

Measuring Income Differentials of Farm Households in Onna Local Government Area, Akwa Ibom State: Gini – Hoover - CV Approach

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Keywords.

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Abstract

The study measured income differentials among farming households in Onna Local Government Area of Akwa Ibom state, Nigeria. The result presented was based on primary data collected from a multi stage sampling of 180 households selected from 3 cells in the study area using Akwa Ibom Agricultural Development Programme (AKADEP) structure. Descriptive statistics, Gini coefficient, Hoover index, coefficient of variation, Lorenz curve and regression analysis were employed as analytical techniques. Descriptive statistics was used to assess the socioeconomic characteristics of farming households. 68.3 % were household heads, 76.7 % were married, and the mean number of farmers participating in farm activities was 89.0 % while that of off farm was 17.1 %. The Gini, Hoover and coefficient of variation indices and the Lorenz curve were used to measure the distribution of household income as well as estimate the level of volatility. However, the regression analysis was used to examine the determinants of income differentials among farming households. Lorenz curve analysis showed that there was an unequal distribution in the income of farming households. Other welfare indices; the Gini coefficient of 0.11 (89 %), Hoover index of 0.37 (63 %) and CV of 0.65 (35 %) were estimated. The regression analysis revealed that age, household size, years of farming experience, farm practice, non-farm income, and household expenditure were negatively related to income. The study recommend that income and other resources should be distributed equally. Housholds accumulating excess wealth should redistributed among the very poor households while appropriate tool be used for measuring income differentials. Timely monitoring and measurement of income differentials of farming households should be carried out by government and developmental agencies.

Introduction

Nigeria is endowed with large fertile agricultural land, rivers, streams, lakes, forest and grassland as well as a large active population that can sustain a productive and profitable agricultural sector, (Charles *et al.*, 2010). Several studies including World Bank (2008) identified agriculture as the widest spread form of human activity and it is more basic than any other industry in sub-Saharan Africa, (World Bank, 2008). In the past five decades, agriculture contributed over 70 % to Gross Domestic Product (GDP), it remains the largest contributor of over 38 % of non-oil earnings and employs over 70 % of the active labour force of the population, (Anyanwu *et al.*, 1999). Apart from the provision of food to the farming families, creation of employment opportunities and contribution to national revenue, agriculture serves as a major source of income to most farmers in developing countries of the world including Nigeria (Lawal, 1997). However, despite these numerous economic importance, there exist income differentials among farming households in Nigeria and Akwa Ibom State in particular. Efforts made over the years to reduce income differentials become dwindling, as a result linkage between income and poverty and its effect on agricultural production (Awoyemi, 2007). The low performance

of the agricultural sector can be attributed to subsistence level of production which consequently results in reduce income of farmers thereby causing disparity in income compared to non-agricultural sectors. The involvement of farmers in other income generating activities outside agriculture further widens the gap among farming households (Ipinnaiye, 2001). Aigbokhan (2000) argued that income differentials adversely affect growth and may generate social conflict over dimensional issues that are likely to diminish the security of property rights thereby lowering income of farmers. Also, the need to reduce poverty through lowering income differentials in the face of social conflict might encourage higher tax, affects investment of human capital and also may increase poverty. Jacob (2000) reported that total income differentials accounted for differences between age group is very low ≤ 5 , therefore age does not explain much of the observed income differentials.

In Nigeria, accompanying the rapid economic growth between 1965 and 1975 there was serious income disparity which widened substantially (Aigbokhan, 1997). This shows that though the economy may be performing strongly, the gap between the lower income households and the upper income households is increasing, which is an

