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Risk Attitudes and Poverty Status Nexus: A Study of Fish Farmers in Ondo State, Nigeria

Lawrence Olusola Oparinde[1,2*], Adewale Isaac Fatuase[3] and Adebiyi Gregory Daramola[2]

[1]Institute of Food Economics and Consumption Studies, University of Kiel, Johanna-Mestorf- Str. 5, 24118 Kiel, Germany.
[2]Department of Agricultural and Resource Economics, The Federal University of Technology, Akure, P.M.B. 704, Akure, Nigeria.
[3]Department of Agricultural Technology, Rufus Giwa Polytechnic, P.M.B. 1019, Owo, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aims: This study examined risk attitudes and poverty status nexus among fish farmers in Nigeria.
Place and Duration of Study: The study was conducted in Ondo State, Nigeria between July, 2014 and October, 2014.
Methodology: Multistage sampling procedure was used to select 200 fish farmers from Ondo State. Descriptive statistics, Foster Greer Thorbecke Poverty Measures, Safety-First Model and Ordered Probit Regression Model were used to analyse the data.
Results: Findings from the study indicated that 42.5% of the respondents were poor as majority of the respondents identified Natural risks (29.0%) and Economic risks (30.4%) as the sources of risks. The study further revealed that majority (57.0%) of the respondents in the study area were high risk-averse. Experience, household size, income diversification, poverty status, membership of

**Corresponding author: E-mail: looparinde@futa.edu.ng, loparin@food-econ.uni-kiel.de;*

association and tertiary education were the significant factors that affected fish farmers' risk attitudes.
Conclusion: It could be concluded that poverty status significantly influenced the risk attitudes of the respondents, which is an indication that there is an important connection between poverty status and risk attitudes among fish farmers in the study area. Therefore, individuals, government and non-governmental organizations should put programmes and policies that are capable of alleviating poverty in place in order to improve the ability of fish farmers to take risks in the study area.

Keywords: Attitudes; fish; Nigeria; poverty; risk; safety-first model.

1. INTRODUCTION

Agricultural production throughout the world is believed to be intrinsically risky for many reasons that could be categorized into factors that can be controlled and cannot be controlled by farmers. Agricultural production depends crucially on biotic and abiotic processes that cannot be completely understood (e.g., why some crops are less vulnerable to drought than others). Even when there is a reasonable understanding of certain processes, there may still be little that can be done to control them such as rainfall and drought [1]. No wonder, agribusiness is widely believed to be highly risky compared to other businesses. This is accentuated by [2] who stated that agricultural enterprises constitute the most risky business in Nigeria.

People naturally vary in the way they take decisions involving risk and uncertainty; and these variances are often described as differences in risk attitude. Understanding individual risk likings is a precondition to understanding economic pattern exhibited by individuals [3]. Farmers like most other decision makers, place greater importance on potential negative outcomes of risk and they are generally willing to trade-off potential income for avoiding either risk or uncertainty [4,5]. Fishing exhibits a unique risk form from other occupations. It is widely agreed that fish farmers' risk attitude is a major determinant of their responses to various changes in fishing stock, market, and weather conditions [6].

Authors [7] stated that due to the fact that some inputs increase while others reduce the level of production risk in farming activities, [8] therefore, emphasized reasons for taking production risk in inputs into consideration in the empirical analysis of business unit behaviour and productivity change. First, risk-averse producers prefer input levels which differ from the optimal input levels of risk-neutral producers. Secondly, risk-averse producers will be concerned about risk properties when they consider the adoption of innovations; therefore, they may not necessarily choose the innovations with the highest outcome.

Peasant farmers are naturally keen to avoid taking risk which might threaten their livelihoods. This behaviour influences the quantity and types of inputs they use and the aggregate quantity of output realised from production. Risk aversion is a very important element of the vicious circle of poverty that takes many forms in various environments. Poverty is perpetually inevitable for people who are risk averse to the point of showing unwillingness to put their investments in adoption of certain innovations just because of the risks associated with them [9]. Agricultural production is subject to risk and the attitudes of farmers toward risk would influence level of input usage as these affect production risk [5].

