

DETERMINANTS OF DIVERSIFICATION OF INCOME SOURCE AMONG RURAL FARMING HOUSEHOLDS IN OYO STATE, NIGERIA

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ABSTRACT

In sub-Saharan Africa, reliance on agriculture tends to diminish continuously as income level rises. Diversification of income sources is the livelihood strategies households employed to minimize household income variability. This study investigated the determinants of diversification of income among rural farming households in Oyo state, using data from a cross sectional survey of 120 farming households. Data were analyzed using descriptive statistics, Inverse Herfindahl-Hirschman Diversity (IHHD) index and Probit regression model. Results showed that 55.3% of the sample respondents were male with an average age of 42 years and an average of 10 years of farming experience and educational level respectively. Result of IHHD showed that 73.3% of the sample households in the study area had diversified income sources. It was found that agriculture still remains the major source of rural income for the farmers with 60% of the farmers derived their income from arable crop farming and 37.5% from livestock production. Among the non-farm income source, Okada riding (48.3%) and artisanal (33.3%) were the prevalent income generating activities. Similarly, in the off-farm categories, marketing of farm produce (41.2%) and collection of firewood and charcoal (30%) were the dominant income generating activities. During the period, an average income of ₦68,979.50 was earned from on-farm activities while ₦55,852.77 and ₦33,465.52 were earned from non-farm and off-farm activities respectively. Results revealed that the age and education level of household head, household size, farm size and ownership of assets were the relevant and significant factors that influenced the likelihood of income diversification among rural farming household.

Keywords: *Determinants, diversification, income, non-farm, off-farm, farming-household.*

INTRODUCTION

The rural household in sub-Saharan African countries usually have to cope with both poverty and income variability to shift from subsistence agriculture to a more pluriform society where farm and non-farm opportunities are available. The report from Federal Office of Statistics (2004) shows that between 1980 and 2004, rural households in Nigeria derives their livelihood from subsistence agriculture. The total income of households in most developing countries Nigeria inclusive, comes from diverse

sources, however, rural income is equated with farm income. Multiple motives prompt household to diversify income and activities (Mohammed 2015, Temesgen *et al.*, 2016). It is evident in the literature that wage income and off-farm self-employment income account for richer household-diversification. Diversification of income sources has been put forward as one of the strategies households employed to minimize household income variability and to ensure a minimum level of income (Dev *et al.*, 2016). Diversification refers to the patterns

individual voluntary exchange assets and the allocation of assets across various activities (non and off-farm) so as to achieve an optimal balance between expected return and risk exposure conditional on the constraints they face (Wan *et al.*, 2016, Dev *et al.*, 2016). Another school of thought refers diversification as income generating activities of rural individuals regardless of the sector or location (Loison and Loison, 2016; Martin and Lorenzen, 2016).

There are three broad categories of farm income-generating activities, namely, on-farm, off-farm and non-farm activities (Sherren, Loik and Debner, 2016). On-farm income-generating activities involve commitment to farming (crop and livestock production), off-farm income involves income from agricultural activities that take place outside the farmer's own farm, such as local daily wage labour in return for cash payment or the agricultural work at another farmer's farm. Non-farm income-generating activities take place outside the agricultural sector, such as artisans' activities (carpentry, house mudding, weaving, etc.), petty trading, security guard and civil servant. Household with capability to operate a heterogeneous set of activities are likely to enjoy higher "flexibility" and resilience" capacity than agricultural dependent rural households. Thus, it is not surprising that in the lights of the reiterated environmental, economic and political shocks affecting rural areas in developing countries, diversification has been increasingly attractive for many rural households (Osarfo *et al.*, 2016, Benmehaia and Brabez, 2016). Rural households in many different countries worldwide have been found to diversify their income sources

thereby allowing them to spread risk and smoothen consumption (Yanesew, 2015, Yisihake, 2016). This is necessary in agriculture-based peasant economics because of risk such as crop diseases, price shock, unpredictable rainfall etc. This consequently leads to low productivity which continually trap them in the vicious cycle of poverty.