indication that rapid economic growth may result in concentration of income in the hands of few proportion of the population (Clarke *et al.*, 2003). Oyekale (1997) and Adejare (1999) in a micro survey in Ibadan revealed Gini and Coefficient of variation to be 0.3716 and 0.57 respectively. World Bank (2007) reported that Gini index for Nigeria was 0.506 while countries with relatively equitable distributions have their Gini coefficient between 0.20 and 0.35. It can be deduced that income differentials is higher in many African countries. Nigeria is rated among the 30 most unequal countries in the world in terms of income distribution while more than half of the population holds only 10 % of the national income (Bakare, 2011). The reason for income differentials may be attributed to lack of equal opportunity in areas such as education, employment, health, and access to productive assets (Diejomah and Anusionwu, 1981). Income inequality is therefore an important disturbing factor on the way to development in developing countries. Rising income differentials threatens growth and poverty reduction targets. This in part explains the overriding target endorsed at the recent United Nations Millennium Summit by virtually all world leaders to reduce the incidence of income-poverty in developing countries from 30 % to 15 % between 1990 and 2015 (Timothy and Olanrewaju, 2005). The elimination of income differentials among the rural poor in Nigeria has become the central focus in recent development agenda and has caused several debates in Nigeria's development policies for farming households. The poverty profile in Nigeria is over 60 % and is inherent among the poor National Bureau of Statistics (NBS, 2010). This study seeks to measure income differentials of farming households in Onna, Akwa Ibom state, Nigeria using Gini-Hoover and Coefficient of Variation approaches.

Theoretical Framework

The Capitalist Entrepreneurial Theory: This theory opines that the rather crude exploitation of the poor by means of low wages and poor conditions of service allows for a possible rise in saving among entrepreneurial class. The resultant inequality in

income could result in the preponderance of poverty among the peasant majority (Sunday and Kingsley, 2011).

Individual Attributes Theory: The individual attributes theory emphasised that an individual location in the society's hierarchy of income and wealth is presumed to be determined above all by his motivations, attitudes and abilities (McClelland, 1961). This theory presented by Milton Friedman is referred to as the individual choice theory in which stochastic influences are combined with optimizing behavior on behalf of the individual. According to Friedman being a risk taker is what explains the amount of income that an individual can have (Ferran, 1997). This theory suggests that the rich are risk takers while the poor are risk averse individuals, as such a society composed of risk averse individuals will generate less inequality than one composed of risk-taking individuals. However, Ferran (1997) refers to the work by Stanley (1959) who tests Friedman's model using data from USA and found that the group who takes the most risky investment is not the richest while the small scale investors especially the farmers expects an increase in income level.

Research Methodology

The study area

The study was conducted in Onna Local Government of Akwa Ibom State. Onna is located in the south east of Nigeria. The study area covers a total land area of approximately 174 Km² with a projected population of 166,465 people consisting of 82,975 males and 83,470 female. The people are of Ibibio speaking stock and are mainly involved in farming and fishing and downstream sector exploration. The major crops grown are cassava, vegetable, waterleaf, yam, sweet yam, etc. livestock kept include goat, sheep, pigs, etc. plantain, banana, palm fruit, coconut, pineapple are some of the arable crops produced by the people. The study area has one large market known as Edereobo market, this market attract sellers and buyers across the State and beyond for exchange of goods and services.



Fig. 1: Map of Akwa Ibom State showing the study area in in Onna Local Government Area

The study targeted farm households in Onna Local Government Area, Akwa Ibom State. The selection of respondents was based on Akwa Ibom Agricultural Development Programme (AKADEP) framework as shown in Fig. 2. A multi-stage sampling procedure was used to select respondents for the study. The first stage was purposive selection of *Abat* bloc from Eket AKADEP zone. Under the AKADEP structure, Eket Agricultural zone has only one bloc. The second stage was

simple random sample of three (3) out of five (5) cells in the bloc by balloting. The cells were Ikot Akpatek, Ndoneyo and Afaha Atai. In Stage 3, five (5) sub cells (villages) were randomly selected. A total of fifteen (15) villages were selected for the study. The fourth stage was simple random sample of twelve (12) farm households from the fifteen (15) sub cells (villages), giving a total of 180 farm households.

