FISH FARMERS' PARTICIPATORY FACTORS INFLUENCING THE DEMAND FOR AQUACULTURE INSURANCE: EVIDENCE FROM LAGOS, NIGERIA

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Abstract

Boosting aquaculture insurance, as a financial instrument, can assist the sustenance of aquatic food demand to cushion fish farmers' income, and ensure adequate farm property safety in Nigeria. This study examined the participatory factors affecting aquaculture insurance and its related demand determinants, with empirical evidence drawn from fish farmers in Lagos State. The study employed a survey approach cum multiphase sampling technique. A descriptive statistic and Friedman's rank test were adopted in the data analysis. This study contributes immensely with the tabular and graphical models that explain the both the demographic and institutional factors affecting uptake of aquaculture insurance and demand determinants for aquaculture insurance in Lagos State, Nigeria. All the demographic factors, from the findings, showed critical effects on the uptake of aquaculture insurance. Thus, findings further showed that all the institutional factors, except for access to cooperative society, affect the uptake of aquaculture insurance in Lagos State. The study recommended that aquaculture underwriters should ensure critical evaluation of all demographic and institutional factors to be sure of effective demand capacities of fish farmers in Nigeria. However, the government should expand the subsidy net for more fish farmers to have access. With the simplicity of insurance contract design, aquaculture underwriters will gain attraction from farmers, which will, in turn, generate improved premium and their potential profitability.

Key Words: *Aquaculture risks, participatory factors, demand for aquaculture insurance, fish farmers, Nigeria*

1. Introduction

Aquaculture has been existing for more than three decades but started contributing tremendously to the world food supply and rural source of earnings. Hence, the increasing demand for aquatic products, globally, in a bid to attain food sustenance (Huntington, 2017). Aquaculture has the possibility to contribute greatly to social, environmental, and economic sustainability while attending to the increasing demand for blue food (Bush et al., 2019; Stuart et al., 2022). The rising requirement for aquatic products of aquaculture sustainable production and efficiency. Studies (such as Food & Agriculture Organisation, 2020; Mensah et al., 2021; Ninne & Teleki, 2023) had

recorded continuous unachievable harvest from capture fishing stock; therefore, seeing aquaculture as the only substitute solution to addressing these needs. In Nigeria, the yearning for fish usually outpaces the local production. Nigeria has been regarded as the largest producer of fish in the West African Subregions, with Senegal and Ghana behind

(ECOWAS Commission, 2020; Olaoye et al, 2020); second producer in Africa behind Egypt (Kaleem & Sabi, 2021); and one of the countries with the highest consumption of aquatic foods (Nwuba et al, 2023). Aquaculture, otherwise known as aquafarming, is challenged in Nigeria with a numbers of potential loss exposures, which include predation, aeration, theft, flood and water shortages, water supply, natural perils, storms and swells, water pollution, climate change-induced perils, transit risks and so on (Alam & Guttormsen, 2019; Lind et al., 2015; Luna et al., 2023).

The endemic challenges of the practice of aquaculture are the risks usually encountered by fish farmers in many parts of the world. Findings from literature survey regarding aquaculture risks had indicated that while existing studies focused on evaluating ecological risks, climate change risks, and disease-related risks (Alalah & Sanchez-Jerez, 2020; Kabir et al., 2017; Rahman et al., 2021); other studies had focused on risks associated with production, profitability, and economic efficiency (Ali et al., 2020; Asche et al., 2018; Khan, Begum, Nielsen, & Hoff, 2021). Studies concerned with risk management techniques (such as Luna et al., 2023; Theodorou & Tzovenis, 2023; Watson et al., 2018), focused on insurance as a risk control measure for managing aquaculture. These risks indeed affect the entire value chain processes of fish farmers, as appropriate financial services such as aquaculture insurance as imperative to advert aquaculture losses from becoming disastrous for fish farmers and the whole society. Nonetheless, fish farmers' risk perceptions have a crucial role in the decision-making processes (in terms of production, price determination, profitability, economic efficiency, and the likes); only limited studies (such as Hohl & Kalavakonda, 2021; Mensah et al., 2021; Pongthanapanich, van Anrooy, Liu, & Alder, 2020) had been conducted relating to participatory factors influencing demand for aquaculture insurance in the world.

Aquaculture insurance has its potential dominance in the Asian continent with evidence from China, India, Indonesia, Vietnam, and Bangladesh; being the top-five countries in the globe, contributing to its development. Egypt, being the top-six country in the world, takes the place of Africa, as it contributes to its advancement (FAO, 2018, Hohl, 2019). Even with the extent of development, aquaculture insurance penetration level to the world aquaculture production is still recorded at 0.06 percent due to socio-demographic and institutional factors which had affected aquaculture production, efficiency, and progression (Hohl & Kalavakonda, 2021; Rahman et al., 2021). The foremost objective is to examine the participatory factors affecting the uptake of aquaculture insurance and its related demand determinants in Lagos State, Nigeria. The specific objectives then are to ascertain the rank analysis of demographic factors affecting uptake of aquaculture insurance among fish farmers in Lagos State, Nigeria; determine the rank analysis of institutional factors affecting the uptake of aquaculture insurance among fish farmers in Lagos State; and examine the rank analysis of demand determinants for aquaculture insurance among fish farmers in Lagos State, Nigeria. The justification of this study, therefore, is to evaluate the fish farmers' participatory factors influencing their demand for aquaculture insurance in Lagos State. Lagos State is being chosen being the state with the highest number of metrics tons of fish

in Nigeria in terms of its commercial bases regarding production, accessibility for exportation and consumption, technological advancement etc.

