Income Level and Investment Decision Nexus of Urban Farm Households in Akwa Ibom State, Nigeria

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Abstract: Increasing farm incomes is particularly important in urban farming because of its associated effect in combating poverty, food insecurity and employment generation. Policy makers and city planners in developing countries need to take urban farming into consideration. Informed decisions could only be meaningful if factors that influence income level of urban households as well as their decisions to re-invest these incomes are empirically determined. This study identifies some of these factors in urban smallholder farming in Akwa Ibom State, Nigeria. The study was based on farm level data from 100 randomly selected farmers across six agricultural zones of the State and analyzed using simultaneous quantile regression and binary logistic model. The quantile regression estimates showed that socio-economic variables such as educational level, farmers' age and membership of cooperative organizations, farm size and probability of establishing new enterprises were the major determinants of farm income. Furthermore, the binary logit results showed that the likelihood of investing in new enterprises increases with increasing educational level (p < 0.01), farm income (p < 0.01), membership of organization (p < 0.01) and for male headed households (p < 0.10), while it decreases as the farmer advance in age (p < 0.01) and for bigger household sizes (p < 0.01). It is suggested that medium and long term loan should be given to urban farmers as this could boost their income level. Also, policy trust aimed at identifying farm households with track record of investments successes for financial support is recommended.

Key words: Binary logit • Farm income • Investment • Urbanization • Akwa Ibom State • Nigeria

INTRODUCTION

Rapid urbanization is increasing urban poverty and food insecurity in sub-Saharan Africa. Despite the Millennium Development Goal 1, set internationally for reduction of 50% between 1990 and 2015 the proportion of hungry people and whose income is less than US $ 1.25 a day. Sub-Saharan Africa still has the highest prevalence of poverty in the world, due to the inability to meet the Millennium Development Goal 1. However, more than one in four people in this region still remain undernourished [1]. Undoubtedly, Nigeria the most populous nation in Africa is urbanizing at about 4.66% per annum [2]. The number of urban poor in Nigeria is on the increase. Available statistics indicated that Nigeria has over 12 million people in a state of hunger and this can trigger vulnerability to even the slightest shocks to food supply [3]. Further, the National Bureau of Statistics reported that 60.9% of Nigerians in 2010 were living in "absolute poverty" this figure raised from 54.7% in 2004 indicating an increase in poverty rate. This could be due to rapid urbanization which has not yet been matched with the country’s infrastructural development [4]. Consequently, there is high rate of unemployment in the country, estimated at 12.1% of economically active population [5].

This rapid urbanization has implications in the areas of social, economic, environmental protection and the supply of adequate shelter, food, water and sanitation. However, urban poverty is not only growing, but has tended to be underestimated in the past. According to Food and Agricultural Organization, poverty and food insecurity have been considered for decades to be rural
problems [6]. In urban settings, lack of incomes translates more directly into lack of food than in rural settings [4]. In this case, the urban dwellers need cash to purchase their basic needs, but where there is limited or no money to purchase these basic needs. Most of them resort to urban agriculture UA, (which is simply the growing of crops and rearing of animals within and around cities [7] either as full time employment or part time activity. Although, most of these urban farmers are resource poor, a factor that could limits their production output, income, savings and investment decisions. Okon et. al. [4], Vagneron [8], van-Veenhuizen [9], Okon and Enete [10] and Cook et. al. [11] suggested that urban agriculture has the capacity of generating income, creating employment, food security and reducing vulnerability among those practicing it, but inadequate finance and impeded access to farm credit constitute their major constraint. However, these could have a negative influence on their productivity.

One way out is for these farmers to re-invest their farm profits in other enterprises. This is important because lack of re-investment among small-holder farmers have been identified as one of the basic constraints to the development of agricultural sector in Nigeria. In addition, with lack of government policy on urban farming in Nigeria re-investment of income or farm profits among farm households becomes a prerequisite. This is because re-investment will solve the problem of financing and capital formulation, while reducing farm households’ vulnerability to income shock incase of urban expansion or eviction due to insecure land tenure. Studies by Rutherford [12] and, Zeller and Sharma [13] asserted that investments are very imperative for supporting and establishing new enterprises, improving well-being, insuring against times of shocks and providing a buffer to help people cope in times of crisis. Households invest to improve their assets stock and enhance productivity. Also, Oluwakemi [14] articulate that the ability, willingness and opportunity of households to invest over time can therefore significantly influence the rate and sustainability of capital accumulation and economic growth in developing countries.

