World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

Check for updates

Analysis of food security and nutritional status of artisanal fishing communities in Kogi State, North central Nigeria: USDA Food Security Questionnaire Core Module approach

Haruna Ibrahim Opaluwa [1,*], Meriyahmoh Mero Onimisi [2], Gbenga Opeyemi [1] and David Adama Monday [3]

[1] *Department of Agricultural Economics and Extension, Faculty of Agriculture, Kogi State University Anyigba, P.M.B. 1008, Anyigba, Kogi State, Nigeria.*
[2] *Department of Fisheries and Aquaculture, Faculty of Agriculture, Kogi State University Anyigba, P.M.B. 1008, Anyigba, Kogi State, Nigeria.*
[3] *Federal Inland Revenue Service, Lagos Main Land East Region, Ikeja, Lagos State, Nigeria.*

World Journal of Advanced Research and Reviews, 2023, 20(02), 1098–1113

Publication history: Received on 25 September 2023; revised on 18 November 2023; accepted on 20 November 2023

Article DOI: https://doi.org/10.30574/wjarr.2023.20.2.2356

Abstract

This study evaluated the food security and nutritional condition of households that engage in artisanal fishing in Kogi State North Central, Nigeria. The information for the study was gathered using a standardized questionnaire through a multistage sampling approach from a total number of 399 artisanal fishing households across the fishing communities in the research area. Descriptive statistics and an ordered probit regression model were used to evaluate the data. The United States Department of Agriculture (USDA) 18-item core module questionnaire was used to determine the respondents' food security status, and the Household Dietary Diversity Scores (HDDS) were calculated using data from 16 food groups. Mean age of the fisherfolks was 42 years. They were mostly married (74.19%), male dominated (61.15%), with average household size of 8 persons. More than half (57.14%) utilized hook and line, cages (20.80%) and (42.86%) Dugout plank canoe. The result of the study revealed that (55.89%) of the respondents oscillate between High and Marginal Food Security while (27.07%) and (17.04%) of them were within the Low Food Security (LFS) and Very Low Food Security (VLFS) respectively. Age, marital status, educational status, years of fishing experience, household size and membership of association were factors influencing the level of food security and nutritional status of the artisanal fishers in the study area. The result revealed that close to half (44.11%) of the fishing households were entrapped in the Low Food Secure (LFS) and Very Low Food Secure (VLFS) category. The study findings also revealed that the nutritional status was good as (49.12%) of them were in the High Dietary Diversity category (HDD). The study recommended that strategies aimed on increasing food and nutrition security are needed in fishing communities in the country.

Keywords: Artisanal fishers; Food security; Nutrition; Households; Kogi State; Nigeria

1. Introduction

Around 200 million people are employed both directly and indirectly along the entire value chain of fisheries and aquaculture, from harvest to distribution. Women make up 14% of those working in the primary sector, which is a significant portion of the workforce (FAO, 2018). If the secondary sector is taken into account, half of them (Montfort, 2015). A significant portion of the world's population depends on the fishing and aquaculture industries for their food security, nutrition, and means of subsistence. These industries also have a significant impact on economic growth because they generate jobs, food, and income through the harvesting, processing, and marketing of fish. Many countries, including several developing countries, depend on fisheries and aquaculture sector for their economic and nutritional

* Corresponding author: Opaluwa HI

needs. Fish provides nutrient to several people particularly Low-income earners in the world. It is a source of nutritious and affordable food for this category of persons (Bene et al., 2015). Fish is widely traded in a variety of product forms, and trading is important for increasing fish consumption as well as generating revenue. Even while the national economy or labor force may not include a large portion of fisheries and aquaculture, their products may not be consumed in proportion to other food sources nationally.

Fish and fish products occupies a very important niche in both human and livestock diets in most parts of the world. Report from Food Agricultural Organization (FAO)(2018), revealed that about 88.42% proportion of a total estimated value of 171 million tons of fish produced globally, were consumed by humans, showing the very important role that fishing plays in facilitating global food and nutrition security. In a similar report, FAO's (2018) states that fish makes up of about17 percent of animal protein consumed worldwide and bulk of this fish comes from Artisanal fishermen. Furthermore, in a similar report of FAO (2008), small-scale fishermen engage in fishing as their means of livelihood either on a part-time or full-time basis. They do this to earn income for a living as well as for food. A primary attribute of artisanal fisheries is their dependence on traditional fishing tools, like tiny boats and canoes, along with a variety of fishing gear. Additional characteristics include their inclination to fish near coasts and riverbanks, labor-intensive pursuits requiring little capital, and the amount of fish they catch (FAO, 2008; Sumaila, 2017; and Ifabiyi et al., 2017). To catch a variety of fish species, artisanal fishermen use small boats and rudimentary gear (Adisa et al., 2021).

Several communities in far-off in rural areas suffers different kinds of deprivations (Bush and Keylock,2018; Tata and McNamara et al.,2018). Those who rely on fishing for a living frequently live in areas where extreme weather events are particularly likely to occur. As a result, artisanal fishing provides a living for more than 98% of fishing communities (Akankali and Elenwo, 2015). Thus, fishing has evolved into a source of revenue for fishing households as well as a way to meet their fundamental requirements (Ipinmoroti and Adesina, 2011).

Approximately 767 million individuals worldwide, or 11% of the total population, are thought to live in extreme poverty (World Bank, 2016). This group includes people who are marginalized and face political discrimination, are undernourished and food insecure, have poor health, are less educated, and have insecure tenure rights. Lack of access to social programs and the formal job system is the root cause of marginalization (FAO, 2017a). This group of people includes homes that fish. Their inability to fish is a result of these hardships, which exacerbates their vulnerability and poverty. Small-scale fishing and farming communities less developed countries of the world, are deprived and live at the lowest level of socio-economic status (Jentoft and Midré, 2011). There aren't enough sector-specific data available right now to figure out exactly what proportion of the aforementioned overall population is living in poverty and is dependent on the fishing industry. However, since small-scale fisheries account for more than 90% of the sector employment, including processing and marketing. Béné, Macfadyen, and Allison (2007), reported that this is the area with the highest rates of poverty. The geographical location as well as the economic predicament of this persons, make them vulnerable. Because of their proximity to the coast, fishing communities are especially vulnerable to climate change-related extreme events, such as hurricanes, cyclones, sea level rise, ocean acidification, floods, and coastal erosion. Living in low-lying coastal and floodplain locations, many millions of people are unable to escape the periodic flooding that destroys natural resources, harms wildlife, and depletes fisheries. Since fish farmers are less mobile, they have less of an opportunity to take advantage of this.