2. Review of Related Literature

2.1. Aquaculture Insurance: Developmental Perspective

The evolution of insurance for aquaculture stocks began in 1974, when the first policy was designed for aquacultural risks in the Lloyd's of London and the London Insurance Market (Secretan, 2008 as cited in Zhang, 2021). Aquaculture insurance is seen as a policy designed to safeguard most often aquaculture

farms including activities enclosed bays, as well as open ocean farms situated several kilometers offshore (Van Anrooy et al., 2022a; Zheng et al., 2018). Aquaculture insurance has the prospect to rectifying weather-related events because it is an alternative means of finance in the happenings of unpredicted state of affairs (Mensah et al., 2021).

Aquaculture insurance is a pecuniary instrument that provides a system for transacting risks encountered in aquaculture production. The accessibility and availability of aquaculture insurance is very confined; hence it makes provision for aquaculture production and aquaculture larger-sized enterprises (Rahman et al., 2021; Watson et al., 2018). Perils usually covered under aquaculture insurance include but not limited to extreme weather events, environmental pollution and natural calamity, technical failure, which may result in fish stock mortality and aquaculture facilities' damages (Hohl & Kalavakonda, 2021; Pongthanapanich et al., 2020).

Hohl and Kalavakonda (2021) stipulated that aquaculture insurance products can be categorized into index-based insurance and indemnity-based insurance. While index-based insurance constitutes revenue insurance (indemnity in case of changes in prices of aquaculture products/costs of feed components) and weather index covers (meteorological variables linked with indemnity estimates); indemnity-based insurance includes named perils insurance (market-specific covers) and all-risk stock mortality insurance (safeguard aquaculture operators against all possible perils that lead to stock mortality). Van Anrooy et al. (2022b) stipulated that the underwriting bases for private underwriters to provide aquaculture insurance include financial ability and willingness to sustain strict pong management, maintaining the right water quality, ensuring actual water movement through inlets/outlets, and so on. Perils covered involved both capture fisheries and aquaculture (Nguyen & Pongthanapanich, 2016; Sule et al., 2019).

Aquaculture insurance provision cannot be without some difficulties such as high cost of premium, incomplete statistical data, financial losses, low awareness, poor record of claims, absence of financial literacy, high moral hazards, among others (Wei et al., 2016; Zheng et al., 2018). While insurance contract is in force, the insurer ought to ensure premium estimation on the basis of average sum insured incorporated in the aquaculture insurance scheme (Tisdel et al., 2012). According to Hohl (2019), premium rates are mainly based on the production mechanisms, perils insured, locations, species, and deductible; for the safety of stock mortality and named perils.

2.1.2. Lagos State and Fish Farming

Lagos State is situated in the Southwest geopolitical area of Nigeria. It has a northern and eastern border with the state of Ogun, and western territory shared with the Republic of Benin (Lagos State Government, 2021). While Lagos lagoon has a twenty-two (22) percent land mass, 0.4 percent was recorded for its Nigeria territory. In 2011, the Lagos State government established the fish farm estate to bolster the production and efficacy of the aquaculture. The essence of the estate was to meet the expectations of the low-income groups and corporate bodies within the state (Adelesi & Baruwa, 2022).

However, the estate is founded as a public-private initiative for employment generation and increasingly high productivity in domestic fish (Ogunmefun & Achike, 2018; Punch, 2019). The Lagos State Government has rekindled its interest many times to promote aquaculture in all parts of the State; with efforts to increase fish local production by providing fishing inputs such as floats, hooks, netting materials, sinkers, and so on.

2.2. Theoretical Review

2.2.1. Prospect Theory (PT)

Prospect theory (PT) is a theory of behavioural economics, judgment, and decision making that was earlier developed by Kahneman and Tversky (1979) and further assessed by Tversky and Kahneman (1992). Under this theory, individual decisions are assessed on gains and losses relatively. Four features are considerable for possible evaluation on the bases of loss aversion, reference point, probability weighting, and diminishing sensitivity (Barberis, 2013). This theory established concave circumstances where gains are sure and convex situations where losses appeared. These two situational points show a value function.

However, the value function shaped ‘S’ captures risk consciousness of each individual agent over gains and risk seeking attitude over losses (Kaluszka & Krzeszowiec, 2012). Eckles and Wise (2011) stated that individual with prospect theory desires is longing to take on additional risk in a bid to avert opinions regarding losses. Objectively, PT adopts a weighting function that overweight minor probabilities on the basis that individuals had displayed more sensitive feelings towards a minor relativity in gains/losses to larger outcomes. While smaller probabilities are overweighted, larger probabilities are underweighted.

Accordingly, a highly raised probability weighting point signifies that individuals are pessimistic in a loss situation while optimistic in a gain situation (Booij et al., 2009). According to Lim and Bruce (2015), prospect theory pushes more for risk preference (. i.e., risk taking or risk consciousness) and loss aversion. While risk preference seeks more of probabilistic gains or losses; loss aversion is of the ideology that people would rather wish to avert a loss then seeking a reward. Loss aversion is one of the major biases which individual agents depend upon when dealing with insurance, as they tend to overweight minor probabilities to protect against losses. The theory

serves as a yardstick for which theoretical understanding is laid as it expounds participatory dispositions of individual fish farmers to the uptake of aquaculture insurance.

