INCOME DIVERSIFICATION AND POVERTY STATUS AMONG ARABLE CROP FARMERS IN SHIRORO LOCAL GOVERNMENT AREA OF NIGER STATE, NIGERIA

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ABSTRACT

This study examined income diversification and poverty status among arable crop farmers in Shiroro Local Government area, Niger state, Nigeria. Sample size of 117 households was obtained through a multi-stage sampling technique. Tobit regression model was used to find the determinants of the degree of diversification measured by Simpson's Index of Diversity (SID). The results showed that the level of diversification was low with SID of 0.307. The result revealed that the share of household income from farm sources accounted for 58.11% while non-farm income accounted for 41.89% of the total household income. Sex, age, years of schooling, household size, number of extension visits and household income were found to be statistically significant in determining income diversification of farmers in the study area. The result of the Foster-Greer-Thorbeck (FGT) model revealed that 50.43% of the respondents were poor, while 49.57% were non-poor, the depth of poverty was 0.67 and severity of poverty was 0.47. The study suggests the need for arable crop farmers to get involved in non-agricultural activities in order to earn more income and diversify income sources. Government and private sector need to support farming households to increase the gains made in participating in various diversification strategies through policy, provision of public goods, skill acquisition and training on modern farming to raise standard of living.

KEYWORDS: Income diversification, Poverty status and Arable Crop Farmers

INTRODUCTION

Arable crop farming is predominantly practiced on the agricultural landscape in Nigeria. Inadequate finance and limited access to farm credit amenities constitute the major challenge faced by these farmers. Therefore, they find alternative means in non-farm enterprise in order to generate sustainable income for their farming venture (Ogbanje, *et al.,* 2014). Off-farm work refers to activities from which farmers earn income apart from their own farm. According to (Ibekwe

et al., 2010; Ogbanje, *et al.,* 2014), off-farm work is grouped generally into agricultural, non agricultural wage employment, and self-employment.

Income diversification is the process of switching from low-income crop production to higher value crops, livestock and non-farm activities. Income diversification is a potential source of income expansion and means of poverty reduction. It is the process of switching from crop production generating low return or income to higher value crops, livestock and non-farm activities crops that yield high economic return per unit of labour of land such as cassava, Cocoa etc. (Escobal, 2001).

Poverty is said to be the lack of empowerment essential for an individual to control the challenges of the environment while poverty alleviation is seen as ways that are being adopted in the society to reduce poverty. The increase in poverty levels has led the arable crop farmers to develop several strategies to mitigate its harmful effects. Poverty among the rural households is as a result of lack of assets, limited economic opportunities and poor education and capabilities, as well as the negative effects resulting from social and political inequalities.

In Nigeria, the poverty situation is quite alarming. The situation contradicts the vast human, mineral and physical resources the country is blessed with. Despite successive government intervention whereby huge resources have been committed to reduce the incidence of poverty, it is quite unfortunate that the actual depth and severity of poverty is still at its worst in the country.

There are significant differences in relation to the reasons or motives for diversification among rural households as well as the existing opportunities across settings and income groups (Joshi *et al., 2005*). This creates a distinction between diversification undertaken to manage risk, cope with shock or escape from agricultural seasonality. Ellis (2000) argued that, the seasonal pattern of farm operations which result to labour inefficiency during off-farm seasons prompted families to engage in activities which are mostly of non-agricultural origin in order to utilize their human capital. This study, therefore, explicitly seeks to: describe the socio-economic characteristics of the sampled farmers, identify their various income sources, estimate the share of farm and non-farm income in the Total Household Income (THI), estimate the degree of income diversification, examine the determinants of income diversification, and determine the poverty status of the respondents in the area.