An increasing number of publications point to declining fish catches as the cause of declining income, joblessness, and general food insecurity (Kimani et al., 2018). Even while small-scale fisheries play a crucial role in nutrition and food security, many fishing communities live well below the poverty line, which has a significant impact on their ability to make meaningful contributions to these areas. There is increasing report of diminishing fish catches per fisher compared to the past when there were plenty of fish stocks. Therefore, fishers spend much time and efforts toiling a world of uncertainties. In light of this, the study examined the nutritional and food security concerns pertaining to fishermen in the fisheries and aquaculture industries. It talks on how, despite their important social roles, the local fishing communities and their citizens are vulnerable to issues with food security and nutrition. The particular goals of this study are to:

- Describe the socio-economic characteristics of artisanal fishing households in Kogi state fishing communities;
- Examine the level of food security of the artisanal fishers in the study area;
- Examine the nutritional status of the artisanal fishers in the study area.
- Investigate the socio-economic factors influencing the food security and nutritional status in the study area;
- Identify the coping strategies employed by the artisanal fishers in the event of food insecurity in the study area.

2. Methodology

Kogi State, North-central, Nigeria was the study area for this research. The state is situated in the North-Central Geo-Political Zone of Nigeria. Kogi state covers from latitudes 6.330N to 8.44 o N and as well as from longitudes 5.40 o E to 7.49 o E. Kogi State have an average land mass of about 75,000 square kilometers. About 20% of the land mass is occupied by people. Artisanal fishermen across the Nine (9) Local Government Areas of the State constitute the population for this research. The nine LGAs which borders the Niger and Benue rivers include, Lokoja, Koto Karfe, Ajaokuta, Ofu, Igalamela-Odolu, Bassa, Idah, Ibaji and Omala. As a result of their closeness to water resource, fishing is a very important economic activity of the people of the area. They also participate significantly in agriculture cultivating Rice, Cassava, Yam, Maize, Sorghum, Benniseed, Okro, Melon, Pepper, some leafy vegetables among others. The study utilized primary data which was elicited with the aid of structured questionnaire administered to fisherfolks.

The participants for this study were chosen using a three-stage selection process. The first step in the selection process entailed the deliberate selection of Nine (9) Local Government Areas (LGAs) in Nigeria's Kogi State near the banks of the River Benue and Niger, where fishing is highly prevalent. The Kogi State LGAs that were chosen are Lokoja, Kogi, Ajaokuta, Ofu, Igalamela-Odolu, Bassa, Idah, Ibaji and Omala LGAs. Stage two (2), from the list of fishing communities in each of the selected LGAs, two (2) fishing communities were randomly selected from the selected LGAs. This gave a total of eighteen fishing communities (18). Twenty (24) fishing household heads were selected from each of the communities to give a total of four hundred and twenty (432) respondents. Questionnaire was then administered to the chosen 432 artisanal fisher households. Based on consistency and appropriateness 399 of the fishing household heads' responses were used for analysis. The obtained data were processed using STATA 13.0 statistical software. Descriptive statistics, USDA 18-item questionnaire, the Household Dietary Diversity Score, and an ordered probit regression model were used to address the objectives of the study.

2.1. Food Security Analysis

In order to categorize the fishing households into different food security levels, the USDA 18 food security questionnaire was utilized in the study to gather data from the homes. The individual household responses were classified as either good or unfavorable. According to the USDA's established standards, households with a score of 0 to 2 are classed as High Food Secure (HFS), households with a score of 3 to 7 as Marginal Food Secure (MFS), households with a score of 8 to 12 as Low Food Secure (LFS), and homes with a score of 13 to 18 as Very Low Food Secure (VLFS).

2.2. Household Dietary Diversity Score (HDDS)

In 2006, the FANTA II Project developed the Household Dietary Diversity Score (HDDS), a population-level assessment of household food access. The number of food types that a household consumes within a certain reference period—in this study, the past 24 hours—is referred to as household dietary diversity (Kennedy et al., 2011). Cereals, roots/tubers, fish and seafood, vegetables, fruits, legumes, nuts, milk and milk products, meat, poultry, offal, eggs, pulses, oil/fats, sugar/honey, and miscellaneous are some of the food groups. With this method, a score of 1 is given for each food category that is ingested, and a score of 0 is given if none of the food groups are taken. The overall number of food groups consumed by the household is equal to the total score, which is the sum of the scores from each individual food group consumed and ranges from 0 to 16.

2.3. Model Specification

2.3.1. Ordered Probit model

The research employed ordered probit regression model to investigate the factors influencing home food security and household dietary diversity. The model was chosen because the dependent variables for both the level of food security and the degree of dietary diversity in the respondent's home were ranked or ordered.

$$Yi^* = Xi\beta + ui$$

Yi* is the continuous latent variable, and Xi is the vector of parameters or coefficients that the model is supposed to estimate.

2.3.2. Determinant of the Level of Household Food Security

Y* = The household's degree of food security fell into levels (0, 1, 2, 3) of probability (Yi= j). J denotes the food security status order set, where j = 0 indicates high food security (HFS), j = 1 indicates marginal food security (MFS), j = 2 indicates low food security (LFS), and j = 3 indicates very low food security (VLFS).

- Xj is the vector of explanatory variables that influence the decision to select the jth option. δj = to be estimated parameters
- Ui= term of error
- X_1= The heads of the household's age in years
- X_2 = gender of head of household (1 = male, 0 = otherwise)
- X_3 = Marital Status of Head of Household (1 = married, 0 = not married)
- X_4 = Years of Formal Education
- X_5 = number of people living in the household
- X_6 =Years of experience fishing
- X_7= affiliation membership
- X_8 = Credit Accessibility (1 = had access, 0 = otherwise)
- X_9= Mean agricultural revenue (Naira)
- X_{10} =represents choice to engage in non-fishing activities (1 = yes, 0 = no).

2.3.3. Determinants of the Level of Household Dietary Diversity category

Y* = A household's designated status for dietary diversity (0, 1, 2, and 3)

If j = 0 indicates high dietary diversity (HDD), j = 1 indicates marginal or moderate dietary diversity (MDD), j = 2 indicates low dietary diversity (LDD), and j = 3 indicates very low dietary diversity (VLDD), then Prob (Yi= j) = J = Household Dietary Diversity status.

