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DETERMINANTS OF FARM INCOME AMONG URBAN FARMERS IN NIGER DELTA, NIGERIA

*Ubokudom E. Okon, Nsikan E. Bassey and Uwemedimo E. Okon

Department of Agricultural Economics & Extension, Akwa Ibom State University,
Ikot Akpaden Mkat Enin, P.M.B. 1167, Uyo, Nigeria

*Corresponding Author

ABSTRACT

This article identifies the determinants of total household income among urban farm households in Niger Delta, Nigeria. The study was based on micro-level data from 289 randomly selected households across the three States of the Niger Delta region, and analyzed using a simultaneous quantile regression approach. The summary statistics showed that the average age and the mean educational level of the respondents were 44 years and 14 years, respectively. The average farm size was 0.79 hectare, with a mean farming experience of about 9 years. The average household size was about 5 persons, while the mean annual farm income and the mean asset value were, ₦ 430,370 and ₦ 650,000, respectively. The results further showed that socio- economic variables such as age, farm size, and asset value and non-farm income status positively and significantly influenced farm income. While age was positive and statistically significant at the 50th and 25th quantiles, farm size, asset value and non-farm income status were statistically significant at 25th, 50th, 75th quantiles and also at mean. Conversely, farm location, educational level, farming experience, household size, credit access and market proximity had negative and significant relationships at different quantiles with farm income. It is suggested that careful integration of these income determinants in urban development policies will no doubt improve welfare of urban dwellers, as well as achievement of the sustainable development goals of ending poverty and hunger.

Keywords: household income; urban poverty; urban agriculture; quantile regression; Nigeria.

1.0 INTRODUCTION

The past few decades, have witnessed accelerated urbanization and urban growth in many developing countries. This urbanization appears to amplify poverty, food insecurity and social

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exclusion. This is so because urbanization in developing countries is not in tandem with infrastructural development. Africa has the highest rate of urbanization, largely because it has the highest rate of overall population growth. Given the rapid rate of urbanization in Africa, it is estimated that if the current trend continues, by 2050 about half of the 60 million people added to the urban population each year will be in Africa (United Nations Population Division, 2014). Tacoli, Mc-Granaham & Satterthwaite (2015) observed that, sub- Saharan Africa is the world region with the highest urban population growth rate (four percent a year). Also, the World Bank estimated that more than a million people in sub-Saharan Africa still live in acute poverty.

In Nigeria, urban poverty and food insecurity are fast becoming major problems. Urbanization exacerbates the conditions of poor urban dwellers, especially those with weak livelihood strategies. Given that Nigeria lack urban agricultural policies, the persistency of which marginalizes urban farmers' access to resources such as land, credit facilities, and farm inputs. A greater proportion of poor urban households in Nigeria face serious difficulties in accessing adequate basic food stuffs, which are sold at high prices (beyond what some consumers can afford). These high food prices has drastically reduced people's purchasing power and raised the specter of food and income disequilibrium at the household level, making the urban poor to suffer most because they lack access to employment, inadequate services, including access to health care and formal education. Consequently, our country Nigeria appears to be witnessing what You (2007) described as "the urbanization of poverty where the urban population is just as likely to suffer from malnutrition, disease and hunger as their rural counterparts".

Poor urban households are using coping strategies in order to meet household food expenditures, by practicing and/or intensifying urban agriculture (UA – which is simply the growing of crops and rearing of animals within and around cities (RUAF, 2007). Urban agriculture has continued to attract much interest in Nigeria due to the prevailing relatively harsh economic conditions. Urban farming contributes greatly to food security, employment and household income generation (Armar-Klemesu & Maxwell, 2000; Rogerson, 1998; Lynch, 2001; Ebuna, 2009 and Okon & Enete, 2009). The urban farming practice has sustained the physical and economic survival of the urban poor in most developing countries (Addo, 2010). It is therefore an important component of food systems in an urbanizing world. The primary driving force for continuous increase in urban farming in developing countries is a lethal combination of factors that includes, worsening poverty, market failures, economic recession and political upheavals that have caused a severe food crisis throughout the developing countries including Nigeria. Similarly, at the household level the motivation is largely due to lack of formal employment opportunities among poor urban dwellers and as a means of increasing household income.