Given that urban farmers could make significant income from their farm activities, because most urban consumers prefer fresh fruits and vegetables which could be produced within the city. Okon and Enete [10], Ebuna [15], Arene and Mbata [16], Drechsel and Dongus [17] and Aina et. al. [18] suggested that urban farming is profitable. This means that with the readily available market, they could make farm profits which could be re-invested either to expand their farm business or invest in new enterprises. Although agricultural financing has been a serious problem facing farmers in Nigeria, policy makers have not really drawn up adequate and comprehensive scheme that will motivate the farmers to productively invest their capital [19, 20]. Against this background, this study was designed to (i) determine the effect of socio-economic characteristics of urban farmers on their level of income and (ii) estimate the effects of socio-economic characteristics on the probability of the urban farm households investing their farm profit in new enterprises. Studies on farm investment are of great importance to urban farmers because of their associated risk of eviction due to insecure tenure or urban expansion. Also, Nigeria, an economy in transition is an agrarian nation whose agricultural production depends on the vagaries of weather. In addition, the International Fund for Agricultural Development and stakeholders in agricultural finance could use the factors in this study to understand and develop models that would guarantee adequate finance for sustainable food production and urban development. Finally, findings from this study will enhance proper management of urban resources and thus, enable urban farm households to take advantage of the policy thrust on agribusiness and financial inclusion.

**Relationship Between Income and Investment:** Farm households need to re-invest their farm profit in order to reduce their vulnerability to future income shock. This is because farm households that do not re-invest their farm profit could use a greater proportion of their farm income to satisfy consumption demand of the household. Conventional thinking holds that raising income increases savings which is essential in promoting investment, hence, households’ welfare. Although raising incomes is not a sufficient condition for welfare maximization, however, it does appear to be a necessary condition for higher investments and therefore sustained growth. Oduemenem et al. [20] observed that small scale farmers invest their farm profit in two major areas. These are the agricultural and non-agricultural sectors. The authors further identified investment in the agricultural sector or farm activity to include; the purchase of fertilizer and chemicals, hired labour and buying more land for farming. While investment in non-agricultural sector are mainly centered on education, trade expansion, building houses, dowry obligation and purchase of durable assets. The volume of investment depends on the level of income, cost of procuring investible funds and entrepreneur’s expectations on the trend of the business in future.
Developmental economists and policy makers suggest that developmental problems such as poverty, food insecurity, vulnerability, and deprivation have been caused by lack of incomes. These indicators are key requirements for economic growth and majority of farmers in developing nations and Nigeria in particular lack investment culture.

Studies by Lambert [21] and Kwon et al. [22] indicated that the inadequacy of farm income and high prevalence of poverty have resulted in the inability of small-scale farmers to meaningfully invest in farm business. Others have contended that farmers’ resort to sourcing credit from financial intermediaries has not brought the much anticipated farm capital relief [23, 24]. Therefore, increasing farm production could provide farm households with income security or a decent standard of living and the liquidity to invest in new enterprises (production activities or technologies).

One major determinants of investment is changes in income. In this case, the assumption is that when farm income increases, it will also trigger investments. Some households take advantage of increases in income, investing in new enterprises, while other households with the same family composition and the same access to labor and basic resources spent most of their cash income on consumption. Each households made different decision about mixing urban farming and participating in other new enterprises. This is why some households accumulate capital while others do not. In other words some farm households pooled their labor and money and channeled it into productive investments, while others do not. Investing on new enterprises among farm households could reduce their vulnerability to income shock, by increasing their asset base through increased income. It could also improve their food security status, well-being as well as giving them social security in their environment. Households who do not invest their income could be exposed to vulnerability by the slightest income shock, hence, worsening their livelihood conditions. This is because of the cyclical relationship between farm households’ re-investment and outcomes (building of assets, which could reduce their vulnerability).