- Ui= term of error
- X_1= The heads of the household's age in years
- X_2 = gender of head of household (1 = male, 0 = otherwise)
- X_3 = Marital Status of Head of Household (1 = married, 0 = not married)
- X_4 = Years of Formal Education
- X_5 = number of people living in the household
- X_6 =Years of experience fishing
- X_7= affiliation membership
- X_8 = Credit Accessibility (1 = had access, 0 = otherwise)
- X_9= Mean agricultural revenue (Naira)
- X_{10} =represents choice to engage in non-fishing activities (1 = yes, 0 = no).

3. Results and Discussion

Table 1 The distribution of Artisanal fishers` Socio-economic characteristics

Variables	Frequency	Percentage
Age		
< 20	21	5.26
21-30	45	11.28
31-40	101	25.31
41-50	134	33.59
51-60	76	19.05
>60	22	5.51
Mean: 43 years		
Gender		
Male	244	61.15
Female	155	38.85
Marital Status		

Single	68	17.04
Married	296	74.19
Separated	13	3.26
Divorced	3	0.75
Widow(ed)	19	4.76
Educational Qualification		
No formal education	65	16.29
Primary School	76	19.05
Secondary School	227	56.89
Tertiary Education	31	7.77
Household size (persons)		
1-5	133	33.33
6-10	170	42.61
>10	96	24.06
Mean: 8 individuals		
Fishing in Experience (years)		
1-10	81	20.30
11-20	140	35.09
21-30	111	29.82
>30	67	16.79
Mean: 21 years		
Primary Occupation		
Fishing	311	77.94
Farming	45	11.28
Trading	35	8.77
Civil servants	8	2.01
Membership of Association		
Member	140	35.09
Not member	259	64.91
Credit Access		
Had Access	140	35.09
Had no access	259	64.91
Extension contacts		
Had contact	54	13.53
Had no contact	345	86.47
Average monthly income		
< 50,000	159	39.85

50,001-100,000	142	35.59
100,001-150,000	47	11.80
150,001-200,000	28	7.01
>200,000	23	5.76
Mean: N 105,978		
Total	399	100.00

Source: Field Survey, 2023

The socioeconomic characteristics of the sampled artisanal fishers in the research area were displayed in Table 1. The study's findings showed that the average age of fishermen was 43, meaning that the majority of them were still in their prime fishing years. Of the household heads of artisanal fishermen in the survey, one-quarter (25.31%) were between the ages of 31 and 40, while the majority (33.59%) were between 41 and 50. The study's findings are consistent with those of Jared et al. (2021), who found that younger people tend to find fishing more enjoyable. This is most likely due to the difficulty of fishing in terms of setting up gear, making trades, and having viable fishing sites. The gender distribution result showed that men headed the majority (61.15%) of fishing families. There was male dominance over the females. This could possibly be due to the fact that most fishing activities require more strength. The women have many responsibilities of cooking, collecting firewood, washing clothes, fetching water and child-rearing.

However, female dominance was often recorded in processing and marketing of fish. Fishing has historically been seen as a purely male activity, and in some countries, women do not even identify as fishermen in environments where fishing is seen as a man's domain (Jared et al., 2021). The result showed that most (74.19%) of the artisanal fishers were married while only (17.04%) of the respondents were still single as at the time of the survey. This is in line with the results of a Homa-Bay County research that showed the majority of respondents (80.4%) were married and just 6.8% were unmarried (Jared et al., 2021). Of the respondents, more than half (56.89%) had completed secondary school. Only 16.29% of the heads of fishing households lacked formal education, according to the study's findings, which showed that the majority of respondents had some sort of formal education. According to Unger et al. (2011), fishers' livelihoods improved in areas where they received more education, which enhanced their capacity to engage in alternative income-generating activities and allow them to utilize fisheries resources sustainably.

According to the distribution of heads of artisanal fishing homes, the mean size of these families was eight people, and nearly half (42.61%) of the fishing households consisted of six to ten people. This indicates that a majority of the heads of households had sufficient people to help them with their fishing operations. Adeleke's (2013) findings, which indicated that fishermen maintain a moderate family size, are in line with this. (82.5%) maintain a membership of 6.7 on average, ranging from 1 to 10.

The result revealed more than one-quarter (35.09%) of fishing households had between 11 and 20 years of fishing experience in fishing business. (29.82%) of the artisanal fishers had fishing experience of between 21 and 30 years old. The heads of fishing households had an average of twenty-one years of fishing experience, according to the results. This suggests that the majority of the heads of fishing households had a sufficient level of fishing experience, which may have a favorable impact on their company productivity and raise their level of food security. This is in line with the findings of Bawa et al. (2019), who found that 43.6% of the fishermen in their study had more than 20 years of fishing experience. More than two third (77.94%) of the artisanal household heads had fishing as their primary occupation. This suggests households in fishing communities settle in such areas because of their means of livelihood. This is consistent with the finding of Bawa et al.,(2019), (97.9%) were engaged in fishing activities as their primary occupation. The findings showed that the majority of the heads of artisanal fishing households (64.91%) did not belong to any associations. Artisanal fishermen at Kainji Lake were members of fishing associations, according to Tafida et al. (2011). The result revealed that most (64.91%) of the artisanal fishing household heads were not members of any association. Tafida et al.,(2011), reported that artisanal fishers in Kainji Lake were members of fishing association. Only (35.09%) had credit access from any source while majority (64.91%) had no credit access. About (40.00%) of the fishers had average monthly income of less than or equal to N50,000, while (35.59%) had average monthly income of between N100,001-N 200,000. The mean monthly household income is N105,978.

Table 2 The Distribution of Fishing Characteristics among the Respondents

Variables	Frequency	Percentage
Type of Fish work		
Fresh fish	141	35.33
Smoked fish	43	10.79
Both forms	213	53.38
Daily Fishing hours		
1-5 hours	192	48.12
6-10 hours	199	49.87
>10	8	2.01
Fishing practices		
Use of Hook & line		57.14
Use of fishing pots		6.02
Use of cages		20.80
Use of wire/Baskets		26.82
Types of crafts		
Boat with engine		19.55
Boat without engine		19.55
Dugout plank canoe		42.86
Use of Gourd		2.76

Source: Field Survey, 2023

The percentage distribution of responders by type of fishing is displayed in Table 2. The majority of fishermen (53.38%) sold both fresh and smoked fish, according to the results. solely 10.79% of fish sold was smoked, compared to 35.33% who sold solely fresh fish. Approximately 49.87 percent of the participants fish for six to ten hours per day. While (48.12%) spend between 1 and 5 hours fishing daily. (57.14%) of the respondents used hook and line for fishing, one fourth (26.82%) used wire/Baskets and (20.80%) used cages for fishing. Majority (42.86%) used Dugout plant canoe, (19.55%) and (19.55%) used Boats with engine and without engine respectively. The study's findings are consistent with those of Bawa et al. (2019), who found that nets, traps, hooks, and lines were the main fishing gear used by locals. Adeleke (2013), reported fisherfolk in the study rely majorly on the use of small fishing crafts such as Dugout canoe and Motorized canoe for fishing.