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Even though there is widespread evidence of an increasing important of urban farming in urban economies of the developing world, Nigerian policy makers are yet to formulate urban agricultural policies to encourage urban farmers. The importance of urban farming in total household income varies because of several factors, one of which is the farmers' precarious tenure right for urban farming practices. Despite this, urban agriculture still remains a sector in which the majority of the urban poor have a stake, thereby having a significant potential for the poor households to improve their income level, hence moving out of poverty. It is imperative to understanding the factors influencing the income level of these urban farmers, as this will assist in formulating policies that could reduce poverty and food insecurity in the Nigeria.

Despite a plethora of studies on urban agriculture in Nigeria, most of which focused on employment, poverty reduction and income generation (Gefu, 1992; Enete & Achike, 2008; Arene & Mbata, 2008; Ebuna, 2009), efficiency (Umoh, 2006; Udoh & Etim, 2008; Okon & Enete, 2009; Okon, Enete & Bassey, 2010) and commercialization (Akinlade, Balogun & Obisesan, 2016). Similarly, studies on the determinants of farm income in Nigeria (Ibekwe, 2010), in Pakistan (Alberto, 2006 and Qaim, 2012) and Tanzania (Roberto & Emmanuel, 2012) focused on rural households. With the rapid rate of urbanization, areas that were classified as rural in the last decade are now urban towns. In Nigeria, the urbanization rate is put at 3.5 percent per annum, the fastest in the world (CIA, 2012).

Nigeria is a nation that is endowed with multifarious and multitudinous resources - both human and material. However, there is still much poverty among both rural and urban dwellers in Nigeria, due to high unemployment rate and lack of incomes. To achieve the Sustainable Development Goals (SDGs) of ending all form of poverty and hunger by 2030, it is projected that more than 22 million people must achieve food security every year. This could only be possible if factors influencing their income level are empirically determined. In this regards, the aim of this paper is to determine the socio-economic factors influencing farm income among urban farmers in Niger Delta region of Nigeria. This, it is hoped, will inform pro poor to develop better strategies of reducing poverty and food insecurity to meet the Sustainable Development Goals (SDGs) 1 and 2 which respectively, stresses the need to end poverty in all its forms everywhere; end hunger, achieve food security and improve nutrition and promote sustainable agriculture.

2.0 MATERIALS AND METHODS

2.1. Study area

The study area is the Niger Delta Region of Nigeria. It lies between latitudes 4º 2' and 6º 2' north of the equator and longitudes 5º 1' and 7º 2' east of the Greenwich Meridian. Nine of Nigeria's

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constituent States make up the region, namely: Abia, Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo and Rivers States, with an area of 112,000 sq. km, a population of 27 million people, 185 LGAs, about 13,329 settlements; 94% of which have populations of less than 5,000 (Ojameruaye, 2008). According to the Ministry of Niger Delta Affairs (2011), the climate of the Niger Delta Region varies from the hot equatorial forest type in the southern lowlands to the humid tropical in the northern highlands and the cool montane type in the Obudu plateau area. Further, the wet season is relatively long, lasting between seven and eight months of the year, from the months of March to October.

The region has huge oil reserves and ranks sixth exporter of crude oil and third as world's largest producer of palm oil after Malaysia and Indonesia (Omafonmwan & Odia, 2009). Further, the Niger Delta led in the production of staple food crops such as cassava, maize, fresh vegetables, pineapple, plantain, cucumber etc.

2.2 Sampling Procedure and Data collection

Purposive and simple random sampling techniques were employed for this study. Three out of the nine States in the Niger Delta region were randomly selected, namely: Akwa Ibom, Cross River, and Delta States. Major urban areas (from Nigerian living standard survey) were purposively selected from each State. These urban centers were Uyo, Calabar, and Asaba (selected from Akwa Ibom, Cross River, and Delta States, respectively). Through the assistance of the city council, a list of urban farmers in each town was compiled, from which 100 urban farm households were randomly selected from each of the three urban centers. This gave a sample size of three hundred respondents. Data were collected by the use of well-structured questionnaires as well as personal interviews. However, due to inconsistency in data from some farmers, some copies of the questionnaires were rejected. The analysis was therefore based on information from a total of 289 urban farmers (100 from Akwa Ibom and Cross River, and 89 from Delta State). Data were obtained mainly from primary sources during 2013/14 planting season, using structured questionnaires.