According to the portfolio theory of diversification, household trade-off the relatively high mean profitability of one activity to reduce risk and maximize utility. Employment in non-farm activities is essential for diversification of the sources of farm household's livelihood. It enables households to modernize their production by giving them an opportunity to apply the necessary inputs and reduces their food shortage during periods of unexpected crop failure (FAO, 2017, Maniriho and Nilsson, 2018). In sub-Saharan Africa, reliance on agriculture tends to diminish continuously as income level rises, that is, the more diverse the income portfolio the better off is the rural household. Past studies (Yisihake, 2016, Odoh and Nwibo, 2016; Khatiwada *et al.* (2017) reported that the contribution of non-farm income sources to the rural economy cannot be neglected. This is because it has grown substantially during the last two decades thus enabling them to spread risk and enhance income generation.

There are many reasons why some households maintain a more diversified income portfolio than others. This can be due to economic and social factors (i.e. constraints in labour and land market, weak financial system, climate uncertainty, weak and inadequate infrastructures such as transport access, market, education and credit

service). The amount of diversity in a household's income portfolio reflects the amount of diversity in the assets it owns or has access to (Yenesew *et al.*, 2015). Similarly, diversification is being used by the household as a way of insuring against income shocks during adverse conditions (Mohammed, 2015; Yenesew *et al.*, 2015). Based on this, it is expected that the amount of diversification varies across households. In this respect, the behavior of rural households in diversifying their sources of income and employment from solely agricultural activities could be considered to be important and critical requirements for rural poverty reduction in Nigeria. The promotion of off-farm activities and income diversification in order to provide attractive income earning opportunities for rural households has received increased policy attention recently (Dev *et al.*, 2016, Maniriho and Nilsson (2018)). The growing importance of off-farm activities has also led to rising interest in analyzing the wider implications for household livelihoods and development, especially in Africa. However, there has been an increased recognition among researchers especially in the past one or two decades that farmers diversify their livelihood strategies, including on-farm (Crop, livestock fisheries) and off-farm activities or market and non-market activities, to mitigate risks inherent in unpredictable agro climatic and politico-economic circumstances (Odoh and Nwibo, 2016; Dev *et al.*, 2016, Maniriho and Nilsson, 2018). Evidence from literatures showed that smallholder farmers in Nigeria operate on one hectare or less, lack access to productive resources and adequate agricultural

financing, thus leads to stagnation or even decline in the economic system. This suggests the necessity of alternative livelihood diversification strategies in order to help reducing poverty in rural farming household. Based on the above, this research was carried out to examine the determinants of income diversification among rural farming households in Oyo State, Nigeria. Specifically, the study profiles the socio-economic characteristics of farm household; examine the income diversification activities of the farmers; assess the level of income diversification and determine the factors influencing farm household income diversification.

MATERIALS AND METHODS

Study area

Data for this study were collected from a cross-sectional survey of farming households in Oyo State, Nigeria. The state is located in the southwestern part of country. Oyo state covers approximately a land area of 28,584 square kilometers and a population of 5,591,589 (National Population Commission 2006). It lies between latitude 2°38 and 4°35 east of the Greenwich meridian. The major occupation in the state is agriculture. The soil in the area is suited for the cultivation of export crops such as cocoa, cashew, palm tree and arable crops which include maize, yam, millet and rice etc. Other economic activities include trading, hunting and civil service. The climate is tropical with distinct dry and wet seasons with relatively high humidity. The dry season lasts from November to March while the wet season starts April and ends in October. The annual mean rainfall is 300 mm. Average daily temperature ranges

between 25 and 35°C almost through- out the year.

Sampling procedure

A multistage sampling technique was employed for this study. In the first stage, two Agricultural Development Programme (ADP) zones were randomly selected (Ibadan/Ibarapa and Saki zones). In the second stage, two Local Government Areas (LGAs) were randomly selected from each of the zones (Ibadan/Ibarapa: Akinyele and Lagelu LGAs; Saki zone: Saki-west and Atisbo LGAs). The third stage involved random selection of three villages from each LGA and lastly 135 farming households were randomly selected from the LGAs based on probability proportionate to the size of farming households in the selected area. Although a total of 135 questionnaires were administered on the respondents, 15 of these were found unsuitable for analysis and consequently, data from 120 questionnaires were analyzed for the study.