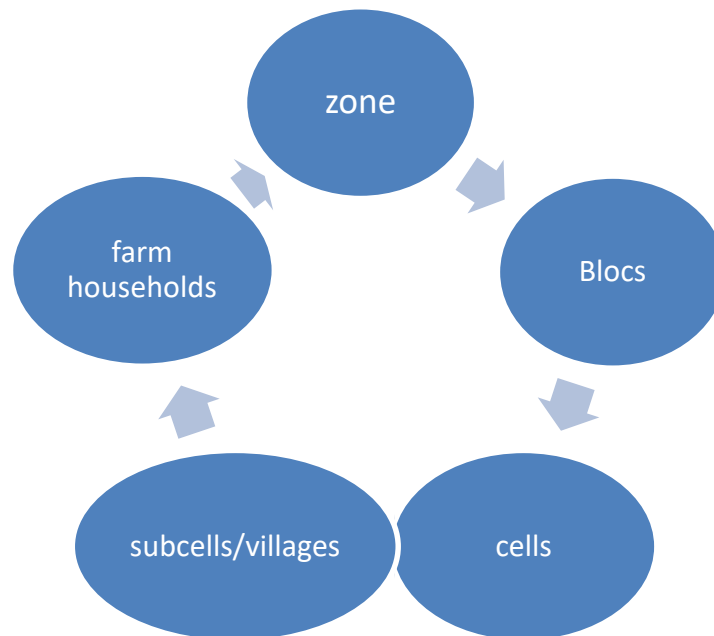


Fig. 2: An Organogram of AKADEP structure in in Onna Local Government Area
Source: Researcher’s Design (2018)

Data collected were analyzed using descriptive statistics including Gini coefficient, coefficient of variation, Hoover index and Lorenz curve. The determinants of income differentials were analysed using Ordinary least square estimates as stated in equations 1-6.

Model Specifications

Gini coefficient: Gini coefficient was used for the measuring income differentials in the study area . The hoover index and the coefficient of variation were also use analyzed this objective. It shows the degree of income inequality between households in the population. The Gini coefficient was computed using the modified form by Akpan (2013) as shown below:

$$G(S) = \left[\frac{1}{n-1} n + 1 - 2 \left[\frac{\sum_{i=1}^n (n+1-i)y_i}{\sum_{i=1}^n y_i} \right] \right] \dots\dots\dots (1)$$

Where n = number of observation, y_i = Income source, G (S) = Gini index.

The Lorenz curve: This was used to show the extent of income distribution. Percentages of income were plotted against population. The Lorenz analysis is shown in Fig. 2.

Hoover Index Analysis: It measures the deviation from an ideal income distribution. It can be interpreted as the maximum vertical deviation of the Lorenz curve from the 45 degree line. The Hoover index is expressed as;

$$HI = \frac{1}{2} \sum |P_i - W_i| \dots\dots\dots (2)$$

Where: i= number of households, HI= Hoover index, P=income, W=population

Multiple Regression Analysis:

Four functional forms were used on the regression model; the model that best fit the data in terms of the number of variables that are significant was used for the study. These functional forms are linear, exponential, semi-logarithm and double- logarithm functions. The general forms of the function were used as specified below:

Linear function:

$$cv = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + u_i \dots\dots\dots (3)$$

Exp. Function: $Ln cv = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + u_i \dots\dots\dots (4)$

Semi – logfunction: $cv = ln\beta_0 + \beta_1 lnX_1 + \beta_2 lnX_2 + \beta_3 lnX_3 + \beta_4 lnX_4 + ln\beta_5 X_5 + ln\beta_6 X_6 + \beta_7 lnX_7 + u_i \dots\dots\dots (5)$

Doublelog: $Lncv = ln\beta_0 + \beta_1 lnX_1 + \beta_2 lnX_2 + \beta_3 lnX_3 + \beta_4 lnX_4 + ln\beta_5 X_5 + ln\beta_6 X_6 + \beta_7 lnX_7 + u_i \dots\dots\dots (6)$

Where; cv = the income differentials of farming households, X₁ ... X_n are Explanatory variables, β₁ ... β_n are coefficients of the explanatory variables, U_i = error term. The independent variables are X₁ = age (years), X₂ = household size (number of persons), X₃ = farm size (hectare), X₄ = years of farming (years), X₅ = farm practices (types), X₆ = nonfarm income (₦), X₇ = farm income (₦), X₈ = household expenditure (₦).