The level and incidence of poverty is very pronounced in the rural areas where bulk of agricultural production in Nigeria takes place [10]. In any agricultural production process, where farmers' outputs and income are dependent on various exogenous factors such as weather conditions and price fluctuations, risk is always present in farming decisions [11]. Means of alleviating high level of poverty that is prevalent among the Nigerian people is one of the major development challenges facing Nigeria [12]. Author [13] further linked poverty to food in-security by stating that high levels of poverty in rural households in Nigeria are due to food insecurity ravaging the country.

There is paucity of information in the area of nexus between risks attitude and poverty status among fish farmers particularly in Ondo State and Nigeria in general. There has been information emanating from studies on poverty and risk attitudes independently without connecting the two together [14-17]. Therefore, this study was set to analyse risk attitudes and poverty status nexus among fish farmers in Ondo State, Nigeria with the following specific objectives of determining the poverty level among fish farmers, identifying diverse risks affecting fish farmers, assessing the attitudes of fish farmers towards risks and determining the effects of poverty status and other factors on risk attitudes of the fish farmers in the study area.

This study will provide needed information on the relationship between poverty and risk attitudes among fish farmers especially in Ondo State in particular and Nigeria in general. Programmes that will greatly encourage fish farmers to be risk takers can also be developed and implemented from the results of this study. All these are expected to reduce the poverty level among farmers as they get involved in risky activities but with immense benefits.

2. METHODOLOGY

2.1 Study Area

The study was carried out in Ondo State, Southwestern Nigeria. The State lies between longitudes $4°30^{11}$ and 6^{11} East of the Greenwich Meridian, $5°\ 45^{11}$ and $8°\ 15^{11}$ North of the Equator. This means that the State lies entirely in the tropics. The State has a land area of about 14,793 Square Kilometers (km^2) [18]. It has a population of about 3,460,877 [10]. The State is characterized by heavy rainfall with climate following the usual tropical pattern. The rainy season starts from March and rounds up around October while dry season is from November to February/March. Temperature throughout the year ranges between 21℃ and 29℃ and humidity is relatively high. The annual rainfall varies from 2,000 mm in the southern areas to 1,150 mm in the northern areas. The State enjoys luxuriant vegetation with high forest zone (rain forest) in the south and sub-savannah forest in the northern fringe. The inhabitants are mostly fish farmers and cultivate food crops such as cocoyam, sweet potato, tomato, maize, pepper, plantain and cash crops such as cocoa and timber are cultivated in the state [19].

2.2 Data Collection and Sampling Procedure

Primary data were collected through administration of well-structured questionnaire and interview schedule on the selected respondents. Multistage sampling procedure was used in selecting the respondents. In the first stage, simple random sampling technique was used to select 10 Local Government Areas in the State. In the second stage, four (4) communities were purposively selected considering the level of urbanization from each of the selected Local Government Areas. In the third stage, five (5) aquaculture fish farmers were selected using snow ball sampling technique from each of the selected communities. In all, a total of 200 respondents were selected for the study.

2.3 Data Analytical Procedure

Descriptive Statistics, Foster-Greer-Thorbecke (FGT), Safety-First Model and Ordered Probit Regression Model were used for the analysis of data. Out of 200 copies of questionnaire administered, 179 copies were used for the analysis. The remaining 21 were not used due to insufficient data provided.

2.3.1 Foster, greer, and thorbecke –FGT

This study employed absolute measure approach of \$1.25 USD per day as a yardstick to set the poverty line. i.e. the poverty line was drawn based on total expenditure of the households. From the survey data, a household is considered to be poor if the household's per capita expenditure per day is lower than the poverty line (\$1.25 US dollars/day). On the other hand, a household is considered to be non-poor if per capita household expenditure per day is higher than the poverty line (\$1.25 US dollars/day) as at the time of data collection.