Materials and Methods

Study Area: The study was conducted in Akwa Ibom State in Nigeria, with a population of about 3,920,208 million [25]. The state is a major oil-producing area and is located in the South-South geo-political zone of the country, lying between latitudes 4°32’ and 5°33’ N and longitude 7°25’ and 8°25’ E. It shares its southern boundary with the Atlantic Ocean. The State has a very rich potential for agriculture and is suitable for food and tree crops, fish and livestock farming. Crops widely grown in the area are leafy vegetables such as waterleaf, fluted pumpkin and garden egg. Others include cassava, maize, yam, pepper, plantain, garden egg and cucumber. The state comprises six agricultural zones, namely: Oron, Eket, Abak, Ikot-Ekpene, Etinan and Uyo, with agriculture being the main local employer.

Data Collection: Data for the study were obtained mainly from primary sources during the 2014/2015 planting season using a structured questionnaire. Because the study was on UA, the major urban areas in each of the six agricultural zones were purposively selected (Abak, Eket, Etinan, Ikot-Ekpene, Oron and Uyo). Through the assistance of the city council, a list of farmers in each town was compiled, from which 120 farmers were then randomly selected. 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 100 farmers (30 from Uyo, 20 from Eket and Ikot-Ekpene and 10 from Abak, Etinan and Oron zones). Data collection took place between April 2014 and March 2015.

Estimation Procedure

The Quantile Regression Model: 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 level and/or determinants [26, 27]. 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 OLS when errors are normally distributed [28]. The quantile regression also enable the researcher to pre-define any positions of the distribution according to their specific inquires [29]. Following the specification of the quantile regression as presented by Koenker and Basset [30], given a random variable Y with probability distribution function F(y) = Prob (Y ≤ y), the qth quantile of Y is defined as the inverse function.
Q(□) = \text{invf} \{y: F(y) = \varpi \}, where 0 < \varpi < 1.

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

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

In general, the \(\varpi\)th sample quantile \(\hat{Q}(\cdot)\), which is the equivalent of \(Q(\cdot)\), may be formulated as the solution of the optimization problem.

\[
\min_{\zeta \in \mathbb{R}} \sum_{i=1}^{n} \rho_{\varpi}(y_i - \zeta)
\]

where \(\rho_{\varpi}(z) = z(\varpi - I(z < 0), 0 < \varpi < 1. I(\cdot)\) denotes the indicator function.

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

\[
\hat{\beta}(\varpi) = \arg \min_{\beta \in \mathbb{R}} \rho \sum_{i=1}^{n} \rho_{\varpi}(y_i - \zeta) \text{ for any quantile } \varpi \in (0, 1).
\]

The quantity \(\hat{\beta}(\varpi)\) is called the \(\varpi\)th regression quantile. The case \(\varpi = 1/2\), which minimizes the sum of absolute residuals, corresponds to median regression [31].

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:

\[
Q_T(Y \mid X = x) = x'\hat{\beta}(T), O < T < 1,
\]

where \(Y = \text{total farm income, } x = (X_1, \ldots, X_6)\) are the explanatory variables, \(\hat{\beta}(\)\) is the marginal change in the \(\varpi\)th quantile due to marginal change in \(x\).

\(Y = \text{Farm income (annual farm income measured in Naira)}\)

\(X_1 = \text{Educational level of household Head (Years of formal schooling)}\)

\(X_2 = \text{Age of Household Head (in years)}\)

\(X_3 = \text{Gender of household head (dummy, male =1, otherwise =0)}\)

\(X_4 = \text{Marital Status (dummy, 1 if couple, 0 = otherwise)}\)

\(X_5 = \text{Household size (number of persons in the household)}\)

\(X_6 = \text{Membership of cooperative organizations (Number of cooperative organizations which they subscribe to, 1, 2, \ldots..)}\)

\(X_7 = \text{Farm size in ha (total area of land farmed by household. The land could be located in urban, rural or peri-urban area)}\)

\(X_8 = \text{Establishment of new enterprises (if the household reinvest farm income in other non-farm enterprises = 1, otherwise = 0)}\)

In the analysis, annual farm income was the dependent variable, while socioeconomic and demographic characteristics (i.e. 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 comprehensive understand [32]. 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 [31]. 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.