Sources of Data: Primary data were collected for this study. The data were collected through the aid of well-structured questionnaire. The questionnaire covered the socio-economic characteristics of the farmers like age, sex, level of education, household size, and farming experience, primary and secondary occupation. Information was also collected on type of farming activities engaged, sources of capital, credit access, membership in cooperative society, farm inputs and outputs, types and number of assets owned, labour cost, incomes from farm, non-farm and off-farm activities etc.

Method of data analysis

Data collected were analyzed using simple descriptive statistics, Inverse Herfindahl-Hirschman Diversity (IHHD) index and Probit regression model

(1). **Descriptive statistics** used includes mean, standard deviation and percentages. This was used to analyze the socio- economic characteristics of the respondents.

(2) **Inverse Herfindahl-Hirschman Diversity (IHHD) index:** the income diversification activities were grouped into three major activities which include on-farm, off-farm and non-farm activities. On-farm activities includes income derived from farming activities. Off-farm activities are income derived from agricultural activities that take place outside the farmer’s own farm or at another farmer’s farm; while non-farm activities include income derived from activities that take place outside the agricultural sector. Following Ellis and Freeman (2004) Inverse Herfindahl-Hirschman Diversity (IHHD) index was used to measure the level of income diversification.

$$IHHD_i = \left[\frac{1}{\sum a_j^2} \right] \dots\dots\dots 1$$

Where,

- IHHD_i = Inverse Herfindahl-Hirschman Diversity index of the ith farmer
- each a_j represent the proportional contribution of each activity j to household i’s overall income

The ith household is considered to be diversified in its income sources if IHHD >1 and otherwise if equal to 1.

The level of household's income diversification was measured as:

$$LHID = \left(\frac{n}{N}\right) 100 \dots\dots\dots 2$$

Where,

LHID = level of household's income diversification

n = Number of farmers with IHHD index > 1

N = sample size.

(3). The Probit Model:

The probit model was used to capture the determinants of farming household's income diversification in the study area. The study adopted the model from Uzuno and Akcay (2012). In the binary probit model Y is a dichotomous variable depicting the probability of diversification of household income, taking up value 1 if a farmer diversified income (IHHD >1) and 0 otherwise (IHHD = 1). The probability p_i of a farmer diversified or not can be expressed in equation (ii);

$$P_i = \text{Prob} [Y_i = 1/X] = \int_{-\infty}^{X_i\beta} (2\pi)^{-1/2} \exp\left(-\frac{t^2}{2}\right) dt \dots\dots\dots (ii)$$

$$Y^* = \text{Prob} [Y_i = 1/X] = \Phi(\beta X_i') \dots\dots (iii)$$

where Φ represents the cumulative distribution of a standard normal random variable (Greene 2011). The relationship between a specific variable and the outcome of the probability is interpreted by means of the marginal effect, which accounts for the partial change in the probability. The marginal effect associated with continuous explanatory variables X_k on the probability $\text{Prob} (Y_i=1|X)$, holding the other variables constant, can be derived as follow: (Greene 2011).

$$\partial p_i / \partial X_{ik} = \phi(X_i'\beta) \beta_k \dots\dots\dots (iv)$$

where ϕ represents the probability density function of a standard normal variable. The marginal effect on dummy variables should be estimated differently from continuous variables. Discrete changes in the predicted probabilities constitute an alternative to the marginal effect when evaluating the influence of a dummy variable. Such an effect can be derived from the following

$$\Delta = \Phi(\bar{X} \beta_i d = 1) - \Phi(\bar{X} \beta_i d = 0) \dots\dots\dots (v)$$

Y^* = Responses of farmer taking up value 1 if a farmer diversified income (IHHD >1) and 0 otherwise (IHHD = 1)

Independent variables X's are the socio-economic features, farm and institutional characteristics included in the model.