2.3. Data Analysis

The determinants of urban farm households' income was estimated using simultaneous quantile regression approach. The quantile regression approach has an advantage of allowing parameter variation across quantiles of income distribution. Previous studies used traditional approach, particularly (Ordinary Least Squares), to investigate household income determinants (Ibekwe, 2010 and Qasim, 2012). The advantage of quantile regression over OLS regression has been explicitly discussed in the literature. The estimated coefficients of the quantile regression are not sensitive to outliers of the dependent variable, and the quantile estimator is more efficient than

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OLS when errors are normally distributed (Buchinsky, 1998). The quantile regression also enable the researcher to pre-define any positions of the distribution according to their specific inquires (Hao & Naiman, 2007). Following the specification of the quantile regression as presented by Koenker & Basset, (1978). Given a random variable Y with probability distribution function F(y) = Prob (Y ≤ y), the τth quantile of Y is defined as the inverse function

$Q(\tau) = \text{invf}\ \{y : F(y) \geq \tau\}$, where $0 < \tau < 1$.

For a random sample $\{y_1, ..., y_n\}$ of Y, The sample median is the minimizer of the sum of absolute deviations

$$\min_{\zeta \in R} \sum_{i=1}^{n} |y_i - \zeta|$$

In general, the τth sample quantile $\varepsilon_{\tau}(\tau)$, which is the equivalent of $Q(\tau)$, may be formulated as the solution of the optimization problem

$$\min_{\zeta \in R} \sum_{i=1}^{n} \rho_{\tau}(y_i - \zeta)$$

Where $\rho_{\tau}(z) = z(\tau - I(z < 0)$, $0 < \tau < 1$. I (·) denotes the indicator function.

The linear conditional quantile function, $Q(\tau|X = x) = X'\beta(\tau)$, can be estimated by solving

$\beta(\tau) = \operatorname{argmin}_{\beta \in R} \rho \sum_{i=1}^{n} \rho_{\tau}(y_i - \zeta)$ for any quantile $\tau \in (0, 1)$.

The quantity $\beta(\tau)$ is called the τth regression quantile. The case $\tau = 1/2$, which minimizes the sum of absolute residuals, corresponds to median regression (Koenker, 2005)

In estimating the determinant of farm income in the survey area, this study adopted the quantile regression analytical tool. The explicit form is stated thus:

$$Q_{\tau}(Y|X = x) = x^T \beta(\tau), \quad 0 < \tau < 1,$$

Where Y = total farm income, $\chi = (X_1 ..... X_n)$ are the explanatory variables, β_{γ} is the marginal change in the $_{\gamma}$th quantile due to marginal change in χ .

X_1 = location of the farm (dummy, urban =1, and rural = 0).

X_2 = Educational level of household Head (Years of formal schooling),

X_3 = Age of Household Head (in years),

X_4 = Gender of household head (dummy, male =1, otherwise =0),

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X_5 = Farming Experience (in years),

X_6 = Marital Status (dummy, 1 if married, 0 = otherwise)

X_7 = Household size (number of persons in the household)

X_8 = Farm size in ha (total area of land farmed by household. The land could be located in urban, rural or peri- urban area),

X_9 = Access to formal or informal credit (dummy, if have access = 1, otherwise = 0),

X_{10} = Proximity to market (approximate distance to nearby market in km),

X_{11} = Assets (value of productive asset owned by the household in naira),

X_{12} = Non-farm income status (dummy, 1=if partake in off-farm income, 0 = otherwise)

In the analysis, total farm income was the dependent variable, while socioeconomic and demographic characteristics (i.e. location of farm land, educational level of household head, gender, years of farming experience, age, marital status, household size, farm size, access to formal credit, proximity to market, value of productive assets, Non-farm income status) served as explanatory variables. The simultaneous quantile regression at 25th, 50th, and 75th quantiles was applied to examine how socio-demographic factors affect the income distribution in urban farm households. In fact, a large number of studies has explored the theory background and application of quantile regression, and also made a clear comparison about Ordinary Least Squares regression (OLS) and quantile regression. It is crucial to note that the Ordinary Least Squares regression estimates the relationship between the set of explanatory variables and the conditional mean of the response variable, while the quantile regression extends the regression model to conditional quantiles of a response variable, such as the 10th, or 90th quantile. Just as the mean gives an incomplete picture of a single distribution, the regression curve of the OLS also gives a corresponding incomplete picture for a set of distributions, thus we could compute several different regression curves corresponding to the various percentage points of the distributions to get a comprehensive understanding (Koenker & Hallock, 2001). Also, in contrast to OLS approach, as noted earlier, the quantile regression procedure is less sensitive to outliers and provides a more robust estimator in the face of departures from normality (Koenker, 2005). Since this study does not enforce the assumption that socio-demographic factors have exactly the same effects at every point of farm income, thus, quantile regression approach is more suitable.