Following authors [20], FGT was used for the poverty analysis. The model is specified as:

$$P_\alpha(y,z) = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z-y_i}{z}\right)^\alpha \tag{1}$$

Where P is the poverty index, α is a non-negative parameter, which took the value 0, 1 and 2 thus indicating the head count ratio, the poverty gap and the poverty severity respectively. Symbol n is total number of farmers; q is the number of poor farm households; Z is the poverty line relevant to a given expenditure unit and y_i is the farm household per capita expenditure. They are given as:

$$P_0 = \left(\frac{q}{n}\right) \quad (2)$$

$$P_1 = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{Z - y_i}{Z}\right)^1 \quad (3)$$

$$P_2 = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{Z - y_i}{Z}\right)^2 \quad (4)$$

2.3.2 Safety-first model

Author [21] explained that there are different risk attitude measurement methods in the literature such as expected utility model and multi-item scale approach. Expected utility model views decision making under risk as a choice between alternatives, while multi-item scale approach considers a set of observable variables (so-called indicators, which could be questions or items). Another method of measuring attitudes of farmers toward risk is safety-first model employed by [22-25]. Equally Likely Certainty Equivalent with a Purely Hypothetical Risky prospect (ELCEPH) was used to analyse attitudes of food crop farmers toward risk in Ghana. The design of ELCEPH model was done to avoid bias caused by probability preferences through the use of ethically neutral probabilities (i.e., P = (1-P) = 0.5) [26]. Author [27] gave alternative specifications of safety-first rules where it was stated that maximize d subject to Pr(r ≤ d) ≤ α. d represents subsistence or disaster net income level, r is the random net income and α is the accepted probability of disaster (presumably low). It is postulated that α depends on a vector S of variables that represent the socioeconomic characteristics of the farming household i.e α = α (S). If it is assumed that mean μ and standard deviation σ of r are known, a certainty equivalent to the model above can be derived by maximizing the upper bound of the disaster level as stated by Chebychev's inequality [28]. Therefore, the model becomes;

$$\text{Max } V(\mu, \sigma) = \mu - K\sigma \text{ for } K = K(S) \quad (5)$$

where K is the marginal rate of substitution between the expected net income and risk which is the measure of risk aversion suggested by [29]. Just like α, K is a function of characteristics of the household S. According to [30], if it is assumed that the randomness of net income is derived from yield uncertainty, and the relationship between inputs (vector X) and yield (Y) is represented by a generalized power production function,

$$Y = AI_iIX_{i\,i}^{f(X)}e^u \quad (6)$$

For a given production function, a given coefficient of variation of yield ($\theta = \sigma_y / \mu_y$), given factor price ($P_i$), and a given product price (P), the preference order (1) can be maximized with respect to the input levels. The resulting first order conditions are

$$\mathrm{P}f_i \frac{\mathrm{E}(Y)}{X_i} = \frac{\mathrm{P}_i}{1 - \theta K(S)} \quad (7)$$

where f_i is the elasticity of production of the ith input.

The value of the risk aversion parameter K can be deduced from the observed levels of product and inputs by solving equation 7:

$$K(S) = \frac{1}{\theta}\left(1 - \frac{P_i X_i}{Pf_i \mu_Y}\right) \quad (8)$$

Equation (8) provides a measure of risk aversion that can easily be derived for each farmer from knowledge of production function, coefficient of variation of yield, product and factor prices, and other levels of factor used [22].

For this study, the risk attitude coefficient was calculated using safety-first model derived following [22; 24] as follows:

A Cobb-Douglas production function was estimated as:

$$Y = aFERT^{b_1} FEED^{b_2} LAB^{b_3} FING^{b_4} e^u \quad (9)$$

Where;

Y = Fish output in kg
a = intercept of the equation
FERT = Quantity of fertilizer in kg
FEED = Quantity of feed in kg
LAB = Labour in man days
FING = Number of fingerlings
b's = Partial regression coefficient
e = Error term

The double log form of Cobb-Douglas function was used in the estimation based on evidenced from literature [22,24]. In estimating risk attitude coefficient, quantity of feed was selected among all the inputs because of its importance in increasing fish output and the uniformity in feed usage by different types of farmers in the study area. The elasticity of fertilizer which is the same as its coefficient together with the coefficient of variation of output, product and factor prices was used to estimate a value of K for each farmer.