**Binary Logistic Regression Model:** Investment decision is a dichotomous or binary dependent variable, with the option of either ‘to invest’ or ‘not’ [33]. Investment decisions determined the growth of the farmer’s earnings
Table 1: List, codes and description of variables used in the regression

<table>
<thead>
<tr>
<th>Variable</th>
<th>Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education (X₁)</td>
<td>Years</td>
<td>Continuous</td>
</tr>
<tr>
<td>Age of the head of household (X₂)</td>
<td>Years</td>
<td>Continuous</td>
</tr>
<tr>
<td>Gender (X₃)</td>
<td>Male=1, Female=0</td>
<td>Dummy</td>
</tr>
<tr>
<td>Marital Status (X₄)</td>
<td>Couple = 1, single = 0</td>
<td>Dummy</td>
</tr>
<tr>
<td>Household size (X₅)</td>
<td>Number of people</td>
<td>Continuous</td>
</tr>
<tr>
<td>Membership of cooperatives (X₆)</td>
<td>Number of cooperative organizations</td>
<td>Continuous</td>
</tr>
<tr>
<td>Farm Size (X₇)</td>
<td>Hectares</td>
<td>Continuous</td>
</tr>
<tr>
<td>Farm income (X₈)</td>
<td>Amount (Naira/year)</td>
<td>Continuous</td>
</tr>
<tr>
<td>Establishment of New enterprises (X₉)</td>
<td>If yes =1, otherwise = 0</td>
<td>Dummy</td>
</tr>
</tbody>
</table>

Source: Field survey, 2015

through his life-cycle paths in terms of both human and physical capital [34]. At the macro level, the decisions taken by many individual farmers were essential to the overall development of the agricultural sector and the economy as a whole, resulting in major policy implications.

Binary logistic regression was considered to be the appropriate analytical tool to estimate the factors influencing urban farm households’ decision to invest in new enterprises. Logit model have been widely used in order to explore the factors affecting farmers’ decision in adoption studies by Feeder et al. [34], Rogers [35] and Ullah et al. [36]. In order to facilitate analysis of the data, a value of 1.00 was assigned to the farm households that invested their farm profit in new enterprises and 0.00 to those that did not invest. The parameters of the model were estimated with the maximum likelihood estimation technique. The logit specification then provides a model of observing the probability of a farmer investing in new enterprise (s). The model is specified explicitly as follows:

\[ Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \varepsilon \]

where,
- \( Y_i \) = Investment in new enterprises
- \( \beta_0 \) = intercept
- \( \beta_i \) = the coefficients error term
- \( X_1 \) = Level of Educational attainment (Years)
- \( X_2 \) = Age of the household head (Years)
- \( X_3 \) = Gender (Dummy, takes the value 1 if male and 0 otherwise)
- \( X_4 \) = Marital Status (Dummy, takes the value 1 if couple and 0 otherwise)
- \( X_5 \) = Household size (number)
- \( X_6 \) = Membership of cooperative organizations (Number of cooperative organizations which they subscribe to, 1, 2……)

Table 2 shows the summary statistics of explanatory variables. The data presented in Table 2 showed that the mean annual farm income was about N 350435.7, suggesting that the farmers made a monthly income of about N 29, 205, an indication that the monthly income from urban farming in the area is greater than the present minimum wage of N 18, 500.00 in Nigeria. The mean educational level of about 14 years of formal schooling shows that an average farmer in the area had at least secondary education. The mean age of about 44 years, showed that the farmers were in their active and productive age. The mean household size and farm size were about 5 persons and 0.85 hectares, respectively. This implies that, the household size was in-line with the recommended household size in Nigeria; while the land size indicates that they were basically small-scale farmers.

**RESULTS AND DISCUSSION**

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**The Summary Statistics of Some Explanatory Variables:**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm income</td>
<td>350453.7</td>
<td>207739.6</td>
<td>400000</td>
<td>950000</td>
</tr>
<tr>
<td>Education</td>
<td>13.78</td>
<td>3.75938</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>Age</td>
<td>43.78</td>
<td>8.46213</td>
<td>30</td>
<td>65</td>
</tr>
<tr>
<td>Household size</td>
<td>5.38</td>
<td>2.36464</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>Membership of org.</td>
<td>0.8804</td>
<td>0.77788</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Farm size</td>
<td>0.8468</td>
<td>0.53034</td>
<td>0.33</td>
<td>1.02</td>
</tr>
<tr>
<td>Establishment of new enterprises</td>
<td>.58042</td>
<td>.4955</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>No of household that established</td>
<td>58</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>new enterprises otherwise</td>
<td>42</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Field survey, 2015
Quantile Regression Estimates of the Determinants of Farm Income among Urban Farm Households in Akwa Ibom State: The factors that determine the level of farm income among urban farm households were analyzed using simultaneous quantile regression. Table 3 displays the estimation results of the quantile regression at 10th, 25th, 50th and 75th quantiles, as well as the ordinary least square results (OLS). The first four columns show the quantile regression results and as a comparison, the last column is the OLS results.