Table 3 Distribution of Categories of households` food security status in the study area

Level of Food security	Frequency	Percentage
High Food Security	124	31.08
Marginal Food Security	99	24,81
Low Food Security	108	27.07
Very Low Food Security	68	17.04
Total	399	100.00

Source: Field Survey, 2023

Table 3 showed the result of the distribution of the respondents' food security situation in the study area. The result revealed that more than (30.00%) of the artisanal fishing households were in the High food secure category and about

one fourth (24.81%) were marginally food secure. The result further showed that a total estimate of (44.11%) of the artisanal fishing households were in the Low food security and Very Low food security category with (27.07%) in the Low food security and (17.04%) in the Very Low food security category. The result reveals that close to half (44.11%) of the fishing households in the study area were food insecure (Low and Very low food secure put together) despite the strategic they play in the promotion of food security and nutrition in society. The result shows that close half of the households in the fishing communities were still food insecure despite the fact that the bulk of fish consumed is made available by them. Obayelu (2012) reported similar finding that (84%) food insecurity among farming households in North-Central Nigeria. This is also consistent with Abdulrahman et al.,(2017), stating that 49% of the farmers in his study area were food insecure. While 51% of farmers were food secured.

Table 4 Distribution of Categories of households` food security status in the study area

Household DD	Frequency	Percentage
Very Low DD	11	2.76
Medium DD	86	21.55
High DD	196	49.12
Very High DD	106	26.57
Total	399	100.00

Source: Field Survey, 2023

The result of the study showed that close to half (49.12%) of the fishing households were in the Figh Dietary Diversity category implying that they consume diverse diets. One fourth of the households (26.57%) were in the very high Dietary diversity category. (21.55%) were in the medium category and only (2.76%) were in the very low diverse diet category.

Table 5 Factors affecting the level of food security in fishing communities.

Variables	Coefficient	Std Err	Z	P>/z/
Age	0.319113	.0072014	4.43	0.000
Gender	-0.141715	0.138353	-1.02	0.306
Marital Status	0.5467087	0.203045	2.69	0.007
Educational Status	0.001864	0.014891	-1.79	0.074
Household size	0.001864	0.014891	0.12	0.903
Years in Artisanal	-0.346353	0.070901	-5.00	0.000
Membership of Assoc	1.356124	1.799356	7.61	0.000
Access to credit	0.248468	0.289678	1.53	0.127
Ave. monthly income	-3.15e-07	-0.121986	-1.09	0.277
Participation in non-fishing activities	-0.1513738	0.5603246	1,24	0.215
Cut 1	0.6653196	0.5615154		
Cut 2	1.569953	0.5701403		
Cut 3	2.711085	0.5039459		
Diagnostic Test				
No. of Observation	397			
LR Chi2 (10)	213.95			
Prob >Chi2	0.000			
Pseudo R2	0.1974			

Source: Field Survey, 2023; Note: ***, ** and * significant at 1%, 5% and 10% respectively.

Table 5 presented the findings of the factors influencing the state of food security in fishing communities. It was noted that the ordered response model's pseudo R-square was an unsuitable indicator of its predictive ability. According to the results, the Ordered probit model's pseudo R-square was 0.1974 (19.74%). There were 213.95 and -434.99 for the Chi-square value and log-likelihood ratio, respectively. The outcome showed that the model's variables are well-fitting and have the ability to describe the factors influencing the degree of food security enjoyed by artisanal fishermen in the fishing villages that were studied. Furthermore, the model is significant at the 1% probability level ($p<0.01$), as indicated by the Chi-square probability value of 0.000. The calculated cut-off threshold (μ) meets the $\mu1< \mu2< \mu3$ requirement, meaning that the variables were sorted correctly.

Results showed that years in the fishing business ($p<0.01$), educational background ($p<0.10$), age and marital status ($p<0.01$), and association membership ($p<0.01$) were all significant. While years in the fishing industry ($p<0.01$) and educational background ($p<0.10$) had a detrimental impact on food security, the age of artisanal fishermen and their marital status both significantly affect it ($p<0.01$). The association membership ($p<0.01$) also had a favorable impact. The findings indicated that age was positively correlated with food security, suggesting that the age of the heads of artisanal fishing households enhances the likelihood that their dwellings will have enough food. This outcome deviates from Obayelu's (2012) findings, which showed a negative correlation between age and the level of food security in the home. However, the study was conducted in South Western Nigeria rather than Kogi State. The results also showed that being married raises the likelihood of having food security; specifically, the results indicate that the likelihood of having food security improves as the marital status of household heads increases. While Obayelu (2012) reported an indirect relationship between marital status and food security, Ubokudom et al. (2017) found a direct relationship between marital status and household food security. It should be noted, however, that the study was conducted in North-central Nigeria. According to the results, there was a positive correlation between food security and membership in the association of household heads involved in artisanal fishing. This suggests that having more household heads in the association enhances the likelihood of food security for the households. This is in line with the findings of Odetola et al. (2015), who noted that although government organizations do not deal directly with farmers, fish farmers can obtain government intervention through cooperative societies. The findings showed a negative association between the family heads' educational attainment and food security, suggesting that the likelihood of being food secure diminishes with increasing educational attainment among artisanal fishermen.

Table 6 Factors influencing food security levels in households engaged in artisanal fishing

Variables	**High food security**		**Marginal food security**		**Low food security**		**Very Low Food security**	
	dy/dx	P>Z	dy/dx	P>Z	dy/dx	P>Z	dy/dx	P>Z
Age	-0.09853	0.000	-0.0026	0.003	0.00724	0.000	0.00531	0.000
Gender	0.035256	0.338	0.01018	0.368	-0.0259	0.333	-0.1952	0.353
Marital Status	-0.17093	0.006	-0.0468	0.250	0.125657	0.084	0.09208	0.008
Educational Status	0.037846	0.080	0.01036	0.105	0.27821	0.084	0.02038	0.083
Household size	-0.00556	0.903	-0.0015	0.904	0.000408	0.903	0.000299	0.903
Years in Artisanal	0.10665	0.000	0.00292	0.001	-0.00784	0.000	0.0574	0.000
Membership of Association	0.383397	0.000	-0.1173	0.000	0.060203	0.115	0.257952	0.000
Access to credit	-0.82266	0.113	-0.0262	0.185	0.0602	0.115	0.048319	0.149
Average monthly fishing income	0.92e-08	0.294	2.55e-08	0.307	-6.8e-08	0.295	-5.2e-08	0.296
Participation in non-fishing activities	0.45348	0.221	0.01279	0.249	-0.33298	0.223	-0.24842	0.232

Source: Field Survey, 2023 Note: ***, ** and * significant at 1%, 5% and 10% respectively.