$$K_{(s)} = \frac{1}{\theta}\left[1 - \frac{P_i X_i}{P_y f_i \mu_y}\right] \quad (10)$$

Where;

$K(s)$ = Risk parameter
θ = Coefficient of variation of output
P_i = Factor price (Feed price/kg)
X_i = Input level (Feed)
μ_y = Mean output
f_i = Elasticity of feed input
P = price of output /kg
The coefficient of variation of output, θ was calculated from summary statistics of output from the study area.
$\theta = \sigma_y / \mu_y$

Where

σ_y = standard deviation
μ_y = Mean output.
Following [22;25], the risk aversion parameter K(s) was used to classify farmers into three (3) distinct groups:
Risk preferring (Low risk averse) – ($0 < K(s) < 0.4$),
Risk neutral (Intermediate risk averse) – ($0.4 < K(s) < 1.2$)
Risk averse (High risk averse) – ($1.2 < K(s) < 2.0$).

2.3.3 Ordered probit regression model

According to author [31], multinomial probit model, that gives room for two or more categories, has been known to suffer from "independence of irrelevant alternatives" assumption, as errors are assumed to be independent for each category. In order to evade this problem, the ordered probit model tolerates the dependent variable (risk attitude) to assume values which are ordinal in nature. Authors [32] further stated that Ordered Probit model is an extensively used approach in estimating models with ordered type which almost engages the probit relationship function. Latent continuous metric is fundamental to the ordinal responses being observed by the expert.

Y*, which is the latent continuous variable, is a linear function of some variables, X and a normally distributed disturbance term:

$$Y_i^* = X_i\beta + \varepsilon \quad (11)$$

The latent variable Y_i^* displays itself in ordinal categories, which could be coded as 0, 1, 2, 3…, m. The response of category m is thus observed when the underlying continuous response falls in the *m*-th interval as:

$Y^* = 0$ if $Y^* \leq \delta_0$
$Y^* = 1$ if $\delta_0 < Y^* \leq \delta_1$
$Y^* = 2$ if $\delta_1 < Y^* \leq \delta_2$
$Y^* = 3$ if $\delta_2 < Y^* \leq \delta_3$

Where δ_1 (i=0, 1, 2, 3) are the unobservable threshold parameters which will be estimated together with other parameters in the model. δ_0 is normalized to a zero value when an intercept coefficient is included in the model [33] and therefore only m-1 additional parameters are estimated with β_s. Similar to the models for binary data, the probabilities for each of the observed ordinal response which in this study had 3 responses (0, 1, 2,) will be given as:

prob $(Y = 0) = P(Y^* \leq 0) = P(\beta'X + \varepsilon_i \leq 0) = ø(-\beta'X)$
prob $(Y = 1) = ø(\delta_1 - \beta'X) - ø(-\beta'X)$
prob $(Y = 2) = 1 - ø(\delta_1 - \beta'X)$

where $0 < \delta 0 < \delta_1 < ... < \delta_{m-1}$ …. n is the cumulative normal distribution function such that the sum total of the above probabilities is equal to one. The marginal effects of the regressors X on the probabilities are not equal to the coefficients. Therefore, the marginal probabilities could be calculated from the Probit model as:

$$\frac{dprob[Y_m]}{dX_m} = \left[\phi(\delta_{m-1} - \beta' X_m) - \phi(\delta_m - \beta' X_m)\right]\beta \quad (12)$$

where $\phi(.)$ is the normal density function, δ_m is the threshold parameter and X_m is the k-th explanatory variable.

2.3.4 The empirical model

The ordered probit model for this study is specified as follows;

$$Y_{i=0,1,2,..j} = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + b_{11}X_{11} + b_{12}X_{12} + b_{13}X_{13} + b_{14}X_{14} + b_{15}X_{15} \quad (13)$$

Y = Risk attitudes (0 = Low Risk Averse, 1 = Intermediate Risk Averse and 2 = High Risk Averse).

