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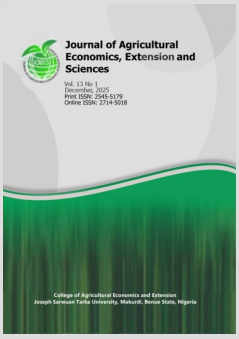
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MODELING SOCIO-ECONOMIC VARIABLES AND HOUSEHOLD INCOME DIVERSIFICATION AMONG FISHER FOLKS ALONG RIVERS NIGER AND BENUE IN KOGI STATE, NIGERIA.

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Abstract

Nigerian households along the Niger and Benue rivers depend heavily on the fishery industry for their livelihoods. Despite confronting challenges and actively diversifying their income sources, there is a knowledge gap regarding the effect of household demographics on income diversification. This study, examined income diversification patterns among riverine fishermen and identified key influencing factors. Three-stage sampling was used to select 235 respondents, and a validated, structured questionnaire was employed to collect primary data. The data were analyzed using descriptive and inferential statistics, including the Tobit Regression Model. The findings revealed that demographic factors had a significant impact on income diversification decisions in households ($p < 0.05$). Age (0.00247), education (0.00607), distance to the nearest city (0.00189), non-farm income (0.00143), and marital status (0.05552) showed a significant correlation with income diversification, indicating a positive association with the likelihood of households engaging in income diversification. However, household size, fishing experience, and gender did not demonstrate significant effects on income diversification. The findings provide policymakers and development practitioners with vital insights for designing interventions that improve the livelihoods of fishing communities.

Keywords: Income diversification, Fisher folks, Socioeconomic factors, Determinants, Tobit Regression Model

Introduction

The fishing industry is an important source of income for many Nigerian households, notably those along the Niger and Benue rivers. These rivers are home to numerous fish species and support a substantial fishery industry. However, fishermen frequently encounter a number of obstacles, such as fluctuating fish stocks, environmental degradation, and limited credit and market access. As a result, numerous households have decided to diversify their sources of income. In recent years, the pattern of income diversification among fishermen has been the subject of numerous studies. Understanding the factors that influence households' decisions to diversify their income sources and the effects of income diversification on households' livelihoods was the focus of these studies. In Ghana, Asante, Amankwaa, Adu-Dapaah, and Arko (2017) discovered that fishermen frequently engage in multiple income-generating activities, such as farming, trading, and artisanal mining. Access to credit, access to markets, and household size were identified as significant factors influencing households' decisions to diversify their income sources.

In Nigeria, Adegbite and Adekoya (2019) discovered that Lagos fishermen engage in a variety of income-generating activities, such as trading, crop cultivation, and wage labor. Education level, household size, and access to credit were identified as significant factors that influenced households' decisions to diversify their income sources. The study conducted by Oladimeji (2018) sheds light on the patterns of diversification of income among fishermen living along Artisanal Fishery Households in North-Central and North-Western Nigeria. The study identified off- and non-fish household size, capital expenditure level of education, access to credit and markets, and local economic conditions as major determinants of household decisions to diversify income sources. These studies emphasize the prevalence of income diversification options among fishermen and shed light on the factors that influence the decisions of households to diversify their income sources. In addition, the studies emphasize the need for interventions that improve access to credit and markets and foster skill development and training in income-generating activities. By comprehending the patterns of income diversification among fishermen, policymakers and development practitioners can design more effective interventions to support these households' means of subsistence.

While existing literature has highlighted several socioeconomic factors influencing income diversification among fishermen, there are still gaps to be addressed in future research. Specifically, there is a lack of studies exploring the impact of demographic household characteristics on income diversification, such as age, gender, and household size. To address this, the present study examines the demographic characteristics of fisherfolk and their contribution to income diversification decisions along the Rivers Niger and Benue in Kogi State, Nigeria. The objective is to establish whether significant relationships exist between the income diversification index and demographic factors among Nigerian fishermen in this region.