According to Abdulrahman et al. (2016), increased education has an impact on food security. This outcome is consistent with their findings. This is consistent with the findings of Bala (2016), who found that fostering a favorable mental

attitude toward the adoption of new farming techniques is facilitated by education. The findings showed that the household heads' years of fishing experience had a negative association with food security, suggesting that the likelihood of having enough food to eat diminishes with increasing household head experience in the fishing industry.

According to Table 6's results, the marginal effect of age is as follows: if an artisanal fisher's age increases by one year, the food security status of HFS households decreases by 0.009, indicating that age reduction has a negative impact on food security status; likewise, if the household heads' age increases by one year, the food security status of MFS households decreases by 0.002, which is in line with the findings of Olagunju et al., (2012) and Oni et al., (2011 However, if the age of the household heads increases by one year, the food security status of Very Low Food Security (VLFS) and Low Food Security (LFS) increases by 0.005 and 0.007, respectively. This suggests that while productivity grows with age, it has a beneficial impact on the food security status. This is consistent with the findings of Balogun and Akinyemi (2017), Ajayi and Olutumise (2018), and Oyetunde-Usman and Olagunju (2019) showing those with active incomes dominated the fish farming industry. It suggests that if the required resources are made available, this group of farmers could boost their output.

The food security status of High food security (HFS) decreases by 0.1709 if the number of fishing household heads increases by one married, according to the marginal effect of marital status on artisanal fishers. This suggests that marriage lowers productivity, which has an adverse effect on the food security status. The situation is comparable to that of MFS, where the findings showed that for every additional married fishing household head, the marginal food security (MFS) status drops by 0.047. The situation with MFS is different, though, as if the number of fishing household heads increases by 1, the food security status of Low Food Security (LFS) and Very Low Food Security increases by 0.125 and 0.092, respectively. This suggests that getting married enhances the likelihood of achieving a certain food security status. This contradicts the findings of Obayelu (2012), who found that in North Central Nigeria, there was a negative correlation between the condition of household food security and marital status.

The study of the marginal effect of education found that if household heads obtain one additional year of education or one more qualification, their food security status (HFS) increases by 0.038. This suggests that an increase in education level is positively correlated with productivity, which in turn affects food security status. If education or the number of years of formal education increases by one, the same situation applies to households with low food security (LFS) and very low food security (VLFS), where food security status increases by 0.0278 and 0.0204, respectively. This is in line with the findings of Willows et al. (2008), who found that individuals' chances of having a stable food supply increased with the number of school years or educational attainment. The findings of Wiranthi (2014) further demonstrate that the likelihood of a household having food security rises with the artisanal fishermen' educational attainment.

The food security status of household heads in high food security (HFS) increases by 0.011 if they gain an additional year of fishing experience, according to the marginal effect of year of fishing experience. This suggests that as year of fishing experience increases, productivity increases, which in turn has a positive impact on the food security status. If the heads of the households have one more year of fishing experience, the situation is likewise true for marginal food security (MFS) and very low food security (VLFS) households with food security status increasing by 0.0029 and 0.0057, respectively. However, if the household heads' years of fishing experience rise by one year, the food security status of LFS lowers by 0.0078. The food security status of High Food Security (HFS) decreases by 0.383 if household heads choose to become members of the association, according to the marginal effect of the association's year of membership. This suggests that membership in the association lowers the likelihood of food security among HFS households. This also applies to MFS, where household heads who choose to join the association will see a 0.117 drop in their food security status. The situation was reversed for LFS and VLFS, where household heads who choose to join an association see gains in food security status of 0.243 and 0.258, respectively. This suggests that association membership raises the likelihood of food security for both LFS and VLFS households. In a related study, In a related study, Obayelu (2012) found a positive correlation between respondents' membership in associations (a measure of social capital) and food security.

Table 7 Factors influencing the Fishing households` Dietary Diversity in the study area

Variables	Coefficient	Std Err	Z	P>/z/
Age	-0.0195249	0.0068095	-2.87	0.004
Gender	0.2423505	0.119912	2.02	0.043
Marital Status	-0.510302	0.192089	-2.66	0.008
Educational Status	0.0328502	0.069281	0.47	0.635
Household size	0.0810306	0.0149165	5.43	0.000
Years in Artisanal	0.0302859	0.006552	4.55	0.000
Membership of Ass.	-0.324491	0.1750315	-1.85	0.064
Access to credit	0.0281544	0.1825989	0.15	0.877
Average monthly fishing income	166e-07	2.77e-07	0.60	0.550
Participation in non-fishing activities	-0.2511341	0.1214983	-2.07	0.039
Cut 1	-2.380047			
Cut 2	-0.9711136			
Cut 3	0.5482329			
Diagnostic Test				
No. of Observation	397			
LR Chi2 (10)	87.87			
Prob >Chi2	0.000			
Pseudo R2	0.0980			

Source: Field Survey, 2023 ***, ** and * implies significant at 1%, 5% and 10% respectively.

The Pseudo R-square of the Ordered probit model was found to be 0.098 (9.8%) in Table 7. The results of the Chi-square and log-likelihood ratio were 87.87 and -404.51, respectively. The probability of the Chi-square of 0.000 revealed the overall significance of the model at 1% probability level ($p<0.01$), and the threshold (μ) satisfies that $\mu1< \mu2< \mu3$, indicating that the variable in question was properly defined.

Age ($p<0.01$), gender ($p<0.05$), marital status ($p<0.01$), household size ($p<0.10$), years in the fishing business ($p<0.01$), association membership ($p<0.01$), and the decision of the household head to engage in non-fishing work ($p<0.05$) were all shown in the results. Age ($p<0.01$), marital status ($p<0.01$), association membership ($p<0.10$), and the decision of the head of the household to engage in non-fishing work ($p<0.05$) were found to have negative effects on the dietary diversity of the household, whereas gender ($p<0.10$), household size ($p<0.10$), and years in the fishing business ($p<0.01$) had positive effects. The result further demonstrated that age had was negative meaning that the age of the artisanal fishing household heads showed that decrease in age of the household heads increases the possibility of consuming more diverse diets in the research area.