2.3. Empirical Review

Han and Jiang (2019) examined a systematic risks of climate events and individual's participation in mariculture mutual insurance, with empirical investigation among shrimp producers in Zhejiang Province, China. The study conducted a survey with the aim to evaluate underlying determinants of individuals' participation in mariculture mutual insurance. On the basis of logistic model approach, findings revealed that environmental risks, climate risks, and technical risks had severely affected the evolvement of food security and aquaculture in Zhejiang. Findings further showed that fish farmers' insurance participation were on the basis of individual characteristics such as perceived burden of premium level, insurance awareness, individual income, family size, production capabilities, national insurance subsidies, policy support, and so on. The study suggested government subsidy as on way of encouraging individual fish farmer towards patronizing fishery insurance. It further suggested high-level

production efficiency and large-scale specialisation of aquaculture production to motivate farmers towards aquaculture insurance.

Paptsov et al. (2020) investigated insurance as a marketing determining factor to develop aquaculture in Russia. The study was exploratory in nature. It was observed in the study that fish farmers' needs for

insurance vary hinging upon the size and type of aquaculture businesses, the pecuniary structure of their enterprises, and the aquatic organisms' growth. Findings revealed that aquaculture insurance hasn't become a marketing tool to reduce economic risks encountered most times by fish farmers. It was further noticed that the Russian aquaculture industry is devoid of knowledge and experience in fish farming insurance. The study presupposes increase in the demand for knowledge in order to develop the fish farming enterprises.

Mensah et al. (2021) evaluated the prospect, determinants, and profitability of aquaculture insurance among fish farmers in the eastern region, Ghana. This study was conducted among 140 fish farmers through the adoption of a structured questionnaire. A multistage sampling technique was employed. The data analytical technique adopted was thematic analysis, used to determine the perceived aquaculture insurance chances. In a bid to determine the factors affecting participation of aquaculture insurance, its size, and profitability, the Heckman's two-stage model was employed. The findings revealed loss recovery, farm renovation, and agricultural promotion as three key perceived aquaculture insurance areas of prospect. While the study came up with some sets of demographic and institutional factors influencing aquaculture insurance participation and amount intensity among fish farmers, profitability index and return on investment (ROI) were 2.07 percent and 3.2 percent respectively. The study recommended that constant education on and awareness of aquaculture insurance as yardstick to increasing its participation and size intensity among fish farmers in Ghana. It further suggested that insurance companies should focus more on fish farmers with higher stock size.

Jaiye (2022) examined the effect of flood insurance on sustainable aquaculture, within Lapa-Gwari, Minna, Nigeria. The study adopted survey design cum structured questionnaire data gathering technique. The study was conducted among One hundred and fifty fish farmers in Minna. Findings revealed that nearly 730 US Dollars was lost to disasters around fish ponds without insurance average or government interference for sustainable achievement. The study suggested that operators of aquaculture should possess insurance policy in a bid to save the nation and her economic agents in fish farming.

In the work of Suresh and Kiran (2023), a retrospective and prospective evaluation of climate change was conducted in reference to marine fishery insurance in India. The study employed both primary and secondary data collection instruments. A snowballing sampling technique was adopted cum a structured questionnaire, from 200 fishermen in the city of Kerala, India. The data gathered was supplemented by Fishermen Welfare Cooperative Development Society in Ernakulam, Kerala, which assisted facilitation of insurance coverage among traditional fish farmers. Findings showed that fishermen got insurance coverage with the credit facilities provided by Cooperative venture supported by the Government of Kerala. The study observed absence of satisfactory insurance products and trouble of verifiability affects its deepening. More findings showed that fishers observed insurance as extra expenses and are of the judgment that the community would be responsible for the loses to a definite extent.

3. Research Methods

This study adopted cross sectional survey design analysis, which captured the thoughts of fish farmers' perceptions with respect to participatory factors affecting the uptake of aquaculture insurance in Lagos State. The assumption of this survey design ensures data gathering from subjects within identical timespan; and helped free the outcomes from biases. The total number of individuals engaged in fish production, as empowered by the Lagos State Government in 2023, was recorded at not less 20,000, which was set to be the population of the study (Punch, 2022).

The study employed a multiphase sampling technique comprised of judgmental and convenience in nature. For judgmental sampling technique, fish farmers' judgments were required for thoughtful elicitation of information relating to aquaculture production, efficiency, quality, cost, risks, and profitability. For convenience sampling, fish farmers were engaged on their readiness and availability. The data gathering instrument employed was a structured questionnaire. The questionnaire was self-developed with respect to the notable concepts and variables studied. The choice of the survey technique was due to fitness to the adopted research design, its economic nature, and simplicity in distribution (Sallies et al., 2021). To this end, a Taro Yamane's formula was applied, as cited in Israel (2013) as

$$n = \frac{N}{1+Ne^2}$$

$$n = \frac{20{,}000}{1 + 20{,}000\ (0.05)^2} = 392$$

392 copies of questionnaire were distributed among fish farmers in different locations in Lagos, most specially Badagry, Ikorodu and Epe divisions. Out of the total distributed questionnaire, 329 copies were retrieved while 284 of the collected copies were finally adopted for the data analysis; giving a response rate of 72 percent.