3.0 RESULTS AND DISCUSSION

Table 1 Descriptive statistics and socio-economic variables in the regression analysis.

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Table 1 showed that the average age and mean year of formal schooling of the respondents were 44 years and 14 years, respectively. Suggesting the respondents were in their active and productive age brackets, and literates with at least Ordinary National Diploma (OND) certificate. The mean farming experience of about 9 years implies that the respondents had reasonable years of farming experience and were conversant with farming problems in the area. The average household size of about 5 persons showed that number of persons in the households was in line with the recommended average household size of 5 persons in Nigeria. The average farm size of 0.79 hectare was a reflection of the entire land area used for agricultural production by the respondents (irrespective of the location, whether in urban, rural or peri-urban area). Even though the major constraint to urban farming in the area is land, most households also have rural or peri-urban land to boost their income level. The average annual farm income and mean asset value were ₦ 430,370 and ₦ 650,000, respectively. The Table further showed that average annual farm income was more than the average annual minimum wage in the country. This could mean that encouraging urban farming will go a long way to reduce unemployment as well as urban poverty in Nigeria.

Table 1 Summary statistics and description of socio-economic variables

Variables	Min	Max	Mean	Std. dev.	Description
Edu	6	24	14.3944	3.8256	continuous
Age	25	92	44.1905	9.6987	continuous
Gender	0	1	0.6641	0.4730	Discrete
Farm exp.	2	58	8.6012	5.4092	Continuous
Mstatus	0	1	0.8512	0.3565	Discrete
HHsize	1	12	4.89	1.9928	Continuous
Farm Loc	0	1	0.467	0.4997	Discrete
Farm size	0.021	8	0.582	0.7949	Continuous
Asset value	114000	2,300,000	650,000	105106.7	Continuous
Farm inc	212,500	1,870,800	430,370	158683	Continuous
Credit access	0	100,000	346.4429	5882.328	Continuous
Mkt. prox	0.01	10	2.8453	1.6638	Continuous

Source: computed by authors from field survey, 2013/14

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3.1 Quantile regression estimates of the determinants of farm income among urban farm households in Niger Delta, Nigeria.

Socio-demographic factors that determine the level of farm income in the surveyed area were analyzed using simultaneous quantile regression. Table 2 displays the estimation results of the quantile regression at 25th, 50th and 75th quantiles, as well the ordinary least square results (OLS). The first three columns show the quantile regression results and as a comparison, the last column is the OLS results.

Location of farmland coefficient was positive and not significant at the 25th and 50th income quantiles (i.e two lowest quantiles), but was negative and statistically significant ($p<0.01$) at 75th income quantiles, and also at mean level. This finding stresses that, household whose majority of thier farm land was located in the urban centers made less income than households whose farm land were located in rural areas. This finding has implication on economy of scale, because urban farmers are land constrained, they may not be able to expand their farm lands to produce more income. However, urban agriculture is not a recognized land use activity in Nigeria. As such there is no policy guide on urban farming that could warrant farmland expansion.

The parameter educational level was found to be a significant factor. At the 25th and 50th quantiles, the coefficient of education was positive but not statistically significant. Interestingly, at 75th quantile, educational attainment was negative and statistically significant ($P< 0.01$). The implication of this is that, higher educational attainment reduces participation in farm income (Reardon, Berdegue, Barret & Stamoulis, 2006). Perhaps, because highly educated household heads will work in wage employment. Also as farm income increases, there is every indication that highly educated household heads will tend to divert income from farm to other non-farm activities.

The coefficient of age was positively correlated with farm income across all quantiles, and at mean level (Table 2). At 50th and 75th quantiles, the coefficient of age is statistically significant ($p < 0.01$). This findings stresses that farm income increases with age. Perhaps, because as the household head grows older, he may gain new skills which could improve farm profit, thereby increasing income, but again this response may be tempered when the farmer is too old (from seventy years and above). Also, in a traditional African society, older household heads have better access to land resource which is an important factor of production unlike the younger household heads that mainly rely on inherited land (Taruvinga & Mushunje, 2010). This finding also supports the role of age in resource ownership (Mukundi, Mathenge & Ngigi, 2013).