The parameter of educational level had a positive relationship with farm income across all quantiles. Interestingly, educational attainment was statistically significant (P<0.01) at higher income quantile (75th quantile) and at mean (P< 0.10). The implication of this is that higher educational attainment increases income. Perhaps, because highly educated household heads will be more knowledgeable on the best techniques of improving farm productivity. This could also increase farm income. Okon et al. [4] observed that educational level affects the level of exposure to new ideas and managerial capacity in production, hence, increasing productivity.

Age was positively correlated with farm income and was statistically significant (p <0.10 and p < 0.05, respectively) at the 25th and 50th quantiles. This finding stresses that farm income increases with age, but at a significantly decreasing rate for households with median or lower income quantiles. 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 (65 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 [37]. This finding also supports the role of age in resource ownership [38].

The coefficient of gender and marital status were both negative and not statistically significant, while the coefficient of household size had a positive relationship with farm income across all quantiles, but was not statistically significant. The Parameter of membership of cooperatives has economic implication on the household income. A positive and significant coefficient of the membership of organizations on households’ income is an indication that number of social organizations in which the household heads belongs could increase their income status. The analysis shows that, membership of organizations had a positive effect on farm income as income quantiles increases (25th, 50th and 75th) and at mean level. This could mean that the more organizations the household heads participate, the greater their income level.

The coefficient of farm size was positive and statistically significant at the highest income quantile (75th). This means that increasing farm size increases farm income. It could also mean that as farm income increases, household will be financially strong to purchase additional portion of land for agricultural production, which could led to increased farm income. This also translates to economies of scale.

The parameter establishing new enterprises had a positive and significant relationship with farm income at higher income quantiles (25th, 50th and 75th) and also at mean. This finding stresses the important of enterprise diversification on farm income. The implication of this finding is that when farm households invest on new enterprises, there is every indication that the income from new enterprises will be used to purchase new farm inputs and technology to boost production volume, which thereby increases farm income. Martey et al. [39] also had similar findings. In addition, Matshe and Young [40] observed that non-farm income has positive spin-offs in agricultural performance by providing cash for productivity, enhancing inputs, thus easing credit constraints.

The Relationship Between Establishment And/or Investing in New Enterprises and Socio-economic Characteristics of Urban Farmers in Akwa Ibom State: The maximum likelihood estimates of the parameters in the binary logistic regression model characterizing the behavior of urban farmers towards the establishing new enterprises are shown in Table 4. The results showed that most of the explanatory variables were statistically significant at the one percent level except for a few, which are discussed below. The Chi-square results show that likelihood ratio statistics are highly significant (P< 0.001) suggesting the model has a strong explanatory power. The pseudo R^2 value of the model was 0.7321. Thus the explanatory variables used in the model are collectively able to predict about 73 % of the variations in establishing new enterprises. However, the parameter estimates of the binary logit model provide only the direction of the effect of the independent variables on the dependent (response) variable: estimates do not represent actual magnitude of change or probabilities. In order to derive the magnitude of the impact of the independent variables on the probability of establishing new enterprises, the marginal
Table 3: Results of quantile regression and OLS for the determinants of farm income among the respondents