The result revealed that gender had was positive implying that the male household heads of the artisanal fishing households increase the probability of consuming more diverse diets than their female-headed counterparts in the study area. The gender of the head of the household was also significantly associated with HDDS as being in a female-headed household had a negative effect on the relative change of HDDS (Teshome et al.,2023). The coefficient of marital status showed that being married reduces the likelihood of consuming a variety of diets; hence, the research area's household dietary diversity level appears to increase as the marital status of the household heads drops. The coefficient of household size revealed that household size increases the probability of consuming diverse diets, the result suggests increase in household size of the household heads increases the household dietary diversity level in the study area. The coefficient of years of experience in fishing business increases the probability of consuming diverse diets, the result suggests increase in years of fishing experience of the household heads increases the household dietary diversity level in the study area. The result revealed that household head participation in non-fishing decreases the probability of consuming more diverse diets in the study area. The result is consistent with a study conducted in South Africa

concluded that higher attainment of formal education by the head of the household, a higher income, a smaller household size, and a higher age of the head of household were positively associated with HDDS (Sambo et al.,2022likewise Powell, Kerr, Young, & Johns (2017) found that the gender of the home leader, personality and tradition, and household size were major factors that affected HDD.

Table 8 Factors influencing the degree of food security in artisanal fishing households

Variables	**Low DDS**		**Medium DDS**		**High DDS**		**Very High DDS**	
	dy/dx	P>Z	dy/dx	P>Z	dy/dx	P>Z	dy/dx	P>Z
Age	0.000686	0.027	0.00499	0.005	0.00031	0.547	-0.0059	0.004
Gender	-0.00913	0.100	-0.0628	0.048	-0.0081	0.898	0.7278	0.039
status of marriage	0.017378	0.330	0.01304	0.010	0.008166	0.547	-0.1565	0.008
Educational Status	0.001154	0.680	-0.0084	0.636	0.005257	0.706	-0.0100	0.635
Household size	0.02848	0.005	0.02072	0.000	0.001296	0.543	-0.0248	0.000
Years in Artisanal fishing business	0.010646	0.007	-0.0077	0.000	0.004847	0.543	0.00929	0.000
Membership of Association	0.120727	0.127	0.08351	0.066	0.002458	0.769	0.09804	0.060
Access to credit	-0.00980	0.877	-0.0071	0.877	0.00503	0.891	0.00866	0.878
Average monthly fishing income	-0.581e-09	0.555	-4.-e08	0.551	-2.64e-o9	0.667	5.0e-08	0.550
Participation in non-fishing activities	0.008666	0.063	0.63558	0.041	0.00546	0447	-0.7768	0.040

Source: 2023 Field Survey Remark: ***, **, and * significant at 1%, 5%, and 10%, in that order.

Age appears to have a positive impact on the dietary diversity of Low Dietary Diversity (LDD) households, as evidenced by Table 8 below, where the marginal effect of age revealed that the dietary diversity of LDD households increases by 0.0007 if the age of the household heads increases by one year. The circumstances align with Medium Dietary Diversity (MDD), wherein a one-year rise in the age of the household heads results in a 0.0049 increase in household dietary diversity. Similar findings from a prior study seem to be asserted (Romeo et al., 2016; Ochieng et al., 2017). However, if the age of the household heads increases by one year, the dietary diversity of Very High Dietary Diversity (VHDD) households drops by 0.0059. This is in line with the findings of Geremem et al. (2019), who found that, when controlling for other variables, the odds ratio favoring the high category increased by 1.353 for every unit rise in the age of the household head.

Male-headed households appear to have a negative impact on the food diversity of MDD households, as indicated by the marginal effect of gender, which showed that the dietary diversity of MDD households drops by 0.0628 if male-headed household heads rise by 1. For VHDD residences, on the other hand, dietary diversity increases by 0.0728 if the number of male-headed households rises by 1. According to Powell, Kerr, Young, and Johns (2017), the gender of the head of household has a substantial impact on HDD.

According to the marginal effect of marital status, if the number of married household heads increases by 1, the dietary diversity of LDD and MDD households increases by 0.0179 and 0.1304, respectively. This suggests that married household headed households have a positive impact on the dietary diversity of LDD and MDD households. In contrast, if married family heads rise by 1, the situation for VHDD families is different, with household dietary diversity decreasing by 0.156.

The marginal effect of household size showed that the household dietary diversity of LDD and HDD increases by 0.0028 and 0.00129 respectively if household size increase by 1, this suggests that LDD and HDD dietary diversity increases with increase in household size in the study area. The situation is however different for MDD and VHDD households where household dietary diversity decreases by 0.0207 and 0.0248 if household size of the household heads increases

by 1. Powell, Kerr, Young, & Johns, (2017) identified household size of the household head as factor significantly influenced HDD.

The marginal effect of household head years of fishing experience showed that the household dietary diversity of LDD, HDD and VHDD increases by 0.0028, 0.00129 and 0.0093 respectively if fishing household head increase by 1 year, this suggests that LDD, HDD and VHDD household dietary diversity increases with increase in household head fishing experience in the study area. The situation is however different for MDD households where household dietary diversity decreases by 0.0077 if household head fishing experience increases by 1 year.

The marginal effect of household head membership of association showed that the household dietary diversity of MDD and VHDD increases by 0.010 and 0.0981 respectively if fishing household head become a member of association this suggests that MDD and VHDD household dietary diversity increases with membership of association in the study area This result is consistent with that of Oluwatayo et al. (2004), who found that households belonging to a group had higher levels of food security than households without such a group. This was because the group could help by lending members money, which increased household requirements, particularly during times of hardship. The marginal effect of household head participation in non-fishing activities showed that the household dietary diversity for LDD and MDD increases by 0.0087 and 0.0636 respectively if fishing household head participates in non-fishing activities. Nonetheless, the outcome was consistent with the VHDD result, which shows that a household's dietary diversity rises as its participation in non-fishing activities in the study area grows.