The study measurement of validity consisted of construct, and content validity. While construct validity was structured in line with convergent and discriminant views of earlier studies, content validity was conducted among experts in aquaculture, and insurance which enable the draft useful research instrument adopted, in this study, for the data gathering. Thus, the reliability test was conducted with a Cronbach alpha above the standard 0.7 for all concerned constructs. These concluding results were in conformity with statistical intervention of the exactitude of the adopted scales, and the paramountcy of the internal stability.

4. Results and Discussion of Findings

4.1. Descriptive Analysis of Participants Responses

Table 4.1: Participants' Bio-Data Information

Variable	Response Label	Frequency	Percentages
Gender	Male	132	46.5
	Female	152	53.5
Age Bracket	18 but less than 30	30	10.6
	30 but less than 40	47	16.5
	40 but less than 50	91	32.0
	50 but less than 60	59	20.8
	60 yrs & above	57	20.1
Educational Qualification	BSc./HND	172	60.6
	Master Degree	48	16.9
	Doctorate Degree	07	2.5
	Professional	05	1.8
	Others	52	18.2
Business Scale	Large Scale	24	8.5
	Medium Scale	148	52.1
	Small Scale	112	39.4
Capital Structure	Less than #500,000	65	22.9
	#500,000 but less than #1,500,000	105	37.0
	#1,500,000 but less than #2,500,000	60	21.1
	#2,500,000 but less than #3,500,000	18	6.3
	#3,500,000 & above	36	12.7
Awareness of Aquaculture Insurance	Yes	195	68.7
	No	89	31.3
Existence of Aquaculture Insurance policy	Yes	79	27.8
	No	203	71.5
Claims History	Yes	26	9.2

	No	258	90.8

Source: Researchers' Computation, 2023

Table 4.1 above reveals that while more than fifty-three percent of the participants were female, the remaining forty-seven percent were male. This is an indication that more female genders are on engaged in the aquaculture enterprises. For the *age bracket*, more responses (i.e., thirty-two percent) was recorded for those fish farmers that were 40 years but less than 50. While twenty-one percent was recorded for those fish farmers that were 50 years but less than 60, twenty percent for those 60 years and above, seventeen percent for 30 years but less than 40, and ten percent was recorded for 18 years but less than 30. This is an indication that most of the fish farmers interacted with were from 40 years and above. For *educational qualification*, most fish farmers hold BSc/HND with a sixty-one percent reaction. While seventeen percent of the participants hold master's degree, nineteen percent was recorded for others (OND, SSCE, etc.), two percent and one percent for those fish farmers that hold Doctorate degree and Professional certificate. These responses indicate that most fish farmers that responded to the research instrument were all graduates.

For *business scale*, many of the fish farmers were both of medium-sized and small-sized enterprises with respective responses of fifty percent and forty percent. Only eight percent was recorded for large-sized fish farmers. This is an indication that most aquaculture businesses in Lagos State are of medium and small enterprises. For *capital structure*, thirty-seven percent was recorded for those fish farmers whose capital were #500,000 but less than #1,500,000. While twenty-three percent was recorded for those whose capital were less than #500,000, twenty-one percent was recorded for #1,500,000 but less than #2,500,000. Thirteen percent and six percent were recorded, respectively, for those participants with #3,500,000 & above, and #2,500,000 but less than #3,500,000. This affirms the earlier claims around the business scale hence most participants had their capital from those less than #500,00 to #2,500,000.

For *awareness of aquaculture insurance*, sixty-nine percent claimed to be aware while the remaining thirty-one percent were unaware. This implies the level of insurance awareness among fish farmers. For the *existence of aquaculture insurance policy*, while twenty-eight percent claimed that they hold aquaculture insurance policy, seven two percent did not hold such policy. This indicates, according to the responses gathered from the fish farmers, that aquaculture insurance is still unpopular among fish farmers in Lagos State, Nigeria. For *claims history*, over ninety percent of fish farmers in Lagos State have not made any insurance claims, which supported their claims of majority not holding the policy.

4.2. Descriptive Analysis of Research Variables

Table 4.2: Demographic Factors affecting uptake of Aquaculture Insurance

Variables	Scale Level					Mean	Std Dev.
	SD	D	U	A	SA		
	1	2	3	4	5		

My gender has influenced my participation in aquaculture insurance	22.5	33.8	16.9	21.5	5.3	2.53	1.205
My age has influenced my participation in aquaculture insurance	18.0	30.3	18.7	30.6	2.5	2.69	1.156
My formal education has influenced my participation in aquaculture insurance	13.7	31.3	18.0	23.6	13.4	2.92	1.278
My religious belief has influenced my participation in aquaculture insurance	21.1	30.3	23.2	23.6	1.8	2.55	1.119
My household size has influenced my participation in aquaculture insurance.	20.1	41.2	15.5	19.7	3.5	2.45	1.122
My farm experience has influenced my participation in aquaculture insurance	13.4	22.5	12.3	29.6	22.2	3.25	1.375
My farm income has influenced my participation in aquaculture insurance	15.1	21.5	13.0	35.2	15.1	3.14	1.329
My farm size has influenced my participation in aquaculture insurance	16.2	22.9	16.	29.2	15.5	3.05	1.339
My perceived value for fish farming has influenced my participation in aquaculture insurance	13.4	17.3	34.9	23.2	11.3	3.02	1.181