X_1 = Gender of household head (1= male, 0 otherwise)

X_2 = Age of household head (years)

X_3 = Educational level of household head (number of years)

X_4 = Farm size (hectare)

X_5 = Household size (number of dependants)

X_6 = Ownership of assets (number)

X_7 = Access to credit (access =1, 0 otherwise)

X_8 = Membership in cooperative society (member=1, 0 otherwise)

RESULTS AND DISCUSSION

Socio-economic characteristics of the farmers

Table 1 presents the socio-economic characteristics of the farmers. The result shows that 55.3% of the sampled farmers were male and the rest female. This indicates that men were more engaged in farming

activities than women in the study area. This may be as a result of the laborious and strenuous activities of farming that made men the major actor. The average age of the farmers was 42.41 ± 10.08 years. This depicts an active and productive population which translate to potential improvement in productivity and facilitate ease of diversification of income into non- farm and off-farm activities. This result supports the findings of Awoniyi and Salman (2012) and Sallawu *et al.*, (2016) that income diversification is common among the farm households headed by the youthful who are more agile, productive and could withstand the risk associated with income diversification. Majority (78.3%) of the farmers were married. This implies that diversification of income generating activities into non-farm and off- farm increases with married household in order to sustained their family. Educational level of the farmers showed that 45% had no formal education while 36.7% and 18.3% of the farmers had primary and secondary education respectively. It is believed that education of farming household will enhance their exposure to modern farming technologies that would improve their productivity. This implies that literate farmers would be better in diversifying their household income

generating activities. Result revealed further that farmers had an average farming experience of 10.03 ± 8.55 years. This indicates that, on the average, sampled farmers had above ten years of experience in farming that may facilitate diversification into non and off-farm income generating activities. Majority (62.5%) of the farmers have between 1-4 household members. The average household size was 6 persons. A large household size improved the potential labour position on the farm which may facilitate the diversification into non-farm and off-farm income generating activities. Majority (65.2%) of the farmers had farm size between 1-2 ha while 9.2% had above 5 ha. The average farm size was 2.27 ha. This indicates that most of the sample households were operating on small- scale farming. This is expected to enhance diversification into non-farm and off- farm income generating activities for sustainability. Results showed that 57.5% of the farmers did not have access to credit. This would greatly impede the expansion of their farm operations and may result in diversification to non and off- farm income generating activities to meet their households needs. About 62% of the sampled farmers did not belong to any cooperative societies while 38.7% took part in cooperative activities.

Table 1: Socio-economic characteristics of the farmers.

Variables	Frequency	Percentages	Mean	Std. deviation
Gender				
Male	54	45.0		
Female	66	55.0		
Age (years)				
21 - 30	16	13.3		
31-40	45	37.5		
41-50	35	29.2	42.41	10.08
Above 50	24	20.0		
Marital status				
Single	11	9.2		
Married	94	78.3		
Divorcee/widow	15	12.5		
Education level				
Informal	54	45.0		
Primary	44	36.7		
Secondary	22	18.3	10.08	4.12
Farming experience (years)				
< 5	29	24.2		
6 – 10	53	44.2		
>10	38	31.6	10.33	8.55
Household size (number)				
1 -4	55	62.5		
5 – 10	61	34.2		
>10	4	3.3	6.28	3.05
Farm size (ha)				
1 – 2	79	65.8		
3 – 4	30	25.0		
>5	11	9.2	2.27	0.94
Access to credit				
Yes	51	42.5		
No	69	57.5		
Membership of cooperative				
Yes	46	38.3		
No	74	61.7		

Source: Field survey, 2018

Income diversification activities of farm households

The income diversification activities of farming household are presented in Table 2. It was found that 60% of the farmers derived their income from arable crop farming, 17.5% from cash crop farming, 37.5% from

livestock production and 10% from fish farming. Results also show that farm households earned an average income of ₦68,979.50 from on-farm activities representing 43.57% of total household income during the year with the highest income from arable crop farming (16.99%).