The independent variables are as follows:

X_1 – Gender (1 = male, 0 = otherwise)
X_2 – Experience in years
X_3 – Extension visits
X_4 – Household size
X_5 – Number of ponds
X_6 – Age of farmer in years
X_7 – Membership of association (1= Yes, 0= No)
X_8 – Primary education (1=Yes, 0 = otherwise)
X_9 – Secondary education (1= Yes, 0 = otherwise)
X_{10} – Tertiary education (1= Yes, 0 = otherwise)
X_{11} – Income diversification (1= Yes, 0 = otherwise)
X_{12} – Quantity of feed used in kg
X_{13} – Poverty status of farmer (1= Non-poor, 0 = otherwise)
X_{14} – Stocking density
X_{15} – Access to credit (1=Yes, 0=No).

3. RESULTS AND DISCUSSION

3.1 Summary Statistics of Production Variables

The summary statistics of production variables as shown in Table 1 revealed that average fish output realised by the farmers was 1,320.00 kg with average quantity of feed of 2,370.20 kg. The average output realised from this study is higher than the one reported by [7]. Also, the mean quantity of fertilizer used in the cause of production was 210 kg, while the labour used was 541 man days. The average number of fingerlings used to raise the cropped fish was 1,500.

3.2 Determinants of Fish Output

Table 2 shows that quantity of feed and number of fingerlings used were statistically significant at 1% in influencing fish output in the study area. Quantity of feed and number of fingerlings had direct relationship with the fish output. The direct relationship with output exhibited by the quantity of feed is in line with the results of [34]. This implies that increase in the quantity of feed and number of fingerlings stocked would bring about increase in the fish output. As a result of this, the elasticities of fish output with respect to quantity of feed and number of fingerlings were 6.789E-03 and 0.214 respectively. These results support the findings of [7,35,36] who reported that fish output is significantly influenced by quantity of feed.

3.3 Poverty Status of Fish Farmers

This study adopted absolute measure approach of $1.25 USD per day as a yardstick to set the poverty line. The poverty line was drawn based on total expenditure of the fish farming households. From the collected data, a household is considered to be poor if the household's per capita expenditure per day is lower than the poverty line ($1.25 US dollars (₦225.00)/day). On the other hand, a household is considered to be non-poor if per capita household expenditure per day is higher than the poverty line ($1.25 US dollars (₦225.00)/day) as at the time of data collection. Table 3 reveals that the proportion of respondents who earned less than the value of poverty line (poor) was 42.5%, while those who earned at least the value of poverty line (non-poor) was 57.5% of the sampled households. The reason for this could be attributed to the fact that majority of the respondents diversified their means of livelihood. The outcome of this study contradicts the findings of [37] who submitted that 60% of the sampled households were poor among rural farmers in Ondo State, Nigeria.

3.4 Extent of Poverty among Sampled Households Using FGT Indices

FGT poverty index was used to explain the extent of poverty among aquaculture fish farmers in the study area. The poverty parameters employed were P_0, P_1, and P_2 which means poverty incidence (headcount), gap (depth) and severity respectively. The incidence of poverty (P_0) in this study was 0.425 indicating that 42.5% of the sampled fish farming households were actually poor based on the poverty line ($1.25 US dollar/day) as revealed in Fig. 1. The poverty depth among the sampled respondents was 0.245, implying that an average poor respondent would require 24.5% of the poverty line to get out of poverty. The poverty severity among the sampled respondents was 0.134, indicating that the poverty severity of poor households was 13.4%. These results were lower than what [37] got among rural farming households in Ondo States.

Table 1. Summary statistics of production variables

Variable	Mean	Standard deviation	Minimum	Maximum
Fish output in Kg	1,320.00	1,050.20	890.00	1,500.00
Quantity of feed in Kg	2,370.20	2,140.30	1,200.00	3,150.00
Fertilizer in Kg	210.00	187.34	198.00	340.00
Labour in man days	540.54	532.12	492.00	870.00
Number of fingerlings	1,500.00	1,347.87	1,400.00	1,750.00

Source: Computed from Field Survey, 2014

Table 2. Production function estimates

Variable	Coefficient	Standard Error	T-Value
Constant	12.134	18.084	0.671
Feed	6.789E-03***	0.001	6.789
Lab	-0.758	0.522	-1.452
Fert	0.935	0.630	1.484
Fing	0.214***	0.077	2.789