Source: Researchers' Computation, 2023

In Table 4.2 (and Fig 4.1), the demographic factors' survey items for which data were gathered from the entire participants were *Fish farmers' gender, age, formal education, religious belief, household size, farm experience, farm income, farm size, and perceived value*. The participants reacted to the numerous items, wherein 56 percent expressed their disagreement in terms of *Fish farmers gender*, 17 percent indifferent, and 27 percent indicated their agreement. For *Fish farmers' age*, while participants expressed 48 percent in not supporting this item, 19 percent were in undecided with it. Then, 33 percent supported. As for *Fish farmers' education*, 45 percent of the entire participants exhibited their disagreement, 18 percent were indecisive, and 37 percent agreed. For *Fish farmers' religious belief*, 52 percent disagreed, 23 percent undecided, and 25 percent expressed their pleasure. For *Fish farmers' household size*, 61 percent disagreed, 23 percent agreed, and 16 percent indifferent. For *Fish farmers' farm experience*, 36 percent disagreed, 12 percent indecisive, and 52 percent expressed agreement. For *Fish farmers' farm income*, 37 percent disagreed, 13 percent indecisive, and 50 percent expressed agreement. For *Fish farmers' farm size*, 39 percent disagreed, 16 percent indecisive, and 45 percent expressed agreement. For *Fish farmers' perceived value*, 31 percent disagreed, 35 percent indecisive, and 34 percent expressed agreement. The mean and standard deviation scores supported the outcomes

for all the factors except for Fish farmers' household size which declined. This implies that fish farmers' judgments towards the survey items were normally distributed and centered around the mean. The result of the descriptive statistics on demographic factors affecting uptake of aquaculture insurance clearly show that all the demographic factors have similar judgments about all the subject matter, except for Fish farmers' household size, in the distribution of the participants' judgments.

Demographic Factors affecting Uptake of Aquaculture Insurance

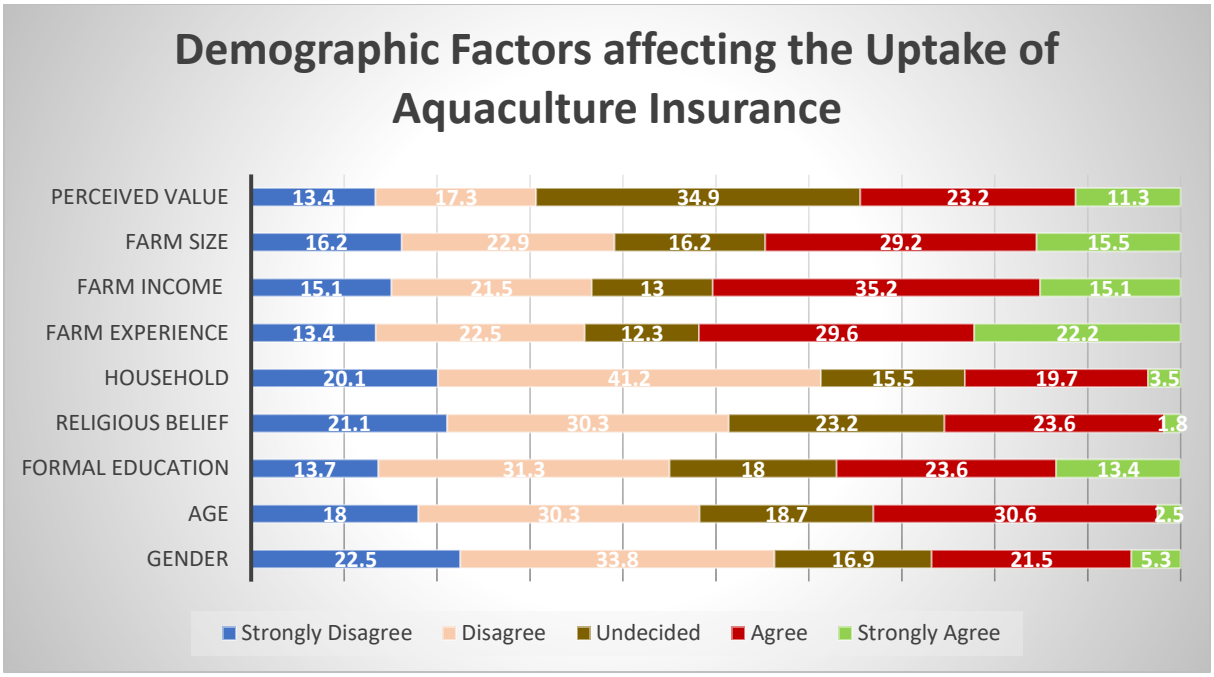

Figure 4.1

Table 4.3: Institutional Factors affecting uptake of Aquaculture Insurance

Variables	Scale Level					Mean	Std Dev.
	SD	D	U	A	SA		
	1	2	3	4	5		
My access to insurance experts has influenced my participation in aquaculture insurance	20.8	13.4	17.6	28.2	20.1	3.13	1.428
My access to credit facilities has influenced my participation in aquaculture insurance	19.7	12.0	15.8	32.7	19.7	3.21	1.410
My level of Insurance awareness has influenced my participation in aquaculture insurance	18.3	10.6	21.1	29.9	20.1	3.23	1.376
My access to cooperative societies has influenced my participation in aquaculture insurance	18.3	16.5	19.7	27.8	17.6	3.10	1.370