Results and Discussions

The result in Table 1 revealed that 56.6 % of the respondents were females while 43.4 % were males. It follows that majority of the respondents were females and that more females were involved in income activities (especially farming) than the males. 76.7 % of the respondents were married, 7.2 % were single, 16.1 % are widowed implying that majority of the respondents are married men and women with children whose labour are used in various income activities of the household. Most of the respondents (30.0 %) were between the ages of 36 – 45 years, respondents with age range of 26 – 35, 46 – 55, 16 – 25 and 56 and above are represented by 17.2 %, 29.4 %, 4.4 %, and 18.9 % respectively, This finding showed that age is related to income differentials of the household. Income was low at relatively young age but increases at middle age and then decreases again at old age. The result also revealed that over 50.6 % engages in off-farm activities for their main source of income and also involve in an alternative means of livelihood. 49.4 % depended on farming as their main source of livelihood as shown in table. The implication is that while farm household engages in farming, they are at the same time receiving income from other off-farm activities either as paid employment, trading or self-employed businesses.

Table 1: Socioeconomic Characteristics of Respondents (n=180, % = 100) in Onna Local Government Area

Socioeconomic characteristics	Frequency	Percentages (%)
Sex of the Respondent		
Male	115	63.9
Female	65	36.4
Age		
16 – 25	8	4.4
26 – 35	31	17.2
36 – 45	54	30
46 – 55	53	29.4
56+	34	18.9
Marital Status		
Single	13	7.2
Married	138	76.7
Widowed	27	15
Separated	2	1.1
Educational Status		
Non formal education	12	6.7
Primary education	43	23.9
Secondary education	79	43.9
Tertiary education	46	25.6
Occupation of the Respondent		
Farming	89	49.4
Non farming	98	50.6
Household Size		
2 – 4	49	27.2
5 – 7	99	55
8 – 10	30	16.7
11+	2	1.1
Farm size		
< 1 ha	129	71.7
1– 2 ha	45	25
>2 ha	6	3.3
Respondent's Years in Farming		
< 5	22	12.2
6 – 10	52	28.9
11 – 15	71	39.4
16 – 20	29	16.1
21 – 25	6	3.3
Household Farm Income		
1 – 10,000	41	22.8
11 – 20,000	50	27.8
21 - 30,000	27	15
31 – 40,000	29	16.1
41 – 50,000	29	16.1
>/ 51,000	4	2.2
Off Farm Income		
0	26	14.4
1 – 10,000	17	9.4
11 – 20,000	37	20.6
21 - 30,000	28	15.6
31 – 40,000	8.3	8.3
41 – 50,000	12	6.7
≥ 51,000	45	25

Source: Field Survey (2018)

Farm households whose farm size were less than one hectare (< 1ha) constituted 71.7 % in the study area, 25.% had their farm sizes between 1- 2 ha, only 3.3 % had farm sizes of 2ha and above (>2). The implication is that majority of the farmers are small-holder farmers growing mainly food crops and raising livestock on a small scale. It also means that households whose farm sizes are small tend to diversify into off-farm income generating activities such as trading, agro-processing among others as

means of their livelihood. The result also revealed that most (39.4 %) have 11-15 years of farming experience, while households with years of experience 6 – 10, 16 – 20, 21 – 25 and less than 5 years are represented by 28.9 %, 16.1 %, 3.3 % and 12.2 % respectively. The implication is that farm households with greater years of experience tend to improve in farm production (especially crop) than those with lesser years of experience in the study area.