R^2 = 0.571, Adjusted R^2 = 0.543and F = 4.75

*** Statistically different from zero at 5% level of significance, *** Statistically different from zero at 1% level of significance*

Source: Computed from Field Survey, 2014

Table 3. Poverty status among sampled fish farmers

Poverty Status	Frequency	Percentage
Poor	76	42.5
Non-Poor	103	57.5
Total	179	100

Source: Computed from Field Survey, 2014

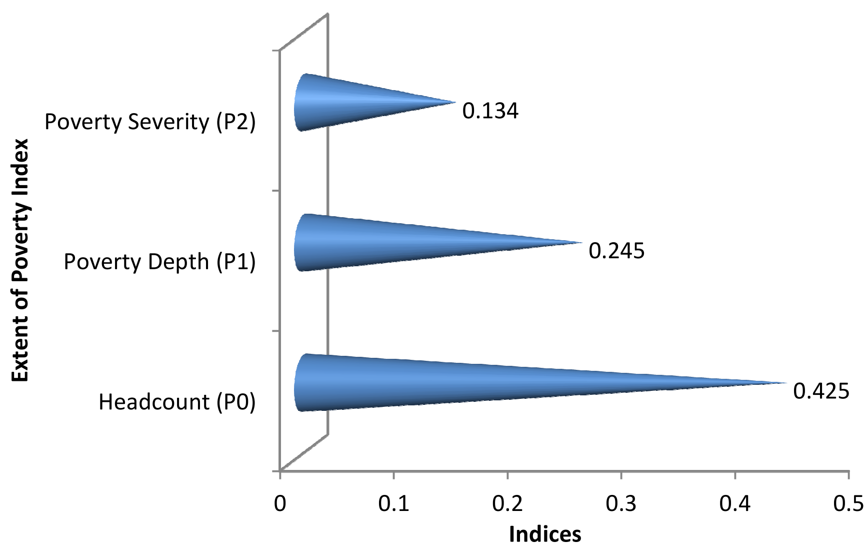

Fig. 1. Extent of poverty among the respondents
Source: Computed from Field Survey, 2014

3.5 Sources of Risks Affecting Fish Farmers

Table 4 shows the type of risks affecting aquaculture fish farmers in the study area. This study adopted the grouping of risks into natural, social, economic, production and technical by [25,24]. Social risk could mean poaching and invasion of farm by predators and some (24.9%) of the respondents were affected by this type of risk. This could not be unconnected with the major problem being faced by the fish farmers to the point of reducing the output. Technical risk could be scarcity of labor and insufficient credit facilities which adversely affected 13% of the respondents. Most (30.4%) of the respondents were adversely affected by economic risks which could be producer price fluctuation and insufficient supply of fingerlings. This could occur in a situation when farmers did not get good prices for fish output. Fewer (2.2%) respondents identified production risk which means pond leakage and poor management of the pond environment. This could bring about low output resulting from mortality. Natural risk refers to drought, flood, wind and storm, diseases and pests. Some (29.0%) of the respondents identified natural risk as the source of risk that affected aquaculture fish production in the study area. This implies that fish output could be low due to the adverse effect of these natural occurrences.

Table 4. Type of risk affecting fish farmers

Risk	Frequency	Percentage
Social	182	24.9
Technical	99	13.5
Economic	222	30.4
Production	16	2.2
Natural	212	29.0
Total	731	100

Multiple responses
Source: Computed from Field Survey, 2014

3.6 Attitudes of Fish Farmers towards Risks

The distribution of respondents by risk attitudes as shown in Table 5 revealed that some (57.0%) of the fish farmers were high risk averse. Some (31.8%) of the respondents were intermediate risk averse, while few (11.2%) of the respondents were low risk averse. The outcome of this study contracts the findings of [23] on poultry egg producers, who stated that 68.47% of the respondents had medium level of aversion to risk while about 6.53% had high level of risk aversion. The reason for this could be traced to the fact that poultry is more fragile than fishery. However, this study contradicts the findings of [38] where it is reported that about 53% of Tanzanian fishermen can be said to be broadly risk preferring or risk neutral, 25% modestly risk averse, and about 22% strongly risk averse.