Source: Researchers' Computation, 2023

In Table 4.3 (and Fig 4.2), the institutional factors' survey items for which data were gathered from the entire participants were *Fish farmers' access to insurance experts, access to credit facilities, level of insurance awareness, and access to cooperative societies.* The participants reacted to the numerous items, wherein 48 percent expressed their agreement in terms of *Fish farmers' access to insurance experts*, 18 percent indifferent, and 44 percent indicated their disagreement. For *Fish farmers' access to credit facilities*, while participants expressed 52 percent in support this item, 16 percent were in undecided with it. Then, 32 percent disapproved. As for *Fish farmers' level of insurance awareness*, 50 percent of the entire participants exhibited their agreement, 21 percent were indecisive, and 29 percent disagreed. For *Fish farmers' access to cooperative societies*, 45 percent agreed, 20 percent undecided, and 35 percent expressed their pleasure. The mean and standard deviation scores supported the outcomes. This implies that fish farmers' judgments towards the survey items were normally distributed and centered

around the mean. The result of the descriptive statistics on institutional factors affecting uptake of aquaculture insurance clearly show that all the participants have similar judgments about all the subject matters as there are no pertinent variations in the distribution of the participants' judgments.

Institutional Factors affecting Uptake of Aquaculture Insurance

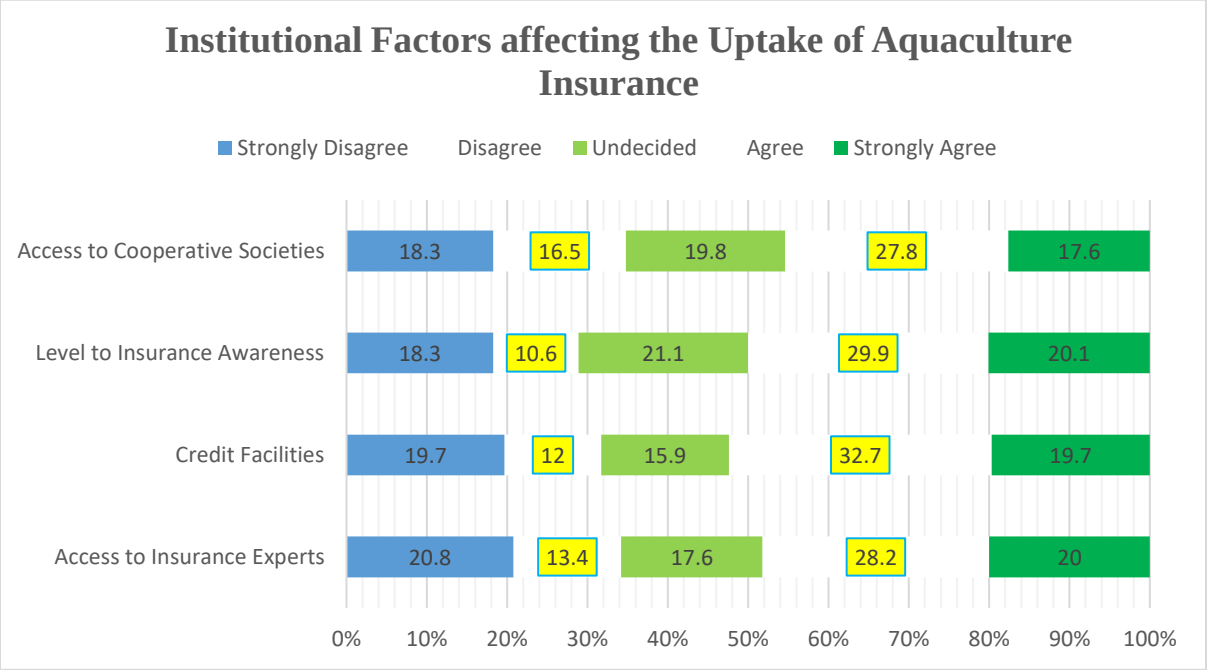

Figure 4.2

Table 4.4: Demand Determinants of Aquaculture Insurance

Variables	Scale Level					Mean	Std Dev.
	SD	D	U	A	SA		
	1	2	3	4	5		
Claims settlement provided from aquaculture insurance policy has not encouraged my desire.	14.1	14.1	20.4	32.4	19.0	3.28	1.310
Insurance regulation has not encourage my demand for aquaculture insurance	3.5	16.2	20.1	43.0	17.3	3.54	1.064
Risk awareness regarding aquaculture insurance is low, thereby, negatively affecting the demand for the policy	5.3	13.7	25.7	29.6	25.7	3.57	1.164
My level of financial literacy has negatively affected my demand for aquaculture insurance	13.7	32.0	19.7	21.6	13.0	2.88	1.264

Source: Researchers' Computation, 2023

In Table 4.4 (and Fig 4.3), the barriers items for which data were gathered from the entire participants were *claims settlement, insurance regulation, insurance awareness, and financial literacy.* The participants reacted to the numerous items, wherein 51 percent expressed their agreement in terms of *claims settlement,* 21 percent undecided and 28 percent indicated their

disagreement. For *insurance regulation*, while participants expressed 60 percent in support, 20 percent were both for undecided and

disagreed respectively. As for *risk awareness*, 55 percent of the entire participants exhibited their agreement, 25 percent were indecisive, and 19 percent disagreed. For *financial literacy*, 35 percent disagreed, 20 percent undecided, and 45 percent expressed their support. The mean and standard deviation scores support the outcomes. This implies that fish farmers' judgments towards the survey items were normally distributed and centered around the mean. The result of the descriptive statistics on demand determinants of aquaculture insurance clearly show that all the participants have similar judgment about all the subject matters, except for financial literacy, as shown in the distribution of the participants' judgments.