The study revealed that Okada riding (48.3%) and artisanal activities (33.3%) are the dominant non-farm income sources that were engaged by rural farmers. However, farm households that engaged in non-farm activities earned an average income of ₦55,852.77 which is about 35.28% of total household income of the household. This result supports the findings of Ogbanje *et al.* (2015), Odoh and Nwibo (2017), Davis, Giuseppe and Zezza (2017) that non-farm income contributed 30-50% of total household income in rural economy of some developing countries. Similarly farm households that engaged in off-farm activities earned an average income of ₦33,465.52 and this contributed 21.14% of total household income with highest income

from marketing of farm produce (12.72%). This indicates that farming households in the study area diversified their livelihood to other income generating activities aside the farm works they engage in. This may be as a result of increasing household needs to cope with adverse conditions associated with rural farming. This result supports the findings of Anang (2017) where it was reported that the decline in farm wages and emerging opportunities for work outside the farm sector can promote farmers' engagement in rural non-farm work. In addition, the result showed that farming households who engaged in on-farm, non-farm and off-farm together earned an average income of ₦158,297.78 which in relative term was not adequate considering their household size.

Table 2. Income diversification activities of farming households

Income sources	Frequency	Percentage	Mean Income	% Contribution to household Income
On-farm				
Arable crop	72	60.0	31,127.50	19.66
Cash/Tree crop	21	17.5	12,782.00	8.07
Livestock	45	37.5	15,350.00	9.70
Fish farming	12	10.0	9,720.00	6.14
Non-farm				
Artisanal	40	33.3	20,313.22	12.83
Petty trading	35	29.2	12,288.15	7.76
Public servant	12	10.0	3,616.10	2.29
Okada riding	58	48.3	19,635.30	12.40
Off-farm				
Firewood & Charcoal	36	30.0	8,240.00	5.21
Marketing of farm Produce	50	41.7	20,120.50	12.72
wage labour on other farms	26	21.7	5,105.02	3.22
Total income			158,297.79	100.0

*Multiple response

Source: Author's Computation

Level of income diversification

Table 3 shows the degree of income diversification of the farming households in the study area. Using Inverse Herfindahl-Hirschman Diversity (IHHD) as used by Ellis and Freeman (2004) to measure the level of income diversification. If there is lack of diversity, the index is unity. So, the degree of diversification depends on the amount by which diversity index exceeds unity. Result reveals that 73.3% of the farming households in the study had diversified income sources as shown by IHHD > 1. This implies that majority of the farmers in our study had diversified their productive income base to non-farm and off-farm activities to generate additional income for their sustainability. This result corroborates the findings of

Rahman and Akter (2014) that rural farmers diversify their income generating activities to cope with adverse weather condition that affects agriculture. The mean income diversification index is 5.12. This implies that an average farmer in the study area is involved in different types of income-generating activities that ranges from on-farm, non-farm and off-farm activities. This result is consistent with the findings of Oyewole et al., 2015 and Idowu et al. (2011) who reported an average income diversification index of 2.02 and 2.83 respectively. Result also showed that 26.7% of the farming households did not diversify their income as shown by IHHD =1. The reason might be that these set of households are risk-averse.

Table 3. Distribution of farmers by their level of income diversification

Diversity	Frequency	Percentage
1	32	26.7
1.1 – 5.0	34	28.3
5.1 – 10	30	25.0
10.1 – 15.0	10	8.3
>15.0	14	11.7
Total	120	100.0
Mean	5.12	

Source: Field survey, 2018

Determinants of income diversification of farming households

Table 4 presents the probit regression result of the determinants of household's income diversification in the study area. The pseudo R^2 was 0.3419 implying that 34.19% of the variation in households' income diversification were explained by the

explanatory variables included in the model. The likelihood function of the probit model was significant (Wald $\chi^2 = 46.12$, $p < 0.000$). This indicates the strong explanatory power of the model. The value of marginal effect was used to explain our results since the coefficients of parameters do not have precise explanations of the magnitudes of

regression estimate. Most of the explanatory variables and their marginal values were statistically significant at different levels. The estimated marginal effects measure the expected changes in the probability of household income diversification with respect to a unit change in the independent variables.

Result shows that age of the farmer has a negative and significant ($p < 0.01$) relationship with diversification of income. A year increase in the age of the household head decreases the probability of diversifying income to other incomes generating activities by 0.0177 unit. The possible reason could be that ageing farmer forecloses the probability of taking risk in diversifying their income base from farming activities to non-farm and off-farm activities. However, the more productive and energetic young farmer would be more receptive in risk taking by diversifying their income whenever it likely to result in additional income for his livelihood sustainability. This result supports the findings of Awoniyi and Salman (2012) and Sallawu *et al.*, (2016) that younger household heads derived more wage employment income compared to their older fellow farmers.

