

ANALYSIS OF INCOME DIVERSIFICATION AMONG FISH FARMERS IN SHIRORO LOCAL GOVERNMENT AREA OF NIGER STATE, NIGERIA

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ABSTRACT

The study examined income diversification among fish farmers in Shiroro Local Government Area of Niger State, Nigeria. Primary data were obtained from 120 respondents selected through a multistage sampling technique. Data obtained were analyzed using descriptive statistics, Simpson index of diversity, Gini coefficient and Tobit regression model. Result showed that an average fish farmer in the area was 45 years old and had household size of 8 persons. 86.7% of the respondents were males, 95.0% were married and 99.2% had one form of formal education or the other. The SID result obtained revealed that the fish farmers were highly diversified with diversification index of 0.8055 and that income distribution among them is relatively even with estimated Gini coefficient of 0.1955. The tobit regression result shows that the respondents' gender at $p < 0.05$, age at $p < 0.05$, educational level at $p < 0.01$, marital status at $p < 0.10$, household size at $p < 0.01$, income from primary occupation at $p < 0.10$ and access to extension services factors at $p < 0.10$ were the significant determinants of income diversification among the fish farmers in Shiroro LGA of Niger State. It was recommended that income diversification through fish production in the study area can be encouraged by involving females and youth's participation in fish production, and that further research work in the area among the fish farmers should focus on their poverty and food security status.

Key words: Income, Diversification and Fish production

INTRODUCTION

Most surveys such as those of Ogunniyi and Ganiyu (2014) and Nwabeze *et al.* (2015) carried out in the continent of Africa brought to fore some reasons majority of rural households resort to agricultural activities like fish production and livestock rearing as primary sources of income with other income generating ventures also following suit as alternative means to support the main source of income. Diversification therefore becomes a necessity to broadening the income portfolio base of the rural household (Barrett *et al.*, 2001). As a result of limited resources to support household activities and consumption, diversification becomes the most compelling means of making such resources available to guaranty a robust livelihood (Minot *et al.*, 2006). It also renders positive synergy between different activities which complement each other to reduce the incidence of income risk especially in the face of dwindling credit security (Reuben and Vanden Berg, 2001). In developing countries where Nigeria happens to belong, incidence of disparity in income has drawn the attention of the United Nations to incorporate solutions to the above mentioned to conquer poverty and bring about growth and development through

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Millennium Development Goals (Adejuwon and Tijani, 2012). With economic prosperity recorded in recent times in the country and financial awareness among the citizenry, income inequality still continues to take a front seat among households. The margin of income is growing wider by the day between the poor and non-poor as households continue to wallow in hardships. This can only be alleviated and evened up by income diversification and should be incorporated in the developmental goals of the country (Oyekale *et al.*, 2004 and Minot *et al.*, 2006).

Diversification in a broad context refers to the allocation of some resources in a given venture like a farm venture to new products. The concept of diversification over the years is believed to be a remedy for "Dutch effect" which implies a situation where a single plague pose some effects on a group of enterprise which is homogenous in their product's nature and standard Ajayi *et al.* (2016). Fish production therefore, can be enhanced to better position the fishery sector towards impacting positively on household income, food security and enhanced standard of living especially of the rural farmer. Having this in mind, the study is therefore handy to analyze the effect of establishing fish farms and its contribution to income diversification especially in the rural setting. Specifically as it sought to describe the socio-economic characteristics of the fish farmers, identify their sources of livelihood, examine the diversity in individual income sources, determine the income inequalities among them and also determine the factors that influence their livelihood diversification in the study area.

METHODOLOGY

The study was carried out in Shiroro Local Government Area of Niger State, Nigeria. It has a land area of 5,015 km² and inhabited by a population of 235,404 (NPC, 2006) which is estimated to be 326,679 as at 2017. Geographically, it is located between Latitude 10°6'N and Longitude 6°40'E. It has water bodies and its home to the Shiroro dam which is one of the dams that supplies electricity to the country. The LGA has two districts namely Galkolo and Kuta and fourteen wards. Agriculture is the major occupation of the people in the area with a large proportion of them being smallholders who are predominantly involved in arable crops and livestock farming and trading. The predominant tribe in the area is Gbagyi. Other tribes present include Nupe, Hausa, Kadara and Koro.