Table 5. Distribution of respondents by risk attitudes

Risk attitude	Frequency	Percentage
Low risk averse	20	11.2
Intermediate risk averse	57	31.8
High risk averse	102	57.0
Total	179	100

Source: Computed from Field Survey, 2014

3.7 Farmers' Risk Attitudes According to Poverty Status

The distribution of farmers based on risk attitude and poverty status as shown in Table 6 revealed that many (60.0%) of non-poor fish farmers were low risk averse while 40% of poor fish farmers were low risk averse. Also, about 56.1% of the respondents who were not poor were intermediate risk averse, while 43.9% of the poor respondents were intermediate risk averse. Lastly, 44.1% of non-poor fish farmers were high risk averse, while the remaining 55.9% of the poor farmers were high risk averse. This implies that being risk taker would make one to be non-poor considering the results in Table 6.

Table 6. Distribution of farmers based on risk attitude and poverty status

Risk factor	Frequency	Percentage
Low risk averse		
Poor	08	40.0
Non-Poor	12	60.0
	20	100.0
Intermediate risk averse		
Poor	25	43.9
Non-Poor	32	56.1
	57	100.0
High risk averse		
Poor	57	55.9
Non-Poor	45	44.1
	102	100.0
Total	179	

Source: Computed from Field Survey, 2014

3.8 Factors Influencing Farmers' Attitudes towards Risks among Aquaculture Fish Farmers

The ordered probit model estimation results, which show factors influencing farmers' attitude towards risk, are presented in Table 7. It is to be noted that, according to [39], the coefficients estimated in ordered probit model do not have direct interpretations but can be used to calculate probabilities of the dependent variable with different levels and the corresponding marginal probabilities. The threshold parameters δ_1 and δ_2 are significant at 1% level, which implies that the ordered probit model with the 3 different attitudes is highly appropriate. The log likelihood value of -106.452 indicates that the explanatory variables used in the ordered probit model are appropriate. The probability value of 0.001 for chi squared of 117.6 shows that at least one of the parameters of the variables is different from zero. This means that the null hypothesis that all parameters equal to zero in the model is rejected. The empirical results from the analysis revealed that experience, household size, income diversification and poverty status are significant at 1% level, while membership of association and tertiary education are significant at 5% level. Fish farmers with higher experience tend to have lesser probability of being risk averse. This follows the *a priori* expectation that with growing experience in fish farming, the farmer will understand better the production technology, all associated challenges and benefits of taking risks. This is, therefore, expected to give good methods of dealing with such challenges, which would not deter them from taking risks. Having more household size would bring about decreased likelihood of the respondents being risk averse. The reason for this could be due to the presence of family labour that could assist in putting in place strategies at combating risk on the farm, which made them to be risk loving. This result supports the outcome of the study by [40] which stated that household size tends to reduce the probability of risk neutrality in spite of the large family size. Famers who did not belong to one farmer's association or the other would have higher probability of being risk averse, while farmers who belonged to one farmers' association or the other tend to have lesser probability of being risk averse. The reason for this scenario could be due to supports being received from the association when there is need to combat risk emanating from the farm. Tertiary education exhibits negative sign which implies that farmers without tertiary education tend to have higher probability of being risk averse, while the ones with tertiary education would have lower likelihood of being risk averse. This could be attributed to the fact that tertiary education assists the respondents in the area of adoption of new technologies in spite of the associated risk since they know that risk always comes with immense benefits. This agrees with the findings of [41] who observed that low game levels education variable had little influence on risk aversion, but at higher game levels, it generally reduced the level of risk aversion. There is a negative relationship between income diversification and risk attitude of the respondents, which means that farmers who did not diversify their income tend to have higher likelihood of being risk averse. This could be due to the fact that there would be no income from other sources which could serve as shock absorber in case there is risk in fish production, thereby making them to be risk averse.

