Latitude 7° 47'N and Longitudes 6° 44'E. It is bounded by the following States: Edo and Ekiti (to the West),Kwara, Niger and Abuja (to the North), Nasarawa and Benue (to the East) Enugu, Anambra and Delta (to the South).The state serves as a confluence for the two most prominent rivers in Nigeria: River Niger and River Benue; and have the temperature of 22^0C to 31^0C with a typical savannah climate with two clearly marked seasons of wet season. Agriculture is one of the mainstays of people who live in Kogi State. They engage in farming and fishing. Kogi State is notable for cultivation of crops such as; cassava, yam, coffee, cocoa, cashew, maize, groundnut, melon and rice. This study focused on homestead fish farmers irrespective of the breed or variety they keep in Lokoja and Adavi Local government areas of Kogi State, because of the preponderance of homestead fish farmers.

The study employed the multi-stage sampling technique. The first stage involved convenient selection of one agricultural zone out of the available four zones namely, Koton-Karfe. The second stage involved purposive selection of two Local Government Areas (LGAs) *viz:* Lokoja and Adavi Local Government Areas (LGAs) of Kogi State where over 70% of homestead fish farmers in the state could be found and also due to readily available market demand. The third stage involved purposive selection of four communities from the selected LGAs due to the preponderance of active homestead fish farms. The fourth stage involved random selection of 210 representative sampling size *via* Yamane formula as adopted by Ibrahim (2016). Primary data were used for the study with personal interview and observation to elicit required information from target homestead fish farmers. Descriptive statistics was used to achieve objective 1, objective 2 was achieved using costs concept and income measure. Objective 3 and 4 were achieved using the factor analysis. Cost related to fish production were split into various cost concepts Z_1, Z_2 Q and P.

Cost Z_1.The following were included in cost Z_1.

i. price of fingerlings
ii. wages of human labour
iii. price of feeds
iv. price of water
v. price of lime
vi. price of fertilizer
vii. price of vaccines
viii. price of hormones
ix. veterinary services

Cost Z_2: cost Z_1+Rent paid for leased in farm

Cost Q: Cost Z_1 + interest on the fixed capital excluding land + rent value on owned farm

Cost P: Cost Q + imputed value of family labour
Cost D: Cost P +10% of TVC as management cost
Income Measure: These are the returns over different cost concepts. Different income measures can be derived using the cost concepts. The following formulae were use:

1. Farm business income = Gross income – cost Z_1
2. Family labour income = Gross income – cost Q
3. Net income = Gross income – cost P
4. Farm investment income = Farm business in come – imputed value of family labour OR Net income + imputed rental value of owned land + interest on owned fixed capital invested.

4. Results and Discussion

4.1. Socio-economic Characteristics of Respondents
From Table 4.1 the result revealed that majority (70.5%) of the respondents fell within the age ranges of 21-40 years which means that bulk of the respondents were within active age and thus participation in fish farming was likely to be high and only 2.9% were above 60 years. The mean age was 37.67. This is in consonance with the findings of Ekunwe and Emokaro (2009). About 62.9% of the respondents were males. It can also be justified by the assertion of Brummett (2010) who stated that fish farming activities were mostly dominated by men. Majority (70.5%) of the respondents were married. The high number of married respondents could increase the release of family labour, thus making more hands available for productive activities on respondents' fish farms. Majority 89% of the respondents had household size of 1-5. The mean household size was 5 persons. This implies that the respondents in the study had moderate household members which could enhance cheap source of labour. This supports the result of Oladejo (2010), which reported that 83% of the small scale catfish farmers in Ido LGA of Oyo State claimed between 1 – 6 members within their households. Majority of the fish farmers in the study had one form of educational attainment or the other: 59.0% of the respondents had tertiary education. This implies that the community waa literate fish farming community thus, there would be increase in adoption of modern technologies for fish farming. More than half (53.3%) of the respondents acquired their land through purchase. This finding disagree with the findings of Godson-Ibeji *et al*. (2016) who reported that majority of farmers in that study acquired their land through inheritance. About 46% of the respondents had 6 - 10 years of fish farming experience. The mean farming experience was 7. It could therefore be suggested that most of the farmers in the study had adequate farming experience which would help them to utilize their resources efficiently.