<table>
<thead>
<tr>
<th>Methods</th>
<th>Simultaneous Quantile Regression (SQR)</th>
<th></th>
<th></th>
<th></th>
<th>OLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable Name/Coefficient (Std Error)</td>
<td>0.10</td>
<td>0.25</td>
<td>0.50</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>33694.18 (144910.7)</td>
<td>-3142.81 (153040.7)</td>
<td>-75109.45 (223704.5)</td>
<td>-350906.7 (400057.8)</td>
<td>-576061.2 (376903.1)</td>
</tr>
<tr>
<td>Education (Years of Schooling)</td>
<td>2363.437 (7603.151)</td>
<td>1166.432 (6524.892)</td>
<td>9162.306 (11233.76)</td>
<td>31524.93*** (12910.92)</td>
<td>32360.72* (16727.08)</td>
</tr>
<tr>
<td>Age (in years)</td>
<td>2575.947 (3183.451)</td>
<td>5426.528* (4215.519)</td>
<td>6611.25** (4864.999)</td>
<td>5685.781 (4306.255)</td>
<td>86696.39</td>
</tr>
<tr>
<td>Gender</td>
<td>-72201.81 (43539.68)</td>
<td>-61488.83 (43777.19)</td>
<td>-17676.95 (60990.75)</td>
<td>5661.781 (87513.02)</td>
<td>-80011.69</td>
</tr>
<tr>
<td>Marital status</td>
<td>-7737.921 (67428.75)</td>
<td>-52418.37 (69339.69)</td>
<td>-25599.53 (66577.73)</td>
<td>14278.02 (134804.7)</td>
<td>143067.7</td>
</tr>
<tr>
<td>Household size</td>
<td>5266.934 (6678.752)</td>
<td>2178.57 (9373.423)</td>
<td>-4093.408 (12224.21)</td>
<td>14278.02 (30747.03)</td>
<td>14167.39</td>
</tr>
<tr>
<td>Membership cooperatives</td>
<td>36257.5 (45777.02)</td>
<td>103755.9** (44461.66)</td>
<td>67002.74* (35965.28)</td>
<td>188594.9*** (72865.24)</td>
<td>141765.3*</td>
</tr>
<tr>
<td>Farm size</td>
<td>1546.392 (36961.21)</td>
<td>51486.34 (49656.86)</td>
<td>22663.39 (79077.76)</td>
<td>211265.6** (96204.84)</td>
<td>140818.4</td>
</tr>
<tr>
<td>Est Enterprise</td>
<td>56268.88 (94914.96)</td>
<td>166274** (77409.44)</td>
<td>245474.8*** (67256.47)</td>
<td>278830.4** (127941.3)</td>
<td>369999.5***</td>
</tr>
</tbody>
</table>

Pseudo R² = 0.23912
Probability F (3.57) = 0.0012***

Source: Field survey, 2015

Note: *, ** and *** denote significant at 10%, 5% and 1% levels, respectively. Standard errors (in parentheses) are bootstrap estimates based on 100 replications of the design matrix.

Table 4: Binary logistic estimates of the effects of socio-economic characteristics on establishing and/or investing new enterprises by urban farmers

<table>
<thead>
<tr>
<th>Explanatory variables</th>
<th>Coefficient/std. error</th>
<th>Z- values</th>
<th>Marginal effects (dy/dx)</th>
<th>Std error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-14.42267 (6.594572)</td>
<td>-2.19**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education (X₁)</td>
<td>0.96556 (0.32344)</td>
<td>2.99***</td>
<td>0.13999**</td>
<td>0.05695</td>
</tr>
<tr>
<td>Age (X₂)</td>
<td>-0.110504 (1.128699)</td>
<td>-1.93*</td>
<td>-0.01602*</td>
<td>0.0089</td>
</tr>
<tr>
<td>Gender (X₃)</td>
<td>2.400194 (1.35506)</td>
<td>1.77*</td>
<td>0.451374*</td>
<td>0.29708</td>
</tr>
<tr>
<td>Marital status (X₄)</td>
<td>1.166956 (1.51331)</td>
<td>0.77</td>
<td>0.214581</td>
<td>0.32423</td>
</tr>
<tr>
<td>Household size(X₅)</td>
<td>-0.86709 (0.32003)</td>
<td>-2.71***</td>
<td>-0.12572**</td>
<td>0.0361</td>
</tr>
<tr>
<td>Membership Cooperatives (X₆)</td>
<td>3.21189 (0.96452)</td>
<td>3.36***</td>
<td>0.46569 ***</td>
<td>0.17212</td>
</tr>
<tr>
<td>Farm size (X₇)</td>
<td>0.412973 (0.795219)</td>
<td>0.52</td>
<td>0.05988</td>
<td>0.11656</td>
</tr>
<tr>
<td>Farm income (X₈)</td>
<td>0.000013 (4.80e-06)</td>
<td>2.68***</td>
<td>1.87e-06***</td>
<td>0.00000</td>
</tr>
</tbody>
</table>

Log likelihood ratio = -18.22621
LR Chi² = 99.612
Pseudo R² = 0.7321

Number of observations = 100

*** = Significant at 1 % level of Probability
** = Significant at 5 % level of Probability
* = Significant at 10 % level of Probability

(*) dy/dx is for discrete change of dummy variable from 0 to 1.