Methodology

The study was carried out in Kogi State, Nigeria situated in the savannah region between longitude 05°20" and 08°00" East and latitude 05°30"and 08°50" North. Kogi State, Nigeria is located in the central region of Nigeria, at the confluence of the Niger and Benue rivers. Fishing is an important economic activity in many of these communities, particularly those located along the Niger and Benue rivers. Three-stage sampling procedure was used in the selection of respondents for this study. At the first stage, eight (8) Local Government Areas (LGAs) along River Niger (Ibaji, Ajaokuta, Ofu, Lokoja, Igalamela and Idah) and River Benue (Omala and Bassa) in Kogi State were purposely selected based on intensity of fishing activities. At the second stage, three fishing villages were randomly selected from each of eight (8) LGAs. At the third stage, a simple random sampling technique was used for selection of ten fisher folks based on a list of fish households obtained from the Kogi State Fisheries Department. A total of only two hundred and thirty-five (235) respondents provided meaningful information. A validated structured questionnaire was used to generate primary data for the study. Descriptive and inferential statistics were adopted for the data analyses. Tobit Regression Model was use for the estimation of the relative relationship between explanatory and criterion variables. The demographic characteristics of fisher folks were analyzed using descriptive statistics (frequency table, percentage, mean, and standard deviation). while controlling for other factors that may influence income diversification, such as access to credit, market opportunities, and environmental conditions.

The Tobit regression model was used to analyze the determinants of diversification among households in the study area. The Tobit model assumes that the dependent variable (Y*) is

censored, meaning it is observed only within a certain range (between zero and one in this case). The error term (e) is assumed to follow a normal distribution with zero mean and constant variance.

Implicit form: Diversification index (Y*) = f(X1, X2, X3, X4, X5, X6, X7, X8)……i

Explicit form: Y* = b1X1 + b2X2 + b3X3 + b4X4 + b5X5 + b6X6 + b7X7 + b8X8 + e……ii

Equations: Y* = b1X1 + b2X2 + b3X3 + b4X4 + b5X5 + b6X6 + b7X7 + b8X8 + e……iii

Where:

Y*: Income diversification index obtained by dividing the number of livelihood sources employed by the entire livelihood sources available in the study area. The value of the diversification index ranges between zero and one.

X1: Farm size (in hectares).

X2: Household size (number of individuals).

X3: Age (in years).

X4: Education (in years).

X5: Distance to the nearest city (in kilometers).

X6: Access to credit (dummy variable; Yes = 1, No = 0).

X7: Sex (Male = 1, Female = 0).

X8: Marital status (Married = 1; otherwise = 0).

b1, b2, b3, b4, b5, b6, b7, b8: Regression parameters or coefficients corresponding to X1-X8.

e: Error term, representing the unexplained variation in the income diversification index.

Result and Discussion

Socio-economic characteristics of the Artisanal Folks along Rivers Niger and Benue

According to the results presented in Table 1, a significant majority of the respondents (48.59%) are aged between 41 to 50 years, implying that the fish producers in this age group are characterized by youth and vigor. Consequently, they possess the potential to achieve more and generate higher profits compared to their older counterparts. This finding is supported by the studies conducted by Nwabueze, Akinbile, and Okorie (2017); Anifowose and Oladapo (2019); and Adekoya and Okuneye (2018), which demonstrate that young fish

farmers enjoy certain advantages over their older peers. These benefits include higher levels of energy, enthusiasm, and a greater willingness to explore and adopt new techniques and technologies

The results of sex revealed that the majority of respondents in the study area were male (91.90%), with the remaining respondents being female (8.10%). This indicates that the smoked and dried fish industry encompasses both genders, signifying inclusivity. The findings of Tesfaye, Bekele, and Wondimeneh (2017) and Badjeck, Allison, Halls, and Dulvy (2010) support this conclusion by highlighting that fishing communities are often predominantly male, potentially presenting obstacles for women's participation in fishing and related activities. However, there are opportunities for both men and women to diversify their livelihoods through farming, commerce, and artisanal production.

The dominance of men in fishing aligns with the findings of Rohe, Schlüter, and Ferse (2018), who noted that women are underrepresented in decision-making processes concerning fisheries and face inequitable access to natural, social, and material resources. This highlights the need to address gender disparities and promote greater gender equality in the fishing industry.

A significant percentage of respondents (99.9%) were married. The roles and responsibilities of married couples may vary, with the husband typically responsible for fishing activities and the wife for processing and marketing the fish (Inyang and Udong, 2013). Adzitey and Lawer (2017) found that the marital status of fish farmers can inform the design and implementation of income diversification strategies that are more effective at enhancing household livelihoods and reducing poverty in fishing communities.

According to the findings, a significant majority of households (60%) have a household size ranging from 3 to 8 members, which aligns with the typical household size observed in many communities (Lestari & Hartono, 2019). These households can benefit from shared resources and labor, leading to potential improvements in their socio-economic conditions (Bora, 2018). It is worth noting that a notable proportion of households (20%) have fewer than 3 members, indicating the presence of smaller households within the community.