Table 9 Mean Score on Coping Strategies Employed by Artisanal Fishing Households in Event of Food Insecurity

Coping Strategies	**Mean Score**
Eating foods that are less preferred.	2.31
Reduction in quality and quantity of food consumed.	2.03
Borrowing food from friends and relative.	1.43
Mothers reducing food intake in enable their children have more food to eat.	2.36
Household Skipping meals once or twice in a day.	2.35
Skipping eating for whole day.	1.19
Engaging in criminal practices like prostitution and theft.	1.11
Parents abandoning children to fend for themselves.	1.24
Reducing the number of people eating in the household.	1.44
Increased reliance on wild food.	1.51
Short-term alteration in crop and livestock production pattern.	1.55
Begging for food on streets	1.20
Selling of household assets and valuables.	1.90
Distress migration	1.45
Eating less preferred food outside the home because they are cheaper.	2.41
Engaging in jobs that are not related to farming so as to earn more income.	1.18
Buying food to eat now but payment to be made later	2.74
Utilizing money meant for other things to buy food.	1.79

Source: Field Survey, 2023

Respondents 'response on the coping strategies adopted in the event of insufficient food for the households by Artisanal fishing households in the study area is presented in Table 9. The mean score indicated that the major coping strategies employed by the artisanal fishers include buying food on credit (mean score=2.74), eating cheaper foods (mean score=2.41), skipping one or two meals per day (mean score=2.35), Parents limiting their own food intake in order to

ensure that their children get enough to eat (mean score=2.36), eating less preferred food (mean score=2.03) and reduce the quality and quantity of food consumed (mean score=2.03). Conversely, engaging in criminal practices such as theft and prostitution, skipping a whole day without taking food and begging for food on the street with (mean score=1.11), (mean score=1.19) and (mean score score=1.20) respectively were the least adopted coping strategies by the respondents in the study area. The result of the study is consistent with the results of John et al.,(2013), Demi and Kuwormu (2013) who revealed that eating less preferred food. Skipping meal within a day, limiting the size of food consumed were the most adopted coping strategies households adopted in event of food insecurity. However, least adopted coping strategies including engaging in vice habits and begging. This result is consistent with John et al.,(2013), who reported begging and acts capable of making households lose their pride and dignity in the community are usually less adopted by households.

4. Conclusion and Recommendations

The study examined the food security and nutritional status of artisanal fishing communities in Kogi State, Nigeria. It concluded based on empirical findings that the households largely food insecure as close to half of the artisanal fishers were food insecure. Age, marital status, educational status, years of fishing experience, household size and membership of association were factors influencing the level of food security and nutritional status of the artisanal fishers in the study area. The result of the however, revealed through the Household Dietary Diversity Score (HDDS) that the majority of the artisanal fishing households were nutritionally secured. The study recommends that food security initiatives should be put in place to enhance food accessibility, availability and affordability to fishing households. The food security level of the fishing households was influenced by different socioeconomic factors considered in the study. The binary probit model was used to identify factors. Based on the study conclusion, appropriate measures or policies are to be put in place by both policy makers and relevant stakeholders in the design and implementation of programs capable of improving the food insecurity situation of the fishing households.

Compliance with ethical standards

Acknowledgments

The authors are grateful to Tertiary Education Trust Fund (TETFund), Nigeria for providing necessary support that enabled carrying out the research and management of Prince Abubakar Audu University, Anyigba, Kogi State, Nigeria for the enabling environment.

Disclosure of conflict of interest

There is no conflict of interest whatsoever to the research knowledge.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

[1] Abdulrahman, S., Mani, J.R., Oladimeji, Y.U. Abdulazeez, R.O. and Ibrahim L.A. (2017) Analysis of entrepreneurial management and food security strategies of small ruminant women farmers in Kirkaasammaa Local Government Area of Jigawa State, Journal of Animal Production Research, 29(1):419-429.

[2] Abdulrahman,S., Okam, C.Y., Yusuf, O. and Suleiman, A. D. (2016). Comparative Analysis of Profitability of Rice Production among Men and Women Farmers in Ebonyi State, Nigeria. Asian Journal of Agricultural Extension, Economics & Sociology, 10(1): pp. 1-7.

[3] Adeleke, M.L. (2013). The Socio-economic Characteristics of the Artisanal Fishers in the Coastal Region of Ondo State, Nigeria. Journal of Economics and Sustainable Development, 4(2); pp. 133-139.

[4] Adisa, R.S., Ifabiyi J.O., Gbenga, O., 2021. Determinants of Capacity Building Needs of Artisanal Fishers in Kogi State, Nigeria. Journal of Asian Rural Studies, 2021, 5(1): 78-89.

[5] Ajayi, C. O. and Olutumise, A. I. (2018). Determinants of Food security and technical efficiency of cassava farmers in Ondo State, Nigeria. International Journal of Food and Agribusiness Management Review 21:915-928.

[6] Akankali, J.A. and Elenwo, E.I. (2015), "The Atmospheric Input of Species to the World Oceans", Joint Experts on the Scientific Aspects of Marine Pollution, Vol. 38 No 1, pp. 111.

[7] Bala, F. K. (2016). Analysis of women ginger production as a means for achieving farm household food security in Kaduna State, Nigeria. A M.Sc. Dissertation submitted to the School of Postgraduate Studies, Ahmadu Bello University, Zaria. 79p.

[8] Balogun, O. L. and Akinyemi, B. E. (2017). Land fragmentation effects on technical efficiency of cassava farmers in SouthWest geopolitical zone, Nigeria. Cogent Social Sciences 3: 1-10.

[9] Bawa, D.Y., S.M. Nurul Amin, A Arshad, F.M.D Yusoff, I.S. Kamaruddin and L.A. Argungu (2019). Socio-economic Characteristics of Artisanal fishermen in Inland waters of Kebbi State, Northwestern Nigeria. International Journal of Fisheries and Aquatic Studies; 7(4); 416-421.

[10] Béné, C., Macfadyen, G. & Allison, E.H. (2007). Increasing the contribution of small-scale fisheries to poverty alleviation and food security. FAO Fisheries Technical Paper No. 481. Rome, FAO. 125 pp.

[11] Bene, C.,Barange, M., Subasinghe, R., Pinstrup-Andersen, P., Merino, G., Hemre, G.I. &Williams, M. (2015). Feeding 9 billion by 2050–putting fish back on the menu. Food Security, 7 (2), 261–274.

[12] Bush, A. and Keylock, J. (2018). Strengthening integration of Nutrition within Health Sector Programmes. Brussels, European Commission.

[13] Demi, M. and Kuwomu, J.K. (2013). Assessing the Degree of Food Insecurity among Farming Households: Evidence from Central Region of Ghana. Asian Journal of Agricultural Research. 3(3); 183-187.

[14] FAO (2008). Fisheries management. 3. Managing fishing capacity. FAO Technical Guidelines for Responsible Fisheries. No. 4, Suppl. 3. 104p. Rome, Italy.

[15] FAO (2018). The State of World Fisheries and Aquaculture 2018 – Meeting the Sustainable Development Goals. Rome, Italy.