Multi-stage sampling technique was used. Shiroro LGA of Niger State was purposely chosen because of the water resources found in the local government area which permits culture and capture fish farming. This forms the first stage. The second stage involved a purposive sampling of six major fishing communities (Erena, Gwada, Zumba, She, Mutun-Daya and Kuta) and the last stage involved simple random sampling of 20 respondents from each of the communities to give a total sample size of 120 respondents. Primary data were obtained from the selected fish farmers using structured questionnaire that was complemented with personal interview schedule. Enumerators were trained to assist during the data collection.

Data on socioeconomic characteristics and source of livelihood were analyzed using descriptive statistic such as frequency and percentage distribution table. Simpson index of diversity was employed in determining the diversity of income sources of the households. Gini coefficient was used to analyze the extent of income inequalities in the study area. Tobit regression model was used in determining the factors influencing livelihood diversification among the fish farmers.

Simpson Index Diversity formula:

The Simpson Index of Diversity (SID) was used in this study to estimate the degree of income diversification among fish farming households following Minot *et al.* (2006). The index of diversity ranges between Zero (0) and One (1). Thus, 0 denotes specialization while 1 denotes the extremity of diversification. The more the index value is closer to one, the more diversified the household is.

$$SID = 1 - \sum_{i=1}^N S_i^2$$

Where;

SID = Simpson Index of Diversity which ranges from Zero (0) to One (1),

S_i = Share of income source i with respect to the total income from all sources ($S_i = Y_i/Y$),

Y_i = Total household income from source i , and

Y = Total household income from all sources

Gini Coefficient:

Gini coefficient shows the degree of unevenness or evenness of income distribution, it ranges between 0 and 1. Coefficient with 0 indicate equal distribution of income while 1 implies uneven distribution of income which means that one person has all the income i.e. monopoly and others have none. Lower Gini coefficient indicates equal distribution of income while higher Gini coefficient implies that income is concentrated in the hand of fewer groups of people in the study area. Gini coefficient is derived from formula given as:

$$\text{Gini coefficient} = 1 - \sum XY$$

Where;

1 = Constant

\sum = Summation sign

X = Income proportion

Y = Total income proportion in categories

Tobit regression model:

The tobit regression model was used to estimate the determinants of income diversification among the fish farming households in the study area.

The implicit form is expressed as:

$$Y = f(X_1, X_2, X_3, X_4, X_5, \dots, X_{10})$$

The explicit form is expressed as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \dots + \beta_{10} X_{10}$$

Where;

Y = Individual diversity index

X_1 = Gender; (male = 1; otherwise = 0)

X_2 = Age (years)

X_3 = Educational level (years of schooling)

X_4 = Marital status, (married = 1; otherwise = 0)

X_5 = Household size (Number)

X_6 = Primary occupation (dummy, 1 for farming, 0 for other occupations)

X_7 = Income from primary occupation (Amount in ₦)

X_8 = Access to credit (Amount in ₦)

X_9 = Access to extension service (Number of contacts)

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X_{10} = Level of involvement in fish farming (Full-time = 1, Part-time = 0)

RESULTS AND DISCUSSION

Socio-economic Characteristics of Fish Farmers in the Study Area

The socio-economic characteristics described in this study were gender, marital status, age, educational status and household size. The results presented in Table 1 revealed that majority of respondents involved in fish production were males (86.7%), while 13.3% of the respondents were females. This means that males were more involved in fish production than the females in the study area. This may be as a result of energy required in terms of coping with stress, decision making and coordination of production activities. This is in conformity with the finding of Brummett *et al.* (2011) that fishing activities are mostly dominated by men. Result also showed that married respondents constituted 95.0% of the total respondents as against 4.2% single and 0.8% widowed. This indicates domination of fish production by the married. This is similar finding of James *et al.* (2014) that most of the fish farmers in Delta State were married. Age distribution revealed a mean age of 45 years. This indicates that farmers are in their active, productive age, are energetic and can withstand the challenges that come with production activities. The result on the educational status of the fish farmers revolved that majority (71.87%) of them had secondary education, 16.7% had tertiary education, 10.8% had primary education and only 0.8% had no formal education. This indicates that a high percentage (99.1%) of the respondents had one form of formal education or the other. Otaro *et al.* (2004) stated that education is not only an important determinant for adoption of innovations but also a tool for successful implementation of new technology or innovation for profitability. The result further revealed that 49.2% of the respondents had a household size of 7-10, 32.5% with a household size of 4-6 and a mean household size of 8. This indicates greater responsibility in catering for the large household and also the use of the household as source of family labour in production activities.