Furthermore, use of extension agents to farmers has positive influence as they help to disseminate information and innovations to farmers. The results show that majority (86.7%) of the respondents did not have access to extension agents. Extension contact is an essential tool for adoption of modern technologies and effective communication system that encourage increase in productivity of any agricultural enterprise. This implies that fish farmers in the study area had no access to recent technologies on best fish rearing practices and that would greatly affect their output level. This is in agreement with the finding of Zaknayiba and Tanko (2013) who reported that farmers in their study did not have access to

extension services, an indication that most of the farmers did not have access to new innovations in the studied area. Still on the results of our study, it was revealed that majority (77.1%) of the respondents were not members of a co-operative. This implies that a high percentage of the fish farmers in the study were not members of cooperative society which might reduce access to micro credit as lending agencies would prefer to give credit to cooperative soceities rather than individuals as group lending is known to have a high repayment rate. Family labour accounted for 32.4% of labour used while 30.5% of the farmers used both family and hired labour, and this could be an indication that most of the farmers' family members were vulnerable and could not carry out most of the fish farming operations due to its drudgery nature.

Table 4.1: Distribution of respondents according to socio –economics characteristics

	Frequency	Percentage
Age		
21-40	148	70.5
41-60	56	26.7
>60	6	2.9
Mean= 37.67		
Gender		
Male	132	62.9
Female	78	37.1
Marital Status		
Single	54	25.7
Married	148	70.5
Divorce	8	3.9
Household Size		
1-5	187	89.0
6-10	23	11.0
Mean = 5		
Educational Status		
Primary	24	11.4
Secondary	44	21.0
Tertiary	124	59.0
Quranic	18	8.6
Mode of Land Acquisitions		
Inheritance	72	34.3
Purchase	112	53.3
Rent	26	12.4
Farming experience		
1-5	66	31.4
6-10	98	46.7
11-15	26	10.8
15 above	20	9.5
Mean = 7		

	Frequency	Percentage
Extension Contact		
Yes	28	13.3
No	182	86.7
Membership		
Member	24	22.9
non-member	81	77.1
Labour Used		
Family	68	32.4
Hired	60	28.6
Communal	18	8.6
Family and Hired	64	30.5

Source: Field Survey, 2018

4.2 Analysis of Costs and Returns of Fish Production

The result in Table 4.2 shows the cost and returns estimates of fish production in the study area. The total revenue accrued from fish output per fish farm was ₦495,569.85 with the total cost of production been ₦223,153.79: total variable cost and fixed cost been ₦127,430.24 and ₦95,723.55, respectively. The cost of fingerlings accounted for the highest amount (₦50,135.00) of the cost of production. However, the variable cost accounted for the chunk of the cost of production incurred in fish production in the study area when compared to the fixed cost. The enterprise recorded a net farm income of ₦356,776.09 and a gross margin of ₦368,139.61 per farm. Therefore, based on income measures, it can be inferred that fish farming enterprise was profitable in the study area. This corroborate with the findings of Olukosi *et al.* (2006).

Table 4.2 Cost and return analysis of fish farming in the study area

Item	Average amount (₦/farm)
Variable Cost	
Fingerlings	50,135.00
Wages of family labour	14,250.35
Wages of hired labour	10,500.00
Feed	14,600.35
Water	20,000.00
Hormone	1,999.00
Vaccine	2,159.00
Fertilizer	3,650.13
Lime	2,150.25
Veterinary service	2,140.15
Transportation	4,596.00
Storage	1,250.01
Total Variable Cost	127,430.24

Item	Average amount (₦/farm)
Fixed Cost	
Pond	59,250.00
Pumping machine	14,300.00
Fishing net	5,250.00
Interest on fixed capital items	1,500.10
Rent on land (lease in)	1,500.15
Economic rent on land (owned land)	1,450.28
Imputed managerial cost (10% of TVC)	12,743.02
Total Fixed Cost	95,723.55
Total Cost	223,153.79
Total Revenue	495,569.85
Cost Concepts	
Cost Z_1	121,592.98
Cost Z_2	123,093.13
Cost Q	124,543.41
Cost P	138,793.76
Income Measures	
Family business income	373,976.87
Family labour income	371,026.44
Net income	356,776.09
Farm investment income	362,676.90

Source; Field survey data, 2018

4.3. Associated Risk Homestead Fish Farming

The result in Table 4.3 shows that, fish farmers in the study area identified drought($X = 3.99$, poor power supply $X=3.97$ and disease outbreak, $X=3.49$ as major risks associated with fish farming and were ranked 1st, 2nd, and 3rd respectively. This means that water is one of the major determinants of fish farming. The respondents also identified flood and weather vagaries as the less severe risk associated with fish production in the study area and were ranked 5th and 6th.