METHODOLOGY

Study Area: This research was carried out in Shiroro Local Government Area of Niger State. The state capital is Minna and other major cities that constitute the state are Suleja, Bida and Kontagora. The state got its name from the predominant river Niger and the principal hydro-power plants in Nigeria are located in the state which include the Shiroro and Kainji dams. The land mass is about 77, 000 sq/km, 85% of which is arable land. The tribes that are predominant are the Gbagyis and the Nupes. Shiroro LGA has its Headquarters located at Kuta. It has an area land mass of 5,015 Km^2 and a population of about 236, 000 as at 2006 population census count. The 2016 population figure for the LGA was estimated to be 317164 persons at an annual growth rate of 3%. The seasons that characterize the state are dry and wet seasons. The rainfall ranges from 1,600mm and 1200mm in the southern and Northern parts respectively with a temperature of 32^0F towards the half of the year. There are three major soil types which are hydromorphic, ferosols and ferruginous soils and the major ecological problem in the state is flooding, particularly when the Niger River overflows its banks.

Sampling procedure and data collection: Primary data were used for this study. The data were collected using questionnaire. A multi- stage sampling technique was used for this study. The first stage was the purposive selection of Shiroro LGA from the state based on the apriori knowledge that the rural household engage in arable farming. Secondly, three communities were randomly selected from Shiroro LGA. Third stage involves the proportionate selection of 15% of the registered arable crop farmers from each of the three communities. This gave a total of 117 farmers as the sample size.

Method of Data Analysis: Data on socio-economic characteristics of the farmers, the various income sources were analyzed using descriptive statistics such as mean, frequency table and percentage.

The Mean of Income Shares approach: This was used to estimate the income shares obtained by the farm households. This approach estimates the shares of incomes at the individual household level (Davis *et al*., 2007) by finding the share of each income source in THI for each household. The mean share for each income source for all households is then found. The general Mean of Income Shares formula is given in equation   1:

Table 1: Sample frame and sample size of the respondents

Local Government Areas	Selected Communities	Sample Frame	Sample Size
Shiroro	She	329	49
	Muntun Daya	140	21
	Bangajiya	312	47
TOTAL		**781**	**117**

Source: Niger State Agricultural and Mechanization Development Agency (NAMDA) (2016)

$$M\,S_i = \frac{\sum_{h=o}^{n} {y_{ih}}/{Y_h}}{n} \qquad (1)$$

Where;
i = the income source,
Y=Total Income,
y = income from particular activity,
h =the household,
n = the number of households.
The sum of Total Household Income (THI) is given equation 2:

$$T\,H\,I = \sum_{j=1}^{9} Y_j \qquad (2)$$

Where: THI=Total Household Income, thus income coming from all sources j
j =1, 2, 3, 4….9, farm and Non-farm income.
The mean Share of Farm Income (SFI) is given in equation 3:

$$SFI = \sum \left(\frac{\sum {fi}/{thi}}{n} + \frac{\sum {ami}/{thi}}{n} + \frac{\sum {nri}/{thi}}{n} + \frac{\sum {livsti}/{thi}}{n} + \frac{\sum {fwi}/{thi}}{n} \right) \qquad (3)$$

The mean Share of Non-farm Income (SNFI) is given in equation 4:

$$SNFI = \sum \left(\frac{\sum {tradi}/{thi}}{n} + \frac{\sum {csi}/{thi}}{n} + \frac{\sum {carpi}/{thi}}{n} + \frac{\sum {othersi}/{thi}}{n} \right) \qquad (4)$$

Where;

SFI = Share of Farm Income;

SNFI = Share of Non-Farm Income; thi = total household income; fci = fish keeping income; cci = arable crop income; ami = agricultural marketing income; livsti = livestock income; fwi = farm wage income; carpi = carpentry income; csi = civil service income; tradi = trading income; others = other sources income and n = number of households.

Estimating the degree of income diversification: The Simpsons Index of Diversity (SID) was used in this study to estimate the degree of income diversification among farm households. The SID takes into consideration both the number of income sources as well how evenly the distributions of the income between the different sources are (Minot *et al.*, 2006). The SID ranges between Zero (0) and One (1). Thus, 0 denotes specialization and 1 the extremity of diversification. The more the SID value is closer to one, the more diversified the household is.