Estimation of Income Differentials among Farming Households in Onna L.G.A

The results of Gini, Hoover and Coefficient of variation indices, derive from generated volatility indices were presented in Table 3 above. From the result of the analysis, income volatility indices were generated from farm households. The result of the CV measure showed the concentration of income volatility within the range of 0.51 to 0.60 and 0.61 to 0.70 which represents 30 % and 38.8 % respectively. Others within the range of 0.10 to 0.40, 0.41 to 0.50, 0.71 to 0.80, and 0.81 to 0.90 and greater than 0.91 represented 7.7 %, 11.6 %, 5.0 % and 3.4 % respectively. The results affirmed that income volatility exist among farming households. The overall coefficient of variation generated was 0.65. This value implied that households in the study area were faced with high income volatility. The overall Gini Coefficient (GC) of the study was 0.11 implying

that there exist a high level of income (volatility inequality and based on Pareto yardstick of wealth measures, the Gini index revealed that 89 % of the farming households were poor and wealth controlled by 11 % of the population. The value indicates that a greater proportion of the respondents in the study area are in low income group. The result showed the Hoover index of 0.37; implying that 63 % of the farming households were poor and wealth was circulated within a population of about 37 %. The Hoover index greater than the Gini as shown in this study is theoretically correct, the values obtained could predict the possibility of occurrence of social problems as well as economic instability as a result of poor wellbeing of the farming households measured considering the Gini indices. However, the Gini Coefficient and Hoover indices and CV result of 0.65 showed higher income differential among farming households which is contrary to *a priori* expectations of the study.

Table 2: Estimation of Income Differential among farm households in Onna Local Government Area

Volatility indices	Measures of income volatility		
	Gini	Hoover	CV+
≤ 0.40	14(7.7)	8 (4.4)	14 (7.7)
0.41 – 0.50	38(21.1)	38 (21.1)	21 (11.6)
0.51 – 0.60	38 (21.1)	44 (24.4)	54 (30.0)
0.61 – 0.70	39 (21.6)	44 (24.4)	70 (38.8)
0.71 – 0.81	39 (21.6)	20 (11.4)	9 (5.0)
0.81 – 0.90	6 (3.4)	8 (4.4)	6(3.4)
≥ 0.91	6 (3.4)	18 (10.0)	6 (3.4)
<i>Total</i>	<i>180</i>	<i>180</i>	<i>180</i>
<i>Minimum</i>	<i>0.10</i>	<i>0.37</i>	<i>0.26</i>
<i>Maximum</i>	<i>0.89</i>	<i>0.65</i>	<i>0.65</i>
<i>Mean</i>	<i>0.55</i>	<i>0.51</i>	<i>0.57</i>

Figures in parenthesis represent percentages. + =lead welfare index

Source: Computed by the researcher from analyzed data (2018)

Lorenz Curve Analysis of Farming Household Welfare

The result of the income differentials was also represented graphically using the Lorenz curve as shown in Fig. 3 above. The Lorenz curve showed the quantitative relationship between percent of income and the population. The Lorenz curve showed the deviation from the 45 ° line, this implies that income is unequally distributed in the study area. The straight line represents the most possible equality and stability of income with a gradient of one implying that virtually all farming households

income fluctuates and tend to stability in the study area. The curve has a slope of 0 until the end of x-axis denoted by 1, at this point; the curve becomes abruptly vertical; tending to equality. This suggests that only few households have any of the resources (income) on the Y-axis. At every point on the graph, the percentage of income received is exactly equal to the percentage of population (income recipients). For instance, the point half way along the diagonal line represents 50 % of the income being distributed to exactly 50 % and is receiving the same percentage of the total income.