Demand Determinants for Aquaculture Insurance

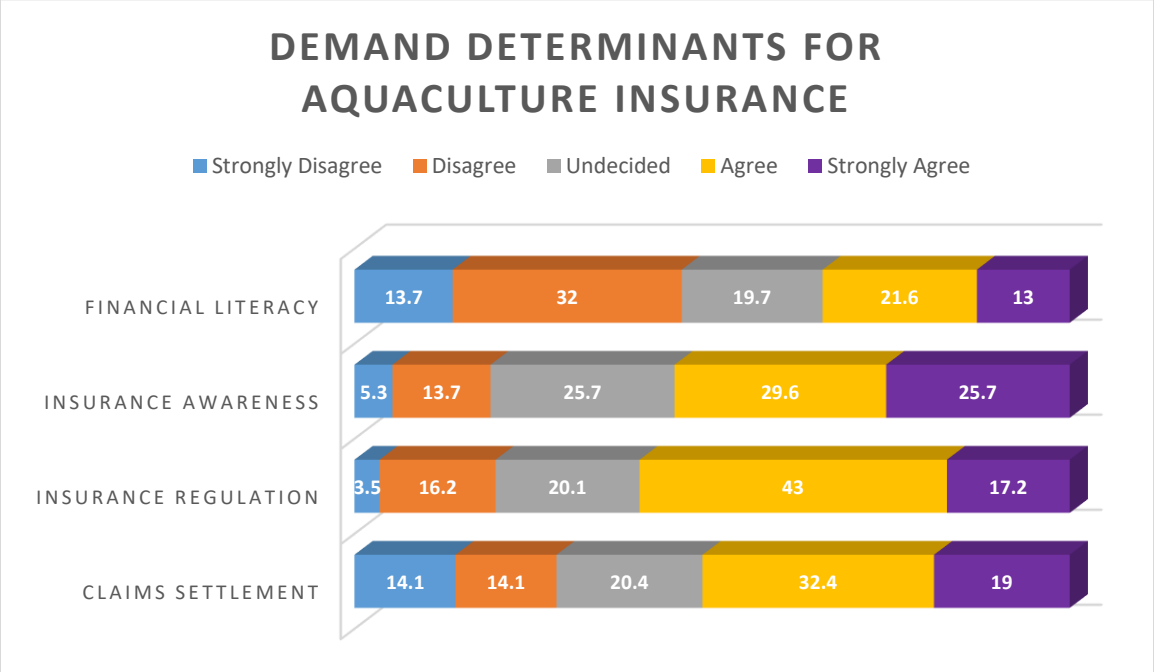

Figure 4.3

4.3. Hypotheses Testing

4.3.1. Friedman's Rank Test

Friedman's symbiotic analysis test, represented by K, measures repeatedly identical population with same median. Friedman's test presupposes, under a null hypothetical atmosphere, that the dependent variable has similar underlying constant distribution, which thus require at least an ordinal measurement (Eisinga et al., 2017). However, data, under the Friedman's rank test, are always pitched in a symbiotic tabular model consisting of 'n' rows and 'k' column. Friedman's test ascertains if the rank combined effects for each of the conditions estimated is different largely from the estimations which could be expected by prospect (St. Laurent & Turk, 2013).

Table 4.5: Results of Friedman's Rank Test on Demographic Factors affecting the Uptake of Aquaculture Insurance

S/N	Survey Items	Mean Rank	Rank
1.	Gender	4.27	8
2.	Age	4.70	6
3.	Formal Education	5.19	5
4.	Religious Belief	4.30	7
5.	Household Size	4.10	9
6.	Farm Experience	5.80	2
7.	Farm Income	5.85	1
8.	Farm Size	5.57	3
9.	Perceived Value	5.31	4

Source: Researchers' Computations, 2023

Table 4.6: Chi-Square Results from the Friedman's Test

N	284
Chi-Square	205.320
Df	8
Asymp.sig.	.000

a. Friedman Test

The analytical outcomes of the Friedman's test signify the existence of a statistically significant variance in demographic factors affecting uptake of aquaculture insurance [gender, age, formal education, religious belief, household size, farm experience, farm income, farm size, perceived value, X^2 (8, n=284) = 205.320, $p < 0.05$]. Consequently, taking critical scrutiny of the mean estimations suggested a descending layer in fish farmers' insights from *farm income* (5.47) to *farm experience* (5.80), to *farm size* (5.47), to *perceived value* (5.31), to *formal education* (5.19), to *age* (4.70), to *religious belief* (4.30), to *gender* (4.27), to *household size* (4.10). The significance of these demographic factors affecting the uptake of aquaculture insurance were plainly ranked to give grounds for the above clarifications.