[16] FAO. (2017). Social protection to foster sustainable management of natural resources and reduce poverty in fisheries-dependent communities. Report of the FAO Technical Workshop. 17–18 November 2015, Rome. FAO Fisheries and Aquaculture Proceedings No. 51. Rome. 319 pp.

[17] Geremew, M.J., Akalu D.S. and Beneberu, A. (2019). Determinants of household dietary diversity in Yayu Biosphere Reserve, Southwest Ethiopia. Ethiop. J. Sci & Technol 12(1): 45-68.

[18] Ifabiyi, J.O., Banjoko I.K. and Komolafe S.E. (2017). Assessment of the Training Needs of Artisanal Fishers' in Asa Local Government Area of Kwara State, Nigeria. Nigerian Journal of Rural Extension and Development Vol. 11.

[19] Ipinmoroti, M.O. and Adesina, B.T. (2011), "Fisheries and Aquaculture in Rural Development", in S. F. Adedoyin (ed). Rural Agricultural and Environmental Sociology in Nigeria. Nigerian Rural Sociology Association (NRSA), Ibadan, Andkolad Publishers Ltd. Pp 228- 38.

[20] Jared Linus Magego, Christopher Obel Gor and Zackary Kinaro (2021). Artisanal Fisheries Socio-Economic Characteristics in Development Planning Strategies, Journal of Humanities And Social Science (IOSR-JHSS), 26, Issue 4(8); pp. 01-06

[21] Jentoft, S. & Midré, G. (2011). The meaning of poverty: conceptual issues in small-scale fisheries research. In S. Jentoft, & A. Eide. eds. Poverty mosaics: realities and prospect in small-scale fisheries, pp. 43–70.

[22] John K.M. Kuwornu, D. M. Suleyman, D.P.K.(2013), Analysis of food Security Status of farming households in the forest belt of the central region of Ghana. Russian Journal of Agricultural Socio-Economic Sciences, 1(13), pp. 26-42.

[23] Kennedy et al., (2011). "Guidelines for Measuring Household and Individual Dietary Diversity"

[24] Kimani, E.N., Aura, M.C., Okemwa, G.M (eds.). (2018). The Status of Kenya Fisheries: Towards the sustainable exploitation of fisheries resources for food security and economic development. Kenya Marine and Fisheries Research Institute (KMFRI), Mombasa. 135 pp.

[25] Monfort, M.C.(2015). The role of women in the seafood industry. GLOBEFISH Research Programme Vol. 119, Rome, FAO. 67 pp.

[26] Obayelu A. E., 2012, Households' food security status and its determinants in the North-Central Nigeria, Food Economics 9:4, 241-256.

[27] Ochieng, J., Afari-Sefa, V., Lukumay, P.J and Dubois, T. (2017). Determinants of dietary diversity and the potential role of men in improving household nutrition in Tanzania. PloS one 12(12): 0189022.

[28] Odetola, S. K., Awoyemi, T. T. and Ajijola, S. (2015). Impact of cooperative society on fish farming commercialization in Lagos State, Nigeria. African Journal of Agricultural Research, 10(18): 1982-1988.

[29] Olagunju, F. I., Oke, J. T. O. Babatunde, R.O., Ajiboye, A., (2012), Determinants of Food Insecurity in Ogbomoso Metropolis of Oyo State, Nigeria, PAT 8 (1), 111 -124.

[30] Oluwatayo, I. B. (2004). Income Risk and Welfare Status of Rural Households in Nigeria: Ekiti State as a Test Case. WIDER Research Paper Helsinki, Finland.

[31] Oni, O. A., Salam, K. K., Idowu, B. O., (2011), Social capital dimensions and food security among farming households in Ogun State, Nigeria. Journal of American Science 7(8), 776–783.

[32] Oyetunde-Usman, Z. and Olagunju, K. O. (2019). Determinants of food security and technical efficiency among agricultural households in Nigeria. Economies 7: 1-13.

[33] Romeo, A., Meerman, J., Demeke, M., Scognamillo, A and Asfaw, S. (2016). Linking farm diversification to household diet diversification: evidence from a sample of Kenyan ultra-poor farmers. Food Security 8(6): 1069-1085.

[34] Sambo, T. A., Oguttu, J. W., & Mbombo-Dweba, T. P. (2022). Analysis of the dietary diversity status of agricultural households in the Nkomazi Local Municipality, South Africa. Agriculture & Food Security, 11(1), 1-12.

[35] Sumaila, U. R. (2017). Small-Scale Fisheries and Subsidies Disciplines: Definitions, Catches, Revenues, and Subsidies. Information Note. Geneva: International Centre for Trade and Sustainable Development (ICTSD).

[36] Tafida, A., Adebayo, A, Galtima, M., Raji A., Jimme M, John, C (2011). Livelihood Strategies and Rural income: The Case of Fishing Communities in Kainji Lake Basin Nigeria, Agricultural Journal, 6 pp. 259-263.

[37] Tata, J.S. and McNamara, P.E, (2018). Impact of ICT on agricultural extension service delivery: evidence from Catholic Relief Services SMART Skills and Farmbook project in Kenya. Journal of Agricultural Education and Extension, 24(1): 89-110.

[38] Teshome Kabeta, Renè Holst, Beyene Wondafrash, Arnoldo Frigessi, Mekdes Kebede Gebremariam (2023). Determinants of household dietary diversity in rural Ethiopia: A household panel study, Journal of Agriculture and Food Research, Volume 12,

[39] Ubokudom, E. O., Namso, N. F., Egbe, B. E., Kesit, K. N., (2017), Household level food security status and its determinants among rural farmers in Akwa Ibom State, Nigeria Agricultural Science Research Journal 7(10), 297 – 303.

[40] Unger, J., Rauch, A., Frese, M., and Rosenbusch, N. (2011). Human capital and entrepreneurial success: a meta analytical review. Business Venturing, 26(3): 341-358.

[41] Willows, N.D.; Veugelers, P.; Raine, K.; Kuhle, S. (2008). Prevalence and sociodemographic risk factors related to household food security in Aboriginal peoples in Canada. Public Health Nutr, 12, 1150–1156.

[42] Wiranthi, P.E. (2014). Determinants of Household Food Security: A Comparative Analysis of Eastern and Non-Eastern Indonesia. Master's Thesis, Bogor Agricultural University, Bogor, Indonesia.

[43] World Bank. (2016). Poverty and shared prosperity 2016: taking on inequality. Washington, DC, World Bank. 170 pp.