Livelihood Income Sources of Fish Farmers

Result in Table 2 revealed that fish production ranked 1st among the respondents' source of income as all of them were engaged in fish production. This was followed by crop production, handcraft/artisan, trading, other livestock production and agro-processing among others that ranked 2nd, 3rd, 4th, 5th and 6th respectively with civil service which ranked 8th the least livelihood source engaged in by the respondents. This is an indication that that fish farmers in the area are highly diversified as they engaged in various livelihood sources to boost their household income generation. This lends credence to the argument of Sallawu (2014) that farming households are engaged in other profitable enterprises so as to increase their total earning. Olaoye *et al.* (2013) also stated that people have one or two things they engage in which gives them income, sense of satisfaction and belonging in the society.

Table 1: Respondent's Socio-economic Characteristics

Variables	Frequency (n=120)	Percentages (%)	Mean
Gender			
Male	104	86.7	
Female	16	13.3	
Marital status			
Single	1	4.2	
Married	114	95.0	
Widowed	1	0.8	
Age (years)			45
Below 21	1	0.8	
21 – 40	34	28.3	
41 – 60	79	65.8	
Above 60	6	5.0	
Educational status			
Non-formal	1	0.8	
Primary	13	10.8	
Secondary	86	71.77	
Tertiary	20	16.7	
Household size			8.0
1 – 3	4	3.3	
4 – 6	39	32.5	
7 – 10	59	49.2	
11 – 13	12	10.0	
Above 13	6	5.0	

Sources: Field Survey, 2016.

Table 2: Distribution of respondents according to income sources

Income source	*Frequency	Percentage	Rank
Fish production	120	100.00	1 st
Crop production	92	76.67	2 nd
Handcraft/artisan	65	54.17	3 rd
Trading	45	37.50	4 th
Other livestock production	36	30.00	5 th
Agro-processing	23	19.17	6 th
Others	20	16.67	7 th
Civil service	17	14.17	8 th

* Multiple responses recorded

Sources: Field Survey, 2016

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Livelihood Diversity among the Respondents

Result in Table 3 shows that the Simpson index of diversity (SID) of respondents in the study area was estimated to be 0.8055 (80.55%). Given that the closer the SID is to zero, the more the specialization and the farther it is from zero, the more the diversification. With the result obtained; it therefore implies that respondents' degree of income diversification is very high in the area. This could also imply that the fish farmers are well enlightened about the income diversification opportunities available in the study area. The degree of diversification of 0.8055 obtained for this study is higher than the 0.3380 reported by Bernard *et al.* (2014).

Table 3: Simpson Index of Diversity of Respondents

Income source	Total monthly income (₦)	Proportion of income (S_i^2)
Fish production	2,658,300	0.1031
Crop production	1,904,700	0.0530
Handcraft/artisan	560,900	0.0046
Trading	913,800	0.0122
Other livestock production	870,500	0.0111
Agro-processing	310,800	0.0014
Others	350,000	0.0018
Civil service	708,000	0.0073
Total	8,277,000	0.1945

Sources: Field Survey, 2016.

$$SID = 1 - \sum_{i=1}^N S_i^2$$

$$SID = 1 - 0.1945 = 0.8155$$

Income Inequality of Respondents

Result in Table 4 revealed the degree of income inequalities of the respondents in the study area with a Gini coefficient of 0.1955. Gini coefficient shows the degree of unevenness or evenness of income distribution and it ranges between 0 and 1. Lower coefficient indicates equal distribution of income while higher coefficient implies unequal income distribution. The lower Gini coefficient of 0.1955 obtained implies that income is evenly distributed among the fish farming households in the study area. This could be due to the fact that most of the respondents in the study area engage themselves in other profitable farming and off farming ventures as presented in Table 2. This result is in contrast to the 0.4920 reported by Mohammed (2017) for cattle marketers in Niger State which could be largely due to the enterprising nature of the respondents in the study area.

Table 4: Gini Coefficient of Respondents.