The existence of negative relationship between poverty status and risk attitude indicates that poverty status increases the probability of the respondents being risk averse as poor fish farmers had higher probability of being risk averse unlike non-poor ones who had lesser probability of being risk averse. This agrees with the findings of [23] who stated that the lower a household's per capita income, (a measure of poverty) the more risk averse they will be. In other words, households whose incomes fall below the poverty line are less willing to take risk than the non-poor households.

Table 7 also presents reports on the marginal effects which measures the response of farmers' attitude towards risk when there is a unit change in the explanatory variables. A unit increase in the experience of the farmer would increase the probability of being low risk averse, intermediate risk averse and high risk averse by -21.3%, 11.2% and 1.4% respectively. This implies that increase in experience would lead to increase in the readiness of the farmers to take risk. A farmer with higher household size would have better chance of being risk taker, that is, the probability of being low risk averse is -17.1% compared to 10.1% in intermediate risk averse category and 0.9% in high risk averse category. Also, farmers who belong to one farmers' association or the other tend to have lesser probability of being risk averse with -17.2% probability of being low risk averse compared to 7.2% in intermediate risk averse category and 6.2% in high risk averse category. Any farmer

Table 7. Ordered probit model estimation results

Variables	Coefficients	T-Value	Marginal Effects		
			Prob (Y=0)	Prob (Y=1)	Prob (Y=2)
Gender	-0.423	-0.21	0.223	-0.123	0.003
Experience	-0.634***	3.11	-0.213	0.112	0.014
Extension Visits	-0.872	-1.01	-0.111	0.031	0.017
Number of Ponds	-0.301	-1.54	-0.102	0.032	0.002
Household Size	-0.290***	-2.84	-0.171	0.101	0.009
Age	0.297	0.78	-0.003	-0.017	0.233
Membership of Association	-0.964**	-2.11	-0.172	0.072	0.062
Primary Education	0.824	0.34	-0.100	-0.120	0.160
Secondary Education	0.658	0.92	-0.001	-0.101	0.181
Tertiary Education	-0.834**	-2.00	-0.162	0.101	0.054
Income Diversification	-0.283***	-2.80	-0.219	0.019	0.007
Quantity of Feed	-0.145	-0.65	-0.213	0.113	0.016
Poverty Status	-0.582***	-6.21	-0.241	0.142	0.091
Stocking Density	-0.774	-1.58	-0.121	0.021	0.011
Access to Credit	-0.632	-1.57	-0.132	0.032	0.028
δ_1	1.436***	2.43	Log Likelihood = -106.452		
δ_2	2.563***	2.82			
Chi^2 (15)	117.6				
Prob.	0.001				

*** Statistically different from zero at 5% level of significance, *** statistically different from zero at 1% level of significance.*
Source: Computed from Field Survey, 2014

with tertiary education and income diversification would have higher likelihood of being risk taker with -16.2% and -21.9% in low risk averse category, 10.1% and 1.9% in intermediate risk averse category and 5.4% and 0.7% in high risk averse category respectively. Lastly, non-poor farmers tend to have lesser probability of being risk averse with -24.1% compared to 14.2% in intermediate risk averse category and 9.1% in high risk averse category.

4. CONCLUSION

The study focused on the analysis of risk attitudes and poverty status nexus among fish farmers in Ondo State, Nigeria. The results showed that feed is the most important determinant of fish output in the study area. Majority of the respondents were non-poor probably because of the diversification of means of livelihood. The results also showed that majority of the respondents were high risk averse in spite of the livelihood diversification that characterized fish farmers which is expected to encourage them to be low risk averse. The study revealed that poverty status significantly influenced the risk attitudes of the respondents which is an indication that there is an important connection between poverty status and risk attitudes among fish farmers in the study area. Based on the findings of this study, it is recommended that fish farmers should be encouraged to participate in agricultural insurance programmes. Also, cooperative societies should be formed amongst the fish farmers so as to enable them have access to credit facilities and also to take the advantage of economies of scale inherent in the societies. All these are expected to make high risk-averse fish farmers to be low risk-averse. Individuals, government and non-governmental organizations should put in place programmes and policies that are capable of alleviating poverty in order to improve the ability of fish farmers to take risks in the study area. Such programmes and policies should target infrastructural and human capital development in the study area.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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