Table 4.7: Results of Friedman's Rank Test on Institutional Factor affecting the Uptake of Aquaculture Insurance

S/N	Survey Items	Mean Rank	Rank
1.	access to insurance experts	2.42	4
2.	Access to credit facilities	2.52	2
3.	Level of insurance awareness	2.60	1
4.	Access to cooperative societies	2.45	3

Source: Researchers' Computations, 2023

Table 4.8: Chi-Square Results from the Friedman's Test

N	284
Chi-Square	7.339
Df	3
Asymp.sig.	.062

a. Friedman Test

The analytical outcomes of the Friedman's test signify the existence of a statistically significant variance in demand determinants for aquaculture insurance [access to insurance expert, access to credit facilities, level of insurance awareness, X^2 (3, n=284) = 7.339, $p < 0.05$]. Consequently, taking critical scrutiny of the mean estimations suggested a descending layer in fish farmers' insights from *level of insurance awareness* (2.60), to *access to credit facilities* (2.52), to *access to cooperative societies* (2.45), to *access*

to insurance expert (2.43). The import of these institutional factors for aquaculture insurance were significantly ranked to give grounds for the above clarifications.

Table 4.9: Results of Friedman's Rank Test on demand determinants for Aquaculture Insurance

S/N	Survey Items	Mean Rank	Rank
1.	Claims settlement	2.42	3
2.	Insurance regulation	2.67	2
3.	Insurance awareness	2.78	1
4.	Financial literacy	2.14	4

Source: Researchers' Computations, 2023

Table 4.10: Chi-Square Results from the Friedman's Test

N	284
Chi-Square	57.391
Df	3
Asymp.sig.	.000

b. Friedman Test

The analytical outcomes of the Friedman's test signify the existence of a statistically significant variance in demand determinants for aquaculture insurance [claims settlement, insurance regulation, insurance awareness, financial literacy, X^2 (3, n=284) = 57.391, $p < 0.05$]. Consequently, taking critical scrutiny of the mean estimations suggested a descending layer in fish farmers' insights from *insurance awareness* (2.78) to *insurance regulation* (2.67), to *claims settlement* (2.42), to *financial literacy* (2.14). The import of these demand determinants for aquaculture insurance were significantly ranked to give grounds for the above clarifications.

4.4. Discussions of Findings

This study confirms fish farmers' perceptions of participatory factors influencing the demand for aquaculture insurance in Lagos, Nigeria.

The results from objective one indicated that '*farm income'* is ranked first, followed by '*farm experience'*, '*farm size'*, '*perceived value'*, '*formal education'*, '*age*', '*religious belief'*, '*gender*', and '*household size'*. This result is corroborated with the recent studies (such as Hohl & Kalavakonda, 2021; Mensah et al., 2021; Olaoye et al., 2023) noted that socio-demographic factors have a huge effect on the productive and efficient capacities of aquaculturists around the world. Also supported with the findings of Watson et al. (2018) and Ali et al. (2020) who noted that fish farmers' income, farm size and experience can upscale the demand and supply conditions of fishery insurance.

The results for the second objective indicated that while '*level of insurance awareness'* was ranked first; followed by '*access to credit facilities'*, '*access to cooperative society'*, and '*access to insurance experts*. This result aligned with recent studies (such as Mensah et al., 2021; Watson et al., 2018; Zheng et al., 2018) who noted that regular push for insurance awareness among fish farmers and prompt access to sustainable credit facilities will improve and add positive value to aquaculture insurance.

As for the demand 'determinants for Aquaculture insurance', The results affirmed that fish farmers ranked *insurance awareness, insurance regulation, claims settlement and financial literacy* as first, second, third, and fourth. These findings are in consonance with earlier such studies of Anrooy et al. (2022b); Zheng et al. (2018); Mensah et al. (2021).

5. Conclusion and Recommendations

Without iota of doubt, aquaculture risks (such as ecological, production, market, regulatory, technological, personal risks, etc.) present critical challenges to fish farmers and their related income, perceptions, preferences, and other economies of scale for survival. This study therefore investigated the fish famers' participatory metrics (both demographic and institutional factors) affecting aquaculture insurance uptake and its related demand determinants. Findings being drawn showed the opinions of the selected participants where '*gender', 'age', 'formal education', 'religious belief', 'household size',* '*farm experience', 'farm size', and 'perceived value' were* all ranked accordingly.

Results for objective two showed that a ranked analysis for institutional factors comprising *'access to insurance experts', access to credit facilities', level of insurance awareness', and access to cooperative societies'* were evaluated.

Lastly, results showed a similar rank analysis for *insurance awareness, insurance regulation, claims settlement, and financial literacy* as demand metrics for aquaculture insurance.

Based on these outcomes, the researchers suggested that aquaculture insurance providers should advance and increase the awareness campaign among fish farmers. The study recommended that aquaculture underwriters should ensure critical evaluation of all demographic and institutional factors to be sure of effective demand capacities of fish farmers in Nigeria. However, government should expand the subsidy net for more fish farmers to have access. Insurance providers should, indeed, design their aquaculture insurance policies in the simplest and most acceptable form, so as to attract fish farmers' beliefs and patronage. With the simplicity of insurance contract design, aquaculture underwriters will gain attraction from fish farmers, which will, in turn, generate improved premium and their potential profitability.

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