Smaller households may encounter unique socio-economic challenges, such as limited labor resources and reduced income potential (Pillai, 2017). Conversely, an equal proportion of households (20%) consists of 9 or more members, signifying the presence of relatively larger families within the artisanal community. Larger households may face difficulties related to resource allocation, income generation, and access to essential services (Pramanik, Sardar, & Sen, 2021). These findings shed light on the socio-economic characteristics of households within the community and emphasize the importance of considering the specific needs and challenges associated with different household sizes for effective development planning and support.

The study findings indicated that a majority of fisherfolks had achieved post-secondary education (69.4%), reflecting a strong inclination towards pursuing higher education to enhance their skills and career opportunities. These results challenge the assertion made by Olaoye, Idowu, Omoyinmi, Akintayo, Odebiyi, & Fahina (2012) that a significant portion of fisherfolks lacked formal education, contradicting the common perception of them being primarily illiterate or semi-literate individuals who dropped out of the education system.

Furthermore, a considerable proportion of fisherfolks (21.7%) had completed primary education (Odeh and Alobo, 2015), while a smaller yet significant group (8.9%) had attained tertiary education. These findings highlight the presence of specialized knowledge and the potential for fisherfolks to engage in advanced roles within their field (Okafor, 2016).

The majority of respondents (69.4%) had a fishing experience ranging from 10 to 35 years, signifying a significant portion of seasoned fishers who have accumulated considerable knowledge and expertise in the field. This aligns with the findings of Adekunle, Olaoye, and Shaba (2014), who demonstrated that experienced fishers were more likely to diversify their income sources than inexperienced fishermen. According to the study, this is due to the fact that experienced fishermen have acquired skills and knowledge applicable to non-fishing activities. In addition, seasoned fishermen may have established social networks and market connections that can facilitate the development of alternative sources of income.

The vast majority of fishermen (62,6%) reported not having access to credit. Access to credit

is crucial for the diversification of income among fishermen. Several studies have demonstrated that a lack of credit limits fishermen's ability to invest in their enterprises and diversify their income sources. In a 2009 study on the determinants of income diversification among fishery communities in Kenya, Omiti, Otieno, and Nyanamba found that access to credit was positively associated with income diversification. Similarly, Cissé, Seck, and Thiam (2018) discovered that access to credit was positively associated with income diversification among fishing communities in Senegal. As reported by Ukwungwu and Iwara (2021) in their study on income diversification among fisher people in Kogi State, Nigeria, a substantial majority of fisherman (62.6%) said they did not have access to credit. This lack of access to credit can impede fishermen's ability to invest in their enterprises and diversify their income sources, which can have detrimental effects on their ability to earn a living.

Table 1: **Distribution of Socio-economic Characteristics of the Respondents in the Study Area n=235**

S/No	Variables	Frequency	Percent
1	**Age {Years}**		
	Less than 31	8	3.4
	31 - 40	41	17.4
	41 - 50	115	48.9
	51 - 60	50	21.3
	Above 60	21	8.9
2	**Sex**		
	Male	216	91.9
	Female	19	8.1
3	**Marital Status**		
	Married	233	99.1
	Single	2	0.9
4	**Household Number**		
	Less than 3	47	20
	3 – 8	141	60
	9 and above	47	20
5	Educational Status		
	Primary	51	21.7
	Post-secondary	163	69.4
	Tertiary	21	8.9
6	**Fishing Experience(years)**		
	Less than 10	14	6
	10 - 35	163	69.4
	36 - 55	55	23.4
	56 and above	3	1.3
7	**Access to Credit**		
	No	147	62.6
	Yes	88	37.4

Effect of Socioeconomic Variables on Household Income Diversification in the Study Area

Table 2 present the estimated for the determinants of income diversification Fisher Folks along Rivers Niger and Benue in Kogi State. The F-statistic (30.29), and the associated p-value was 0.000 indicated that the model is statistically significant, suggesting a good fit. The pseudo-R-squared is a measure of the proportion of variance in the dependent variable explained by the independent variables in the model. In this case, the pseudo-R-squared is 0.064, indicating that the model explains approximately 6.4% of the variation in income diversification.

Table 2 presents the findings of a regression analysis investigating the impact of socioeconomic factors on income diversification in the study area. Education shows a positive and highly significant effect on income diversification (coefficient = 0.00607, p-value = 0.001). An increase in education level is associated with a 0.00607 increase in income diversification. It suggests that individuals with higher levels of education are more likely to engage in multiple income-generating activities, leading to a more diversified income portfolio. These findings are in disagreement with Katchova (2015) who reported that education make farmers to pay less attention to diversification and concentration in building strong single enterprise. The distance to the nearest city has a positive and highly significant effect on income diversification (coefficient = 0.00189, p-value < 0.001). As the distance to the nearest city increases, income diversification also increases by 0.00189. This result is consistent with result reported by Ergicho and Markos (2015); Yishak (2017). This suggests that households located farther from cities are more likely to engage in diverse income-generating activities.