The educational level of the household head has positive significant ($p < 0.05$) relationship with income diversification. This indicates that an increase in the year of education of household head increases the likelihood of household income diversification by 0.0231 units. This implies that literate farmers are better-off in taking decisive actions to increase their productive income base hence diversifying into non-farm and off-farm activities to generate additional incomes.

This corroborates the findings of Demissie and Legesse (2013); Seng (2015) and Oyewole *et al.*, 2015 that literacy level of farmers increases the opportunities to engaged in other income generating activities. Farm size has a negative and significant ($p < 0.1$) relationship with income diversification. This indicates that a unit increase in the household's farm size decreased the probability of household diversifying into other income generating activities by 0.0789 units. The possible reason could be that households with relatively large farm size would be more concerned and therefore concentrate more of their efforts to increase their farming activities than engage in non-farm work and wage employment. This result is in consonant with the findings of Awoniyi and Salman (2012), Bekelu and Abdil-Khalil (2013), Sallawu *et al.* (2016), that farmers with relatively larger area of farm land tended to involve more in farming activities than those farmers who have smaller areas of farm land to cultivate.

Household size has a positive and significant relationship to the likelihood of income diversification. This indicates that as the household size increase by one member the probability of farming household diversification from income base to non-farm and off-farm activities increases by 0.0822 ($p < 0.05$). This in line with the findings of Asravor, (2017), Oyewole *et al.*, (2015), Demissie and Legesse (2013) where the presence of large number of economically active members in the household improves the capacity and ability of household to participate in different income earning

activities such as non-farm and off-farm wage employment.

Ownership of productive assets has positive and significant impact on the likelihood of income diversification. Ownership of assets increases the probability of household income diversification by 0.0516 ($p < 0.1$). This implies that farmers who owned assets such as land, livestock, cash crops, etc., which is associated with wealth would be

able to derive incomes from other income generating activities. This finding has an economic implication of reducing production risk and solving the liquidity problems faced by the farmers during adverse conditions. This result supports the findings by Ellis and Freeman (2004), Demissie and Legesse (2013), and Sallawu *et al.*, (2016) that mean assets grows along income from farm

Table 4: Probit result of the determinants of household's income diversification

Variables	Marginal effect	Standard error	Z
Sex	-0.0523	0.8803	-0.59
Age	-0.0177***	0.0061	-2.91
Education	0.0231**	0.0107	2.17
Farm size	-0.0789*	0.0465	-1.70
Farm experience	0.0066	0.0066	0.99
Household size	0.0822**	0.0354	2.32
Ownership of asset	0.0516*	0.0286	1.80
Access to credit	0.0589	0.0901	0.65
Membership of coop.	-0.0148	0.8148	-0.18
Number of observations.	117		
LR chi2	46.12		
Prob > chi2	0.0000		
Pseudo R2	0.3409		
Log likelihood	-44.5877		

Source: Field survey, 2018

Legend: *** = $p < 0.01$, ** = $p < 0.05$, * = $p < 0.1$

CONCLUSION

RECOMMENDATION

The study revealed that majority of the farming households engaged in non-farm and off-farm activities to generate additional incomes to sustained their livelihood. Though farm households had diversified, income from agricultural activities still remain the dominant source of rural households' income. The mean income diversification index obtained showed that an

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average farmer in the study area is involved in different types of income-generating activities. This study has shown that multiple factors underpinning farming households' choice to diversify. Age of household head, education of household head, household size, farm size, and ownership of assets were key determinants of farming household income diversification. It is therefore, recommended that there is need for the farmers to get involved in both agricultural and non-

agricultural activities in order to earn more income so as to uplift their standard of living. Also, ageing farmers should be encouraged to diversify their livelihood source to cater for their future needs, literacy level of farmer should be raised through enlighten campaign and adult literacy programme in the rural area.

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