The SID general formula is given in equation 5:

$$SID = 1 - \sum_{i=1}^{n} P^2{}_i \qquad (5)$$

$$SID = 1 - \sum_{i=1}^{9} \left(\left(\frac{fci}{thi}\right)^2 + \left(\frac{cci}{thi}\right)^2 + \left(\frac{nri}{thi}\right)^2 + \left(\frac{livsti}{thi}\right)^2 + \left(\frac{fwi}{thi}\right)^2 + \left(\frac{nfwi}{thi}\right)^2 + \left(\frac{ssi}{thi}\right)^2 + \left(\frac{rsi}{thi}\right)^2 + \left(\frac{othersi}{thi}\right)^2 \right) \qquad (6)$$

SID=Simpsons Index of Diversity, *n*=number of income sources, *Pi*=Proportion of income coming from the source *i*, the value of SID ranges from Zero (0) to One (1), however, if there is only one Source of Income, P*i*=1, then SID=0.

Determining income diversification: The Tobit regression model was used to estimate the determinants of income of income diversification in the study area. The implicit form is expressed below;

$Y = f$ (X_1, X_2, X_3, X_4, X_5, X_6……… X_n) The explicit form is expressed as:
$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \dots + \beta_{11} X_{11}$
Where;
Y = Individual Diversity index
X_1 = Gender; Male = 1; otherwise = 0
X_2 = Age (years)
X_3 = Educational level (years)
X_4 = Marital status (Married = 1, Others = 0)
X_5 = Household size (Number)
X_6 =Occupation (farming = 1, Others = 0)
X_7 = Access to credit (Yes =1, No = 0)

X_8 = Number of extension visit

X_9 = Access to electricity (Yes = 1, No = 0)

X_{10} = Distance from market (Kilometer)

X_{11} = Household income (₦)

β_0 = Constant

$\beta_1 - \beta_{11}$ = regression coefficients

Foster –Greer-Thobecke (FGT) Poverty Measures: The Foster – Greer-Thorbecke (1984) was used to determine the poverty status of the respondents in the study area.

$$PCHMI = \left(\frac{THMI}{HHS} \right)$$

$$PCHAI = \frac{THAI}{HHS}$$

$$MPCHMI = \frac{TPCHMI}{TNR}$$

Where;

PCHMI = Per capital household monthly income

PCHAI = Per capital household annual income

THMI = Total household monthly income

THAI = Total household annual income

HHS = Household size

MPCHMI = Mean per capital household monthly income

TPCHMI = Total per capital household monthly income

TNR = Total number of respondents

$$Pa = \frac{1}{N} \sum_{i=1}^{Hi} \left(\frac{Z - yi}{Z} \right)^{\alpha} \quad (8)$$

Where N = total number of respondents;

Yi = Annual income;

Z = Poverty line using $\frac{2}{3}$ of mean income of respondents in the study areas

q = number of households with income less than Z

α = Poverty Aversion Parameter index which takes on the values of 0,1, and 2 representing incidence of poverty, poverty gap and severity of poverty respectively (Foster *et al.*,1984).

The measure relates to different dimensions of the incidence of poverty.

The poverty line was placed at two-third mean income of respondents. Based on this, respondents will be classified into three groups.

- Non-poor: those with income above two-third mean income of respondents, i.e , $NP > \frac{2}{3}$ (mean income)

- Poor: those with income between one-third and two-third income of respondents, i.e. between $\frac{1}{2}$ and $\frac{2}{3}$ (mean income)

- Very poor: those with income below one-third mean income of respondents ,i.e. $VP < \frac{1}{3}$ (mean income)

$$P_{0} = \frac{Ho}{N} \quad (9)$$

This is proportion of the population that falls below the poverty line which is called the head count of incidence of poverty.

If $\alpha = 1, FGT\ becomes:$

$$P_1 = \frac{1}{N}\sum_{i=1}^{Hi}\left(\frac{z-yi}{z}\right)\alpha \quad (10)$$

The depth of poverty which is the percentage of income required to bring each individual below the poverty line up to the poverty line was estimated with the equation (10).