Income	Frequencies	Proportion(X)	Total Income	Proportion (Y)	$\sum Xy$
1 – 100,000	113	0.94	7,050,000	0.85	0.7990
100,001 – 200,000	6	0.05	782,000	0.10	0.005
Above 200,000	1	0.01	445,000	0.05	0.0005
Total	120	1	8,277,000	1	0.8045

Sources: Field Survey, 2016.

$$G = 1 - \sum Xy$$

$$G = 1 - 0.8045 = \underline{0.1955}$$

Factors Influencing Income Diversification of Farmers

The result presented in Table 5 shows the estimated tobit regression model of the factors influencing the income diversification among the fish farmers. It revealed that the LR chi-square value of 97.42 was significant at 1% probability level. This means that the model has a good fit which implies that there is a significant relationship between the dependent variable (Y) and the independent variables ($X_1 - X_{10}$) included in the model. Result revealed that sex of the respondents had a positive significant relationship with diversification at $p < 0.05$ probability level. This implies that male farmers tend to diversify more than the female counterpart in the study area. The result further showed that the age coefficient of the respondent had a negative significant relationship at $p < 0.05$ probability level which implies that as respondent increase in age; they tend to reduce their level of diversification as most of them don't have much inner strength to engage in other activities that will increase their income. This conforms to the findings of Fikru (2008) who reported that as the household head gets older, he/she is expected to be less active and hence would rely more on farm than non-farm income. It also conforms to the finding of Awoniyi and Salman (2012) that age of household head reduces the likelihood that farming households would engage in non-farm livelihood activities.

The educational level of the respondents in the study area had a positive relationship with diversification at $p < 0.01$ level of probability since it increases the opportunities of the respondents to diversify income sources, in which those with fewer years in school might find this difficult or impossible. So the more the education of the respondents, the more they diversify into other income activities as education tends to open more employment opportunities for income generation, making people to be aware of more opportunities as a result of the level of exposure and experience they have. This is also consistent with the findings of Minot *et al.* (2006) and Sallawu (2014) who found out that education facilitates access to a number of different economic activities, either as a formal requirement for wage earning jobs or because it helps setting up and managing own small businesses.

Marital status and household size were found to be positively significant at $p < 0.10$ and $p < 0.01$ level of probability respectively which has an adverse effect on the level of livelihood diversity, as respondents who are married and those with larger family size tend to have more mouths to feed, so they are forced to venture into more profitable activities in order to generate more income. This is in line with the findings by Ibrahim and Onuk (2009) and Sallawu (2014) who found out that household with a very high ratio of dependants had a higher tendency to diversify into non-agricultural activities in order to feed more persons and cope with the needs of the household.

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The result in Table 5 further revealed that income from primary occupation to be negative and statistically significant at $p < 0.10$ probability level. Thus, farmers with larger income will diversify less than farmers with less income. Also, the coefficient of access to extension services was found to be positively significant at $p < 0.05$ probability level. This shows that, number of extension visits increases the level of diversification among the households and this could as a result of extension agents been present to offer support to the fish farming households such as provision of trainings and other agricultural services which could help them engage in other income generating activities.

Table 5: Tobit Regression showing Factors Influencing Income Diversification

Variables	Coefficients	t-value
Constant	0.1480	1.34
Gender (male = 1, otherwise = 0)	0.1560	2.57**
Age (years)	-0.0025	-2.24**
Educational level (years of schooling)	0.0130	4.20***
Marital status (married = 1, otherwise = 0)	0.0730	1.65*
Household size (number)	0.0292	6.79***
Primary occupation (farming = 1, otherwise = 0)	0.0250	0.73
Income from primary occupation (₦)	-1.76E-07	-1.91*
Access to credit (₦)	-0.0480	-0.73
Access to extension service (number)	0.0239	1.75*
level of involvement in fish farming (full-time = 1, part-time = 0)	-0.0544	-1.10

LR Chi² (10) = 97.42***

Log likelihood = 27.6592

*** implies significant level at 1%,

** implies significant level at 5%

* implies significant level at 10%

Source: Field survey, 2016.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Based on the findings of this study, it can be concluded that the fish farmers in Shiroro LGA of Niger State were highly diversified in the livelihood activities and that their level of income is evenly distributed. Also, the respondents' gender, age, educational level, marital status, household size, income from primary occupation and access to extension services were the major determinants of income diversification among the fish farmers in the study area.

Recommendations

1. Fish production in the study area can create job opportunities for the unemployed, underemployed and also a secondary occupation for the employed. Therefore, income diversification through fish production in the study area can be encouraged by involving females and youth's participation in fish production, processing and marketing.
2. Full time participation in fish production should be encouraged since majority of the respondents' source of income comes from fish production in the study area. The level of income generated in fish production in the study area is significant to move production to a higher scale and create infrastructural development.

3. Research institutions should organized extension programs that will educate the farmers on ground breaking research on improved fish farming production and practices.
4. Further research work in the area among the fish farmers should focus on their poverty and food security status.

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