Gender is an important indicator of household decision making whereby in a traditional African set-up, key decisions in the household are made by men. Gender also depicts preferences (intra-

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household activity choice) of male and female household heads. The coefficient of gender was positively correlated with farm income across all quantiles, and at mean level. At 75th quantile, the coefficient of gender was positive and statistically significant. The implication of this finding is that, men earn more income from urban farming than women. This result confirmed the findings of Okorji (1988), who observed that household income were erroneously skewed in favour of men although women may earn more income. This could be attributed to the importance of gender in defining specialization of labour supply within a household. This finding also agrees with observation of Musyoki, Mugwe, Mutundu & Muchiri (2013).

The parameter farming experience was negatively correlated with farm income. This is counter intuitive because one could expect that years of experience in farming could increase farm income, but this is not the case. This could be because experienced household head may not have gotten enough farm land to display their wealth of experience or diminishing returns from the farm due to depleting nutrients from the same parcel of land. It could also mean that most household heads were too old. Similarly, in the life cycle of a farmer, point of decreasing marginal labour productivity is anticipated whereby further increase in farming experience is expected to be negatively associated with farm income (Amaza, Tahirou, Patrick, & Amara, 2009).

The parameter marital status had a negative effect on farm income. Also, at 50th and 75th quantiles, the coefficient of marital status was negative and significant ($p < 0.01$). This finding is consistent with the observation that married household are inclined to have less income than their single counterpart (Reardon, 1997). This could be because married household could have more household members that consume farm produce, which otherwise could have been sold for money.

The parameter household size had a negative and significant influence on farm income. At lower income quantiles (25th and 50th quantiles) the coefficient of household size was negative and not statistically significant, but negative and statistically significant ($p< 0.01$) at 75th income quantile. A plausible explanation is that bigger household sizes reduce farm income through consumption of farm produce hitherto meant for sales. This is true, because a typical urban farming household could have relatives (who could be unemployed) staying with them while searching for white collar jobs. As farm income increases, this could attract more members of the extended family into their household thereby increasing the household size.

Land is an asset that is very useful across a range of activities and has a direct value in agricultural production, although it can be used for different agricultural activities. It may have an indirect value in other economic activities, as it could be used as collateral for credit. As expected, the coefficient of land size had a positive and significant relationship with farm

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income. It is expected that as land size increases, this could discourage participation in non-farm activities, since increase in land size would help to lower cost of production, thereby increasing farm income. Several studies, Yunez-Naude & Taylor (2001); Winters, Davis & Corral, (2002); Adams, (2002) and de Janvry, Sadoulet & Zhu, (2005), found a positive relationship between land size and farm income.

The parameter credit access was negatively correlated with farm income across all income quantiles, and at mean level. At 50th and 75th quantiles loan access was negative and statistically significant ($p < 0.01$). The implication of this finding is that farm household that had access to loan in the last two years, could diversify their farm income into non-farm activities when their farm income increases. It could also mean that households who had access to loan diverted the loan to off-farm activities.

Market proximity has economic implication on the household farm and market activities (Owuor, 2009). A positive significant coefficient of the household distance to the market is an indication of the relative effect of transaction cost to the household's socio-economic activities. Market proximity affects farm income in terms of travel time and costs. The analysis showed that, distance to the market had a positive effect on farm income at the lower income quantiles (25th and 50th), and at mean level. At 75th income quantile, market proximity had a negative and significant ($p<0.01$) relationship with farm income. A plausible explanation to this finding could be attributed to farm location (urban or rural). Interestingly, household whose farm lands are located in rural areas made more income than their counterparts, whose farm land are located in urban centers (as noted earlier). Also, these same groups of household (who are at higher income quantile) are far from agricultural market. This could be the reason why market proximity was negative at the 75th income quantile.

The coefficient of asset value was positive and statistically significant ($p < 0.01$) both at the 75th income quantile and at mean level. This result stresses the important of assets in households' income generation. Lack of assets is seen as both symptom and cause of poverty (de Janvry & Sadoulet, 2001). In addition, assets support consumption by contribution to overall production, income and allowing exchange and/or consumption in periods when there is no income.