If $\alpha = 2$, FGT becomes:

$$= \frac{1}{N}\sum_{i=2}^{H2}\left(\frac{z-y2}{z}\right)\alpha$$

$$(11)$$

This is the severity of poverty. It is indicated by giving larger weight to the extremely (core) poor. It is achieved by squaring the gap between their income and the poverty line to increase its weight in the overall poverty measure.

RESULTS AND DISCUSSION
Income sources of the farming households: Table 2 comprises the various income sources of the respondents; arable crop farming has the highest percentage of (87.18%) as a source of income because all the respondents engage it but not all recover income from it being just for their own family consumption only. Livestock with (29.91%), others (bricklayer, blacksmith, carpentry, mechanic, tailoring, gold mining) with (29.91%), carpentry, civil service, trading, handicraft, agric marketing, hired labour and fish keeping with varying percentages respectively.

Table 2: Distribution of the respondents according to the various sources of income

Source of income	Frequency*	Percentage
Arable crop	102	87.18
Livestock	35	29.91
Carpentry	4	3.42
Civil service	38	32.48
Trading	11	9.40
Handcraft	4	3.42
Agric marketing	5	4.27
Hired labour	10	8.55
Fish keeping	5	4.27
Others	35	29.91
Total	***249**	

Source: Field Survey, 2016.

Mean Share of Farm and Non-farm Income in Total Household Income: Table 2 reveals the share of farm and non farm income in the total household income of the farming family. In the farm income category, arable crops income source recorded the highest income share of 43.44%. Livestock income share had (8.37%) of the total household income. The low share of fish keeping, agricultural marketing, and farm wage income with (1.24%), (1.74%), (3.33%) respectively is as result of the fact that, most of the respondents are purely arable crop farmers and these other activities are just to sustain their family during the off seasons. Thus, in total the farm income share represents 58.11% of Total Household Income. This result indicates the importance of farming and its related activities to the Study area. This provides a justification for these villages in Shiroro local government as one of the agrarian community.

Furthermore, in the non-farm income, Civil service income share (29.13%) represents the largest share in the Non-farm income share category. Others income share follows with (8.08%), trading, carpentry and handcraft income share recorded 3.24%, 1.08%, 0.35% respectively. In total, the Share of Non-farm income in Total household income was found to be 41.89%, lower than the share of income generated from the farm sector by farm households. This finding on the shares of income coming from farm and Non-farm source is in line with the findings of Schwarze *et al.*,(2005) who found larger shares of farm income of 68% and 32% coming from the Non-farm sector of farm households in Indonesia. The results reveal that the farm sector continues to be vital to farm households in the study area, since a major portion of their income is derived from activities in this sector and buttresses the argument for supporting farm households in the study area.

Degree of Income Diversification of Farm Households: Result presented in Table 4 reveals a mean degree of diversification of 0.3072 (30.72%), which implies that the level of diversification is low. Given that the closer the SID is to zero, the more the specialization and the further it is from zero the more the diversification. Arable crop farmers from She, Bangajiya, Mutundaya villages recorded 0.2894, 0.3586, and 0.2324 mean SID respectively. The mean degree of diversification of 0.3072 can be compared to that observed by Bernard *et al.* (2014) of 0.338. The result of the SID shows what farm households in the study area are more specialized in. Therefore, farm households concentrated on farm related activities since it is their main income source.

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Table 3: The share of farm and non-farm income in the total household income of the farming families

Income sources	Mean income (₦)	Mean income share (%)
Arable crop	278324.79	43.44
Livestock	53598.29	8.37
Agricultural marketing	11145.30	1.74
Farm wage from hired labour	21307.21	3.33
Fish keeping	7914.53	1.24
Total farm income	**372290.11**	**58.11**
Carpentry	6923.08	1.08
Civil Service	186630.74	29.13
Trading	20752.14	3.24
Handicraft	2264.96	0.35
Others	51777.78	8.08
Total non-farm income	**268348.68**	**41.89**
Total income per year	**640638.79**	**100.00**

Source: Field Survey, 2016.

Table 4: Distribution of respondents according to degree of income diversification

Village	Proportion of diversification (Pi)	Simpson's Index of Diversity (SID)
She	0.7106	0.2894
Bangajiya	0.6414	0.3586
Mutun Daya	0.7676	0.2324
Pooled	**0.6928**	**0.3072**

Source: Field Survey, 2016.