As expected, income has a positive and highly significant impact on income diversification (coefficient = 0.00143, p-value < 0.001). An increase in non-farm income is associated with a 0.00143 increase in income diversification. This finding is consistent with the studies of Ogaji, Adewumi, Ibrahim, and Danlami, (2019). which stated that income diversification is common among farmers with several income sources and sizable non-farm income. Marital status shows a positive and marginally significant effect on income diversification (coefficient = 0.05552, p-value = 0.045). This implies that being married is associated with a

0.05552 increase in income diversification. These findings are consistent with the research conducted by Saba, Abdul, Muhammad, and Muhammad (2015), who also found that unmarried household heads tend to have lower levels of income diversification compared to their married counterparts.

Table 2: Effect of Socioeconomic Variables on Household Income Diversification in the Study Area

Symbol /Variable	Coefficient	Std. Err.	P>|t|	Marginal Effect dy/dx
X1 = Household size	-0.00136	0.00293	0.64300	-0.00136
X2 = Age	0.00247*	0.00128	0.05400	0.00247
X3 = Education	0.00607***	0.00186	0.00100	0.00607
X4 = Distance to the nearest city	0.00189***	0.00017	0.00000	0.00189
X5 = Non-Farm Income	0.00143***	0.00021	0.00000	0.00143
X6 = Year of Fishing Experience	-0.00041	0.00123	0.74200	-0.00041
X7 = Access to Credit	-0.01782	0.01734	0.30500	-0.01782
X8 = Sex (	-0.00473	0.03363	0.88800	-0.00473
X9 = Marital Status	0.05552**	0.02756	0.04500	0.05552
_cons	0.03273	0.05545	0.55600	
Number of Observation	235			
F-stat. [P-value]	30.29 [0.000]			
Log likelihood	158.296			
Pseudo R^2	0.064			

***Source**: Field Survey, 2020. **Note**: ***, ** and * represents significance at 1%, 5% and 10% respectively.*

Conclusion/Recommendations

Conclusion:

The study on the determinants of income diversification among fisherfolk along the Rivers Niger and Benue in Kogi State, Nigeria, has yielded valuable insights into the factors influencing decisions regarding income diversification in this context. The findings highlight the significance of demographic and socioeconomic factors such as access to

credit and markets, level of education, household size, and local economic conditions.

The study revealed that the majority of the region's fishermen were young and energetic, indicating a greater profit potential. Men and women participated equally in the fishery industry, demonstrating gender equality. It was discovered that marital status affects income diversification strategies, as married couples assume various roles and responsibilities. In addition, household size, education level, and access to credit played significant roles in determining income diversification choices.

The study also highlighted the positive impact of higher levels of education on income diversification, indicating the need to promote education as a means to increase income diversification and reduce poverty in fishing communities. In addition, fishing experience and credit availability were identified as important factors. Experienced fishermen were more likely to engage in non-fishing activities, capitalizing on their talents and market relationships. However, limited credit access hindered fishermen's ability to invest in their enterprises and diversify their income streams.

On the basis of these findings, policymakers and development practitioners should prioritize instituting interventions that enhance fishermen's access to credit and markets. Education and skill development in alternative income-generating activities should be encouraged. To devise targeted interventions, strategies should also consider the demographic characteristics of fishermen, such as age, gender, and household size.

Recommendations

i. Facilitate easier access to credit for fisher folks, enabling them to invest, explore new income opportunities, and withstand economic shocks.

ii. Develop and strengthen market linkages for fisher folks through infrastructure, value chain support, and connections with potential buyers.

iii. Promote educational programs and vocational training to equip fishing communities with knowledge and skills for alternative income activities, reducing reliance on fishing and enhancing resilience.

iv. Tailor interventions based on demographic characteristics (age, gender, household size) of fisher folks for inclusive and effective strategies.

v. Encourage the formation and strengthening of fishing cooperatives to enhance collective bargaining power, access to credit, shared resources, and joint marketing efforts, leading to improved income diversification opportunities.

The implementation of these recommendations can aid policymakers and development practitioners in fostering the welfare of fisher folks, fostering sustainable livelihoods, and making significant contributions to poverty reduction in fishing communities residing along the Rivers Niger and Benue in Kogi State, Nigeria.

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