Non-farm Income (off- farm status) coefficient was negative and not significant at the lower income quantiles. However, it had a positive and significant ($P < 0.01$) coefficient at the 75th income quantile, and also significant ($p < 0.05$) at mean. This finding stresses the important of off-farm income on farm income. The implication of this finding is that, as off-farm income increases, there is every indication that the farmers will invest the off-farm income in farm technology to boost production volume, which thereby increases farm income. Marthy, Al-Hassan & Kuwornu (2012) also had similar findings. Also, Matshe & Young (2004) observed

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that non-farm income has positive spin-offs in agricultural performance by providing cash for productivity, enhancing inputs, thus easing credit constraints.

Table 2. Results of Quantile regression and OLS for the Determinants of farm income among the respondents.

Methods	Quantile Regression			OLS
Variable Name/Coeff. (Std Error)	**0.25**	**0.50**	**0.75**	
Intercept	-351116.3 (671899.5)	-270218.7 (433228.4)	5344669 (288832.6)***	-1678326** (7.1495.9)
Farm Location	63532.18 (104280.7)	6348.374 (62190.44)	-161567.1*** (47562.83)	-48433.13 (100318.7)
Education (years of Schooling)	3320.718 (24437.04)	23400.59 (14945.61)	-260003.4*** (10735.95)	41797.29 (23785.05)
Age (in years)	8555.203 (10639.26)	21305.76*** (6627.368)	26701.2*** (5007.103)	10382.89 (11144.39)
Gender	150641.9 (167408.9)	165273.1 (100839.4)	339587.4*** (77681.05)	215944.8 (162739.2)
Farming Experience (in years)	-14295.06 (16355.19)	-15476.7 (11190.73)	-46271.41*** (7676.886)	-9218.711 (18029.27)
Marital Status	101000.2 (238569.7)	-444624.1 *** (144563.1)	-1263643*** (84783.48)	-70401.25 (230584.2)
Household size	-35039.35 (53810.33)	-213.8702 (30579.58)	-440571.4*** (23842.22)	8306.954 (48492.18)
Land size	139908.2*** (52523.46)	-30579.38 (41635.82)	1429727 *** (22647.58)	421614.6*** (66081.7)
Credit access	-1.926729 (2.13027)	-3.23483** (1.382502)	-5.145402*** (1.044318)	-3.659664 (8.770927)
Mkt. prox	340.7962 (40906.47)	21465.6 (29293.34)	-187782.6*** (23260.92)	69421.53 (47777.48)
Asset value	0.017299 (0.0664477)	.0123132 (.0530999)	.8344552*** (.034297)	.2622232*** (.084092)
Non-farm income	195924.3 (671899.5)	-229092.9 (225127.7)	702820.8*** (189985.5)	742320.3** (378978.6)
Pseudo R	0.1524	0.1543	0.3828	R^2 = 0.4853

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Probability F (8.64)	0.0000***

***, **, indicates significance at 1, and 5% respectively. Figures in parenthesis are standard errors.

Source: Field survey 2013/2014

4.0 CONCLUSIONS AND POLICY IMPLICATIONS

Determining factors influencing income level of urban farmers is an important concept in Nigeria, particularly because of high incident of urban poverty, worsening income distribution and lack of urban agricultural policies. Households whose farms were located in rural areas made more income than their counterpart who concentrated mainly on urban land. At some point (within the productive age bracket), the older the household head, the more the income. Male headed households made more income than female headed households. Increasing farm size and households' asset stock led to increase in household income. Off-farm work also increased farm income while increasing years of formal schooling led to decrease in farm income. Households with bigger sizes decreased farm income. Similarly, access to credit facilities and market proximity led to a reduction in farm income.

The following policy implications can be drawn from this research. Traditional focus of development aids on rural areas in sub- Saharan Africa and Nigeria in particular, should redesign their policies and/or focus on urban areas, due to high level of poverty in urban areas in this region. Also, measures to reduce poverty and increase farm incomes should focus on investment targeted at household level. The result indicated that farm size, asset value and off- farm income status plays important roles in increasing income level. Investments in building up household assets and designing agricultural villages during city planning will reduce food insecurity, while enabling the vulnerable households to move out of poverty.

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