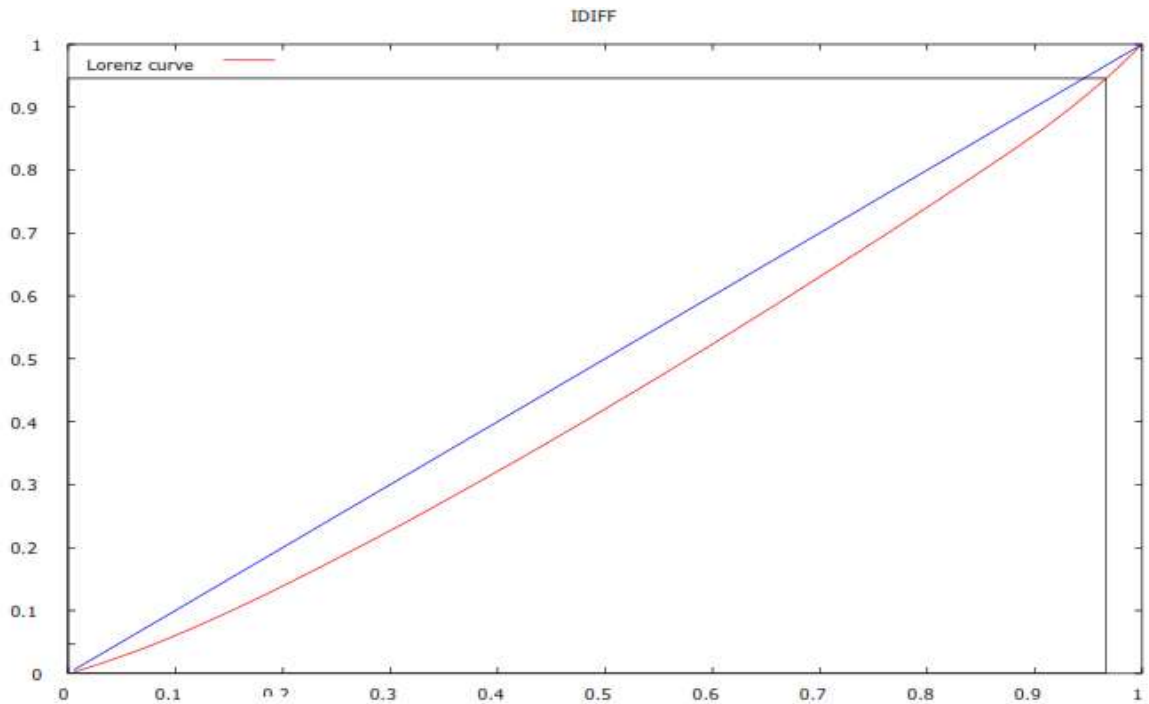


Fig. 3: Income Differential Measure in the Study Area, IDIFF = Income Differentials, % of population

Table 3: Multiple Regression result of the Determinants of Income Differentials among Farming Household in Onna Local Government Area

Variables	Linear	Exponential	Semi- log ⁺	Double log
CONST	0.586***	0.356**	0.658***	0.455***
AGE	-0.0003 (-0.356)	0.052 (1.015)	-0.005*** (-3.179)	-0.004 (-0.004)
HHS	0.001 (1.3458)	0.057* (1.755)	-0.002** (-1.991)	0.069 (1.154)
FMS	0.008 (0.600)	0.005** (0.140)	0.011 (0.414)	0.057 (0.834)
YFM	-0.003 (-1.355)	0.075 (-2.287)	-0.008 (-1.666)*	-0.081 (-1.356)
FMP	0.018 (1.205)	-0.008 (-0.211)	-0.042* (-1.676)	-0.021 (-0.356)
NFINCO	0.008 (-0.213)	-0.027 (1.627)	-1.934* (-1.958)	-0.040 (-1.369)
FINCO	-7.077 (-0.433)	0.016 (1.248)	-2.235 (-0.083)	-0.010 (-0.440)
HEXP	0.067 (0.201)	0.005 (0.223)	-0.027** (-2.244)	0.029 (0.616)
Diagnostic statistics				
R ²	48.8	95.2	82.5	85.1
Adjusted R ²	-1.00	94.9	81.7	84.3
LOG Likelihood	112.2	83.9	-2.18	7.23
AIC	-208.5	-151.8	22.37	1.52
Schwartz criteria	-183.0	-128.3	51.10	25.05
Hannan Quin	-192.2	-142.3	34.02	11.08

Figures in brackets are the respective t- ratios, + = lead equation

Source: Extracted from Computer print out by the Researcher, 2018. ***, ** and * represent 10 %, 5 % and 1 % level of significant respectively.