Source: Calculations from field survey data, 2015

The coefficient of education (X₁) was positive and statistically significant (P<0.01). The marginal effects suggest that a one year increase in educational level of the household head raises the probability of establishing new enterprises by 1.4 percent. This implies that the educated farmers are more likely to invest in new enterprise as a way of diversifying their income sources.

The coefficient of age (X₂) was negative and statistically significant (p< 0.10). The marginal effects with respect to age indicated that a unit increase in age of the

Effect which measures the expected change in an independent variable were estimated and discussed. In Table 3, the last two columns present the marginal effects. The results show that the coefficient of level of education (X₁) was positive and statistically significant (P<0.01). The marginal effects suggest that a one year increase in educational level of the household head raises the probability of establishing new enterprises by 1.4 percent. This implies that the educated farmers are more likely to invest in new enterprise as a way of diversifying their income sources.

The coefficient of age (X₂) was negative and statistically significant (p< 0.10). The marginal effects with respect to age indicated that a unit increase in age of the
household head will reduce the likelihood of establishing new enterprises by about 0.2 percent. A plausible explanation to this is that as the farmer advance in age, the intensity of investing in new enterprises reduced. Also, the tempo of farm activities and the level of total investment dropped with increase in age, perhaps because older people may not be willing to invest in new enterprises.

Conversely, the coefficient of gender (X₁) was positive and statistically significant (p<0.010). The marginal effects suggest that men were 4.5 times more likely to establish new enterprises as compared with women. The coefficient of marital status (X₂) was positive but not statistically significant. Household size (X₃) had a negative but statistically significant (P<0.01) coefficient. This implies that households with more number of persons are not likely to establish new enterprises. More specifically, the probability of establishing new enterprises reduces with increase in household size. Perhaps, bigger household size means increase in consumption expenditure which in turns decreases investment. The marginal effects show that a unit increase in household size reduces the probability of investing in new enterprises by 1.2%. Farm size (X₄) had positive but not significant coefficient. The coefficient of farm income (X₅) and membership of cooperative (X₆) were both positive and statistically significant (p<0.01). The marginal effects showed that a unit increase in farm income and being a member of one additional organization will increase the likelihood of investing in new enterprises by 0.5 percent and 4.6 percent, respectively. A plausible explanation to these findings is that belonging to many organizations could increase households’ income, hence increasing the likelihood of investing in many enterprises.

Conclusion and Policy Implications: Investment in new enterprises will contribute to reducing the riskiness of income stream facing urban farm households. This paper explores the socio-economic factors influencing variations in farm income as well as factors that determine investment decisions among urban farm households in Akwa Ibom State, Nigeria. The quantile regression approach enables the analysis of income determinants for extreme categories such as low income households. Result showed that coefficients estimated through ordinary least squares (OLS) could be misleading. The quantiles estimates preserve their signs in most cases but their magnitude varies across quantiles. Socio-economic factors such as, educational level, Age of household heads, membership of organization, farm size and the establishment of new enterprises were the major determinants of farm income in the study area. In addition, the probability of establishing new enterprises increases with increase in educational level of the household heads. Also, male headed households who were members of more than one social organization and/or were in a higher income quantile were more likely to establish new enterprises. Conversely, the probability of establishing new enterprises reduces with increase in age of household heads and household sizes.

The policy implication drawn from these findings is that since educational attainment led to increase in income and investment in new enterprises, policy trust aimed at investment in education is likely to increase household income. Also, farmers participating in more than one cooperative organization made more income; encouraging farmers to form and/or belong to many co-operative organizations is also likely to increase their income level, hence, reducing poverty and food insecurity problems in the area. Finally, most farm households have good track records of success in investments; identification of these households for financial support is likely to reduce their vulnerability to income shock.

REFERENCES