Table 4.3: Distribution of Respondents according to Risk Associated with Fish Farming

Associated Risk in fish farming	Mean	Varimax rotated component matrix	
		Systematic Risk	Unsystematic Risk
Flood (C1)	2.72 (6th)	0.50	
Disease outbreak (C2)	3.49 (3rd)	0.59	
Weather	2.72 (6th)	0.50	

Associated Risk in fish farming	Mean	Varimax rotated component matrix	
		Systematic Risk	Unsystematic Risk
vagaries (C3)			
Drought	3.99 (1^{th})		0.89
Power supply(C4)	3.97 (2nd)		0.78
Poor road network(C3)	3.40 (5^{th})		0.69
Pest and disease (C1)	3.49 (3rd)		0.59

Source: Field survey, 2018

4.4 Risk Mitigating Strategies in Homestead Fish Farming

Table 4.4 shows the various strategies used by respondents in mitigating risk were as follows: Adequate contact with extension agents for information on risk management, breeding of improved resistant breed of fingerlings, and use of recommended feeds which is ranked 1^{st} 2^{nd} and 3^{rd} while mixed farming is ranked last 9^{th}.

Table 4.4: Mean score distribution of mitigating strategies against risk

Strategies	Mean Score	Remarks	Rank
Farming insurance	1.90	Less Severe	7^{th}
Non-farming business	1.89	Less Severe	8^{th}
Mixed farming	1.70	Less Severe	9^{th}
Used of qualitative medication measure	3.60	Severe	4^{th}
Adequate qualitative veterinary measure	2.51	Severe	5^{th}
Breeding of improved fingerling	4.89	Severe	2^{nd}
Adequate contact with extension agent for information on risk management	4.93	Severe	1^{st}
Use of recommended feeds	3.99	Severe	3^{rd}
Borrowing of money from lending institution	2.23	Less severe	6^{th}

Source: Field Survey, 2018

4.4 Constraints Affecting Fish Farming

The result in Table 4.5 revealed that inadequate extension service, $(X = 4.59)$, high cost of fingerlings, $(X = 4.57)$, storage facility problem, $(X = 4.55)$, price fluctuation $(X = 4.54)$, and inadequate capital, $(X = 4.40)$ were the highly severe problems and they were ranked 1^{st}, $2^{nd,}$ 3^{rd}, 4^{th} and 6^{th} respectively and poaching was identified as the less severe problems and ranked 19^{th}.

Table 4.5: Factors constraining fish farmers in the studied area

Constraining factors	Mean	Varimax rotated component matrix			
		Market constraint	Infrastructure constraint	Credit constraint	Institutional constraint
Market problem (C3)	3.86 (12th)	0.70			
Pest and diseases (C8)	3.61 (15th)	0.69			
High cost of fingerlings (C9)	4.57 (2nd)	0.65			
Price fluctuation (C11)	4.54 (4th)	0.62			
Water problem (C1)	3.64 (14th)		0.82		
Poor road network (C4)	4.23 (6th)		0.73		
Flood and drought (C2)	3.25 (18th)		0.70		
Poaching (C2)	3.19 (19th)		0.65		
Poor power supply (C2)	4.13. (9th)		0.62		
High transportation cost (C11)	4.19 (8th)		0.59		
Inadequate capital (C1)	4.40 (5th)			0.68	
Limited access to credit (C3)	3.49 (16th)			0.57	
Problem of land tenure system (C5)	3.72 (13th)				0.74
Poor government policy(C7)	4.21 (7th)				0.70
Research problem (C2)	3.47 (16th)				0.68
Inadequate extension services (C10)	4.59 (1st)				0.67
High labour cost (C1)	3.96 (11th)				0.55
Storage facility problem	4.55 (3rd)				0.63
Predators	4.0 (10th)				0.42

Source: Field survey, 2018

5. Conclusion and Recommendations

Most of the farmers were within their active age with sustainable household size which is a precursor for healthy farm family. The enterprise was found to be male dominated, majority of the fish farmers were found to be educated and fish enterprise was found to be profitable. Adequate extension visits found to be effective means of risk mitigation and inadequate extension contact was ranked first in terms of constraints faced by the respondents.

Based on the findings, the following recommendations were drawn:

i. Inadequate extension services rank first in terms of constraints. Therefore, effort should be geared towards provision of extension services in order to acquaint fish farmers with technical information to increase their productivity
ii. Despite the cost of fingerling, farmers should acquire their fingerlings from a reliable source to maximize output with little input.
iii. Farmers should join cooperative societies to help them share ideas and teach themselves better ways of maximizing profit and for easy access to credit facilities from government interventions.

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