Determinants of Income Diversification: Table 5 shows the effect of sex, age of household heads, years of schooling, household size, number of extension visits and household income on income

diversification. Age coefficient of the respondent has 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 sources and they even has less burden on them as most of their wards have matured and have taken up the responsibilities of their parents. This also agrees with the findings of Fikru (2008) who affirmed 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.

The sex of the respondents has a negative significant relationship with diversification, which implies that male farmers tend to diversify more than the female counterpart in the study area. The years of schooling 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) 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.

Household size was found to be positively significant at p<0.05 level of probability which has an adverse effect on the level of diversity, as respondents with larger family size tend to have more mouths to feed, so they are forced to venture into more off farm activities in order to acquire more income. This is in line with the findings by Ibrahim and Onuk (2009) 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.

The coefficient of number of extension visit 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 farm households such as provision of credit and other agricultural services which could help

them engage in other income generating activities. Table 4 further reveals household income to be negative and statistically significant at p<0.01 probability level. Thus, households with larger income will diversify less than households with less income.

Poverty Profile of the farming households: The poverty head count or incidence (P_0), poverty gap or depth (P_1) and squared poverty gap or severity (P_2) were also calculated and the results are presented in Table 6. The mean income of all farm households was ₦640, 638 per annum. The poverty line is an income-based threshold line that divides the poor and the non-poor farm households in the study area. The value of the poverty line is ₦429, 227.99 per annum. The P_0 for the entire households was 0.5043. This means that 50.43% of the respondents were poor, while 49.57% were non poor. The poverty gap index (P_1) usually Teaching, Civil Service, Handcraft, Bricklayer Worker, Tailoring, Gold mining, and Traditional Medical Practitioner. 50.43% of the respondents were poor, while 49.57% were non-poor, the depth of poverty was 0.67 and severity of poverty was 0.47. The study recommends the need for arable crop farmers to get involved in agricultural and non-agricultural activities in order to earn more income and diversify income sources.

referred to as the depth of an average poor person from the poverty line was 0.6678. This implies that 66.78% of the poverty line (₦429,227.99) that is ₦286,638.45 was required to bring an average poor person in the study area to the poverty line. The poverty index (P_2) which measures the distance of each poor person to one another was found to be 0.4675. This means that among the poor household heads, 46.75% were severely poor.

CONCLUSION
The study has shown that diversification into a number of income sources especially to non-farm work is very low among the arable crop farmers since the degree of income diversification of farm households was found to be generally low indicating that farm households generate their incomes from few livelihood activities. Non-farm activities identified in the study area were carpentry, Trading, Blacksmith, Tailoring, Palm wine tapping, Government and private sector need to support farming households to increase the gains made in participating in various diversification strategies through policy, provision of public goods, skill acquisition and training on modern farming to raise standard of living.

Table 5: Determinants of income diversification among respondents

Variables	Coefficient	t-value
Sex	- 0.1536566	-3.39***
Age	- 0.002183	-2.03**
Years of schooling	0.0143612	4.70***
Marital status	0.0377637	0.95
Household size	0.0181126	2.18**
Major occupation	0.0131343	0.51
Access to credit	- 0.0714652	-1.00
No of extension	0.0231647	2.05**
visit	0.0684662	1.39
Access to	- 0.0006197	-0.26
electricity	- 0.84e-07	-4.08***
Market distance	0.2973305	2.95*
Household income		
Constant		

F-value =19.77***;   Pseudo R^2 = 2.7571
Note. *** = p<0.01, ** = p<0.05 and * = p<0.10 level of probability
Source: Field Survey, 2016.

Table 6: Distribution of respondents according to poverty profile

Poverty status	Frequency		Percentage	
Non-poor	58		49.57	
Poor	59		50.43	
Total	117		100.00	
FGT indices	Head count(P_0)	Poverty depth(P_1)	Poverty Severity(P_2)	
Value	0.5043	0.6678	0.4675	

Source: Field Survey, 2016.

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