The Lorenz curve presented in Fig. 3 showed deviation from the line of perfect equality this implies that income is unequally distributed and that income of fewer households are stable while greater number of households income are very volatile are poor. The results is consistent with earlier Gini, CV and Hoover results obtained by Akpan et al., (2016). The Lorenz curve analysis shows unequal and volatile income distribution of households in the study area. The bottom 20 % of the household received 10 % Of the total income, while the top 20 % of the population received about 90 % Of the total income, thereby tends to move toward 1 indicating perfect equality. The closer the Lorenz curve is to the line of perfect inequality, the less the inequality and the smaller the Gini coefficient, the farther the Lorenz curve is away from the diagonal, the greater the degree of disparity presented. This study is consistent with Ayinde et al., (2012), Olawepo (2010), Akin-Olagunju and Omonona (2013) in Nigeria.

The determinants of income differentials of farm households were presented in Table 3 above. For the lead equation (semi-log), the coefficient of multiple determination (R²) was 0.825. This implies that 82.5 % of observed variations accounts for income differentials among farming household by the independent variables. The adjusted R² is 0.817 (81.7 %). Age was statistically significant at 10 % level and a coefficient of -0.005, showing a negative relationship to income differentials of farming households. This is in conformity with a priori expectation that the older the farmer is , the less productive he becomes in agriculture and by extension the lesser the income from primary occupation which may leads to diversification to other sources of income. The result also revealed that household size (Hhsize) was significant but negative effect on income differentials. The coefficient of this variable was significant at 5 % level. This implies that an increase in household size decreases income, hence triggering income volatility in the study area. This result contrasts with Akpan (2013). However, the possible reason could be that increased household size may require farm labour, thus reducing the cost of labour which is an additional expenditure and thus capable of reducing farmers welfare in the study area. This result is in line with a priori expectation, because households with large family size have high dependency ratio, low income and a higher chance of poverty, and thus they tend to diversify into non-farm income generating activities in order to be able to take proper care of their large families hence creating income gap.

The coefficient of years of farming was – 0.008 and was statistically significant at 1 % level and negatively correlated with income differential of

farming households. This implies that 1 % increase in farming experience will lead to 1 % reduction in income volatility. The longer the farming experience acquired by farming households, the more conversant the household will be with use of improved cultivars, chemicals, improved techniques of production for high productivity. The result reveals that, farm experience may reduce income volatility among households in the study area. The result further shows that coefficient of type of agriculture practices by farming households (-0.042) was negatively correlated with income differentials and significant at 1 % level. The implication of this finding is that type of agriculture practice (either subsistence of commercial) influences income of farming households. Subsistence farmers in the study area may diversify to other sources of income to improve their welfare and this may reduce volatility in income among between low and income households in the study area. The coefficient of non-farm income (NFINCO), was -1.934 and negatively impacted on income of farming households in the study area.

NFINCO was statistically significant at 1 % probability level. This implies that an increase in non-farm income may likely reduce volatility. The result may also reveals that salary paid workers who diversify into farming as an additional means of livelihood are earning from one or more sources of income and has contributed to reduction in income volatility among farming households in the study area. Household expenditure (HHEXP) negatively correlates with income differentials with a coefficient of -0.027 and statistically significant at 5 % level. This implies that a naira increase in household expenditure reduces income volatility by 0.027 %.

Conclusion and Recommendations

The study having analysed the income differentials of farm households in the area concluded among others that, the age range of farm households was 36-45 years with basic primary and sendary school attendance. Their farm sizes were less than and equal to one hectre of land and average monthly income of ₦11,000 - 20,000.00. The result evidently ascertained the existence of high income volatility which affected their welfare and income inequality. There exist a wide gap between the farmers whose income was low compared to hosueholds who engaged in farming as part-time occupation. Farm households inability to access productive resources especially land and credit, reduction in non-farm income accounts for income differentials in the study area. The study recommends that farm households should diverslfy their income sources, utilize family

labour and redistribution of credit and land resources to increase access by the farmers.

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